

UPS5000-H-(400 kVA-800 kVA)

User Manual (100 kVA Power Module)

Issue 02
Date 2021-04-22



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Huawei Technologies Co., Ltd.

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

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

About This Document

Purpose

This document describes the UPS in terms of its features, performance specifications, working principles, appearance, structure, installation, and operation and maintenance (O&M).

The figures provided in this document are for reference only.

Intended Audience

This document is intended for:

- Sales engineers
- Technical support engineers
- System engineers
- Hardware installation engineers
- Commissioning engineers
- Data configuration engineers
- Maintenance engineers

Symbol Conventions

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

Symbol	Description
 DANGER	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
 WARNING	Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
 CAUTION	Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

Symbol	Description
 NOTICE	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. NOTICE is used to address practices not related to personal injury.
 NOTE	Supplements the important information in the main text. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

Change History

Changes between document issues are cumulative. The latest document issue contains all updates made in previous issues.

Issue 02 (2021-04-22)

Added the description about the 800K model.

Issue 01 (2020-11-30)

This issue is the first release.

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1 Safety Information

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.

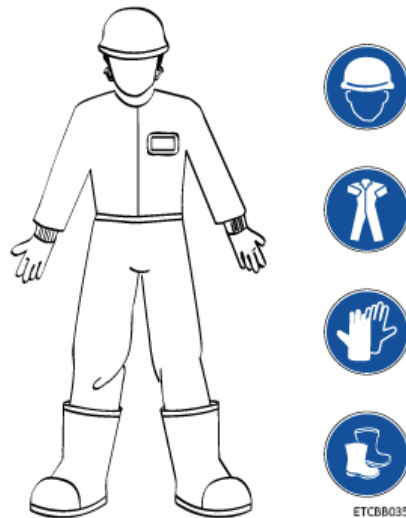
Follow local laws and regulations when installing, operating, or maintaining the equipment. The safety instructions in this document are only supplements to local laws and regulations.

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

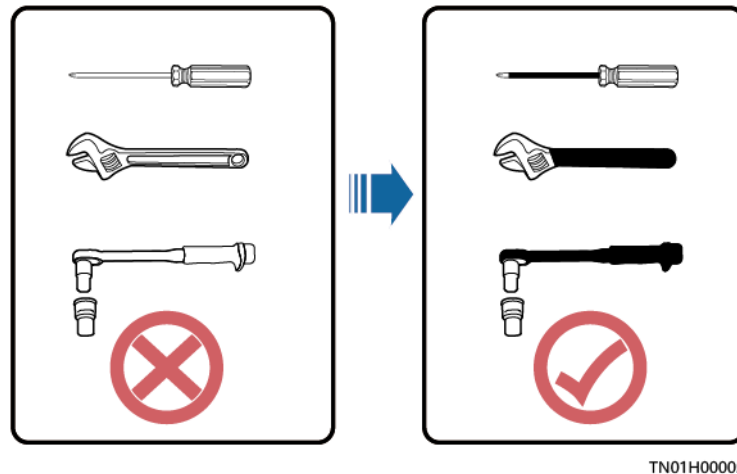
- Operation beyond the conditions specified in this document
- Installation or use in environments which are not specified in relevant international or national standards
- Unauthorized modifications to the product or software code or removal of the product
- Failure to follow the operation instructions 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

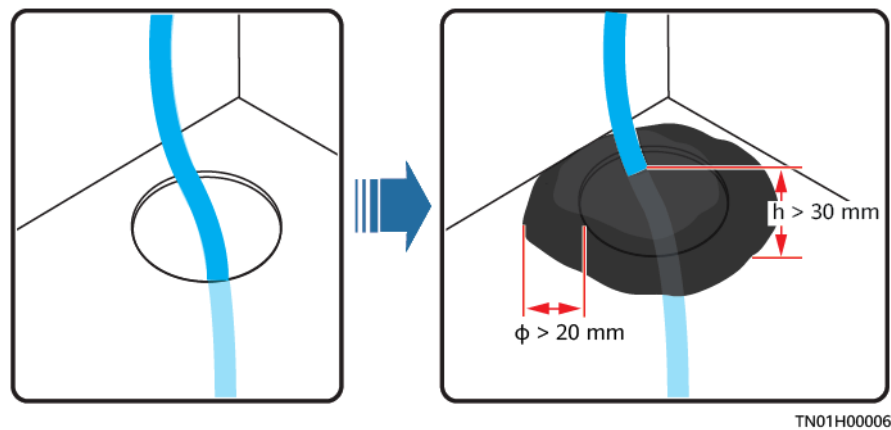
- Do not install, use, or operate outdoor equipment and cables (including but not limited to moving equipment, operating equipment and cables, inserting connectors to or removing connectors from signal ports connected to outdoor facilities, working at heights, and performing outdoor installation) in harsh weather conditions such as lightning, rain, snow, and level 6 or stronger wind.
- Before 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 personal protective equipment such as insulation gloves, goggles, and safety clothing, helmet, and shoes, as shown in the following figure.



- Follow the specified procedures for installation, operation, and maintenance.
- Before handling a conductor surface or terminal, measure the contact point voltage and ensure that there is no risk of electric shock.
- 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.
- Use insulated tools or tools with insulated handles, as shown in the following figure.



- All cable holes should be sealed. Seal the used cable holes with firestop putty. Seal the unused cable holes with the caps delivered with the cabinet. The following figure shows the criteria for correct sealing with firestop putty.



- Do not scrawl, damage, or block any warning label on the equipment.
- When installing devices, use a torque wrench with a proper measurement range to tighten bolts. Ensure that the wrench is not skewed and the torque error does not exceed 10%.
- Do not work with power on during installation.
- Repaint any paint scratches caused during equipment transportation or installation in a timely manner. Equipment with scratches cannot be exposed to an outdoor environment for a long period of time.
- Before operations, ensure that the equipment is firmly secured to the floor or other solid objects, such as a wall or an installation rack.
- Do not use water to clean electrical components inside or outside of a cabinet.
- Do not change the structure or installation sequence of equipment without permission.
- Do not touch a running fan with your fingers, components, screws, tools, or boards before the fan is powered off or stops running.

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.

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.
- 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, 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
- Only professionals or authorized personnel are allowed to replace the equipment or components (including software).

1.3 Electrical Safety

Grounding

- 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.
- Ensure that the equipment is connected permanently to the protective ground. Before operating the equipment, check its electrical connection to ensure that it is securely grounded.

General Requirements

Use dedicated insulated tools when performing high-voltage operations.

AC and DC Power

DANGER

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 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.
- If the equipment has multiple inputs, disconnect all the inputs before operating the equipment.
- A circuit breaker equipped with a residual current device (RCD) is not recommended.
- A damaged power cable must be replaced by the manufacturer, service agent, or professionals to avoid risks.
- High voltage operations and installation of AC-powered facilities must be performed by qualified personnel.

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 or ZB flame spread rating requirements or higher.
- 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.
- 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.
- When the temperature is low, violent impact or vibration may damage the plastic cable sheathing. To ensure safety, comply with the following requirements:
 - Cables can be laid or installed only when the temperature is higher than 0°C. Handle cables with caution, especially at a low temperature.
 - Cables stored at subzero temperatures must be stored at room temperature for at least 24 hours before they are laid out.

- Do not perform any improper operations, for example, dropping cables directly from a vehicle.
- When selecting, connecting, and routing cables, follow local safety regulations and rules.

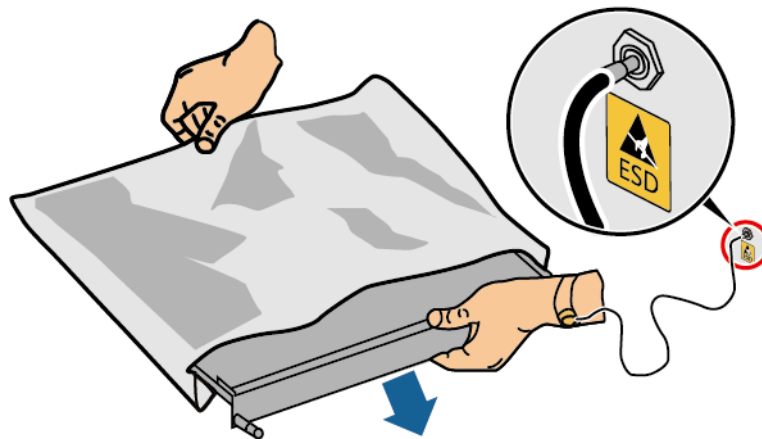
ESD

NOTICE

The static electricity generated by human bodies may damage the electrostatic-sensitive components on boards, for example, the large-scale integrated (LSI) circuits.

- Wear ESD gloves or a well-grounded ESD wrist strap when touching the device or handling boards or application-specific integrated circuits (ASICs).
- 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.

Figure 1-1 Wearing an ESD wrist strap



DC15000001

Neutral-Ground Voltage

It is recommended that the three-phase loads be equalized and the neutral-ground voltage be kept at less than 2 V to meet power distribution requirements.

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.
- 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.

- If any liquid is detected inside the equipment, immediately disconnect the power supply and contact the administrator.
- Do not expose the equipment to flammable or explosive gas or smoke. Do not perform any operation on the equipment in such environments.
- Ensure that the equipment room provides good heat insulation, and the walls and floor are dampproof.
- Install a rat guard at the door of the equipment room.

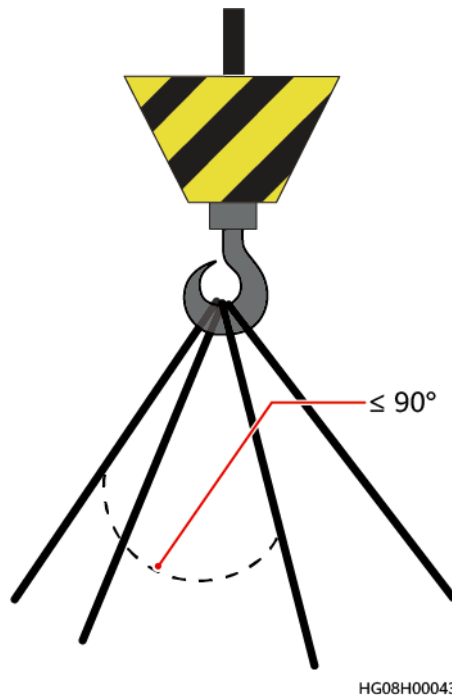
Installation at Heights

- Working at heights refers to operations that are performed at least 2 meters above the ground.
- Do not work at heights if the steel pipes are wet or other potential danger exists. 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.
- 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.
- 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.
- 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.

1.5 Mechanical Safety

Hoisting Devices

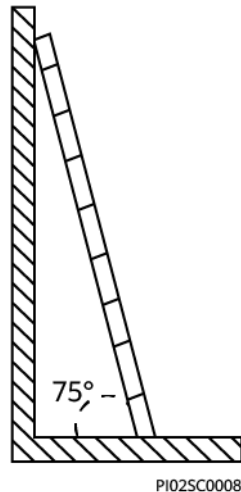
- Do not walk under hoisted objects.
- Only trained and qualified personnel should perform hoisting operations.
- Check that hoisting tools are available and in good condition.
- Before hoisting objects, ensure that hoisting tools are firmly secured onto a load-bearing object or wall.
- Ensure that the 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 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. 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.



- When climbing a ladder, take the following precautions to reduce risks and ensure safety:
 - Keep your body steady.
 - Do not climb higher than the fourth rung of the ladder from the top.
 - 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.

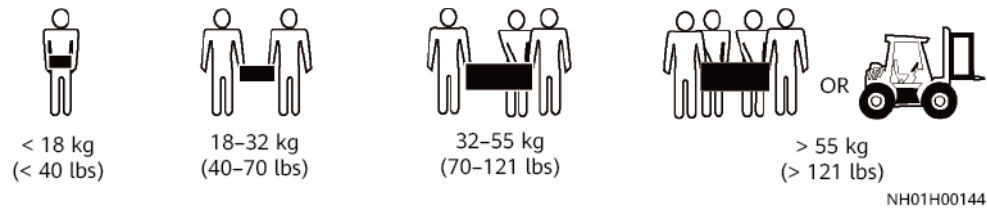
- Obtain the consent from the customer and subcontractor before drilling.
- Wear goggles and protective gloves when drilling holes.
- When drilling holes, protect the equipment from shavings. After drilling, clean up any shavings that have accumulated inside or outside the equipment.

Moving Heavy Objects

DANGER

When removing a heavy or unstable component from a cabinet, be aware of unstable or heavy objects on the cabinet.

- 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.
- Avoid scratching the cabinet surface or damaging cabinet components and cables during equipment transportation.
- When transporting the equipment using a forklift truck, ensure that the forks are properly positioned to ensure that the equipment does not topple. Before moving the equipment, secure it to the forklift truck using ropes. When moving the equipment, assign dedicated personnel to take care of it.
- Choose railways, sea, or a road with good condition for transportation to ensure equipment safety. Avoid tilt or jolt during transportation.
- Move a cabinet with caution. Any bumping or falling may damage the equipment.

1.6 Device Running Safety

The UPS is used for commercial and industrial purposes only. It cannot be used as a power supply for life support devices.

For power supply systems that are critical to significant economic interests or public order, such as the national computing center, military command system, emergency command center, railway signal system and control center, civil aviation and air traffic control center, airport command center, financial clearing center, and transaction center, the Tier 4 or 3 power architecture specified in TIA-942 must be used. That is, two power supplies must be used to supply power to loads.

Ensure that the equipment is used in an environment that meets the product design specifications (including power grid, temperature, and humidity). Otherwise, the equipment may become faulty, and the resulting equipment malfunction and component damage are not covered under the warranty.

The UPS operating environment must meet the requirements for the climate indicator, mechanically active substance indicator, and chemically active substance indicator in ETSI EN 300 019-1 class 3.6.

NOTICE

- This is a category C3 UPS product for commercial and industrial application in the second environment – installation restrictions or additional measures may be needed to prevent disturbances.
 - After unpacking the UPS, you are advised to power on the UPS as soon as possible. If you temporarily do not use the UPS, take appropriate measures to prevent moisture, dust, and foreign matter from entering the UPS.
 - After unpacking batteries, you are advised to connect the battery supply as soon as possible. If you temporarily do not use the batteries, store them in a dry and clean environment. If batteries are stored for more than 90 days, charge them in time. Otherwise, the battery lifespan may be affected.
 - Install the UPS in an area far away from liquids. Do not install it under 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 UPS to prevent short circuits. Ensure that there is no condensation inside the equipment or equipment room.
 - If any liquid is detected inside the equipment, immediately disconnect the power supply and contact the administrator.
-

DANGER

- Do not expose the equipment to flammable or explosive gas or smoke. Do not perform any operation on the equipment in such environments.
 - During installation and maintenance, ensure that sundries do not enter the UPS. Otherwise, equipment damage, load power derating, power failure, and personal injury may occur.
-

If the valid mains voltage exceeds 320 V AC, the UPS may be damaged.

A UPS can be used to serve resistive-capacitive loads, resistive loads, and micro-inductive loads. It is recommended that a UPS not be used for pure capacitive loads, pure inductive loads, and half-wave rectification loads. A UPS does not apply to regeneration loads.

Any operation on any electrical device in an environment that has inflammable air can cause extreme danger. Strictly obey the operating environmental requirements specified in related user manuals when using or storing the device.

The UPS can be configured with a backfeed protection dry contact to work with an external automatic circuit breaker, preventing the voltage from flowing back to input terminals over static bypass circuits. If the installation and maintenance personnel do not need backfeed protection, paste labels on external mains and bypass input switches, informing that the UPS is connected to a backfeed protection card. Disconnect the backfeed protection card from the UPS before operating the UPS.

Do not use the UPS in the following places:

- Environments that are close to flammable or explosive materials, dust, corrosive gases or dust, conductive or magnetic dust, abnormal vibration, or collision
- Rooms or outdoor environments where temperature and humidity are not controlled (with high temperature, low temperature, moisture, direct sunlight, or heat sources)
- Non-confined environments near the ocean (0–3.7 km) and indoor or semi-indoor environments where the temperature and humidity are not controllable, such as simple equipment rooms, civil houses, garages, corridors, and direct ventilation cabinets near the sea; or houses with only roofs, railway station platforms, gymnasiums, and aquariums
- Environments that are conducive for the growth of microorganisms such as fungus or mildew
- Environments where rodents (such as mice) and insects exist

1.7 Battery Safety

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.
-
- 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.
 - Use batteries of specified models. Using batteries of other models may damage the batteries.
 - 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.

- The site must be equipped with qualified fire extinguishing facilities, such as firefighting sands and powder fire extinguishers.

NOTICE

To ensure battery safety and battery management accuracy, use batteries provided with the UPS by Huawei. Huawei is not responsible for any battery faults caused by batteries not provided by Huawei.

Battery Installation

Before installing batteries, observe the following safety precautions:

- Install batteries in a well-ventilated, dry, and cool environment that is far away from heat sources, flammable materials, moistures, extensive infrared radiation, organic solvents, and corrosive gases. Take fire prevention measures.
- 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.
- Check battery connections periodically, ensuring that all bolts are securely tightened.
- When installing batteries, do not place installation tools on the batteries.

Battery Short Circuit

DANGER

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

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.

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 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.
- If the electrolyte overflows, follow the instructions of the battery manufacturer or neutralize the electrolyte by using sodium bicarbonate (NaHCO_3) or sodium carbonate (Na_2CO_3).

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.
- Do not charge a battery when the ambient temperature is below the lower limit of the operating temperature (charging is forbidden at 0°C). Low-temperature charging may cause crystallization, which will result in a short circuit inside the battery.
- Use batteries within the allowed temperature range; otherwise, the battery performance and safety will be compromised.
- Do not throw a lithium battery in fire.
- When maintenance is complete, return the waste lithium battery to the maintenance office.

1.8 Others

- Exercise caution when manually shutting down the UPS inverter for transferring to bypass mode, or when adjusting the UPS output voltage level or frequency. Doing so may affect the power supply to equipment.
- Exercise caution when setting battery parameters. Incorrect settings will affect the power supply and battery lifespan.

2 Product Overview

2.1 Positioning

The UPS5000-H is a high-end modular UPS launched by Huawei. It adopts online double conversion and modular redundancy design for components. Based on the digital signal processing (DSP) technology, the UPS5000-H features high efficiency and power density.

The UPS5000-H provides reliable, efficient, and simple solutions. It supplies reliable and high-quality power to:

- Large-sized data centers
- ISP data centers
- Internet data centers
- DR data centers
- Cloud data centers
- Infrastructures, large-sized control equipment rooms, and railways

2.2 Features

Simple

- Power, bypass, and control modules are hot swappable. A common engineer can finish maintenance within 5 minutes.
- Smooth capacity expansion is supported. The initial investment on the UPS is reduced and the UPS operating efficiency is improved.
- The UPS is configured with an SNMP card, which reduces the management cost and features simple and flexible configurations. Huawei NetEco 6000 easily implements remote centralized management.
- The power supply and distribution status is monitored in real time. Core parameters of the UPS power supply and distribution system are automatically inspected, so manual inspection is not required.

Green

- Space is efficiently used. The UPS saves space for placing more IT equipment and reduces the footprint by 50% compared with traditional solutions of combining cabinets.
- The power density of power modules can reach 100 kW/3 U, which is the highest in the industry.
- High efficiency is ensured even with a low load rate. If the load rate is extremely low, the intelligent rotation hibernation technology ensures redundancy and improves the UPS efficiency.

Intelligent

The iPower fault warning function is supported. If a battery, capacitor, fan, or any other key component fails, a warning is generated to prevent the fault from escalating.

Safe

- UPS power and control modules use redundant design. No single-point fault occurs.
- The UPS supports a wide input voltage range of 138–485 V AC (line voltage) to adapt to poor power grids.
- The UPS has an output power factor (PF) of 1.0, which is suitable for linear and non-linear loads with a PF greater than 0.5. This allows the UPS to connect to more loads and reduces customer investments.
- The UPS passes reliability tests which focus on high temperature, high humidity, and dust adaptation. The impact of environment on the UPS reliability is reduced.

2.3 Application Scenarios

The UPS5000-H is suitable for power systems in various indoor scenarios, including large-sized data centers or communications centers, equipment rooms of large-sized enterprises, equipment rooms of financial systems, industrial automated equipment, and scheduling centers.

Table 2-1 Typical UPS configurations

Configuration	Application Scenario	Description
Single UPS	Supplies power to common loads.	-
Parallel system	Supplies power to large-sized data centers or important loads. It features high reliability and strong transient overload resistance capability.	A maximum of four UPSs can be connected in parallel.

Configuration	Application Scenario	Description
Multi-bus system	Supplies power to important loads in large- and medium-sized equipment rooms, data centers, and other places that require high reliability. In addition to advantages of common parallel systems, the multi-bus system is free from bottleneck failures, but its configuration is complex.	Dual-bus supported

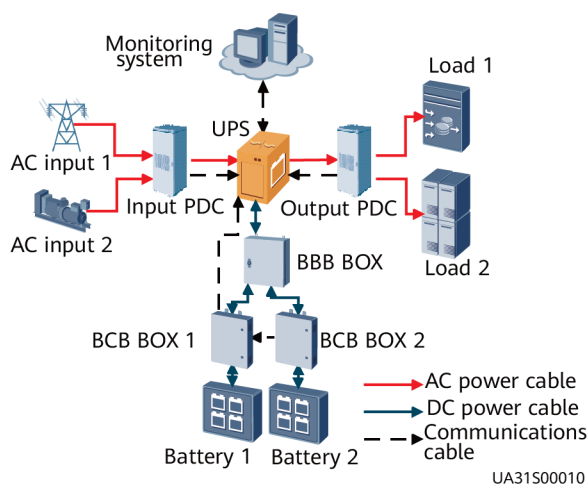
NOTE

If the mains and bypass use different power sources, ensure that the neutral wires of the mains and bypass input power sources are equipotential. For example, the mains and bypass inputs are from the same transformer.

Single UPS

The UPS uses a modular design. It uses multiple power modules connected in parallel to deliver a high loading capacity. If one power module is faulty, other power modules continue working. If loads are light, the UPS provides redundant capacity even if only a single UPS is operating, which ensures high reliability.

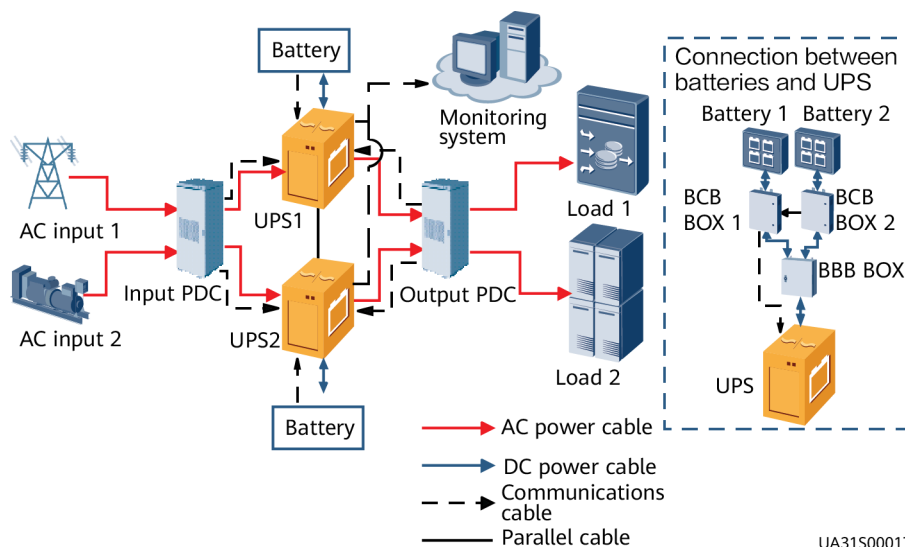
Figure 2-1 Typical application scenario of a single UPS



Parallel System

In a parallel system, mains input, bypass input, and AC output terminals of UPSs are connected in parallel. ECMs on different UPSs are connected over parallel cables to synchronize UPS outputs to supply power to loads. If one UPS fails, another UPS continues supplying power to loads, which ensures system reliability.

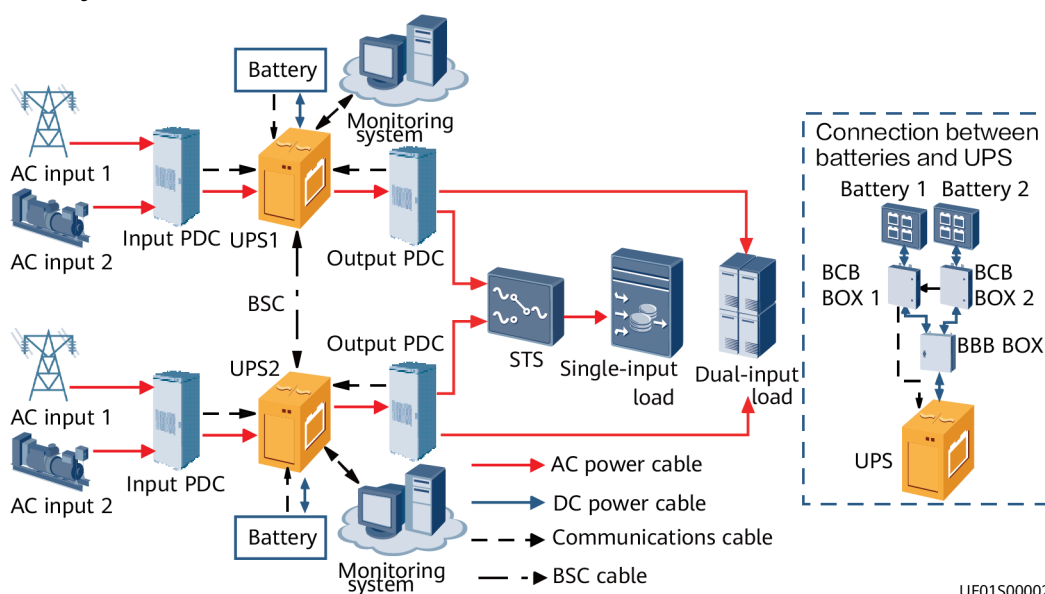
Figure 2-2 Typical application scenario of 1+1 parallel system



Dual-Bus System

A dual-bus system consists of two independent UPS systems. Each UPS system consists of one UPS or multiple UPSs connected in parallel. Of the two UPS systems, one is the master system and the other is the slave system. The dual-bus system is highly reliable and is suitable for loads with multiple input terminals. You can install an optional static transfer switch (STS) to start a bus synchronization controller (BSC) provided in standard configuration. The UPS systems work in inverter mode or bypass mode.

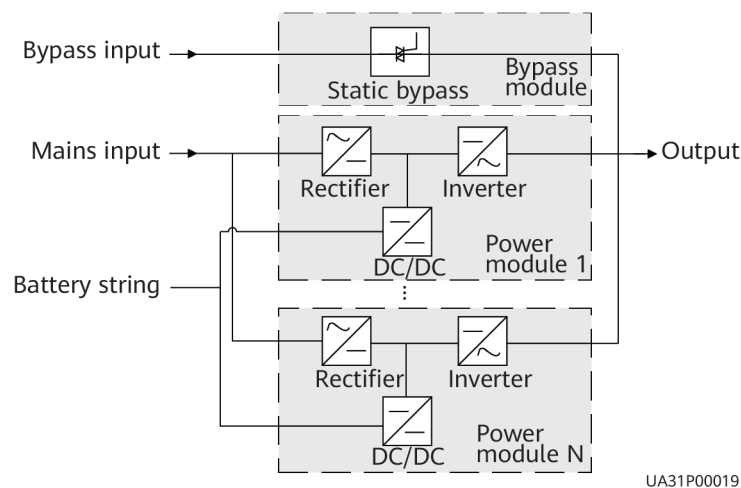
Figure 2-3 Typical application scenario of a dual-bus system consisting of single UPS systems



2.4 Working Principle

The UPS is an online product. It uses modular design, which facilitates maintenance and capacity expansion. The UPS uses the DSP technology for intelligent control. The power module consists of a rectifier, inverter, and DC/DC converter. The UPS converts inputs into pure high-quality sine wave outputs by using the high-frequency switching technology.

Figure 2-4 Conceptual diagram

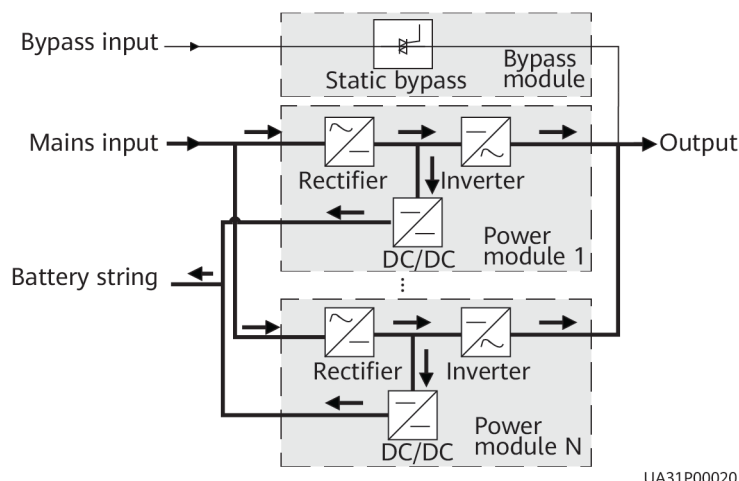


2.5 Working Modes

2.5.1 Normal Mode

In normal mode, the rectifier converts AC power into DC power. Then the inverter converts DC power into AC output. At the same time, the rectifier charges batteries over a charger. The two conversions ensure high-precision and high-quality output voltages, protecting loads from interferences such as input harmonics, glitches, and voltage transients.

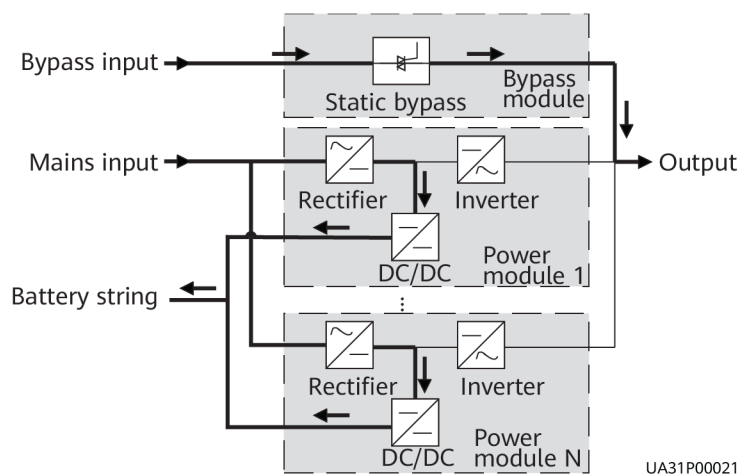
Figure 2-5 UPS conceptual diagram in normal mode



2.5.2 Bypass Mode

When the UPS detects that the power module experiences overtemperature, overload, or other faults that may shut down the inverter, the UPS automatically transfers to bypass mode. At the same time, the rectifier is started and charges batteries over a charger. In bypass mode, loads are powered by the bypass module. The bypass power supply is not protected by the UPS and therefore is prone to the mains outage, abnormal AC voltage waveform, or abnormal frequency.

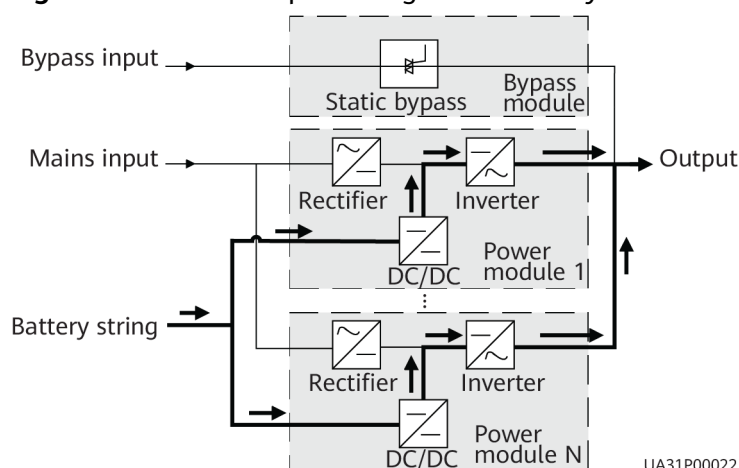
Figure 2-6 UPS conceptual diagram in bypass mode



2.5.3 Battery Mode

If the mains input is abnormal or the rectifier becomes abnormal, the UPS transfers to battery mode. The power module obtains energy from batteries, and the energy is converted into AC output by the inverter.

Figure 2-7 UPS conceptual diagram in battery mode

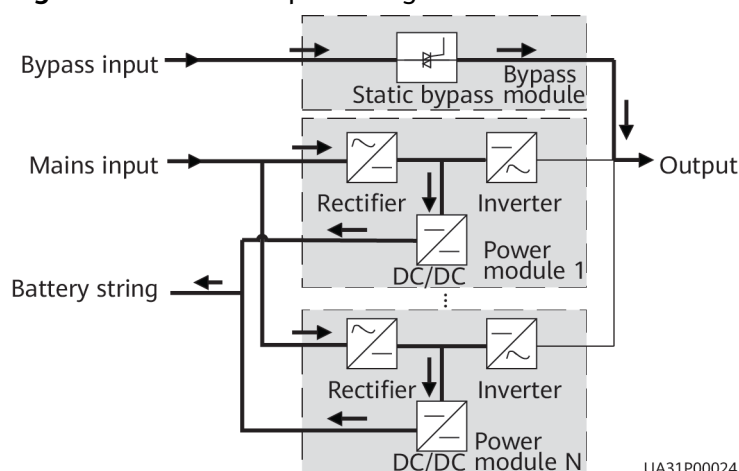


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2.5.4 ECO Mode

The economic control operation (ECO) mode is an economical working mode, which can be configured on the LCD or web user interface (WebUI). In ECO mode, when the bypass input is within the ECO voltage and frequency ranges and other ECO power supply conditions are met, the UPS works in bypass mode and the inverter is in standby state. When the bypass source voltage is outside the ECO voltage range, the UPS transfers from bypass mode to inverter mode. In bypass mode or inverter mode, the rectifier keeps working and charges batteries using a charger. The ECO mode delivers a high efficiency.

Figure 2-8 UPS conceptual diagram in ECO mode



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NOTE

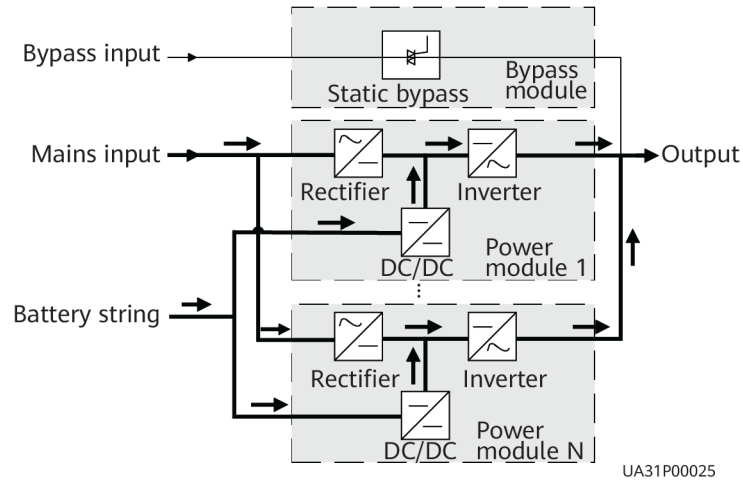
Manual startup is required to ensure that the inverter is in standby state and the power flow has reached the inverter.

2.5.5 Source-Share Mode

If the UPS works properly and the AC input power of rectifiers is insufficient, the UPS transfers to source-share mode. In this case, the power module obtains

energy from both the mains and batteries, and the energy is converted into AC outputs by the inverter.

Figure 2-9 Conceptual diagram in source-share mode



3 Product Introduction

3.1 Model Description

Figure 3-1 Model number (600K is used as an example)

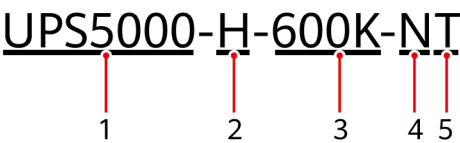
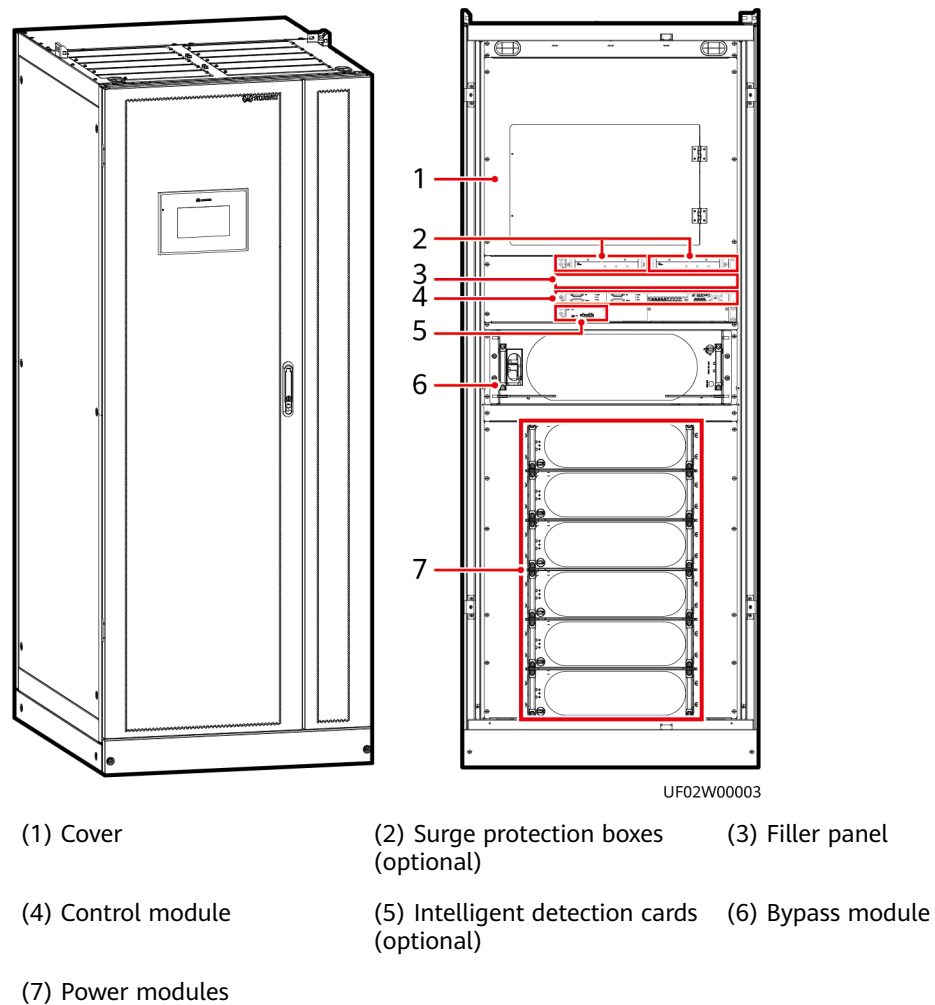


Table 3-1 Model description

No.	Item	Description
1	Product category	UPS5000
2	Product subcategory	H: high power density and high efficiency
3	Rated capacity	800K: The output capacity is 800 kVA. 600K: The output capacity is 600 kVA. 500K: The output capacity is 500 kVA. 400K: The output capacity is 400 kVA.
4	Switch configuration	N: no switch
5	Cabling	T: Cables are routed in and out from the top. NOTE - If the system is not configured with optional components, cables can be routed in and out from the top. - If the system is configured with a bottom cabling cabinet, cables can be routed in and out from the bottom.

