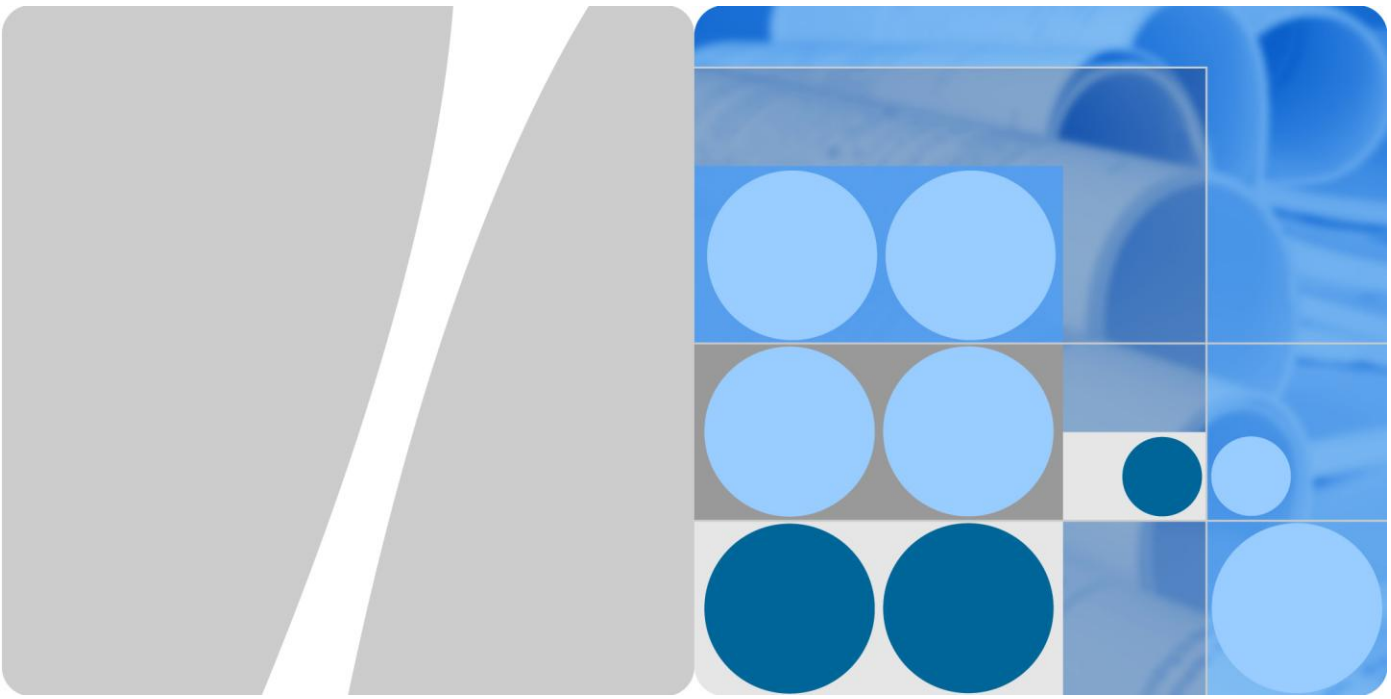

ETP48400-C6A3
V500R001
User Manual

Issue 02

Date 2015-06-30

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About This Document

Purpose

This document describes the DC power system in terms of product overview, components, installation, commissioning, and maintenance. This document also describes operations for the site monitoring unit (SMU) and rectifiers.

The 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 an imminently hazardous situation which, if not avoided, will result in death or serious injury.
WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION	Indicates a potentially hazardous situation which, if not avoided, may 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	Calls attention to important information, best practices and tips. 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 02 (2015-06-30)

Modified all structural diagrams in the document.

Issue 01 (2015-02-15)

This issue is the first official release.

Contents

1 Safety Precautions

1.1 General Safety Precautions

- Ensure that the product is used in environments that meet its design specifications to avoid damaging components and voiding the warranty.
- Ensure that only trained and qualified personnel install, operate, and maintain Huawei equipment.
- Comply with local laws and regulations. The safety instructions in this document are only supplements to local laws and regulations.
- Do not operate the device or cables during thunderstorms.
- Remove metal objects such as watches, bracelets, and rings when using the product.
- Use insulated tools on the product.
- Follow specified procedures during installation and maintenance.
- Measure contact point voltage with an electric meter before touching a conductor surface or terminal. Ensure that the contact point has no voltage or it is within the specified range.
- Note that the load may power off during maintenance or fault location if the power system is not connected to a battery or if battery capacity is insufficient.
- Store cables for at least 24 hours at room temperature before laying out them if they were previously stored at sub-0 ℃.
- Routinely check installed equipment and perform maintenance according to the user manual; replace faulty components quickly to ensure that the device works properly.

1.2 Electrical Safety

Grounding Requirements

- When installing a device, install the ground cable first. When removing a device, remove the ground cable last.
- Before operating a device, ensure that the device is properly grounded.

AC and DC Operation Requirements

DANGER

- The power system is powered by high-voltage power sources. Direct or indirect contact (through damp objects) with high-voltage power sources may result in serious danger.
- Non-standard and improper operations may result in fire and electric shocks.

- Before electrical connections, turn off the upstream protection switch for the device.
- Before connecting the AC power supply, ensure that electrical connections are complete.
- Before you connect cables to loads or battery cables, check cable and terminal polarities, preventing reverse connections.

ESD Requirements

- To prevent electrostatic-sensitive components from being damaged by the static on human bodies, wear a well-grounded ESD wrist strap or gloves when touching circuit boards.
- When holding a board, hold its edge without components. Do not touch chips.
- Removed boards must be packaged with ESD packaging materials before storage and transportation.

Liquid Prevention Requirements

- Place this product far away from areas with liquid. Do not place the product under positions prone to leakage, such as air conditioner vents, ventilation vents, and feeder windows of the equipment room. Prevent liquid from entering the inside of the device to avoid short circuits, and ensure that there is no condensation inside the equipment room or device.
- If detecting any liquid inside the device, immediately disconnect the power supply and contact the administrator.

1.3 Battery Safety

Before installing, operating, and maintaining batteries, read the instructions provided by the battery vendor. The safety precautions in this document are for special attention. For more safety precautions, see the instructions provided by the battery vendor.

Basic Requirements

- Before installation and maintenance, wear goggles, rubber gloves, and protective clothes to prevent injury caused by electrolyte overflow.
- When handling a battery, ensure that its electrodes are upward. Leaning or reversing batteries is prohibited.
- Keep the battery loop disconnected during installation and maintenance.
- Secure battery cables to a torque specified in battery documentation. Loose connections will result in excessive voltage drop or cause batteries to burn out when the current is large.

Preventing Battery Short Circuit

DANGER

Short circuits will generate high transient currents and release a great deal of energy, which may cause personal injury.

If conditions permit, disconnect the batteries in use before performing any other operations.

Preventing Flammable Gas

NOTICE

- Do not use unsealed lead-acid batteries.
- Place and secure lead-acid batteries horizontally to prevent device inflammation or corrosion due to flammable gas emitted from batteries.

Lead-acid batteries in use emit flammable gas. Therefore, store the batteries in a place with good ventilation, and take measures against fire.

Preventing Battery Leakage

NOTICE

High temperatures may result in battery distortion, damage, and electrolyte overflow.

When the battery temperature is higher than 60 ℃, check the battery for electrolyte overflow. If the electrolyte overflows, absorb and counteract the electrolyte immediately. When moving or handling a battery whose electrolyte leaks, exercise caution because the leaking electrolyte may hurt human bodies. When you find electrolyte leaks, use sodium bicarbonate ($NaHCO_3$) or sodium carbonate (Na_2CO_3) to counteract and absorb the leaking electrolyte.

Preventing Battery Overdischarge

After you connect batteries, ensure that the battery fuse is disconnected or the circuit breaker is OFF before powering on the power system. This prevents battery overdischarge, which damages batteries.

1.4 Cable Layout

- When cables are used in a high temperature environment, the insulation layer may age and be damaged. Ensure that a sufficient distance exists between the cables and the DC busbar, shunt, and fuse.

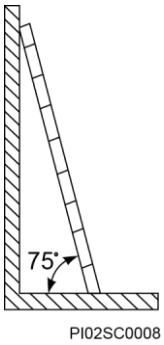
- Signal cables must be bound separately from strong-current cables and high-voltage cables.
- Cables prepared by the customer must have the fire resistance capability.
- Cables must not pass behind the air exhaust vents of rectifiers in the cabinet.

1.5 Mechanical Safety

Using a Ladder

- Before using a ladder, ensure that the ladder is intact. Check the weight bearing capacity of the ladder. Do not overload the ladder.
- The recommended gradient of a ladder is 75 degrees. You can measure the gradient with a right square or your arms, as shown in Figure 1-1. When using a ladder, ensure that the wider feet of the ladder are downward, or take protection measures for the ladder feet to prevent the ladder from sliding. Ensure that the ladder is placed securely.

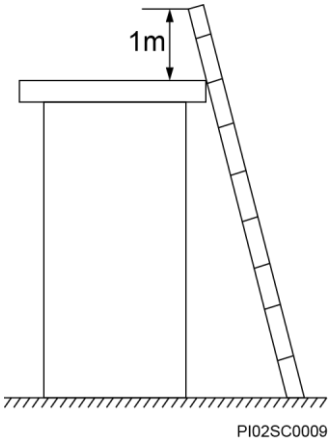
Figure 1-1 Proper angle of a ladder



- When climbing a ladder, observe the following precautions:
  - Ensure that the center of gravity of your body does not deviate from the edges of the two long sides.
  - To minimize the risk of falling, hold your balance on the ladder before any operation.
  - Do not climb higher than the fourth rung of the ladder (counted from up to down).

If you want to climb up a roof, ensure that the ladder top is at least one meter higher than the roof, as shown in Figure 1-2.

Figure 1-2 One meter higher than the roof



Drilling Holes

NOTICE

Do not drill holes on the subrack without permission. Non-standard drilling may affect electromagnetic shielding performance of the subrackand damage the internal cables, and metal scraps generated during drilling may short-circuit a circuit board.

- Before drilling holes on the subrack, remove the cables inside the rack.
- Wear goggles and protective gloves when drilling holes.
- After drilling, clean up metal shavings.

Moving Heavy Objects

- Be careful to prevent injury when moving heavy objects.
- Wear protective gloves when moving sharp objects.

2 Overview

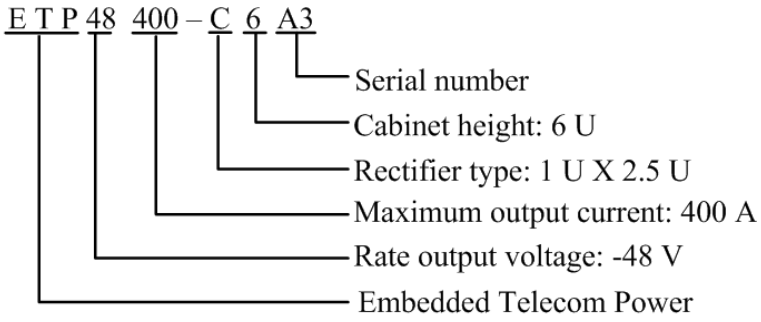
2.1 Introduction

ETP48400-C6A3 is embedded telecom power system that supplies power to -48 V DC communications equipment with a maximum current of 400 A.

2.2 Model Number Description

Figure 2-1 shows the model number description for the ETP48400-C6A3.

Figure 2-1 Model number description for the ETP48400-C6A3



2.3 Features

- Wide voltage range of 85–300 V AC in the case of 220 V AC input.
- Wide voltage range of 58–150 V DC in the case of solar power input.
- Comprehensive battery management.
- Network application over a fast Ethernet (FE) port and an RS485/RS232 port.
- Communication with Huawei NetEco or third-party network management systems (NMSs) over protocols such as the Simple Network Management Protocol (SNMP) and Hypertext Transfer Protocol Secure (HTTPS) to enable remote management and unattended working.

- Remote software upgrade.
- Liquid crystal display (LCD) for display and operations.
- Web user interface (WebUI) for display and operations.
- Display in multiple optional languages, such as English, Chinese, Italian, French, Spanish, Portuguese, Russian, German, and Turkish.
- Hot-swappable rectifiers, site monitoring units (SMUs), and solar supply units (SSUs).
- Rectifier power factor up to 0.99.
- Super-high-efficiency rectifier with a maximum efficiency of 98%, high-efficiency rectifier with a maximum efficiency of 96%, and standard-efficiency rectifier with a maximum efficiency of 94%.
- SSU efficiency up to 98.5%.

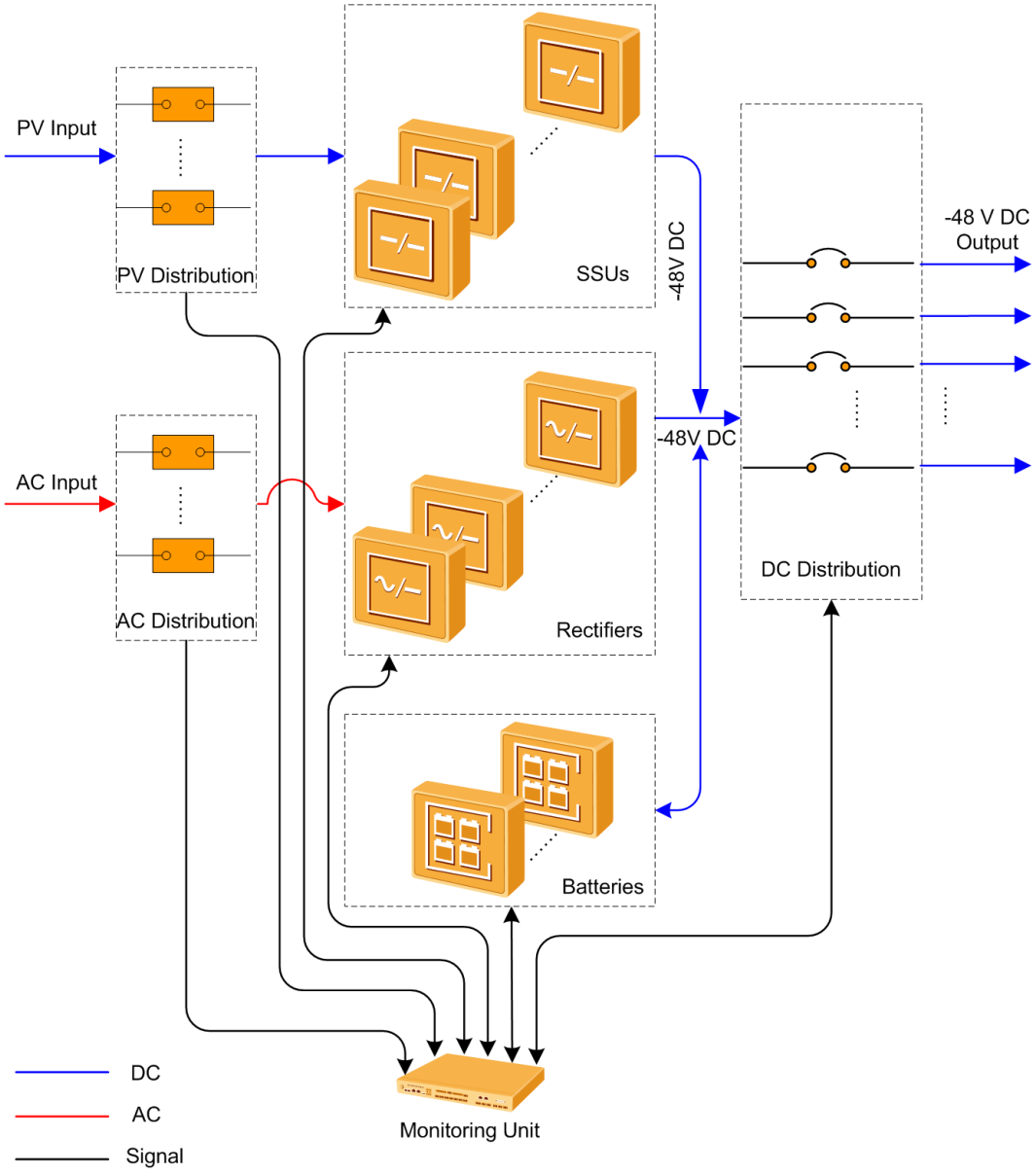
2.4 Working Principle

Figure 2-2 shows the working principle of the power system. The solar power enters SSU over the PVDU and the SSU converts the DC power into –48 V DC power. The AC power enters the rectifiers over the ACDUs and the rectifiers convert the AC power into –48 V DC power. The priority sequences for power supply are as follow: solar power, mains, and batteries.

