LUNA2000-(215-2S10, 215-2S12) Smart String ESS

Maintenance Manual

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About This Document

Purpose

This document describes routine maintenance, troubleshooting, and parts replacement of LUNA2000-215-2S12 and LUNA2000-215-2S10 Smart String Energy Storage Systems (also referred to as ESSs). Before maintaining the ESS, read this document carefully to understand the safety information as well as functions and features of the ESS.

Intended Audience

This document is intended for:

- Technical support engineers
- Maintenance engineers

Symbol Conventions

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

Symbol	Description
DANGER	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
WARNING	Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
CAUTION	Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. NOTICE is used to address practices not related to personal injury.

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Symbol	Description
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 the changes made in earlier issues.

Issue 01 (2024-07-31)

This issue is the first official release.

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1 Safety Information

Statement

Before transporting, storing, installing, operating, using, and/or maintaining the equipment, read this document, strictly follow the instructions provided herein, and follow all the safety instructions on the equipment and in this document. In this document, "equipment" refers to the products, software, components, spare parts, and/or services related to this document; "the Company" refers to the manufacturer (producer), seller, and/or service provider of the equipment; "you" refers to the entity that transports, stores, installs, operates, uses, and/or maintains the equipment.

The **Danger**, **Warning**, **Caution**, and **Notice** statements described in this document do not cover all the safety precautions. You also need to comply with relevant international, national, or regional standards and industry practices. **The Company shall not be liable for any consequences that may arise due to violations of safety requirements or safety standards concerning the design, production, and usage of the equipment.**

The equipment shall be used in an environment that meets the design specifications. Otherwise, the equipment may be faulty, malfunctioning, or damaged, which is not covered under the warranty. The Company shall not be liable for any property loss, personal injury, or even death caused thereby.

Comply with applicable laws, regulations, standards, and specifications during transportation, storage, installation, operation, use, and maintenance.

Do not perform reverse engineering, decompilation, disassembly, adaptation, implantation, or other derivative operations on the equipment software. Do not study the internal implementation logic of the equipment, obtain the source code of the equipment software, violate intellectual property rights, or disclose any of the performance test results of the equipment software.

The Company shall not be liable for any of the following circumstances or their consequences:

- The equipment is damaged due to force majeure such as earthquakes, floods, volcanic eruptions, debris flows, lightning strikes, fires, wars, armed conflicts, typhoons, hurricanes, tornadoes, and other extreme weather conditions.
- The equipment is operated beyond the conditions specified in this document.

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- The equipment is installed or used in environments that do not comply with international, national, or regional standards.
- The equipment is installed or used by unqualified personnel.
- You fail to follow the operation instructions and safety precautions on the product and in the document.
- You remove or modify the product or modify the software code without authorization.
- You or a third party authorized by you cause the equipment damage during transportation.
- The equipment is damaged due to storage conditions that do not meet the requirements specified in the product document.
- You fail to prepare materials and tools that comply with local laws, regulations, and related standards.
- The equipment is damaged due to your or a third party's negligence, intentional breach, gross negligence, or improper operations, or other reasons not related to the Company.

1.1 Personal Safety

DANGER

Ensure that power is off during installation. Do not install or remove a cable with power on. Transient contact between the core of the cable and the conductor will cause electric arcs, sparks, fire, or explosion, which may result in personal injury.

DANGER

Non-standard and improper operations on the energized equipment may cause fire, electric shocks, or explosion, resulting in property damage, personal injury, or even death.

DANGER

Before operations, remove conductive objects such as watches, bracelets, bangles, rings, and necklaces to prevent electric shocks.

DANGER

During operations, use dedicated insulated tools to prevent electric shocks or short circuits. The dielectric withstanding voltage level must comply with local laws, regulations, standards, and specifications.

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WARNING

During operations, wear personal protective equipment such as protective clothing, insulated shoes, goggles, safety helmets, and insulated gloves.

General Requirements

- Do not stop protective devices. Pay attention to the warnings, cautions, and related precautionary measures in this document and 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.
- Do not touch the power supply equipment directly or with conductors such as damp objects. Before touching any conductor surface or terminal, measure the voltage at the contact point to ensure that there is no risk of electric shock.
- Do not touch operating equipment because the enclosure is hot.
- Do not touch a running fan with your hands, components, screws, tools, or boards. Otherwise, personal injury or equipment damage may occur.
- 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 enter the affected building or equipment area under any circumstances.

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 adequate training, be able to correctly perform all operations, and understand all necessary safety precautions and local relevant standards.
- 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 must possess the required local qualifications.
- Only certified high-voltage electricians are allowed to operate medium-voltage equipment.

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- Only authorized professionals are allowed to replace the equipment or components (including software).
- Only personnel who need to work on the equipment are allowed to access the equipment.

1.2 Electrical Safety

DANGER

Before connecting cables, ensure that the equipment is intact. Otherwise, electric shocks or fire may occur.

DANGER

Non-standard and improper operations may result in fire or electric shocks.

DANGER

Prevent foreign matter from entering the equipment during operations. Otherwise, equipment short-circuits or damage, load power derating, power failure, or personal injury may occur.

WARNING

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.

CAUTION

Do not route cables near the air intake or exhaust vents of the equipment.

General Requirements

- Follow the procedures described in the document for installation, operation, and maintenance. Do not reconstruct or alter the equipment, add components, or change the installation sequence without permission.
- Obtain approval from the national or local electric utility company before connecting the equipment to the grid.
- Observe the power plant safety regulations, such as the operation and work ticket mechanisms.
- Install temporary fences or warning ropes and hang "No Entry" signs around the operation area to keep unauthorized personnel away from the area.

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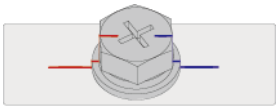
- Before installing or removing power cables, turn off the switches of the equipment and its upstream and downstream switches.
- If any liquid is detected inside the equipment, disconnect the power supply immediately and do not use the equipment.
- Before performing operations on the equipment, check that all tools meet the requirements and record the tools. After the operations are complete, collect all of the tools to prevent them from being left inside the equipment.
- Before installing power cables, check that cable labels are correct and cable terminals are insulated.
- When installing the equipment, use a torque tool of a proper measurement 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.
- Ensure that bolts are tightened with a torque tool and marked in red and blue after double-check. Installation personnel mark tightened bolts in blue. Quality inspection personnel confirm that the bolts are tightened and then mark them in red. (The marks must cross the edges of the bolts.)



- After the installation is complete, ensure that protective cases, insulation tubes, and other necessary items for all electrical components are in position to avoid electric shocks.
- If the equipment has multiple inputs, disconnect all the inputs before operating the equipment.
- Before maintaining a downstream electrical or power distribution device, turn off the output switch on the power supply equipment.
- During equipment maintenance, attach "Do not switch on" labels near the upstream and downstream switches or circuit breakers as well as warning signs to prevent accidental connection. The equipment can be powered on only after troubleshooting is complete.
- If fault diagnosis and troubleshooting need to be performed after power-off, take the following safety measures: Disconnect the power supply. Check whether the equipment is live. Install a ground cable. Hang warning signs and set up fences.
- Check equipment connections periodically, ensuring that all screws are securely tightened.
- Only qualified professionals can replace a damaged cable.
- Do not scrawl, damage, or block any labels or nameplates on the equipment. Promptly replace labels that have worn out.
- Do not use solvents such as water, alcohol, or oil to clean electrical components inside or outside of the equipment.