3.2 Cabinet Description

Figure 3-2 UPS exterior and interior (600 kVA)

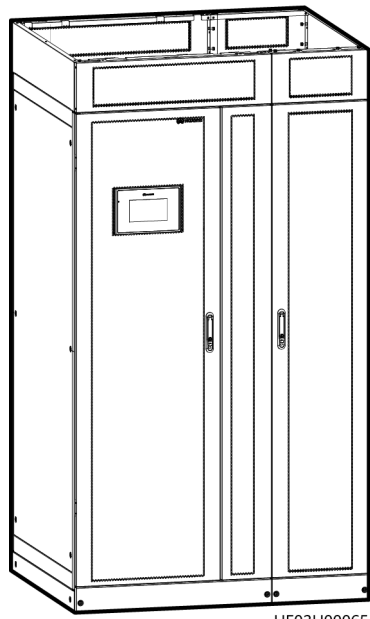


NOTE

The number of power modules varies depending on the configuration. The figure uses a 600 kVA UPS as an example.

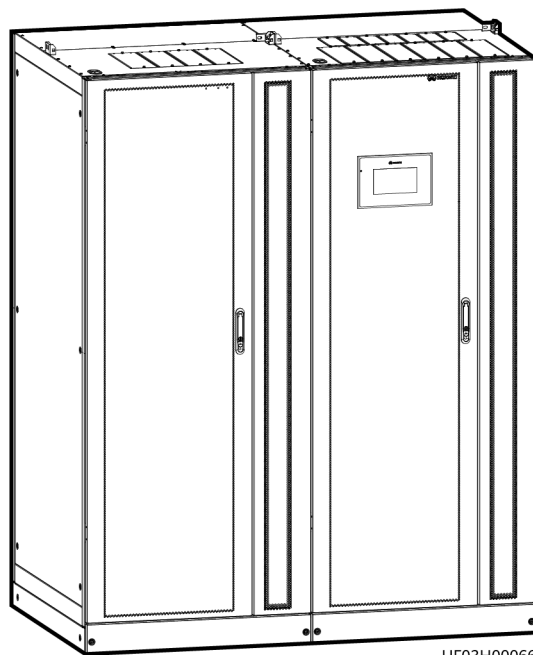
Four power modules are configured for a 400 kVA UPS. Five power modules are configured for a 500 kVA UPS. Six power modules are configured for a 600 kVA UPS.

Figure 3-3 UPS + bottom cabling cabinet



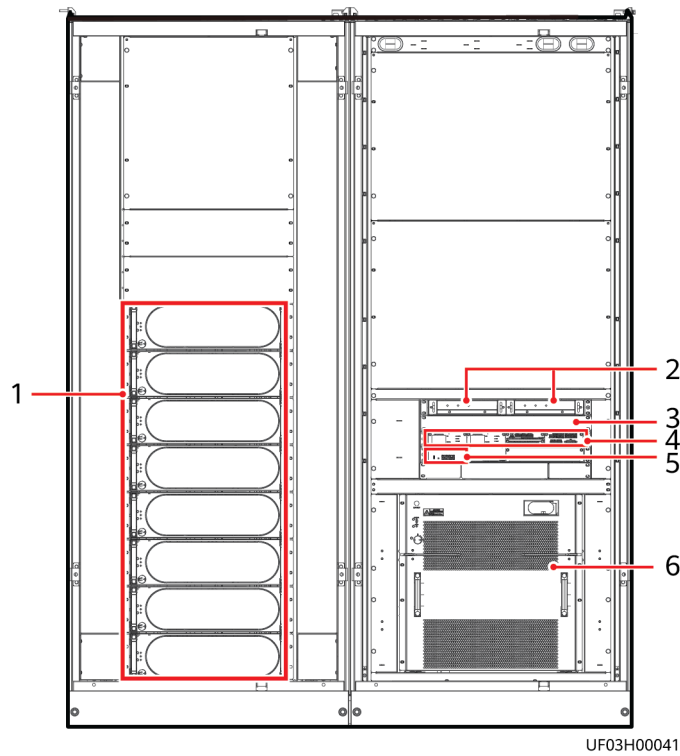
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Figure 3-4 Exterior (800 kVA)



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Figure 3-5 Interior (800 kVA)



(1) Power modules

(2) Surge protection boxes
(optional)

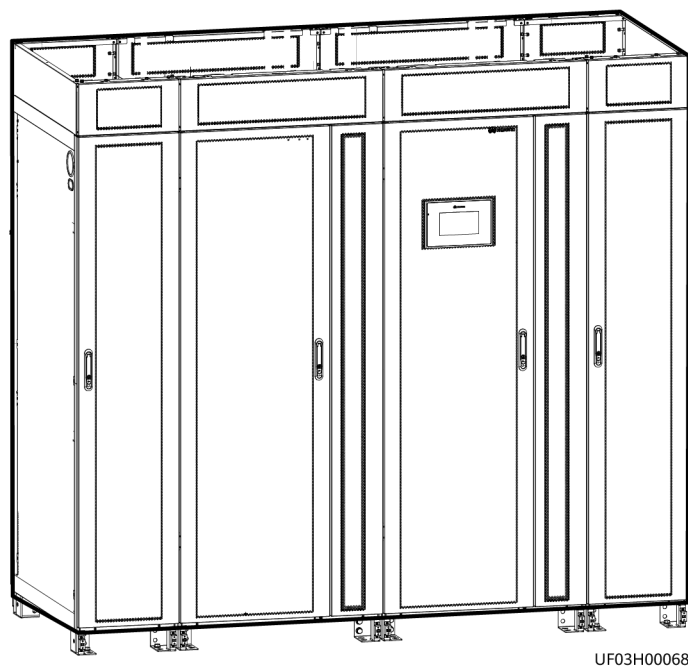
(3) Filler panel (for an optional
ECM extended subrack)

(4) Control module

(5) Intelligent detection cards
(optional)

(6) Bypass module

Figure 3-6 UPS + bottom cabling cabinet



4 Component Description

4.1 Power Module

The power module consists of a power factor correction (PFC) rectifier and inverter. It performs AC/DC or DC/DC conversion on the mains and battery inputs, and stabilizes the bus voltage. The inverter (DC/AC) converts the inputs into sine wave outputs.

Figure 4-1 Appearance

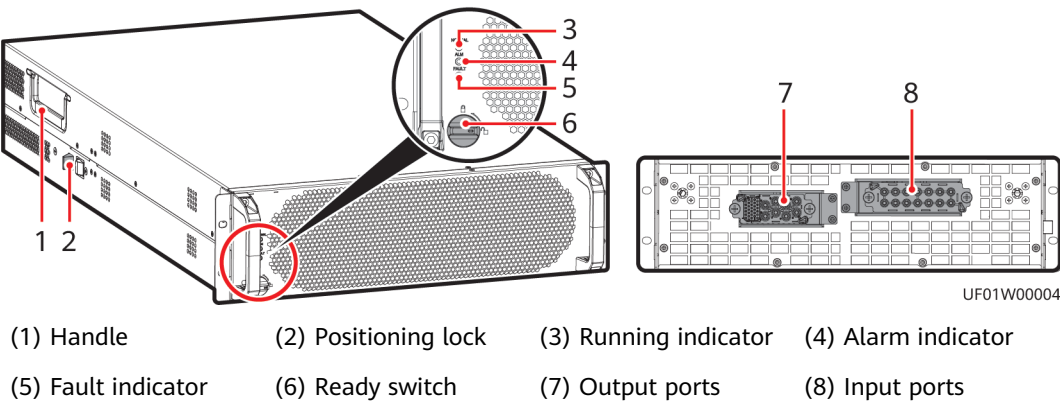


Table 4-1 Indicator description

Indicator	Color	Status	Description
Running indicator	Green	Steady on	The system is working in inverter mode.
		Blinking at long intervals	- The inverter is ready and in standby state (blinking at 0.5 Hz, on for 1s and off for 1s). - The inverter is not started (blinking at 0.2 Hz, on for 2.5s and off for 2.5s).

Indicator	Color	Status	Description
		Blinking at short intervals	The module is not configured, the inverter software and rectifier software are being upgraded, or the inverter software is being upgraded (blinking at 4 Hz, on for 0.125s and off for 0.125s).
		Off	The software is being upgraded.
Alarm indicator	Yellow	Steady on	A minor alarm is generated for the inverter or rectifier.
		Off	There is no minor alarm for the inverter or rectifier, or the software is being upgraded.
Fault indicator	Red	Steady on	A critical alarm is generated for the inverter or rectifier.
		Off	There is no critical alarm for the inverter or rectifier, or the software is being upgraded.

Table 4-2 Specifications

Item	Specifications
Rated output capacity	100kVA/100kW
Dimensions (H x W x D)	130 mm x 442 mm x 750 mm
Weight	< 55 kg

4.2 Bypass Module

The UPS works in bypass mode under the following circumstances:

- The ECO mode is used and the bypass voltage is within the specified range.
- The power module overload times out.
- Both active and standby energy control modules (ECMs) in the system are abnormal.
- The system runs abnormally.
- The UPS is transferred to bypass mode manually.

Figure 4-2 400–600 kVA bypass module

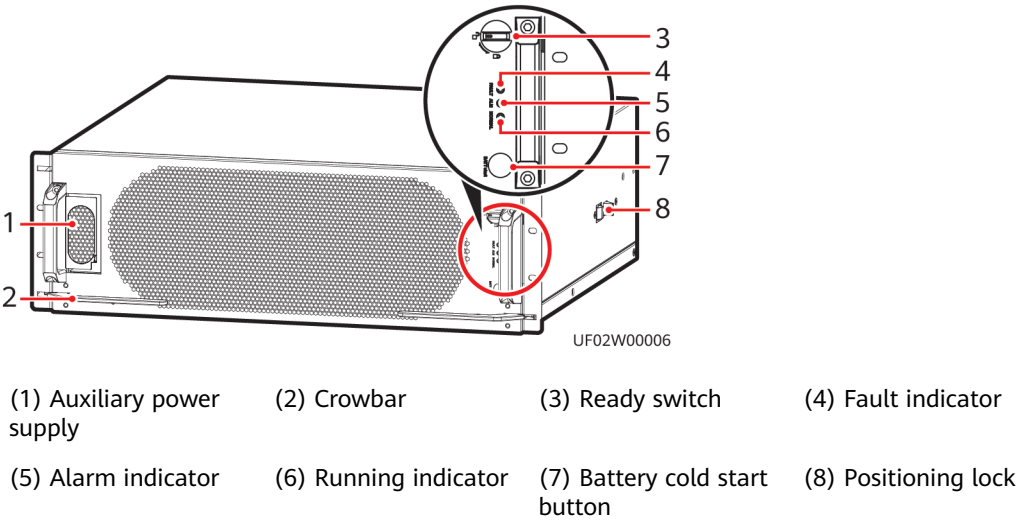


Figure 4-3 800 kVA bypass module

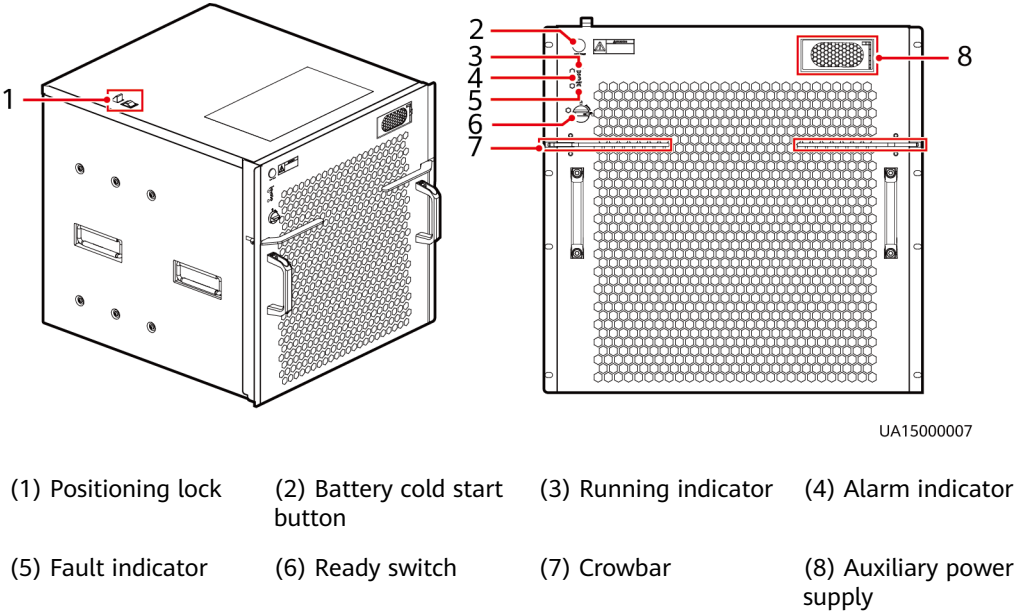


Table 4-3 Indicator description

Indicator	Color	Status	Description
Running indicator	Green	Steady on	The system is working in bypass mode.
		Blinking at long intervals	The bypass has no output (blinking at 0.2 Hz, on for 2.5s and off for 2.5s).
		Blinking at short intervals	The bypass is not configured or the software is being upgraded (blinking at 4 Hz, on for 0.125s and off for 0.125s).

Indicator	Color	Status	Description
		Off	The bypass software is being upgraded.
Alarm indicator	Yellow	Steady on	A minor alarm is generated for the bypass.
		Off	There is no minor alarm for the bypass, or the software is being upgraded.
Fault indicator	Red	Steady on	A critical alarm is generated for the bypass.
		Off	There is no critical alarm for the bypass, or the software is being upgraded.

Table 4-4 Specifications

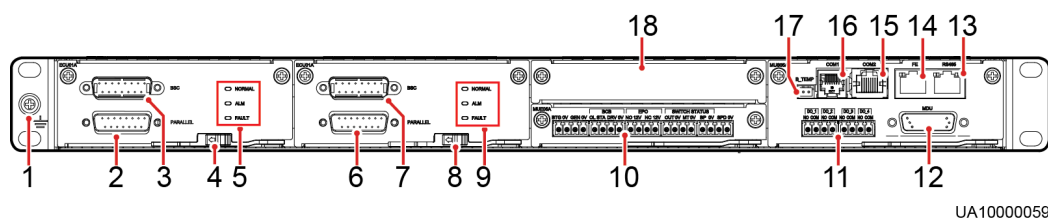
Item	Specifications
Dimensions (H x W x D)	400–600 kVA: 200 mm x 600 mm x 600 mm 800 kVA: 500 mm x 480 mm x 550 mm
Weight	400–600 kVA: ≤ 50 kg 800 kVA: ≤ 83 kg

4.3 Control Module

4.3.1 Overview

The control module in a standard configuration contains two ECMs, one dry contact card, and one monitoring interface card from left to right. The four cards are hot-swappable. One subrack is reserved above the dry contact card. A backfeed protection card or dry contact extended card can be inserted into the subrack.

Figure 4-4 Signal panel of the control module



- | | | | |
|--------------------------------------|----------------------------------|-------------------|---|
| (1) Ground terminal | (2) Parallel port 1 | (3) BSC port 1 | (4) Ready switch on ECM 1 |
| (5) ECM 1 indicators | (6) Parallel port 2 | (7) BSC port 2 | (8) Ready switch on ECM 2 |
| (9) ECM 2 indicators | (10) Dry contact card | (11) Dry contacts | (12) Monitoring display unit (MDU) port |
| (13) RS485 port | (14) FE port | (15) COM2 port | (16) COM1 port |
| (17) Battery temperature sensor port | (18) Optional card subrack cover | | |

NOTE

Ports are protected by a security mechanism.

4.3.2 ECM

- As a control interface for the entire system, the ECM communicates with each module and provides a bus for communication between the dry contact card and the system control card. The ECM ensures equalized output currents between modules so that load power is equally shared.
- The ECM provides module working status information to the monitoring system.
- The ECM controls the running of a single UPS and a parallel system, and reports the UPS status information to other monitoring modules.
- The system provides three types of CAN communication: monitoring CAN communication, intra-rack parallel CAN communication, and inter-rack parallel CAN communication.
- The control module consists of one active ECM and one standby ECM.
- Hot-swappable, 1 U high.

Figure 4-5 Appearance

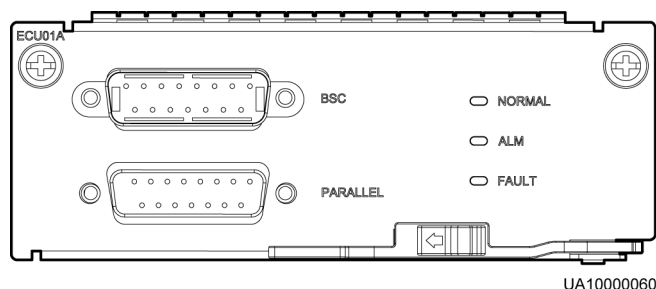


Table 4-5 Port description

Silk Screen	Description
PARALLEL	The PARALLEL port transmits parallel signals between racks.
BSC	The BSC port is used in a dual-bus system to synchronize output frequencies and phases between UPS systems, ensuring that two buses can switch with each other. BSC cables are hot-swappable.

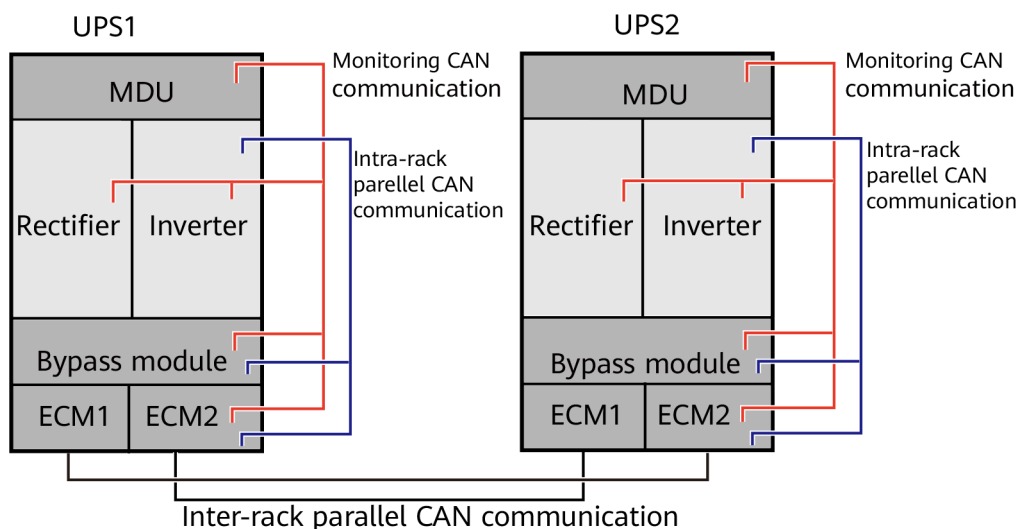
 NOTE

No parallel cable is required for a single UPS.

Table 4-6 Indicator description

Indicator	Color	Status	Description
NORMAL	Green	Steady on	This ECM is the active ECM.
		Blinking at 0.5 Hz	This ECM is the standby ECM and it is ready.
		Off	This ECM is not ready or the software of this ECM is being upgraded.
		Blinking at 4 Hz	The ECM software is being upgraded or not configured.
ALM	Yellow	Steady on	The ECM has a minor alarm, but it does not need to be replaced.
		Off	The ECM has no minor alarm or the software of the ECM is being upgraded.
FAULT	Red	Steady on	The ECM has a critical alarm.
		Off	The ECM has no critical alarm or the software of the ECM is being upgraded.

Figure 4-6 CAN communication logic



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4.3.3 Dry Contact Card

The dry contact card allows the UPS to detect and manage the switch status of the battery system (including the external battery switch) and implement remote emergency power off (EPO). The dry contact card is 0.5 U high and hot-swappable.

NOTICE

- A dry contact card port takes effect only after you set it in the software. You need to disable unused dry contact signals.
- Set the EPO port to normally open (NO) or normally closed (NC) as required.
- If multiple UPSs are connected in parallel, connect all used dry contact signals to each UPS.
- Signal cables must be double-insulated twisted cables. If the cable length is within 25–50 m, the cross-sectional area must be 0.5–1.5 mm².
- For dry contact outputs, the rated DC voltage and current are 24 V DC and 0.6 A and the maximum values are 30 V DC and 1.0 A. The rated AC voltage and current are 24 V AC and 0.6 A and the maximum values are 30 V AC and 1.0 A. During cable connection, ensure that the voltage and current do not exceed these maximum values.

Figure 4-7 Appearance

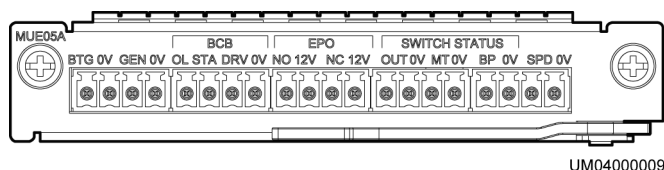


Table 4-7 Functions of control signal ports on the dry contact card

Silk Screen	Signal Description	Status Description	Initial Status
BTG	Port for monitoring battery grounding failures	• Closed: There is a battery grounding failure. • Open: There is no battery grounding failure.	Open ^a
0V	Port for signal ground		
GEN	Port for detecting the diesel generator (DG) mode	• Closed: DG mode • Open: non-DG mode	Open ^a
0V	Port for signal ground		
BCB_OL	Port for monitoring the battery circuit breaker (BCB) box	• Grounded: BCB box connected • Disconnected: BCB box not connected	Grounded
BCB_STA	Port for monitoring the BCB	• Closed: The BCB is ON. • Open: The BCB is OFF.	Open
BCB_DRV	Port for controlling BCB trip. When the voltage is +12 V, the BCB trips.	• 0 V: BCB not tripped • 12 V: BCB tripped	0 V
BCB_0V	Port for signal ground		
EPO_NO	If the NO port is connected to the EPO_12V port, EPO is triggered.	Closing the EPO port triggers EPO.	Open
EPO_12V	+12 V		
EPO_NC	If the NC port is disconnected from the EPO_12V port, EPO is triggered.	Opening the EPO port triggers EPO.	Closed
EPO_12V	+12 V		
SWITCH STATUS_OUT	Port for monitoring the UPS output circuit breaker	• Closed: The UPS output circuit breaker is ON. • Open: The UPS output circuit breaker is OFF.	Closed ^a
SWITCH STATUS_0V	Port for signal ground		

Silk Screen	Signal Description	Status Description	Initial Status
SWITCH STATUS_MT	Port for monitoring the maintenance switch	● Open: The maintenance switch is ON. ● Closed: The maintenance switch is OFF.	Open ^a
SWITCH STATUS_0V	Port for signal ground		
SWITCH STATUS_BP	Port for monitoring the bypass input circuit breaker	● Closed: The bypass input circuit breaker is ON. ● Open: The bypass input circuit breaker is OFF.	Closed ^a
SWITCH STATUS_0V	Port for signal ground		
SPD	Port for monitoring the input AC SPD	● Closed: The input AC SPD is normal. ● Open: The input AC SPD fails.	Closed ^a
0V	Port for signal ground		

a: On the LCD, choose **System Info > Settings > System Settings > Dry Contact Set > MUE05A DI type configure**, and customize the initial status of **Battery ground fault [BTG]**, **D.G. connection [GEN]**, **PDC output breaker [OUT]**, **PDC maintenance breaker [MT]**, **BP/SYSMT switch**, and **SPD/SYSOUT switch**.

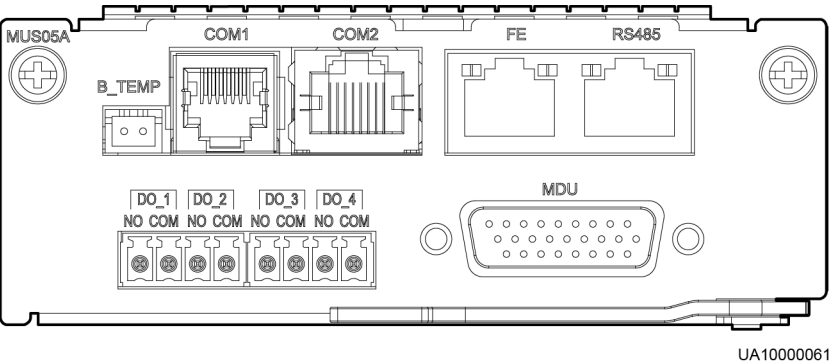
4.3.4 Monitoring Interface Card

The monitoring interface card provides external ports as well as monitoring and control functions for the MDU. The monitoring interface card provides the ambient temperature and humidity sensor port, FE port, battery temperature monitoring port, and network management port. The MDU monitors the UPS, allows users to set parameters, delivers commands, reports system information, and displays key UPS information and parameters on the LCD.

NOTICE

- The FE port resembles the RS485 port. Therefore, follow the silk screens when you connect communications cables. If you mistake the RS485 port as the FE port during cable connection, the WebUI communication fails. If you mistake the FE port as the RS485 port during cable connection, RS485 communication fails.
- Dry contact signals take effect after you set them. Disable unused dry contact signals on the monitoring system.
- When multiple UPSs are connected in parallel, all dry contact signals to be used need to connect to each UPS.

Figure 4-8 Monitoring interface card



NOTE

DO_1 to DO_4 meet the maximum voltage and current requirements of 30 V DC/1 A or 60 V DC/0.5 A.

Table 4-8 Description of ports on the monitoring interface card

Port	Silk Screen	Description
DO_1	NO	• DO_1, DO_2, DO_3, and DO_4 indicate alarm outputs. The default values are Critical alarm, Minor alarm, Bypass mode, and Battery mode, respectively. • On the LCD, choose System Info > Settings > System Settings > Dry Contact Set. Set MUS05A DO_1, MUS05A DO_2, MUS05A DO_3, and MUS05A DO_4 to Disable, Critical alarm, Minor alarm, Bypass mode, Battery mode, Low batt. volt., Batt. SOC below thres., Abnormal mains, Sys maint breaker enable, Sys outp breaker enable, Maint. breaker closed, No power supplied, Mains supplies power, ECO mode, Battery test, Batt. volt. below thres, Rack output
	COM	
DO_2	NO	
	COM	
DO_3	NO	
	COM	
DO_4	NO	

Port	Silk Screen	Description
	COM	overload, Battery temp. abnormal, and Battery EOD. Configure power segment settings based on backup time.
DB26	MDU	Supports FE, RS485, I2C, CAN, and other signals.
Battery temperature sensor port	B_TEMP	Connects to an indoor battery temperature sensor.
Southbound communications port 1	COM1	- Supported protocol: Modbus-RTU - Connects to an ambient temperature and humidity sensor over two wires.
Southbound communications port 2	COM2	- Supported protocol: Modbus-RTU - Connects to a southbound device.
Network port	FE	- Supported protocols: Modbus-TCP, HTTPS, and SNMP - Connects to the network port on a PC. - Network port for connecting to the web service and for SNMP networking
Northbound communications port	RS485	- Supported protocol: Modbus-RTU - Connects to a northbound network management device or third-party network management device over two wires.

NOTE

- Signal cables must be double-insulated twisted cables. If the cable length is within 25–50 m, the cross-sectional area must be 0.5–1.5 mm².
- RS485 cables and FE cables must be shielded cables.

Figure 4-9 and **Figure 4-10** are recommended wiring methods for DO ports.

Figure 4-9 Wiring method 1

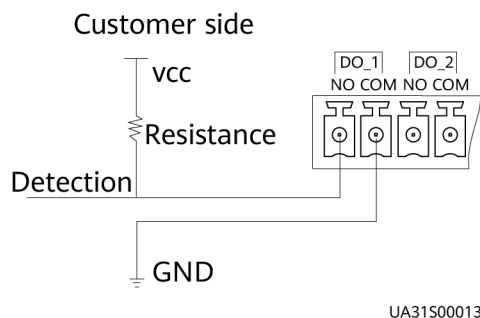


Figure 4-10 Wiring method 2

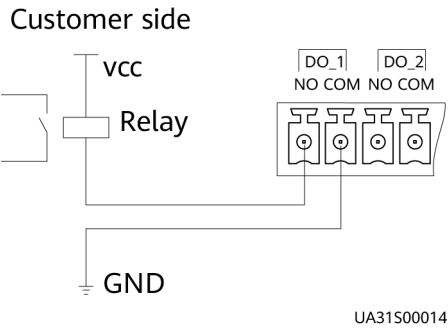


Figure 4-11 COM1 port pins

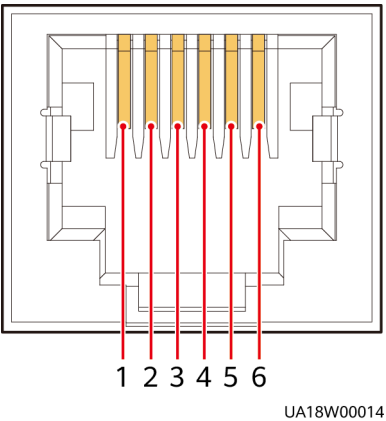


Table 4-9 Pin definitions for the COM1 port

Pin	Description
1	GND
2	-
3	RS485-
4	RS485+
5	-
6	12V_PORT

Figure 4-12 COM2 port pins

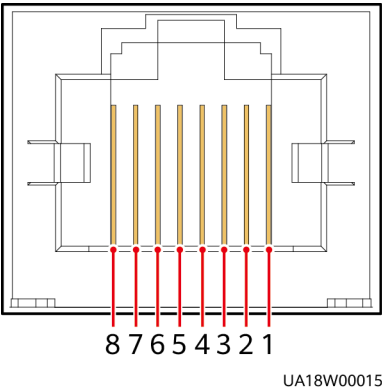


Table 4-10 Pin definitions for the COM2 port

Pin	Description
1	RS485+
2	RS485-
3	-
4	RS485+
5	RS485-
6	GND
7	CANH0
8	CANL0

Figure 4-13 RS485 port pins

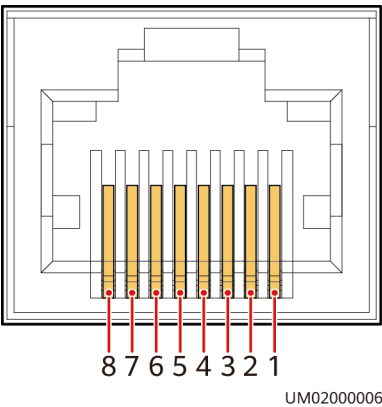


Table 4-11 Pin definitions for the RS485 port

Pin	Description
1	RS485_T+

Pin	Description
2	RS485_T-
3	-
4	RS485_R+
5	RS485_R-
6	GND
7	-
8	-

 NOTE

If cables are prepared onsite, follow the three methods below:

- Connect pin 1 and pin 2. Pin 1 connects to RS485+ and pin 2 connects to RS485-.
- Connect pin 4 and pin 5. Pin 4 connects to RS485+ and pin 5 connects to RS485-.
- Connect pins 1, 2, 4, and 5. Twist cables to pin 1 and pin 4 into one cable and then connect it to RS485+. Twist cables to pin 2 and pin 5 into one and then connect it to RS485-.

4.4 MDU

The MDU allows you to control UPS operations, view the running status and alarms, and set parameters. For details, see the *UPS5000 Monitoring Module User Manual*.

Dimensions (H x W x D): 175 mm x 264 mm x 40 mm

Figure 4-14 Appearance

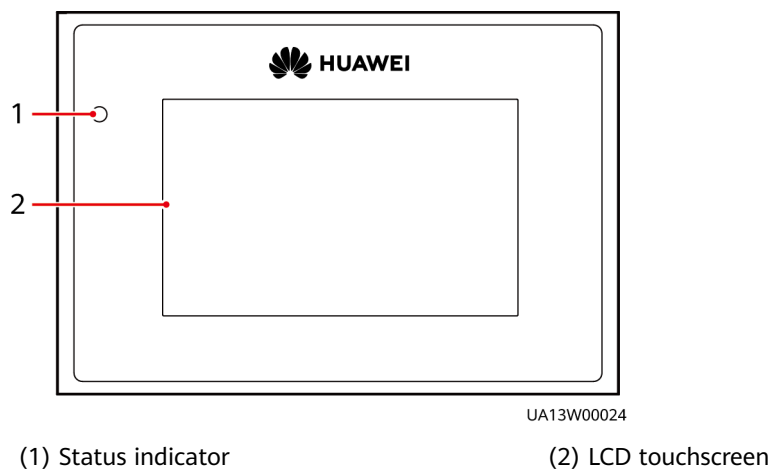


Table 4-12 Indicator status

Status	Color	Meaning
On	Red	A critical alarm has been generated, and the buzzer sounds continuously.
	Yellow	A minor alarm has been generated, and the buzzer buzzes intermittently at 2 Hz.
	Green	The UPS is running properly or a warning has been generated.
Off	-	The MDU is powered off.

NOTE

The indicator on the MDU panel is yellow when the bypass supplies power in non-ECO mode.

Figure 4-15 MDU ports

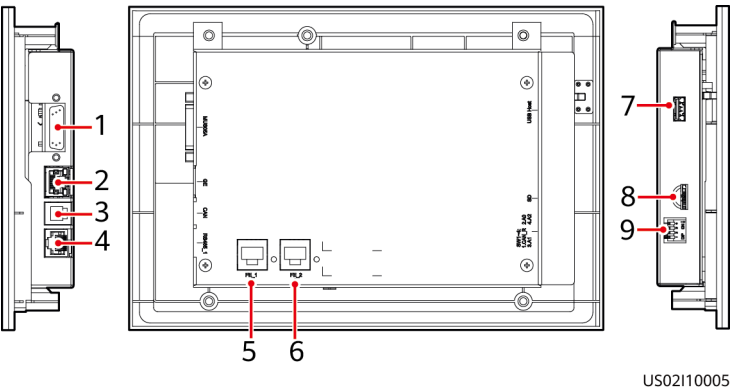


Table 4-13 MDU port description

No.	Port Name	Description
1	MUS05A (DB26)	Connects to the MDU and monitoring interface card.
2	GE	Network port
3	CAN	Reserved
4	RS485_1	Reserved
5	FE_1	Reserved
6	FE_2	Reserved

No.	Port Name	Description
7	USB Host	- After installing the WiFi module, locally connect to the UPS over the Service Expert app. Obtain the initial startup password during deployment. View or obtain UPS running information during inspection. NOTE Only Huawei service engineers or authorized service engineers are allowed to use the WiFi module. To ensure security, remove the WiFi module immediately after use. - Insert a USB flash drive to import and export configuration files, export run logs, and upgrade software.
8	SD	Reserved
9	DIP switch	Implements specific functions by using the DIP switch and specific buttons; controls the CAN communication build-out resistor in a parallel system.

5 Optional Components

5.1 List of Optional Components

Optional Component	Model	Function
BCB-BOX	- PDU8000-040 0DCV8- BXA001 - PDU8000-063 0DCV8- BXA001 - PDU8000-080 0DCV8- BXA001	Controls the connection between battery strings and the UPS, and supports overload protection, short circuit protection, and remote trip control.
Dry contact extended card	-	Provides extended monitoring ports: five relay output ports and five input ports.
Backfeed protection card	-	Detects mains and bypass backfeed and provides protection.
ECM extended subrack	-	Installed when the UPS is equipped with a backfeed protection card and dry contact extended card.
Intelligent detection card	-	- Detects the temperatures of UPS input and output wiring terminals. - Used for the optional switch cabinet to detect the temperatures of the input and output wiring terminals and the status of each switch in the cabinet.
Surge protection box	-	Improves the UPS surge protection capability.

Optional Component	Model	Function
Surge protection box subrack	-	Installed when a surge protection box is used.
Ambient temperature and humidity sensor	-	Monitors ambient temperature and humidity.
Battery temperature sensor	-	Monitors the battery temperature.
BSC cable	5 m/10 m/15 m/60 m	Transmits bus synchronization signals in a dual-bus system.
Parallel cable	5 m/10 m/15 m	Connects UPSs in parallel.
Bottom cabling cabinet	-	Applies to the bottom cabling scenario.
Rear copper bar protection component	-	Protects copper bars at the rear of the cabinet.

NOTE

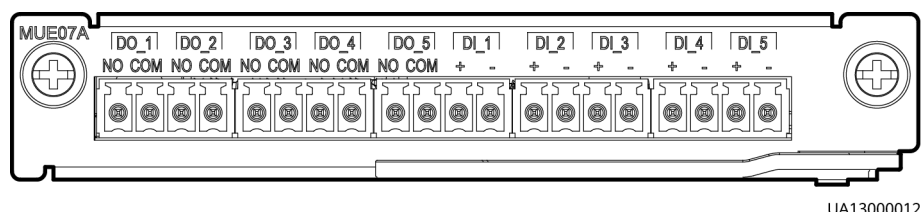
The ECM extended subrack, surge protection box subrack, and intelligent detection card do not support onsite installation. If you require the optional components, inform Huawei when you purchase the UPS so that Huawei can install them before delivery.

5.2 Dry Contact Extended Card

The dry contact extended card provides five groups of electric relay output ports for dry contact signals and five groups of signal input ports to implement various alarm and control functions as required.

A maximum of one dry contact extended card supported in the power monitoring subrack. The card is hot swappable.