- If the sun exposure is sufficient, the solar power supplies power to loads and charges batteries.
- If the sun exposure is insufficient, the solar power system and the mains supply power to loads and charge batteries.
- If no sun exposure is available, the mains supplies power to loads and charges batteries.
- If neither sun exposure nor mains is available, batteries supply power to loads.

The SMU monitors the operating status of each component in the power system in real time and performs appropriate intelligent control operations. If any abnormal cases occur, the SMU reports the alarm signals.

Figure 2-2 Working principle of the power system



2.5 System Configurations

Table 2-1 describes ETP48400-C6A3 configurations.

Table 2-1 ETP48400-C6A3 configurations

Item	System Configuration
Application environment	Indoor Class B
Subrack	• 3 U power distribution space

Item	System Configuration
	• 1 U SMU space • 2 U rectifier and SSU space
Power distribution unit (PDU)	• Input power distribution: DC input circuit breaker and terminal for the SSU; AC input terminals for rectifiers • Output power distribution: battery low voltage disconnection (BLVD) route, load low voltage disconnection (LLVD) route, and battery route
SSU	One S4850G1
Rectifier	A maximum of seven R4850N2s, R4850G2s or R4850S1s
SMU	SMU02B
User interface module (UIM)	UIM02C
Surge protective device (SPD)	DC surge protection. Differential mode: 10 kA (8/20 μs); common mode: 20 kA (8/20 μs)

NOTE

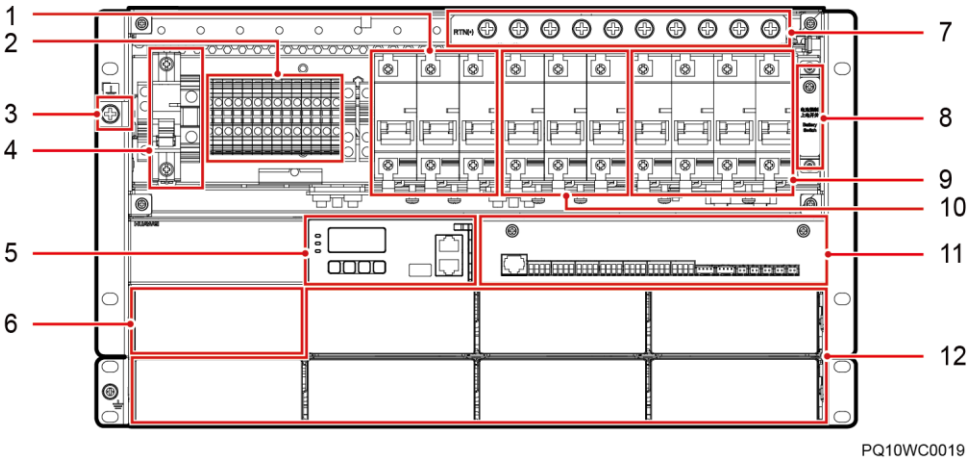
- Class B environments refer to indoor environments in which the ambient temperature and humidity are not controlled and outdoor environments (with simple shielding measures) where humidity sometime can occasionally reach 100%.
- Class C environments refer to sea environments or outdoor land environments (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 environments that are 500 m away from the sea. It is a specific scenario in Class C environments.

3 Components

3.1 Appearance

Figure 3-1 shows an ETP48400-C6A3.

Figure 3-1 ETP48400-C6A3 (without a cover)



(1) LLVD circuit breakers	(2) AC input terminals	(3) Ground screw
(4) PV input circuit breakers and terminals	(5) SMU02B	(6) Space for SSUs
(7) RTN+ busbar	(8) Battery switch (behind the cover)	(9) Battery circuit breaker
(10) BLVD circuit breakers	(11) UIM02C	(12) Space for rectifiers

NOTE

- The RTN+ busbar has been short-circuited with the subrack PE terminal before delivery.
- When you use this power system, configure the upstream AC switches and SPD.

3.2 PDU

Figure 3-2 shows the AC/DC PDU of the ETP48400-C6A3. Table 3-1 describes the power distribution specifications.

Figure 3-2 ETP48400-C6A3 AC/DC PDU

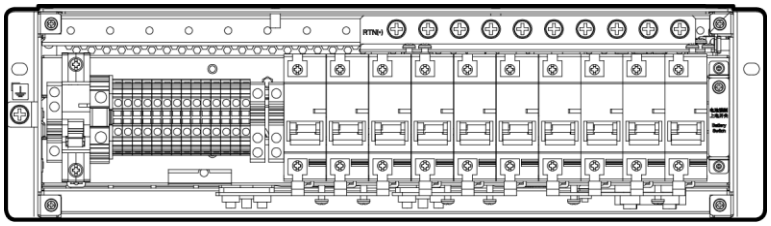


Table 3-1 Power distribution specifications

Item	Specifications
Input system	DC input (SSU); 220 V AC single-phase input (rectifier)
Input power distribution	• AC input: six UT-6 terminals • DC input: one 1-pole 63 A circuit breaker and one UT-16 terminal
Output power distribution	• BLVD route: three 1-pole 100 A circuit breakers • LLVD route: three 1-pole 100 A circuit breakers
Battery route	Four 1-pole 125 A circuit breakers

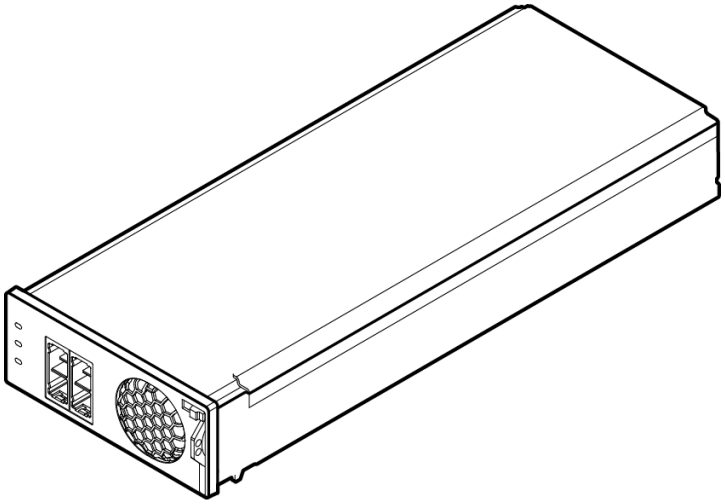
3.3 S4850G1

The S4850G1 converts the DC power into stable output and provides the function of maximum power point tracking (MPPT). The MPPT function adjusts the S4850G1 operating status and enables it to work at maximum power output.

Appearance

Figure 3-3 shows an S4850G1.

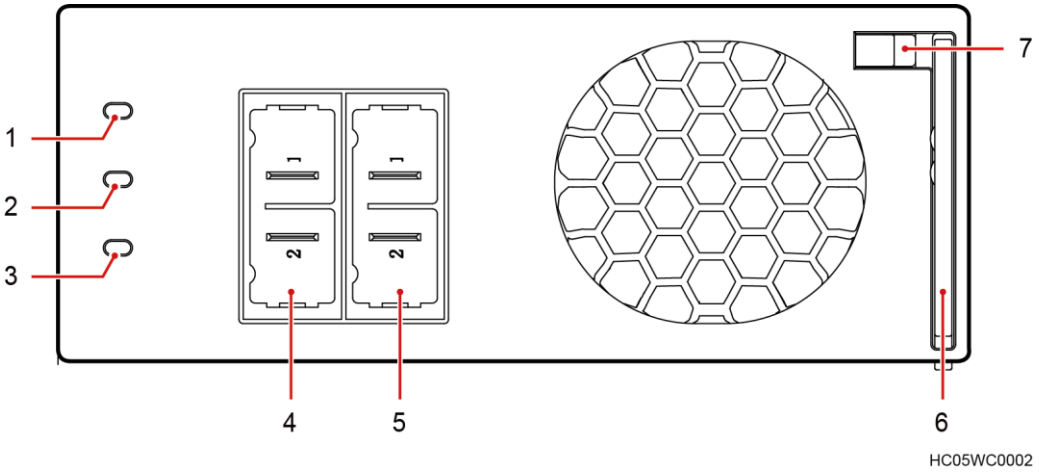
Figure 3-3 S4850G1



Panel

Figure 3-4 shows the S4850G1 panel.

Figure 3-4 S4850G1 panel



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

(4) PV positive input port (5) PV negative input port (6) Handle

(7) Locking latch

Indicators

Table 3-2 describes the indicators on the S4850G1.

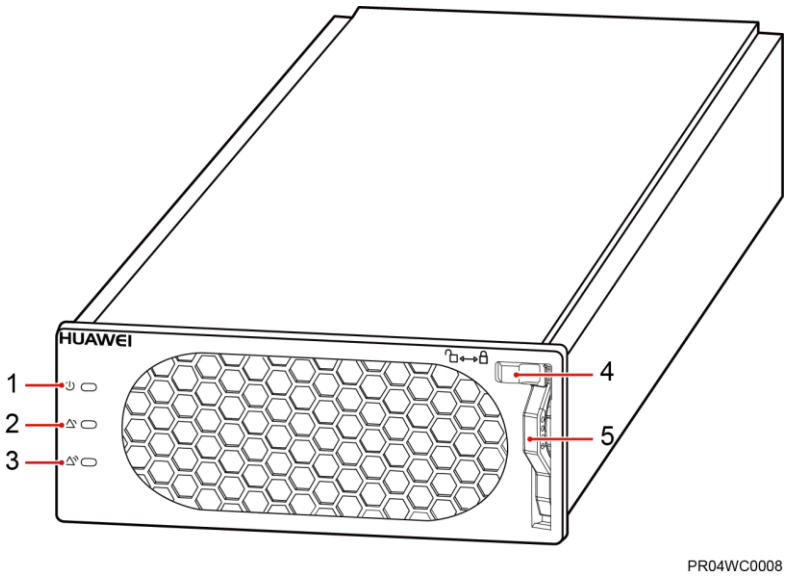
Table 3-2 Indicators on the S4850G1

Indicator	Color	Normal	Abnormal	Possible Cause
Power indicator	Green	Steady on	Off	There is no DC input.
				The input fuse is faulty.
			Blinking	The S4850G1 is being queried manually.
Alarm indicator	Yellow	Off	Steady on	The S4850G1 is experiencing overtemperature.
				Output overvoltage alarm
			Blinking	The communication between the S4850G1 and the external is interrupted.
Fault indicator	Red	Off	Steady on	The S4850G1 shuts down due to output overvoltage.
				Fan fault
				The S4850G1 shuts down due to overtemperature.
				The S4850G1 generates no output due to internal faults.
			Blinking	Software is being loaded.

3.4 Rectifier

Rectifiers convert AC input into stable DC output.

Figure 3-5 Rectifier



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

(4) Locking latch (5) Handle

Table 3-3 Rectifier indicators

Indicator	Color	Status	Description
Power indicator	Green	Steady on	The rectifier has an AC power input.
		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 is generated.
		Steady on	• The rectifier generates an alarm for power limiting due to ambient overtemperature. • The rectifier generates an alarm for shutdown due to ambient overtemperature or undertemperature.
			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.

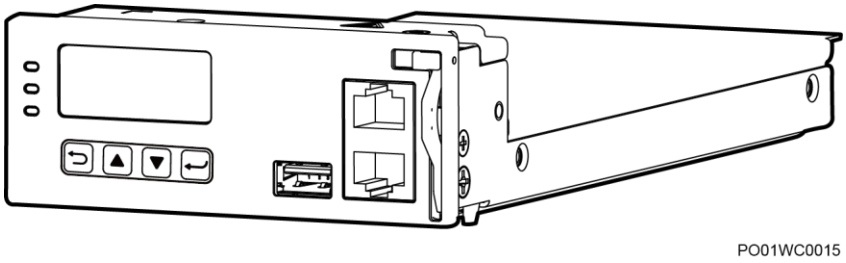
Indicator	Color	Status	Description
Fault indicator	Red	Off	The rectifier is running properly.
		Steady on	The rectifier locks out due to output overvoltage.
			The rectifier has no output due to an internal fault.

3.5 SMU02B

Appearance

Figure 3-6 shows an SMU02B.

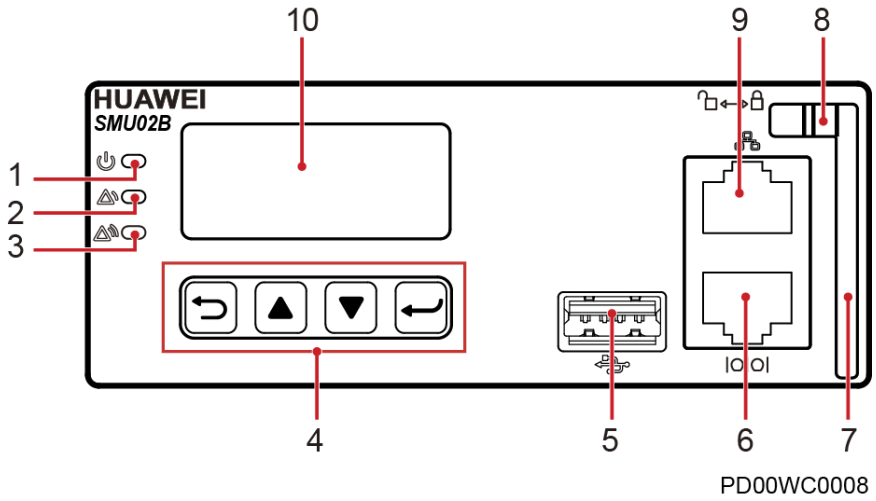
Figure 3-6 SMU02B appearance



Panel

Figure 3-7 shows an SMU02B panel.

Figure 3-7 SMU02B panel



(1) Run indicator	(2) Minor alarm indicator	(3) Major alarm indicator
(4) Buttons	(5) USB port (the port is protected by a security mechanism.)	(6) RS485/RS232 port
(7) Handle	(8) Locking latch	(9) FE port
(10) Liquid crystal display (LCD)		

Indicator

Table 3-4 describes the indicators on the SMU02B panel.

