

ESS-240V12-(9AhBPVBA04, 7AhBPVBA04) Battery Pack

Quick Guide

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Date	2022-06-30



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About This Document

Intended Audience

This document is intended for:

- Technical support engineers
- Hardware installation engineers
- Commissioning engineers

Symbol Conventions

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

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

Issue	Date	Description
02	2022-06-30	1. Added section "Transportation and Storage Requirements." 2. Added the backup time of UPS2000-H-6 kVA/10 kVA. 3. Deleted the long backup time models of UPS2000-G-6 kVA/10 kVA/15 kVA/20 kVA. 4. Optimized section "Safety Information." 5. Added the description of battery recharge.
01	2021-12-23	This is the first official release.

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1 Safety Information

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. The Company 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 will not be 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.

The Company 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

1.1 Personal Safety

DANGER

Do not work with power on during installation. Do not install or remove a power cable with power on. Transient contact between the core of the power cable and the conductor will generate electric arcs or sparks, which may cause a fire or personal injury.

DANGER

Before installing, operating, or maintaining the equipment, remove conductive objects such as watches, bracelets, bangles, rings, and necklaces to prevent electric shocks.

DANGER

When installing, operating, or maintaining the equipment, use dedicated insulated tools to prevent electric shocks and short circuits.

WARNING

When installing, operating, or maintaining the equipment, wear personal protective equipment (PPE) such as insulated gloves, safety clothing, goggles, safety helmet, and safety shoes.

General Requirements

- Do not stop protective devices. Pay attention to the warnings, cautions, and precautionary measures on the equipment.
- If there is a likelihood of personal injury or equipment damage during operations, immediately stop, report the case to the supervisor, and take feasible protective measures.
- Do not power on the equipment before it is installed or confirmed by professionals.
- Before handling a conductor surface or terminal, measure the contact point voltage and ensure that there is no risk of electric shock.
- Do not touch a running fan with your fingers, components, screws, tools, or boards before the fan is powered off or stops running.
- In the case of a fire, immediately leave the building or the equipment area and activate the fire alarm or call emergency services. Do not re-enter the building or affected area until it has been deemed safe by qualified professionals.

Personnel Requirements

- Only professionals and trained personnel are allowed to operate the equipment.
 - Professionals: personnel who are familiar with the working principles and structure of the equipment, 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 trained in technology and safety, 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
- Personnel who plan to install or maintain the 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 perform special tasks such as electrical operations, working at heights, and operations of special equipment should possess the required local national qualifications.
- Only authorized professionals are allowed to replace the equipment or components (including software).
- Keep irrelevant people away from the equipment. Only operators are allowed to access the equipment.

1.2 Battery Safety

DANGER

Do not short-circuit the positive and negative poles of batteries. Battery short circuits can generate high instantaneous current, which may cause battery leakage, overheating, fire, or explosion. To avoid battery short circuit, do not maintain batteries with power on.

DANGER

Do not expose batteries at high temperatures or around heat-generating sources, such as high-temperature sunlight, fires, transformers, and heaters. Battery overheating caused by external heat sources may cause vent opening, leakage, fire, or explosions.

 DANGER

Protect battery modules from mechanical vibration, collision, punctures, and strong impact. Otherwise, the modules may catch fire.

 DANGER

To avoid leakage, overheating, fire, or explosions, do not disassemble, alter, or damage batteries, for example, insert sundries into batteries, squeeze batteries, or immerse batteries in water or other liquids.

 DANGER

Do not burn batteries. Otherwise, the batteries may catch fire or explode.

 DANGER

There is a risk of explosion if the model of the replaced battery is incorrect. The battery should be replaced with a battery of the model recommended by the manufacturer.

 WARNING

It is recommended that an independent battery room be used. Before installing battery modules, prepare fire extinguishing facilities, such as firefighting sands and liquid carbon dioxide fire extinguishers, according to the construction regulations. Before operation, ensure that the battery room is equipped with a fire extinguishing system that complies with local regulations.

 WARNING

Before unpacking battery modules, ensure that the packing cases are intact and correctly placed according to the labels on the packing cases during their storage and transportation. Do not place a battery module upside down, lay it on one side, or tilt it. Stack the battery modules according to the stacking requirements on the packing cases. Any bumping or falling may damage the battery modules.

 WARNING

After unpacking battery modules, place them in the required direction. Do not place a battery module upside down or vertically, lay it on one side, tilt it, or stack it with other modules. Any bumping or falling may damage the battery modules.



WARNING

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.

General Requirements

- If a battery is accidentally exposed to water, do not install it. Move it to a safe place for isolation and contact technical engineers in a timely manner.
- Keep the battery switch off during installation and maintenance.
- When installing batteries, do not place installation tools on the batteries. After the installation is complete, clean up the objects on the batteries and the surrounding area.
- Use batteries of specified models. Using batteries of other models may damage the batteries.
- 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.
- Exercise caution when setting battery parameters. Incorrect settings will affect the power supply and battery lifespan.
- 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.
- 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.

NOTICE

To ensure battery safety and battery management accuracy, use batteries provided by the Company. The Company is not responsible for any battery faults caused by batteries not provided by it.

Battery Leakage

- If a battery leaks, wear goggles, rubber gloves, and protective clothing, power off the equipment in a timely manner, and contact technical support.
- 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.
- Special requirements for lead-acid batteries:

 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 cause damage.

NOTICE

Battery overheating causes deformation, damage, and electrolyte overflow.

- When the battery temperature exceeds 60°C, check whether the electrolyte overflows. If the electrolyte overflows, handle the leakage immediately.
- If the electrolyte overflows, follow the instructions of the battery manufacturer or use sodium bicarbonate (NaHCO_3) or sodium carbonate (Na_2CO_3) to neutralize the electrolyte.
- Electrolyte overflow may damage the equipment. It will corrode metal parts and boards, and ultimately damage the boards.

Flammable Gas

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

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.
-

1.3 Electrical Safety

General Requirements

- Installation, operation, and maintenance must be performed in the sequence specified in the manual. Do not change the structure or installation sequence of the equipment without permission.
- When installing the equipment, use a torque wrench of a proper range to tighten the screws. When using a wrench to tighten the screws, ensure that the wrench does not tilt and the torque error does not exceed 10% of the specified value.
- Before installing or removing power cables, ensure that the switch is turned off.
- Before connecting power cables, check that cable labels are correct and cable terminals are insulated.

- To avoid electric shock, do not connect safety extra-low voltage (SELV) circuits to telecommunication network voltage (TNV) circuits.
- A damaged cable must be replaced by the manufacturer or professionals to avoid risks.
- Check equipment connections periodically, ensuring that all screws are securely tightened.
- Do not use water to clean electrical components inside or outside of a cabinet.
- Do not scrawl, damage, or block any labels or nameplates on the equipment. Promptly replace warning labels that have worn out.

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.
- Ensure that the equipment is connected permanently to the protective ground. Before operating the equipment, check its electrical connection to ensure that it is reliably grounded.
- Do not operate the equipment in the absence of a properly installed ground conductor.
- Do not damage the ground conductor.

Cabling

- When selecting, connecting, and routing cables, follow local safety regulations and rules.
- Ensure that cables meet the VW-1 or ZB and higher flame spread rating requirements and comply with IEC 60332-1 and IEC 60332-3-22 standards.
- Do not route cables behind the air intake or exhaust vents of the equipment.
- If a 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.
- 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.
- 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.
- 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. Otherwise, the cable performance may deteriorate due to cable damage, which affects the current-carrying capacity and temperature rise.

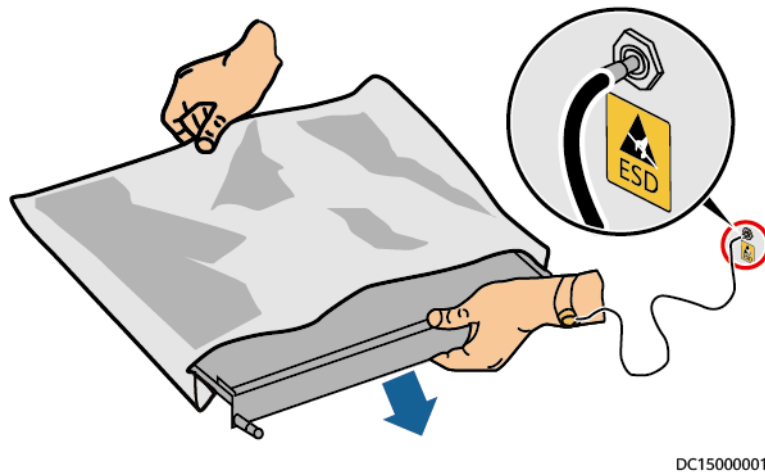
ESD

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.

Figure 1-1 Wearing an ESD wrist strap



1.4 Environmental Requirements

WARNING

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.

General Requirements

- Do not install or run the equipment beyond the technical specifications. Otherwise, its performance and safety will be compromised.
- Do not install the equipment in environments with conductive metal scraps in the air.
- Do not install the equipment in an environment with direct sunlight, dust, volatile gases, infrared and other radiations, organic solvents, corrosive materials, or salty air.

- Do not expose the equipment to flammable or explosive gas or smoke. Do not perform any operation on the equipment in such environments.
- 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.
- If any liquid is detected inside the equipment, disconnect the power supply immediately and contact the administrator.
- To prevent fire due to high temperature, ensure that the ventilation vents or heat dissipation system are not blocked when the equipment is running.
- The equipment room should have good heat insulation, and the walls and floor should be protected against moisture.
- Install a rat guard at the door of the equipment room.
- After installing the equipment, remove idle packing materials such as cartons, foam, plastics, and cable ties from the equipment area.

1.5 Mechanical Safety

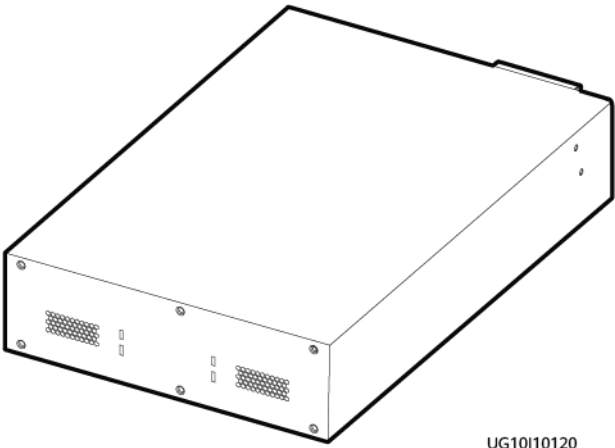
General Requirements

- 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 an extended period of time.
- Before installation, ensure that the equipment is firmly anchored to the floor or other solid objects, such as a wall or an installation rack.