Figure 5-1 Appearance



NOTICE

For dry contact outputs, the rated DC voltage and current are 24 V DC and 0.6 A and the maximum values are 30 V DC and 1.0 A. The rated AC voltage and current are 24 V AC and 0.6 A and the maximum values are 30 V AC and 1.0 A. During cable connection, ensure that the voltage and current do not exceed these maximum values.

Table 5-1 Port definitions for the dry contact extended card

Port		Silk Screen	Signal Description
Output	DO_1	NO	- Indicates relay output signals. The dry contact is normally open by default. When the preset status occurs, the relay is closed. Users can set the dry contacts to normally open or closed based on actual requirements. - On the LCD, choose System Info > Settings > System Settings > Dry Contact Set. Set MUS07A DO_1, MUS07A DO_2, MUS07A DO_3, MUS07A DO_4, and MUS07A DO_5 to Disable, Critical alarm, Minor alarm, Bypass mode, Battery mode, Low batt. volt., Batt. SOC below thres., Abnormal mains, Sys maint breaker enable, Sys outp breaker enable, Maint. breaker closed, No power supplied, Mains supplies power, ECO mode, Battery test, Batt. volt. below thres, Rack output overload, Battery temp. abnormal, and Battery EOD. MUS07A DO_1 is set to Low batt. volt. by default. Others are reserved by default. - DOs transmit passive dry contact output signals. Users need to connect external power supply to DOs.
		COM	
	DO_2	NO	
		COM	
	DO_3	NO	
		COM	
	DO_4	NO	
		COM	
	DO_5	NO	
		COM	
Input	DI_1	+	- All DIs are reserved. - On the LCD, choose System Info > Settings > System Settings > Dry Contact Set and set MUS07A DI_1–MUS07A DI_5 to values such as Door alarm and Water alarm. The default value is None. - DI ports detect input dry contact signals which are passive signals.
		-	
	DI_2	+	
		-	
	DI_3	+	
		-	
	DI_4	+	
		-	
	DI_5	+	
		-	

Port		Silk Screen	Signal Description
		-	

The following wiring methods are recommended for DO ports.

Figure 5-2 Wiring method 1

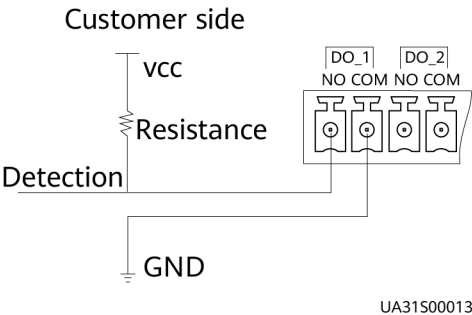
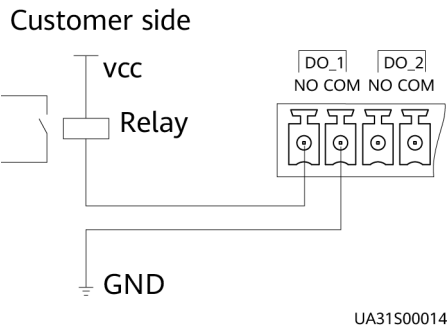


Figure 5-3 Wiring method 2



5.3 Backfeed Protection Card

When energy backfeed occurs, the backfeed protection card sends signals to trigger alarm signals or quickly disconnect the feedback loop. The card is hot swappable.

Figure 5-4 Appearance

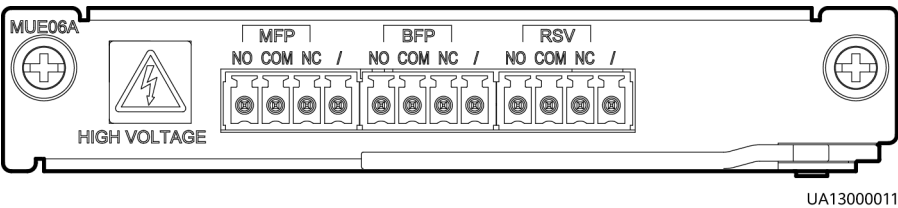


Figure 5-5 Ports on the backfeed protection card

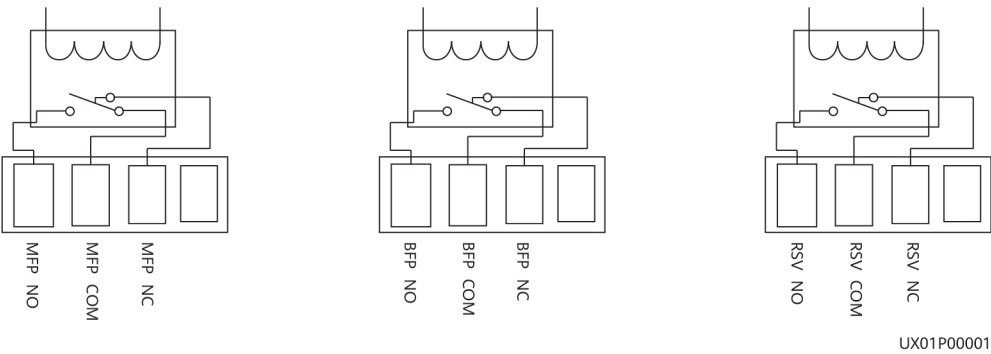


Table 5-2 Port description for the backfeed protection card

Port Position	Silk Screen	Signal Description
MFP (mains feedback protection)	MFP_NO	The MFP port is the signal port for the mains backfeed protection. NO and COM are normally open contacts. NC and COM are normally closed contacts. When a backfeed occurs, the normally open contacts are closed and the normally closed contacts are open.
	MFP_COM	
	MFP_NC	
BFP (bypass feedback protection)	BFP_NO	The BFP port is the signal port for the bypass backfeed protection. NO and COM are normally open contacts. NC and COM are normally closed contacts. When a backfeed occurs, the normally open contacts are closed and the normally closed contacts are open.
	BFP_COM	
	BFP_NC	
RSV (reserved)	RSV_NO	Reserved
	RSV_COM	
	RSV_NC	

5.4 Intelligent Detection Card

In the integrated UPS solution, the intelligent detection card detects the temperatures of the copper bars, switches, and environments of the battery, bypass input, mains input, output, bypass input of the switch cabinet, mains input of the switch cabinet, and output of the switch cabinet, and monitors the status of the mains input, bypass input, and output switches of the switch cabinet.

It is 1 U high and supports hot swap.

Figure 5-6 Intelligent detection card

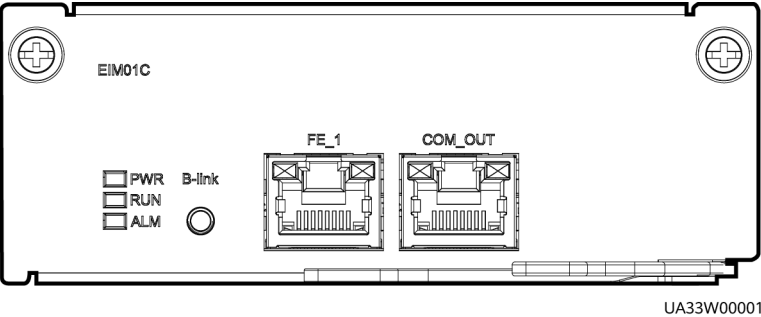


Table 5-3 Intelligent detection card function

Silk Screen	Description
FE_1	Reserved
COM_OUT	Reserved

Table 5-4 Indicator description

Indicator	Color	Status	Description
PWR	Green	Steady on	Indicates the CPU power status of the intelligent detection card. The indicator is steady on after the card is powered on and does not need to be controlled by the CPU.
		Off	Indicates that the intelligent detection card is powered off.
RUN	Green	Blinking at 0.5 Hz	The intelligent detection board is running properly.
		Blinking at 4 Hz	The communication is interrupted.
ALM	Red	Steady on	An alarm is generated.
		Off	No alarm is generated.

NOTE

- Signal cables must be double-insulated twisted cables. If the cable length is within 25–50 m, the cross-sectional area must be 0.5–1.5 mm².
- RS485 cables and FE cables must be shielded cables.

Figure 5-7 COM_OUT port pins

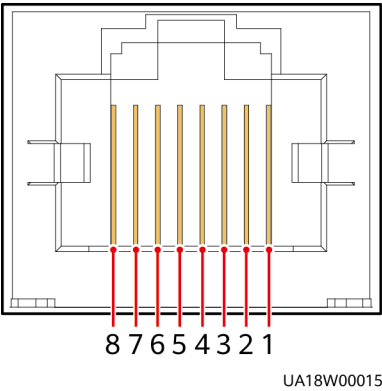


Table 5-5 Pin definitions for the COM_OUT port

Pin	Description
1	RS485+
2	RS485-
3	-
4	RS485+
5	RS485-
6	-
7	CANH
8	CANL

Figure 5-8 FE_1 port pins

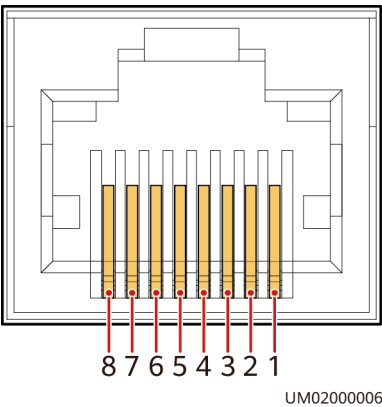


Table 5-6 Pin definitions for the FE_1 port

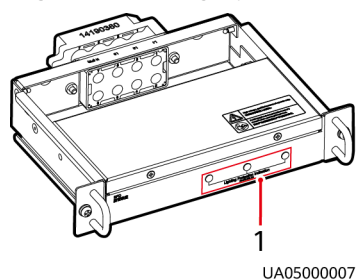
Pin	Description
1	FE4_TX+

Pin	Description
2	FE4_TX-
3	FE4_RX+
4	-
5	-
6	FE4_RX-
7	-
8	-

5.5 Surge Protection Box

The surge protection box is used to improve the surge protection capability for the UPS. It applies to a three-phase four-wire + PE power system.

Figure 5-9 Surge protection box



(1) Working status indicators

5.6 BCB Box

The BCB box controls the connection between battery strings and the UPS, and supports overload protection, short circuit protection, and remote trip control.

Figure 5-10 Appearance

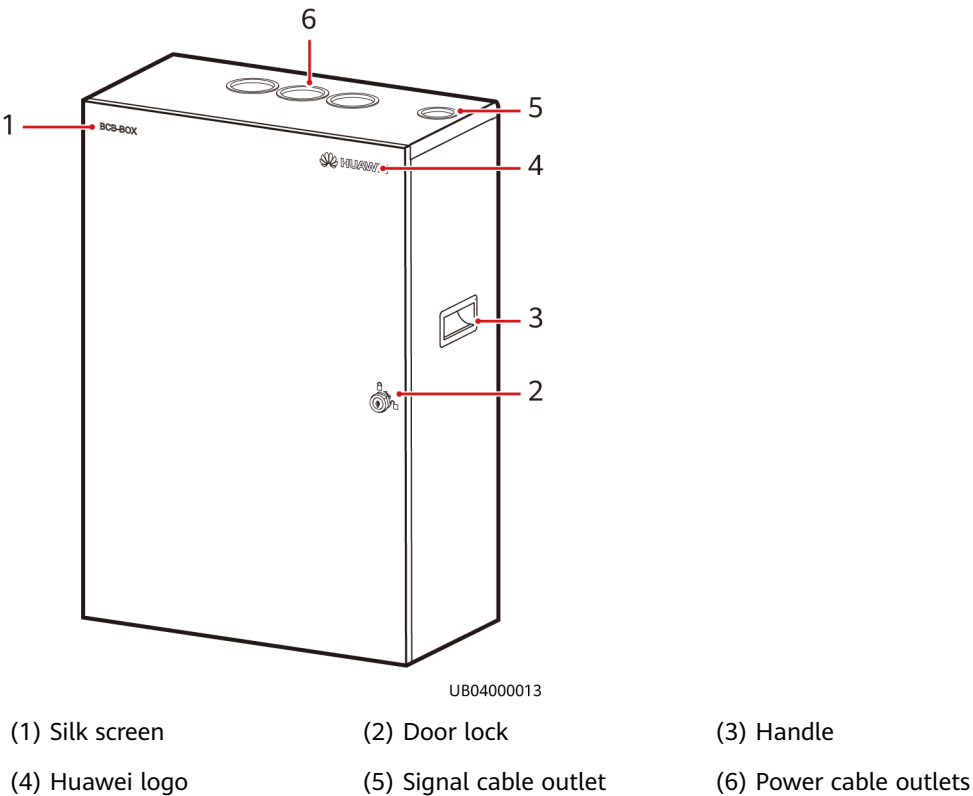


Table 5-7 Specifications

Item	PDU8000-0400D CV8-BXA001	PDU8000-0630D CV8-BXA001	PDU8000-0800 DCV8-BXA001
Rated current (A)	400	630	800
Rated voltage (V DC)	750	750	750
Breaking capacity (kA)	16	20	36
IP rating	20	20	20

5.7 Ambient T/H Sensor

The ambient temperature and humidity (T/H) sensor monitors the ambient temperature and humidity in the equipment room to ensure that the equipment works properly. The ambient T/H sensor can be used as a battery temperature sensor.

Before using the sensor, set the DIP switch on it. Each T/H sensor has a unique DIP switch address, ranging from 32 to 44. A DIP switch has six binary toggle switches. The bit on the leftmost is the most significant bit, and the bit on the rightmost is the least significant bit. Bit 1 indicates ON, and bit 0 indicates OFF.

Figure 5-11 Appearance

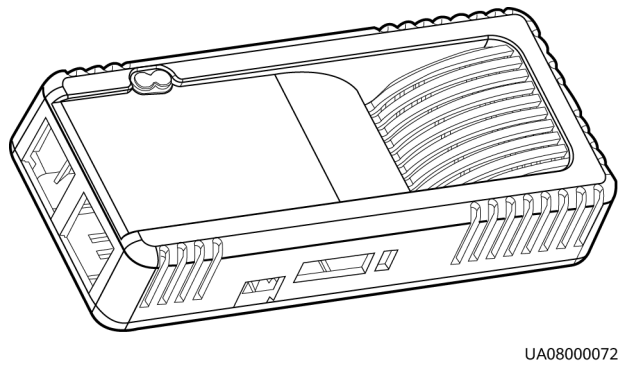
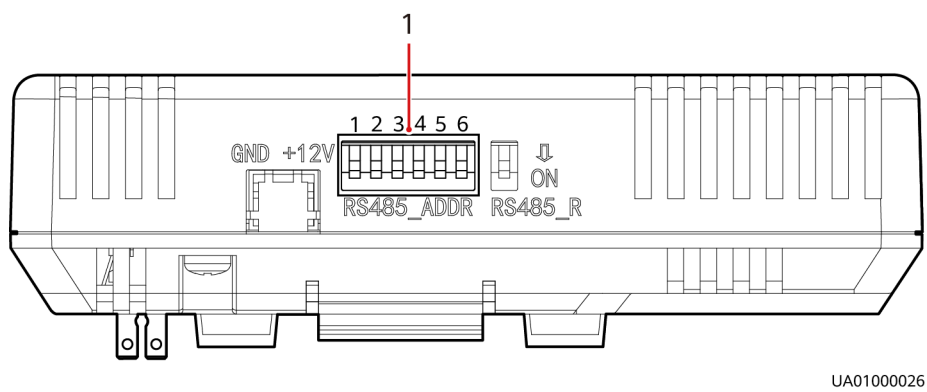


Figure 5-12 DIP switch on the ambient T/H sensor



(1) DIP switch

Table 5-8 DIP switch address mapping

Bit	32	33	34	35	36	37	38	39	40	41	42	43	44
1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	1	1	1	1	1
4	0	0	0	0	1	1	1	1	0	0	0	0	1
5	0	0	1	1	0	0	1	1	0	0	1	1	0
6	0	1	0	1	0	1	0	1	0	1	0	1	0

When the ambient T/H sensor is used as a battery temperature sensor, the DIP switch address ranges from 16 to 28.

Table 5-9 DIP switch address mapping (battery temperature sensor)

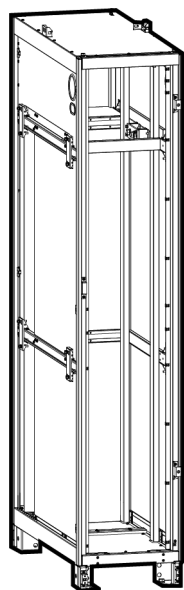
Bit	16	17	18	19	20	21	22	23	24	25	26	27	28
1	0	1	0	1	0	1	0	1	0	1	0	1	0
2	0	0	1	1	0	0	1	1	0	0	1	1	0
3	0	0	0	0	1	1	1	1	0	0	0	0	1
4	0	0	0	0	0	0	0	0	1	1	1	1	1
5	1	1	1	1	1	1	1	1	1	1	1	1	1
6	0	0	0	0	0	0	0	0	0	0	0	0	0

5.8 Bottom Cabling Cabinet

Applies to the bottom cabling scenario.

Cabinet dimensions (H x W x D): 2000 mm x 400 mm x 1000 mm

Figure 5-13 Cabinet

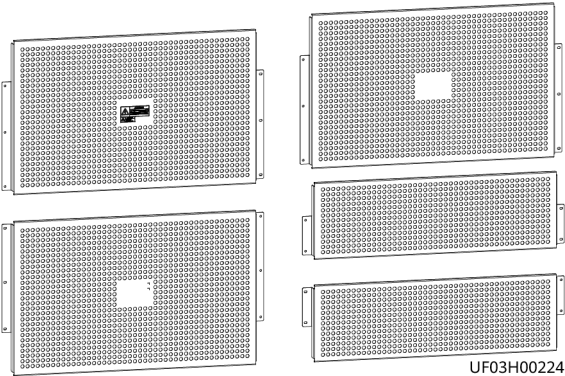


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5.9 Rear Copper Bar Protection Component

Protects copper bars at the rear of the cabinet.

Figure 5-14 Appearance



6 Installation

6.1 Installation Preparations

6.1.1 Installation Environment

Before installing the UPS, note the following:

- Do not install the UPS in a high-temperature, low-temperature, or damp place that is beyond the technical specifications.
- Install the UPS far away from water sources, heat sources, and inflammable and explosive materials. Keep the UPS free from direct sunlight, dust, volatile gases, corrosive materials, and salty air.
- Do not install the UPS in environments with conductive metal scraps in the air.
- The optimal operating temperatures for valve-regulated lead-acid (VRLA) batteries are 20–30°C. Operating temperatures higher than 30°C shorten the battery lifespan, and operating temperatures lower than 20°C reduce the battery backup time.
- Ensure that the floor or installation support can bear the weight of the UPS, batteries, and battery racks.

6.1.2 Installation Clearances

Figure 6-1 UPS installation clearances (400–600 kVA)

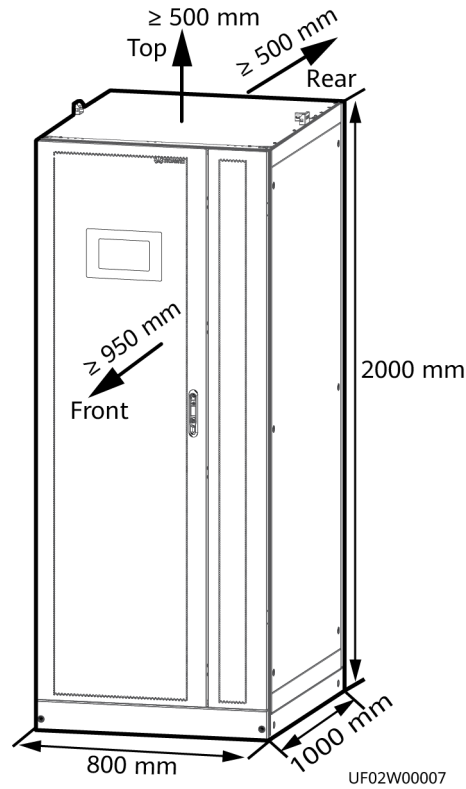


Figure 6-2 UPS + bottom cabling cabinet (400–600 kVA)

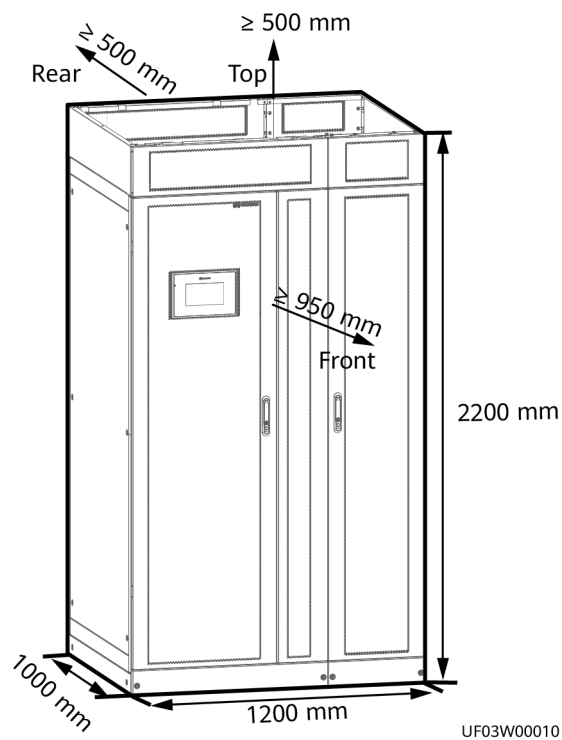


Figure 6-3 UPS installation clearances (800 kVA)

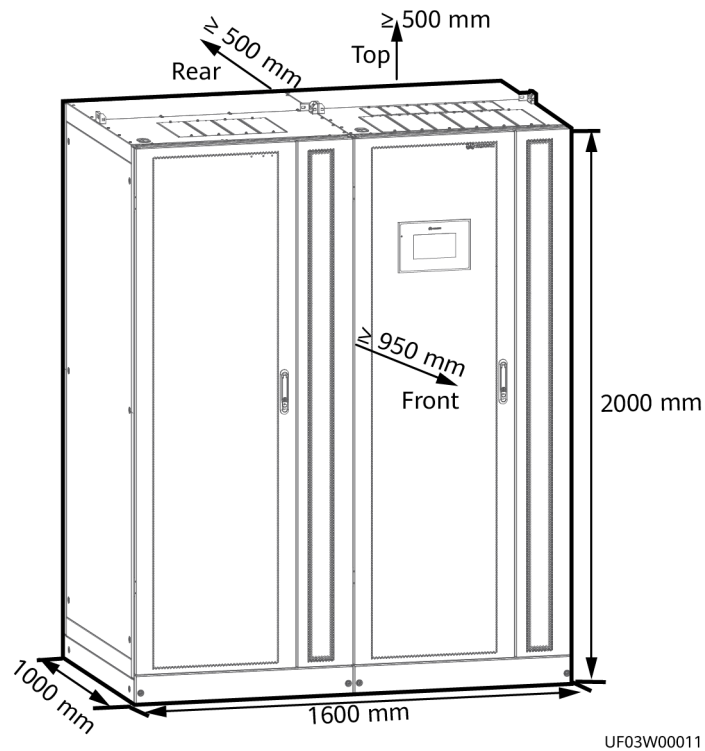
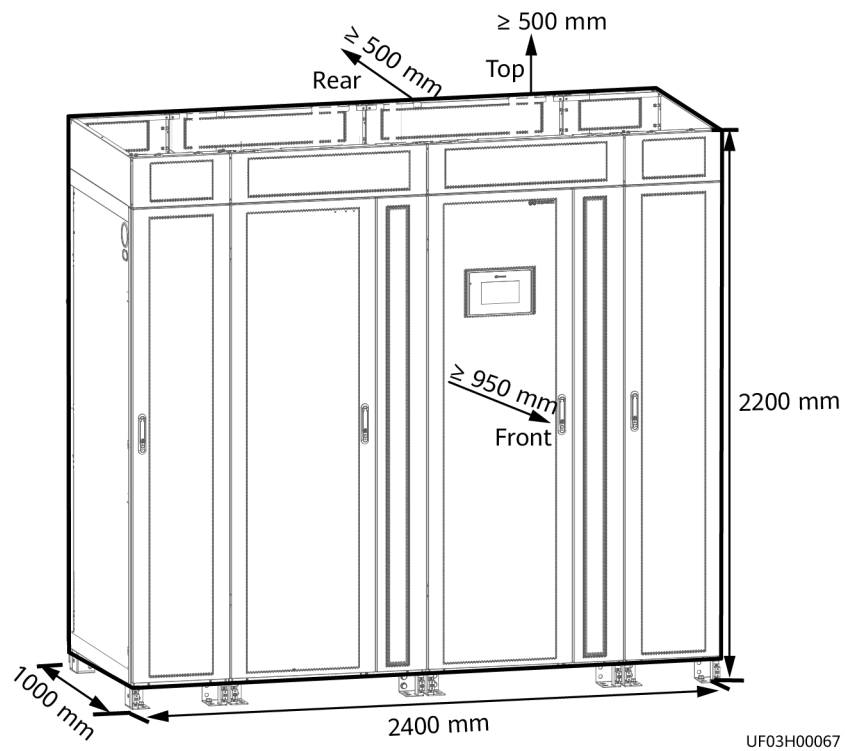


Figure 6-4 UPS + bottom cabling cabinet (800 kVA)



Reserve the following clearances around the cabinet to facilitate operations and ventilation:

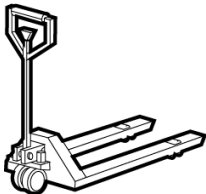
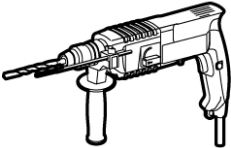
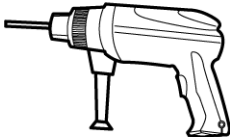
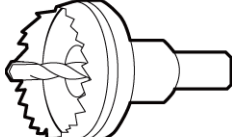
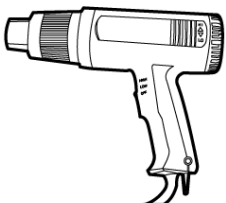
- Reserve a clearance of at least 950 mm from the front of the cabinet for ventilation and operations.
- Reserve a clearance of at least 500 mm from the top of the cabinet for operations.
- Reserve a clearance of at least 500 mm from the rear of the cabinet for ventilation.
- Reserve a clearance of at least 800 mm if you need to perform operations at the rear of the cabinet.

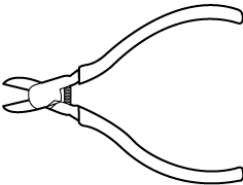
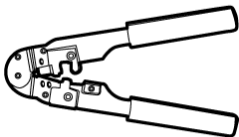
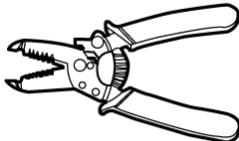
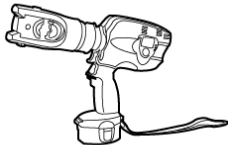
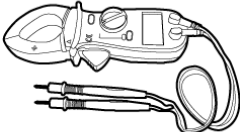
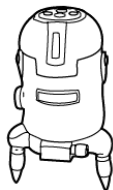
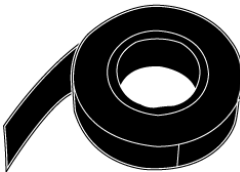
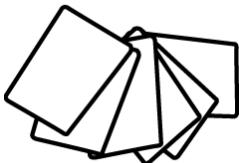
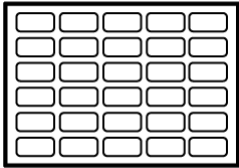
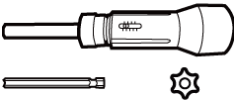
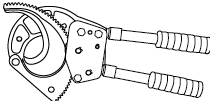
6.1.3 Tools and Instruments

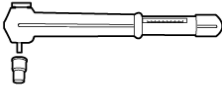
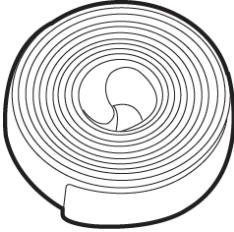
NOTICE

- Use insulated tools to avoid electric shocks.
- The following table lists only the common tools for installation and cable connection. For more dedicated tools required, see the document for each component. Prepare tools based on site requirements.

Table 6-1 Tools and instruments

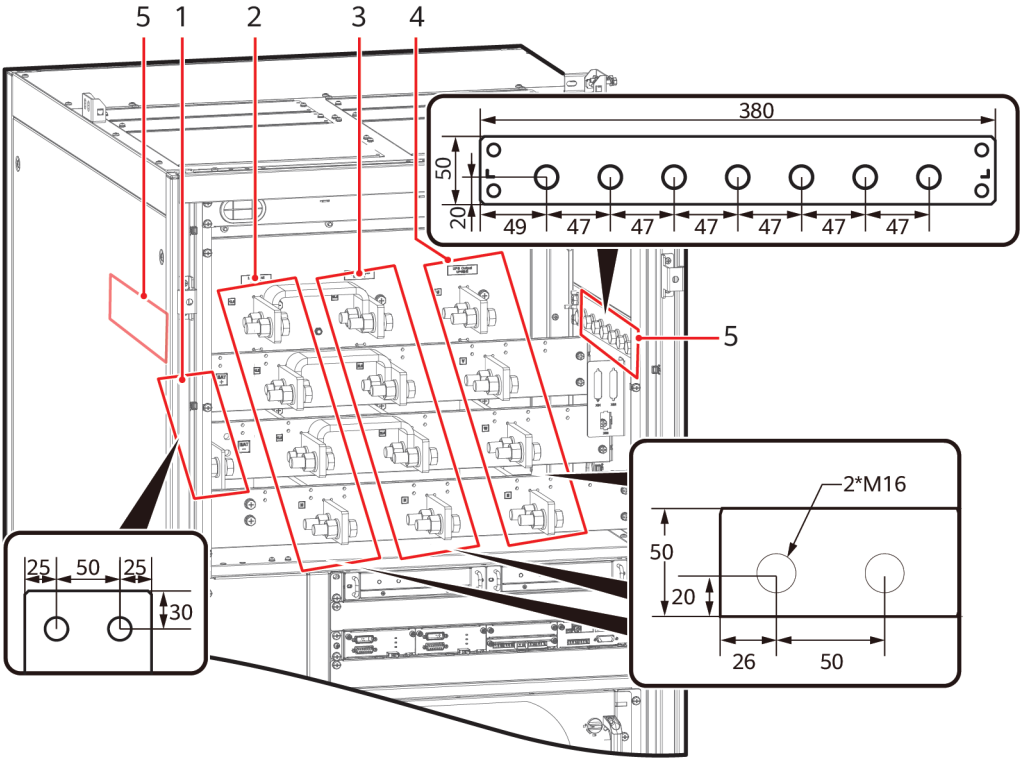
Tools and Instruments			
Electric forklift	Manual forklift	Step ladder	Rubber mallet
			
Hammer drill (with a $\Phi 16$ drill bit)	Hand-held electric drill	Hole saw	Heat gun
			
Diagonal pliers	Crimping tool	Wire strippers	Electro-hydraulic pliers

Tools and Instruments			
			
Clamp meter	Multimeter	Cable tie	Level
			
Insulation tape	Cotton cloth	Labels	Electrician's knife
			
ESD gloves	Protective gloves	Insulation gloves	Insulated protective shoes
			
Torque screwdriver	Cable cutter	Brush	Flat-head screwdriver (2-5 mm)

Tools and Instruments			
Phillips screwdriver (M3/M4/M5/M6/M8)	Insulated torque wrench (M6/M8/M12/M16)	Heat-shrink tubing	Insulated adjustable wrench
			

6.1.4 Power Cable Selection

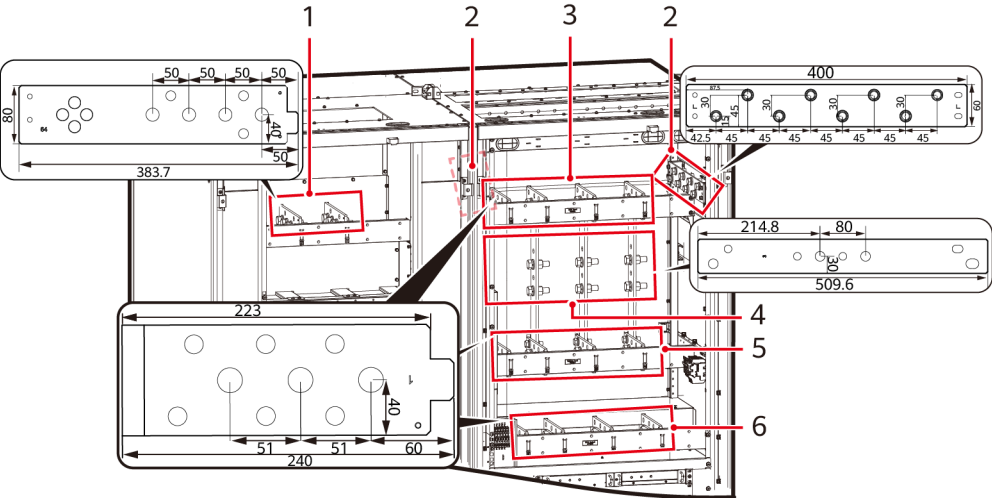
Figure 6-5 400–600 kVA cabinet copper bar layout and specifications (unit: mm)



UF01W00007

- (1) Battery wiring busbar
- (2) Mains input wiring busbar
- (3) Bypass input wiring busbar
- (4) Output wiring busbar
- (5) PE wiring busbar

Figure 6-6 800 kVA cabinet copper bar layout and specifications (unit: mm)



UF03W00012

- (1) Battery wiring busbar
- (2) PE wiring busbar
- (3) Mains input wiring busbar
- (4) Busbar of the same power source for mains and bypass inputs
- (5) Bypass input wiring busbar
- (6) Output wiring busbar

NOTICE

If multiple UPSs are connected in parallel, input and output power cables as well as copper bars for each UPS should have the same length and specifications.

The cables need to be selected according to the site survey data. The cable recommendation is for your reference only.

Table 6-2 Recommended power cable cross-sectional areas (200–500 kVA)

Item			200 kVA	300 kVA	400 kVA	500 kVA
Mains input	Mains input current (A)		372	557	743	929
	Recommended cross-sectional area (mm ²)	L1	2 x 95	2 x 150	2 x 240	3 x 185
		L2	2 x 95	2 x 150	2 x 240	3 x 185
		L3	2 x 95	2 x 150	2 x 240	3 x 185
		N	2 x 95	2 x 150	2 x 240	3 x 185
		PE	95	150	240	240
Bypass input	Bypass input current (A)		304	456	608	760
	Recommended	L1	2 x 95	2 x 150	2 x 240	3 x 185

Item			200 kVA	300 kVA	400 kVA	500 kVA
	cross-sectional area (mm ²)	L2	2 x 95	2 x 150	2 x 240	3 x 185
		L3	2 x 95	2 x 150	2 x 240	3 x 185
		N	2 x 95	2 x 150	2 x 240	3 x 185
		PE	95	150	240	240
Output	Output current (A)		304	456	608	760
	Recommended cross-sectional area (mm ²)	U	2 x 95	2 x 150	2 x 240	3 x 185
		V	2 x 95	2 x 150	2 x 240	3 x 185
		W	2 x 95	2 x 150	2 x 240	3 x 185
		N	2 x 95	2 x 150	2 x 240	3 x 185
		PE	95	150	240	240
Battery input (lead-acid battery)	Nominal battery discharge current (A)		443	665	877	1108
	Maximum battery discharge current (A)		531	796	1062	1327
	Recommended cross-sectional area (mm ²)	+	2 x 120	2 x 185	2 x 240	3 x 240
		-	2 x 120	2 x 185	2 x 240	3 x 240
		PE	120	185	240	240
Battery input (SmartLi)	Nominal battery discharge current (A)		412	617	822	1028
	Maximum battery discharge current (A)		517	774	1032	1290
	Recommended cross-sectional area		For details, see the IEC-60364-5-52 specifications and <i>SmartLi User Manual</i> .			

Item		200 kVA	300 kVA	400 kVA	500 kVA
Equipotential ground point	Recommended cross-sectional area (mm ²)	16			

Table 6-3 Recommended power cable cross-sectional areas (600–800 kVA)

Item			600 kVA	700 kVA	800 kVA
Mains input	Mains input current (A)		1115	1300	1486
	Recommended cross-sectional area (mm ²)	L1	4 x 185	4 x 240	4 x 240
		L2	4 x 185	4 x 240	4 x 240
		L3	4 x 185	4 x 240	4 x 240
		N	4 x 185	4 x 240	4 x 240
		PE	240	240	240
Bypass input	Bypass input current (A)		912	1064	1215
	Recommended cross-sectional area (mm ²)	L1	4 x 185	4 x 240	4 x 240
		L2	4 x 185	4 x 240	4 x 240
		L3	4 x 185	4 x 240	4 x 240
		N	4 x 185	4 x 240	4 x 240
		PE	240	240	240
Output	Output current (A)		912	1064	1215
	Recommended cross-sectional area (mm ²)	U	4 x 185	4 x 240	4 x 240
		V	4 x 185	4 x 240	4 x 240
		W	4 x 185	4 x 240	4 x 240
		N	4 x 185	4 x 240	4 x 240
		PE	240	240	240
Battery input (lead-acid battery)	Nominal battery discharge current (A)		1330	1551	1773
	Maximum battery discharge current (A)		1593	1858	2123
	Recommended cross-sectional area (mm ²)	+	4 x 185	4 x 240	4 x 240
		-	4 x 185	4 x 240	4 x 240
		PE	240	240	240

Item		600 kVA	700 kVA	800 kVA
Battery input (SmartLi)	Nominal battery discharge current (A)	1234	1439	1645
	Maximum battery discharge current (A)	1547	1806	2064
	Recommended cross-sectional area	For details, see the IEC-60364-5-52 specifications and <i>SmartLi User Manual</i> .		
Equipotential ground point	Recommended cross-sectional area (mm ²)	16		

NOTE

The rated voltage of the SmartLi is 512 V. The voltage is 408 V at the maximum discharge current.