Table 3-4 SMU02B indicator description

Name	Color	Status	Description
Run indicator	Green	Off	The SMU is faulty or has no DC input.
		Blinking at 0.5 Hz	The SMU02B is running properly and communicating with the host properly.
		Blinking at 4 Hz	The SMU02B is running properly but is not communicating with the host properly.
Minor alarm indicator	Yellow	Off	The SMU does not generate any minor alarms.
		Steady on	The SMU generates a minor alarm.
Major alarm indicator	Red	Off	No critical or major alarm is generated.
		Steady on	A critical or major alarm is generated.

Button

Table 3-5 describes the buttons on the SMU02B panel.

Table 3-5 SMU02B button description

Button	Name	Description
▲	Up	Turns to the previous menu or sets parameter values. When setting parameter values, you can hold down ▲ to quickly adjust values.
▼	Down	Turns to the next menu or sets parameter values. When setting parameter values, you can hold down ▼ to quickly adjust values.
⮌	Back	Returns to the previous menu without saving the settings.
↵	Confirm	• Enters the main menu from the standby screen. • Enters a submenu from the main menu. • Saves the menu settings.

USB Port

You can insert a USB flash drive into the USB port to upgrade software, set up a site rapidly, and export configuration files and operating logs.

Communication Port

Table 3-6 describes the communication ports on the SMU02B panel.

Table 3-6 SMU02B communication port description

Communication Port	Communications Parameter	Communications Protocol	Function
FE port	10/100 M auto-adaptation	HTTPS, NetEco network management system (NMS), and simple network management protocol (SNMP) protocols	Connects to an upper-level NMS
RS485/RS232 port	Baud rate: 9600 bit/s, 19200 bit/s	NetEco NMS protocol	Connects to upper-level device such as BBU
NOTE All ports mentioned above support the security mechanism.			

Figure 3-8 Pins in the FE port and RS485/RS232 port

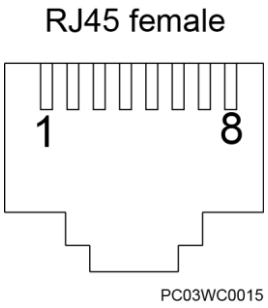


Table 3-7 Pin definitions for the FE port

Pin	Signal	Description
1	TX+	Sends data over FE.
2	TX-	
3	RX+	Receives data over FE.
6	RX-	
4, 5, 7, and 8	None	N/A.

Table 3-8 Pin definitions for the RS485/RS232 port

Pin	Signal	Description
1	TX+	Sends data over RS485.
2	TX-	
4	RX+	Receives data over RS485.
5	RX-	
3	RX232	Receives data over RS232.
7	TX232	Sends data over RS232.
6	PGND	Connects to the ground.
8	None	N/A.

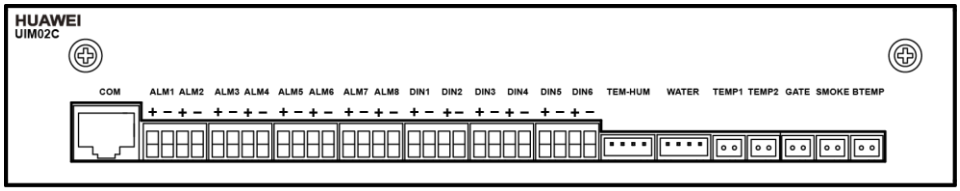
3.6 UIM02C

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 3-9 shows a UIM02C panel.

Figure 3-9 UIM02C panel



Ports

Table 3-9 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	

Port Type	Silk Screen	Description
Dry contact output ports	ALM1	**NOTE** 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 3-10 COM communication port description

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

Figure 3-10 Pins in the COM port

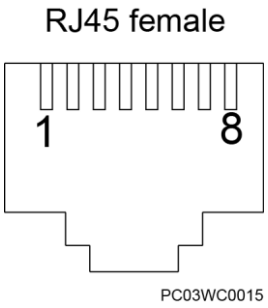


Table 3-11 Pin definitions for the COM port

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 3-11 shows the pin numbers of the sensor ports. Table 3-12 defines the pins.

Figure 3-11 UIM02C pin numbers

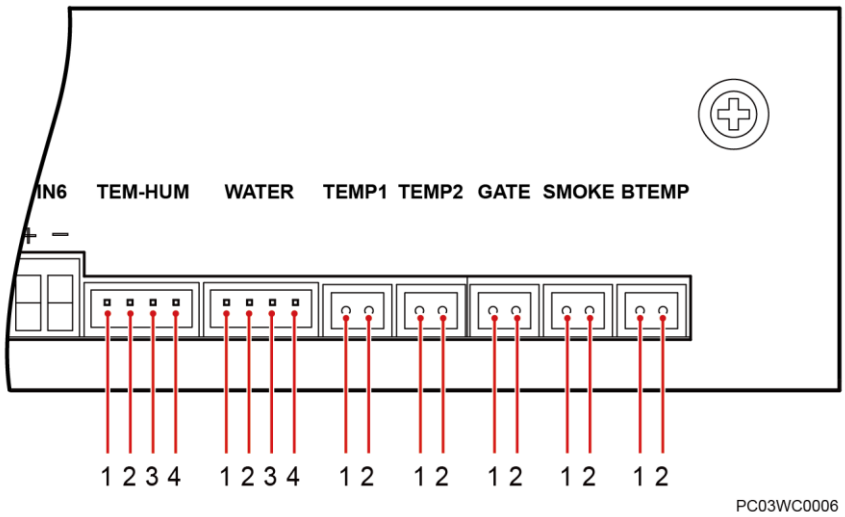


Table 3-12 UIM02C pin definitions

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

4 Installation

4.1 Installation Preparations

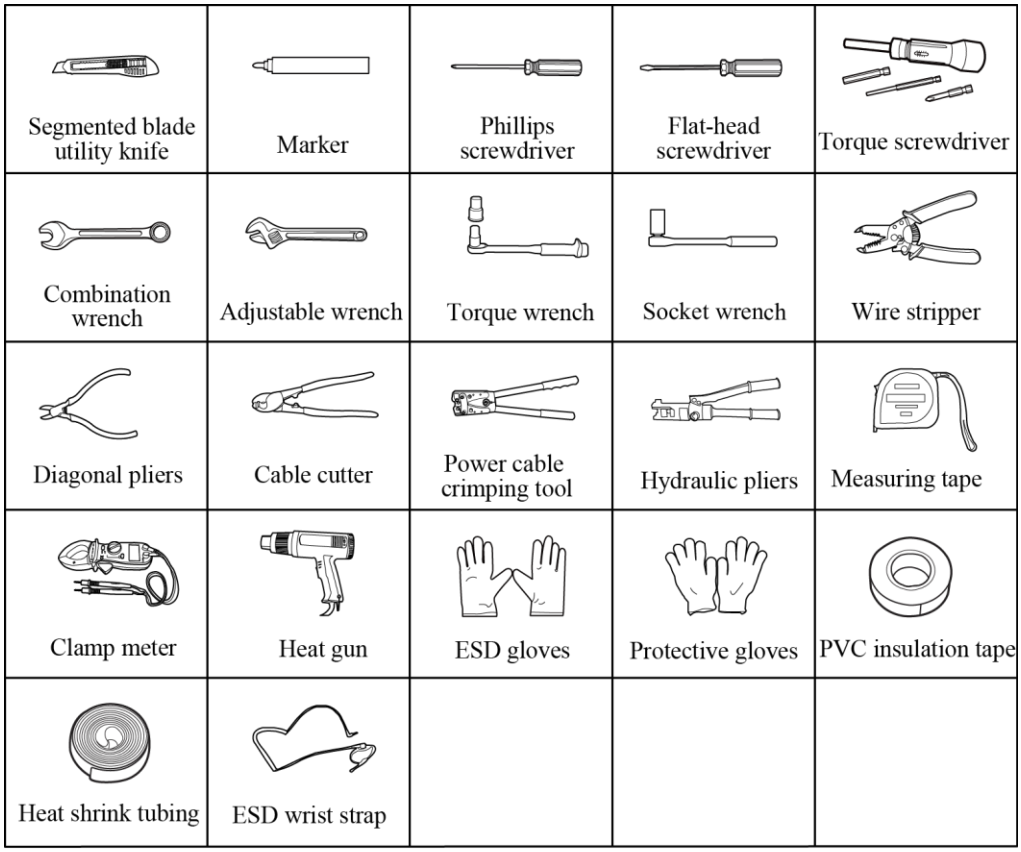
4.1.1 Tools

Figure 4-1 lists the tools required for the installation.

NOTICE

Use tools with insulated handles.

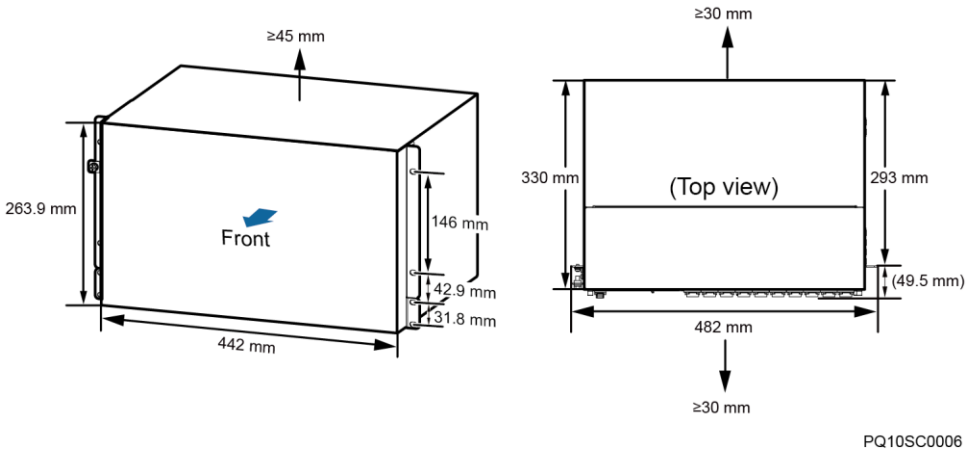
Figure 4-1 Installation tools



4.1.2 Installation Dimensions

Figure 4-2 shows the installation space requirements.

Figure 4-2 Installation space requirements



NOTE

(49.5 mm): indicates that the distance between the installation plane of power subrack mounting ear and the front of the subrack is about 49.5 mm.

4.1.3 Requirements for Cable Routing

- Cables should be more than 20 mm away from heat sources to prevent insulation layer damage (melting) or functional degradation (aging or breakage).
- The bending radius of cables should be at least five times the diameter of the cables.
- Cables of the same type should be bound together. Cables of different types should be a minimum of 30 mm from each other to avoid tangling.
- Cables that are bound together should be close to each other, tidy, and undamaged.
- Ground cables must not be bound to or tangled with signal cables. There should be an appropriate distance between them to minimize interruptions.
- AC power cables, DC power cables, signal cables, and communications cables must be bound separately.
- Power cables must be routed straight. No joints or welding should be performed on power cables. Use a longer cable if necessary.

4.1.4 Unpacking and Acceptance

Procedure

Step 1 Check whether the packing cases are intact. If a packing case is severely damaged or wet, identify the cause and report the issue to your local Huawei office.

Step 2 Unpack the cases.

Step 3 Check the quantity of components against the packing lists attached to the packing cases. If the quantity differs from that specified on the packing lists, identify the cause and report the issue to your local Huawei office.

----End

4.2 Installing a Subrack

Procedure

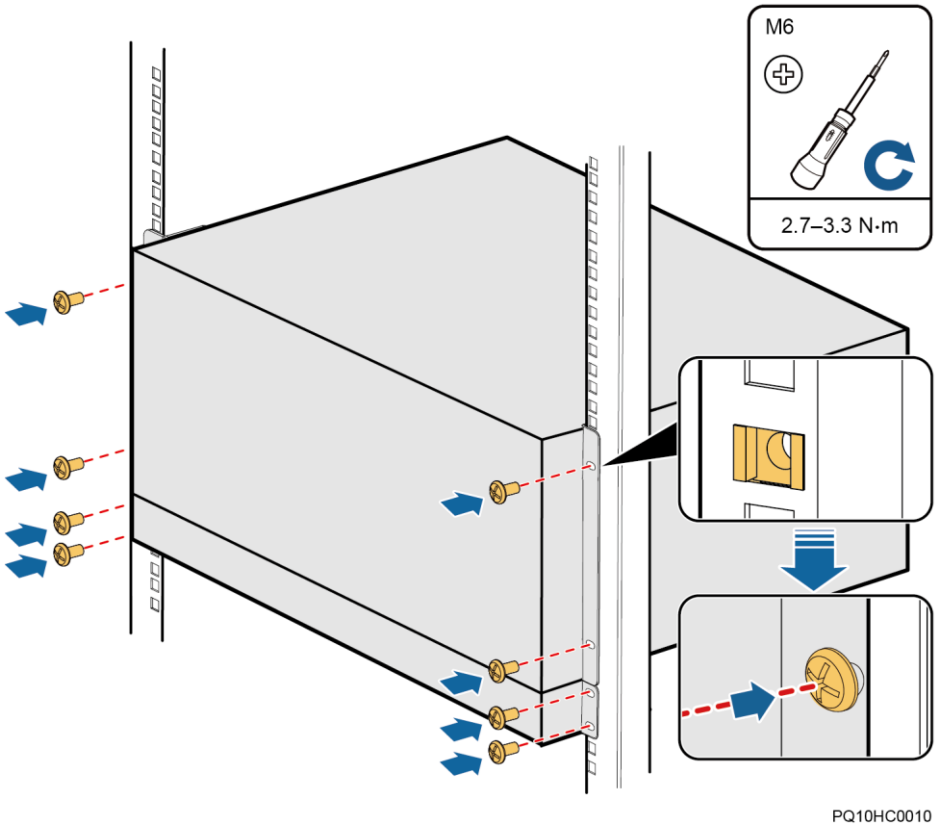
Step 1 Remove the protective panel from the left side of the subrack top based on the removal principle.

Step 2 Remove the front panel from the PDU, and locate the SSU input power cable bound to the front beam in the subrack.

Step 3 Route the input power cable through the epoxy board, and place the cable on the left of the subrack.

Step 4 Install the subrack in a 19-inch rack.

Figure 4-3 Installing a subrack



----End

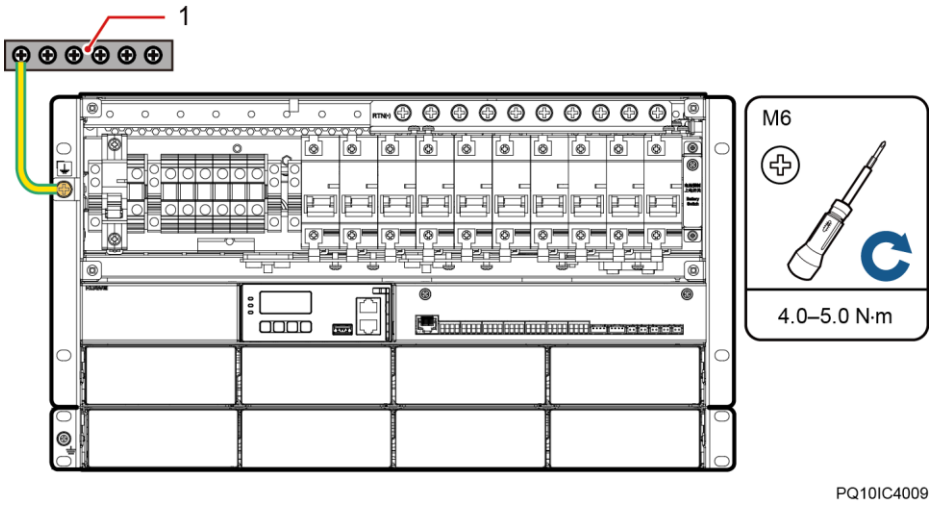
4.3 Installing a Ground Cable

Figure 4-4 shows how to install a ground cable.