Grounding

- Ensure that the grounding impedance of the equipment complies with local electrical standards.

- 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 work on the equipment in the absence of a properly installed ground conductor.
- Do not damage the ground conductor.
- If high touch current may occur on the equipment, ground the protective ground terminal on the equipment enclosure before connecting the power supply; otherwise, electric shock as a result of touch current may occur.

Cabling Requirements

- When selecting, installing, and routing cables, follow local safety regulations and rules.
- When routing power cables, ensure that there is no coiling or twisting. Do not join or weld power cables. If necessary, use a longer cable.
- Ensure that all cables are properly connected and insulated, and meet specifications.
- Ensure that the slots and holes for routing cables are free from sharp edges, and that the positions where cables are routed through pipes or cable holes are equipped with cushion materials to prevent the cables from being damaged by sharp edges or burrs.
- If a cable is routed into the cabinet from the top, bend the cable in a U shape outside the cabinet and then route it into the cabinet.
- Ensure that cables of the same type are bound together neatly and straight and that the cable sheath is intact. When routing cables of different types, ensure that they are at least 30 mm away from each other.
- When cable connection is completed or paused for a short period of time, seal the cable holes with sealing putty immediately to prevent small animals or moisture from entering.
- Secure buried cables using cable supports and cable clips. Ensure that the cables in the backfill area are in close contact with the ground to prevent cable deformation or damage during backfilling.
- If the external conditions (such as the cable layout or ambient temperature) change, verify the cable usage in accordance with the IEC-60364-5-52 or local laws and regulations. For example, check that the current-carrying capacity meets requirements.
- When routing cables, reserve at least 30 mm clearance between the cables and heat-generating components or areas. This prevents deterioration or damage to the cable insulation layer.
- 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 below 0°C must be stored at room temperature for more than 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.

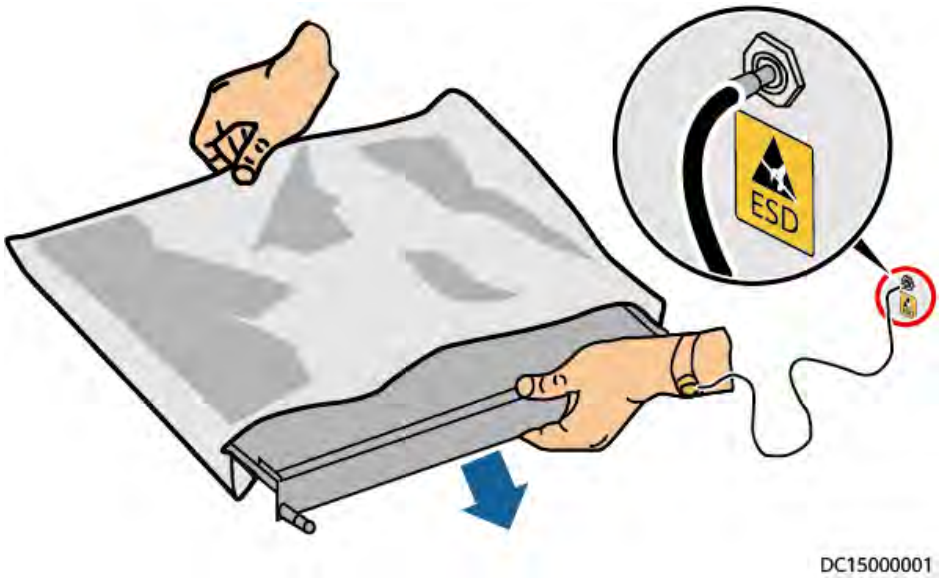
ESD

NOTICE

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

- When touching the equipment and handling boards, modules with exposed circuit boards, or application-specific integrated circuits (ASICs), observe ESD protection regulations and wear ESD clothing and ESD gloves or a well-grounded ESD wrist strap.

  Figure 1-1 Wearing an ESD wrist strap



- When holding a board or a module with exposed circuit boards, hold its edge without touching any components. Do not touch the components with bare hands.
- Package boards or modules with ESD packaging materials before storing or transporting them.

1.3 Environment Requirements

DANGER

Do not expose the equipment to flammable or explosive gas or smoke. Do not perform any operation on the equipment in such environments.

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DANGER

Do not store any flammable or explosive materials in the equipment area.

DANGER

Do not place the equipment near heat sources or fire sources, such as smoke, candles, heaters, or other heating devices. Overheat may damage the equipment or cause a fire.

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.

WARNING

To prevent damage or fire due to high temperature, ensure that the ventilation vents or heat dissipation systems are not obstructed or covered by other objects while the equipment is running.

General Requirements

- Ensure that the equipment is stored in a clean, dry, and well ventilated area with proper temperature and humidity and is protected from dust and condensation.
- Keep the installation and operating environments of the equipment within the allowed ranges. Otherwise, its performance and safety will be compromised.
- 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, performing outdoor installation, and opening doors) in harsh weather conditions such as lightning, rain, snow, and level 6 or stronger wind.
- Do not install the equipment in an environment with dust, smoke, volatile or corrosive gases, infrared and other radiations, organic solvents, or salty air.
- Do not install the equipment in an environment with conductive metal or magnetic dust.
- Do not install the equipment in an area conducive to the growth of microorganisms such as fungus or mildew.
- Do not install the equipment in an area with strong vibration, noise, or electromagnetic interference.

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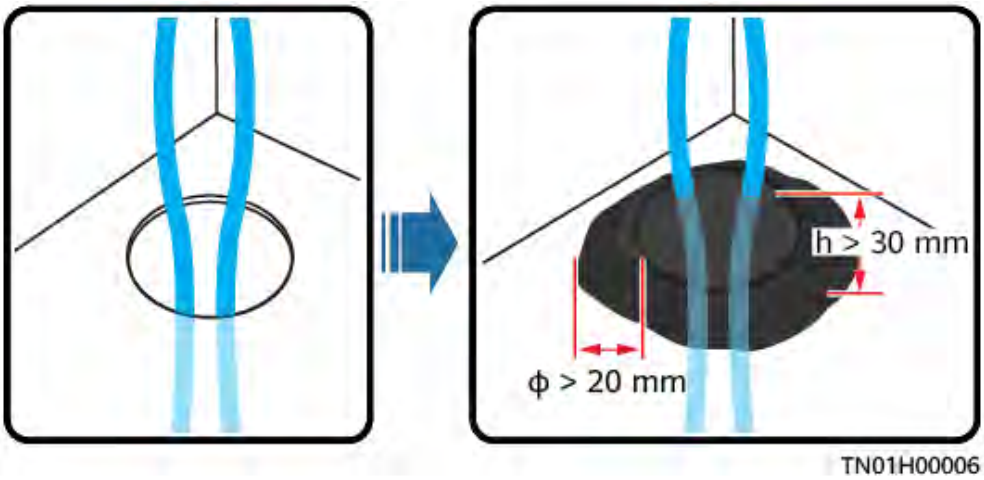
- Ensure that the site complies with local laws, regulations, and related standards.
- Ensure that the ground in the installation environment is solid, free from spongy or soft soil, and not prone to subsidence. The site must not be located in a low-lying land prone to water or snow accumulation, and the horizontal level of the site must be above the highest water level of that area in history.
- Do not install the equipment in a position that may be submerged in water.
- If the equipment is installed in a place with abundant vegetation, in addition to routine weeding, harden the ground underneath the equipment using cement or gravel.
- Before opening doors during the installation, operation, and maintenance of the equipment, clean up any water, ice, snow, or other foreign objects on the top of the equipment to prevent foreign objects from falling into the equipment.
- When installing the equipment, ensure that the installation surface is solid enough to bear the weight of the equipment.
- All cable holes must be sealed. Seal the used cable holes with sealing putty. Seal the unused cable holes with the caps delivered with the equipment. The following figure shows the criteria for correct sealing with sealing putty.