- The currents listed in the table are measured at a rated voltage of 380 V.
- When selecting, connecting, and routing power cables, follow local safety regulations and rules.
- When the external conditions such as the cable layout or ambient temperatures change, perform verification in accordance with the IEC 60364-5-52 or local regulations.
- For the 400 V rated voltage, multiply the current by 0.95.
- For the 415 V rated voltage, multiply the current by 0.92.
- When the primary loads are non-linear loads, increase the cross-sectional areas of the neutral wires to 1.5–1.7 times.
- The nominal battery discharge current refers to the current of forty 12 V batteries at 480 V in standard configuration.
- The maximum battery discharge current refers to the current when forty 12 V batteries in standard configuration, that is, two hundred and forty 2 V battery cells (1.67 V/cell), stop discharging.
- The battery cable specifications are selected based on 40 batteries by default and compatible with application scenarios with 30–50 batteries.
- When the mains input and bypass input share a power source, configure mains input power cables as input power cables. In addition, cables recommended in the table apply only when the following requirements are met:
 - Routing mode: The cables are routed over a tray or bracket in a single layer (E in IEC 60364-5-52). The distance between cables should be greater than twice the cable diameter. Routing mode: The cables are routed over a tray or bracket in a single layer (E multi-core and G single-core in IEC 60364-5-52).
 - The ambient temperature is 30°C.
 - The AC voltage loss is less than 3%, and the DC voltage loss is less than 1%.

- Conductor insulation: PVC insulation
- The 90°C flexible cables with copper conductors are used.
- It is recommended that AC power cables be no longer than 30 meters and DC power cables be no longer than 50 meters.

Table 6-4 Power terminal connection requirements

Port	Connection Method	Bolt Specifications	Bolt Length	Torque
Mains input	Crimped DT terminal	M16	55 mm	120 N·m
Bypass input	Crimped DT terminal	M16	55 mm	120 N·m
Battery input	Crimped DT terminal	M16	55 mm	120 N·m
Output	Crimped DT terminal	M16	55 mm	120 N·m
PE	Crimped DT terminal	M12	30 mm	47 N·m
Equipotential ground point	Crimped DT terminal	M6	12 mm	4.5 N·m

Table 6-5 Recommended input/output circuit breakers

Component Name	Specifications ^a (200 kVA)	Specifications ^a (300 kVA)	Specifications ^a (400 kVA)	Specifications ^a (500 kVA)	Specifications ^a (600 kVA)	Specifications ^a (700 kVA)	Specifications ^a (800 kVA)
Mains input circuit breaker	400 A/3P	630 A/3P	800 A/3P	1000 A/3P	1250 A/3P	1600 A/3P	1600 A/3P
Bypass input circuit breaker	400 A/3P	630 A/3P	800 A/3P	1000 A/3P	1250 A/3P	1600 A/3P	1600 A/3P
Downstream output circuit breaker	400 A/3P	630 A/3P	800 A/3P	1000 A/3P	1250 A/3P	1600 A/3P	1600 A/3P
a: recommended model when the short-circuit current where the circuit breaker is located is less than 65 kA							

 NOTE

- The input circuit breakers recommended are for reference only.
- If multiple loads are connected, use recommended specifications for branch circuit breakers.
- The circuit breaker selection principle is to protect loads and cables, and the cascading principle is to achieve specific protection.

6.1.5 Unpacking

Context

NOTICE

- Only trained personnel are allowed to move the UPS. Use a forklift to transport the UPS case secured to a wooden pallet to the installation position.
- To prevent the UPS from falling over, secure it to an electric forklift using ropes before moving it.
- Move the UPS with caution to avoid bumping or toppling, which may damage the UPS. After placing the case in the installation position, unpack it with caution to prevent scratches. Keep the UPS steady during unpacking.
- If the UPS installation environment is in poor condition and the UPS needs to be stored for a long time after it is unpacked, take measures to prevent dust. It is recommended that the UPS be wrapped with the original plastic coat.

Procedure

- Step 1** Use a pallet truck to transport the UPS cabinet to the specified place, unpack the cabinet, and remove the screws that secure the UPS to the wooden pallet.

Figure 6-7 Unpacking (400-600 kVA)

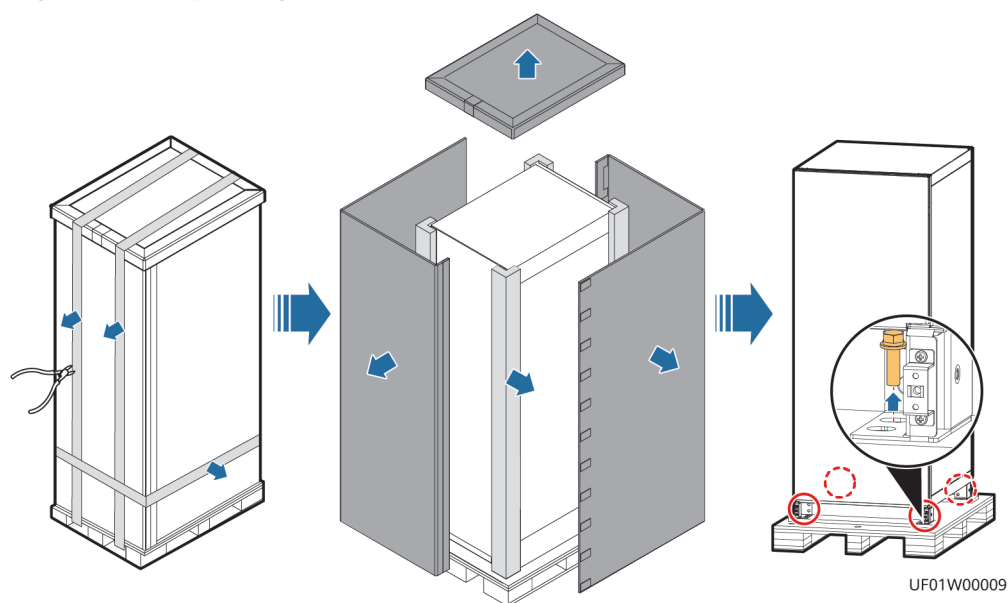
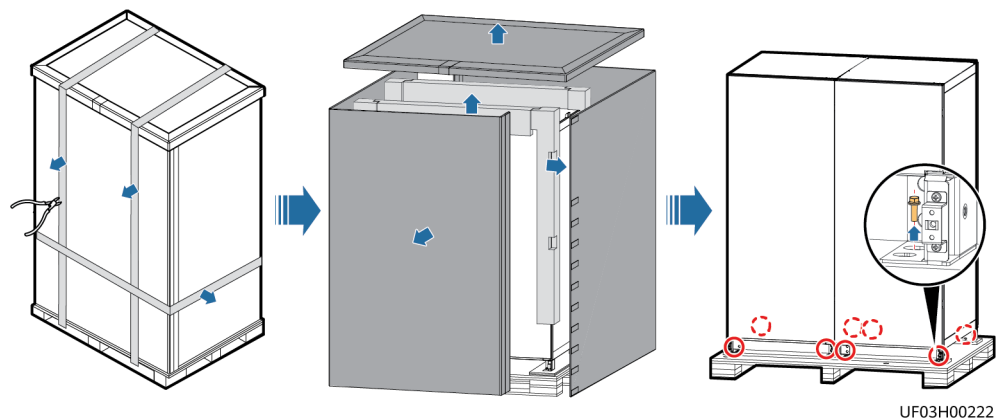


Figure 6-8 Unpacking (800 kVA)



-----End

6.2 UPS Cable Connection Reference

Context

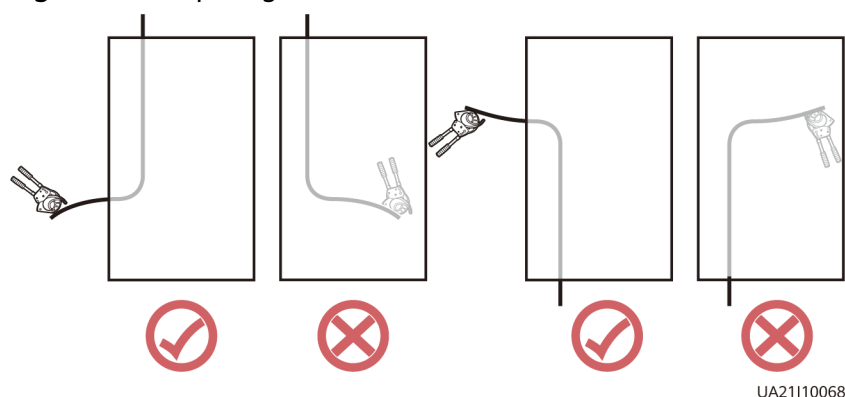
WARNING

- When preparing cables, keep away from the cabinets to prevent cable scraps from entering the cabinets. Cable scraps may cause sparks during power-on and cause personal injury or device damage.
- After installing cables, clean the cabinet top, bottom, copper bar wiring positions, and other positions. Ensure that there is no dust or scraps inside and around cabinets.
- Prepare terminals onsite. The length of the copper wire should be the same as that of the part of the terminal that covers the conductor.

Procedure

- Step 1** Route a cable into the cabinet and bind it to a nearby beam.
- Step 2** Pull the cable to the copper bar to which the cable is to be connected, determine the cable length, and mark the cable at the position where the cable is to be cut.
- Step 3** Pull the marked cable out of the cabinet, cut the cable from the marked position, strip the cable, and crimp a terminal.

Figure 6-9 Preparing a cable terminal outside the cabinet



 NOTE

Choose an appropriate cabling route based on the actual situation. The figure is for reference only.

Step 4 Connect the cable with a crimped terminal to the corresponding copper bar.

Step 5 Clear sundries inside the cabinet.

----End

6.3 Single UPS Installation (400–600 kVA)

 CAUTION

When you install the UPS and connect cables, do not step on the front door baffle plate and the door support at the bottom of the cabinet to prevent paint flake-off and deformation. Otherwise, the front door will not be properly closed.

6.3.1 Installing the UPS

6.3.1.1 Installing the Cabinet

Installation on the Floor

NOTICE

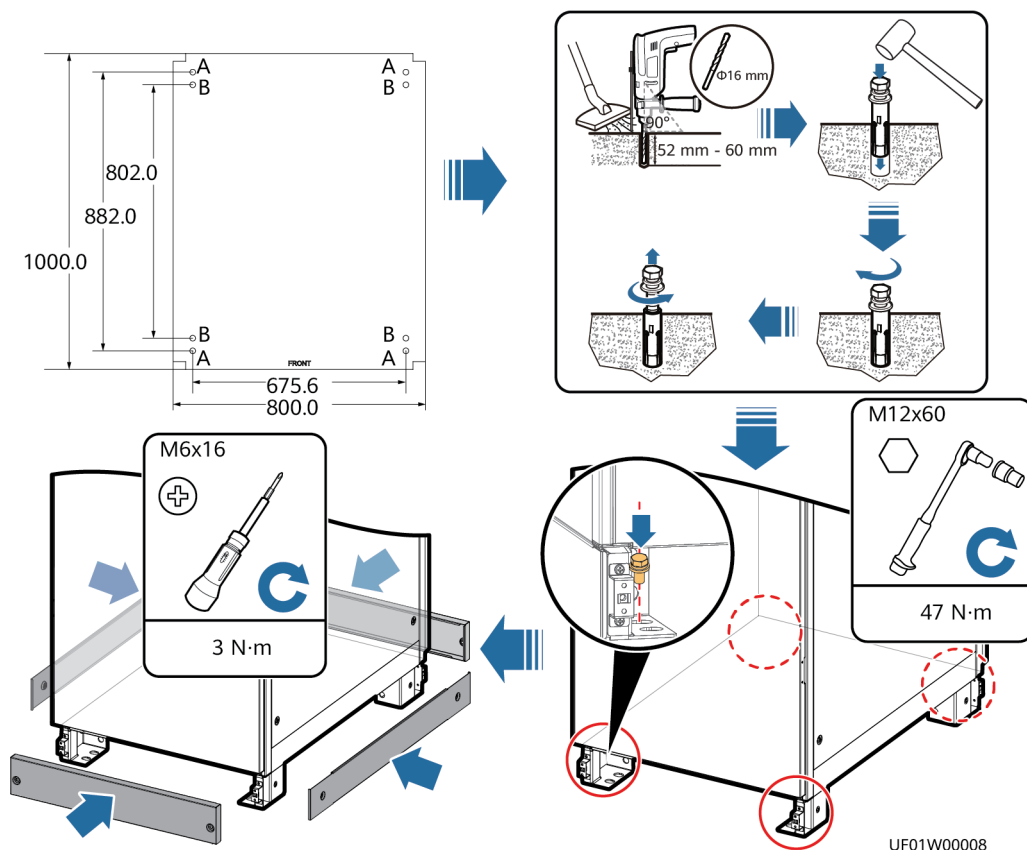
Ensure that the installation floor is level.

Step 1 Install the cabinet.

1. Determine the mounting holes for the cabinet based on the marking-off template. A indicates the mounting holes for channel steel. B indicates the mounting holes for the floor. The unit is mm.

2. Drill holes and install expansion sleeves.
3. Secure the cabinet to the floor.
4. Install anchor baffle plates.

Figure 6-10 Installing the cabinet



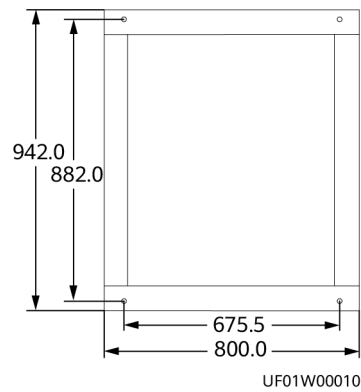
----End

Installation on Channel Steel

NOTICE

- Huawei does not provide channel steel or expansion bolts for securing channel steel. Customers need to purchase them by themselves.
- Ensure that the surface of channel steel is level.
- The procedure for installation on channel steel is similar to that for installation on the floor except the following steps:
 - Determine the mounting holes for the cabinet based on the marking-off template (for installation on channel steel).
 - Drill mounting holes on the channel steel using a hammer drill.
 - Use M12x60 bolts to secure the cabinet on the channel steel.

Figure 6-11 Recommended channel steel dimensions (unit: mm)



6.3.1.2 Installing Cables

Context

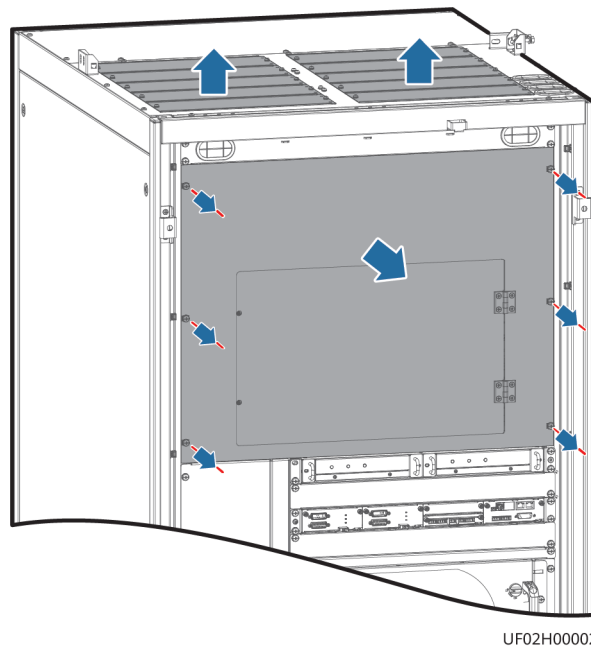
 NOTE

The number and colors of cables in the figures are for reference only.

Procedure

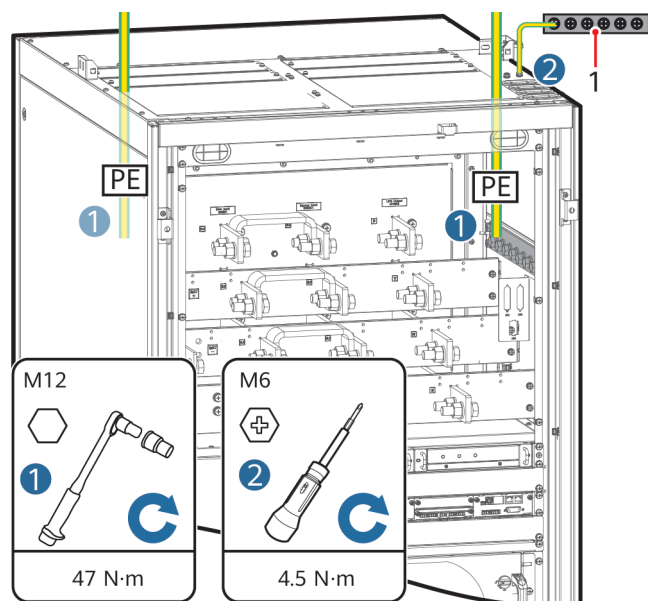
- Step 1** Open the front door of the cabinet, remove the power distribution cover, and remove the top cover as required.

Figure 6-12 Removing the covers



- Step 2** Install ground cables.

Figure 6-13 Installing ground cables



UF02H00001

(1) Ground bar in the equipment room

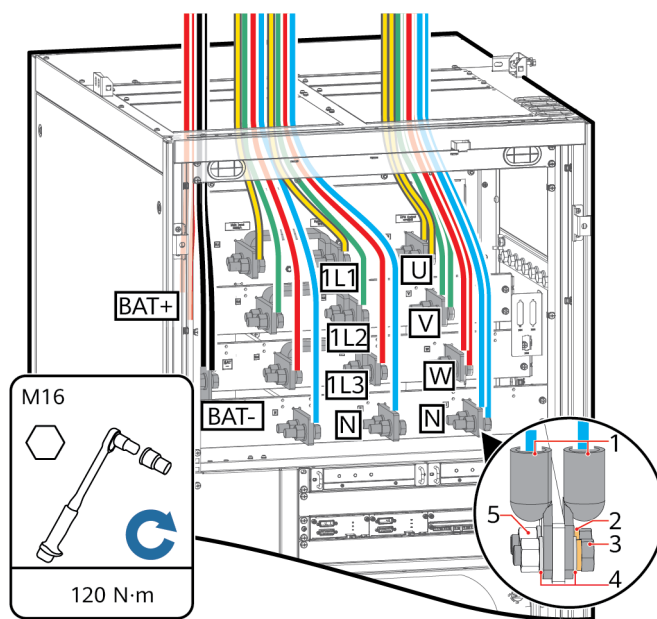
Step 3 Install power cables.

NOTE

Cables of the same group, for example, mains input cables, must be routed through the same cable hole.

- One power source

Figure 6-14 Installing cables



UF02H00003

(1) Wiring terminal

(2) Spring washer

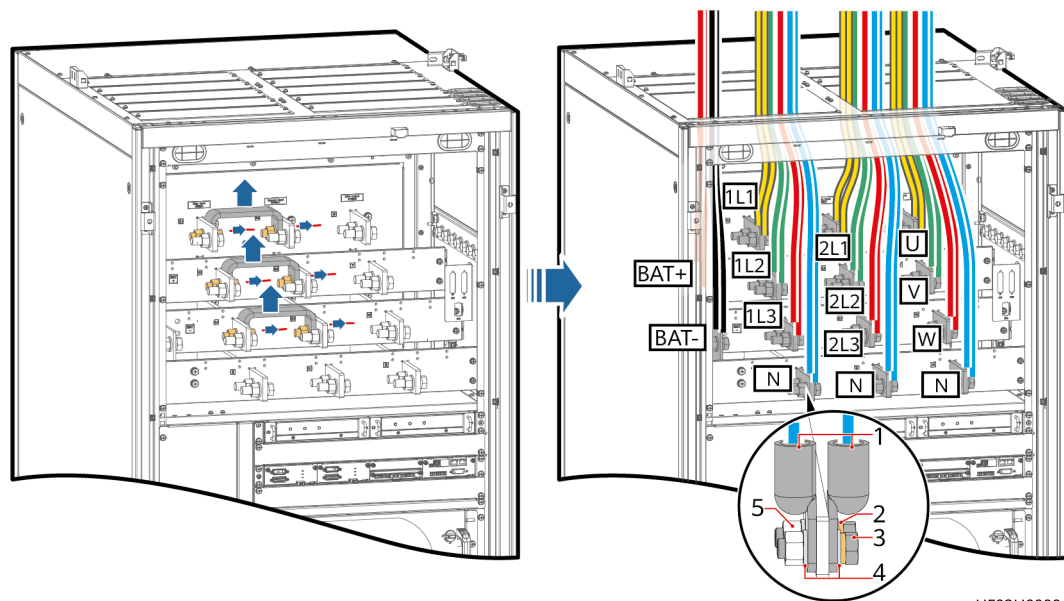
(3) Bolt

(4) Flat washer

(5) Nut

- Two power sources

Figure 6-15 Installing cables



(1) Wiring terminal

(2) Spring washer

(3) Bolt

(4) Flat washer

(5) Nut

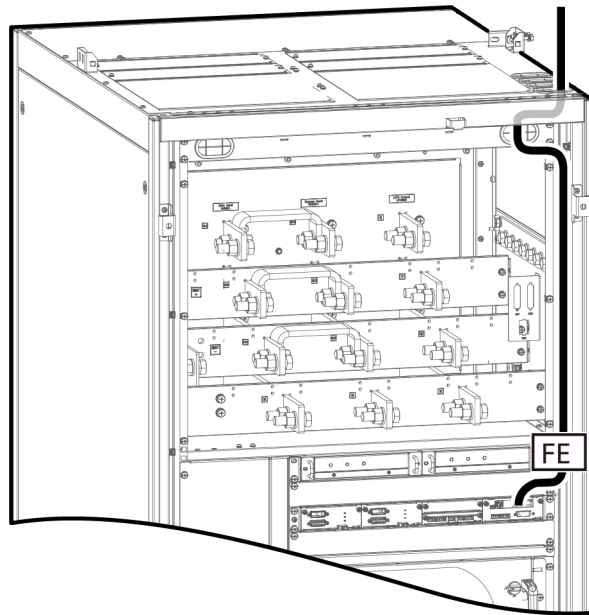
Step 4 Connect signal cables. Bind cables to the cabinet nearby.

- If you need to log in to the WebUI of the UPS monitoring system, connect the network port on a PC to the FE port on the monitoring interface card.
- If the UPS needs to connect to an external network management device, connect the external network management device to the RS485 port on the monitoring interface card.

NOTICE

- Do not bind signal cables and power cables together.
- RS485 cables and FE cables must be shielded cables.

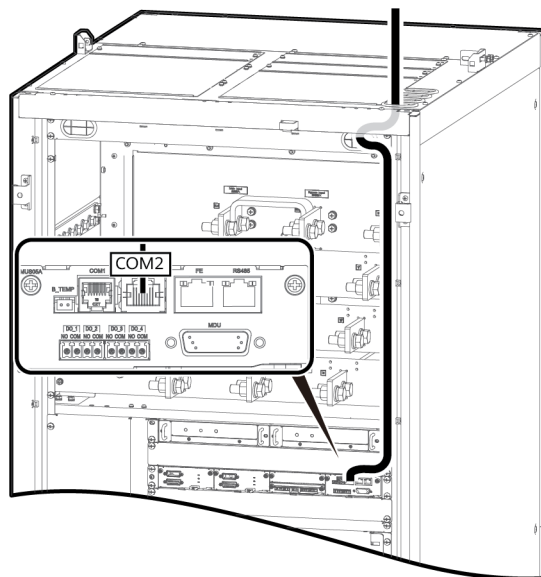
Figure 6-16 Installing a signal cable



UF02H00005

Step 5 Install the SmartLi communications cable.

Figure 6-17 Installing the SmartLi communications cable



UF02H00006

-----End

6.3.2 Installing the UPS + Bottom Cabling Cabinet

6.3.2.1 Installing Cabinets

Installation on the Floor

NOTICE

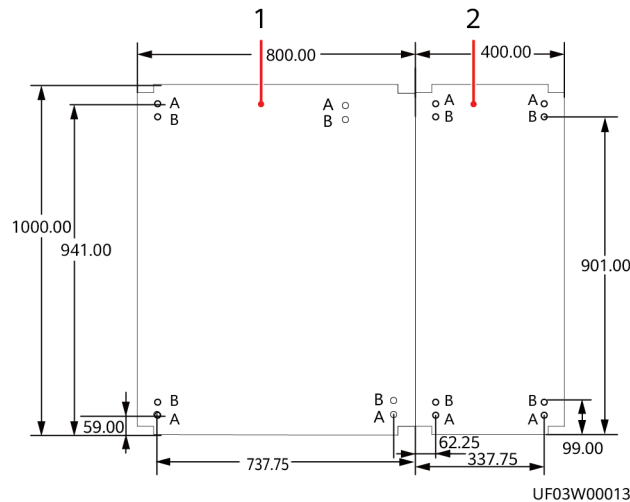
Ensure that the installation floor is level.

- Step 1** Determine the cabinet installation positions on the floor based on the holes in the marking-off template for floor installation.

NOTE

- A: mounting holes on the channel steel
- B: mounting holes on the floor

Figure 6-18 Hole dimensions (unit: mm)



(1) UPS

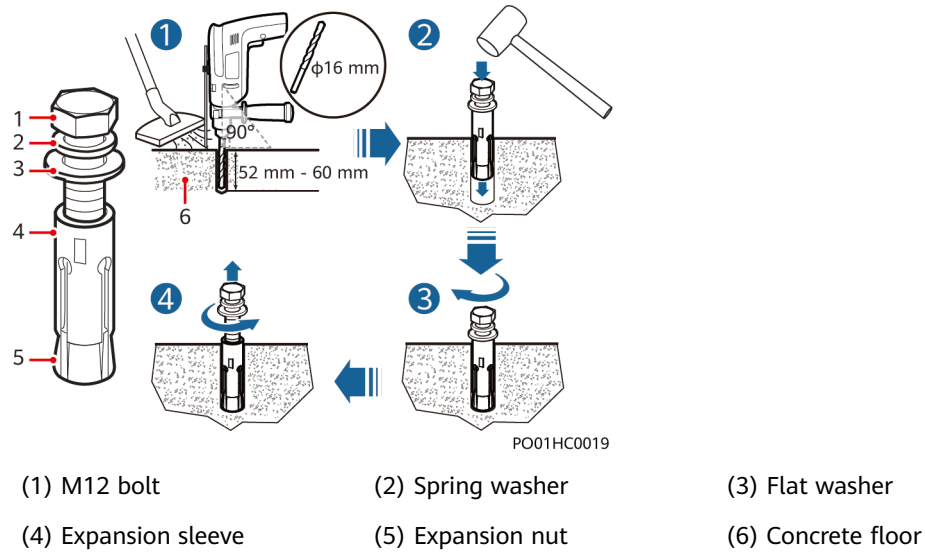
(2) Bottom cabling cabinet (optional)

- Step 2** Use a hammer drill to drill holes for installing expansion bolts and then install expansion sleeves in the holes.
1. Drill a hole into the concrete floor using a hammer drill. The hole depth ranges from 52 mm to 60 mm.
 2. Partially tighten the expansion bolt and vertically insert it into the hole. Knock the expansion bolt using a rubber mallet until the expansion sleeve is fully inserted into the hole.
 3. Partially tighten the expansion bolt.
 4. Remove the bolt, spring washer, and flat washer.

NOTICE

Knock the expansion bolts into the holes until the expansion sleeves completely fit into the holes. The expansion sleeves must be completely buried under the ground to facilitate subsequent installation.

Figure 6-19 Drilling holes and installing expansion sleeves

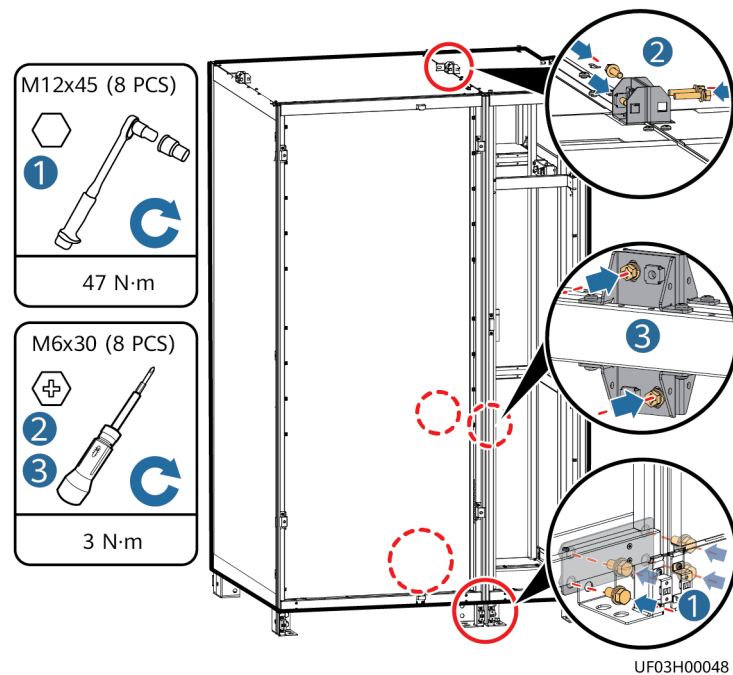


Step 3 Remove the right side panel from the UPS cabinet.

Step 4 Remove the front panel from the bottom cabling cabinet.

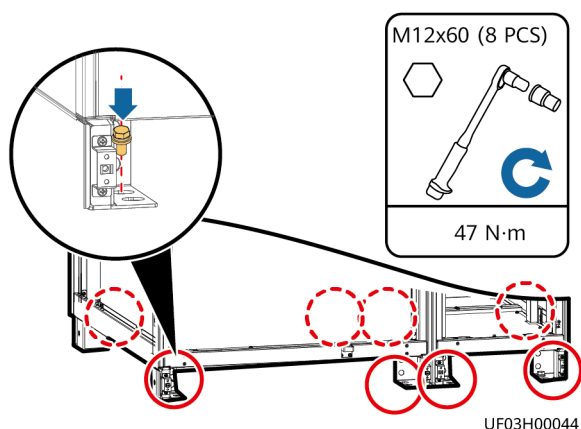
Step 5 Combine the bottom cabling cabinet.

Figure 6-20 Combining the bottom cabling cabinet



Step 6 Secure the cabinets.

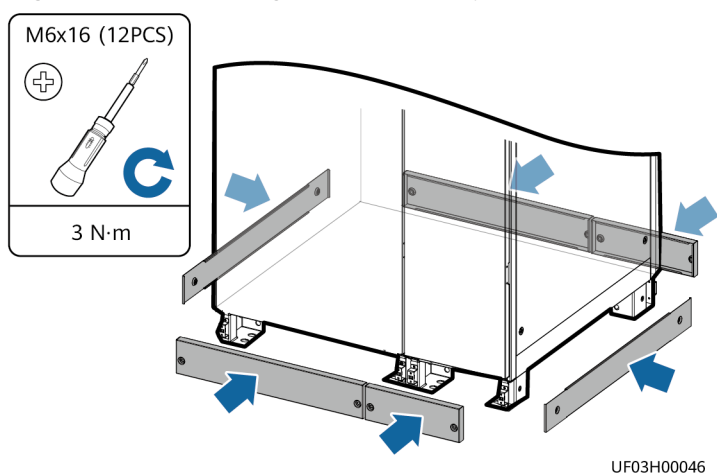
Figure 6-21 Securing the cabinets



Step 7 Install the removed side panel on the side of the bottom cabling cabinet.

Step 8 Install anchor baffle plates.

Figure 6-22 Installing anchor baffle plates



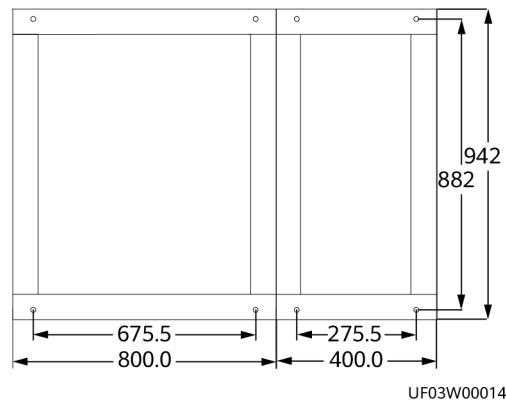
----End

Installation on Channel Steel

NOTICE

- Huawei does not provide channel steel or expansion bolts for securing channel steel. Customers need to purchase them by themselves.
- Ensure that the surface of channel steel is level.
- The procedure for installation on channel steel is similar to that for installation on the floor except the following steps:
 - Determine the mounting holes for the cabinets based on the marking-off template (for installation on channel steel).
 - Drill mounting holes on the channel steel using a hammer drill.
 - Use M12x60 bolts to secure the cabinets on the channel steel.

Figure 6-23 Recommended channel steel dimensions (unit: mm)



6.3.2.2 Installing Cables

Context

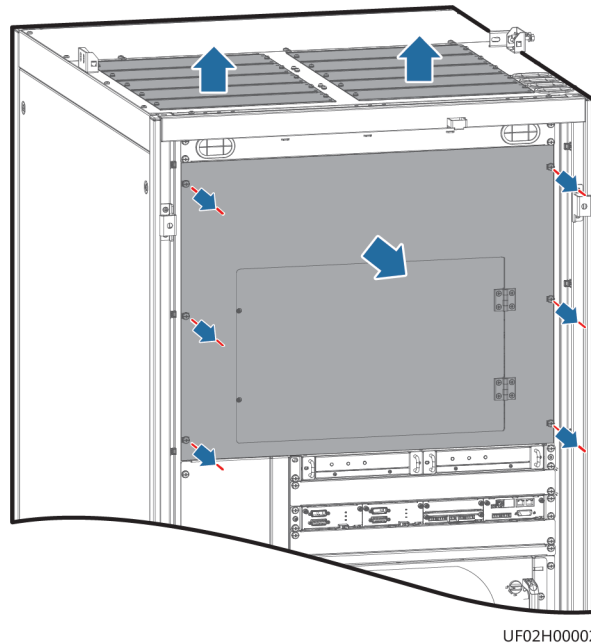
 NOTE

The number and colors of cables in the figures are for reference only.

Procedure

- Step 1** Open the front door of the cabinet, remove the power distribution cover, and remove the top cover as required.

Figure 6-24 Removing the covers



- Step 2** Remove the bottom cabling cover from the bottom cabling cabinet.

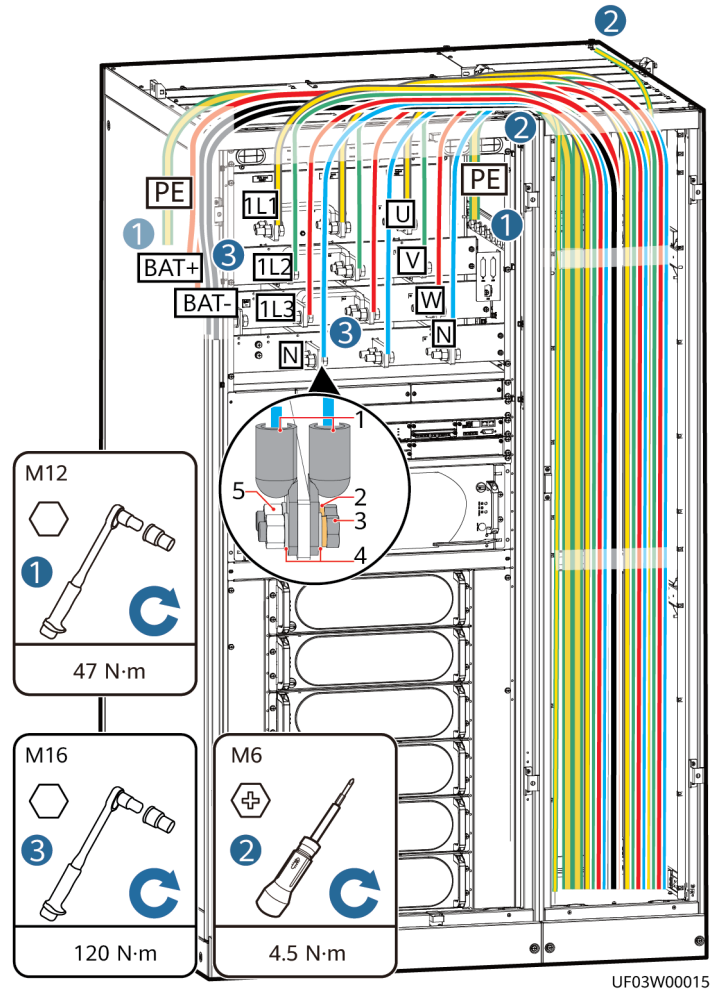
- Step 3** Install the cables.

 NOTE

Cables of the same group, for example, mains input cables, must be routed through the same cable hole.