CAUTION

Ensure that the ground cable is installed securely. Inappropriate grounding may cause device damage and even personal injury.

Figure 4-4 Installing a ground cable



(1) Ground bar

4.4 Installing Components

4.4.1 Installing a Rectifier

Prerequisites

- Rectifiers are found intact after unpacking and check. In case of any discrepancy, contact your local Huawei office.
- The filler panel is removed from the slot where you will install a rectifier.

NOTICE

- Do not put your hands into rectifier slots, avoiding electric shocks.
- When a rectifier is running, a high temperature is generated around the air exhaust vent at the rear. Do not touch the vent or cover the vent with cables or other objects.

Procedure

Step 1 Push the locking latch towards the left.

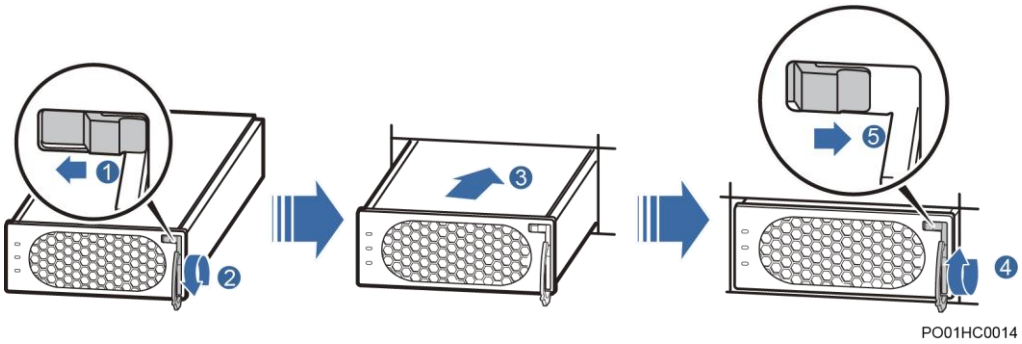
Step 2 Draw the handle downwards.

Step 3 Gently push a rectifier into its slot along the guide rail.

Step 4 Push the handle upwards.

Step 5 Push the locking latch towards the right to secure the handle.

Figure 4-5 Installing a rectifier



----End

4.4.2 Installing an SSU

Prerequisites

- SSUs are found intact after unpacking and check. In case of any discrepancy, contact your local Huawei office.
- The filler panels on the slot for installing the SSUs have been removed from the cabinet.

NOTICE

- Do not put your hands into SSU slots, avoiding electric shocks.
- When an SSU is running, a high temperature is generated around the air exhaust vent at the rear. Do not touch the vent or cover the vent with cables or other objects.

Procedure

Step 1 Push the locking latch towards the left.

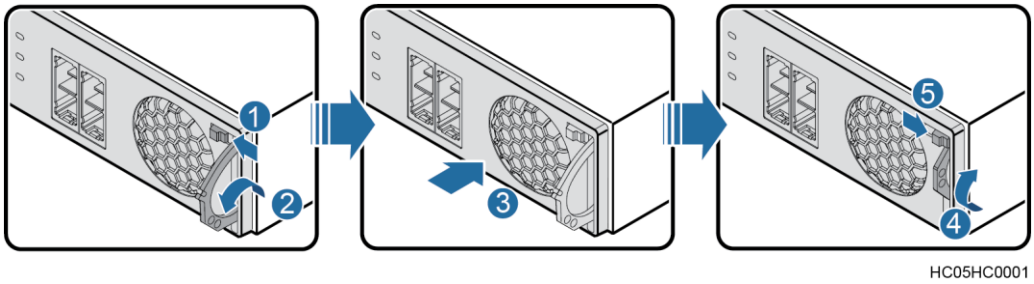
Step 2 Draw the handle downwards.

Step 3 Gently push an SSU into its slot along the guide rail.

Step 4 Push the handle upwards.

Step 5 Push the locking latch towards the right to secure the handle.

Figure 4-6 Installing an SSU



----End

4.5 (Optional) Installing Dry Contact Signal Cables

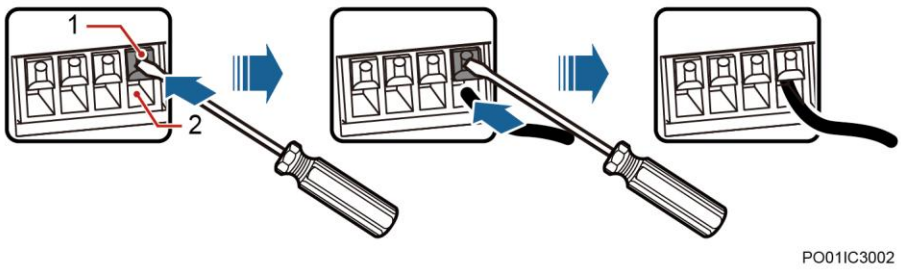
Procedure

Step 1 Press the contact plate using a flat-head screwdriver to flip the metal spring inside each dry contact.

Step 2 Connect the signal cables to the corresponding dry contacts.

Step 3 Put away the flat-head screwdriver and check that the signal cables are securely connected.

Figure 4-7 Installing a dry contact signal cable



(1) Contact plate (2) Dry contact port

----End

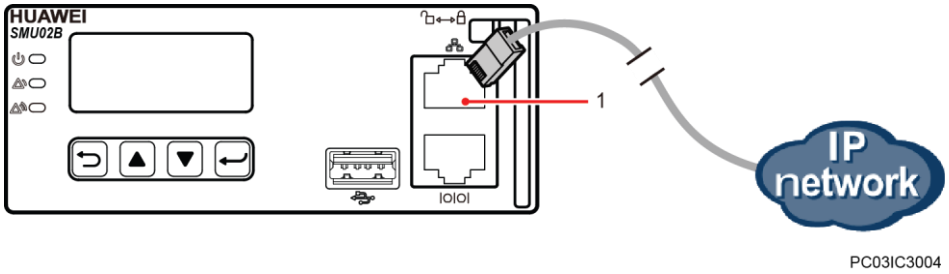
4.6 Installing the Communications Cables

4.6.1 WebUI Management

Procedure

Step 1 Connect the FE port on the SMU by using a network cable, as shown in Figure 4-8.

Figure 4-8 Connecting a communications cable (for WebUI management)



(1) FE port

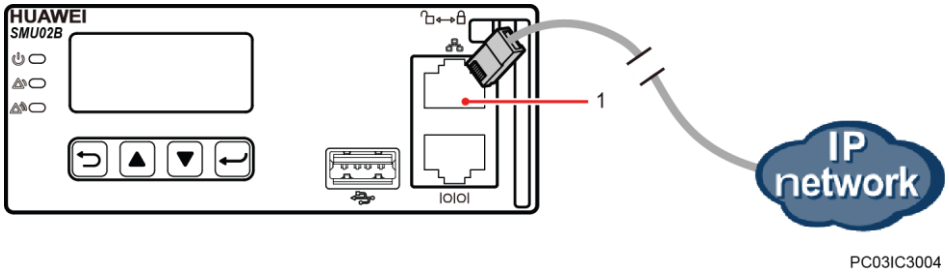
----End

4.6.2 NetEco Management

Networking Mode 1: over FE Port

Step 1 Connect the FE port on the SMU by using a network cable, as shown in Figure 4-9.

Figure 4-9 Connecting a communications cable (over the FE port)



(1) FE port

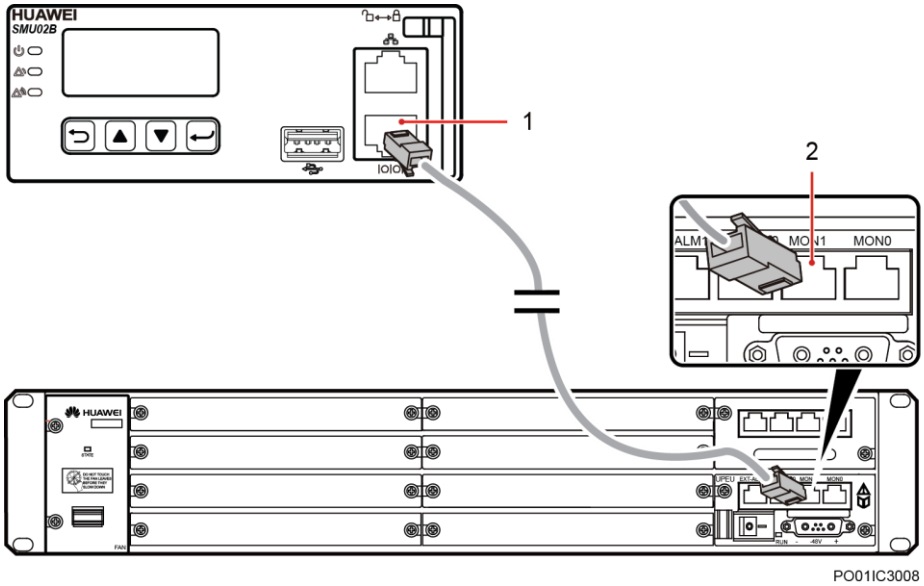
----End

Networking Mode 2: over RS485 Port

Step 1 Connect one end of the network cable to the RS485/RS232 port on the SMU.

Step 2 Connect the other end to the MON1 port on the BBU, as shown in Figure 4-10.

Figure 4-10 Connecting a communications cable (over the RS485 port)



(1) RS485/RS232 port (2) MON1 port

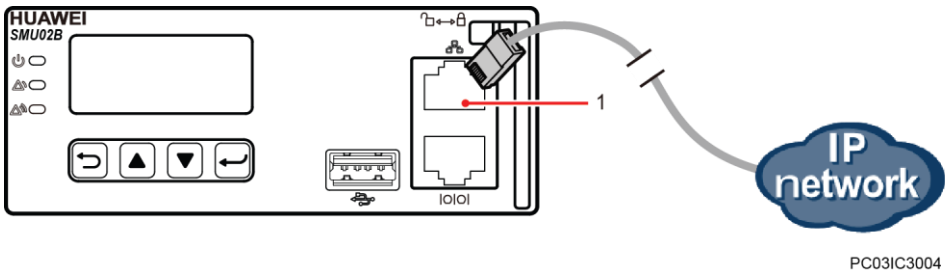
----End

4.6.3 Third-Party NMS Management (over SNMP)

Procedure

Step 1 Connect the FE port on the SMU by using a network cable, as shown in Figure 4-11.

Figure 4-11 Connecting a communications cable (over SNMP)



(1) FE port

----End

4.7 Installing DC Output Power Cables

Prerequisites

DANGER

- Ensure that the upstream AC input circuit breaker is OFF, and attach labels such as "No operations allowed."
- Switch off all circuit breakers before installing power cables.

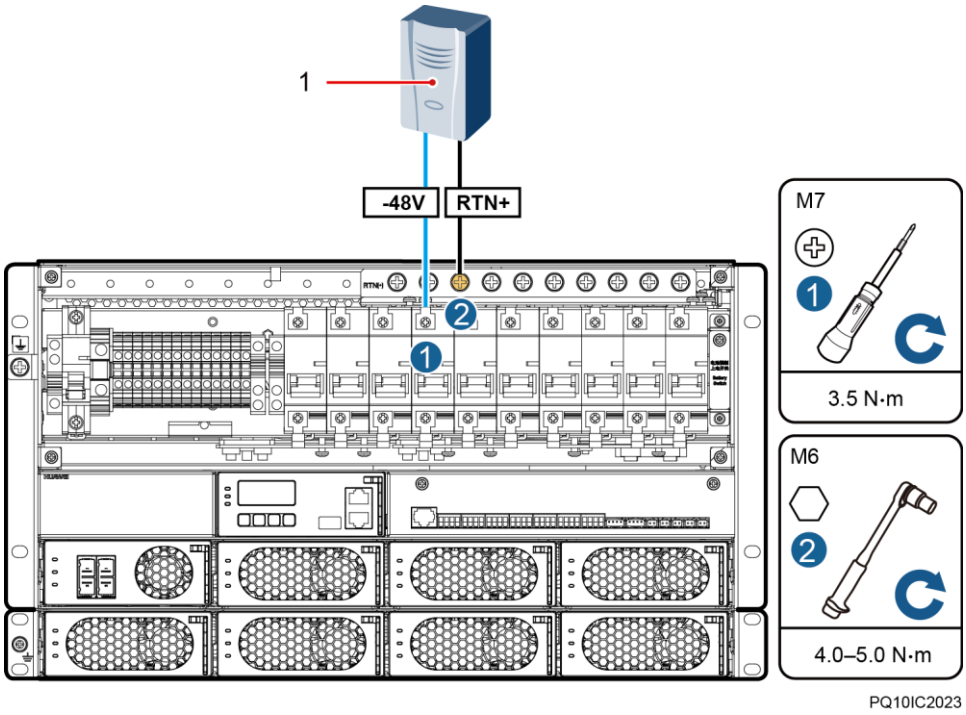
Procedure

Step 1 Route DC output power cables through the protective panel on the top of the subrack.

Step 2 Secure the negative DC output power cable to the corresponding DC output circuit breaker based on the actual load.

Step 3 Connect the positive DC output power cable to the corresponding screw on the RTN+ busbar.

Figure 4-12 Installing DC output power cables



(1) DC load

----End

4.8 Installing Battery Cables

Prerequisites

DANGER

- Smoking and sparks are prohibited near batteries.
- Switch off battery circuit breakers before installing batteries.
- Comply with regulations and warnings of the battery manufacturer.
- Use tools with insulated handles, otherwise, batteries may be burnt out and personal injury may occur.
- During battery operations, wear goggles, rubber gloves, and protective clothes. Remove conductive articles such as watches, bracelets, and rings.
- If battery acid gets in the eyes, rinse with cold water for more than 15 minutes and seek media advice immediately. If battery acid contacts skin or clothing, wash with soap and water immediately.
- Do not use metal to simultaneously contact two or more battery terminals. Do not use metal to simultaneously touch battery terminals and grounded objects (for example, battery compartment); otherwise, transient short circuit occurs, which produces sparks or explosion.
- During battery installation, never short-circuit or reversely connect positive and negative battery terminals. Connect the negative battery cable before the positive battery cable.
- Secure battery cables to a torque specified in battery documentation. Loose connections will result in excessive voltage drop or cause batteries to burn out when the current is large.