2 Product Description

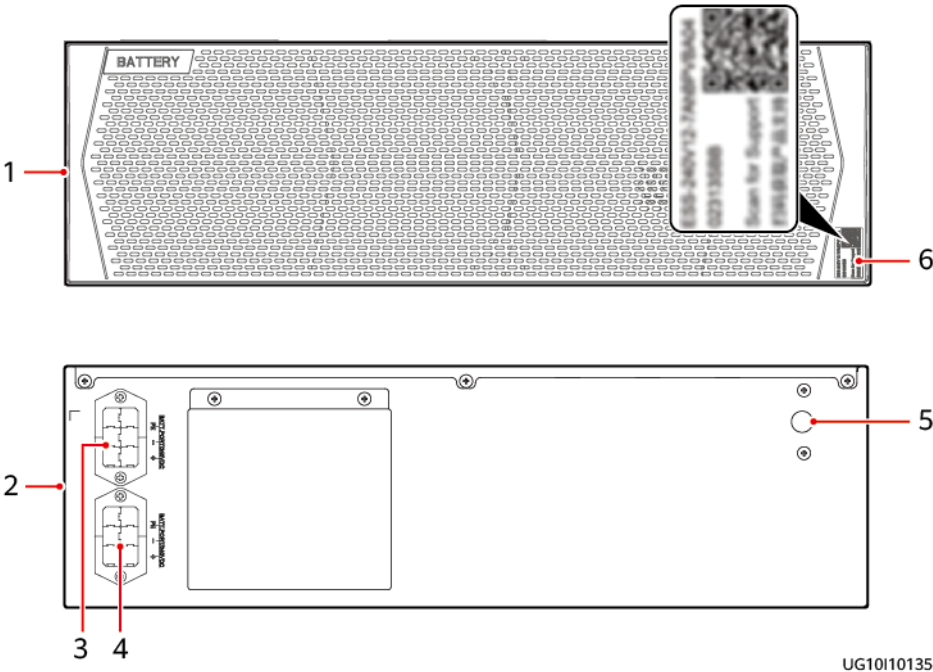
Battery Pack Model	Weight	Dimensions (H x W x D)
ESS-240V12-7AhBPVBA04	63 kg	130 mm x 430 mm x 685 mm
ESS-240V12-9AhBPVBA04	70.5 kg	

Figure 2-1 Battery pack appearance



UG10I10120

Figure 2-2 Front and rear panels of a battery pack



- (1) Front panel (2) Rear panel (3) DC port 1
(4) DC port 2 (5) Cable outlet for the battery (6) QR code^a
temperature sensor

NOTE

- a: position of the QR code. You can scan the QR code to view the quick guide of the product. The information on the QR code label is subject to the actual product.
- The jack in the lower right corner of DC port 2 is solid. Determine the port based on the actual battery pack.

Table 2-1 Environmental specifications

Item	Specifications
Operating temperature range	0–40°C
Altitude	0–4000 m

3 Transportation and Storage Requirements

3.1 Transportation Requirements

- Choose sea or a road with good conditions for transportation to ensure equipment safety and avoid tilt or jolt.
- The packing case must be secured for transportation, and printed with signs such as anti-collision and moisture prevention in compliance with local regulations.
- The battery module cannot be placed upside down or tilted, and must be protected against falling down, mechanical impact, rains, snows, and falling into water during transportation.
- Unless otherwise specified, dangerous goods cannot be mixed with goods containing food, medicine, animal feed, and their additives in the same vehicle or container.

3.2 Storage Requirements

1. Batteries should be upright when being stored.
2. Battery packing cases should be stacked in accordance with the stacking requirements on the external package.
3. The storage environment requirements are as follows:
 - Ambient temperature: -15°C to $+50^{\circ}\text{C}$
 - Recommended ambient temperature: $20-30^{\circ}\text{C}$
 - Recharge temperature: $5-40^{\circ}\text{C}$
 - Relative humidity: $\leq 95\% \text{ RH}$
 - In a dry and clean place with proper ventilation
 - Away from corrosive and organic substances (including gas)
 - Away from direct sunlight
 - At least 2 meters away from heat sources (such as a heater)

- The warehouse keeper should collect data about battery storage status every month and recharge batteries that have been stored for three months in a timely manner.

3.3 Recharge Method of the UPS2000-G-15 kVA/20 kVA

3.3.1 Battery Pack Recharge Control Parameters

The following describes how to use the UPS2000-G-20 kVA to recharge a battery pack.

- Set charging parameters for the UPS based on the number of battery packs connected in parallel in positive and negative battery strings.

Device	Charge Voltage (V)	Charge Current (A/PCS)
UPS2000-G-20 kVA	576±5	1±0.1

NOTE

For example, if two battery packs are connected in parallel in the positive and negative battery strings respectively, the battery pack capacity is 9 Ah, and the charge current coefficient is 0.1, the charge current is calculated as follows: Charge current = 2 (Number of battery packs) × 9 (Battery capacity) × 0.1 (Charge current coefficient) = 1.8 A. The charge current of a battery pack is associated with the battery capacity. A maximum of four battery packs can be connected in parallel in the positive or negative battery string. [Table 3-1](#) lists the charging time.

- The time requirements for using the UPS to recharge battery packs are as follows.

Table 3-1 Charging time

Battery Pack Model	Storage Duration (Month)	3	4	5	6
ESS-240V12-9AhBPVBA04	Charging time (hour)	≥ 3	≥ 4	≥ 5	≥ 6
ESS-240V12-7AhBPVBA04					
Note: Battery packs that have been stored for less than or equal to three months do not need to be recharged.					

3.3.2 Battery Pack Recharge

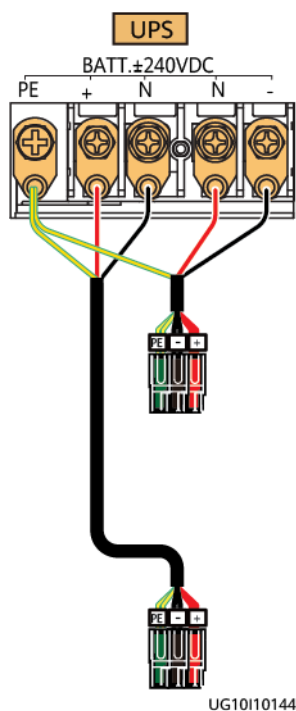
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NOTICE

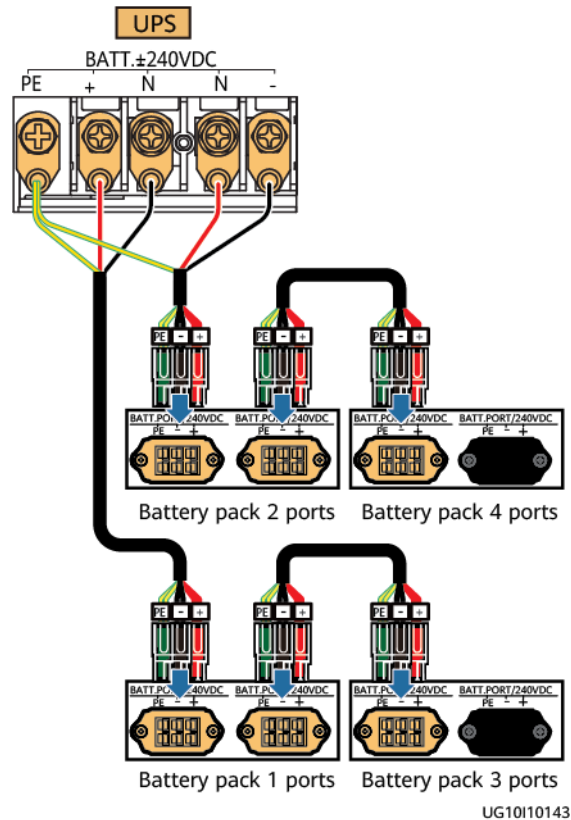
- The following method applies only to the scenario where the UPS2000-G-20 kVA is used to recharge a battery pack.
- When connecting cables for recharging a battery pack, ensure that the cables are correctly and securely connected.
- When recharging a battery pack, assign personnel to monitor the entire recharge process and perform inspections periodically. If any of the following exceptions is detected, stop charging immediately.
 1. The charge voltage is greater than or equal to 588 V.
 2. The surface temperature of the battery pack is greater than or equal to 45°C (hot on your hand).

Procedure

Step 1 Correctly connect battery cables to the UPS.



Step 2 When the UPS is shut down, correctly connect battery cables to the battery pack. After checking that the cables are correctly connected, start the UPS to recharge the battery pack.



- Step 3** After the battery pack is recharged, shut down the UPS. Remove the battery cables from the battery pack and then from the UPS.
- End

3.4 Recharge Method of the UPS2000-H-6 kVA/10 kVA

3.4.1 Battery Pack Recharge Control Parameters

The following describes how to use the UPS2000-H-10 kVA to recharge a battery pack.

1. Set charge parameters for the UPS based on the number of battery packs connected in parallel.

Device	Charge Voltage (V)	Charge curr. limit coef. (C)
UPS2000-H-10 kVA	288±5	0-0.15

 NOTE

For example, if there is one battery pack, the battery pack capacity is 9 Ah, and the charge current limit coefficient is 0.15C, the charge current is calculated as follows: Charge current = 1 (Number of battery packs) x 9 (Battery capacity) x 0.15 (Charge current limit coefficient) = 1.35 A. The charge current of a battery pack is associated with the battery capacity. A maximum of four battery packs can be connected in parallel. [Table 3-2](#) lists the charging time.

2. The time requirements for using the UPS to recharge battery packs are as follows.

Table 3-2 Charging time

Battery Pack Model	Storage Duration (Month)	3	4	5	6
ESS-240V12-9AhBPVBA04	Charging time (hour)	≥ 6	≥ 8	≥ 10	≥ 12
ESS-240V12-7AhBPVBA04					
Note: Battery packs that have been stored for less than or equal to three months do not need to be recharged.					

3.4.2 Battery Pack Recharge

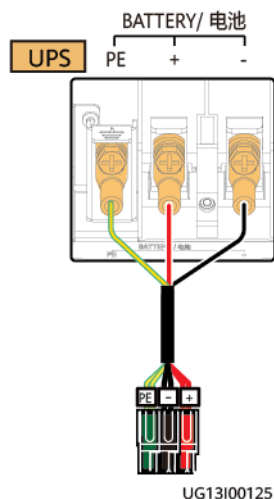
Context

NOTICE

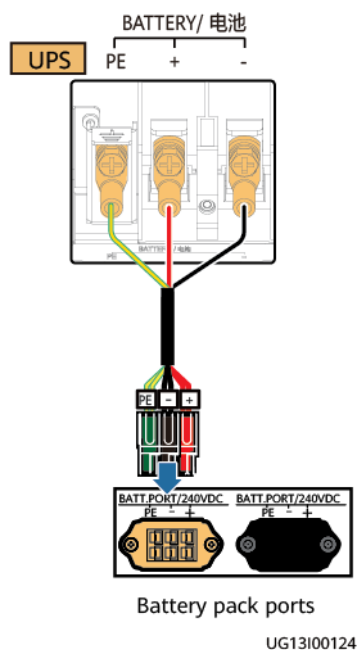
- The following method applies only to the scenario where the UPS2000-H-10 kVA is used to recharge a battery pack.
- When connecting cables for recharging a battery pack, ensure that the cables are correctly and securely connected.
- When recharging a battery pack, assign personnel to monitor the entire recharge process and perform inspections periodically. If any of the following exceptions is detected, stop charging immediately.
 1. The charge voltage is greater than or equal to 288 V.
 2. The surface temperature of the battery pack is greater than or equal to 45°C (hot on your hand).

Procedure

- Step 1** Correctly connect battery cables to the UPS.



Step 2 When the UPS is shut down, correctly connect battery cables to the battery pack. After checking that the cables are correctly connected, start the UPS to recharge the battery pack.



Step 3 After the battery pack is recharged, shut down the UPS. Remove the battery cables from the battery pack and then from the UPS.

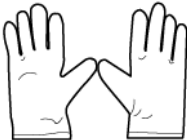
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4 Installation

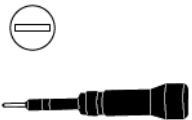
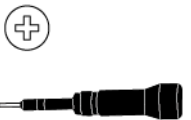
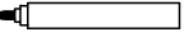
4.1 Tools

The onsite operation personnel can select tools based on the site requirements.