- After installing the equipment, remove the packing materials such as cartons, foam, plastics, and cable ties from the equipment area.

1.4 Mechanical Safety

DANGER

When working at heights, wear a safety helmet and safety harness or waist belt 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.

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WARNING

Ensure that all necessary tools are ready and inspected by a professional organization. Do not use tools that have signs of scratches or fail to pass the inspection or whose inspection validity period has expired. Ensure that the tools are secure and not overloaded.

WARNING

Before installing equipment in a cabinet, ensure that the cabinet is securely fastened with a balanced center of gravity. Otherwise, tipping or falling cabinets may cause bodily injury and equipment damage.

WARNING

When pulling equipment out of a cabinet, be aware of unstable or heavy objects in the cabinet to prevent injury.

WARNING

Do not drill holes into the equipment. Doing so may affect the sealing performance and electromagnetic containment of the equipment and damage components or cables inside. Metal shavings from drilling may short-circuit boards inside the equipment.

General Requirements

- Repaint any paint scratches caused during equipment transportation or installation in a timely manner. Equipment with scratches must not be exposed for an extended period of time.
- Do not perform operations such as arc welding and cutting on the equipment without evaluation by the Company.
- Do not install other devices on the top of the equipment without evaluation by the Company.
- When performing operations over the top of the equipment, take measures to protect the equipment against damage.
- Use correct tools and operate them in the correct way.

Moving Heavy Objects

- Be cautious to prevent injury when moving heavy objects.

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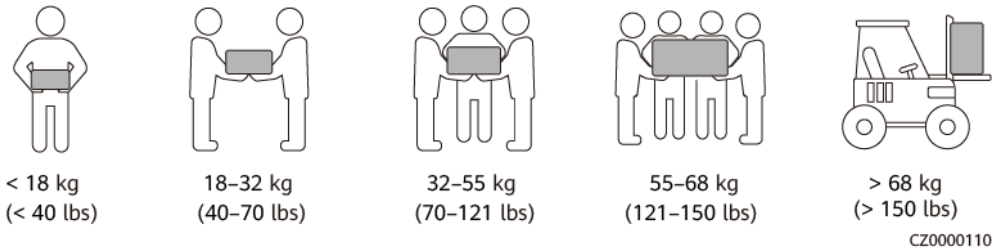
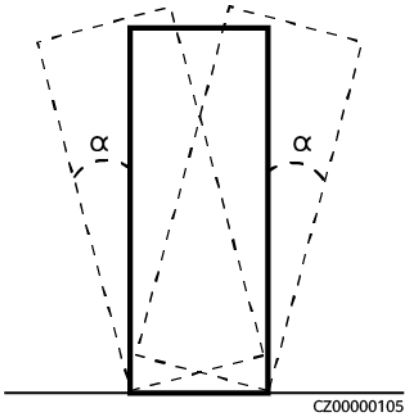


- If multiple persons need to move a heavy object together, determine the manpower and work division with consideration of height and other conditions to ensure that the weight is equally distributed.
- If two persons or more move a heavy object together, ensure that the object is lifted and landed simultaneously and moved at a uniform pace under the supervision of one person.
- Wear personal protective gears such as protective gloves and shoes when manually moving the equipment.
- To move an object by hand, approach to the object, squat down, and then lift the object gently and stably by the force of the legs instead of your back. Do not lift it suddenly or turn your body around.
- Move or lift the equipment by holding its handles or lower edges. Do not hold the handles of modules that are installed in the equipment.
- Do not quickly lift a heavy object above your waist. Place the object on a workbench that is half-waist high or any other appropriate place, adjust the positions of your palms, and then lift it.
- Move a heavy object stably with balanced force at an even and low speed. Put down the object stably and slowly to prevent any collision or drop from scratching the surface of the equipment or damaging the components and cables.
- When moving a heavy object, be aware of the workbench, slope, staircase, and slippery places. When moving a heavy object through a door, ensure that the door is wide enough to move the object and avoid bumping or injury.
- When transferring a heavy object, move your feet instead of turning your waist around. When lifting and transferring a heavy object, ensure that your feet point to the target direction of movement.
- When transporting the equipment using a pallet truck or forklift, ensure that the tynes are properly positioned so that the equipment does not topple. Before moving the equipment, secure it to the pallet truck or forklift using ropes. When moving the equipment, assign dedicated personnel to take care of it.
- Ensure that tilt angle of the cabinet meets the requirements shown in the figure. The tilt angle α of a cabinet with packaging must be less than or equal to 15°. After the cabinet is unpacked, its tilt angle α must be less than or equal to 10°.



Working at Heights

- Any operations performed 2 m or higher above the ground shall be supervised properly.
- Only trained and qualified personnel are allowed to work at heights.
- Do not work at heights when steel pipes are wet or other risky situations exist. After the preceding conditions no longer exist, the safety owner and relevant technical personnel need to check the involved equipment. Operators can begin working only after safety is confirmed.
- Set a restricted area and prominent signs for working at heights to warn away irrelevant personnel.
- Set guard rails and warning signs at the edges and openings of the area involving working at heights to prevent falls.
- Do not pile up scaffolding, springboards, or other objects 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.
- Carry operation machines and tools properly to prevent equipment damage or personal injury caused by falling objects.
- Personnel involving working at heights are not allowed to throw objects from the height to the ground, or vice versa. Objects shall be transported by slings, hanging baskets, aerial work platforms, or cranes.
- Do not perform operations on the upper and lower layers at the same time. If unavoidable, install a dedicated protective shelter between the upper and lower layers or take other protective measures. Do not pile up tools or materials on the upper layer.
- Dismantle the scaffolding from top down after finishing the job. Do not dismantle the upper and lower layers at the same time. When removing a part, ensure that other parts will not collapse.
- Ensure that personnel working at heights strictly comply with the safety regulations. The Company is not responsible for any accident caused by violation of the safety regulations on working at heights.
- Behave cautiously when working at heights. Do not rest at heights.

Using Ladders

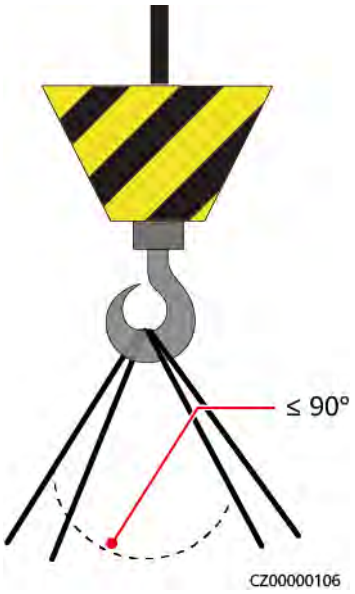
- Use wooden or insulated ladders when you need to perform live-line working at heights.