Procedure

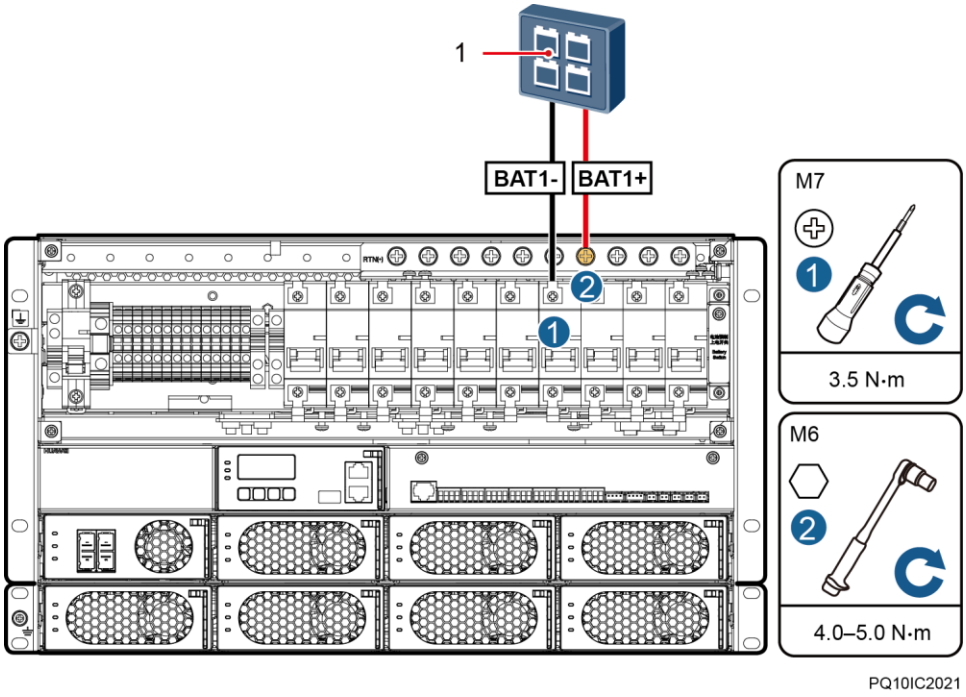
Step 1 Route battery cables through the protective panel on the top of the subrack.

Step 2 Secure negative battery cables for battery strings 1–4 to the corresponding battery circuit breakers.

Step 3 Secure positive battery cables for battery strings 1–4 to the RTN+ busbar.

Battery cables are connected in the same way. The following figure shows how to connect battery cables for one battery string.

Figure 4-13 Installing battery cables



(1) Battery string 1

----End

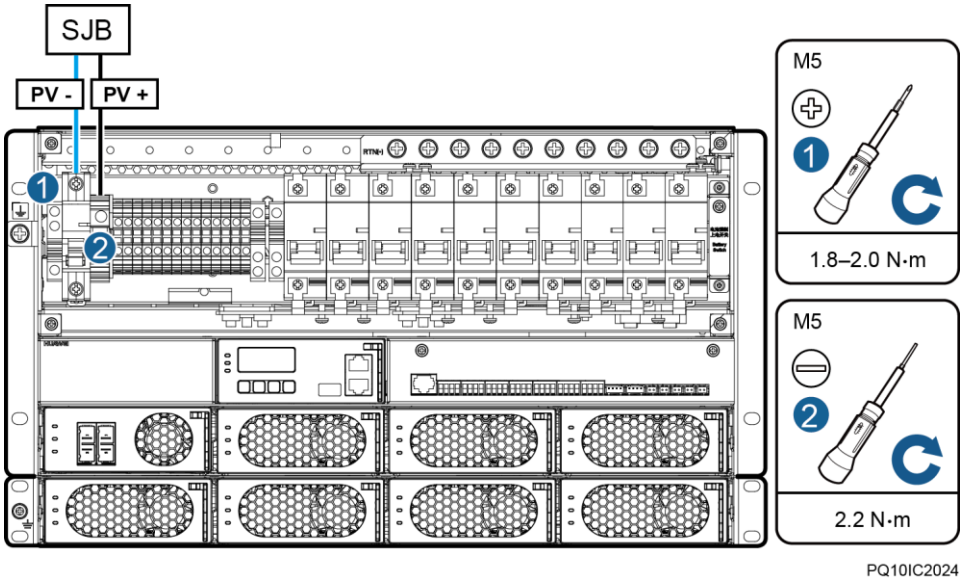
4.9 Installing DC Input Power Cables for PV Modules

Procedure

Step 1 Lay out DC input power cables for photovoltaic (PV) modules, and route the cables through the protective panel on the top of the subrack.

Step 2 Secure the cables to the corresponding DC input circuit breaker and terminal.

Figure 4-14 Installing DC input power cables for PV modules



----End

4.10 Installing Input Power Cables for the SSU

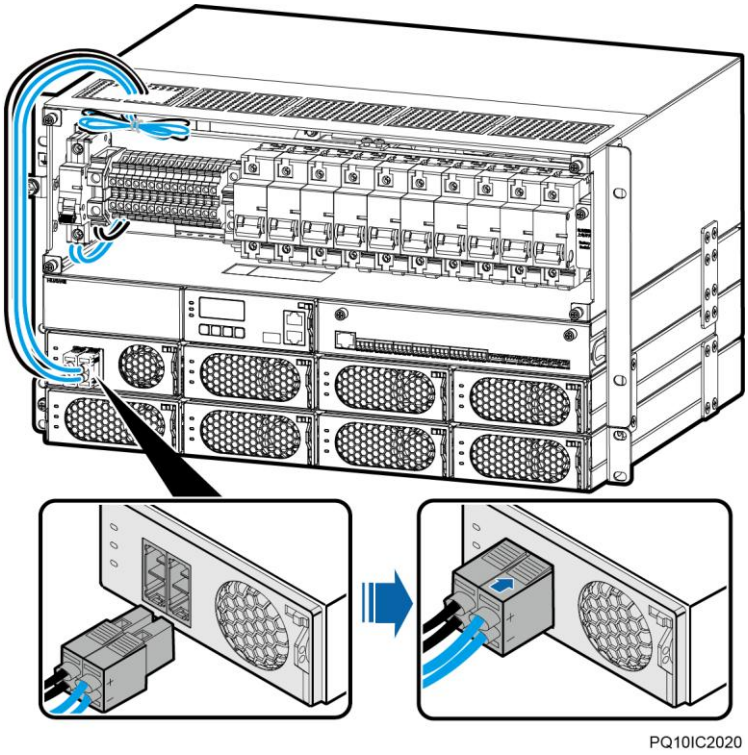
Context

One end of the SSU input power cable has been connected to the subrack, and the other end has been taken out during subrack installation.

Procedure

Step 1 Install SSU input terminals on the SSU.

Figure 4-15 Installing input power cables for the SSU



----End

4.11 Installing 220 V AC Input Power Cables

Prerequisites

CAUTION

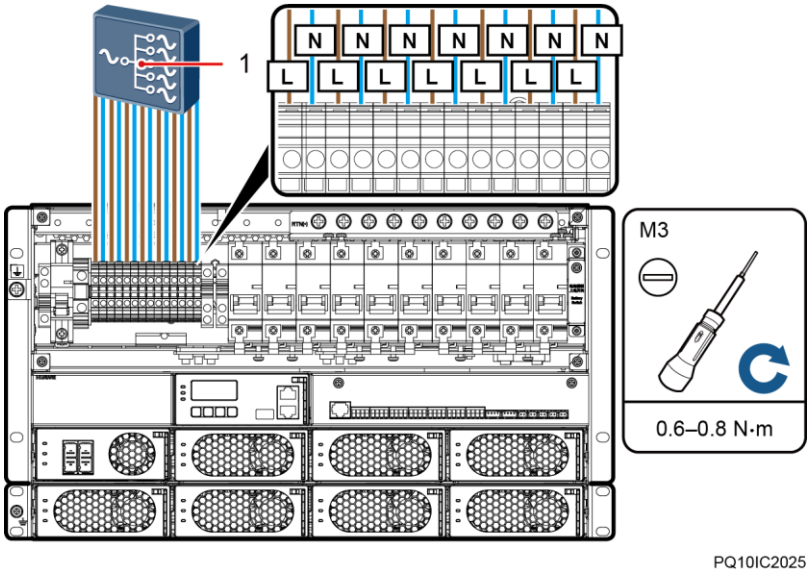
This device has multiple power inputs. When you power off the device, you must disconnect all power inputs.

Procedure

Step 1 Lay out 220 V AC input power cables, and route the cables through the protective panel on the top of the subrack.

Step 2 Secure the cables to the corresponding AC input terminals.

Figure 4-16 Installing 220 V AC input power cables



(1) Alternating current distribution box (ACDB)

----End

5 Verifying the Installation

5.1 Checking Hardware Installation

- Check that all screws, especially those used for electrical connections, are secured. Check that flat washers and spring washers are installed properly.
- Check that rectifiers are completely inserted into their respective slots and properly locked.

5.2 Checking Electrical Connections

- Check that all circuit breakers or fuses are OFF.
- Check that flat washers and spring washers are securely installed for all OT terminals and that all the OT terminals are intact and properly connected.
- Check that batteries are correctly installed and that battery cables are correctly connected and not short-circuited.
- Check that input and output power cables and ground cables are correctly connected and not short-circuited.

5.3 Checking Cable Installation

- Check that all cables are securely connected.
- Check that all cables are arranged neatly and bound properly to their nearest cable ties, and are not twisted or overly bent.
- Check that cable labels are properly and securely attached in the same direction.

6 Commissioning

NOTICE

- The following commissioning procedure may result in power failure or alarms. Inform the alarm center before and after the procedure.
- Commissioning involves various technologies, requires trained personnel, and requires compliance with commissioning instructions.
- Commissioning is performed with the power on. Remove metal items such as watches and necklaces, stand on dry insulating material, and use insulated tools.
- Do not contact two electric bodies that have different currents during operations.
- During commissioning, check that the status of the related unit or component meets requirements before turning on any switch.
- When you are performing operations and do not want others to operate, attach the label "Do not turn on the switch because operations are in process." to the power distribution device.
- During commissioning, shut down the device immediately if any fault is detected. Rectify the fault and proceed with the commissioning.

6.1 Connecting the AC Power Supply

The subrack supports PV input and 220 V AC input. Perform commissioning based on the input system by referring to the power-on procedure in 6.1.1 Connecting the PV Module Supply or 6.1.2 Connecting the AC Power Supply.

6.1.1 Connecting the PV Module Supply

Procedure

Step 1 Switch on PV input circuit breakers. Check that the voltage between PV input circuit breakers and terminals ranges from 58 V DC to 150 V DC.

Step 2 Check that the Run indicator on the SSU is steady on.

Step 3 Check that the voltage between the –48 V busbar and the RTN+ busbar ranges from –42 V DC to –58 V DC.

----End

6.1.2 Connecting the AC Power Supply

Procedure

Step 1 Switch off the PV input circuit breaker.

Step 2 Switch on the upstream AC input circuit breaker. Check that the voltage between AC input terminals (L, N) ranges from 85 V AC to 300 V AC.

Step 3 Check that the Run indicators on rectifiers are steady on.

Step 4 Measure the voltage between the -48 V busbar and the RTN+ busbar. The value should range from -42 V DC to -58 V DC.

Step 5 Switch on the PV input circuit breaker.

----End

6.2 Setting the Display Language

After powering on the SMU, select English by pressing ▲ or ▼ on the LCD, and then press ↵ to enter the standby screen.

NOTE

If you select an undesired language, remove and then insert the SMU. Select a language again after the SMU restarts.

6.3 Setting the Date and Time

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.
- The preset password is **000001**.

Set the date and time as required.

Table 6-1 Setting the date and time

Main Menu	Second-Level Menu	Third-Level Menu	Default Value	Setting Value
Setting Wizard	Date and Time **NOTE** The date and time vary	Date and Time	-	Set to the local date and time.
		Time Zone	UTC +08:00 Beijing	Set to the local time zone.

Main Menu	Second-Level Menu	Third-Level Menu	Default Value	Setting Value
	according to time zones. Set the time zone, date, and time based on the local situation.	NTP Enable	No	Yes/No **NOTE** Set the parameter to **Yes** if you need to synchronize the SMU time and the site network server time.

6.4 Setting Battery Parameters

Set **Battery1 Connected**, **Battery2 Connected**, **Battery3 Connected**, **Battery4 Connected**, **Rated Capacity**, **Installation Time** as required.

Table 6-2 Setting battery parameters

Main Menu	Second-Level Menu	Third-Level Menu	Fourth-Level Menu	Default Value	Setting
Parameters Settings	Battery	Basic Parameters	Battery1 Connected	Yes	Yes/No **NOTE** If *N* battery strings are connected, set **Battery 1 Connected** to **Battery *N* Connected** to **Yes**, and set the other parameters to **No**.
			Battery2 Connected	Yes	
			Battery3 Connected	No	
			Battery4 Connected	No	
			Rated Capacity	150 Ah	Rated capacity of the batteries in a battery string. **NOTE** The batteries connected to one circuit breaker or fuse are called a battery string.
		Other Parameters	Installation Time	N/A	Set this parameter to the current date.

NOTE

- If battery routes 1 and 2 are respectively connected to a battery string (each battery string consists of four 12 V, 150 Ah batteries in series), set **Battery1 Connected** and **Battery2 Connected** to **Yes** and others to **No**, and set **Rated Capacity** to **150 Ah**.
- If battery route 1 is connected to two battery strings in parallel (each battery string consists of four 12 V, 150 Ah batteries in series), set **Battery1 Connected** to **Yes** and others to **No**, and set **Rated Capacity** to **300 Ah**.

6.5 (Optional) Setting Sensor Parameters

Set sensor parameters based on site requirements.

Table 6-3 Setting sensor parameters

Main Menu	Second-Level Menu	Third-Level Menu	Fourth-Level Menu	Default Value	Setting
Parameters Settings	Power System	Sensor Config. Para	Door sensor	None	Set to **Yes** or **None** based on site requirements.
			Water sensor	None	
			Smoke sensor	None	
			Ambient Temp. Sensor	None	
			Ambient Humi. Sensor	None	
			Batt. Temp. Sensor 1	None	

6.6 (Optional) Setting the Hibernation Parameter

Set **Hibernation Enable** to **Yes** if you need to use the intelligent hibernation function of the rectifiers.

Table 6-4 Setting the hibernation parameter

Main Menu	Second-Level Menu	Third-Level Menu	Default Value	Setting Value
Parameters Settings	Energy Saving	Hibernation Enable	No	Yes

6.7 Setting Communications Parameters

6.7.1 Setting Parameters Before Using WebUI Management

Procedure

Step 1 Apply to the site or equipment room network administrator for a fixed IP address.

Step 2 Set the IP address, subnet mask, and gateway on the LCD, as shown in Table 6-5.

Table 6-5 IP parameters

Main Menu	Second-Level Menu	Third-Level Menu	Default Value	Setting Value
Setting Wizard	Network Parameters	IP Address	192.168.0.10	Set this parameter according to the IP address assigned by the network administrator.
		Subnet Mask	255.255.255.0	Set this parameter according to the subnet mask provided by the network administrator.
		Default Gateway	192.168.0.1	Set this parameter according to the gateway address provided by the network administrator.

----End

6.7.2 (Optional) Setting Parameters Before Using the NetEco Management

Networking Mode 1: over FE Port

Step 1 Apply to the site or equipment room network administrator for a fixed IP address.

Step 2 Set the IP address, subnet mask, and gateway on the LCD, as shown in Table 6-6.