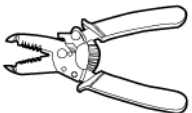
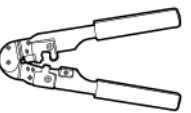
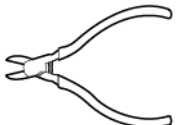
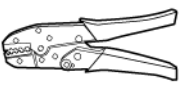
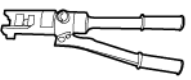
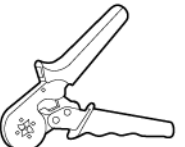
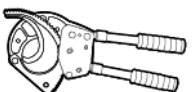
Personal protective equipment

			
Safety helmet	Goggles	Protective shoes	Reflective vest
			-
ESD gloves	Insulated gloves	Protective gloves	

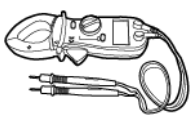
Hardware installation tools

 Flat-head insulated torque screwdriver (2 mm)	 Phillips insulated torque screwdriver (M4/M6)	 Utility knife	 Marker
--	--	---	---

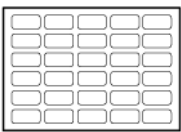
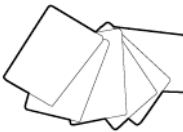
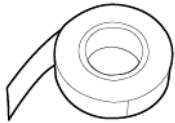
Cable installation tools

 Wire stripper	 RJ45 crimping tool	 Electro-hydraulic pliers	 Heat gun
 Diagonal pliers	 Crimping tool	 Hydraulic pliers	 Cord end terminal crimping tool
 Cable cutter			

Measurement instruments

			-
Clamp meter	Multimeter	Network tester	

Engineering auxiliary materials

			
Label	Cable tie	Cotton cloth	Heat-shrink tubing
	-	-	-
Insulation tape			

Other tools

			
Electrician's knife	Tweezer	Brush	Vacuum cleaner

4.2 Unpacking and Checking

No.	Check Item
1	Check the battery pack appearance after unpacking. If any damage is found, contact the carrier immediately.

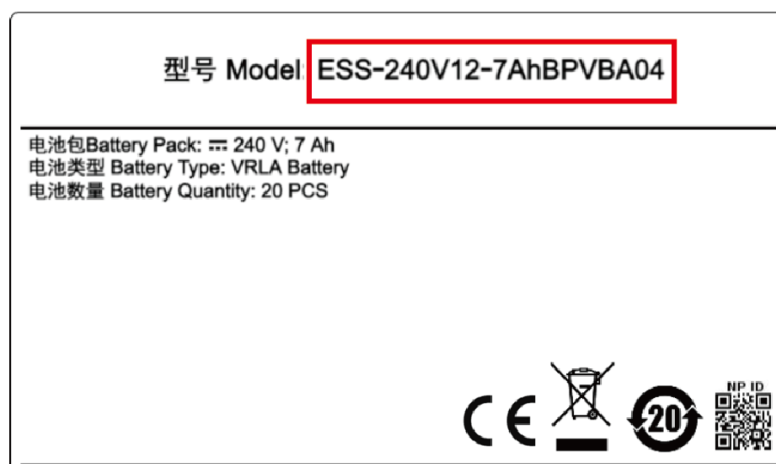
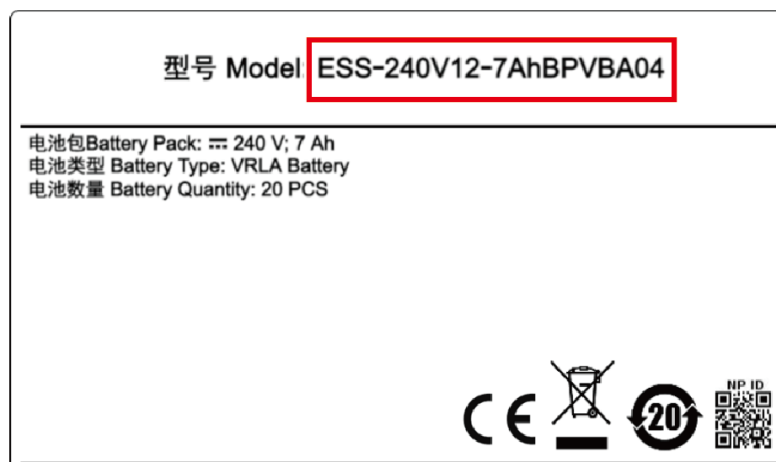
No.	Check Item
2	Check that battery pack barcode (on the rear of the pack near the wiring ports) is consistent with that specified in the order. If any discrepancy is found, contact the local office immediately.

4.3 Installing the Equipment

NOTICE

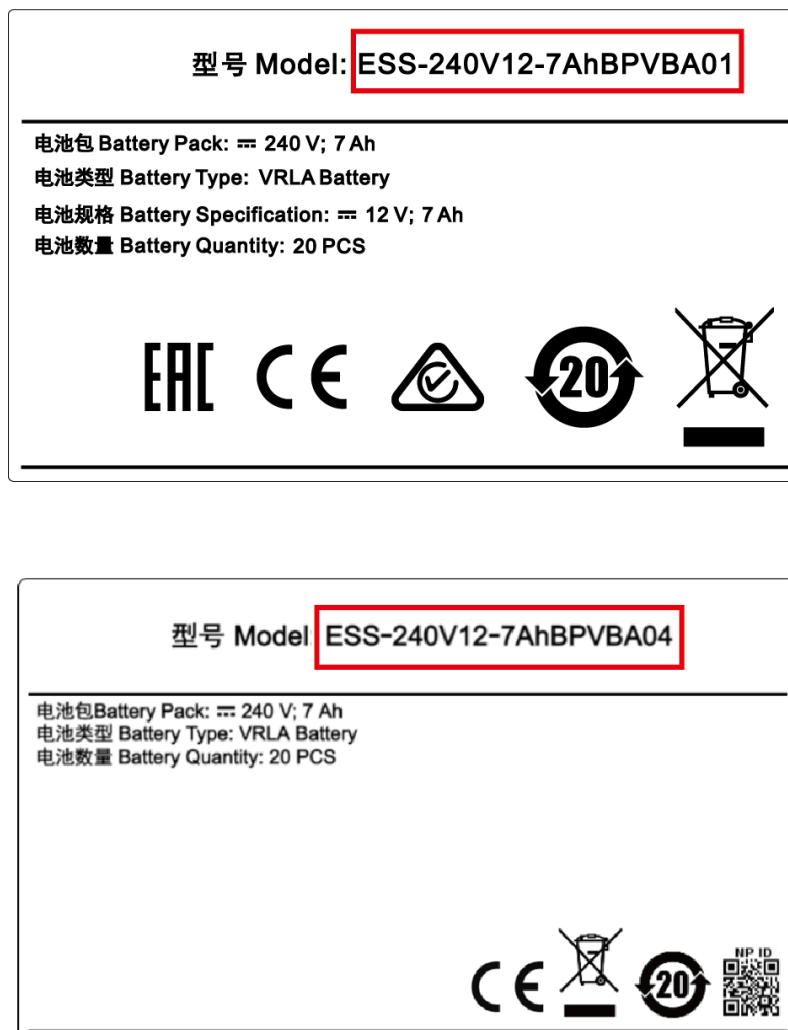
- Do not transport the equipment by holding the mounting ears, front panel, or wiring port covers.
 - Remove rings, watches, and other metal objects before moving battery packs.
 - When battery packs are connected in series or parallel, only battery packs of the same model and specifications can be installed or replaced. Do not use battery packs of different models or specifications together. For details, see the battery pack nameplate. The following figures are for reference only.
-
- Install or replace with battery packs of the same model and specifications.

Figure 4-1 Same battery pack model and specifications



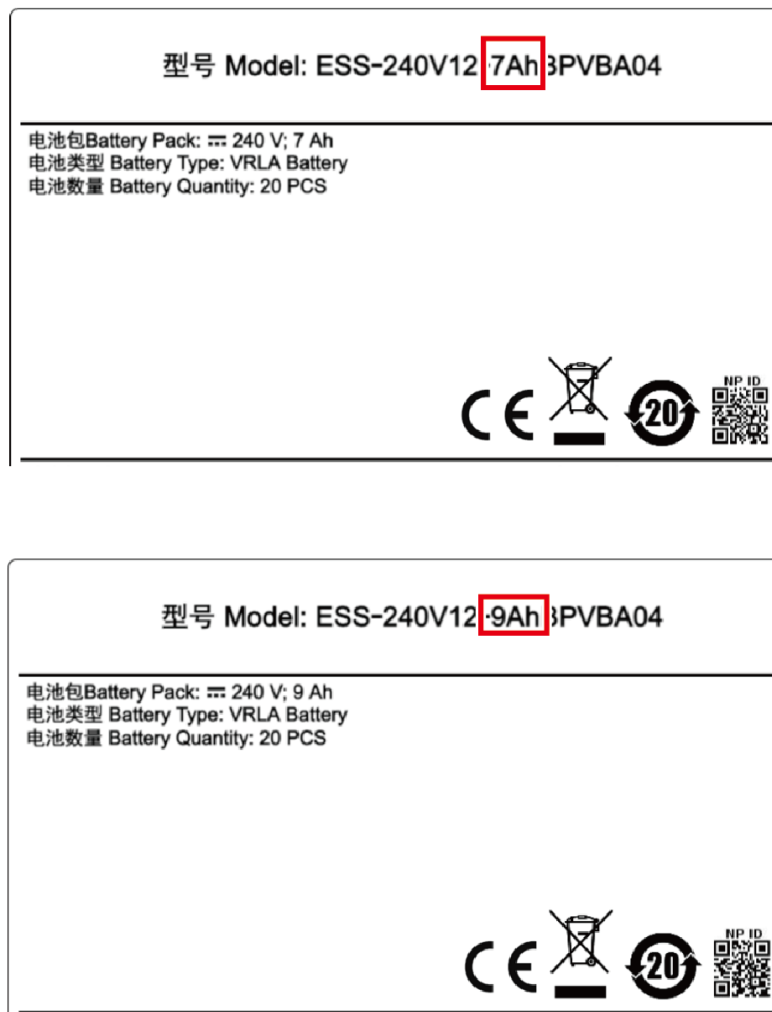
- Battery packs of different models cannot be connected in series or parallel.

Figure 4-2 Different battery pack models



- Battery packs of different specifications cannot be connected in series or parallel.

Figure 4-3 Different battery pack specifications

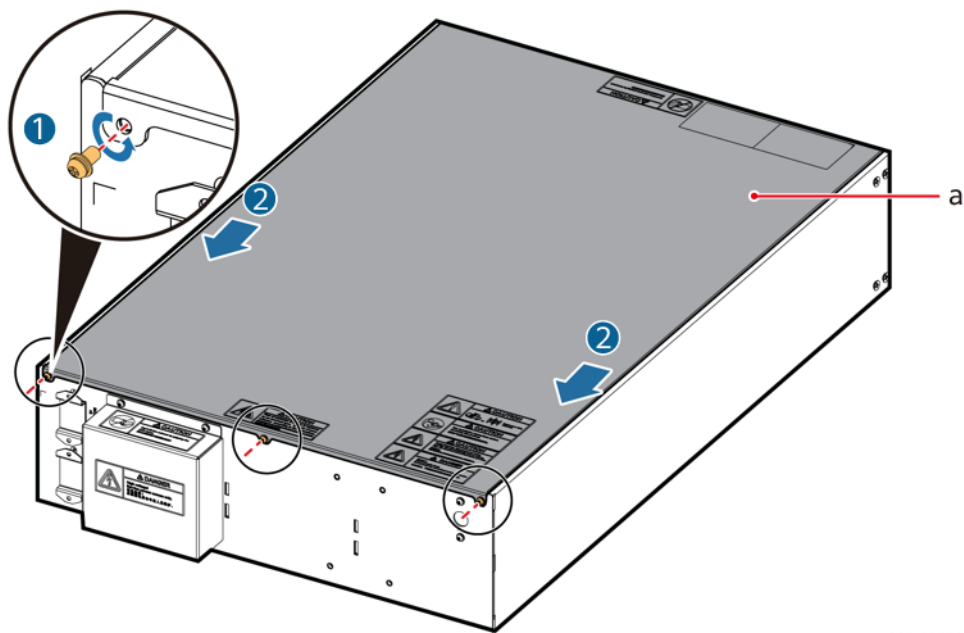


4.3.1 (Optional) Installing a Temperature Sensor

Procedure

- Step 1** Remove three screws from the cover of the battery pack.
- Step 2** Remove the cover horizontally.