- One power source

Figure 6-25 Installing cables



- (1) Wiring terminal (2) Spring washer (3) Bolt
(4) Flat washer (5) Nut

- Two power sources

Figure 6-26 Removing the copper bars of the same power source for mains and bypass inputs

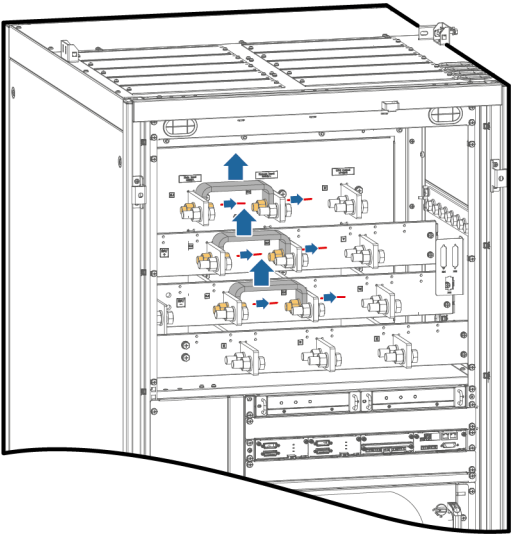
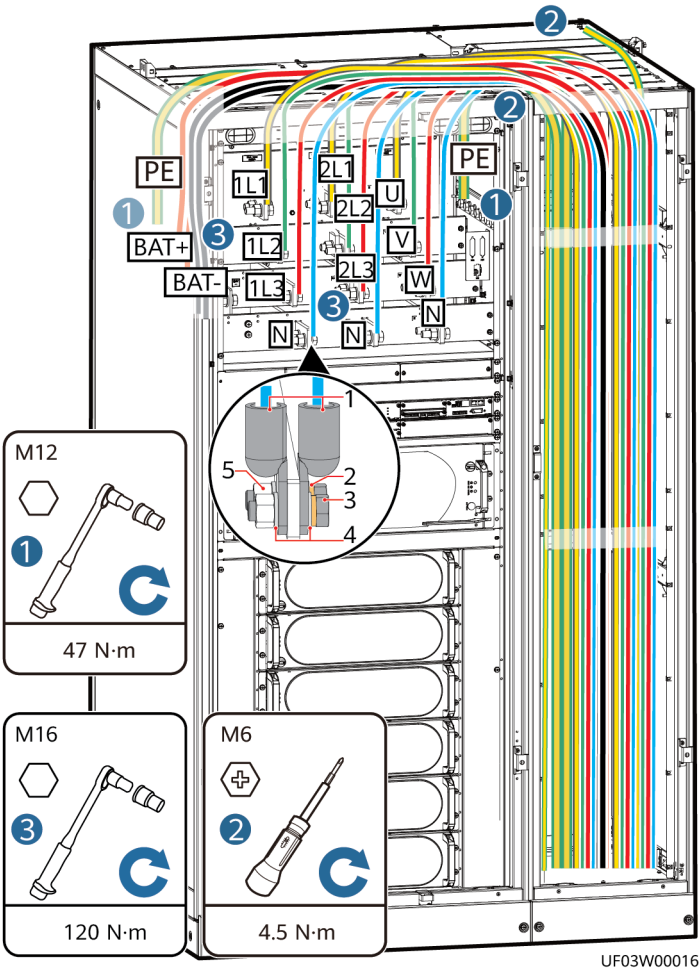


Figure 6-27 Installing cables



- (1) Wiring terminal (2) Spring washer (3) Bolt
(4) Flat washer (5) Nut

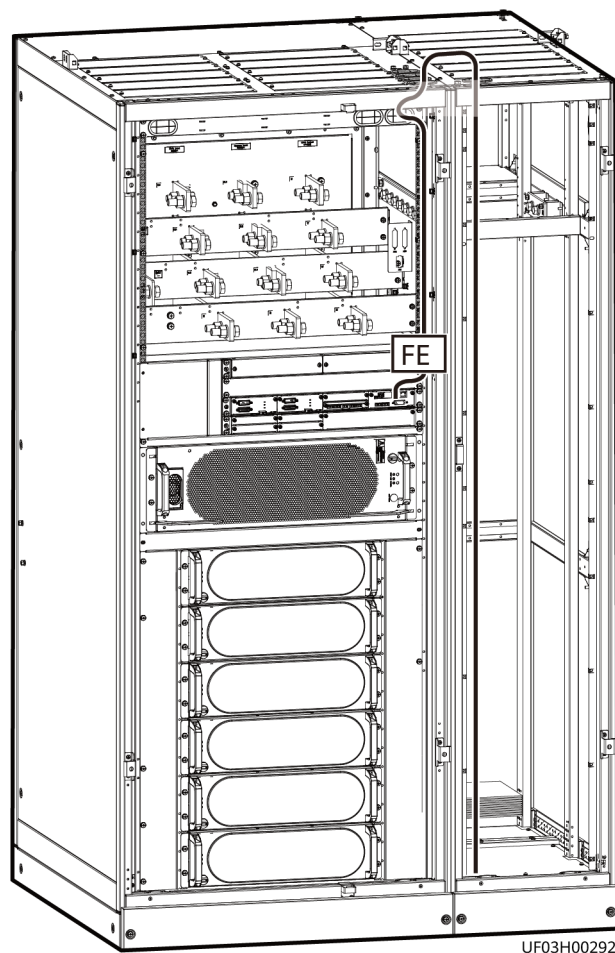
Step 4 Connect signal cables. Bind cables to the cabinet nearby.

- If you need to log in to the WebUI of the UPS monitoring system, connect the network port on a PC to the FE port on the monitoring interface card.
- If the UPS needs to connect to an external network management device, connect the external network management device to the RS485 port on the monitoring interface card.

NOTICE

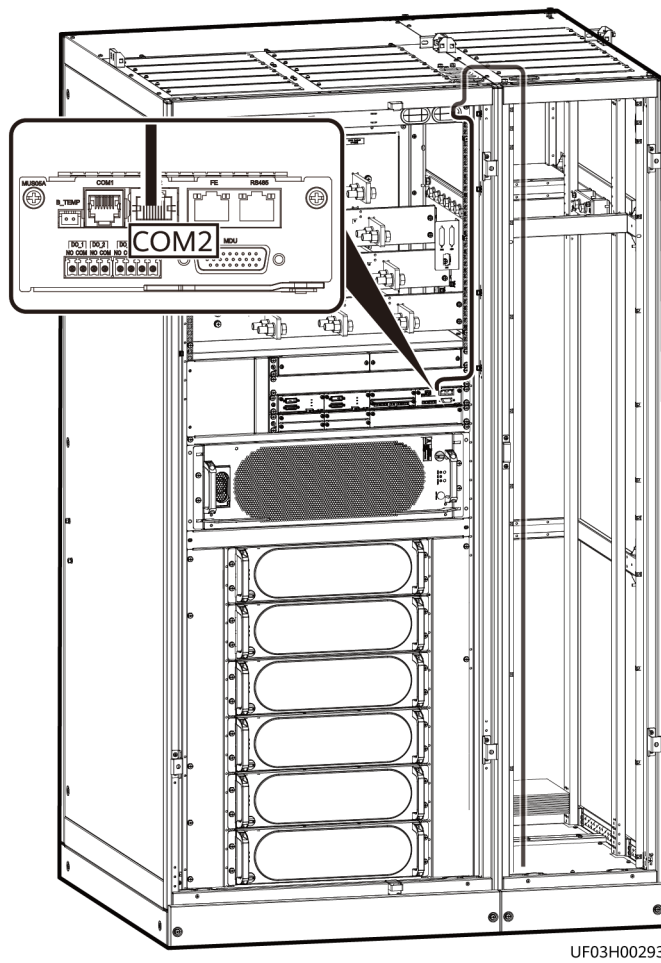
- Do not bind signal cables and power cables together.
 - RS485 cables and FE cables must be shielded cables.
-

Figure 6-28 Installing a signal cable



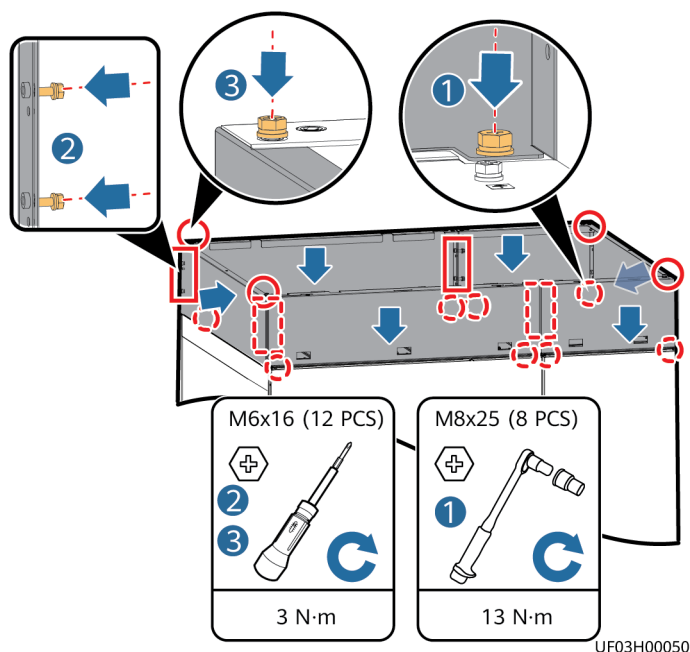
Step 5 Install the SmartLi communications cable.

Figure 6-29 Installing the SmartLi communications cable



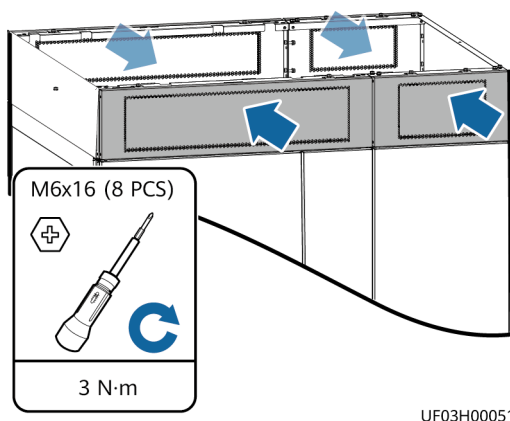
Step 6 Install top frames.

Figure 6-30 Installing top frames



Step 7 Install mounting plates.

Figure 6-31 Installing mounting plates



----End

6.4 Single UPS Installation (800 kVA)

CAUTION

When you install the UPS and connect cables, do not step on the front door baffle plate and the door support at the bottom of the cabinet to prevent paint flake-off and deformation. Otherwise, the front door will not be properly closed.

6.4.1 Installing the UPS

6.4.1.1 Installing Cabinets

Installation on the Floor

NOTICE

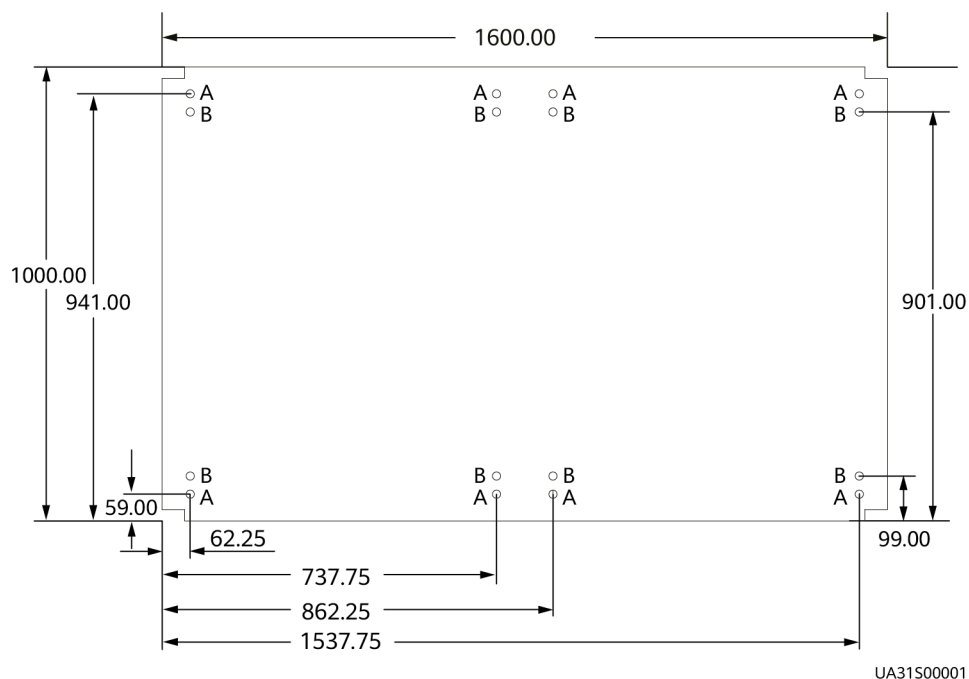
Ensure that the installation floor is level.

Step 1 Determine the cabinet installation positions on the floor based on the holes in the marking-off template for floor installation.

NOTE

- A: mounting holes on the channel steel
- B: mounting holes on the floor

Figure 6-32 Hole dimensions (unit: mm)



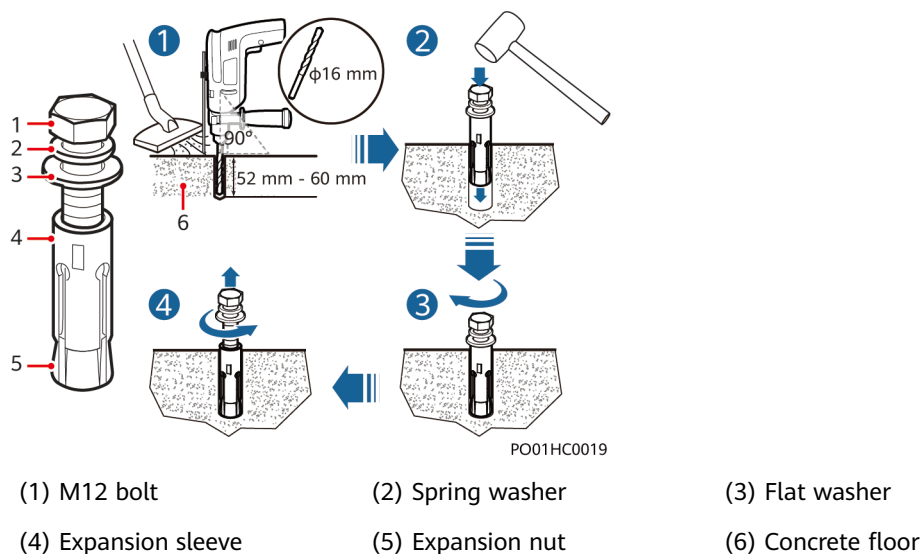
Step 2 Use a hammer drill to drill holes for installing expansion bolts and then install expansion sleeves in the holes.

1. Drill a hole into the concrete floor using a hammer drill. The hole depth ranges from 52 mm to 60 mm.
2. Partially tighten the expansion bolt and vertically insert it into the hole. Knock the expansion bolt using a rubber mallet until the expansion sleeve is fully inserted into the hole.
3. Partially tighten the expansion bolt.
4. Remove the bolt, spring washer, and flat washer.

NOTICE

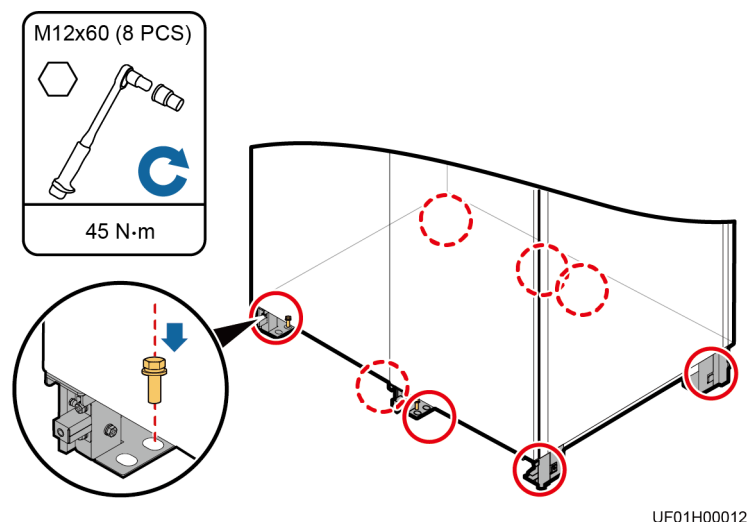
Knock the expansion bolts into the holes until the expansion sleeves completely fit into the holes. The expansion sleeves must be completely buried under the ground to facilitate subsequent installation.

Figure 6-33 Drilling holes and installing expansion sleeves



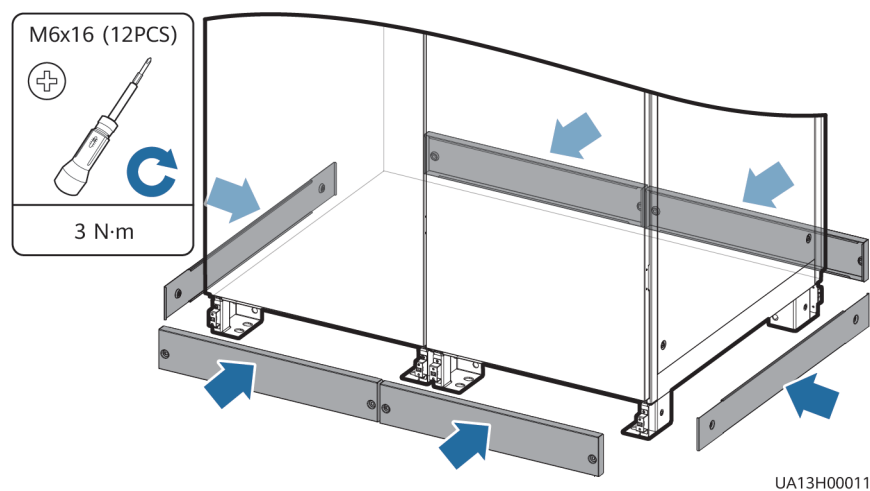
Step 3 Secure the cabinets.

Figure 6-34 Securing the cabinets



Step 4 Install anchor baffle plates.

Figure 6-35 Installing anchor baffle plates



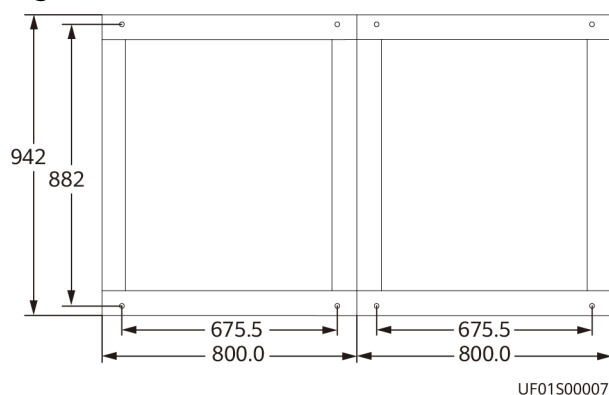
----End

Installation on Channel Steel

NOTICE

- Huawei does not provide channel steel or expansion bolts for securing channel steel. Customers need to purchase them by themselves.
- Ensure that the surface of channel steel is level.
- The procedure for installation on channel steel is similar to that for installation on the floor except the following steps:
 - Determine the mounting holes for the cabinets based on the marking-off template (for installation on channel steel).
 - Drill mounting holes on the channel steel using a hammer drill.
 - Use M12x60 bolts to secure the cabinets on the channel steel.

Figure 6-36 Recommended channel steel dimensions (unit: mm)

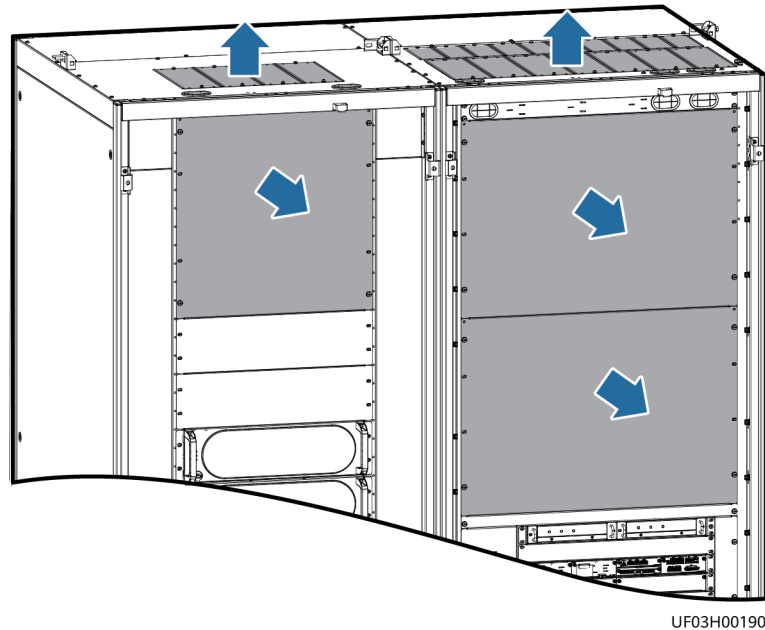


6.4.1.2 Installing Cables

Procedure

Step 1 Remove the cabinet covers.

Figure 6-37 Removing the cabinet covers



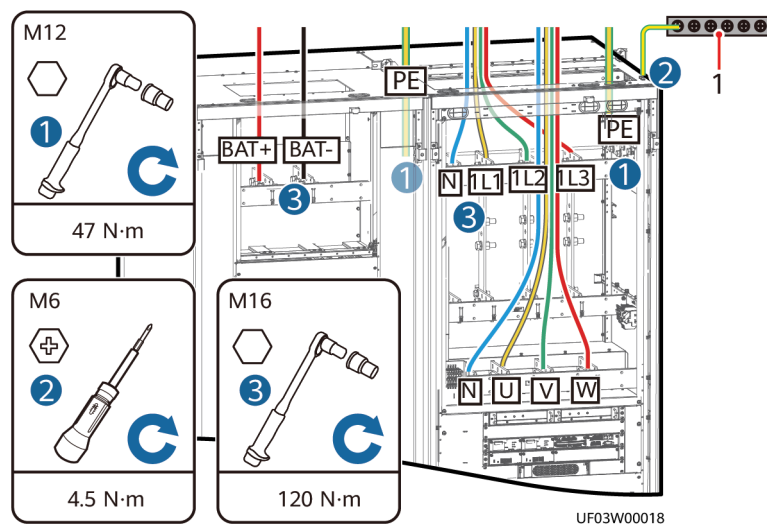
Step 2 Install power cables.

NOTE

Cables of the same group, for example, mains input cables, must be routed through the same cable hole.

- One power source

Figure 6-38 Installing cables



(1) Ground bar in the equipment room

- Two power sources

Figure 6-39 Removing the copper bars of the same power source for mains and bypass inputs

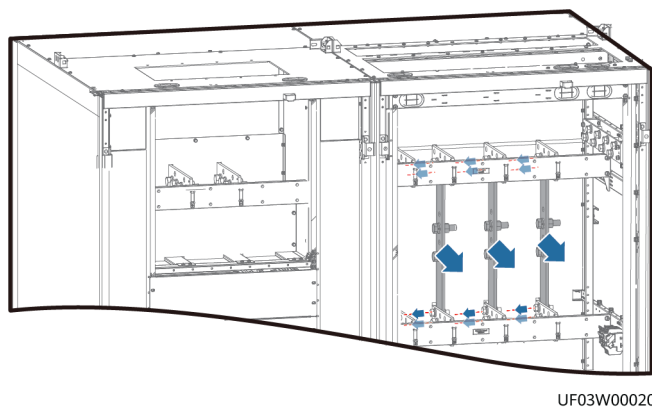
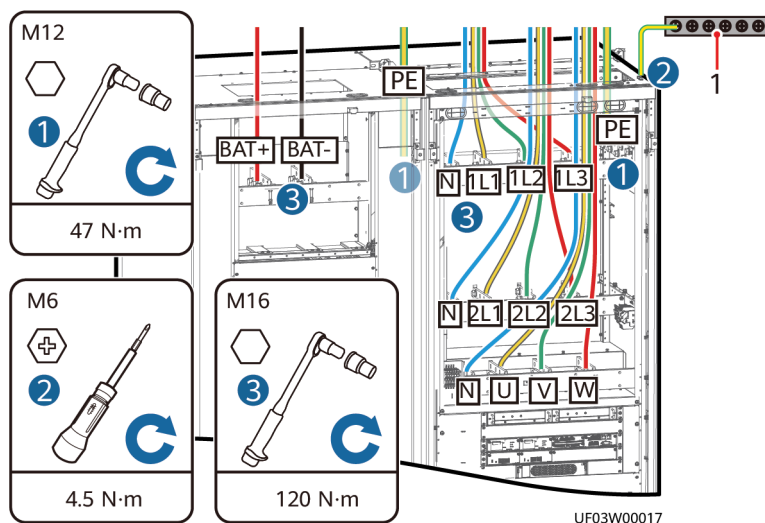


Figure 6-40 Installing cables



(1) Ground bar in the equipment room

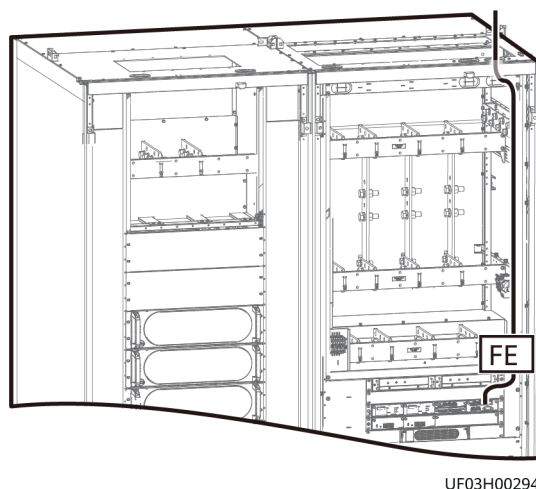
Step 3 Connect signal cables. Bind cables to the cabinet nearby.

- If you need to log in to the WebUI of the UPS monitoring system, connect the network port on a PC to the FE port on the monitoring interface card.
- If the UPS needs to connect to an external network management device, connect the external network management device to the RS485 port on the monitoring interface card.

NOTICE

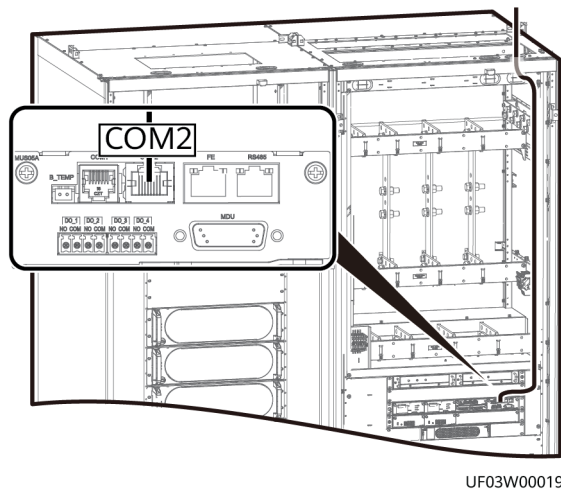
- Do not bind signal cables and power cables together.
- RS485 cables and FE cables must be shielded cables.

Figure 6-41 Installing a signal cable



Step 4 Install the SmartLi communications cable.

Figure 6-42 Installing the SmartLi communications cable



----End

6.4.2 Installing the UPS + Bottom Cabling Cabinet

6.4.2.1 Installing Cabinets

Installation on the Floor

NOTICE

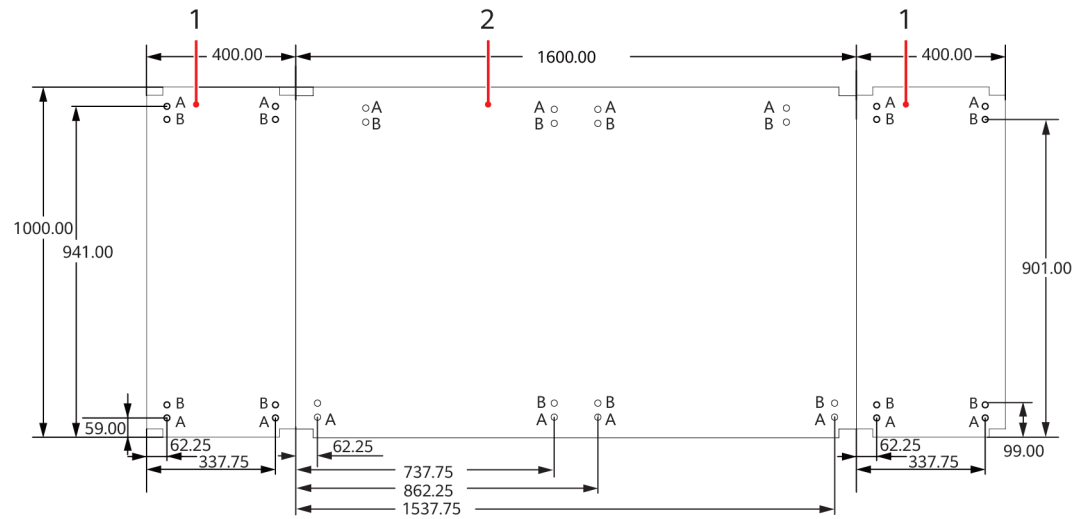
Ensure that the installation floor is flat.

Step 1 Determine the cabinet installation positions on the floor based on the holes in the marking-off template for floor installation.

NOTE

- A: mounting holes on the channel steel
- B: mounting holes on the floor

Figure 6-43 Hole dimensions (unit: mm)



(1) Bottom cabling cabinet (optional)

(2) UPS

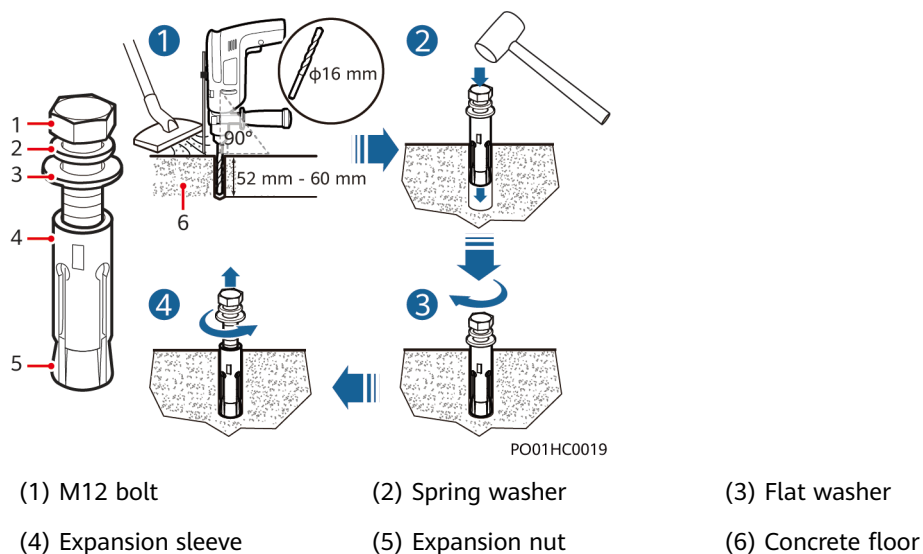
Step 2 Use a hammer drill to drill holes for installing expansion bolts and then install expansion sleeves in the holes.

1. Drill a hole into the concrete floor using a hammer drill. The hole depth ranges from 52 mm to 60 mm.
2. Partially tighten the expansion bolt and vertically insert it into the hole. Knock the expansion bolt using a rubber mallet until the expansion sleeve is fully inserted into the hole.
3. Partially tighten the expansion bolt.
4. Remove the bolt, spring washer, and flat washer.

NOTICE

Knock the expansion bolt into the hole until the expansion sleeve completely fits into the hole. The expansion sleeve must be completely buried under the ground to facilitate subsequent installation.

Figure 6-44 Drilling holes and installing expansion sleeves

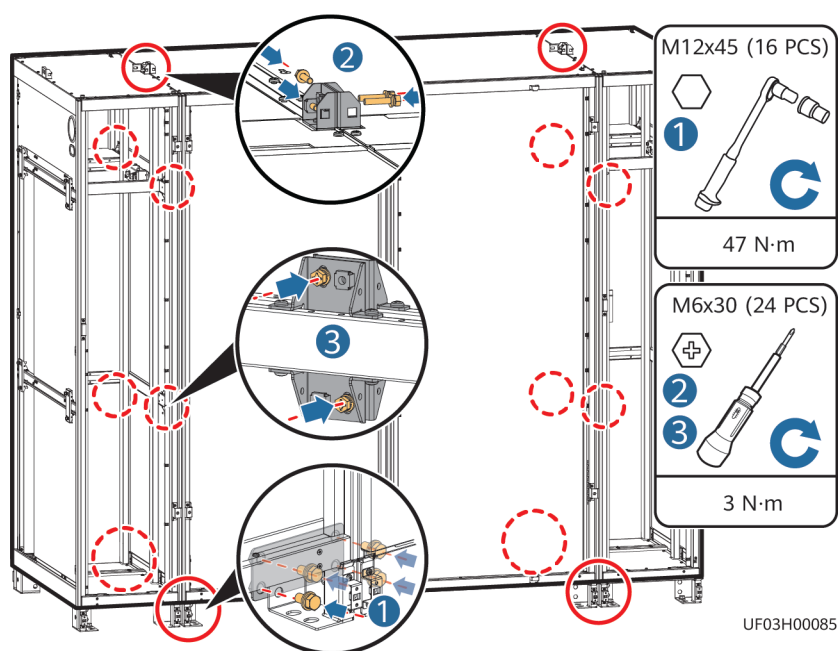


Step 3 Remove the UPS cabinet side panels.

Step 4 Remove the front panel from the bottom cabling cabinet.

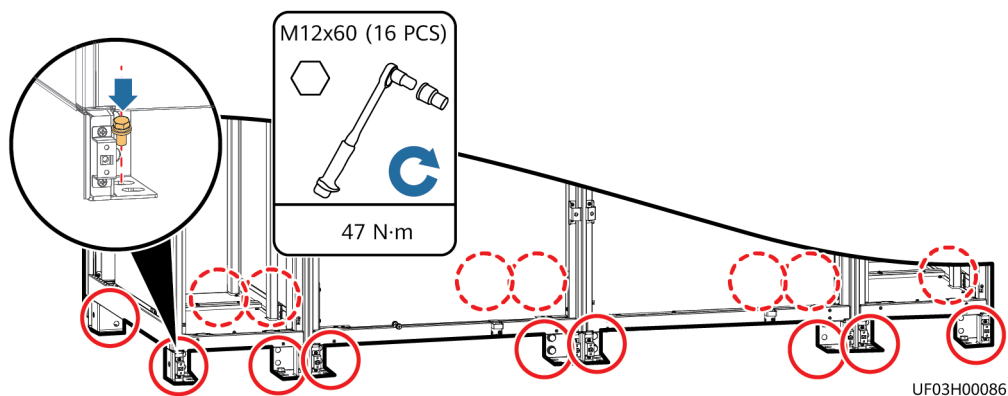
Step 5 Combine the bottom cabling cabinet.

Figure 6-45 Combining the bottom cabling cabinet



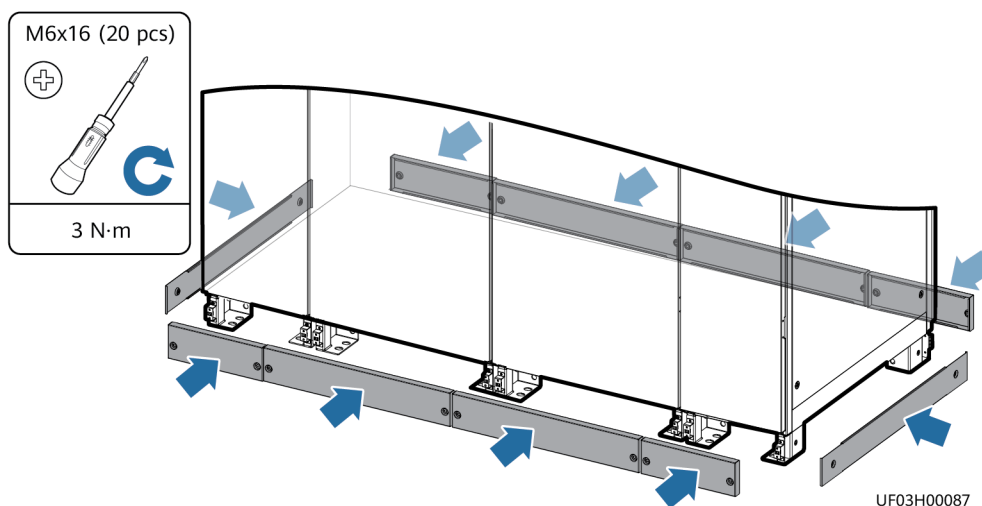
Step 6 Secure the cabinets.

Figure 6-46 Securing the cabinets



Step 7 Install anchor baffle plates.

Figure 6-47 Installing anchor baffle plates



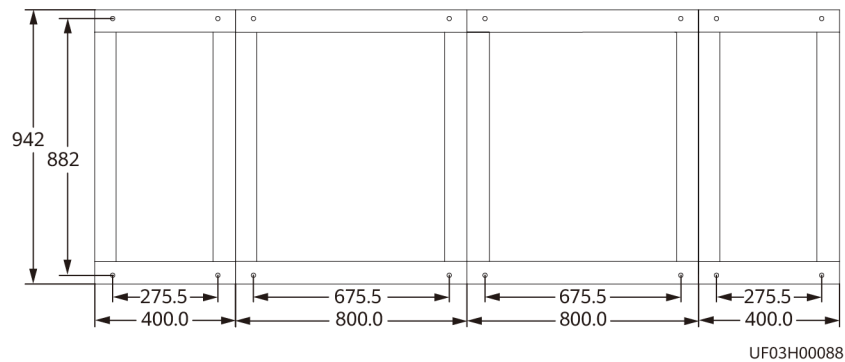
----End

Installation on Channel Steel

NOTICE

- Huawei does not provide channel steel or expansion bolts for securing channel steel. Customers need to purchase them by themselves.
- Ensure that the surface of channel steel is level.
- The procedure for installation on channel steel is similar to that for installation on the floor except the following steps:
 - Determine the mounting holes for the cabinets based on the marking-off template (for installation on channel steel).
 - Drill mounting holes on the channel steel using a hammer drill.
 - Use M12x60 bolts to secure the cabinets on the channel steel.

Figure 6-48 Recommended channel steel dimensions (unit: mm)

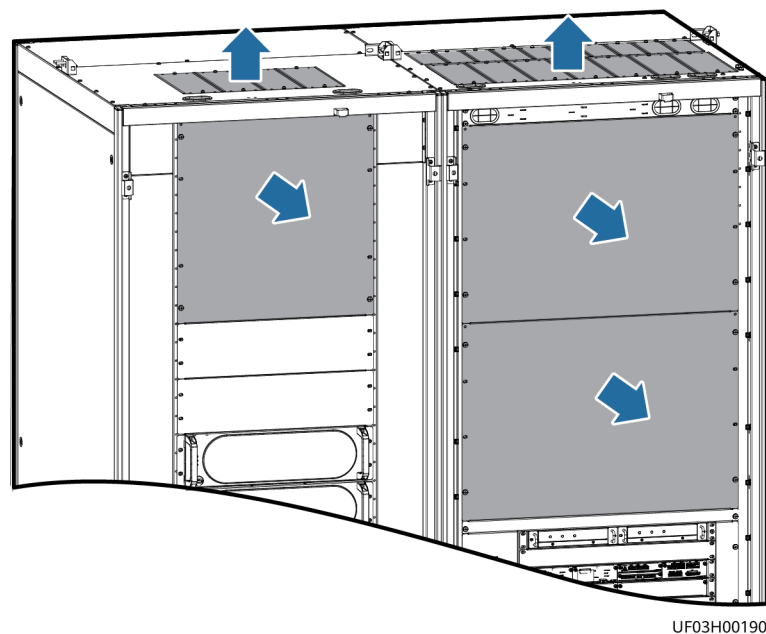


6.4.2.2 Installing Cables

Procedure

Step 1 Remove the cabinet covers.

Figure 6-49 Removing the cabinet covers



Step 2 Remove the bottom cabling cover from the bottom cabling cabinet.