Table 6-6 IP parameters

Main Menu	Second-Level Menu	Third-Level Menu	Default Value	Setting
Setting Wizard	Network Parameters	IP Address	192.168.0.10	Set this parameter according to the IP address assigned by the network administrator.
		Subnet Mask	255.255.255.0	Set this parameter according to the subnet mask provided by the network administrator.
		Default Gateway	192.168.0.1	Set this parameter according to

Main Menu	Second-Level Menu	Third-Level Menu	Default Value	Setting
				the gateway address provided by the network administrator.

Step 3 Set the **IP Addresses** and **Ports** for the active and standby servers of the NetEco on the LCD, as described in Table 6-7.

Table 6-7 NetEco parameters

Main Menu	Second-Level Menu	Third-Level Menu	Fourth-Level Menu	Default Value	Setting
Parameters Settings	Comm. Parameters	Network Parameters	NetEco Primary IP	192.168.0.10	Set an IP address for the active NetEco server.
			NetEco Backup IP	192.168.0.10	Set an IP address for the standby NetEco server.
			NetEco Port Number	31220	Set a port for the NetEco.

----End

Networking Mode 2: over RS485 Port

Step 1 Check that the following parameters are set properly: **Port Mode** to **Manual**, **Protocol Type** to **M/S Protocol**, **Baud Rate** to **9600**, and **Comm. Address** to **3**.

Table 6-8 Communications parameters

Main Menu	Second-Level Menu	Third-Level Menu	Fourth-Level Menu	Fifth-Level Menu	Default Value	Setting
Parameters Settings	Comm. Parameters	Serial Port	Northbound	Port Mode	Manual	Manual
				Protocol Type	M/S Protocol	M/S Protocol
		M/S Protocol	Northbound	Baud Rate	9600	9600
				Comm. Address	3	3

----End

6.7.3 (Optional) Setting Parameters Before Using the SNMP Management

Prerequisites

Before setting SNMP parameters, obtain the information listed in Table 6-9 from the NMS.

Table 6-9 Information obtained from the NMS

Information	Description
SNMP version	SNMP version and port number used by the SMU and NMS. The SNMP versions include **SNMPv1**, **SNMPv2c**, and **SNMPv3**.
SNMP Port Number	
Read Community Name	If you use SNMPv1 or SNMPv2c, enter the read community name and write community name that comply with the NMS. Otherwise, the SMU will not connect to the NMS.
Write Community Name	
User Name	To enhance the security, you need a user name and password for authentication if you use SNMPv3. After the authentication succeeds, the SMU can communicate with the NMS.
MD5 Password	
DES Password	
Trap Target Address	IP address and port number reported in the alarm trap.
Trap Port	

Procedure

Step 1 Apply to the site or equipment room network administrator for a fixed IP address.

Step 2 Set the IP address, subnet mask, and gateway on the LCD, as shown in Table 6-10.

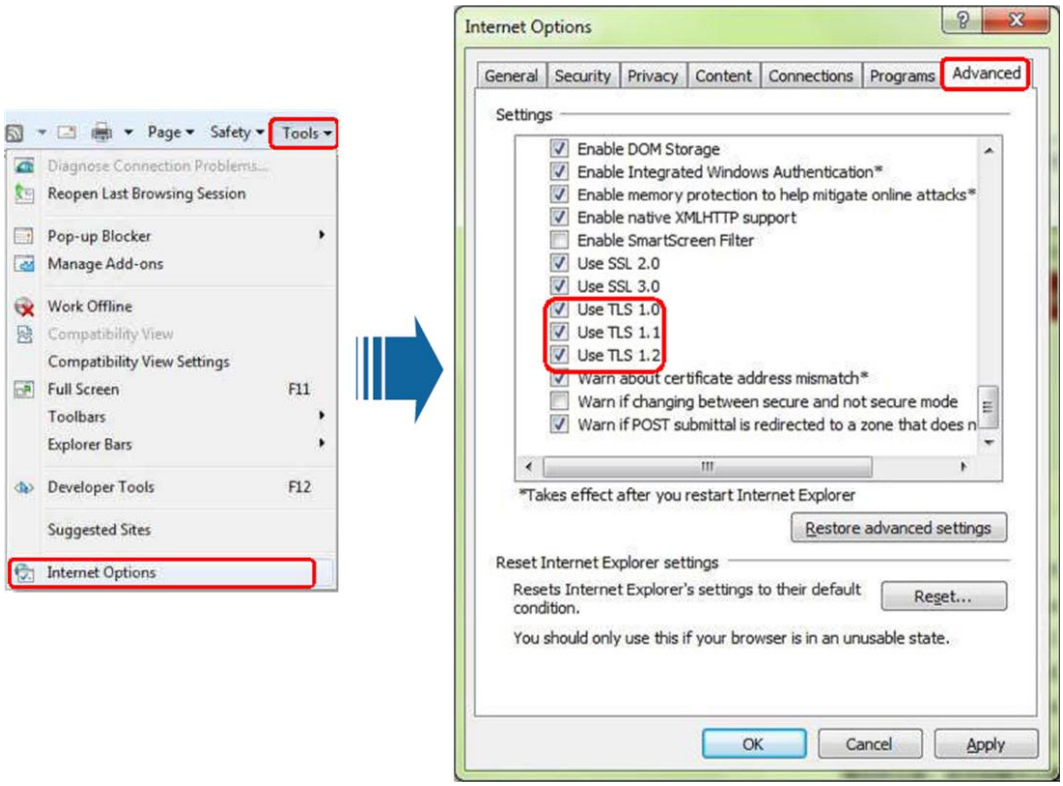
Table 6-10 IP parameters

Main Menu	Second-Level Menu	Third-Level Menu	Default Value	Setting Value
Setting Wizard	Network Parameters	IP Address	192.168.0.10	Set this parameter according to the IP address assigned by the network administrator.
		Subnet Mask	255.255.255.0	Set this parameter according to the subnet mask provided by the network administrator.
		Default Gateway	192.168.0.1	Set this parameter according to the gateway address provided by the network administrator.

Step 3 Open the browser (for example, Internet Explorer 8) and choose **Tools** > **Internet Options**.

Step 4 Click the **Advanced** tab and select **Use TLS 1.0**, **Use TLS 1.1**, and **Use TLS 1.2**.

Figure 6-1 Internet Explorer security setting

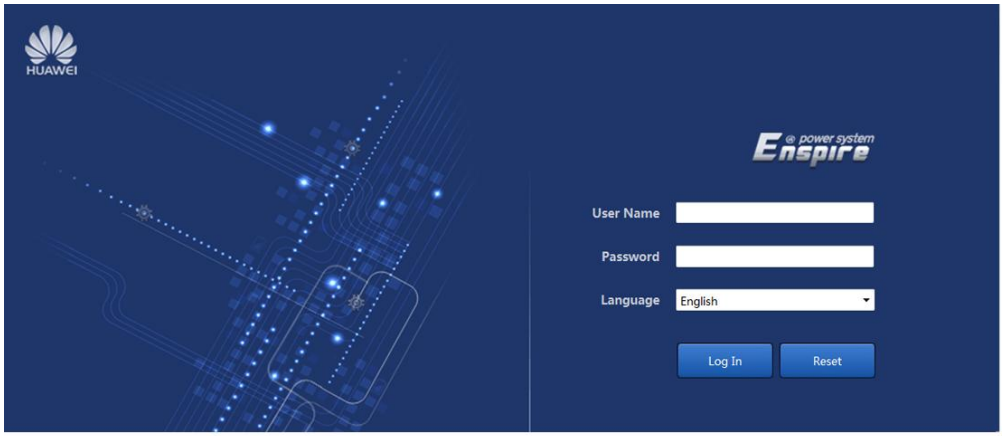


Step 5 Enter the IP address for the SMU in the address box of Internet Explorer (for example: https://192.168.0.10). Log in to the WebUI on the login page shown in Figure 6-2.

NOTE

- The preset user name is **admin** and the preset password is **Changeme**.
- You can set SNMP parameters on the WebUI locally or remotely.

Figure 6-2 Login page



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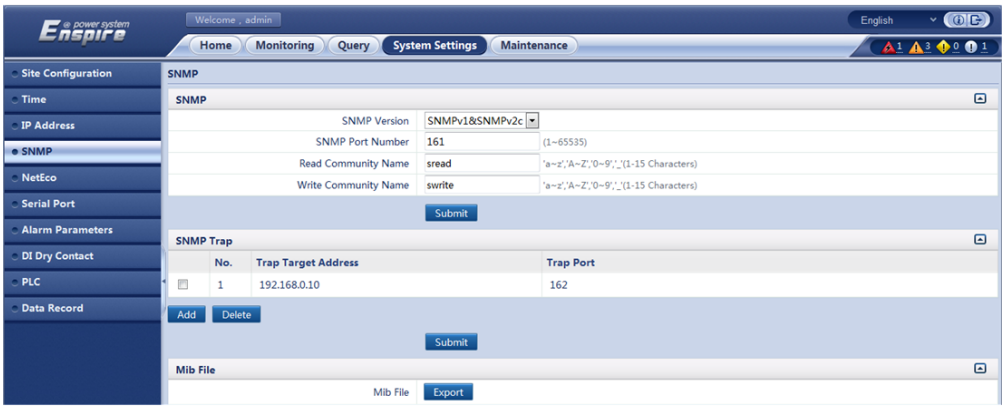
Step 6 On the **System Settings** tab page, select **SNMP**.

- If the SNMP version is SNMPv1 or SNMPv2c, set **SNMP Version** to **SNMPv1&SNMPv2c** under **SNMP**, and then set **SNMP Port Number**, **Read Community Name**, and **Write Community Name**, as shown in Figure 6-3.

Figure 6-3 Setting SNMPv1 and SNMPv2c parameters



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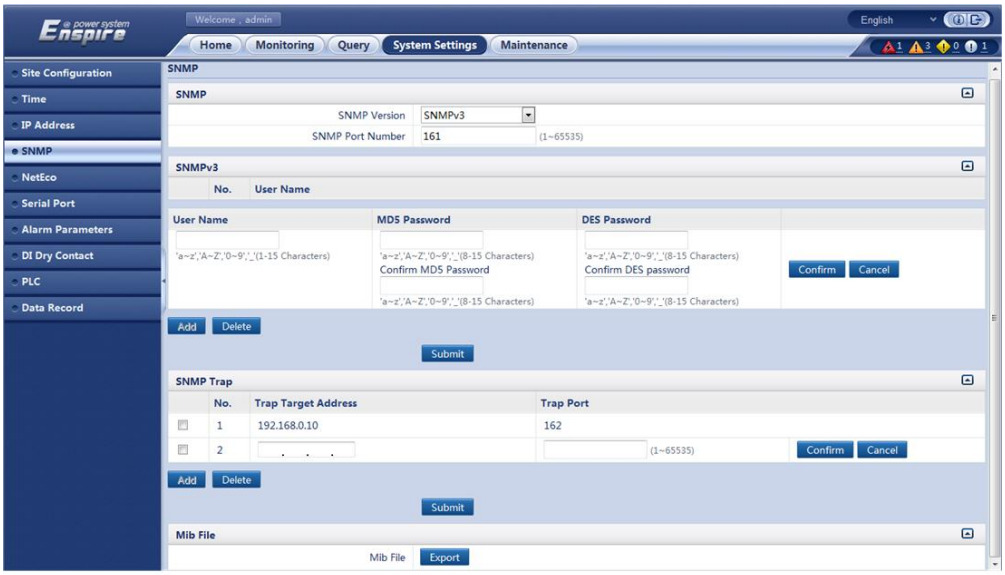
- If the SNMP version is SNMPv3, set **SNMP Version** to **SNMPv3** under **SNMP**, click **Add** under **SNMPv3**, and then set **User Name**, **MD5 Password**, and **DES Password**, as shown in Figure 6-4.

Figure 6-4 Setting SNMPv3 parameters



PC03C00073

Step 7 Under **SNMP Trap**, set **Trap Target Address** and **Trap Port**.

Step 8 Under **Mib files**, click **Export** to export the Mib file and import it to the NMS.

NOTE
If there is only one NMS, perform Step 8 once.

----End

Follow-up Procedure

You can query the power system operating status, active alarms, and the names of user-defined dry contact inputs, and configure dry contact outputs on the NMS that is connected over the SNMP.

6.8 Connecting the Battery Supply

Prerequisites

NOTICE
To avoid damage to batteries, switch on battery circuit breakers or reinstall the battery fuses on the customer power distribution device only after you correctly set battery parameters.

Procedure

Step 1 Switch off the upstream AC input circuit breaker.

Step 2 Switch on the battery circuit breakers.

Step 3 Switch on the upstream AC input circuit breaker.

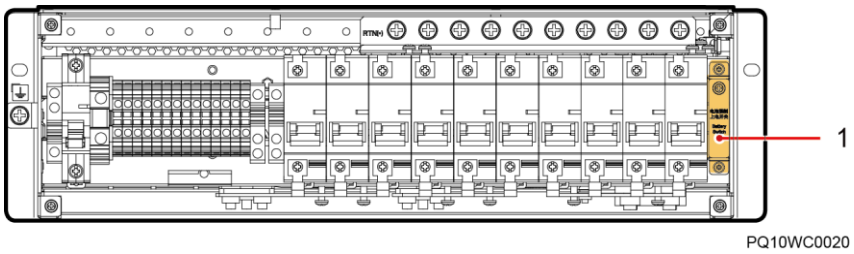
Step 4 Switch all the circuit breakers to the appropriate status based on site requirements.

Step 5 Observe the power system for 15 minutes. If no alarm (excluding door status alarms) is generated on the LCD during this period, the voltages and currents for batteries and loads are normal.

NOTICE

- Before delivery, the battery switch is set to AUTO and the system is under automatic control.
- Open the cover and flip the battery switch to MANUAL only when you need to forcibly connect the battery supply. Flip the battery switch back to AUTO after commissioning.

Figure 6-5 Battery switch



(1) Battery switch (behind the cover)

----End

6.9 Subsequent Operations

Procedure

Step 1 Reinstall the removed cover or panel (if there is).

Step 2 The paint on the subrack exterior should be intact. If paint flakes off, repaint the area to avoid corrosion.

Step 3 Clean the site and leave.

----End

7 Maintenance

7.1 Routine Maintenance

Maintain the power system periodically based on site requirements. The recommended maintenance period is six months.

Table 7-1 Routine maintenance checklist

Item	Maintenance Task			
	Check Whether	**Check Method**	**Repair When**	**Measures**
Electricity	The PV input is normal.	Clamp meter.	The PV input voltage is beyond the normal range.	For details, see 7.2 Rectifying Common Faults and 7.3 Identifying Component Faults.
	The AC input voltage is normal.		The AC input voltage is beyond the normal range.	
	The output voltage is normal.		The battery branch or load branch voltage exceeds the specified range (-42 V DC to -58 V DC).	
Preventive maintenance inspection (PMI)	The indicators are in the normal status.	Observing indicators.	Alarms are generated.	
Grounding	The ground point properly connects to the ground bar in the cabinet.	Clamp meter.	The resistance between the ground point and the ground bar is greater than 0.1 ohm.	Secure the ground cable to the ground point again or replace the ground cable.

7.2 Rectifying Common Faults

7.2.1 Mains Failure

Possible Causes

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

Measures

1. Check whether the AC input cable is loose. If yes, secure the AC input cable.
2. Check whether the upstream AC input circuit breaker is OFF. If yes, rectify the back-end circuit fault and then switch on the circuit breaker.
3. Check whether the AC input voltage is lower than 50 V AC. If yes, handle the mains grid fault.