Figure 4-4 Removing the cover



UG10I10122

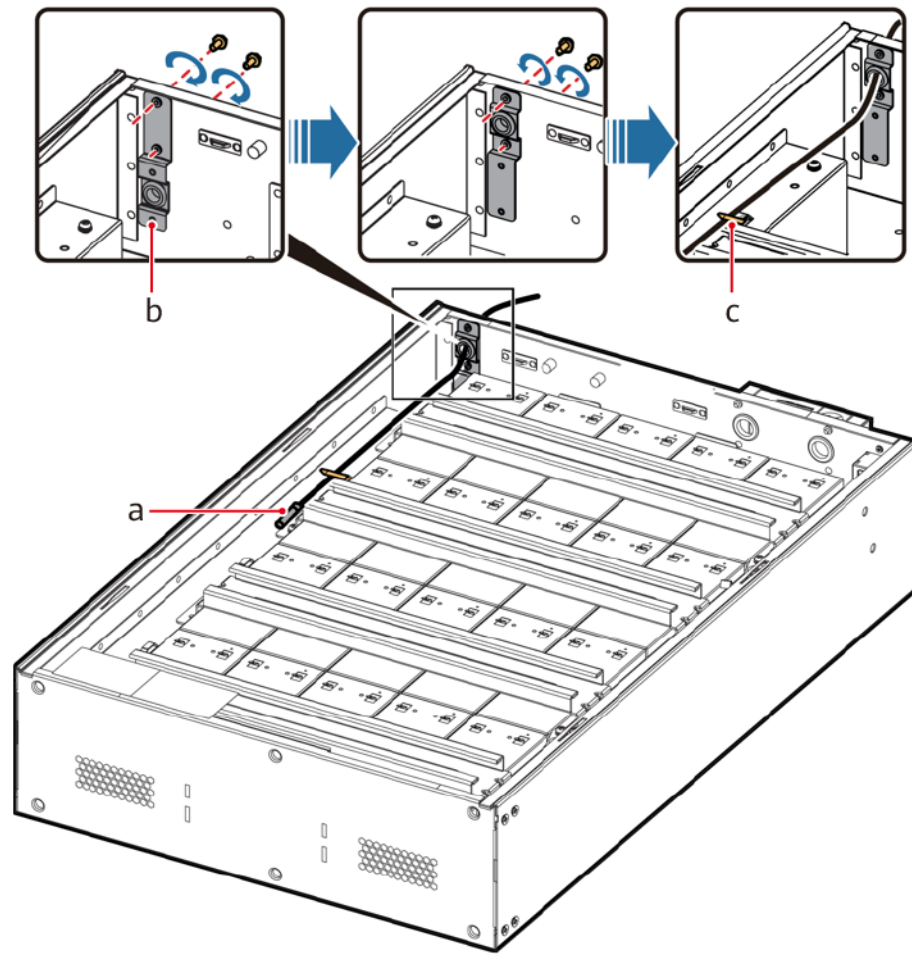
(a) Cover

NOTE

If multiple battery packs are installed, install the battery temperature sensor on one battery pack.

- Step 3** Remove the baffle plate from the cable hole of the battery temperature sensor, rotate the baffle plate 180 degrees, and secure it with the removed screws. Route the battery temperature sensor into the battery pack through the cable hole, and secure the sensor to the cable bridge with a cable tie.

Figure 4-5 Installing the battery temperature sensor



UG10110123

(a) Battery temperature sensor (b) Cable hole baffle plate (c) Cable bridge

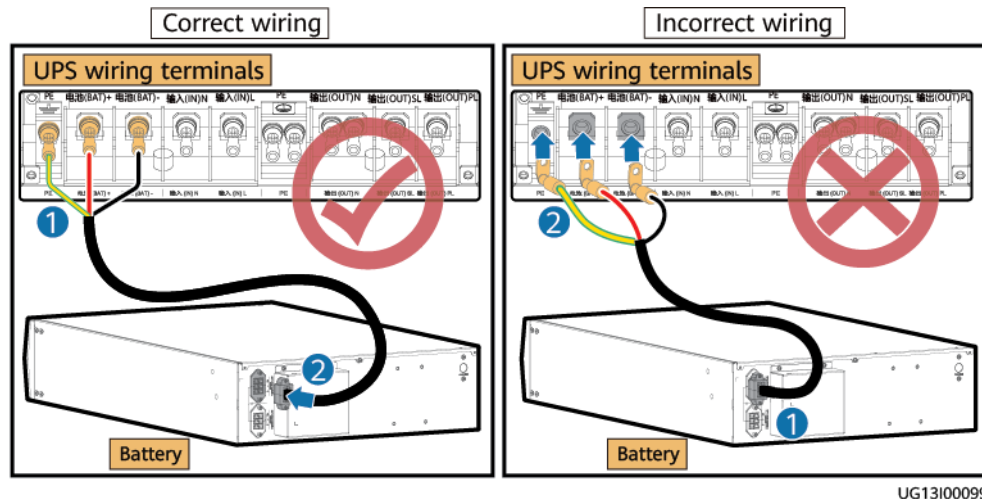
Step 4 Reinstall the cover for the battery pack, and secure the cover with the three removed screws.

----End

4.3.2 Installing a Battery Pack

NOTICE

If no switch is installed for battery cables, install battery cables in the following sequence: 1. Install cables to battery terminals on the UPS side. 2. Install cables to battery terminals on the battery side.

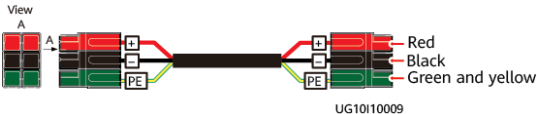


UG13100099

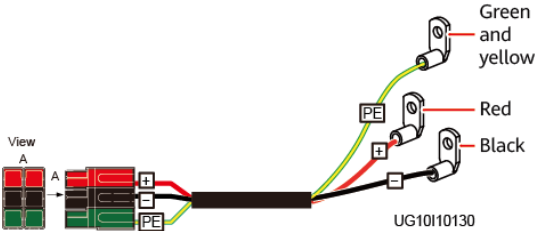
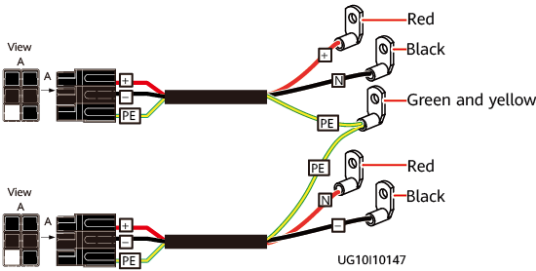
- Set the circuit breaker of the external battery pack or battery rack (if any), load circuit breaker, upstream input circuit breaker, and UPS AC input circuit breaker to OFF.
- When connecting cables, connect cables to the UPS first, and then battery pack terminals. When disconnecting cables, disconnect from battery packs first, and then remove cables from the UPS.
- Check whether batteries are accidentally grounded. If yes, disconnect the power supply from the ground. If batteries are grounded, do not touch any part of the batteries, as this may cause electric shocks. During installation and maintenance, remove grounding to reduce the likelihood of electric shocks.
- Determine the cable colors based on industry standards.
- If PP45 terminals are used for both ends of the cable between battery packs or between the battery pack and the UPS2000-G-6 kVA/10 kVA UPS BATT. 240 V DC terminal, see battery cable 01 in the following table.
- If a PP45 terminal is used for one end (connecting to the battery pack) and an OT-16 mm²-M6-90° terminal for the other end (connecting to the UPS) of the cable between the battery pack and the UPS2000-G-15 kVA/20 kVA UPS BATT. $\pm$ 240 V DC terminal, see battery cables 02 and 05 in the following table.
- If a PP45 terminal is used for one end (connecting to the battery pack) and an OT-10 mm²-M4-90° terminal for the other end (connecting to the UPS) of the cable between the battery pack and the UPS2000-H-6 kVA (PE/battery+/battery-) terminal, see battery cable 03 in the following table.
- If a PP45 terminal is used for one end (connecting to the battery pack) and an OT-16 mm²-M6-90° terminal for the other end (connecting to the UPS) of

the cable between the battery pack and the UPS2000-H-10 kVA (PE/battery+/ battery-) terminal, see battery cable 04 in the following table.

- The standard battery pack model for UPS2000-G-6 kVA is ESS-240V12-7AhBPVBA04, and the standard battery pack model for UPS2000-G-10 kVA is ESS-240V12-9AhBPVBA04. The UPS2000-G-15 kVA/20 kVA connects to at least two battery packs. Select 7 Ah or 9 Ah battery packs based on power backup requirements. Battery packs of different models cannot be used together.
- If customers prepare input and output power cables by themselves, use the cables that comply with standards proposed by the Underwriters Laboratories (UL) or International Electrotechnical Commission (IEC).

Item	Appearance	Remarks
Battery cable 01		Standard configuration . Used for connections between battery packs or between a battery pack and UPS2000-G-6 kVA/10 kVA.

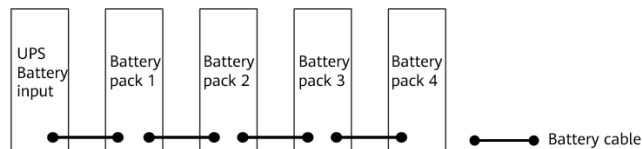
Item	Appearance	Remarks
Battery cables 02	View A View B UG10I10017	- Optional. Used for connections between a battery pack and UPS2000-G-15 kVA/20 kVA. - Applies only to the scenario where batteries are not shared. If battery sharing is involved, battery cables 05 also need to be purchased.
Battery cable 03	View A UG10I10130	Optional. Used for connections between a battery pack and UPS2000-H-6 kVA (OT-16 mm²-M4-90° terminal).

Item	Appearance	Remarks
Battery cable 04		Optional. Used for connections between a battery pack and UPS2000-H-10 kVA (OT-16 mm ² -M6-90° terminal).
Battery cables 05		- Optional. Used for connections between a battery pack and UPS2000-G-15 kVA/20 kVA in the battery sharing scenario. - The lower left corner of the PP45 terminal is empty. Battery cables 05 and 02 are used together in the battery sharing scenario for the UPS2000-G-15 kVA/20 kVA.

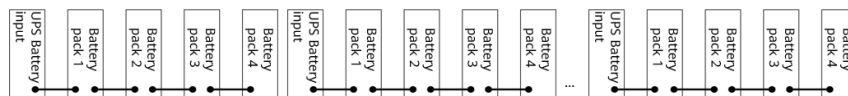
4.3.2.1 Method 1: Rack Mounting

Context

1. A maximum of four battery packs can be configured for a single UPS2000-G-6 kVA/10 kVA. If more than one battery pack is connected to the UPS2000-G-6 kVA/10 kVA, connect the battery packs in parallel as follows.



2. In a UPS2000-G-6 kVA/10 kVA parallel system, each UPS can be configured with one to four battery packs. The installation methods for each UPS and battery pack are the same as those for a single UPS.



3. A maximum of eight battery packs can be configured for a single UPS2000-G-15 kVA/20 kVA (four battery packs in the positive string and four in the negative string). For details about how to install the UPS2000-G-15 kVA/20 kVA and battery packs, see the following figure.