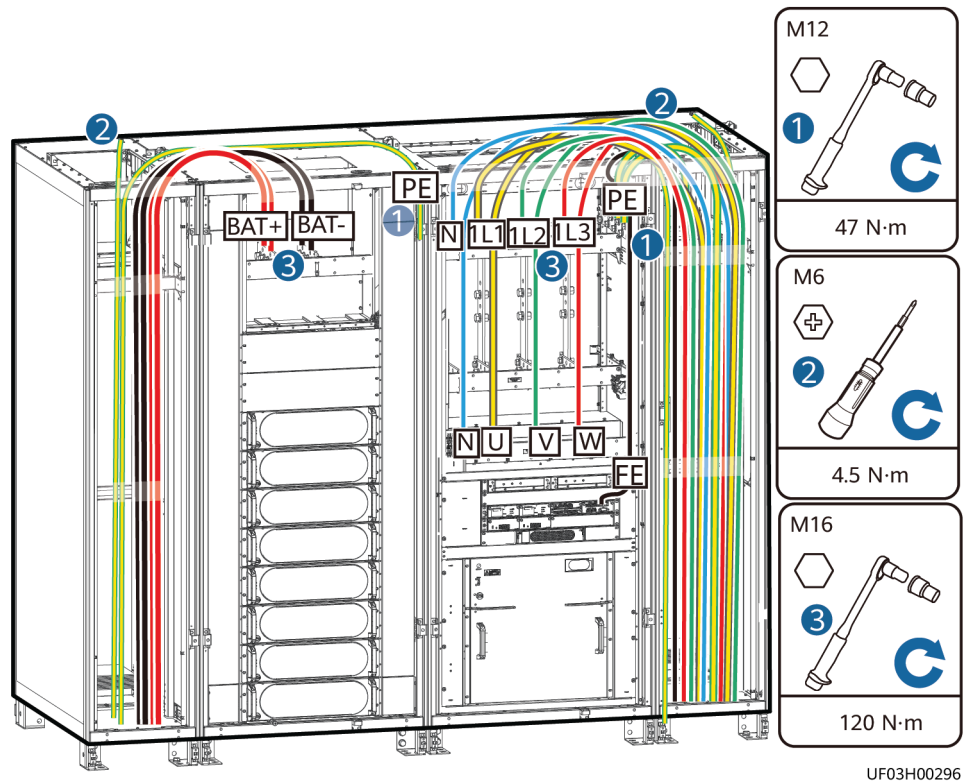
Step 3 Install power cables.

NOTE

Cables of the same group, for example, mains input cables, must be routed through the same cable hole.

- One power source

Figure 6-50 Installing cables



- Two power sources

Figure 6-51 Removing the copper bars of the same power source for mains and bypass inputs

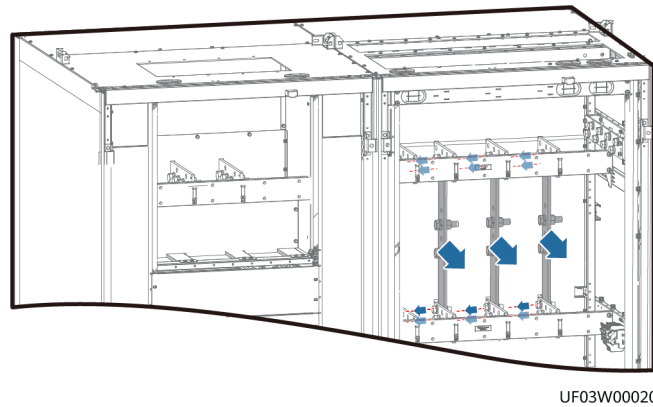
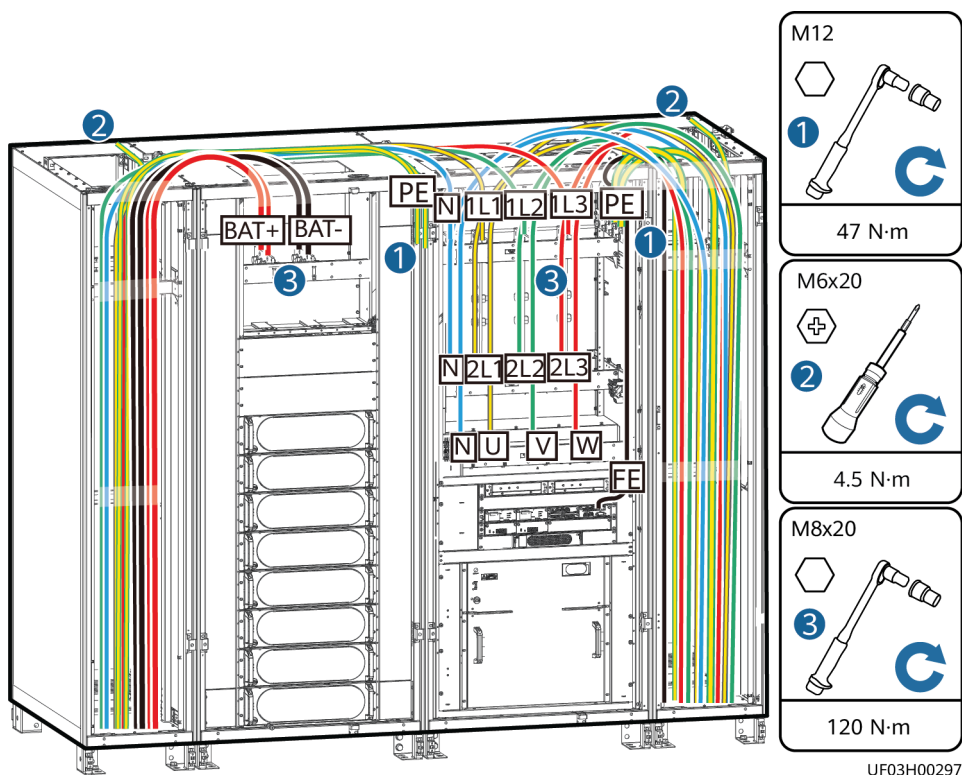


Figure 6-52 Installing cables



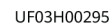
Step 4 Connect signal cables. Bind cables to the cabinet nearby.

- If you need to log in to the WebUI of the UPS monitoring system, connect the network port on a PC to the FE port on the monitoring interface card.
- If the UPS needs to connect to an external network management device, connect the external network management device to the RS485 port on the monitoring interface card.

NOTICE

- Do not bind signal cables and power cables together.
- RS485 cables and FE cables must be shielded cables.

Figure 6-53 Installing a communications cable



Step 5 Install the SmartLi communications cable.

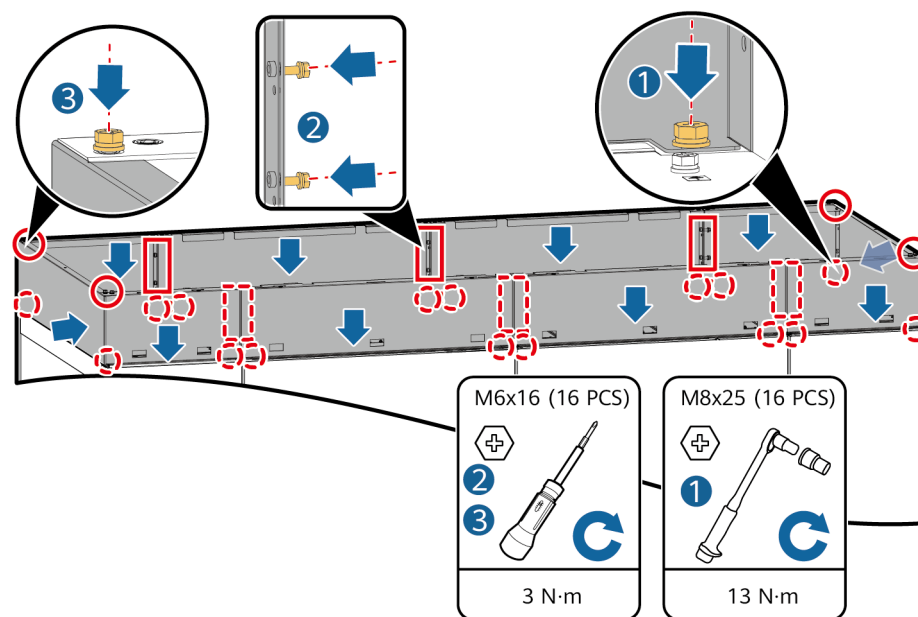
Figure 6-54 Installing the SmartLi communications cable



Step 6 Install the removed side panels on both sides of the bottom cabling cabinet.

Step 7 Install top frames.

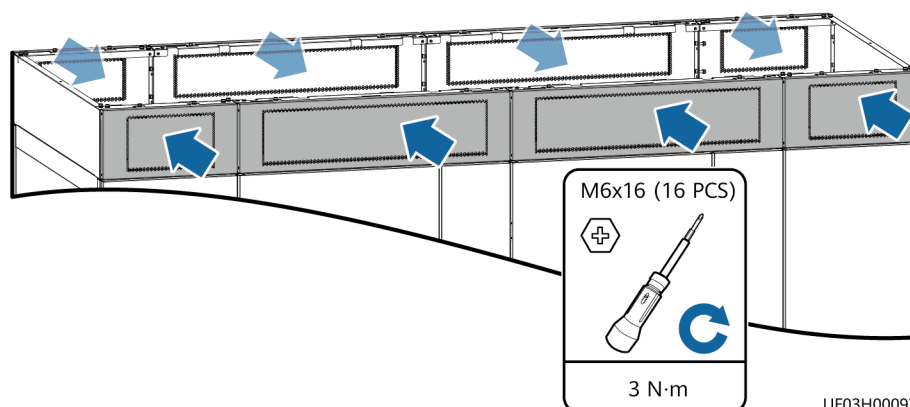
Figure 6-55 Installing top frames



UF03H00096

Step 8 Install mounting plates.

Figure 6-56 Installing mounting plates



UF03H00097

-----End

6.5 Parallel System Installation

Prerequisites

NOTICE

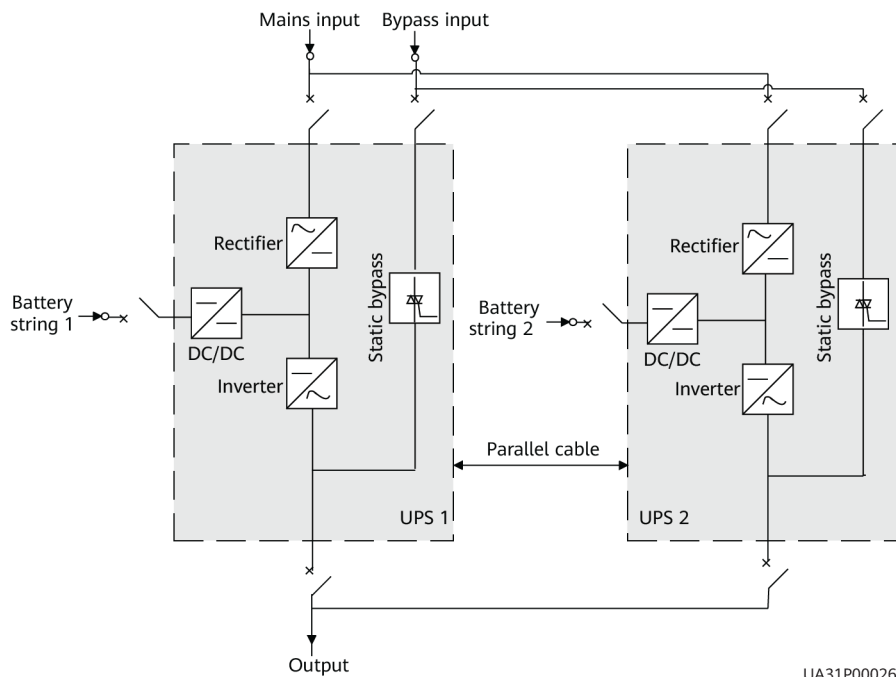
- In a parallel system, cables with the same phase sequence must have the same specifications (cross-sectional area and length) to ensure current equalization between UPSs.
- Ensure that the phase sequences of the mains input, bypass input, and output power cables of each UPS are the same.
- Connect power cables according to port silk screens.

Procedure

- Step 1** Ground each UPS in a parallel system separately, and connect power cables and battery cables.
- Step 2** Choose a parallel mode and connect power cables to the parallel system based on site requirements.

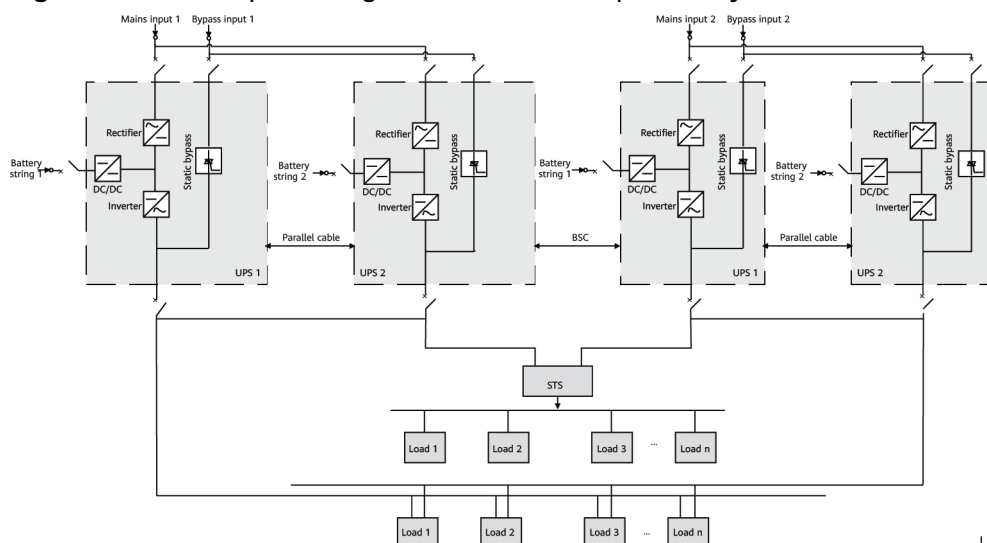
The typical scenario of a 1+1 parallel system is used as an example.

Figure 6-57 Conceptual diagram of a 1+1 parallel system



A dual-bus parallel system consisting of two parallel subsystems is used as an example.

Figure 6-58 Conceptual diagram of a dual-bus parallel system



UA31P00027

----End

6.6 Connecting a Backfeed Protection Card

Prerequisites

NOTICE

- A backfeed protection card is installed.
- The backfeed protection card uses relay contact signals and it can connect to any power signal with a voltage of 240 V AC or less and a current of less than 4 A.
- The backfeed protection card needs to be powered by the UPS output or a more reliable third-party power supply to ensure that the backfeed protection card can isolate faults if backfeed faults occur during power supply in battery mode.

Procedure

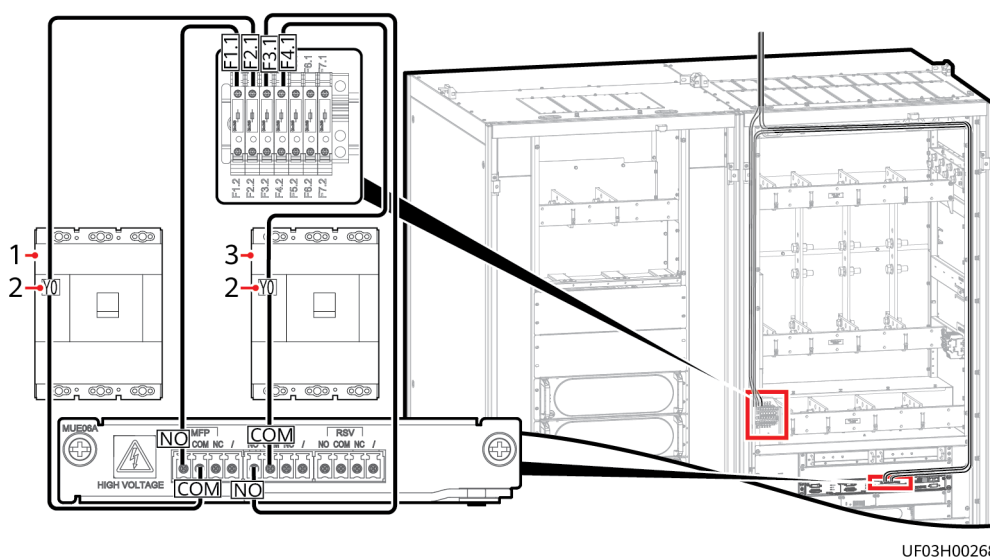
Step 1 Connect cables to the backfeed protection card.

- If the UPS output power supply is used, select a shunt release that matches the rated voltage based on the voltage system. (Currently, only the 800 kVA UPS supports this feature.)

Table 6-6 Shunt release selection

UPS Voltage System	UPS Voltage Level	Supply Voltage to Shunt Release
Three-phase four-wire	380 V	220 V
Three-phase four-wire	400 V	230 V
Three-phase four-wire	415 V	240 V

Figure 6-59 Cable connections between the backfeed protection card and shunt release (800 kVA)



(1) Mains input circuit breaker (provided by the customer)

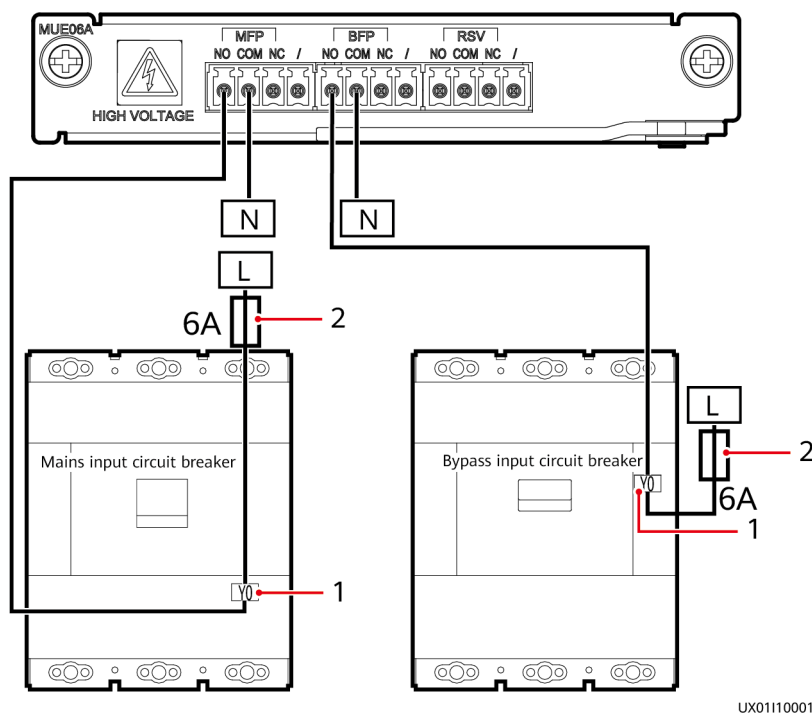
(2) Shunt release (provided by the customer)

(3) Bypass input circuit breaker (provided by the customer)

NOTICE

- The backfeed protection card and fuse terminal block apply to cables with a cross-sectional area of 0.5–1.3 mm². The actual cable size must meet the requirements of the backfeed protection card, fuse terminal block, and shunt release.
 - The cable length can be customized based on the site survey result, or an appropriate cable can be purchased and installed by the customer.
 - Bind the cables separately from signal cables.
- If a third-party reliable power supply is used, use the power signal whose voltage is less than or equal to 240 V AC and current is less than 4 A. (400–800 kVA UPSs support this feature.)

Figure 6-60 Cable connections between the backfeed protection card and shunt release



UX01110001

(1) Shunt release (provided by the customer)

(2) 6 A fuse (prepared by the customer)

----End

6.7 Connecting a Remote EPO Switch

NOTICE

- Huawei does not provide the EPO switch or cable. Prepare them by yourself. The recommended cable is 22 AWG.
- Equip the EPO switch with a protective cover to prevent misoperations, and protect the cable with a protective tube.
- Triggering EPO will shut down the rectifier, inverter, charger, and static bypass, but will not disconnect the UPS mains input. To power off the UPS completely, turn off the upstream input switch when you trigger EPO.

Use a cable to connect the EPO switch to the dry contact port on the control module of the UPS.

Figure 6-61 Cable connection for an NC EPO port

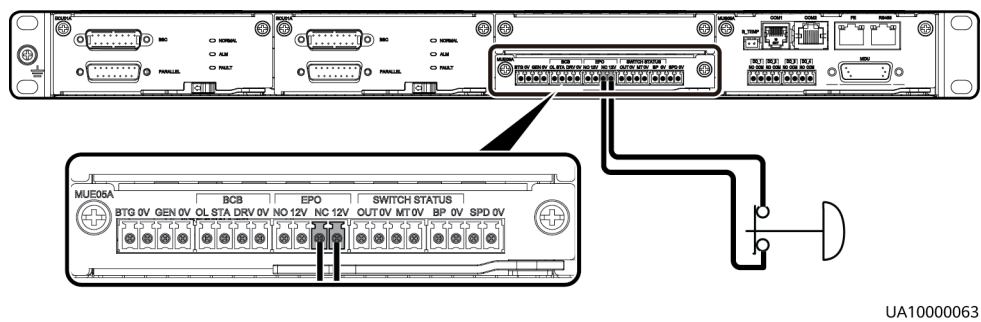
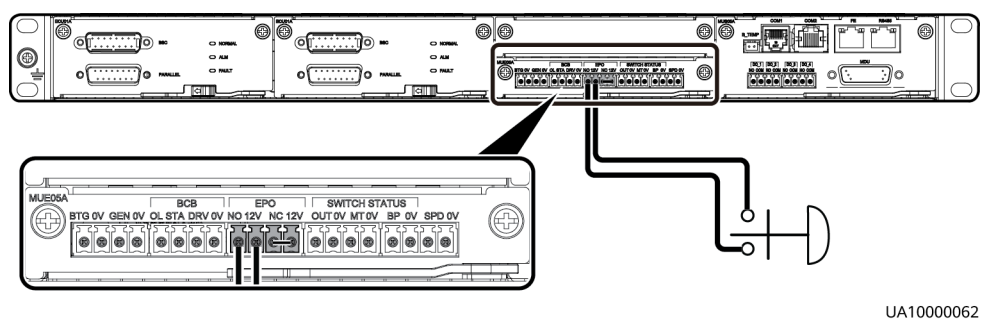


Figure 6-62 Cable connection for an NO EPO port



NOTE

- When you use the NC status, remove the jumper between EPO_NC and EPO_12V first. When you turn off the EPO switch, EPO is triggered.
- When you use the NO status, ensure that the jumper is connected between EPO_NC and EPO_12V. When you turn on the EPO switch, EPO is triggered.

6.8 Verifying the Installation

Table 6-7 lists check items and acceptance criteria.

NOTICE

You need to carefully check items 08 and 09 listed in Table 6-7. If the check results of these two items do not meet the acceptance criteria, the UPS may be damaged.

Table 6-7 Check items and acceptance criteria

No.	Item	Acceptance Criteria
01	Cabinet installation	The cabinets are securely installed and do not tilt due to vibration.

No.	Item	Acceptance Criteria
02	Neat arrangement	The UPS and its adjacent cabinets are neatly arranged and secured with connecting kits.
03	Layout of the busway and cables	The busway and cables are routed properly as required by the customer.
04	Labels on the busway and cables	Both ends of a busway and cable are labeled. Labels are concise and easy to understand.
05	Cable ties	Cable ties are secured evenly and no burr exists.
06	Cable and busbar connections	Input power cables or busbars, output power cables or busbars, and cables between batteries are securely connected. For the cables secured by screws, the spring washers are flattened.
07	Grounding	The resistance between the UPS ground bar and the equipment room ground bar is less than 0.1 ohm.
08	AC phase sequence	The mains input, bypass input, and output phase sequences are correct.
09	Battery cable connections	The battery strings are correctly connected to the UPS.
10	Foreign matter cleaning inside the cabinets	The inside and outside of the cabinets are free from conductive dust or other sundries. 1. There is no foreign matter (such as copper wires and screws) on the top of the cabinets. 2. There is no foreign matter on the copper bar terminals. 3. There is no foreign matter around switch terminals. 4. There is no foreign matter on the bottom plates of the cabinets. 5. There is no foreign matter on the rear module subrack.

 NOTE

1. After routing cables and checking cable connections, use sealing putty to fill in all gaps between the cables and the cabinets.
2. After verifying the installation, reinstall all the covers.
3. Do not remove the dustproof cover before power-on to prevent dust from entering the cabinets.

7 Single UPS Commissioning

7.1 Powering On and Starting the UPS

Prerequisites

Measure the voltage and frequency of the external input switch of the UPS. The voltage ranges from 138 V AC to 485 V AC (line voltage) in the 380 V AC/400 V AC/415 V AC voltage system.

Frequency range: 40–70 Hz

7.1.1 Powering On the UPS

Context

- The following operations are applicable to a single UPS. For parallel systems, contact Huawei technical support.
- Before power-on, ensure that the devices have passed all check items in the section "Verifying the Installation."
- Before power-on, ensure that all the UPS switches and upstream switches are OFF.

Procedure

Step 1 Turn on the upstream bypass and mains input switches.

After the UPS is powered on, initialization begins. The MDU displays the Huawei logo and an initialization progress bar.

----End

7.1.2 Initial Startup

NOTICE

- If the UPS is powered on for the first time, you need to obtain the startup password from the **Service Expert** app. Skip this step if the UPS is not powered on for the first time.
 - The **Service Expert** app can be downloaded from HUAWEI AppGallery and can only run on Android.
-

7.1.2.1 Obtaining Startup Password

Procedure

Step 1 Download and install the **Service Expert** app.

Step 2 On the app home screen, tap **StartUp** to access the **Set Startup** screen.

- Online Startup
 - a. Insert the WiFi module into the USB port on the MDU. Enable the mobile phone WLAN, search for the **UPS_WIFI** signal, and connect to the WiFi signal. The password is **Changeme**.
 - b. Set the **Site** and **Device Type** as required, and connect the device. Set **IP** to **192.168.0.10**, **Port** to **443**, **Username** to **admin**, **Password** to **Changeme**, and click **Login**.
 - c. After login, tap **Power-on password activation** on the screen. A message is displayed, indicating whether to start the UPS. Tap **OK**.
- Offline Startup
 - a. Set **Site** and **Device Type** as required, and tap **Offline Activation**.
 - b. Enter **Bar code** and **Verification code** obtained from the LCD on the **Offline Activation** screen. Tap **Generate PWD** to generate a startup password.
 - c. Enter the generated password in the password text box on the LCD to start the inverter.

NOTICE

The system displays the **Bypass mode** and **No battery** alarms, which do not need to be handled.

----End

7.1.2.2 Settings Wizard

Procedure

Step 1 Set the language, time, network parameters, system parameters, and battery parameters on the **Settings Wizard** screen.

NOTICE

Set system parameters with caution because the settings determine whether the UPS can operate normally.

- Set **Single/Parallel** after double check. Incorrect settings may affect the normal UPS operation.
- **Output voltage level** refers to the line voltage level. Set it based on site requirements.
- Set **Output frequency** correctly. Otherwise, loads may be affected and the UPS may not work properly.
- Set all battery parameters correctly based on site requirements. Battery parameter settings are critical to battery maintenance, battery lifespan, and UPS discharge time.

Figure 7-1 Settings Wizard



 NOTE

- Set the time and date correctly. Incorrect time and date will cause false fault analysis during maintenance or repair, affecting the normal operation.
- After network parameters are set, connect the UPS to the network to ensure that maintenance personnel can manage or control the UPS remotely. If you do not need remote management, retain the default network parameter settings.

Step 2 After you set parameters on the **Settings Wizard** screen, the system displays the **Bypass mode** and **No battery** alarms, which do not need to be handled. Other alarms need to be handled.

 NOTE

- After you set parameters on the **Settings Wizard** screen, choose **System Info > Settings > System Settings**. Check that **Requisite modules** and **Redundant modules** match the actual values.
- If dry contact signals are connected to the system, choose **System Info > Settings > Dry Contact Set**. Check that the connected dry contacts have been enabled and that the disconnected dry contacts have been disabled.

Step 3 If the system has connected to the remote EPO switch, you need to choose **Monitoring > UPS System > Running Parameter > System Settings** on the WebUI and set **EPO detection** to **Enable**.

Step 4 View the system running status diagram on the LCD to check that the UPS is working in bypass mode.

----End

7.1.3 Starting the Inverter

UPS System User List

Table 7-1 UPS system user list

Default User	Preset Password	
admin (administrator)	LCD	000001
	Web	Changeme
operator (common user)	LCD	000001
	Web	Changeme

Starting the Inverter on the LCD

Step 1 Choose **Common Functions > Inv. ON**.

 NOTE

You can also start the inverter by choosing **System Info > Maintenance > Inv. ON**.

Step 2 On the displayed login screen, select a user name and enter the password.

Step 3 In the displayed dialog box, tap **Yes** to start the inverter.

----End

Starting the Inverter on the WebUI

Step 1 Open a browser (Internet Explorer 11 as an example) and choose **Tools > Internet Options**.

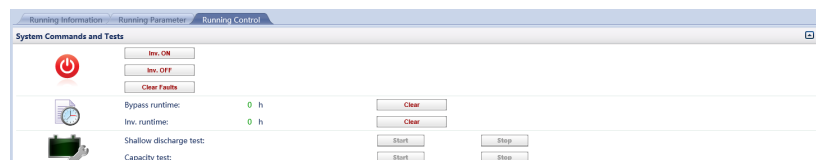
Step 2 Click the **Advanced** tab, check that **Use TLS 1.0** and **Use TLS 1.1** are selected, and click **OK**.

Step 3 In the address box of the browser, enter `https://UPS IP address`.

Step 4 Enter the correct user name and password and click **Login**.

Step 5 On the WebUI, choose **Monitoring > UPS System > Running Control**, and click **Inv. ON**, and confirm the operation to start the inverter.

Figure 7-2 Starting the inverter



NOTE

If the power module receives a startup command when it cannot be started, the startup command will be retained for 1 minute. Within 1 minute, if there is no situation (for example, the power module encounters other faults, executes a shutdown command, or a fault is rectified) that requires the startup command to be cleared and the power module becomes able to start, then the power module responds to the startup command.

----End

7.1.4 Powering On Loads

Context

After the inverter starts, the UPS transfers to inverter mode, and the **Bypass mode** alarm on the MDU disappears.

Procedure

Step 1 After confirming that the battery string is properly connected, switch on the battery string input circuit breaker. If there are multiple battery strings, switch on the circuit breaker for each battery string and then the general circuit breaker between the battery strings and the UPS. The **No battery** alarm on the MDU disappears.

Step 2 Turn on the downstream output switch to supply power to loads.

----End

7.1.5 (Optional) Setting Parameters for the BCB Box

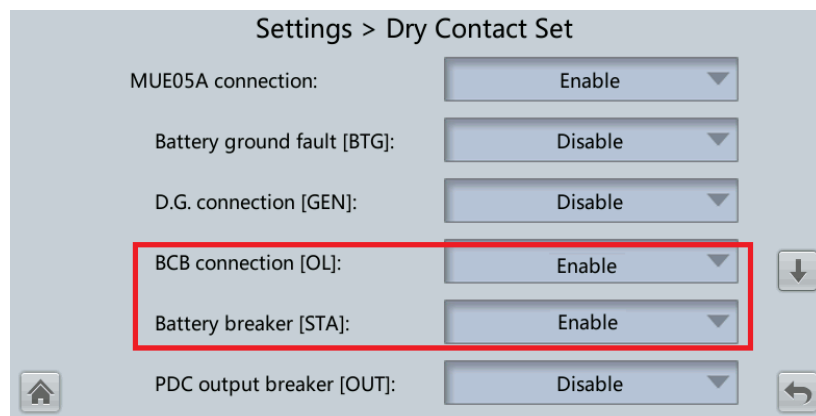
Prerequisites

A BCB box is installed.

Procedure

- Step 1** Choose **System Info > Settings > Dry Contact Set**, set **MUE05A connection** to **Enable**, and set **BCB connection [OL]** and **Battery breaker [STA]** to **Enable**.

Figure 7-3 BCB connection settings



----End

7.1.6 (Optional) Configuring the Bottom Cabling Cabinet

Prerequisites

The bottom cabling cabinet has been deployed.

Procedure

- Step 1** On the LCD, choose **System Info > Settings > System Settings** and set **Bottom cable entry cabinet** to **Enable**.

----End

7.1.7 (Optional) Setting the Backfeed Protection Card

Prerequisites

A backfeed protection card is installed.

Procedure

- Step 1** On the LCD, choose **System Info > Settings > Dry Contact Set** and set **MUE06A connection** to **Enable**.

 NOTE

If **MUE06A connection** is set to **Enable** and the backfeed protection card fails to communicate with the UPS, the system reports a **Dry contact board fault** alarm.

----End

7.1.8 (Optional) Setting the Intelligent Detection Card

Prerequisites

An intelligent detection card is installed.

Procedure

- Step 1** On the LCD, choose **System Info > Settings > System Settings** and set **Intelligent detection module** to **Enable**.

----End

7.2 Shutting Down and Powering Off the UPS

Context

NOTICE

If the bypass is normal, the UPS transfers to bypass mode after the inverter is shut down; if the bypass is abnormal, the UPS supplies no power after the inverter is shut down. Before shutting down the UPS, ensure that all loads have been shut down.

Procedure

- Step 1** Shut down the inverter.

- Shutting down the inverter on the LCD

Choose **Common Functions > Inv. OFF**. After confirmation, the inverter is shut down.

 NOTE

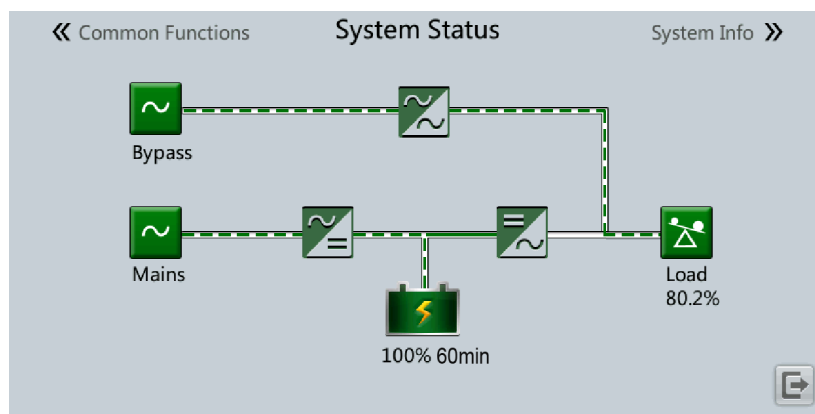
You can also choose **System Info > Maintenance > Inv. OFF** to shut down the inverter.

- Shutting down the inverter on the WebUI

Choose **Monitoring > UPS System > Running Control**, and click **Inv. OFF**.

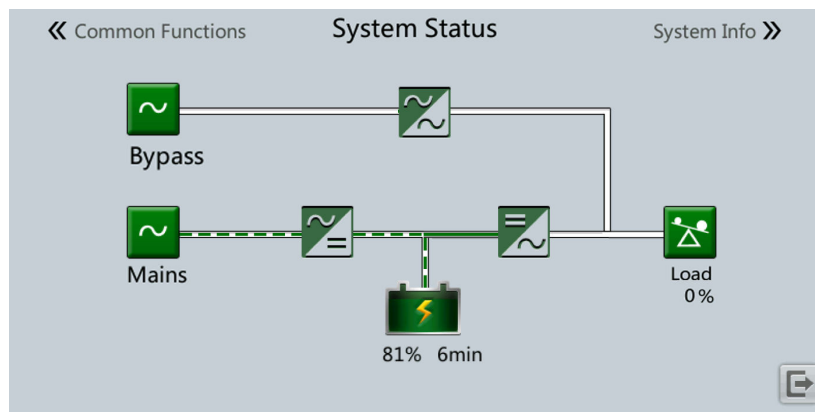
If the inverter shuts down and the bypass is normal, the UPS transfers to bypass mode. The **Bypass mode** alarm is displayed on the LCD.

Figure 7-4 Normal bypass



After you shut down the inverter, the UPS supplies no power if the bypass is abnormal, which causes a power failure for the loads.

Figure 7-5 Abnormal bypass



NOTE

To shut down the inverter and transfer the system to bypass mode, check that the UPS has not generated an alarm and perform [Step 1](#).

Step 2 After the inverter shuts down, turn off the downstream output switch.

Step 3 Switch off the battery string circuit breaker. If there are multiple battery strings, switch off the general circuit breaker between battery strings and the UPS and then switch off the circuit breaker for each battery string.

Step 4 Turn off the upstream mains and bypass input switches.

----End

7.3 Cold-Starting the UPS Using Batteries

Lead-Acid Battery Cold Start

- Step 1** Check that batteries are properly connected. Use a multimeter to measure the voltage of each battery string. The value should be greater than the specified value (Voltage of a single battery x Number of batteries in the battery string).
- Step 2** Turn off the mains and bypass input switches in the external input PDC, and switch on the battery circuit breaker. If there are multiple battery strings, switch on the circuit breaker for each battery string and then the general circuit breaker between the battery strings and the UPS.
- Step 3** Use a multimeter to measure the voltage of each battery string connected to the UPS. If the voltage is greater than the specified value (Voltage of a single battery x Number of batteries in the battery string), batteries are connected properly.
- Step 4** Press and hold down the **BATT START** button on the bypass control module for more than 2 seconds. The system automatically enters the battery cold start state. The MDU displays the Huawei logo and an initialization progress bar.
- Step 5** After the initialization is complete, start the inverter on the LCD.
----End

Lithium Battery Cold Start

- Step 1** Check that the cables between the UPS and the lithium battery cabinet are properly connected.
- Step 2** Turn off the mains and bypass input switches in the external input PDC.
- Step 3** Power on the lithium battery cabinet by referring to the lithium battery cabinet manual.
- Step 4** Use a multimeter to measure the voltages of the positive and negative battery strings connected to the UPS battery input terminals. If the measured values are consistent with the voltages displayed on the **System Status** screen of the lithium battery cabinet, the batteries are properly connected.
- Step 5** When the green indicator on the battery control unit in the lithium battery cabinet blinks at 1 Hz or is steady on, press and hold down the **BATT START** button on the UPS bypass control module for more than 2 seconds. The system automatically enters the battery cold start state. The MDU displays the Huawei logo and an initialization progress bar.
- Step 6** After the MDU initialization is complete, start the inverter.
----End

7.4 Transferring to Bypass Mode Manually

NOTICE

Before you shut down the inverter, ensure that the bypass is normal. If the bypass is abnormal, after you shut down the inverter, the UPS supplies no power, and the loads are powered off.