7.2.2 AC Over Volt

Possible Causes

- The AC overvoltage alarm threshold is not set properly on the SMU.
- The power grid is faulty.

Measures

1. Check whether the AC overvoltage alarm threshold is properly set. If no, adjust it to a proper value.
2. Check whether the AC input voltage exceeds the AC overvoltage alarm threshold (280 V AC by default). If yes, handle the AC input fault.

7.2.3 AC Under Volt

Possible Causes

- The AC undervoltage alarm threshold is not set properly on the SMU.
- The power grid is faulty.

Measures

1. Check whether the AC undervoltage alarm threshold is properly set. If no, adjust it to a proper value.
2. Check whether the AC input voltage is below the AC undervoltage alarm threshold (180 V AC by default). If yes, handle the AC input fault.

7.2.4 DC Over Volt

Possible Causes

- The DC overvoltage alarm threshold is not set properly on the SMU.

- The power system voltage is set too high in manual mode.
- Rectifiers are faulty.

Measures

1. Check whether the DC overvoltage alarm threshold (58 V DC by default) is properly set. If no, adjust it to a proper value.
2. Check whether the system voltage is set too high in manual mode. If yes, confirm the reason and adjust the voltage to normal after the operation.
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.

7.2.5 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 (45 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.

7.2.6 Batt Chg. Overcur.

Possible Causes

- The rectifier communication is interrupted.
- Poor contact of the SMU.
- The SMU is faulty.

Measures

1. Check whether an alarm is generated for rectifier communication interruption. If yes, remove the rectifier and reinstall it to check whether the alarm is cleared. If the alarm still exists, replace the rectifier.
2. Remove the SMU and reinstall it to check whether the alarm is cleared. If the alarm still exists, replace the SMU.

7.2.7 LLVD Disconnected

Possible Causes

- An AC power failure occurs.
- Loads are manually disconnected.
- The load disconnection voltage is set too high on the SMU.
- Rectifiers are faulty.
- The system configuration is not proper.

Measures

1. Check whether an AC power failure occurs. If yes, resume the AC power supply.
2. Check whether loads are manually disconnected. If yes, confirm the reason of the manual disconnection, and reconnect the loads after the operation.
3. Check whether the load disconnection voltage (44 V DC by default) is set too high on the SMU. If yes, adjust it to a proper value.
4. Check whether the power system capacity is insufficient for the loads due to rectifier failures. If yes, replace the faulty rectifier.
5. 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.

7.2.8 BLVD Disconnected

Possible Causes

- An AC power failure occurs.
- Batteries are manually disconnected.
- The battery disconnection voltage is set too high on the SMU.
- Rectifiers are faulty.
- The system configuration is not proper.

Measures

1. Check whether an AC power failure occurs. If yes, resume the AC power supply.
2. Check whether batteries are manually disconnected. If yes, confirm the reason of the manual disconnection, and reconnect the batteries after the operation.
3. Check whether the battery disconnection voltage (43.2 V DC by default) is set too high on the SMU. If yes, adjust it to a proper value.
4. Check whether the power system capacity is insufficient for the loads due to rectifier failures. If yes, replace the faulty rectifier.
5. 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.

7.2.9 Batt Loop Trip

Possible Causes

- The battery circuit breaker trips or battery fuse detection cable is disconnected.

- The battery circuit breaker trips or battery fuse is blown.
- The contactor is faulty.

Measures

1. Check whether the battery circuit breaker trips or battery fuse detection cable is disconnected. If yes, reconnect the cable.
2. Check whether the battery circuit breaker trips or battery fuse is blown. If yes, 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 the battery current changes accordingly. If no, replace the contactor.

7.2.10 High Amb. Temp.

NOTE
This alarm is generated only for the power system that has ambient temperature sensors installed.

Possible Causes

- The ambient overtemperature alarm threshold is not set properly on the SMU.
- The temperature control system is faulty in the cabinet where the ambient temperature sensor is located.
- The ambient temperature sensor is faulty.

Measures

1. Check whether the ambient temperature alarm threshold (55 ℃ by default) is properly set on the SMU. If no, adjust it based on site requirements.
2. Check whether the temperature control system in the cabinet is faulty. If yes, rectify the fault. The alarm is cleared when the cabinet temperature falls within the allowed range.
3. Check whether the ambient temperature sensor is faulty. If yes, replace the temperature sensor.

7.2.11 Low Amb. Temp.

NOTE
This alarm is generated only for the power system that has ambient temperature sensors installed.

Possible Causes

- The ambient undertemperature alarm threshold is not set properly on the SMU.
- The temperature control system is faulty in the cabinet where the ambient temperature sensor is located.
- The ambient temperature sensor is faulty.

Measures

1. Check whether the ambient undertemperature alarm threshold (-20 ℃ by default) is properly set on the SMU. If no, adjust it based on site requirements.
2. Check whether the temperature control system in the cabinet is faulty. If yes, rectify the fault. The alarm is cleared when the cabinet temperature falls within the allowed range.

3. Check whether the ambient temperature sensor is faulty. If yes, replace the ambient temperature sensor.

7.2.12 High Amb. Humi.

NOTE
This alarm is generated only for the power system that has humidity sensors installed.

Possible Causes

- The ambient overhumidity alarm threshold is not set properly on the SMU.
- The humidity is too high in the cabinet where the humidity sensor is located.
- The humidity sensor is faulty.

Measures

1. Check whether the ambient overhumidity alarm threshold (95% RH by default) is properly set on the SMU. If no, adjust it based on site requirements.
2. Check whether water intrudes into the cabinet. If yes, wipe the water with dry cotton or other tools and rectify the fault.
3. Check whether the humidity sensor is faulty. If yes, replace the humidity sensor.

7.2.13 Low Amb. Humi.

NOTE
This alarm is generated only for the power system that has humidity sensors installed.

Possible Causes

- The ambient underhumidity alarm threshold is not properly set on the SMU.
- The humidity is too low in the cabinet where the humidity sensor is located.
- The humidity sensor is faulty.

Measures

1. Check whether the ambient underhumidity alarm threshold (5% RH by default) is properly set on the SMU. If no, adjust it based on site requirements.
2. Check whether the cabinet humidity is too low. If yes, adjust the cabinet humidity. The alarm is cleared when the humidity falls within the allowed range.
3. Check whether the humidity sensor is faulty. If yes, replace the humidity sensor.

7.2.14 Batt. High Temp.

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

Possible Causes

- The battery overtemperature alarm threshold is not set properly on the SMU.
- The battery temperature controlling system is faulty.
- The battery temperature sensor is faulty.

Measures

1. Check whether the battery overtemperature alarm threshold (50 ℃ by default) is properly set. If no, adjust it to a proper value.
2. Check whether the battery temperature controlling system is faulty. If yes, 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 yes, replace the temperature sensor.

7.2.15 Batt. Low Temp.

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

Possible Causes

- The battery undertemperature alarm threshold is not set properly on the SMU.
- The battery temperature controlling system is faulty.
- The battery temperature sensor is faulty.

Measures

1. Check whether the battery undertemperature alarm threshold (-10 ℃ by default) is properly set. If no, adjust it to a proper value.
2. Check whether the battery temperature controlling system is faulty. If yes, 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 yes, replace the temperature sensor.

7.2.16 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.

7.2.17 Water Alarm

NOTE
This alarm is generated only for the power system that has water sensors installed.

Possible Causes

- Water intrudes into the cabinet.
- The water sensor is faulty.

Measures

1. Check whether water intrudes into the cabinet. If yes, wipe the water with dry cotton or other tools and rectify the fault.
2. Check whether the water sensor is faulty. If yes, replace the water sensor.

7.2.18 Smoke Alarm

NOTE
This alarm is generated only for the power system that has smoke sensors installed.

Possible Causes

- There is smoke inside the cabinet.
- The smoke sensor is faulty.

Measures

1. Check whether there is smoke inside the cabinet. If yes, disconnect the power supply from the cabinet, handle the fault, and then resume system operation and clear the alarm on the SMU.
2. Check whether the smoke sensor is faulty. If yes, replace the smoke sensor.

7.2.19 Rect Fault

Possible Causes

- The rectifier is in poor contact.
- The 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 still exists, replace the rectifier.

7.2.20 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 of the rectifier working voltage. If yes, rectify the power supply fault and then resume the power supply.
2. Check whether the AC input voltage is below the lower threshold of the rectifier working voltage. If yes, rectify the power supply fault and then resume the power supply.

3. Check whether the ambient temperature is higher than the normal operating temperature of the rectifier. If yes, check and rectify the temperature unit fault.
4. Remove the rectifier that generates the alarm and reinstall it after the indicator turns off. If the alarm still exists, replace the rectifier.

7.2.21 Rect Comm Fault

Possible Causes

- The rectifier is removed.
- The rectifier is in poor contact.
- The rectifier is faulty.

Measures

1. Check whether the rectifier is removed. If yes, reinstall it.
2. If the rectifier is in position, remove the rectifier and reinstall it.
3. If the alarm still exists, replace the rectifier.

7.2.22 Load Fuse Break

Possible Causes

- The load circuit breaker trips or fuse is blown.
- The load circuit breaker or fuse detection cable is disconnected.

Measures

1. Check whether the load circuit breaker trips or fuse is blown. If yes, rectify the back-end circuit fault and then switch on the circuit breaker or replace the fuse.
2. Check whether the load circuit breaker or fuse detection cable is disconnected. If yes, reconnect the cable.

7.2.23 DC SPD Alarm

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 yes, reconnect the cable.
2. Check whether the DC SPD detection cable is disconnected. If no, replace the DC SPD.

7.3 Identifying Component Faults

7.3.1 Identifying Circuit Breaker Faults

The following lists main 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 kΩ when the circuit breaker is OFF.

7.3.2 Identifying SSU Faults

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

- The PV input and slot connector are normal, but the SSU indicator (red) is steady on or all indicators are off.
- The slot connector and SMU are normal, but the yellow indicator still blinks after the SSU is reseated.
- The PV input and SMU are normal, but the SMU cannot control the SSU.

7.3.3 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.

7.3.4 Identifying SMU Faults

The following are the main symptoms of SMU faults:

- The DC output is normal while 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 the alarm reporting enabled, the SMU does not report alarms when the power system is faulty.
- The SMU reports an alarm while the power system does not experience the fault.
- The SMU fails to communicate with the connected lower-level devices while the communications cables are correctly connected.
- Communication between the SMU and all rectifiers fails while both 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.

7.4 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.
- Do not maintain devices on raining days, preventing water from entering and damaging devices.

7.4.1 Replacing an SSU

Prerequisites

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

CAUTION

Protect yourself from being burnt when moving an operating SSU because it has a high temperature.

Procedure

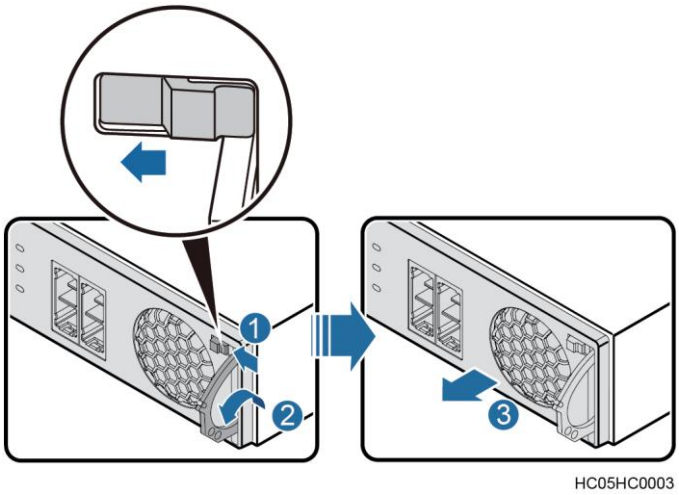
Step 1 Put on protective gloves.

Step 2 Switch off the PV input circuit breaker, disconnect cables from the SSU panel, and mark the cables.

Step 3 Push the locking latch on the right side of the SSU panel towards the left.

Step 4 Gently pull the handle outwards, and then remove the SSU from the subrack, as shown in Figure 7-1.

Figure 7-1 Removing an SSU

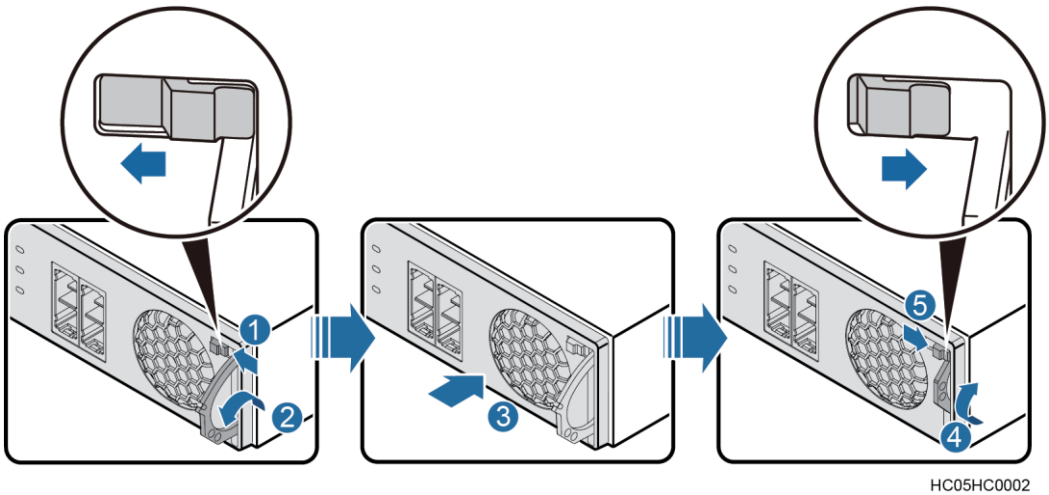


Step 5 Push the locking latch on the new SSU towards the left, and pull out the handle.

Step 6 Place the SSU at the entry to the corresponding slot.

Step 7 Gently slide the SSU 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 7-2.

Figure 7-2 Installing a new SSU



NOTICE

Do not connect the positive and negative DC input cables in reverse.

Step 8 Reconnect the cables marked to the new SSU, and switch on the PV input circuit breaker.

Step 9 Take off the protective gloves.

----End

Follow-up Procedure

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

7.4.2 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.

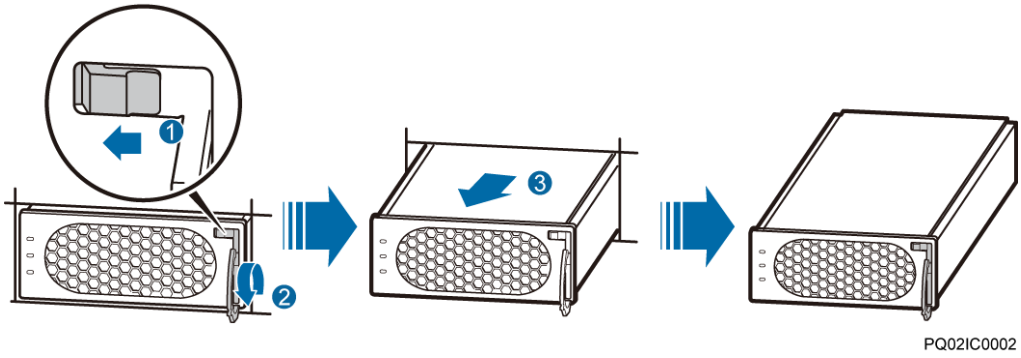
Procedure

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 7-3.