- Platform ladders with protective rails are preferred. Do not use single ladders.
- 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 and held firm.

- When climbing up the ladder, keep your body stable and your center of gravity between the side rails, and do not overreach to the sides.
- When a step ladder is used, ensure that the pull ropes are secured.

Hoisting

- Only trained and qualified personnel are allowed to perform hoisting operations.
- Install temporary warning signs or fences to isolate the hoisting area.
- Ensure that the foundation where hoisting is performed on meets the load-bearing requirements.
- Before hoisting objects, ensure that hoisting tools are firmly secured onto a fixed object or wall that meets the load-bearing requirements.
- During hoisting, do not stand or walk under the crane or the hoisted objects.
- Do not drag steel ropes and hoisting tools or bump the hoisted objects against hard objects during hoisting.
- Ensure that the angle between two hoisting ropes is no more than 90 degrees, as shown in the following figure.



Drilling Holes

- Obtain consent from the customer and contractor before drilling holes.
- Wear protective equipment such as safety goggles and protective gloves when drilling holes.
- To avoid short circuits or other risks, do not drill holes into buried pipes or cables.
- When drilling holes, protect the equipment from shavings. After drilling, clean up any shavings.

1.5 Equipment Safety

1.5.1 ESS Safety

DANGER

Do not open cabinet doors when the system is running.

DANGER

If the ESS is faulty, do not stand within the opening range of the cabinet doors.

CAUTION

Evacuate from the site immediately once the fire alarm horn/strobe is triggered.

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- When installing the ESS, comply with the fire separation distance or fire wall requirements specified in local standards, including but not limited to *GB 51048-2014 Design Code for Electrochemical Energy Storage Station* and *NFPA 855 Standard for the Installation of Stationary Energy Storage Systems*.
- Check the fire safety of the ESS regularly, at least once a month.
- When inspecting the system with power on, pay attention to the hazard warning signs on the equipment. Do not stand at the battery cabin doors.
- After power components of the ESS are replaced or cable connections are changed, you need to manually start cable connection detection to prevent system malfunction.
- It is recommended that you prepare a camera to record the detailed processes of equipment installation, operation, and maintenance.

1.5.2 Battery Safety

DANGER

Do not connect the positive and negative poles of a battery together. Otherwise, the battery may be short-circuited. Battery short circuits can generate high instantaneous current and releases a large amount of energy, which may cause battery leakage, smoke, flammable gas release, thermal runaway, fire, or explosion. To avoid battery short circuits, do not maintain batteries with power on.

DANGER

Do not expose batteries at high temperatures or around heat sources, such as scorching sunlight, fire sources, transformers, and heaters. Battery overheating may cause leakage, smoke, flammable gas release, thermal runaway, fire, or explosion.

DANGER

Protect batteries from mechanical vibration, falling, collision, punctures, and strong impact. Otherwise, the batteries may be damaged or catch fire.

DANGER

To avoid leakage, smoke, flammable gas release, thermal runaway, fire, or explosion, do not disassemble, alter, or damage batteries, for example, insert foreign objects into batteries, squeeze batteries, or immerse batteries in water or other liquids.

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DANGER

Do not touch battery terminals with other metal objects, which may cause heat or electrolyte leakage.

DANGER

There is a risk of fire or explosion if the model of the battery in use or used for replacement is incorrect. Use a battery of the model recommended by the manufacturer.

DANGER

Battery electrolyte is toxic and volatile. Do not get contact with leaked liquids or inhale gases in the case of battery leakage or odor. In such cases, stay away from the battery and contact professionals immediately. Professionals must wear safety goggles, rubber gloves, gas masks, and protective clothing, power off the equipment, remove the battery, and contact technical engineers.

DANGER

A battery is an enclosed system and will not release any gases under normal operations. If a battery is improperly treated, for example, burnt, needle-pricked, squeezed, struck by lightning, overcharged, or subject to other adverse conditions that may cause battery thermal runaway, the battery may be damaged or an abnormal chemical reaction may occur inside the battery, resulting in electrolyte leakage or production of gases such as CO and H_2. To prevent fire or device corrosion, ensure that flammable gas is properly exhausted.

DANGER

The gas generated by a burning battery may irritate your eyes, skin, and throat. Take protective measures promptly.

WARNING

Install batteries 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.

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WARNING

Before installing and commissioning batteries, prepare fire fighting facilities, such as fire sand and carbon dioxide fire extinguishers, according to construction standards and regulations. Before putting into operation, ensure that fire fighting facilities that comply with local laws and regulations are installed.

WARNING

Before unpacking, storage, and transportation, ensure that the packing cases are intact and the batteries are correctly placed according to the labels on the packing cases. Do not place a battery upside down or vertically, lay it on one side, or tilt it. Stack the batteries according to the stacking requirements on the packing cases. Ensure that the batteries do not fall or get damaged. Otherwise, they will need to be scrapped.

WARNING

After unpacking batteries, place them in the required direction. Do not place a battery upside down or vertically, lay it on one side, tilt it, or stack it. Ensure that the batteries do not fall or get damaged. Otherwise, they will need to be scrapped.

WARNING

Tighten the screws on copper bars or cables to the torque specified in this document. Periodically confirm whether the screws are tightened, check for rust, corrosion, or other foreign objects, and clean them up if any. Loose screw connections will result in excessive voltage drops and batteries may catch fire when the current is high.

WARNING

After batteries are discharged, charge them in time to avoid damage due to overdischarge.

Statement

The Company shall not be liable for any battery damage, personal injury, death, property loss, and/or other consequences caused by the following reasons:

- Force majeure such as earthquakes, floods, volcanic eruptions, debris flows, lightning strikes, fires, wars, armed conflicts, typhoons, hurricanes, tornadoes, and other extreme weather conditions

- The battery warranty period has expired. You are advised not to use a battery whose warranty period has expired, as this poses safety risks.
- Actions that do not follow instructions in the user manual or direct advice from the Company, including but not limited to the following scenarios:
  - The onsite equipment operating environment or external power parameters do not meet the environment requirements for normal operation, for example, the actual operating temperature of batteries is too high or too low, or the power grid is unstable and experiences outages frequently.
  - Batteries are dropped or incorrectly operated or connected.
  - Batteries are overdischarged due to delayed acceptance or power-on after battery installation.
  - Battery running parameters are incorrectly set.
  - Different types of batteries, for example, batteries of different brands or rated capacities, are used together without prior approval from the Company.
  - Batteries are frequently overdischarged due to improper battery maintenance.
  - Battery use scenarios are changed without prior approval from the Company.
  - Battery maintenance is not performed according to the instructions in the user manual, for example, failing to check battery terminals regularly.
  - Batteries are not transported, stored, or charged according to the instructions in the user manual.
  - Instructions from the Company are not followed during battery relocation or reinstallation.