Figure 4-6 One UPS (model UPS2000-G-15 kVA/20 kVA) + four battery packs

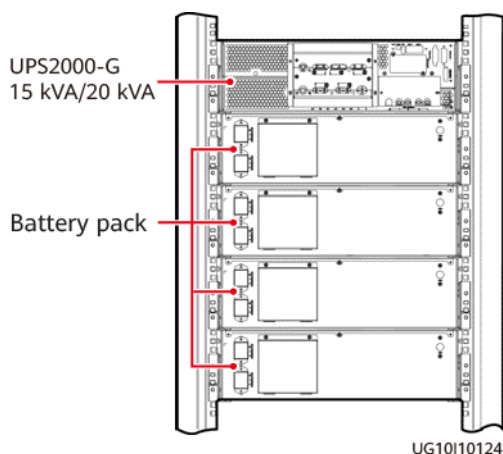


Figure 4-7 Two UPSs (model UPS2000-G-15 kVA/20 kVA, 1+1 parallel system)
+ four battery packs (sharing battery packs)

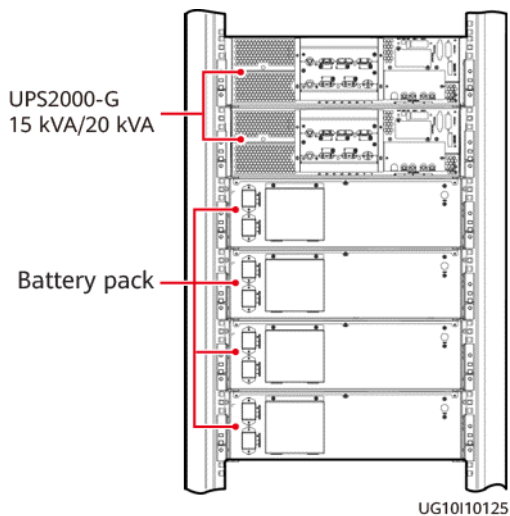
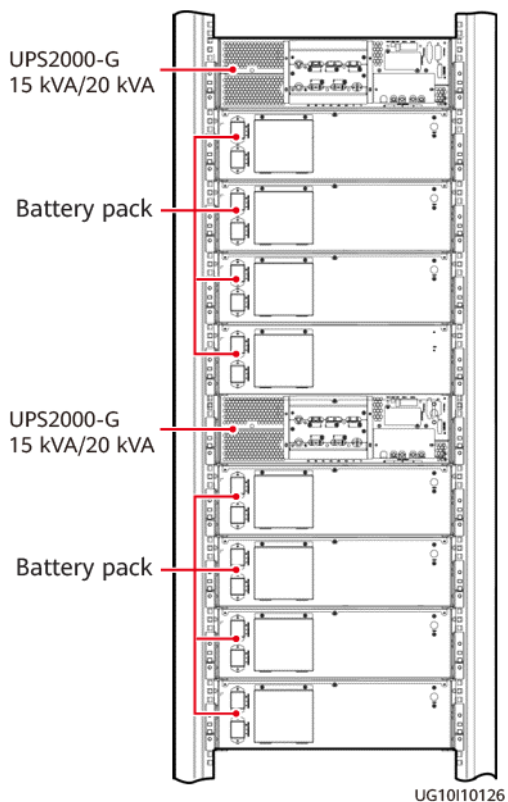


Figure 4-8 Two UPSs (model UPS2000-G-15 kVA/20 kVA, 1+1 parallel system)
+ eight battery packs (not sharing battery packs)

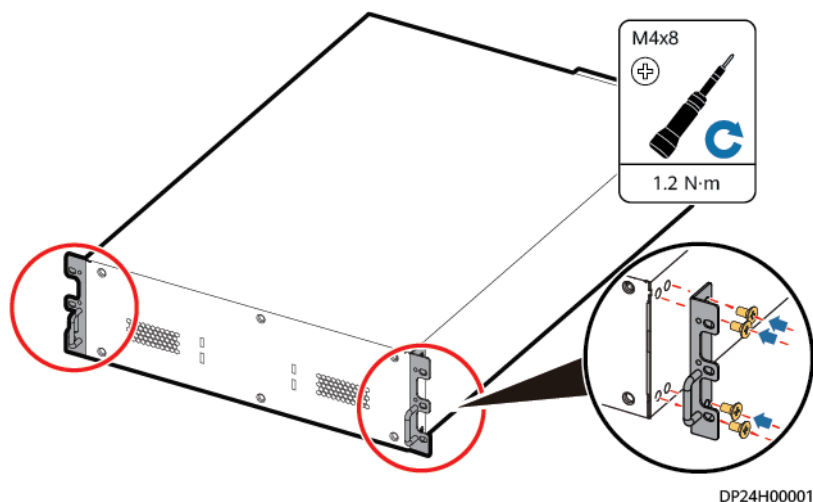


Procedure

Step 1 When battery packs are connected in series or parallel, ensure that the models on the nameplates of the battery packs are the same.

Step 2 Install the mounting ears.

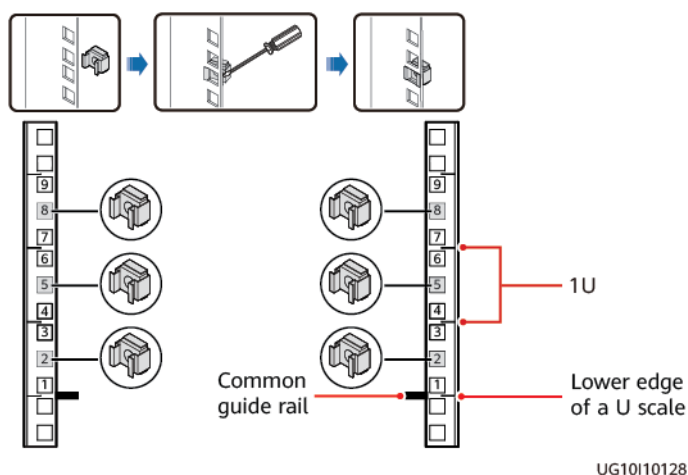
Figure 4-9 Installing the mounting ears



Step 3 There are two methods for installing battery packs on a rack.

Method 1: floating nuts + common guide rails Align the lower edge of the guide rail with the lower edge of a U scale. Install floating nuts (six in total) in positions numbered 2, 5, and 8, as shown in the figure.

Figure 4-10 Installing common guide rails



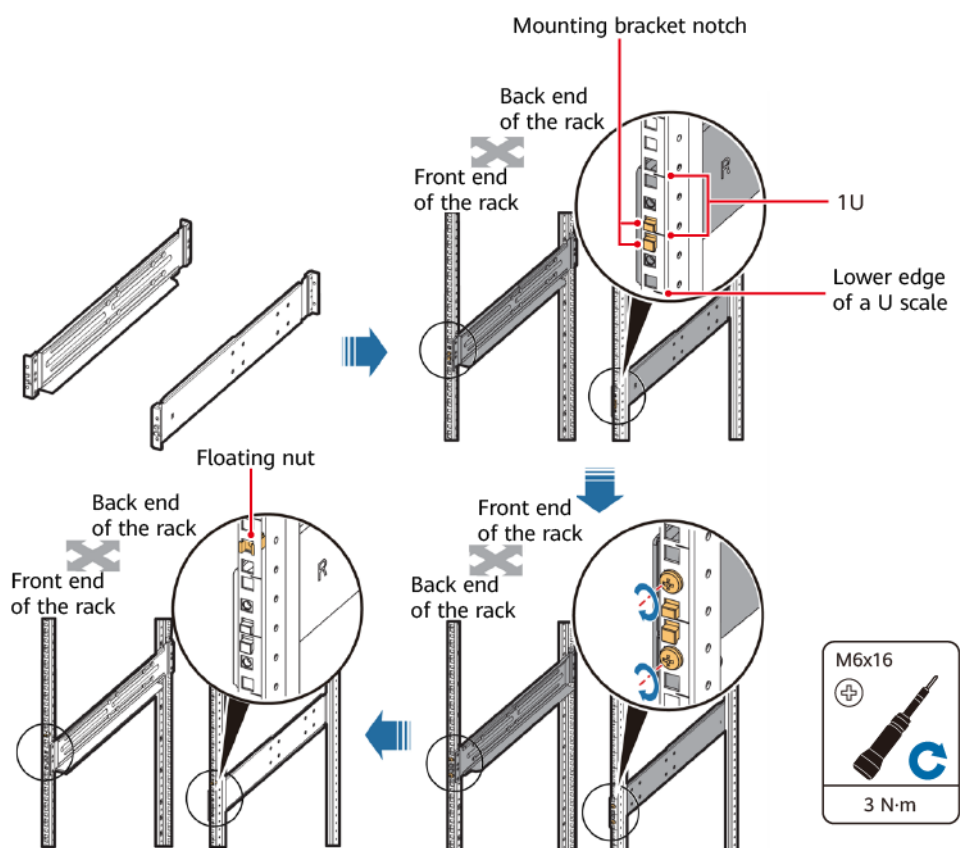
Method 2: adjustable guide rails + floating nuts

1. Determine installation positions for the guide rails (height: 2 U). Align the lower edge of the guide rail with the lower edge of a U scale.
2. Insert the mounting ears at the front and rear ends of the guide rail into the corresponding mounting holes, secure the rear end using M6x16 screws, and level the guide rail. Do not install the screws at the front end. Install the other guide rail in the same method.
3. Install floating nuts in the upper part of the guide rails (on the front end), as shown in the following figure.

NOTICE

- The guide rail on the right has the R silkscreen, and the guide rail on the left has the L silkscreen. Do not install them reversely.
- Adjustable guide rails are optional. You are advised to use adjustable guide rails for rack-mounted installation. For a 3 U device, install guide rails and two floating nuts, and secure the guide rails with screws. The floating nuts are delivered with the device.
- The front end of the adjustable guide rails is not secured by screws. Do not push the adjustable guide rails out of the rack when placing a battery pack on the rack.

Figure 4-11 Installing adjustable guide rails



UG1010127

Step 4 Place a battery pack on the guide rails, and secure it to the rack using M6x16 screws through the mounting ears.

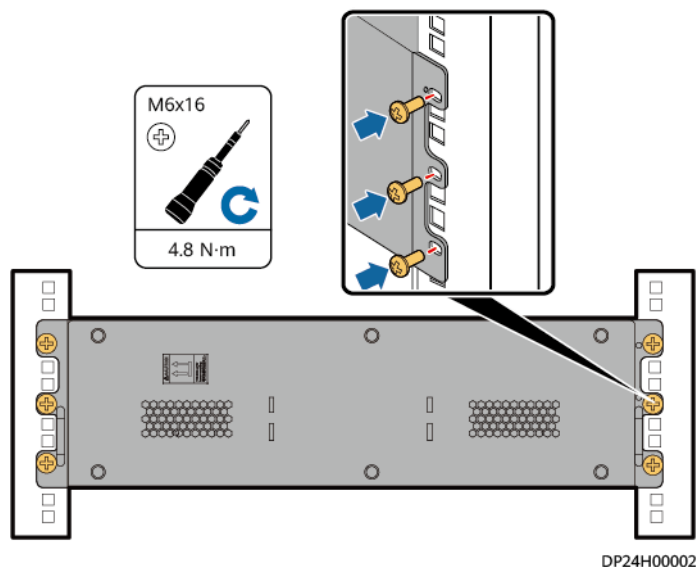
⚠ DANGER

Ground the rack properly before operation.

WARNING

Do not touch uninsulated battery terminals. Otherwise, electric shocks may occur.

Figure 4-12 Installing a battery pack



----End

4.3.2.2 Mode 2: Tower Mounting

Context

- This section describes the installation method using a battery pack and a 6 kVA UPS as an example.
- The support base length is adjustable. You can add components in between to increase the length as required. One additional component (1 U) is required for a single 3 U device.
- Remove a support base with appropriate force in the reverse direction of installation.
- The minimum distance between the two support bases is 280 mm. The support bases cannot exceed the edges of the UPS. The recommended distance from support bases to the edges of the UPS is about 100 mm.