Figure 7-3 Removing a rectifier

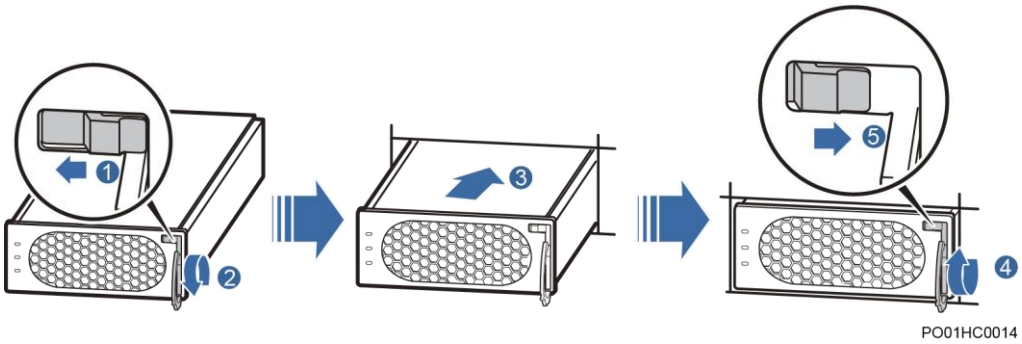


Step 4 Push the locking latch on the new rectifier towards the left, and pull out the handle.

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 7-4.

Figure 7-4 Installing a rectifier



Step 7 Take off protective gloves.

----End

Follow-up Procedure

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

7.4.3 Replacing an SMU

Prerequisites

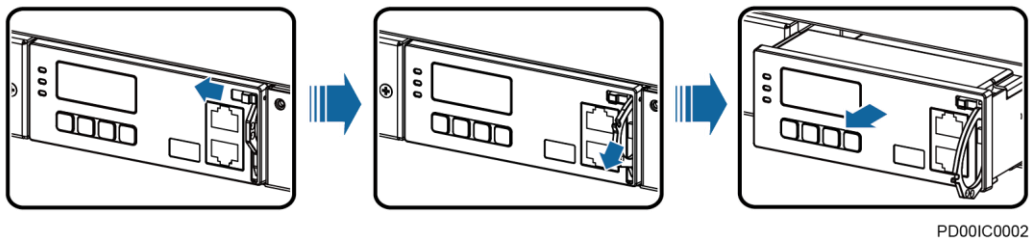
- You have obtained the cabinet door key.
- The new SMU is intact.

Procedure

Step 1 Push the locking latch towards the left.

Step 2 Pull the handle outwards to remove the SMU, as shown in Figure 7-5.

Figure 7-5 Removing an SMU

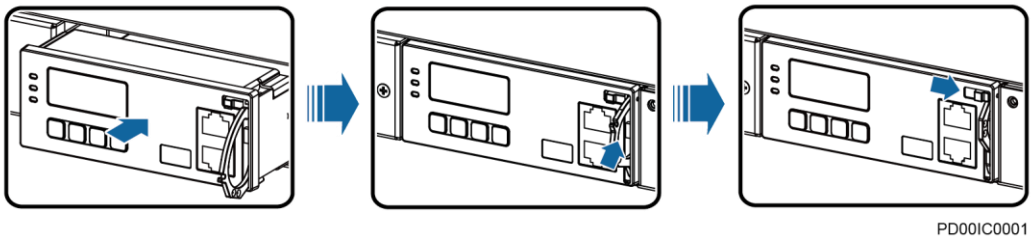


Step 3 Insert a new SMU into the subrack, push the locking latch towards the left, and pull out the handle.

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

Step 5 Reset parameters on the SMU.

Figure 7-6 Installing an SMU



----End

Follow-up Procedure

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

7.4.4 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.

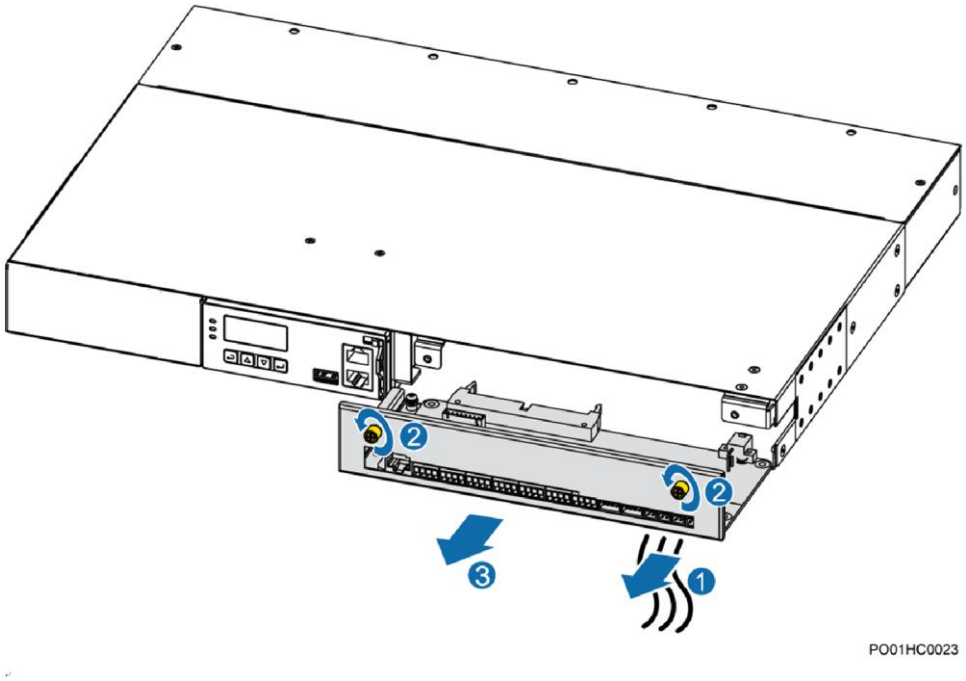
Procedure

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 7-7.

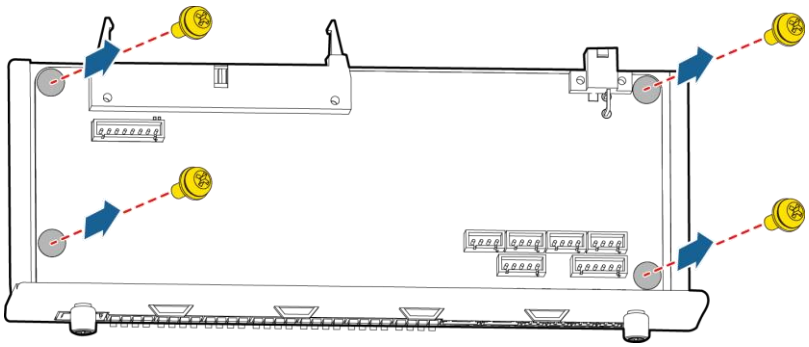
Figure 7-7 Taking out the UIM02C



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

Step 5 Remove the PCB.

Figure 7-8 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 record made previously.

Step 8 Push in the UIM02C and tighten the screws.

Step 9 Reconnect signal cables to the UIM02C panel based on the records made previously.

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.

A Technical Specifications

Table A-1 Environment conditions

Item	Specifications
Operating temperature	-40 ℃ to +65 ℃
Transport temperature	-40 ℃ to +70 ℃
Storage temperature	-40 ℃ to +70 ℃
Operating humidity	5%–95% RH (non-condensing)
Storage humidity	5%–95% RH (non-condensing)
Altitude	0 m to 4000 m (When the altitude ranges from 2000 m to 4000 m, the operating temperature decreases by 1 ℃ for each additional 200 m.)

Table A-2 Electrical specifications

Item	Specifications	
AC input	Input system	DC input (SSU); 220 V AC single-phase input (rectifier)
	Input frequency	45–66 Hz (rated frequency: 50 Hz or 60 Hz)
	Power factor (PF)	≥ 0.99 (rated input and load)
DC output	Output voltage range	–42 V DC to –58 V DC
	Default output voltage	–53.5 V DC
	Maximum output power	• 21,000 W (only AC input) • 24,000 W (AC input and PV

Item	Specifications	
		input)
	Regulated voltage precision	≤ ±1% (output voltage of within 53.5 V ±0.1 V at 50% load)
	Peak-to-peak noise voltage	≤ 200 mV (rated input voltage and load)
	Psophometrically weighted noise	≤ 2 mV (300–3400 Hz; input power ≤ 264 V AC)
	Current sharing imbalance	≤ ±5% (50%–100% load)
AC input protection	AC input overvoltage protection threshold	≥ 300 V AC
	AC input overvoltage recovery threshold	290–300 V AC
	AC input undervoltage protection threshold	≤ 80 V AC
	AC input undervoltage recovery threshold	80–90 V AC
DC output protection	DC output overvoltage protection threshold	–58.5 V DC to –60.5 V DC • If overvoltage occurs due to an internal fault, the rectifier locks out. • If the external voltage is greater than –63 V DC for more than 500 ms, the rectifier locks out.
DC surge protection	Differential mode: 10 kA (8/20 μs); common mode: 20 kA (8/20 μs)	
Safety	IEC/EN60950-1/GB 4943 and CE certification	
Mean time between failures (MTBF)	200,000 hours (at 25 ℃)	

Table A-3 EMC specifications

Item	Specifications	
Electromagnetic interference (EMI)	Conducted emission (CE)	AC port: EN 55022 class B AC port: EN 55022 class A (R4850S1)
		DC port: EN 55022 class A
	Radiated emission (RE)	EN 55022 class B EN 55022 class A (R4850S1)
	Harmonic current	IEC 61000-3-12

Item	Specifications	
	Voltage fluctuation and flick	IEC 61000-3-3
EMS	Electrostatic discharge (ESD)	IEC 61000-4-2 Shell port: contact discharge of 6 kV and air discharge of 8 kV; signal port: contact discharge of 2 kV
	Electrical fast transient (EFT)	IEC 61000-4-4 AC and DC power ports: 2 kV
	Radiated susceptibility (RS)	IEC 61000-4-3 10 V/m field strength
	Conducted susceptibility (CS)	IEC 61000-4-6 Power port: 10 V; signal port: 3 V
	Surge immunity	IEC 61000-4-5 AC and DC power ports: 2 kV (8/20 μs) in differential mode, 4 kV (8/20 μs) in common mode
	Voltage dips immunity (DIP)	IEC 61000-4-11

Table A-4 Subrack specifications

Item	Specifications
Power system dimensions (H x W x D)	263.9 mm x 482 mm x 330 mm
Weight	≤ 25 kg (excluding modules)
Protection level	IP20
Installation mode	Installed in a 19-inch rack
Cabling	Routed in and out from the top
Maintenance mode	Maintained from the front
Heat dissipation mode	Natural heat dissipation

Table A-5 Rectifier specifications

Item	R4850N2	R4850G2	R4850S1

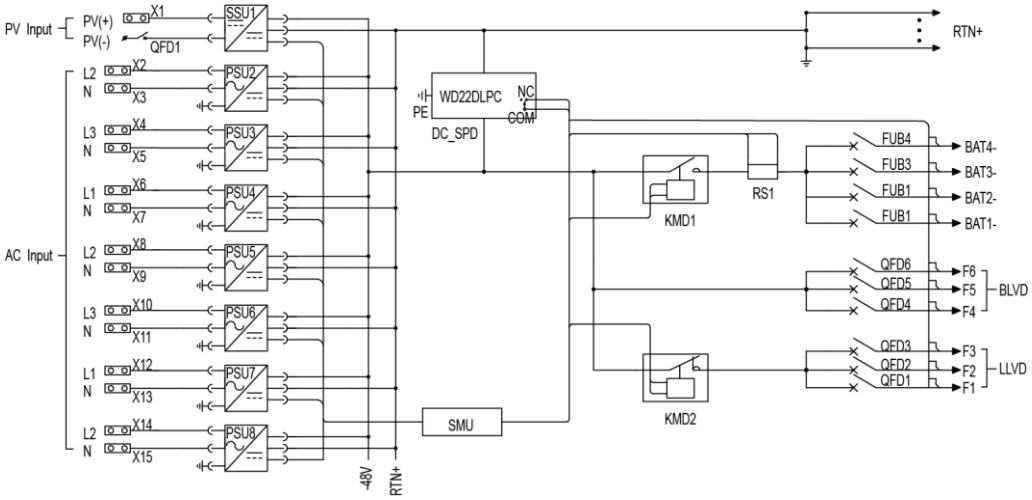
Item	R4850N2	R4850G2	R4850S1
Efficiency	Max. ≥ 94% ≥ 93% (under 230 V AC with 30% to 100% loads)	Max. ≥ 96% ≥ 95% (under 230 V AC with 30% to 100% loads)	Max. ≥ 98% ≥ 96% (under 230 V AC with 30% to 100% loads)
Output power	3000 W (176 V AC–290 V AC) 1250 W (85 V AC–175 V AC)	3000 W (176 V AC–290 V AC) 1250 W (85 V AC–175 V AC)	3000 W (176 V AC–290 V AC) 1250 W (85 V AC–175 V AC)
Dimensions (H x W x D)	40.8 mm x 105 mm x 281 mm	40.8 mm x 105 mm x 281 mm	40.8 mm x 105 mm x 281 mm
Weight	≤ 2 kg	≤ 2 kg	≤ 2.5 kg

Table A-6 SSU specifications

Item	S4850G1
Efficiency	Peak efficiency: 98.5%
Maximum output power	3000 W (58 V DC to 150 V DC)
Maximum output current	52 A
Dimensions (H x W x D)	40.8 mm x 105 mm x 268.5 mm
Weight	≤ 1.8 kg

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 alarms and dry contacts

Port Type	Silk Screen	Associated Alarm
Dry contact input	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 The default setting (closed: alarm; open: normal) can be modified.	ALM1	AC Failure/Long Mains Failure (disabled by default)
	ALM2	DC Ultra Overvoltage/DC Overvoltage/DC Ultra Undervoltage/DC Undervoltage
	ALM3	Rectifier Fault/Rectifier Protection/Rectifier Communication Failure/Rectifier Fault (Redundant)/Rectifier Fault (Non-redundant)/Multi-Rectifier Fault/All Rectifiers Fail to Communicate
	ALM4	DC SPD Fault
	ALM5	Load Fuse Break/Battery Fuse Break
	ALM6	Battery High Temperature/Battery Low Temperature/Battery Very High Temperature/Battery Very Low Temperature
	ALM7	Reserved
	ALM8	Reserved

D Acronyms and Abbreviations

A	
ACDB	alternating current distribution box
B	
BBU	baseband unit
BLVD	battery low voltage disconnection
E	
EFT	electrical fast transient
EMC	electromagnetic compatibility
ESD	electrostatic discharge
H	
HTTPS	Hypertext Transfer Protocol Secure
I	
IP	Internet Protocol
L	
LCD	liquid crystal display
LLVD	load low voltage disconnection
M	
MTBF	mean time between failures

P	
PDU	power distribution unit
PV	photovoltaic
R	
RS	radiated susceptibility
S	
SJB	solar junction box
SMU	site monitoring unit
SNMP	Simple Network Management Protocol
SPD	surge protection device
SSU	solar supply unit
T	
THD	total harmonic distortion
U	
UIM	user interface module