General Requirements

NOTICE

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

- Before installing, operating, and maintaining batteries, read the battery manufacturer's instructions and comply with their requirements. The safety precautions specified in this document are highly important and require special attention. For additional safety precautions, see the instructions provided by the battery manufacturer.
- Use batteries within the specified temperature range. When the ambient temperature of the batteries is lower than the allowed range, do not charge the batteries to prevent internal short circuits caused during low-temperature charging.
- Do not use a damaged battery (such as damage caused when a battery is dropped, bumped, bulged, or dented on the enclosure), because the damage may cause electrolyte leakage or flammable gas release. In the case of

electrolyte leakage or structural deformation, contact the installer or professional O&M personnel immediately to remove or replace the battery. Do not store the damaged battery near other devices or flammable materials and keep it away from non-professionals.

- Before working on a battery, ensure that there is no irritant or scorched smell around the battery.
- When installing batteries, do not place installation tools, metal parts, or sundries on the batteries. After the installation is complete, clean up the objects on the batteries and the surrounding area.
- Check whether the positive and negative battery terminals are grounded unexpectedly. If so, disconnect the battery terminals from the ground.
- Do not perform welding or grinding work around batteries to prevent fire caused by electric sparks or arcs.
- If batteries are left unused for a long period of time, store and charge them according to the battery requirements.
- Do not charge or discharge batteries by using a device that does not comply with local laws and regulations.
- Keep the battery loop disconnected during installation and maintenance.
- Monitor damaged batteries during storage for signs of smoke, flame, electrolyte leakage, or heat.
- If a battery is faulty, its surface temperature may be high. Do not touch the battery to avoid scalds.
- Do not stand on, lean on, or sit on the top of the equipment.
- When battery packs are installed as spare parts, the following requirements must be met:
  - Before unpacking batteries, check whether the packaging is intact. Do not use batteries with damaged packaging. If any damage is found, notify the carrier and manufacturer immediately.
  - Install batteries within 24 hours after unpacking. If the batteries cannot be installed in time, put them in the original packaging and place them in a dry indoor environment without corrosive gases. Power on the ESS within 24 hours after installation. The process from unpacking batteries to powering on the system must be completed within 72 hours. During routine maintenance, ensure that the power-off time does not exceed 24 hours.
  - Before installing a battery pack, check that its enclosure is not deformed or damaged.
  - When installing batteries, do not place installation tools, metal parts, or sundries on the batteries. After the installation is complete, clean up the objects on the batteries and the surrounding area.
  - Do not install battery packs on rainy, snowy, or foggy days. Otherwise, the battery packs may be corroded by moisture or rain.
  - If batteries are exposed to water accidentally, do not install them. Instead, transport the batteries to a safe isolation point and contact technical engineers in a timely manner.
- In backup power scenarios, do not use the batteries for the following situations:

  - Medical devices substantially important to human life
  - Control equipment such as trains and elevators, as this may cause personal injury
  - Computer systems of social and public importance
  - Locations near medical devices
  - Other devices similar to those described above

Short-Circuit Protection

- When installing and maintaining batteries, wrap the exposed cable terminals on the batteries with insulation tape.
- Avoid foreign objects (such as conductive objects, screws, and liquids) from entering a battery, as this may cause short circuits.

Leakage Handling

NOTICE

Electrolyte leakage may damage the equipment. It will corrode metal parts and boards, and ultimately damage the boards.

Electrolyte is corrosive and can cause irritation and chemical burns. If you come into direct contact with the battery electrolyte, do as follows:

- Inhalation: Evacuate from contaminated areas, get fresh air immediately, and seek immediate medical attention.
- Eye contact: Immediately wash your eyes with water for at least 15 minutes, do not rub your eyes, and seek immediate medical attention.
- Skin contact: Wash the affected areas immediately with soap and water and seek immediate medical attention.
- Intake: Seek immediate medical attention.

Recycling

- Dispose of waste batteries in accordance with local laws and regulations. Do not dispose of batteries as household waste. Improper disposal of batteries may result in environmental pollution or an explosion.
- If a battery leaks or is damaged, contact technical support or a battery recycling company for disposal.
- If batteries are out of service life, contact a battery recycling company for disposal.
- Do not expose waste batteries to high temperatures or direct sunlight.
- Do not place waste batteries in environments with high humidity or corrosive substances.
- Do not use faulty batteries. Contact a battery recycling company to scrap them as soon as possible to avoid environmental pollution.

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2 Routine Maintenance

⚠ CAUTION

Safety requirements in maintenance and repair:

- Before connecting or removing cables, turn off the protection switch of the corresponding loop.
- Place a warning sign indicating that the switch must not be turned on at the position where the switch resides.
- Use an electroscope of a proper voltage level to check whether the equipment is energized and ensure that the equipment is completely powered off.
- If charged bodies are found nearby, block or wrap them with insulation plates or insulation tapes.
- Before performing maintenance or repair, securely connect the loop to be repaired to the main ground loop using a ground cable.
- After the maintenance or repair is complete, remove the ground cable between the loop that has been maintained and the main ground loop.

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NOTICE

Do not open the cabinet door when the humidity is high (relative humidity ≥ 80% continuously), for example, on rainy days. If you need to open the cabinet door on rainy days, take protection measures to prevent water from entering the cabinet as this may result in equipment failure. If the cabinet door is open for 0.5 hour or longer when the humidity is high, manually perform forced dehumidification in off-grid and on/off-grid scenarios. Otherwise, the equipment may fail or the microgrid may collapse.

You can check the running scenario on the SmartLogger WebUI. For details, see **SmartLogger3000 User Manual**.

Perform dehumidification as follows:

1. Check that the auxiliary AC power supply to the ESS is powered on. In off-grid scenarios, the genset or other external auxiliary power supply is used. In on/off-grid scenarios, the power grid supplies auxiliary power when available.

2. Log in to the SmartLogger WebUI and choose **Monitoring** > **ESS** > **Running Param.**

3. Choose **Basic Parameters** and set **Forced dehumidification control** to **start-up**.

4. Click **Submit**. After the setting is successful, the manual dehumidification starts. View the alarm information to check that the system has started forced dehumidification. The alarm will be automatically cleared after the dehumidification is complete, which takes more than 10 minutes.

NOTICE

- Perform maintenance by strictly following the requirements for routine maintenance, monthly maintenance, quarterly maintenance, semi-annual maintenance, and annual maintenance. Do not skip maintenance items. When monthly maintenance coincides with quarterly maintenance, both monthly and quarterly maintenance actions need to be performed.
- Before performing power-off operations described in this chapter, please refer to the maintenance manual to determine if the system needs to be powered off for a maintenance item. For details, see **2.1 Powering Off the ESS**.

2.1 Powering Off the ESS

2.1.1 Sending a Shutdown Command on the SmartLogger

Prerequisites

The system has connected to the grid and is running properly.

Procedure

Step 1 Log in to the SmartLogger WebUI, choose **Maintenance > Connect Device**, and click .

Step 2 Choose **Overview** > **Active Alarm** to view system alarms generated after the shutdown. If any alarm is generated, handle the alarm according to the alarm handling suggestions.