Procedure

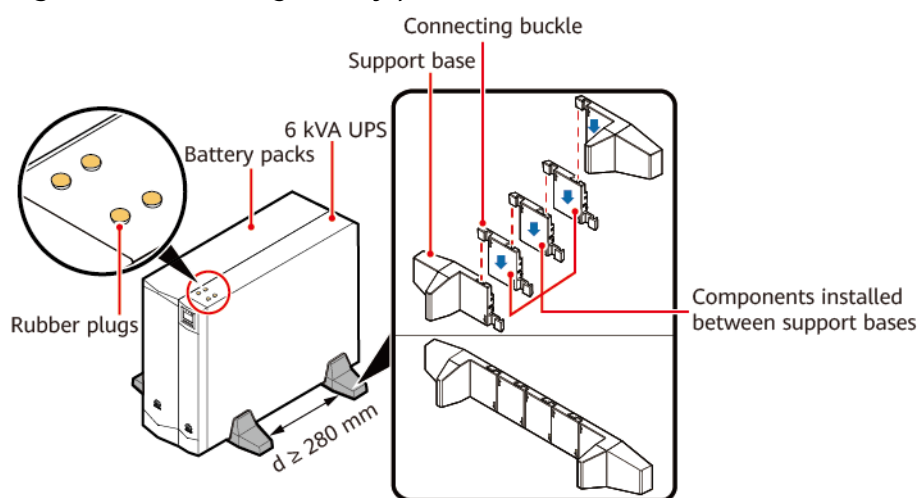
- Step 1** When battery packs are connected in series or parallel, ensure that the models on the nameplates of the battery packs are the same.
- Step 2** Assemble the support bases: Align the connecting buckle with the slot and insert the buckle vertically.

CAUTION

Wear protective gloves when removing and installing the support base components to prevent injury.

- Step 3** Install two support bases for each group of battery packs as follows: Place support bases on the floor, ensure that the distance between the two support bases is at least 280 mm, and then place battery packs on the support bases in sequence.
- Step 4** After the installation is complete, seal the four screw holes on the top with rubber plugs that are delivered with the battery packs.

Figure 4-13 Installing battery packs



UG10110129

----End

4.4 Cable Connection

4.4.1 Connecting Cables to Battery Packs for the UPS2000-G-6 kVA/10 kVA

NOTE

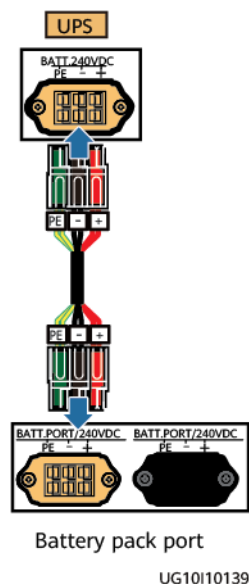
If more than one battery pack is connected to the 6 kVA/10 kVA UPS, connect the battery packs in parallel and then connect them to the UPS battery input ports.

Connecting Cables to Battery Packs for a Single UPS2000-G-6 kVA/10 kVA

NOTE

The following wiring diagram uses a standard UPS with one battery pack as an example.

Figure 4-14 Connecting cables to battery packs for a single UPS2000-G-6 kVA/10 kVA

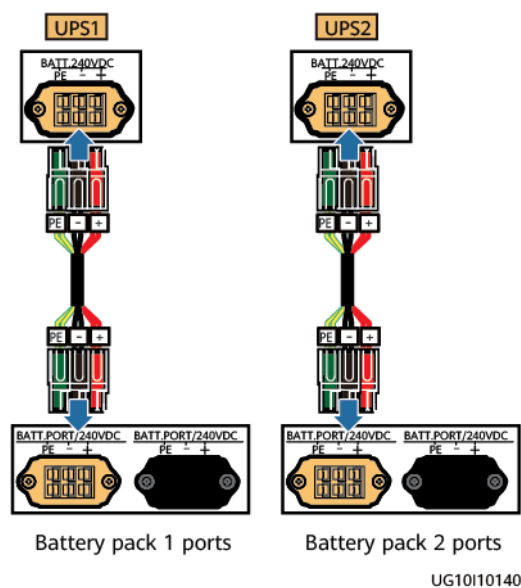


Connecting Cables to Battery Packs for a UPS2000-G-6 kVA/10 kVA Parallel System

NOTE

1. The following wiring diagram uses each standard UPS with one battery pack as an example.
2. In a UPS2000-G-6 kVA/10 kVA parallel system, each UPS can be configured with one to four battery packs. The cable connection methods for each UPS and battery pack are the same as those for a single UPS.

Figure 4-15 Connecting cables to battery packs for a UPS2000-G-6 kVA/10 kVA parallel system



4.4.2 Connecting Cables to Battery Packs for UPS2000-G-15 kVA/20 kVA

NOTE

1. A 15 kVA/20 kVA UPS requires serial connection of two battery packs in each group. A maximum of four groups with eight battery packs can be connected in parallel. If more than two battery packs need to be connected to the 15 kVA/20 kVA UPS, connect the UPS battery input ports first, and then connect the battery packs that have been connected in parallel, as shown in the following figure. Connect battery packs 1, 3, 5, and 7 in parallel and battery packs 2, 4, 6, and 8 in parallel.

Figure 4-16 Connecting cables between a single 15 kVA/20 kVA UPS and battery packs

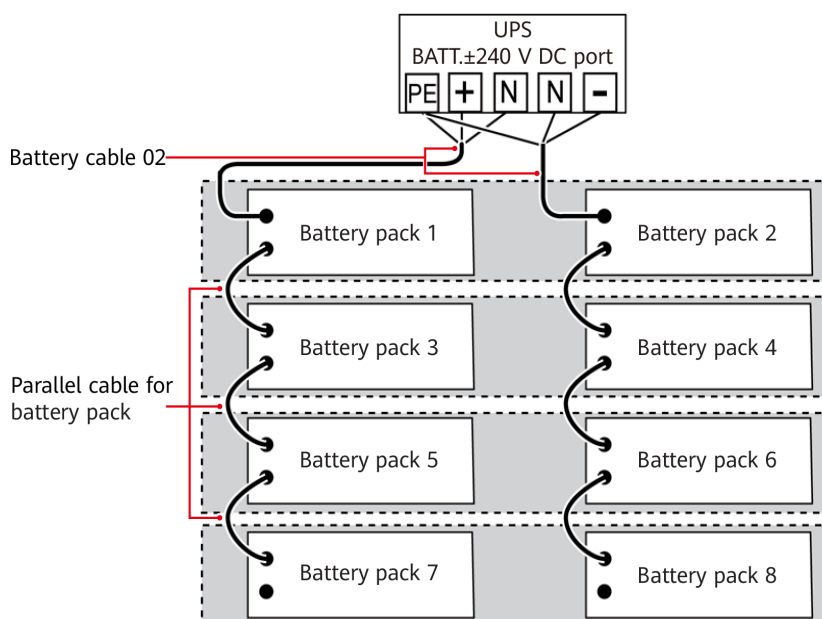
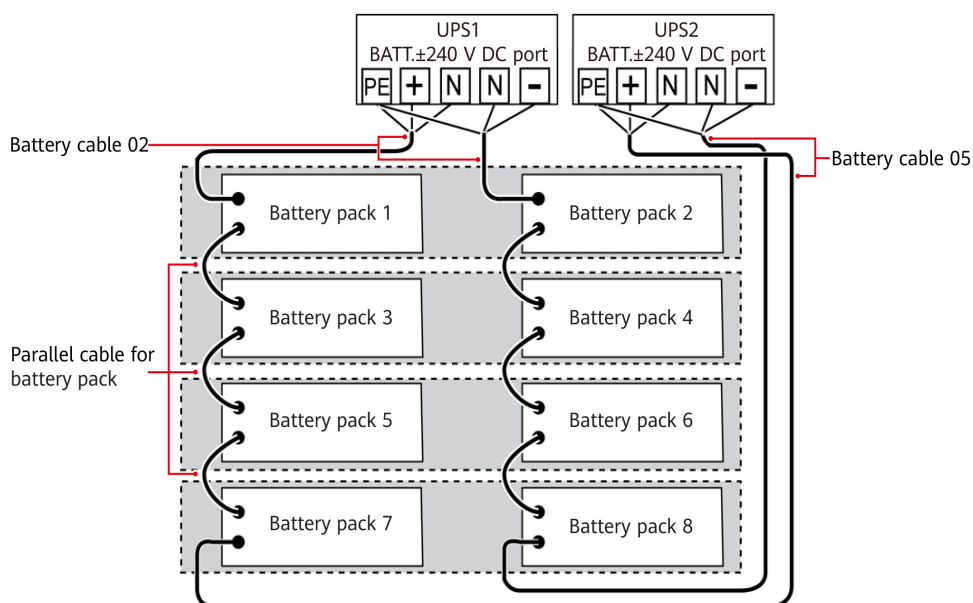


Figure 4-17 Connecting cables between a 15 kVA/20 kVA UPS parallel system and battery packs



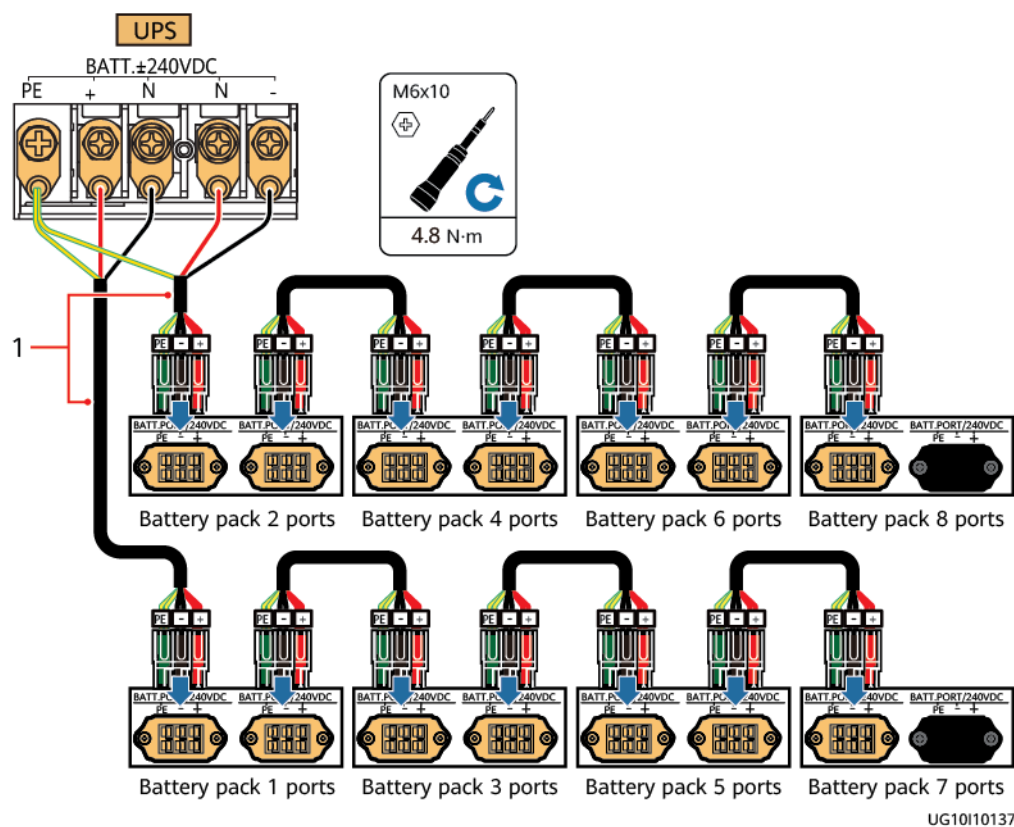
- Note: If battery cable 05 is not used, the connection fails in the battery sharing scenario.
2. If the 15 kVA/20 kVA UPS parallel system does not share battery packs, the cable connection methods for each UPS and battery pack in the parallel system are the same as those in a single 15 kVA/20 kVA UPS system.