Shut down the inverter on the LCD or WebUI. The UPS automatically transfers to bypass mode.

NOTE

If you shut down the inverter when the bypass input voltage or frequency exceeds the specified threshold, the UPS supplies no power, and the loads are powered off.

7.5 Setting ECO Mode

Prerequisites

The UPS is working in inverter mode.

Context

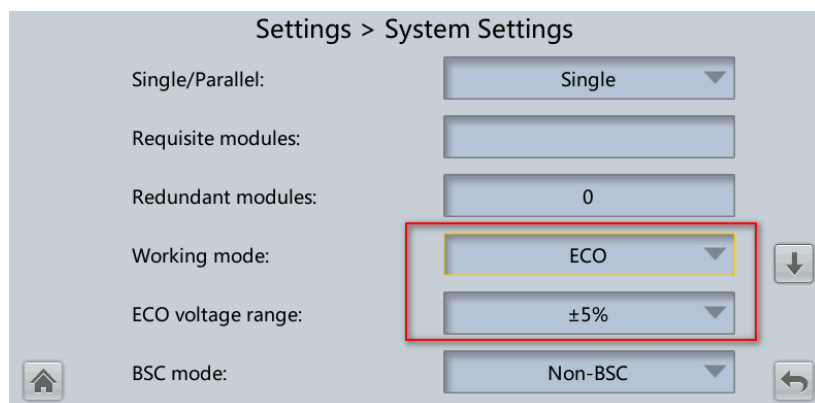
- The UPS is set to non-ECO mode by default. Set the UPS to ECO mode when it is required.
- In ECO mode, the bypass takes priority over the inverter in supplying power. If the bypass fails, the UPS transfers to inverter mode.
- Both a single UPS and a parallel system support ECO mode which ensures a higher efficiency.
- To avoid frequent transfers between ECO mode and normal mode, do not set ECO mode when the bypass input is unstable or is sensitive to load changes.
- ECO mode is not recommended when the load is less than 10%.
- Before setting ECO mode, ensure that the bypass is working properly.

Procedure

Step 1 On the LCD, choose **System Info > Settings > System Settings** and set **Working mode** to **ECO**. The information indicating that the UPS works in ECO mode is displayed on the LCD.

Step 2 Set the ECO voltage range.

Figure 7-6 ECO specifications

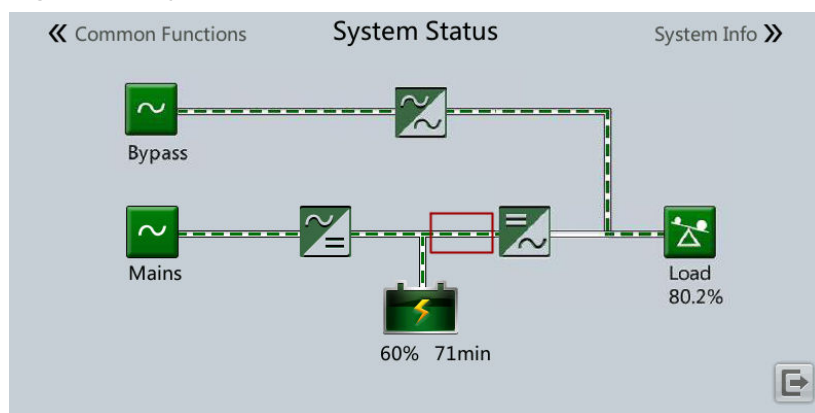


Step 3 (Optional) If you set ECO mode in bypass mode, manually start the UPS inverter.

NOTICE

After the inverter is started, the UPS still works in bypass mode, and the inverter is on standby. When the bypass is abnormal, the UPS transfers to inverter mode immediately. If the inverter is not started, the UPS stops supplying power when the bypass is abnormal, and the system may power off.

Figure 7-7 System status in ECO mode



----End

7.6 Testing Batteries

7.6.1 Lead-Acid Battery Test

7.6.1.1 Performing a Forced Equalized Charging Test

Context

This item allows you to perform equalized charging on batteries forcibly.

NOTICE

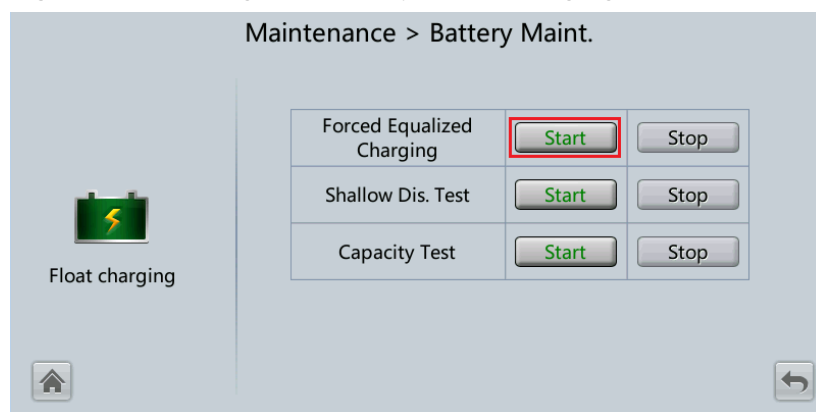
Before performing a forced equalized charging test, ensure that:

- The mains input is normal.
- Batteries are properly connected.
- Batteries are not in equalized charging mode.

Procedure

- Step 1** On the home screen of the LCD, choose **System Info > Maintenance > Battery Maint.**
- Step 2** Tap **Start** on the right of **Forced Equalized Charging** to start a forced equalized charging test.

Figure 7-8 Starting a forced equalized charging test



NOTE

The forced equalized charging test automatically stops in any of the following cases:

- The test duration reaches the forced equalized charging protection time (12–24 h, 18 h by default).
- The UPS generates a battery overtemperature, overvoltage, or overcurrent alarm.
- An alarm is generated.

----End

7.6.1.2 Performing a Shallow Discharge Test

This item allows you to partially discharge batteries. A shallow discharge test is conducted to test the battery loop reliability and short-time discharge capacity when the batteries have not been discharged for a long time.

NOTICE

Before performing a shallow discharge test, ensure that:

- The UPS works in normal mode with a load rate fluctuation less than 10%.
- The UPS generates no battery overtemperature, overvoltage, or overcurrent alarm. No generator is connected to the UPS.
- The mains, batteries, charger, and discharger are normal. No overload alarm is generated.

Automatic Shallow Discharge Test

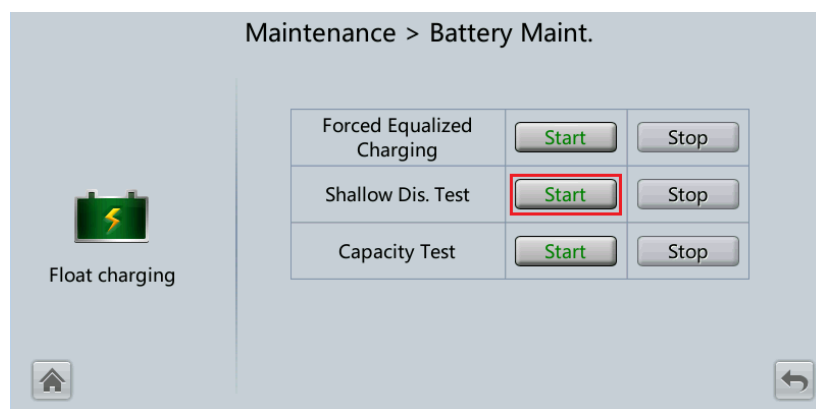
- Step 1** On the home screen of the LCD, choose **System Info > Settings > Battery Settings** and set **Sched. shallow dis. test** to **Enable**.
- Step 2** Set **Sched. shallow dis. test time** and **Sched. shallow dis. test interval** as required. After setting is complete, the system will perform an automatic shallow discharge test based on the settings.

----End

Manual Shallow Discharge Test

- Step 1** On the home screen of the LCD, choose **System Info > Maintenance > Battery Maint.**
- Step 2** Tap **Start** on the right of **Shallow Dis. Test** to start a shallow discharge test.

Figure 7-9 Starting a shallow discharge test



 NOTE

When the battery test is completed normally, the test data is used as common test data. Record the data obtained from the latest five tests.

The shallow discharge test automatically stops in any of the following cases:

- The battery discharge capacity reaches the specified value (10%–50%, 20% by default).
- The discharge voltage reaches the warning threshold (calculated in real time).
- The load rate fluctuation exceeds 10%.
- An alarm is generated.

----End

7.6.1.3 Performing a Capacity Test

Context

This item allows you to fully discharge batteries. A deep discharge test is conducted to obtain the battery discharge performance data.

NOTICE

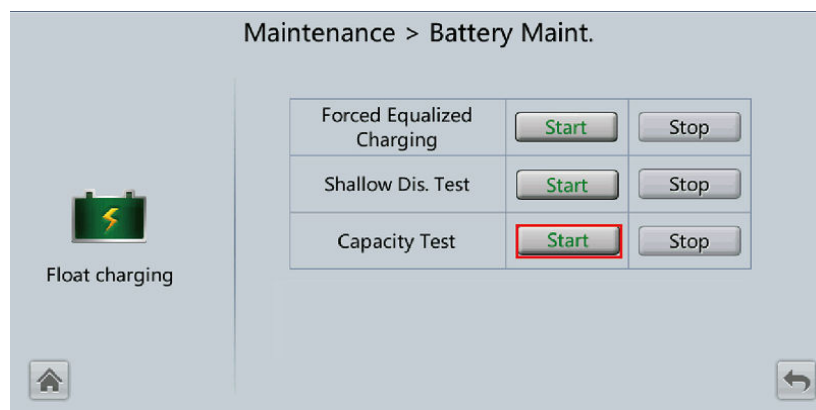
Before performing a capacity test, ensure that:

- The UPS is working in normal mode; float charging or hibernation has lasted for 2 hours after the SOC reaches 100%; the load rate fluctuation is less than 10%.
 - The UPS generates no battery overtemperature, overvoltage, or overcurrent alarm. No generator is connected to the UPS.
 - The mains, batteries, charger, and discharger are normal. No overload alarm is generated.
-

Procedure

- Step 1** On the home screen of the LCD, choose **System Info > Maintenance > Battery Maint.**
- Step 2** Tap **Start** on the right of **Capacity Test** to start a capacity test.

Figure 7-10 Starting a capacity test



 NOTE

The capacity test automatically stops in any of the following cases:

- The battery discharge voltage reaches the EOD voltage plus 0.01 V.
- The load fluctuation exceeds 10%.
- An alarm is generated.

When the battery discharge voltage reaches the EOD voltage plus 0.01 V, the test is complete. The test data is obtained from the capacity test. Based on monthly capacity test data, select the test data obtained from a capacity test that has the maximum discharge capacity as the current-month test data. Save the test data obtained from the latest 36 tests.

----End

7.6.2 Lithium Battery Test

7.6.2.1 Performing a Shallow Discharge Test

This item allows you to partially discharge batteries. A shallow discharge test is conducted to test the battery loop reliability and short-time discharge capacity when the batteries have not been discharged for a long time.

NOTICE

Before performing a shallow discharge test, ensure that:

- The UPS is working in normal mode; float charging or hibernation has lasted for 2 hours after the SOC reaches 100%; the load rate fluctuation is less than 10%.
 - The UPS generates no battery overtemperature, overvoltage, or overcurrent alarm. No generator is connected to the UPS.
 - The mains, batteries, charger, and discharger are normal. No overload alarm is generated.
 - The SmartLi generates no alarms related to lithium batteries.
-

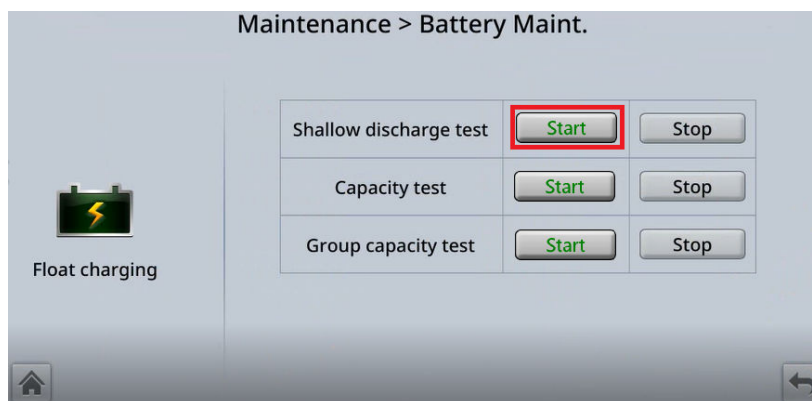
Automatic Shallow Discharge Test

1. On the home screen of the LCD, choose **System Info > Settings > Battery Settings** and set **Sched. shallow dis. test** to **Enable**.
2. Set **Sched. shallow dis. test time** and **Sched. shallow dis. test interval** as required. After setting is complete, the system will perform an automatic shallow discharge test based on the settings.

Manual Shallow Discharge Test

1. On the home screen of the LCD, choose **System Info > Maintenance > Battery Maint.**
2. Tap **Start** on the right of **Shallow Dis. Test** to start a shallow discharge test.

Figure 7-11 Starting a shallow discharge test



NOTE

When the battery test is completed normally, the test data is used as common test data. Record the data obtained from the latest five tests.

The shallow discharge test automatically stops in any of the following cases:

- The battery discharge capacity reaches the specified value (10%–50%, 20% by default).
- The discharge voltage reaches the warning threshold (calculated in real time).
- The load rate fluctuation exceeds 10%.
- An alarm is generated.

7.6.2.2 Performing a Capacity Test

Context

This item allows you to fully discharge batteries. A deep discharge test is conducted to obtain the battery discharge performance data.

NOTICE

Before performing a capacity test, ensure that:

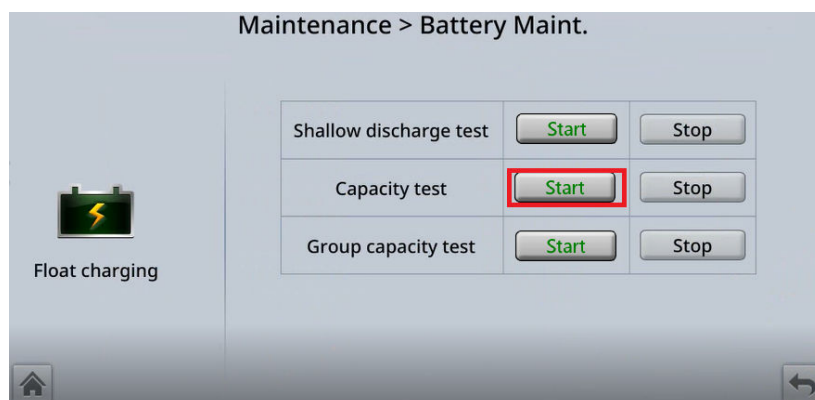
- The UPS is working in normal mode; float charging or hibernation has lasted for 2 hours after the SOC reaches 100%; the load rate fluctuation is less than 10%.
- The UPS generates no battery overtemperature, overvoltage, or overcurrent alarm. No generator is connected to the UPS.
- The mains, batteries, charger, and discharger are normal. No overload alarm is generated.
- The SmartLi generates no alarms related to lithium batteries.

Procedure

- Step 1** On the home screen of the LCD, choose **System Info > Maintenance > Battery Maint.**

Step 2 Tap **Start** on the right of **Capacity Test** to start a capacity test.

Figure 7-12 Starting a capacity test



NOTE

The capacity test automatically stops in any of the following cases:

- The minimum electrochemical cell voltage reaches 2.65 V.
- The load fluctuation exceeds 10%.
- An alarm is generated.

The test is complete when the minimum cell voltage reaches 2.65 V. The test data is obtained from the capacity test. Save the test data obtained from the latest 36 tests.

----End

7.6.2.3 Performing a Group Capacity Test

Context

If multiple SmartLi cabinets are connected in parallel, discharge each SmartLi one by one. (When a SmartLi is fully discharged, charge the SmartLi until its SOC reaches 100%, and then discharge the next SmartLi until all SmartLi cabinets are fully discharged.) A deep discharge test is conducted to obtain the battery discharge performance data.

NOTICE

Before performing a capacity test, ensure that:

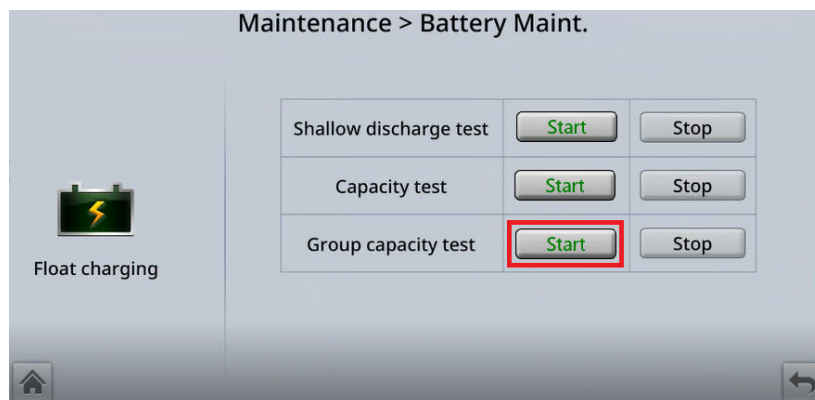
- The active power of the UPS is greater than 20 kW.
- (Total power of SmartLi cabinets in the system – Power of a single SmartLi) > UPS active power x 110%.
- The UPS is working in normal mode; float charging has lasted for 5 minutes after the SOC of batteries reaches 100%; the load fluctuation of the system is less than 20%.
- The UPS generates no battery overtemperature, overvoltage, or overcurrent alarm. No generator is connected to the UPS.
- The mains, batteries, charger, and discharger are normal. No overload alarm is generated.
- The SmartLi generates no alarms related to lithium batteries.

Procedure

Step 1 On the home screen of the LCD, choose **System Info > Maintenance > Battery Maint.**

Step 2 Tap **Start** on the right of **Group Capacity Test** to start a group capacity test.

Figure 7-13 Starting a group capacity test



NOTE

The group capacity test automatically stops in any of the following cases:

- The minimum cell voltage reaches 2.75 V.
- The load fluctuation exceeds 20%.
- An alarm is generated.

The test is complete when the minimum cell voltage reaches 2.75 V. The test data is obtained from the group capacity test. Save the test data obtained from the latest 36 tests.

----End

7.6.3 Downloading the Test Data

Procedure

- Step 1** On the WebUI, choose **Query > Battery Test Records**, choose logs that need to be queried from the **Log** drop-down list box, and click **Query**.

Figure 7-14 Battery Test Records

Battery Test Records								
Log: Cap. test logs Query Export								
Number of logs: 0								
No.	Generated	Cleared	Test Start Reason	Test End Reason	End (V)	Avg. (A)	Dis. (Ah)	Batt. temp. (°C)
No battery test records to display.								

- Step 2** Choose logs that have been queried from the **Log** drop-down list box, and click **Export**.

----End

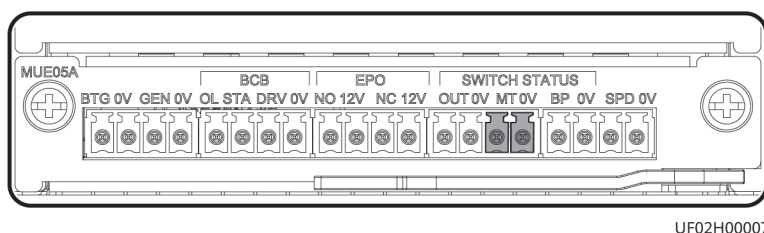
7.7 Transferring to Maintenance Bypass Mode

NOTICE

- You are advised to install a lock on the maintenance bypass switch.
- Strictly observe the following procedure to transfer the UPS to maintenance bypass mode. Otherwise, loads may power off.
- In maintenance bypass mode, the mains supplies power to the loads directly over the maintenance bypass. If the mains is abnormal, the loads may power off.

- Step 1** Ensure that the status signal cable of the maintenance bypass switch for external power distribution is connected to MT/0V. Choose **System Info > Settings > Dry Contact Set** and set **PDC maintenance breaker [MT]** to **Enable**.

Figure 7-15 Maintenance bypass signal port (MT)



UF02H00007

- Step 2** Shut down the inverter. Choose **Common Functions > Inv. OFF**. After the inverter shuts down, the UPS transfers to bypass mode, and the **Bypass mode** alarm is displayed on the LCD.
- Step 3** Turn on the maintenance bypass switch for external power distribution. Then, the **Maint. breaker closed** and **Bypass mode** alarms are displayed on the LCD.

----End

7.8 Transferring from Maintenance Bypass Mode to Inverter Mode

NOTICE

Before you transfer the UPS from the bypass mode to inverter mode, ensure that the bypass input is normal.

- Step 1** Turn off the external maintenance bypass switch. The **Maint. breaker closed** alarm disappears. View the system running diagram on the LCD or WebUI to check whether the system works in bypass mode.
- Step 2** Start the inverter. Choose **Common Functions > Inv. ON**. The system transfers to inverter mode.

----End

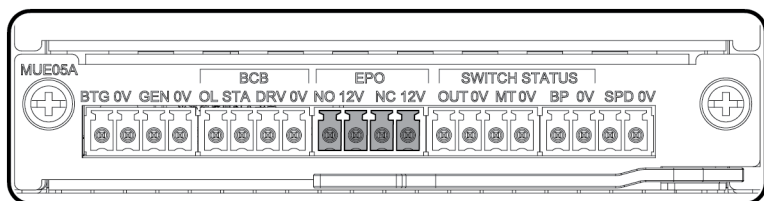
7.9 Performing EPO

NOTICE

- Choose **Monitoring > UPS System > Running Parameter > System Settings** on the WebUI and set **EPO detection** to **Enable**.
- After you press the EPO switch, the UPS supplies no power, and the loads powers off.
- If the UPS is in maintenance bypass mode, the UPS still supplies power after you press the EPO switch.

- Step 1** Press the external EPO switch that connects to the dry contact card or remove the 4-pin terminal on the EPO port of the dry contact card. The UPS enters the emergency shutdown state. **EPO** and **No power supplied** alarms are displayed.

Figure 7-16 EPO port



UA10000097

----End

7.10 Clearing the EPO State

Procedure

- Step 1** Clear the EPO state of the system. Check that the external EPO switch connected to the dry contact is in non-EPO state or insert the 4-pin terminal on the EPO port of the dry contact card.
- Step 2** Clear the EPO alarm.
- On the LCD
Choose **System Info > Alarms** and tap **Clear Faults**. After confirmation, the EPO alarm is cleared.
 - On the WebUI
Choose **Monitoring > UPS System > Running Control > System Commands and Tests** and click **Clear Faults**. The EPO alarm is cleared.
- Step 3** View active alarms and check that the EPO alarm is cleared. If the system bypass input is normal, the UPS transfers to bypass mode.
- On the LCD
Choose **System Info > Alarms > Active Alarms** to check that the EPO alarm has been cleared.
 - On the WebUI
Choose **Home > Active Alarm** to check that the EPO alarm has been cleared.
- Step 4** Start the inverter.
- End

7.11 Exporting Data

Prerequisites

You have logged in to the WebUI.

Context

The following data can be exported:

- Historical alarms
- Active alarms
- Performance data
- Operation logs
- E-label
- Fault information

NOTE

This procedure describes how to export historical alarms.

Procedure

- Step 1** Choose **Query > Export Data > Export Historical Data**, set **Encryption Password for Export**, and select **Historical Alarm** from the **Data Type** drop-down list.

Figure 7-17 Exporting historical data

The screenshot shows a web interface titled "Export Historical Data". It contains a checkbox labeled "Encryption Password for Export" which is checked. Next to it is a text input field. To the right of the input field is a small text hint: "'a~z','A~Z','0~9','_':A combination of at least two types of characters(6-20)". Below the input field is a dropdown menu labeled "Data Type" with "All" selected. At the bottom of the form is a blue button labeled "Export Historical Data".

- Step 2** Click **Export Historical Data** and save the displayed webpage.

----End

7.12 Setting Hibernation Mode

Prerequisites

NOTICE

Ensure that the load power is stable. If the system load power fluctuation is greater than the rated capacity of half a module (for example, the single-phase load power fluctuation is greater than 16.67 kVA for a 100 kVA module), the UPS may enter and exit from hibernation mode repeatedly.

Context

When the load power is small and stable, you can shut down the inverters in some power modules so that these power modules enter hibernation mode and other power modules bear more load power. This improves the system efficiency in the case of small load power and increases the power module service life. The hibernation function can be set on the WebUI.

Procedure

- Step 1** On the WebUI, choose **Monitoring > UPS System > Running Parameter > System Settings**, and set **Paral sys hibernate** to **Enable**.
- Step 2** Set **Module cycle hiber period(d)** to an integer ranging from 1 to 100. The default value is **30**.

Figure 7-18 System settings

Signal Name	Signal Value
Single parallel	Single
Requisite modules	1
Redundant modules	0
Working mode	Normal mode
Eco voltage range	±5%
Bsc mode add	Non - BSC
Bsc m s system	BSC slave system
Amb temp alarm thresh(°C)	55
Environ low temp warn point(°C)	-10
Height above sea lv(m)	±1000
Top outlet fan	Disable
Dust maintain period(d)	0
Emergency shutdown enable	Enable
Bus capa. Life	Disable
Parallel sys hibernate	Disable
Module cycle hiber period(d)	30
Chg eco bps power supply	Enable
Ram parity enabled	Disable
Record time after failure	0ms
Realtime waveform acquisition	Disable
Intra rack power unit starts delay(s)	0.5
Inter rack power unit start delay(s)	5

 NOTE

Click **Submit** after setting parameters on the WebUI.

----End

8 Parallel System Commissioning

8.1 Starting a Parallel System

Prerequisites

CAUTION

- Before starting a parallel system, ensure that each UPS has been commissioned (see [7.1 Powering On and Starting the UPS](#)).
 - Choose **Monitoring > UPS System > Running Parameter > System Settings** on the WebUI of each UPS and set **EPO detection** to **Enable**.
 - If you commission the parallel system where UPSs are not powered off after they are commissioned individually, skip step 4. In addition, ensure that step 1 is performed before commissioning a single UPS.
 - Ensure that all load circuit breakers in the system are OFF. Do not start loads before the parallel system is started.
 - Before connecting parallel cables, if you turn on the external output switch of the rack by mistake, the system may report alarm **0570-002 BPM unit abnormal**. In this case, you need to power off the rack to clear the alarm.
-

Procedure

- Step 1** Check before power-on: Ensure that the mains input, bypass input, and AC output cables of each UPS in the parallel system are connected in the same phase sequence.
1. Check that the general input and output switches are OFF.
 2. Check that power cables to all UPSs are connected in parallel.
 3. Use a multimeter to measure the impedance between phases A, B, and C of the mains/bypass input and AC output of any UPS. If the measured result is low conducted resistance, check whether the cables to each UPS are short-circuited.

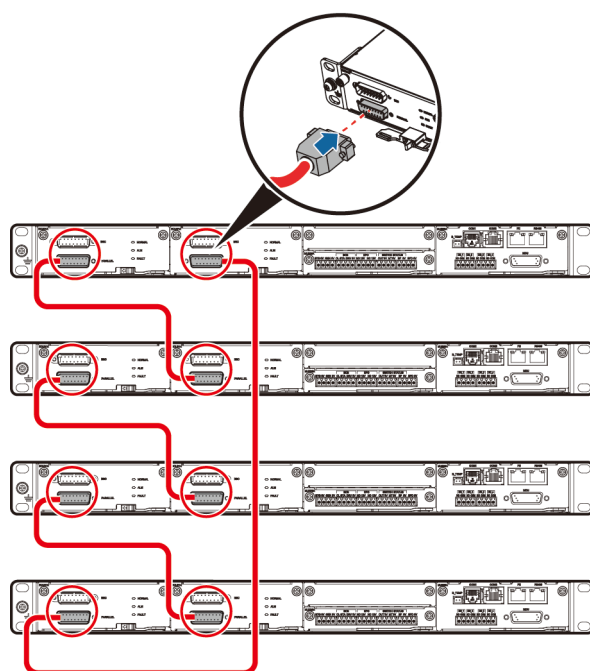
4. Use a multimeter to measure the impedance between phases A, B, and C of the mains/bypass input and AC output of any two UPSs. If the measured result is low conducted resistance, check whether the mains/bypass input and AC output phase sequences of the two UPSs are correct.

Step 2 Trigger EPO on each UPS.

1. Press the EPO switches connected to the dry contact cards of all UPSs one by one, or remove the 4-pin terminals from the EPO ports on the dry contact cards of all UPSs, or remove the general EPO switch.
2. If a single UPS is not powered off after commissioning, verify on the monitoring screen that EPO has been activated successfully.

Step 3 Install parallel cables between parallel cabinets.

Figure 8-1 Control cable connections in a parallel system of four UPSs



UA13000109

Step 4 Power on the parallel system.

1. Turn off the output switch of each UPS to ensure that the output of each UPS is independent.
2. Turn on the external bypass input and mains input power distribution switches.

If the input power is normal, the rectifier starts automatically. The MDU starts and displays the Huawei logo and a progress bar. Wait until the MDU starts properly.

Step 5 Check that the software versions of all UPSs are consistent.

On the LCD of each UPS, choose **System Info > About > Version Info** and check whether all software versions are consistent. If not, update all software versions to be consistent.

Step 6 Set parallel parameters for each UPS.

1. System Settings: On the LCD, choose **System Info > Settings > System Settings**. On the WebUI, choose **Monitoring > UPS System > Running Parameter > System Settings**.

Table 8-1 System Settings

Item	Setting	Description
Single/Parallel	Set it to Parallel .	-
Parallel ID	Number UPSs in sequence (example: 1, 2, 3, 4).	-
Requisite UPSs	Sets it based on the actual number of UPSs.	- In a parallel system, the two parameters must be set to the same values for all UPSs. - The total number of UPSs in a parallel system is the sum of Requisite UPSs and Redundant UPSs.
Redundant UPSs	Sets it based on the actual number of UPSs.	

2. Battery Settings: On the LCD, choose **System Info > Settings > Battery Settings**. On the WebUI, choose **Monitoring > Battery System > Running Parameter > Battery Settings**.

Table 8-2 Battery Settings

Item	Setting	Description
Battery string sharing	Set this parameter as required.	If the parallel system shares one battery string, set this parameter to Enable. If each UPS uses an independent battery string, set this parameter to Disable.

 NOTE

The system may generate alarms such as **Rack quantity mismatch**, **Insufficient redundant racks**, and **Inter-rack par. cable alarm**. The alarms are automatically cleared 1 minute after you connect all parallel cables.

Step 7 Synchronize parallel parameters.

1. If the **Inconsistent parallel param.** alarm is generated, choose **System Info > Settings** on the LCD and tap **Parameter Sync** to synchronize parameters between UPSs in the parallel system.
2. Check that no alarm is generated for any UPS and perform subsequent operations. If an alarm is generated, follow the troubleshooting suggestion to clear the alarm first.

Step 8 Measure the bypass input voltage of each UPS.

1. Check that no **Bypass abnormal** alarm is generated for any UPS in the system. Then, none of the UPSs supplies power.
2. Set the multimeter to the AC voltage position, connect the red probe to UPS 1 bypass input phase A, and connect the black probe to UPS 2 bypass input phase A to measure the bypass input voltage difference between UPSs. Perform the same operations on phases B and C. Complete the measurement between every two UPSs in the parallel system. If the phase sequence is correct and the voltage difference is less than 5 V, perform the subsequent operations. If the phase sequence is incorrect or the voltage difference for a phase between any two UPSs is greater than 5 V, power off the parallel system completely, and check whether the bypass input cables for the UPS parallel system are properly connected.

 CAUTION

Exercise caution when performing operations with power on. There are many electrified parts in the UPS wiring area. It is recommended that the test be performed in the external power distribution area of the UPS.

Step 9 Clear the EPO state of each UPS. For details, see [7.10 Clearing the EPO State](#).

Step 10 Measure the output voltage of each UPS.

1. Check that no **Bypass abnormal** alarm is generated for any UPS in the system. Then, all UPSs in the system supply power in bypass mode.
2. Set the multimeter to the AC voltage position, connect the red probe to UPS 1 output phase A, and connect the black probe to UPS 2 output phase A to measure the output voltage difference between UPSs. Perform the same operations on phases B and C. Complete the measurement between every two UPSs in the parallel system. If the phase sequence is correct and the voltage difference is less than 5 V, perform the subsequent operations. If the phase sequence is incorrect or the voltage difference for a phase between any two UPSs is greater than 5 V, power off the parallel system completely, and check whether the output cables for the UPS parallel system are properly connected.

 CAUTION

Exercise caution when performing operations with power on. There are many electrified parts in the UPS wiring area. It is recommended that the test be performed in the external power distribution area of the UPS.

Step 11 Turn on the output switch of each UPS.

Check that no alarm is generated for any UPS, and then turn on the output switch for each UPS.

Ensure that the output switch on each UPS is ON and the load switch is OFF.

Step 12 Tap **Paral. Inv. ON** on the LCD screen **Common Functions**. The system transfers to inverter mode.

Step 13 Connect batteries to the parallel system.

1. Check that no alarm except the **No battery** alarm is displayed on the LCD of each UPS.
2. Turn on the battery input switch for each UPS. (If there are multiple battery strings, turn on the switch of each battery string first, and then turn on the general switch between the battery strings and the UPS.)
3. Use a multimeter to measure the voltage where the battery switch is located (if there are multiple battery strings, use a multimeter to measure the voltage where each battery switch is located, and then measure the voltage where the general battery switch is located).
4. Ensure that batteries are properly connected (the **No battery** alarm in the active alarm list of all LCDs disappears within 2 minutes and no other alarms are generated).

Step 14 Turn on the general load switch.

 NOTE

- In a parallel system, it is recommended that all racks have the same capacity. When the system is unloaded, the load rate is displayed on the LCD of the UPS that starts first. The load rate is not displayed after all UPSs start.
- If you connect UPSs in parallel for the first time, perform all the preceding steps. If you need to restart the inverters after the parallel system powers off or if the parallel system needs to transfer from bypass mode to inverter mode, you only need to tap **Paral. Inv. ON** on the LCD screen **Common Functions**.

----End

8.2 Shutting Down and Powering Off a Parallel System

Procedure

Step 1 Choose **Common Functions > Paral. Inv. OFF** on the LCD. The system transfers to bypass mode.

Step 2 Turn off the general load switch, external output power distribution switch for each UPS, battery switch, and external input power distribution switch (or the mains and bypass input switches on the external PDC).

 NOTE

- Perform only step 1 if you only need to shut down the UPS inverters to switch the system to bypass mode without powering off loads.
- If you need to power off the entire UPS system, perform all the preceding steps.

----End

8.3 Performing EPO

Procedure

- Step 1** Turn on the EPO switches connected to the dry contact cards on all UPSs one by one or the general EPO switch.

----End

8.4 Isolating a Faulty UPS from a Parallel System

Context

CAUTION

- Only authorized technical engineers are allowed to isolate a faulty UPS from the parallel system. Before the operation, consult professional maintenance personnel.
 - Before maintenance, use a multimeter to check faulty parts for dangerous voltages.
 - If the output switch does not have the neutral wire isolated, do not touch the neutral wire.
 - When the parallel system works properly, do not turn off the output switch of a single UPS if the UPS does not stop supplying power. Otherwise, the parallel system may become abnormal.
-

Procedure

- Step 1** If the UPS needs to be disconnected, check whether the capacity of the remaining UPSs in the parallel system meets the onsite load requirements.
- Step 2** Turn the ready switch on the bypass control module to the not ready state. The system reports alarm **0047-002 Not ready**, which is normal. If the faulty UPS works in bypass mode, there is no output. If the faulty UPS works in normal mode, choose **Common Functions > Inv. OFF** on the LCD of the faulty UPS to shut down the inverter. Then, the UPS has no output, and the other UPSs continue to work in inverter mode.
- Step 3** Turn off the output switch of the faulty UPS or the external output power distribution switch.
- Step 4** Turn off the battery switch of the faulty UPS. If there are multiple battery strings, turn off the general switch between battery strings and the UPS and then the switch for each battery string.
- Step 5** Turn off the mains and bypass input switches on the input PDC or the upstream power distribution switch of the faulty UPS.
- Step 6** The faulty UPS is isolated from the parallel system. Perform maintenance on the UPS.

----End

8.5 Restoring an Isolated UPS in a Parallel System

Procedure

Step 1 Turn on the external mains and bypass input power distribution switches for the isolated UPS. If there is an upstream power distribution switch, turn on it first.

Step 2 After the system is powered on, initialized, and configured, the LCD of the UPS displays **No power supplied** and **No battery** alarms. No other alarms are generated.

 NOTE

After a UPS is isolated, you do not need to synchronize parameters if you have not modified parallel parameters of the UPS.

Step 3 If no alarm is displayed on the LCD, use a multimeter to measure the input voltage. If there is an external output power distribution switch, turn on the switch.

Step 4 Start the inverter on the UPS by referring to [7.1 Powering On and Starting the UPS](#). All UPSs in the parallel system work in inverter mode, and the isolated UPS is restored in the parallel system.

Step 5 Turn on the battery input switch for the UPS (If there are multiple battery strings, turn on the switch for each battery string and then the general switch between battery strings and the UPS) and check that the **No battery** alarm has disappeared from the LCD.

Step 6 Check that the UPS runs properly and no alarm is generated on the LCD.

----End

8.6 Adding a Single UPS or Multiple UPSs to a Parallel System

Expanding Capacity in Bypass Mode

The following operations apply to scenarios where the system works in bypass mode. If the system works in inverter mode, refer to section "Expanding Capacity in Inverter Mode."

NOTICE

Before capacity expansion, ensure that:

- The new UPS has the same software version as all running UPSs.
- The input and output cable connections and phase sequence of the new UPS are correct. The mains input switch, bypass input switch, and output switch are OFF.
- The parallel cable of the new UPS is not connected.
- Before connecting inter-rack parallel cables for the new UPS and the original UPSs in the system, set parallel parameters and ensure that parallel IDs do not conflict.