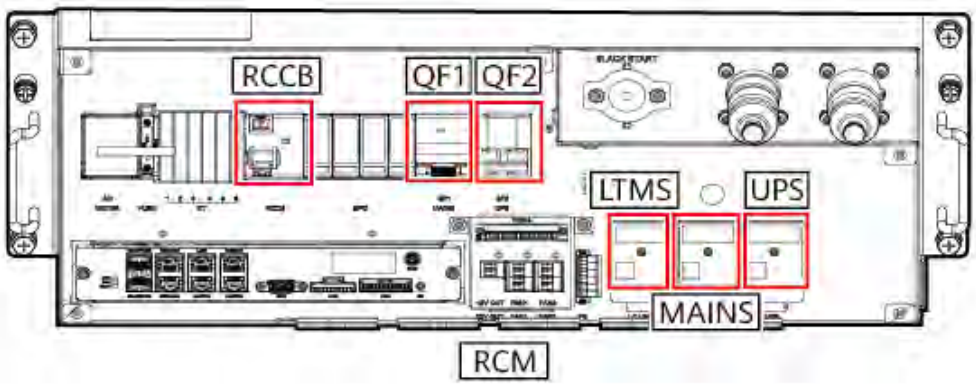
Step 3 Click **Monitoring**, view the device status, and ensure that the shutdown is successful.

----End

2.1.2 Power-Off Operations

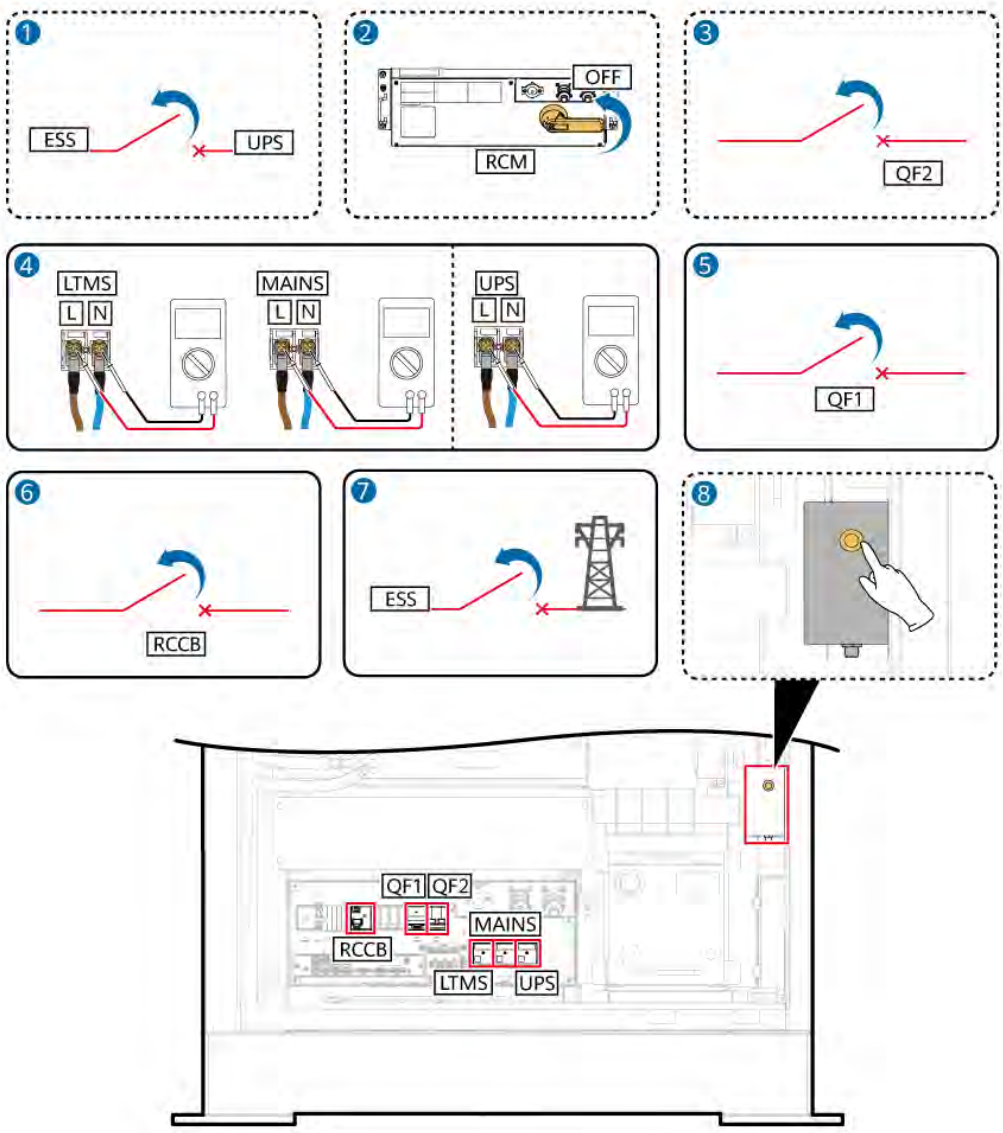
Prerequisites

Figure 2-1 Front view of the RCM



Procedure

Figure 2-2 Power-off process



Step 1 (Optional) Turn off the ESS power switch on the UPS side. This operation is required when a UPS is configured.

Step 2 (Optional) Turn off the disconnector on the Rack Control Module (RCM). This operation is required when a disconnector is configured.

Step 3 (Optional) Turn off the UPS AC input switch QF2 on the RCM. This operation is required when a UPS is configured.

Step 4 Check the AC voltages of the mains input terminals (MAINS), UPS input terminals (UPS), and PCS input terminals in sequence using a multimeter. Ensure that the ports are powered off.

Step 5 Turn off the mains AC input switch QF1 on the RCM.

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Step 6 Turn off the residual current circuit breaker (RCCB) on the RCM.

Step 7 Turn off the auxiliary power switch and general power distribution switch of the customer's power distribution cabinet.

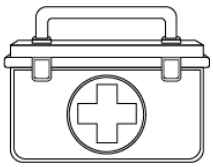
Step 8 Reset the button on the lead-acid battery box to disconnect the power supply to the lead-acid battery.

----End

2.2 Preparations Before Maintenance

NOTE

This section lists only personal protective equipment. For details about the tools required for replacement, see the specific parts replacement section.

Insulated gloves	Protective gloves	Goggles	Dust mask
Insulated shoes	Reflective vest	Safety helmet	Safety harness
 Medical kit	-	-	-

2.3 Routine Maintenance

Log in to the SmartLogger WebUI/FusionSolar app/management system and check whether there are major or minor alarms. If an alarm is generated, handle it by referring to the alarm reference.

NOTE

For details, see the software user manuals.