Connecting Cables to Battery Packs for a Single UPS2000-G-15 kVA/20 kVA

NOTICE

When a single 15 kVA/20 kVA UPS is configured with two battery packs, the maximum charge current must be less than or equal to 1.0 A.

Figure 4-18 Connecting cables to battery packs for a single UPS2000-G-15 kVA/20 kVA



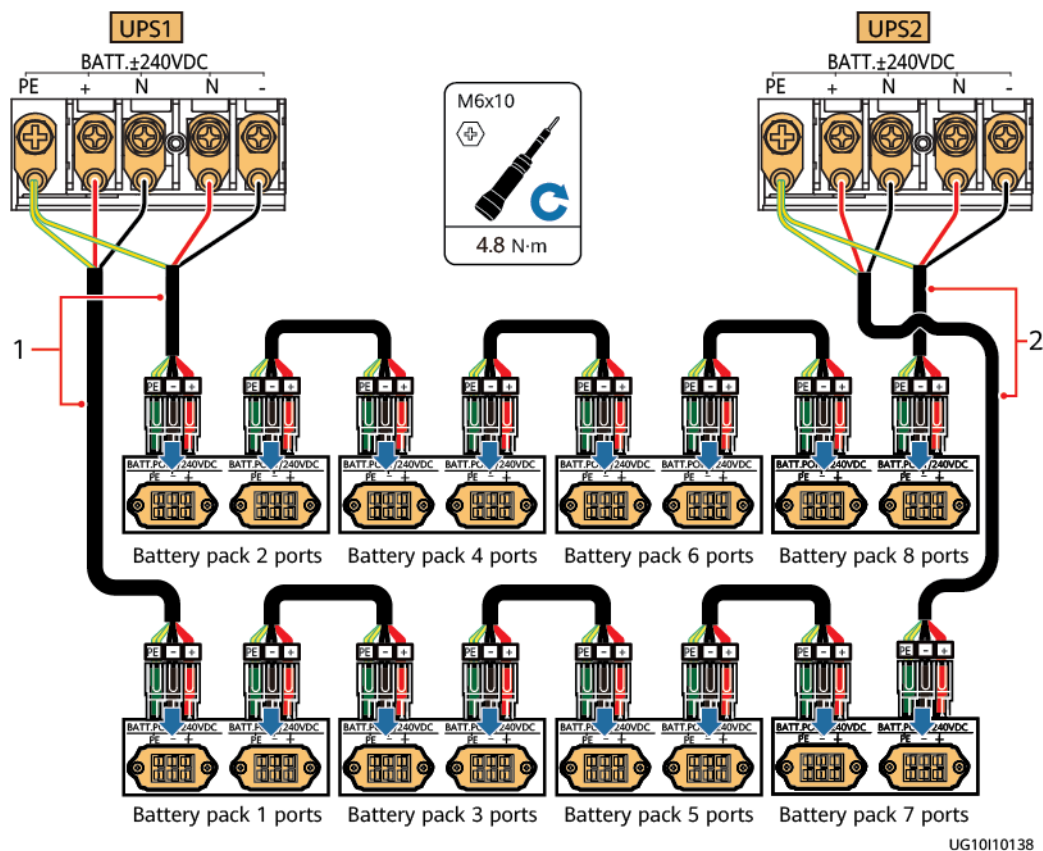
(1) Battery cables 02

Connecting Cables to Shared Battery Packs for a UPS2000-G-15 kVA/20 kVA Parallel System

NOTE

If the 15 kVA/20 kVA UPS parallel system does not share battery packs, the cable connection methods for each UPS and battery pack in the parallel system are the same as those in a single 15 kVA/20 kVA UPS system.

Figure 4-19 Connecting cables to shared battery packs for a UPS2000-G-15 kVA/20 kVA parallel system



(1) Battery cables 02

(2) Battery cables 05

NOTE

After connecting cables, install the delivered front panels for the battery packs.

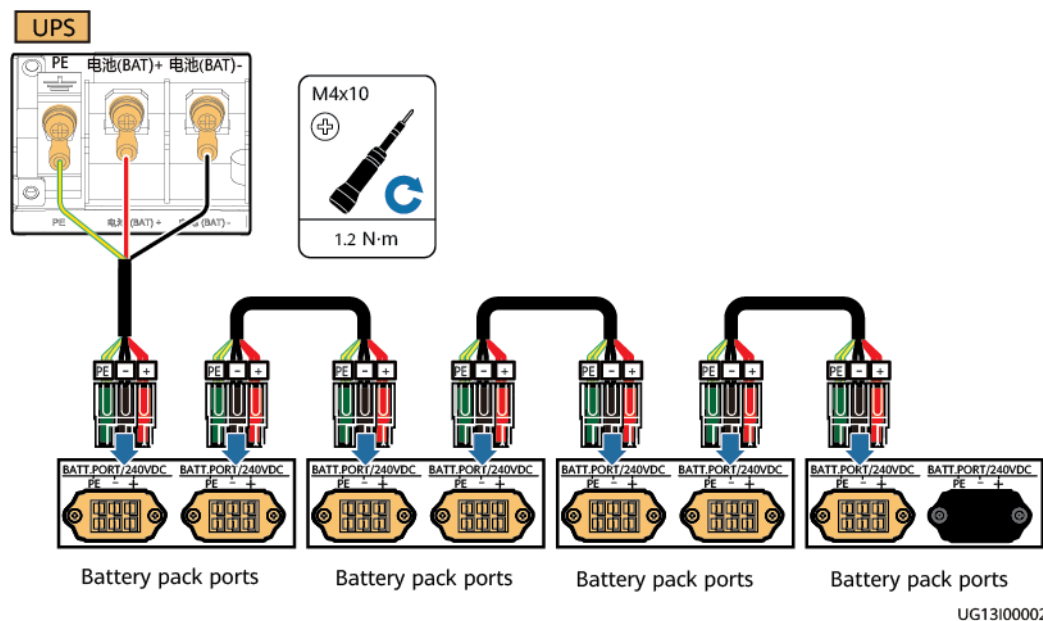
4.4.3 Connecting Cables to Battery Packs for UPS2000-H-6 kVA

Connecting Cables to Battery Packs for a Single UPS2000-H-6 kVA

NOTE

The battery pack cable connections for a single UPS2000-H-6 kVA are similar to those for a single UPS2000-H-10 kVA. The following wiring diagram uses a single 6 kVA UPS with four battery packs as an example to describe how to connect cables.

Figure 4-20 One UPS (model UPS2000-H-6 kVA) + four battery packs

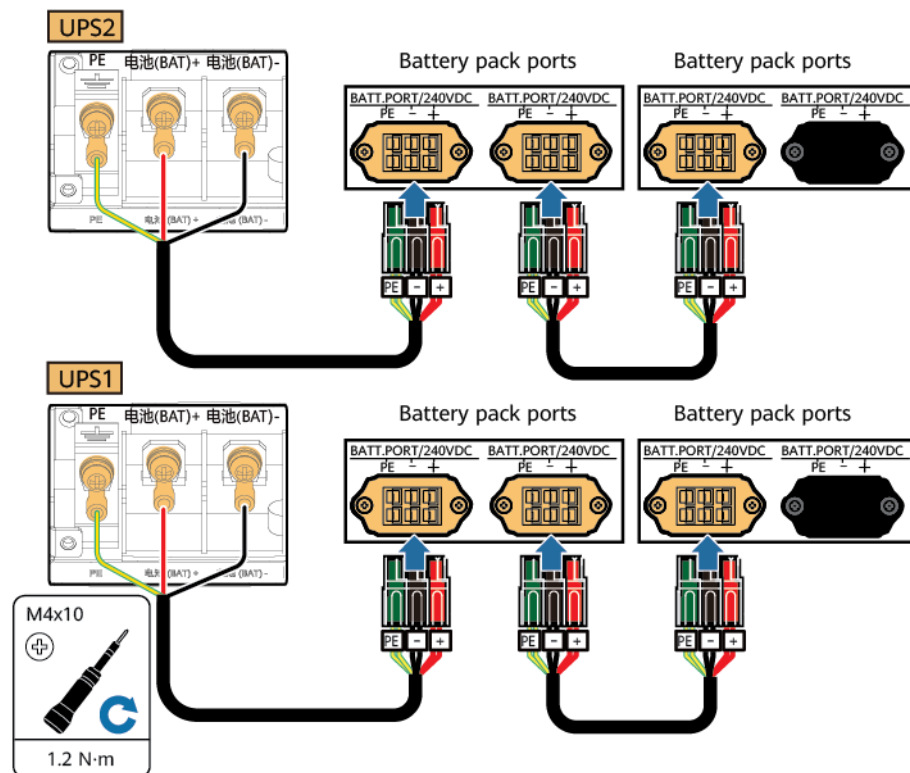


Connecting Cables to Battery Packs for a UPS2000-H-6 kVA Parallel System

NOTE

- The battery pack cable connections for a UPS2000-H-6 kVA parallel system are similar to those for a UPS2000-H-10 kVA parallel system. The following wiring diagram uses a 6 kVA UPS parallel system with four battery packs as an example to describe how to connect cables. Each UPS can be configured with one to four battery packs. The cable connection methods for each UPS and battery pack are the same as those for a single UPS.

Figure 4-21 Two UPSs (model UPS2000-H-6 kVA) + four battery packs



UG13100008

4.5 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 rubber gloves and protective clothing to prevent skin contact with electrolyte in the case of electrolyte overflow.
- When moving batteries, do not place batteries upside down. Handle them gently, and pay attention to personal safety.
- Keep the battery switch off during installation and maintenance.
- If the battery warranty period expires, the battery may be aged and cannot provide backup power properly. Battery aging will cause uncertain failures. You are advised to periodically check and replace batteries whose warranty period has expired.

Battery Maintenance Precautions

- Before battery maintenance, insulate tools such as wrenches. Do not place any objects on the top of batteries.
- Do not use any organic solvent to clean batteries.
- Do not remove the safety valve or fill anything into a battery.
- Do not smoke or use 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.
- If batteries have not been discharged for a long time, discharge and charge them in equalized mode at least once every three months to activate them. Each charge should last at least four hours.
- Normally, discharge and charge batteries once every four to six months. Each charge should last at least four hours.
- In high-temperature areas, discharge and charge batteries once every two months. Each charge should last at least four hours.
- After discharging, fully charge the battery immediately (within 24 hours) to avoid overdischarge.
- The maximum battery discharge duration can be set to 0 to 24 hours. The default value is **16Hour**. If you set the value to **0Hour**, the discharge duration is not limited.