- Step 1** Commission the new UPS by following the instructions in [7.1 Powering On and Starting the UPS](#). During the commissioning, do not switch on the external output circuit breaker. After the commissioning is complete, the UPS shuts down and transfers to bypass mode. Ensure that the external output circuit breaker is OFF.
- Step 2** Check that the bypass phase sequence of the new UPS and the original UPSs is correct.
1. Ensure that no abnormal bypass alarm is generated on all the UPSs in the system (including the new UPS). Then, the original UPSs and the new UPS work in bypass mode.
 2. Set the multimeter to the AC voltage position, connect the red probe to phase A at the front end of the external output switch of the new UPS, and connect the black probe to phase A at the back end of the external output switch of the new UPS to measure the voltage difference. Perform the same operations on phases B and C. If the phase sequence is correct and the voltage difference is less than 5 V, perform the subsequent operations. If the phase sequence is incorrect or the voltage difference for any phase is greater than 5 V, power off the new UPS completely, and check whether the bypass input cable for the UPS is properly connected.
- Step 3** If the original system is a single UPS system, check whether the current version supports a parallel system. If a parallel system is not supported, upgrade the software to support the parallel system.
- Step 4** Set parallel parameters for the original system.
- If the original system is a single UPS system, see [Step 6](#) in [8.1 Starting a Parallel System](#).
 - If the original system is a parallel system, change the **Requisite UPSs** and **Redundant UPSs** on each UPS of the original system so that the sum of **Requisite UPSs** and **Redundant UPSs** is equal to the total number of original parallel UPSs plus the number of new UPSs.

NOTE

The system may generate alarms such as **Rack quantity mismatch**, **Insufficient redundant racks**, and **Inter-rack par. cable alarm**. The alarms are automatically cleared 1 minute after you connect all parallel cables.

- Step 5** Set parallel parameters for the new UPS.

1. System Settings: On the LCD, choose **System Info > Settings > System Settings**. On the WebUI, choose **Monitoring > UPS System > Running Parameter > System Settings**.

Table 8-3 System Settings

Item	Setting	Description
Single/Parallel	Set it to Parallel .	-
Parallel ID	Set this parameter to the original maximum parallel ID plus 1.	The parallel number of each UPS must be unique.
Requisite UPSs	Sets it based on the actual number of UPSs.	In a parallel system, the two parameters must be set to the same values for all UPSs.
Redundant UPSs	Sets it based on the actual number of UPSs.	

2. Battery Settings: On the LCD, choose **System Info > Settings > Battery Settings**. On the WebUI, choose **Monitoring > Battery System > Running Parameter > Battery Settings**.

Table 8-4 Battery Settings

Item	Setting
Battery string sharing	Set this parameter as required.

 NOTE

- The new UPS may generate alarms such as **Rack quantity mismatch**, **Insufficient redundant racks**, and **Inter-rack par. cable alarm**. The alarms are automatically cleared 1 minute after you connect all parallel cables.
- If the bypass is normal, the UPS works in bypass mode.

Step 6 Turn off the mains and bypass input switches for the new UPS.

Step 7 Connect an inter-rack parallel cable for the new UPS.

 NOTE

- The length of the parallel cable between two UPSs depends on the onsite environment.
- Route cables between the two UPSs through the busway between racks. If there is no busway, route the cables along the routes of the EPO, ECC800, and dry contact signal cables.
- If two racks are far away from each other, prepare a longer parallel cable.

- Step 8** Power on the new UPS. For details, see [7.1.1 Powering On the UPS](#).
- Step 9** If the **Inconsistent parallel param.** alarm is generated, choose **System Info > Settings** on the LCD of the original system and tap **Parameter Sync** to synchronize parameters between UPSs in the parallel system.
- Step 10** If the **PDC output breaker open** alarm is generated in the system, choose **System Info > Alarms** on the LCD and tap **Clear Faults** to clear the alarm.
- Step 11** Turn on the external output switch for the new UPS. The UPS connects to the parallel system and works in bypass mode.
- Step 12** If there are multiple new UPSs, repeat the preceding steps to add the UPSs to the parallel system. Then, all UPSs work in bypass mode.
- Step 13** Turn on the battery switches for the new UPSs (if there are multiple battery strings, turn on the switch for each battery string and then the general switch between battery strings and the UPSs).
- If the **No battery** alarm is generated, after you turn on the battery switches, the alarm is cleared automatically within 2 minutes.
- Step 14** Check that no alarm is generated for any UPS, and start each UPS in inverter mode. The parallel system transfers to inverter mode. View the system running diagram to check that the system is working in inverter mode.
- End

Expanding Capacity in Inverter Mode

The following procedure is applicable to capacity expansion of the original system that works in inverter mode.

NOTICE

Before capacity expansion, ensure that:

- The new UPS has the same software version as all running UPSs.
 - The input and output cable connections and phase sequence of the new UPS are correct. The mains input switch, bypass input switch, and output switch are OFF.
 - The parallel cable of the new UPS is not connected.
 - Before connecting inter-rack parallel cables for the new UPS and the original UPSs in the system, set parallel parameters and ensure that parallel IDs do not conflict.
-

- Step 1** Commission the new UPS by following the instructions in [7.1 Powering On and Starting the UPS](#). During the commissioning, do not switch on the external output circuit breaker. After the commissioning is complete, the inverters of the UPS shut down and the UPS transfers to bypass mode. Ensure that the output circuit breaker is OFF.
- Step 2** Check that the bypass phase sequence of the new UPS and the original UPSs is correct.

- Ensure that no abnormal bypass alarm is generated on all the UPSs (including the new UPS). The original UPSs work in inverter mode while the new UPS works in bypass mode.
- Set the multimeter to the AC voltage position, connect the red probe to phase A at the front end of the external output switch of the original system, connect the black probe to phase A at the back end of the bypass input switch of the original system, and record the voltage difference. Set the multimeter to the AC voltage position, connect the red probe to phase A at the front end of the external output switch of the new UPS, connect the black probe to phase A at the rear end of the external output switch of the original system, and record the voltage difference. If the phase sequence is correct and the voltage difference is less than 20 V, perform the subsequent operations. If the phase sequence is incorrect or the voltage difference for any phase is greater than 20 V, power off the new UPS completely, and check whether the bypass input cable for the UPS is properly connected. Perform the same operations for phases B and C.

Step 3 If the original system is a single UPS system, check whether the current version supports a parallel system. If a parallel system is not supported, upgrade the software to support the parallel system.

Step 4 Set parallel parameters for the original system.

- If the original system is a single UPS system, see [Step 6](#) in [8.1 Starting a Parallel System](#).
- If the original system is a parallel system, change the **Requisite UPSs** and **Redundant UPSs** on each UPS of the original system so that the sum of **Requisite UPSs** and **Redundant UPSs** is equal to the total number of original parallel UPSs plus the number of new UPSs.

 NOTE

The system may generate alarms such as **Rack quantity mismatch**, **Insufficient redundant racks**, and **Inter-rack par. cable alarm**. The alarms are automatically cleared 1 minute after you connect all parallel cables.

Step 5 Set parallel parameters for the new UPS.

1. System Settings: On the LCD, choose **System Info > Settings > System Settings**. On the WebUI, choose **Monitoring > UPS System > Running Parameter > System Settings**.

Table 8-5 System Settings

Item	Setting	Description
Single/Parallel	Set it to Parallel .	-
Parallel ID	Set this parameter to the original maximum parallel ID plus 1.	The parallel number of each UPS must be unique.

Item	Setting	Description
Requisite UPSs	Sets it based on the actual number of UPSs.	In a parallel system, the two parameters must be set to the same values for all UPSs.
Redundant UPSs	Sets it based on the actual number of UPSs.	

2. Battery Settings: On the LCD, choose **System Info > Settings > Battery Settings**. On the WebUI, choose **Monitoring > Battery System > Running Parameter > Battery Settings**.

Table 8-6 Battery Settings

Item	Setting
Battery string sharing	Set this parameter as required.

 NOTE

The system may generate alarms such as **Rack quantity mismatch**, **Insufficient redundant racks**, and **Inter-rack par. cable alarm**. The alarms are automatically cleared 1 minute after you connect all parallel cables.

Step 6 Turn off the mains and bypass input switches for the new UPS.

Step 7 Connect an inter-rack parallel cable for the new UPS.

 NOTE

- The length of the parallel cable between two UPSs depends on the onsite environment.
- Route cables between the two UPSs through the busway between racks. If there is no busway, route the cables along the routes of the EPO, ECC800, and dry contact signal cables.
- If two racks are far away from each other, prepare a longer parallel cable.

Step 8 Power on the new UPS. For details, see [7.1.1 Powering On the UPS](#).

Step 9 If the **Inconsistent parallel param.** alarm is generated, choose **System Info > Settings** on the LCD of the original system and tap **Parameter Sync** to synchronize parameters between UPSs in the parallel system.

Step 10 If the **PDC output breaker open** alarm is generated in the system, choose **System Info > Alarms** on the LCD and tap **Clear Faults** to clear the alarm.

Step 11 Turn on the external output switch of the new UPS to connect the UPS to the parallel system. The new UPS has no output.

Step 12 If there are multiple new UPSs, repeat the preceding steps to add the UPSs to the parallel system.

Step 13 Turn on the battery switches for the new UPSs (if there are multiple battery strings, turn on the switch for each battery string and then the general switch between battery strings and the UPSs).

If the **No battery** alarm is generated, after you turn on the battery switches, the alarm is cleared automatically within 2 minutes.

Step 14 Check that no alarm is generated for any UPS, and start the new UPS in inverter mode. The parallel system transfers to inverter mode. View the system running diagram to check that the system is working in inverter mode.

----End

8.7 Commissioning a Dual-Bus System

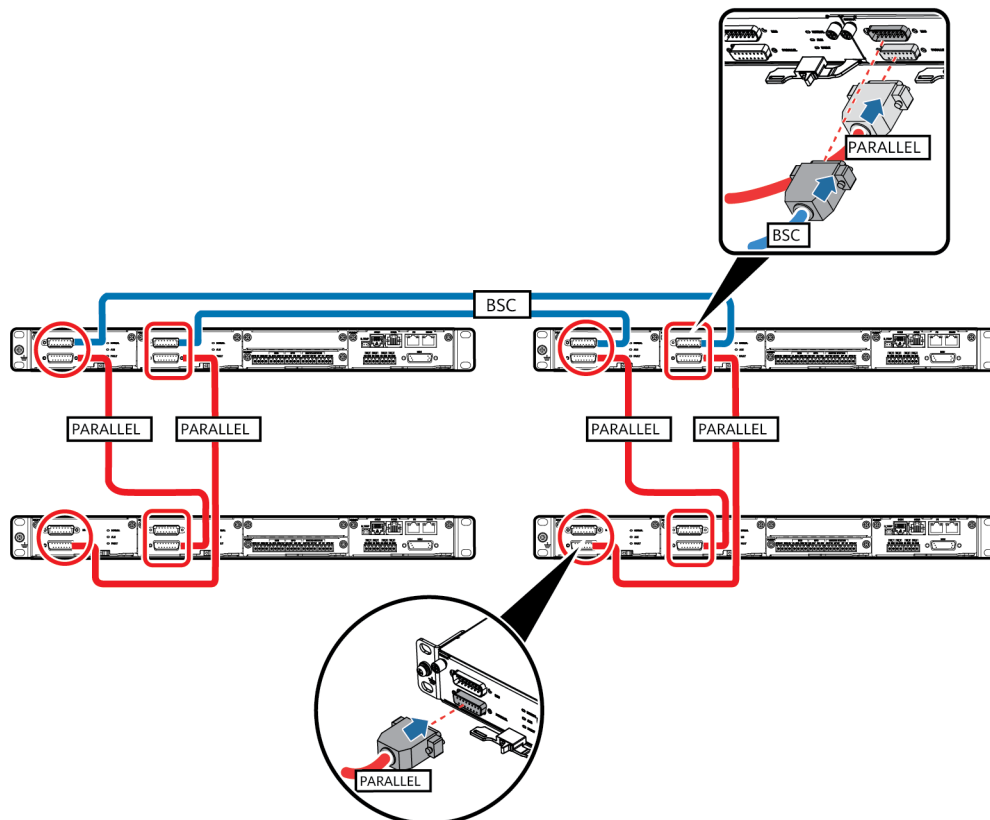
Context

The dual-bus system consists of one master and one slave BSC system. You can specify one master and one slave BSC system (UPSs in the same system cannot be set to both master and slave BSC systems) during initial startup, and change the settings under the guidance of maintenance engineers when needed. Set the BSC master and slave systems to master and slave modes respectively.

Procedure

Step 1 Connect BSC cables.

Figure 8-2 Parallel cable connections in a dual-bus parallel system



UA13000108

Step 2 Commission the UPSs.

- If the dual-bus system consists of single UPS systems, commission each UPS. For details, see [7.1 Powering On and Starting the UPS](#).
- If the dual-bus system consists of parallel systems, commission each independent parallel system. For details, see [8.1 Starting a Parallel System](#).

Step 3 Set each UPS in the system that is defined as the master system to BSC master system.

1. On the LCD, choose **System Info > Settings > System Settings** and set **BSC mode** to **Standard BSC**
2. On the LCD, choose **System Info > Settings > System Settings** and set **BSC master/slave mode** to **BSC master system**

Step 4 Set each UPS in the system that is defined as the slave system to BSC slave system.

1. On the LCD, choose **System Info > Settings > System Settings** and set **BSC mode** to **Standard BSC**
2. On the LCD, choose **System Info > Settings > System Settings** and set **BSC master/slave mode** to **BSC slave system**

Step 5 Check that the valid phase voltage difference between UPS systems is less than 5 V.

----End

9 Routine Maintenance

9.1 UPS Maintenance

NOTICE

- Only trained personnel are allowed to perform maintenance. Before performing operations on the UPS, wear electrostatic discharge (ESD) clothes, ESD gloves, and an ESD wrist strap. Remove conductive objects such as jewelry or watches during operations to avoid electric shocks or burns.
 - Use insulated tools when maintaining internal devices. Only trained personnel are allowed to perform maintenance. Customers are not allowed to maintain components behind protective covers that can be removed only using tools. If the components are to be maintained, contact Huawei technical support.
 - Only maintenance engineers can maintain power modules and bypass modules.
 - Maintain UPSs regularly based on the following requirements. Otherwise, the UPSs may fail to operate properly and the service life may be shortened.
-

9.1.1 Monthly Maintenance

Table 9-1 Monthly maintenance

Check Item	Expected Result	Troubleshooting
Operating environment	- Ambient temperature: 0–40°C - Humidity: 0–95% RH (non-condensing) - Rodent-proof measures have been taken for the equipment room. - The equipment room is airtight.	- If the temperature or humidity is abnormal, check the air conditioner status. - Put rodent-proof baffle plates at the door of the UPS equipment room. - Check that the equipment room is airtight and not in a direct ventilation environment.
Power grid environment	- Input voltage: 380 V AC/400 V AC/415 V AC (line voltage) - Output voltage: 380 V AC/400 V AC/415 V AC (tolerance $\pm 1\%$, line voltage) - Input frequency: 40–70 Hz	- If the input voltage is abnormal, check the power grid status and input cable connection. - If the output voltage is abnormal, check the UPS running status and check whether an alarm is generated.
LCD	The status icons on the LCD indicate that all units are operating properly, all operating parameters are within their normal ranges, and no fault or alarm information is displayed.	If an alarm is generated, rectify the fault by checking the device status and parameters.

9.1.2 Quarterly Maintenance

Table 9-2 Quarterly maintenance

Check Item	Expected Result	Troubleshooting
Cleanliness	Wipe the cabinet surface using a white paper and the paper does not turn black.	Remove the dust, especially from the front panel.

Check Item	Expected Result	Troubleshooting
Parameter configuration	The configuration of the output voltage grade, frequency, number of batteries, and battery capacity meets requirements.	Reset the parameters.
Record the status.	Record the three-phase load rate and output power factor.	If an exception occurs, check the load status.
Shallow discharge test (recommended)	Conduct a shallow discharge test when the UPS is backed up to verify that the batteries can discharge normally.	If an alarm is generated, see the <i>UPS5000 & SmartLi Alarm Reference</i> .

9.1.3 Annual Maintenance

Table 9-3 Annual maintenance

Check Item	Expected Result	Troubleshooting
Grounding	Check that the ground cables are connected securely.	Tighten the screws.
Power cables and terminals (between the UPS and the power distribution cabinet)	The insulation layer of cables is intact and terminals are free from black marks and noticeable sparks.	- Replace the cables. - Secure the output terminals.
Cables and circuit breaker through-current capacity	The circuit breakers and cables meet load requirements. The actual cable through-current capacity is greater than the circuit breaker specifications.	- Replace the circuit breaker. - Replace the cable.

9.2 Lead-Acid Battery Maintenance

NOTICE

Before operating batteries, read through the battery user manual, safety precautions, and correct connection methods provided by the battery manufacturer.

Before installing and maintaining batteries, pay attention to the following points:

- Wrap tools with insulation tape to prevent electric shock.
- Wear protective goggles and take other necessary protective measures.
- Wear insulated gloves and a protective coat to guard against electrolyte overflow.
- When moving batteries, avoid handling batteries upside down, handle them gently, and pay attention to personal safety.
- Keep the battery switch off when installing or maintaining the batteries.

9.2.1 Precautions for Battery Maintenance

- Before battery maintenance, get the tools, such as handles, insulated. Do not place other objects on the top of batteries.
- Never use any organic solvent to clean batteries.
- Never try to remove the safety valve or pour anything into batteries.
- Never smoke or have an open flame around batteries.
- After battery discharge, charge the battery in time to maintain a good service life.
- Only professionals are allowed to perform the maintenance tasks.

9.2.2 Monthly Maintenance

Table 9-4 Monthly maintenance

Item	Expected Result	Troubleshooting
Battery management alarm	No battery management alarm is generated.	Identify the cause of an alarm based on the alarm information.
Battery appearance	1. The surface is clean and tidy without stains. 2. The battery terminals are intact. 3. Batteries are free from damage and cracks. 4. Batteries are free from acid leakage. 5. Batteries are not deformed or bulged.	If the battery appearance is abnormal, contact Huawei technical support.

Item	Expected Result	Troubleshooting
Battery operating temperature	1. The ambient battery temperature is $25\pm5^{\circ}\text{C}$. 2. The battery operating temperature is lower than battery temperature $+20^{\circ}\text{C}$. 3. Battery charge and discharge conditions meet the requirements specified in the battery specifications.	1. Identify the cause of an abnormal battery operating temperature. 2. If the fault persists, contact Huawei technical support.
Charge voltage of battery string	• Equalized charging voltage: $(2.35 \text{ V/cell} \pm 1\%) \times \text{Single battery voltage} / 2 \times \text{Number of batteries in a battery string}$ • Float charging voltage: $(2.25 \text{ V/cell} \pm 1\%) \times \text{Single battery voltage} / 2 \times \text{Number of batteries in a battery string}$	1. If the voltage drop between the battery string output terminals and the battery input terminals at the UPS side is greater than 1% of the battery string voltage, check whether the cable between the battery string and the UPS is excessively long, or the cable diameter is excessively small. 2. Check whether the equalized charging voltage and float charging voltage are correctly set for the UPS. 3. If the fault persists, contact Huawei technical support.

9.2.3 Quarterly Maintenance

Table 9-5 Quarterly maintenance

Check Item	Expected Result	Troubleshooting
Battery temperature sensor precision	The deviation between the detected temperature and the displayed temperature must be less than 3°C .	1. Install the temperature sensor in the correct position. 2. Replace the battery temperature sensor.
Battery management parameter settings	The settings of battery management parameters meet the requirements in the user manual.	Set parameters correctly.

Check Item	Expected Result	Troubleshooting
Tightness of battery screws	The secure connection signs on battery terminal screws are in proper positions.	Take photos from multiple angles and contact Huawei technical support.
Cables between batteries	No cable deteriorates and the insulation layer does not crack.	Replace the faulty cable.
Battery voltage	- Equalized charging voltage: 2.35 V/cell $\pm$ 0.02 V/cell. - Float charging voltage: 2.25 V/cell $\pm$ 0.02 V/cell.	1. Check whether the equalized charging voltage and float charging voltage of a battery are normal. 2. If the charging voltage of a battery exceeds the specifications requirement, perform a complete forcible equalized charging for the battery, and check again whether the voltage is normal. 3. If the fault persists, contact Huawei technical support.
Shallow discharge test (recommended)	Conduct a shallow discharge test when the UPS is backed up to verify that the batteries can discharge normally.	1. If the batteries cannot discharge normally, locate the fault (for abnormal alarms, see the <i>UPS5000 & SmartLi Alarm Reference</i>). 2. If the fault persists, contact Huawei technical support.

9.2.4 Annual Maintenance

Table 9-6 Annual maintenance

Item	Expected Result	Troubleshooting
Capacity Test	When the UPS is backed up, discharge a battery to the undervoltage alarm threshold, to refresh the capacity of the battery.	1. Locate the cause when an exception is identified. 2. If the fault persists, contact Huawei technical support.

Item	Expected Result	Troubleshooting
Battery connection reliability	- Each battery terminal is connected reliably. (When battery strings are powered off, check the reliability of each terminal in the order from positive terminals to negative terminals.) - The tightening torque of each battery screw meets the requirements of the battery manufacturer. (A torque wrench is used for checking the torque. After checking that the battery screws meet the requirements, mark the screws for later check.)	- Rectify any abnormal connection. - If the fault persists, contact Huawei technical support.

10 Troubleshooting

CAUTION

- If the UPS is faulty, alarm information is displayed on the LCD. The UPS can be powered on only after critical alarms are handled. Failing to do so may escalate faults or damage the equipment.
- Do not clear alarms by reseating modules.
- Remove a faulty module after confirming that it needs to be replaced. After removing the module, do not insert it into the UPS again.

NOTICE

- After a UPS is troubleshooted and started, if the LCD continues displaying alarm information, choose **System Info > Alarms > Clear Faults** to clear the alarm and then start the inverter.
- When batteries reach EOD, the battery switch in the BCB box trips if the BCB box is configured. To restore battery discharge, turn on the battery switch in the BCB box.
- To restore battery discharge after batteries reach EOD, use either of the following methods: 1. Switch to another battery string. Ensure that each battery has a voltage greater than the EOD voltage and 11.3 V/cell. 2. Restore the mains power supply to start the inverter. Turn on the battery switch and charge batteries until each battery has a voltage greater than the EOD voltage and 11.3 V/cell.

For details about how to rectify common faults, see [Table 10-1](#). If any unmentioned faults occur, see the *UPS5000 & SmartLi Alarm Reference* or contact Huawei technical support.

Table 10-1 Troubleshooting

Case	Symptom	Possible Cause	Measure
The rectifier is abnormal .	The UPS rectifier cannot work, and the bus voltage is not boosted.	The mains voltage exceeds the upper threshold 280 V or is less than the lower threshold 80 V.	Check whether the mains voltage is beyond the allowed range. If so, contact the electric power company.
		PFC soft-start fails.	Replace the power module.
		The power module is faulty.	Replace the power module.
The inverter is abnormal .	The buzzer buzzes, the fault indicator is on, the inverter is faulty, and the UPS transfers to bypass mode.	Output overload or short-circuit exists.	Reduce the load or troubleshoot the short circuit.
		The power module is faulty.	Replace the power module.
The charger generates an alarm.	The buzzer buzzes, the fault indicator is on, and the charging function fails.	The charger fails.	Replace the power module.
		The charger experiences overcurrent.	Replace the power module.
		The charger experiences undervoltage.	Check whether the configured number of batteries is correct. If the configured number of batteries is correct but the alarm persists, replace the power module.
The UPS works in bypass mode and does not transfer to inverter mode.	When the mains is normal, the UPS works in bypass mode and does not transfer to inverter mode.	The UPS is set to ECO mode.	Set the working mode correctly.
		The number of bypass transfer times reaches the upper limit.	On the LCD, choose Clear Faults .
The bypass is abnormal .	The buzzer buzzes, and the fault indicator is on.	The bypass thyristor is damaged.	Replace the bypass module.

Case	Symptom	Possible Cause	Measure
		The bypass module experiences overtemperature.	Reduce the load, or improve ventilation.

 NOTE

For details about component replacement and maintenance involved in Troubleshooting and Alarm List, consult Huawei maintenance engineers.

11 Technical Specifications

Table 11-1 Physical specifications

Item	400 kVA	500 kVA	600 kVA	800 kVA
Cabling mode	Routed in and out from the top Cables can be routed in and out from the bottom if a bottom cabling cabinet is configured.			
IP rating	IP20			
Communication	Supports dry contacts, RS485 ports, and FE ports. Supports SNMP and Modbus.			
Dimensions (H x W x D)	2000 mm x 800 mm x 1000 mm (without optional components) 2200 mm x 1200 mm x 1000 mm (with a bottom cabling cabinet)		2000 mm x 1600 mm x 1000 mm (without optional components) 2200 mm x 2400 mm x 1000 mm (with a bottom cabling cabinet)	
Weight	- UPS: < 800 kg - UPS + bottom cabling cabinet: < 910 kg		- UPS: <1300 kg - UPS + bottom cabling cabinet: < 1520 kg	

Table 11-2 Environmental specifications

Item	Specifications
Operating temperature	0–55°C Temperature derating coefficient: not derated at 0°C–40°C, derated to 0.9 at 41°C–45°C, derated to 0.8 at 46°C–50°C, and derated to 0.7 at 51°C–55°C
Storage temperature	–40°C to +70°C

Item	Specifications
Humidity	0%–95% RH (non-condensing)
Altitude	0–1000 m When the altitude is greater than 1000 m, the power is derated as described in IEC 62040-3. The upper limit of the altitude is 4000 m.

Table 11-3 Safety compliance

Safety Certification	Standard
CE	EN 62040-1:2013
CB	IEC 62040-1:2013
TUV	EN 62040-1:2013
CQC	CQC 3108-2011
CCC	GB 7260.1-2008
TLC	YD/T 2165-2017
RCM	IEC62040-2

Table 11-4 EMC

EMC Test Item	Standard
Conducted emission	EN/IEC 62040-2
Radiated emission	EN/IEC 62040-2
Low-frequency signal interference	IEC 61000-2-2
ESD immunity	IEC 61000-4-2
Conducted susceptibility	EN/IEC 62040-2 EN/IEC 61000-4-6
Radiated susceptibility	EN/IEC 62040-2 EN/IEC 61000-4-3
Electrical fast transient	EN/IEC 62040-2 IEC 61000-4-4
Surge	EN/IEC 62040-2 IEC 61000-4-5

EMC Test Item	Standard
Impact current (lightning protection)	If a surge protection box is configured: 5 kA (common mode), criterion B
Voltage dips and short interruptions (220 V AC)	IEC 61000-4-11
Power frequency magnetic field	IEC 61000-4-8

Table 11-5 Mains input electrical specifications

Item	400kVA/500kVA/600kVA/800kVA
Power system	Three-phase four-wire + PE
Rated voltage	380 V AC/400 V AC/415 V AC (line voltage)
Voltage range	380 V/400 V/415 V 0–30°C: not derated at 323–485 V, derated from 100% load to 45% load at 323–191 V, and derated from 45% load to 35% load at 191–138 V 30–40°C: not derated at 342–485 V, derated from 100% load to 45% load at 342–191 V, and derated from 45% load to 35% load at 191–138 V
Rated frequency	50 Hz/60 Hz
Frequency range	40–70 Hz
Power factor	• > 0.99 (100% load) • > 0.98 (50% load) • > 0.94 (30% load)
Harmonic current	• THDi < 9% (30% linear load), THDi < 6% (50% linear load), THDi < 3% (100% linear load) • THDi < 11% (30% non-linear load), THDi < 8% (50% non-linear load), THDi < 5% (100% non-linear load) Remarks: 1. The preceding specifications are met when the mains input and bypass input share a power source. 2. The input THDu is less than 2%.

Table 11-6 Bypass input electrical specifications

Item	400 kVA/500 kVA/600 kVA/800 kVA
Power system	Three-phase four-wire + PE
Rated voltage	380 V AC/400 V AC/415 V AC (line voltage)
Rated frequency	50 Hz/60 Hz
Frequency range	50 Hz/60 Hz $\pm$ 6 Hz (adjustable with a tolerance of 0.5–6 Hz, $\pm$ 2 Hz by default)
Input mode	The mains input and bypass input share a power source (by default) or use different power sources.

Table 11-7 Battery electrical specifications

Item	400 kVA/500 kVA/600 kVA/800 kVA
Battery voltage (lead-acid battery)	360–600 V DC 12 V batteries (30–50 batteries optional, 0 by default) 40–50 batteries: not derated 38–39 batteries: derated to 0.9 34–37 batteries: derated to 0.8 30–33 batteries: derated to 0.7 2 V batteries (180–300 batteries optional, 0 by default) 240–300 batteries: not derated 228–239 batteries: derated to 0.9 204–227: derated to 0.8 180–203: derated to 0.7 NOTE The number of batteries is 0 by default and needs to be set based on site requirements. Batteries have no neutral wire, and an odd number of batteries are supported.
Battery cold start	If a mains outage occurs, batteries can start the UPS to supply power to loads.
Charger output power	The maximum charge power is 15% of power of a single module, and the charge current is limited to 30 A.

Item	400 kVA/500 kVA/600 kVA/800 kVA
Battery string sharing (lead-acid battery)	- Lead-acid battery: Battery string sharing is supported in a parallel system. No battery is shared by default. - SmartLi 2.0: Battery string sharing is supported. When multiple UPSs are connected in parallel, the lithium battery cabinet can be expanded for half a cabinet. No battery is shared by default.
Charging voltage (lead-acid battery)	- Default equalized charging voltage: 2.35 V/cell - Default float charging voltage: 2.25 V/cell
Battery type	- VRLA - SmartLi

NOTICE

The UPS supports the SmartLi. For details about the parameters, see the *SmartLi User Manual*.

Table 11-8 Output electrical specifications

Item	400 kVA/500 kVA/600 kVA	800 kVA
Power system	Three-phase four-wire + PE	
Voltage	380 V AC/400 V AC/415 V AC (line voltage)	
Frequency	- In normal mode, the frequency is synchronous with the bypass input frequency. - In battery mode, the frequency is 50 Hz/60 Hz with a tolerance of $\pm 0.05\%$.	
Voltage distortion	- Linear load: THD < 1% (380 V/400 V/415 V, 50–100% balanced load) - Non-linear load: THD < 3% (380 V/400 V/415 V, 50–100% balanced load)	
Power factor	1	
Transfer time	Uninterruptible transfer: 0 ms; interruptible transfer: ≤ 5 ms	
Output voltage imbalance	Voltage imbalance: $\pm 1\%$ Phase imbalance: $120 \pm 1^\circ$ (balanced load and unbalanced load)	

Item	400 kVA/500 kVA/600 kVA	800 kVA
Inverter overload capability	Inverter overload capability for front-to-back airflow: • 105% < load ≤ 110%: transfers to bypass mode after 60 min or longer (ambient temperature ≤ 30°C) • 100% < load ≤ 110%: transfers to bypass mode after 60 min or longer (ambient temperature > 30°C) • 110% < load ≤ 125%: transfers to bypass mode after 10 minutes or longer • 125% < load ≤ 150%: transfers to bypass mode after 1 minute or longer • Load > 150%: The inverter can run for 200 ms or longer and withstand at least 50 shocks.	
Inverter output short-circuit capability	If the initial load rate is less than 40%, the inverter output short-circuit can tolerate twice the rated current for 300 ms.	
Bypass overload capability	400 kVA: At 40°C, runs 60 min at 110% load, 10 min at 125% load, 1 min at 150% load, and 100 ms at over 150% load. 600 kVA: At 25°C, runs continuously at 125% load; generates only alarms and depends on overtemperature protection at 150% load.	At 30°C: runs continuously at 135% load; generates only alarms and depends on overtemperature protection at 135–150% load. At 40°C: runs continuously at 125% load; generates only alarms and depends on overtemperature protection at 125–150% load.
	Remarks: Except for the 400 kVA UPS, if the load of the bypass single-phase or three-phase is 150%–200%, the bypass will be shut down in 5 minutes, and the hardware depends on overtemperature protection. If the load of the bypass single-phase or three-phase is greater than 200%, the bypass will be shut down in 1 minute, and the hardware depends on overtemperature protection.	

Table 11-9 System electrical specifications

Item	Specifications
Parallel system reliability	Redundant parallel signals
ECO in a parallel system	Supported

Item	Specifications
Number of parallel UPSs	4
Power distribution system	TN-C, TN-S, TN-C-S, TT

A (Optional) TN-C System Application

If the TN-C system is adopted, short-circuit the input N and PE, and connect the input PE and N to terminals on the N bar.

Recommended cable cross-sectional area: 240 mm²

Figure A-1 Short-circuiting the input N and PE (400–600 kVA)

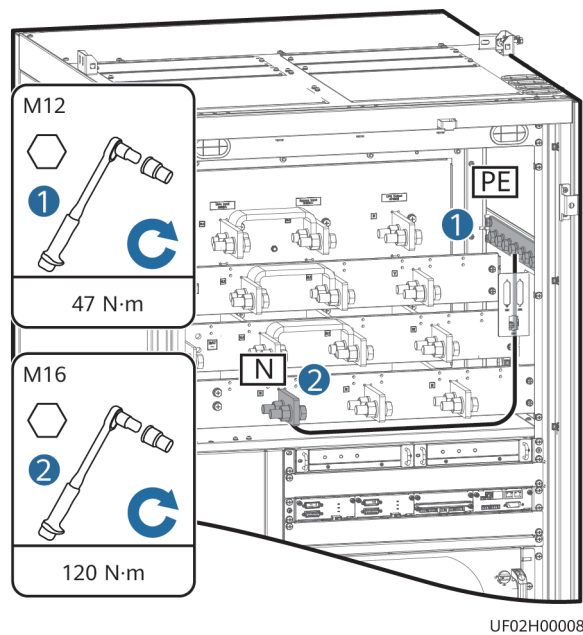
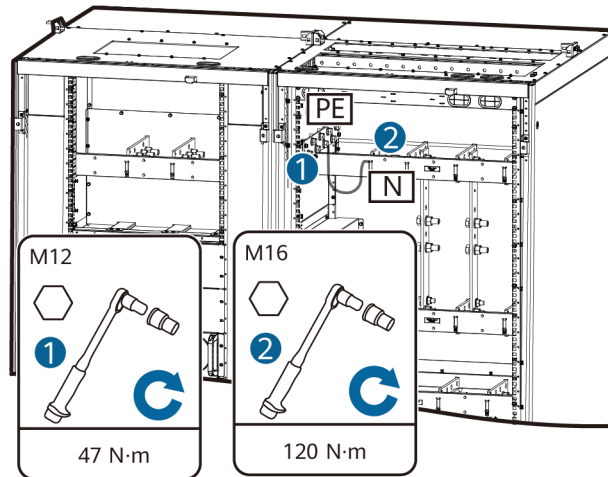


Figure A-2 Short-circuiting the input N and PE (800 kVA)



B Lifting Trolley

Function

A lifting trolley is used as an auxiliary tool for replacing a power module or bypass module.

It is recommended that a lifting trolley be configured for each site to facilitate the maintenance of power modules and bypass modules. You can decide whether to choose it based on site requirements.

Appearance

Figure B-1 Lifting trolley



UF01H00041

(1) Tabletop

(2) Handle

(3) Lowering switch

(4) Elevating pedal

(5) Foot brake

Specifications

Item	Specifications
Weight	115 kg
Load-bearing capacity	350 kg
Minimum height	360 mm
Maximum height	1580 mm
Tabletop dimensions (length x width)	900 mm x 700 mm

Usage

CAUTION

- Overloading is prohibited.
 - Keep hands or feet away from the coverage area of the tabletop.
 - When placing a module, brake the lifting trolley to prevent it from moving.
 - Keep the lifting trolley properly for future maintenance.
-

Step 1 Release the brake of the lifting trolley and push the trolley to the required position.

Step 2 Brake the lifting trolley to stop it and check that it will not move.

Step 3 Repeatedly step on the elevating pedal to raise the tabletop to a proper height.

Step 4 Lift the lowering switch to slowly lower the tabletop to the required height.

----End

C Installing Optional Rear Copper Bar Protection Components

Prerequisites

If optional rear copper bar protection components are configured, perform the following steps to install them.

Procedure

- Step 1** Remove the UPS rear door panels.
- Step 2** Install copper bar protection components.

Figure C-1 Installing copper bar protection components (400–600 kVA)

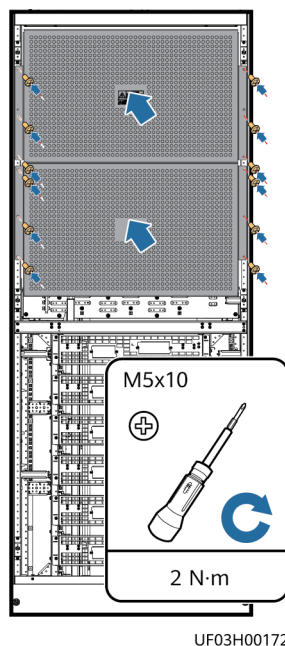
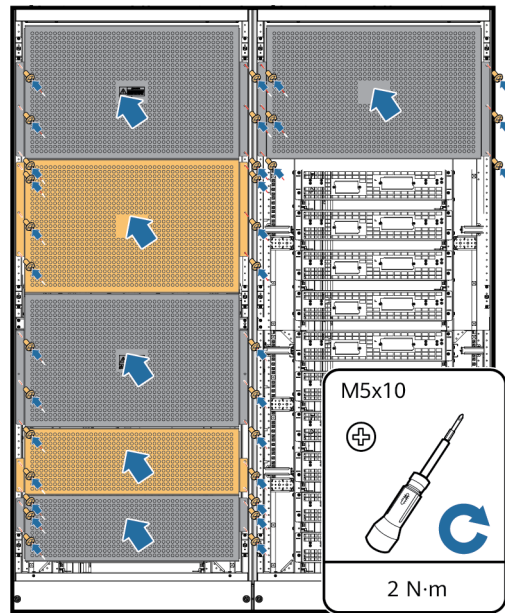


Figure C-2 Installing copper bar protection components (800 kVA)



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Step 3 Reinstall the UPS rear door panels.

----End

D Acronyms and Abbreviations

A

ATS

AC transfer switch

AWG

American wire gauge

B

BSC

bus synchronization controller

BCB-BOX

battery circuit breaker box

C

CE

Conformite Europeenne

E

ECO

economic control operation

EPO

emergency power off

EOD

end of discharge

L

LCD

liquid crystal display

I

IEC

International Electrotechnical
Commission

P

PE

protective earthing

R

RS485	Recommend Standard 485
S	
STS	static transfer switch
SNMP	Simple Network Management Protocol
U	
UPS	uninterruptible power system
USB	Universal Serial Bus
V	
VRLA	valve-regulated lead-acid battery