2.4 Monthly Maintenance

Item	Troubleshooting	Power-Off Required or Not
Check that the cabinet exterior is free from obvious coating peeling and scratches.	Contact engineers to evaluate and handle the problem.	No
Check that there is no obvious paint peeling or rust on the cabinet.	Repaint the damaged part.	No
Check that the cabinet door lock is intact.	Replace the door lock.	No
Check that there is no dust buildup at the vents of the cabinet.	Clean up the dust.	No
Check that the explosion relief panel[1] is free from obvious paint peeling or rust.	Repaint in time.	No
Check that there is no foreign matter, ice, or snow on the top of the explosion relief panel.	Clean up accumulated objects in a timely manner.	No
Check that there are no potential hazards, contaminants, or rubbish around the unit.	Handle potential hazards and clean up rubbish.	No
Check that the fan blades rotate properly and are free from deformation, damage, interference, abnormal noise, and abnormal vibration.	Repair or replace the fan.	No

Item	Troubleshooting	Power-Off Required or Not
Check and clean the air filter of the heat exchanger and the outdoor fan vent to ensure that there is no scale, dirt, or blockage.	Clean the air filter of the heat exchanger. (You are advised to use a vacuum cleaner, cloth, or brush to clean the air filter. You do not need to remove the air filter for cleaning.) **NOTE** • If the dirt or blockage is severe, increase the maintenance frequency. • In harsh scenarios such as deserts and catkins, the heat exchanger must be cleaned periodically to ensure that there is no blockage or dust buildup.	No
Check that the smoke exhaust vent on the top of the cabinet rear is not dirty or blocked.	Clean the smoke exhaust vent of the cabinet.	No
Check that the air filter is not damaged or distorted.	Replace the air filter.	No
Note [1]: In areas with severe sandstorms or heavy ice or snow, perform maintenance based on the actual situation. Ensure that there is no foreign matter, ice, or snow on the explosion relief panels. Clean the foreign matter, ice, or snow in the specified area to avoid damaging the explosion relief devices due to improper operations.		

2.5 Quarterly Maintenance

2.5.1 PACK

Item	Troubleshooting	Power-Off Required or Not
Check whether leakage occurs at the coolant inlet and outlet and the liquid cooling bottom plate of the battery pack.	• Leakage at the coolant inlet and outlet: Replace the valves at the inlet and outlet after draining the coolant. • Leakage at the liquid cooling bottom plate: Replace the battery pack.	Yes

2.5.2 PCS

Item	Troubleshooting	Power-Off Required or Not
Check for leakage at the coolant inlet and outlet of the PCS.	Replace the coolant inlet and outlet of the PCS.	Yes

2.5.3 DCDC (Optional)

Item	Troubleshooting	Power-Off Required or Not
Check for leakage at the coolant inlet and outlet of the DCDC.	Replace the coolant inlet and outlet of the DCDC.	Yes

2.5.4 LTMS

Item	Troubleshooting	Power-Off Required or Not
Check and clean the air filter of the heat exchanger to ensure that there is no scale, dirt, or blockage.	Clean the air filter of the heat exchanger. (You are advised to use a vacuum cleaner, cloth, or brush to clean the air filter. You do not need to remove the air filter for cleaning.) **NOTE** • If the dirt or blockage is severe, increase the maintenance frequency. • In harsh scenarios such as deserts and catkins, the heat exchanger must be cleaned periodically to ensure that there is no blockage or dust buildup.	No

2.5.5 Liquid Cooling Pipe

Item	Troubleshooting	Power-Off Required or Not
Check whether leakage occurs on the liquid cooling pipe and coolant inlet and outlet.	Replace the liquid cooling pipe.	Yes

2.6 Semi-annual Maintenance

2.6.1 Battery Pack/PCS Maintenance Fixture

Item	Troubleshooting	Power-Off Required or Not
Apply lubricating grease to the lead screw periodically: Apply grease to the nut, and then turn the handwheel to rotate the lead screw until the grease is evenly spread around the lead screw.	N/A	No
Note: • If the lead screw is kept idle indoors for more than 6 months, maintain the lead screw before using it each time. If the lead screw is used once or more times within 6 months, maintain it every 6 months. • Butter, aluminum-based grease, composite grease can be used for lubricating the lead screw.		

2.6.2 Battery Pack

Item	Troubleshooting	Power-Off Required or Not
Check that there is no obvious damage, paint peeling off, or rust on the appearance.	Contact technical support.	Yes

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Item	Troubleshooting	Power-Off Required or Not
Check that cables are securely connected.	Secure the cables.	Yes
Check that cables are intact, especially that the cable sheath contacting a metal surface is intact.	Replace the faulty cable.	
Check that the ground cable is securely connected.	Ensure reliable grounding.	Yes

2.6.3 PCS

Item	Troubleshooting	Power-Off Required or Not
• Check that the enclosure is not damaged or deformed. • Check that the system operates with no abnormal sounds. • Check that the parameters are set correctly.	Contact technical support.	Yes
Check that cables are securely connected.	Secure the cables.	Yes
Check that cables are intact, especially that the cable sheath contacting a metal surface is intact.	Replace the faulty cable.	Yes
Check that the ground cable is securely connected.	Ensure reliable grounding.	Yes

2.6.4 LTMS

Item	Troubleshooting	Power-Off Required or Not
Check that the compressor is secured properly.	Tighten the compressor screws.	Yes
Check that the operating compressor generates no metal friction noise or collision noise from inside.	Replace the LTMS.	No
Check that the AC power cable above the compressor is secured.	Secure the AC power cable.	Yes
Check that the air intake vent of the electric control module is not blocked.	Clear the blockage.	Yes
Check that the wiring terminals at the rear of the electric control module are securely connected.	Reconnect the cables.	Yes
Check that the dehumidifying fan is not deformed and its blades are intact.	Replace the dehumidifying fan.	Yes
Check that the dehumidifying fan runs smoothly.	Take out the foreign matter.	Yes
Check that the dehumidifying fan screws are secured and not deformed.	Tighten the screws.	Yes
Check that the dehumidifying fan wiring terminals are securely connected.	Reconnect the cables.	Yes
Check that the gap between the impeller and the flow deflecting ring of the dehumidifying fan is even, to prevent the impeller from colliding with the flow deflecting ring.	Replace the dehumidifying fan.	Yes

Item	Troubleshooting	Power-Off Required or Not
Check that the dehumidifying fan works properly without abnormal noise.		No
Check that the coolant in the pump does not leak.	Replace the LTMS.	Yes
Check that the pump works properly without abnormal noise.	Replace the LTMS.	No
Check that the coolant in the tank is sufficient.	Add coolant. **NOTE** For details about how to add coolant, see **D How Do I Use the Coolant Filling/Drainage Machine to Add or Drain Coolant?**	Yes
Check that coolant in the tank does not leak.	Replace the LTMS.	Yes
Check that the multi-way valve generates no abnormal noise.	Replace the LTMS.	No
Check that the multi-way valve does not leak.		Yes
Check that the liquid cooling evaporator does not leak.	Replace the LTMS.	Yes
Check that the liquid cooling condenser does not leak.	Replace the LTMS.	Yes
Check that the PTC electric heater does not leak and is heating properly.	Replace the LTMS.	Yes
Check that the thermal insulation foam inside the indoor and outdoor units and on the refrigerant pipes connecting the indoor and outdoor units is intact.	Replace the LTMS.	Yes
Check that the refrigerant pipe supports of the indoor and outdoor units are intact and secured properly.	Replace the pipe support and secure it again.	Yes

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Item	Troubleshooting	Power-Off Required or Not
Check that the clamps are secured.	Tighten the clamps.	Yes
Check that the drainage port is free from leakage and blockage.	Replace the component where leakage occurs and clear the blockage.	Yes
• Check that the dehumidifying evaporator does not blow water. • Check that the dehumidifying evaporator surface is free of obvious dirt. • Check that the dehumidifying evaporator fins are not pushed down.	• Clean the evaporator. (It is recommended that you use 5% soda solution for cleaning.) • Use a fin brush to organize the fins that are pushed down. **NOTE** If the dirt or blockage is severe, increase the maintenance frequency.	Yes
Check that all pipes are intact and free from leakage.	Replace the faulty pipe.	Yes
Check that all pipe clamps are secured.	Tighten the clamps or replace the damaged clamp.	Yes
Check that all cables are intact.	Replace the faulty cable.	Yes
Check that all cable wiring screws are tightened and all terminals are secured.	Tighten the screws and reconnect the cables.	Yes