Battery Routine Maintenance

Table 4-1 Battery routine maintenance

Check Content	Baseline Requirement	Troubleshooting	Maintenance Interval
Battery management alarm	No battery management alarm is generated.	Find the alarm cause based on the alarm information.	Monthly

Check Content	Baseline Requirement	Troubleshooting	Maintenance Interval
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 technical support.	Monthly
Battery operating temperature	1. The ambient temperature of the battery is $25\pm5^{\circ}\text{C}$. 2. The battery operating temperature ranges from 0°C to 40°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 the technical support personnel.	Monthly

Check Content	Baseline Requirement	Troubleshooting	Maintenance Interval
Battery string charge voltage	- Equalized charge voltage: 14.1 V x Number of batteries (tolerance $\pm 1\%$) - Float charge voltage: 13.5 V x Number of batteries (tolerance $\pm 1\%$)	- 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. - Check whether the equalized charge voltage and float charge voltage are correctly set for the UPS. - If the fault persists, contact the technical support personnel.	Monthly
Battery temperature sensor measurement accuracy	The deviation between the detected temperature and the displayed temperature must be less than 3°C.	- Install the battery temperature sensor in the correct position. - Replace the battery temperature sensor.	Quarterly
Battery management parameter settings	Check that the settings of battery management parameters meet the requirements in the user manual.	Set parameters correctly.	Quarterly

Check Content	Baseline Requirement	Troubleshooting	Maintenance Interval
Tightness of battery screws	The location of the signs marked on battery terminal screws indicating tight connections does not change.	Take photos from multiple angles and contact technical support.	Quarterly
Cables between batteries	No cable deteriorates and the insulation layer does not crack.	Replace the faulty cable.	Quarterly
Battery voltage	- Equalized charge voltage: 14.1 V (tolerance: ± 0.1 V) - Float charge voltage: 13.5 V (tolerance: ± 0.1 V)	1. Check whether the equalized charge voltage and float charge voltage of a battery are normal. 2. If the charge voltage of a battery exceeds the specifications, perform a complete forcible equalized charge for the battery, and check again whether the voltage is normal. 3. If the fault persists, contact the technical support personnel.	Quarterly
Shallow discharge test (recommended).	Conduct a shallow discharge test when the UPS is backed up to verify that the batteries can discharge properly.	1. Identify the cause when an exception occurs. 2. If the fault persists, contact the technical support personnel.	Quarterly

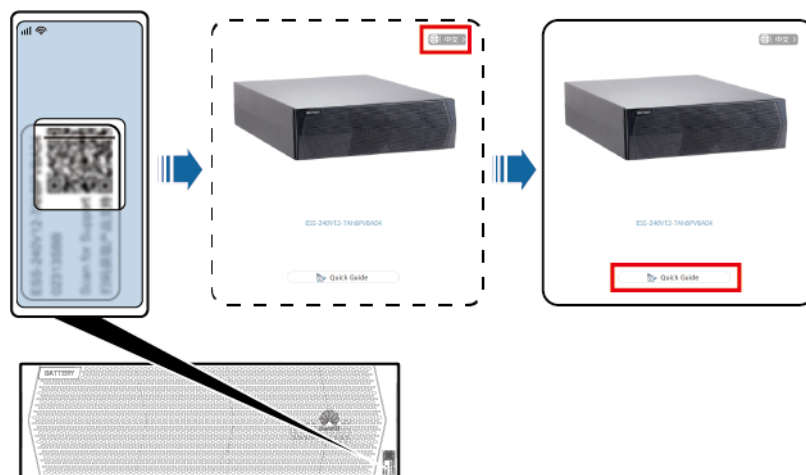
Check Content	Baseline Requirement	Troubleshooting	Maintenance Interval
Capacity test (recommended)	When the UPS is backed up, discharge a battery to the undervoltage alarm threshold to refresh the capacity of the battery.	1. Identify the cause when an exception occurs. 2. If the fault persists, contact the technical support personnel.	Yearly
Battery connection reliability	1. When battery strings are powered off, check the reliability of each connection point from positive terminals to negative terminals. Check that all points are connected reliably. 2. Use a torque wrench to check the tightening torque for each battery screw. The torque must meet the requirements of the battery manufacturer. After checking that the battery screws meet the requirements, mark the screws for later check.	1. Rectify abnormal connection if any. 2. If the fault persists, contact the technical support personnel.	Yearly

A Obtaining Product Documents Through QR Code Scanning

Procedure

- Step 1** Use a mobile phone browser to scan the QR code on the battery pack panel.
- Step 2** (Optional) Select a display language.
- Step 3** Tap **Quick Guide** to access the quick guide of the product.

Figure A-1 Obtaining product documents through QR code scanning



UG101/10136

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B Battery Backup Time

NOTICE

- The following table lists the backup time upon factory delivery, which decreases as the battery capacity decreases. The table is for reference only.
- The ESS-240V12-7AhBPVBA04 battery BOM number is 02313SBB.
- The ESS-240V12-9AhBPVBA04 battery BOM number is 02313SBA.

B.1 UPS2000-G-6 kVA/10 kVA/15 kVA/20 kVA Backup Time

Table B-1 Backup time of the ESS-240V12-7AhBPVBA04 battery pack (6 kVA UPS; calculated based on 94% battery efficiency)

Load (%)	Load (W)	One Battery Pack (min)	Two Battery Packs (min)	Three Battery Packs (min)	Four Battery Packs (min)
100%	5400	6	19	29	46
80%	4320	9	25	43	57
50%	2700	19	46	68	92
30%	1620	36	77	120	174

Table B-2 Backup time of the ESS-240V12-9AhBPVBA04 battery pack (10 kVA UPS; calculated based on 94% battery efficiency)

Load (%)	Load (W)	One Battery Pack (min)	Two Battery Packs (min)	Three Battery Packs (min)	Four Battery Packs (min)
100%	9000	4	12	23	32
80%	7200	7	17	29	44
50%	4500	12	32	53	70
30%	2700	26	57	88	125

Table B-3 Backup time of the ESS-240V12-9AhBPVBA04 battery pack (15 kVA UPS; calculated based on 94% battery efficiency)

Load (%)	Load (W)	Two Battery Packs (min)	Four Battery Packs (min)	Six Battery Packs (min)	Eight Battery Packs (min)
100%	13500	7	19	32	48
80%	10800	9	26	44	57
50%	6750	18	48	70	96
30%	4050	35	79	125	171

Table B-4 Backup time of the ESS-240V12-9AhBPVBA04 battery pack (20 kVA UPS; calculated based on 94% battery efficiency)

Load (%)	Load (W)	Two Battery Packs (min)	Four Battery Packs (min)	Six Battery Packs (min)	Eight Battery Packs (min)
100%	18000	4	12	23	32
80%	14400	7	17	29	44
50%	9000	12	32	53	70
30%	5400	26	57	88	125

B.2 UPS2000-H-6 kVA/10 kVA Backup Time

Table B-5 Backup time parameters for the battery pack ESS-240V12-7AhBPVBA04 (6 kVA UPS; calculated based on 90% battery efficiency)

Load (%)	Load (W)	One Battery Pack (min)	Two Battery Packs (min)	Three Battery Packs (min)	Four Battery Packs (min)
100	6000	5	15	27	35
80	4800	8	20	36	49
50	3000	15	35	59	83
30	1800	30	65	110	164

Table B-6 Backup time parameters for the battery pack ESS-240V12-9AhBPVBA04 (6 kVA UPS; calculated based on 90% battery efficiency)

Load (%)	Load (W)	One Battery Pack (min)	Two Battery Packs (min)	Three Battery Packs (min)	Four Battery Packs (min)
100	6000	8	19	33	42
80	4800	9	29	44	58
50	3000	19	44	78	110
30	1800	36	87	147	206

Table B-7 Backup time parameters for the battery pack ESS-240V12-7AhBPVBA04 (10 kVA UPS; calculated based on 90% battery efficiency)

Load (%)	Load (W)	One Battery Pack (min)	Two Battery Packs (min)	Three Battery Packs (min)	Four Battery Packs (min)
100	10000	3	6	13	19
80	8000	4	10	17	27
50	5000	6	19	32	43
30	3000	15	36	52	83

Table B-8 Backup time parameters for the battery pack ESS-240V12-9AhBPVBA04 (10 kVA UPS; calculated based on 90% battery efficiency)

Load (%)	Load (W)	One Battery Pack (min)	Two Battery Packs (min)	Three Battery Packs (min)	Four Battery Packs (min)
100	10000	4	9	17	27
80	8000	5	13	25	33
50	5000	9	26	38	50
30	3000	19	42	75	105

C Troubleshooting

Low Battery Voltage

Possible cause: The mains is abnormal, and the batteries are overdischarged.

Measure: Connect to the mains supply in non-battery test state.

No Voltage at Battery Pack Port

Possible cause: The battery pack cable is short-circuited, and the fuse is blown.

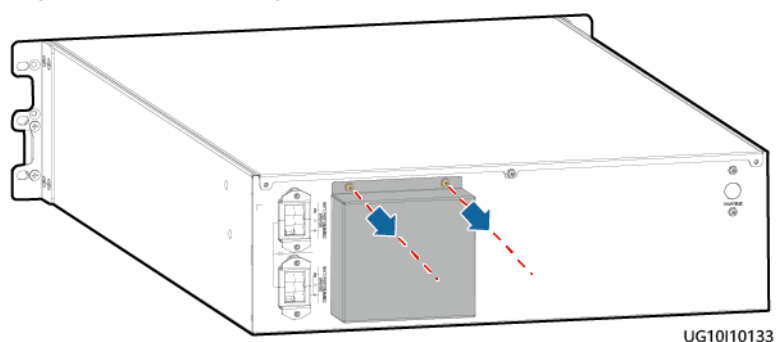
Measure: Replace the fuse board.

D Replacing a Fuse Board

Step 1 Remove the cables between the UPS and battery packs.

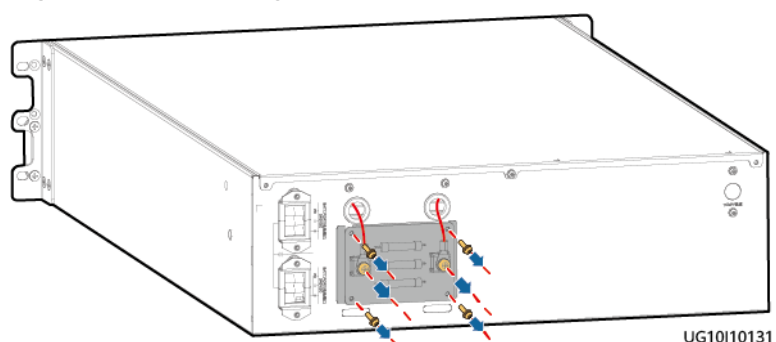
Step 2 Remove the cover from the fuse board.

Figure D-1 Removing the cover



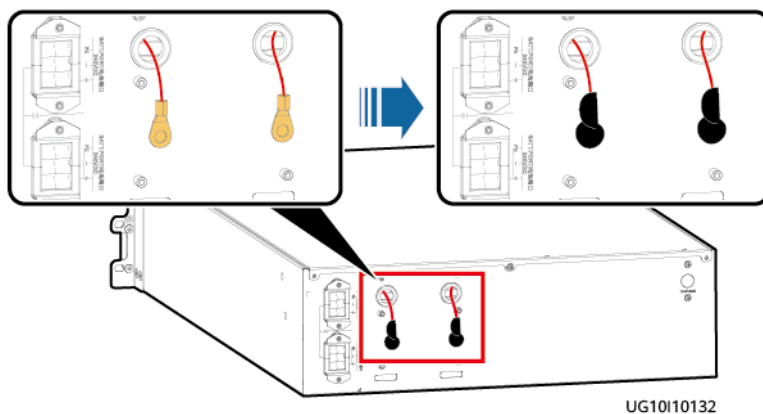
Step 3 Remove the cables and then the fuse board.

Figure D-2 Removing the cables and fuse board



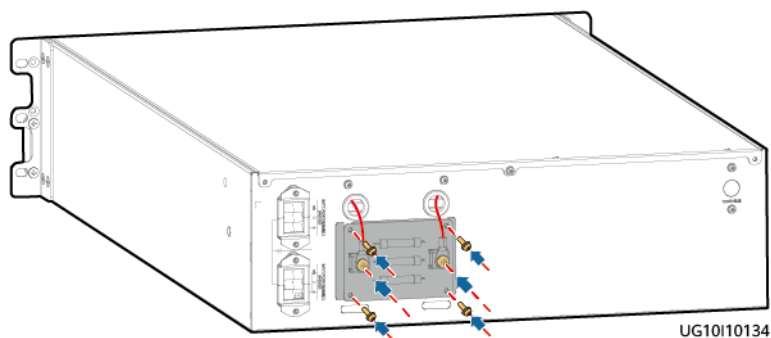
Step 4 Wrap cable connectors with insulation tape.

Figure D-3 Wrapping cable connectors



Step 5 Install a new fuse board and reconnect the cables.

Figure D-4 Installing the fuse board and cables



Step 6 Reinstall the cover on the fuse board.

Step 7 Reconnect the cables between the UPS and battery packs.

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