2.7 Annual Maintenance

Item	Troubleshooting	Power-Off Required or Not
• Visually check that the smoke detector and heat detector are normal and that the inspection indicators blink properly. • Spot check the detectors with smoke or heat generated by using dedicated devices. Check whether the detector indicators are steady red and whether the temperature changes are updated on the SmartLogger WebUI and app.	Replace the faulty component.	Yes

2.8 Replacement of Components with a 10-Year Service Life

LTMS

Item	Troubleshooting	Power-Off Required or Not
LTMS	For details, see **6.1 Replacing an LTMS**.	Yes

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Liquid Cooling Pipe

Item	Troubleshooting	Power-Off Required or Not
All liquid cooling pipes	For details, see **7.1 Replacing a Battery Pack Coolant Return Pipe**, **7.2 Replacing a Battery Pack Coolant Supply Pipe**, **7.3 Replacing a PCS Pipe**, and **7.4 Replacing Male Connectors of the Liquid Cooling Pipe Stop Valves**. **NOTICE** After the liquid cooling pipe reaches the end of its 10-year service life, replace all the male connectors of the stop valves of the LTMS and PACK/PCS/DCDC. For details, see **7.4 Replacing Male Connectors of the Liquid Cooling Pipe Stop Valves**.	Yes
Coolant	For details, see **D How Do I Use the Coolant Filling/Drainage Machine to Add or Drain Coolant?**	Yes

Sensors

Item	Troubleshooting	Power-Off Required or Not
Heat detector	For details, see **8.3 Replacing a Heat Detector**.	Yes
Smoke detector	For details, see **8.2 Replacing a Smoke Detector**.	Yes
CO sensor	For details, see **8.4 (Optional) Replacing a CO Sensor**.	Yes
Fire alarm horn/strobe	For details, see **8.5 Replacing a Fire Alarm Horn/Strobe**.	Yes
T/H sensor	For details, see **15 Replacing a T/H Sensor**.	Yes

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3 Replacing a Battery Pack

DANGER

- Before replacing a battery pack, ensure that the ESS is powered off. Otherwise, electric shocks may occur.
- Wear personal protective equipment and use dedicated insulated tools to avoid electric shocks or short circuits.
- Do not smoke or have an open flame around batteries.
- Do not use wet cloth to clean exposed copper bars or other conductive parts.
- Do not use water or any solvent to clean batteries.

DANGER

Note the polarities when installing batteries. Do not connect the positive and negative poles of a battery or battery string together. Otherwise, the battery may be short-circuited.

WARNING

Do not maintain batteries with power on. To power off the batteries before performing operations such as checking and tightening screw torques, explain the risks to the customer, obtain the customer's written consent, and take effective preventive measures.

Do not move a battery by holding its terminals, bolts, or cables. Otherwise, the battery may be damaged.

Keep batteries in the correct direction during transportation. They must not be placed upside down or tilted, and must be protected against falling down, mechanical impact, rains, snows, and falling into water during transportation.

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⚠ CAUTION

Exercise caution when moving batteries to prevent bumping and ensure personal safety.

⚠ CAUTION

To ensure the air tightness of the battery pack:

- Ensure that all the communications terminals and panel screws are securely installed.
- Before installing screws, check that the sealing strip is intact.
- Ensure that the installation is supervised by two persons, and take photos after the replacement.

NOTICE

- Before installation, ensure that battery packs are stored indoors in compliance with the storage requirements specified in the user manual.
- Before installation, check the status of the battery packs. Do not use the battery packs if the packing cases are exposed to rain, damaged, or deformed, or if the battery packs leak or fall.
- Install batteries within 24 hours after unpacking. If the batteries cannot be installed in time, put them in the original packaging and place them in a dry indoor environment without corrosive gases. Power on the ESS within 24 hours after installation. The process from unpacking batteries to powering on the system must be completed within 72 hours. During routine maintenance, ensure that the down time does not exceed 24 hours.
- Do not install battery packs and its components on rainy, snowy, or foggy days. Otherwise, the battery packs may be corroded by moisture or rain.

NOTICE

- For removed cables, wrap cable terminals with insulation materials, and prevent short circuits and falling off of foreign matter.
- To prevent electric leakage, avoid damaging the sheath of the cable harness when binding the cable harness or cutting off the cable tie.
- Prevent nuts from falling off during removal and installation. After removing nuts, ensure that no residue is left to avoid short circuits.

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3.1 Fixture

DANGER

- Do not enter the bottom of the battery pack fixture for observation or operation.
- Do not stand under the fixture.
- Do not put your head, hands, feet, or other body parts under the fixture.

WARNING

If the battery cannot be pushed because the fixture is not aligned, do not push the battery forcibly. Instead, remove the battery, align the fixture, and try again to avoid damage to the battery.

CAUTION

- In the preparation phase, check the ground flatness. Ensure that the ground flatness of the parking position for the forklift is within 50 mm. If the condition is not met, level the ground. It is recommended that hard spacers (steel plates are recommended) be laid to ensure that the height difference of the forklift plane is within 50 mm.
- The installation ground must be solid without spongy or soft soil and not prone to subsidence. Common forklifts are recommended for concrete ground, and rough-terrain forklifts are recommended for other types of ground.

CAUTION

- Multiple persons are required in the operation. Take protective measures to prevent collision.
- After installing the battery, slowly lift the fixture to remove it and ensure that the handles do not contact the battery connecting rod.
- When working at heights is involved, see the relevant safety precautions.
- Place the ladder close to the handwheel and align it with the fixture. Stand on the ladder to operate the handwheel and observe the fixture connection and battery installation progress.

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NOTICE

- If you use a forklift to remove and install the battery packs, the recommended load-bearing capacity of the forklift is greater than or equal to 500 kg.
- It is recommended that the length of the tynes be greater than or equal to 1800 mm, the width be 230–300 mm, and the thickness be 25–80 mm.
- Lifting height of a forklift: If the foundation is less than or equal to 0.3 m high, the lifting height shall be greater than or equal to 2 m. If the foundation is greater than 0.3 m high, the lifting height shall be increased accordingly.

NOTICE

- For details about battery pack storage requirements and charge policies, see sections "ESS Storage and Charging" and "Battery Storage and Single Battery Charge" in the user manual.
- Do not use the fixture on rainy days. If the fixture is exposed to water, dry it to prevent it from rusting.
- Place the fixture and lead screw in the toolbox after use and store the toolbox in a dry place indoors.

NOTICE

- Remove rust from fixture components in a timely manner and apply lubricating grease.
- Periodically apply grease to the lead screw. For details, see **2.6 Semi-annual Maintenance**.
- Apply grease if the gear and rotating shaft generate loud noise or do not work properly.
- If the two small lead screws are misplaced during the operation, switch the shifter to position 1 and manually rotate the lead screws to correct their positions.

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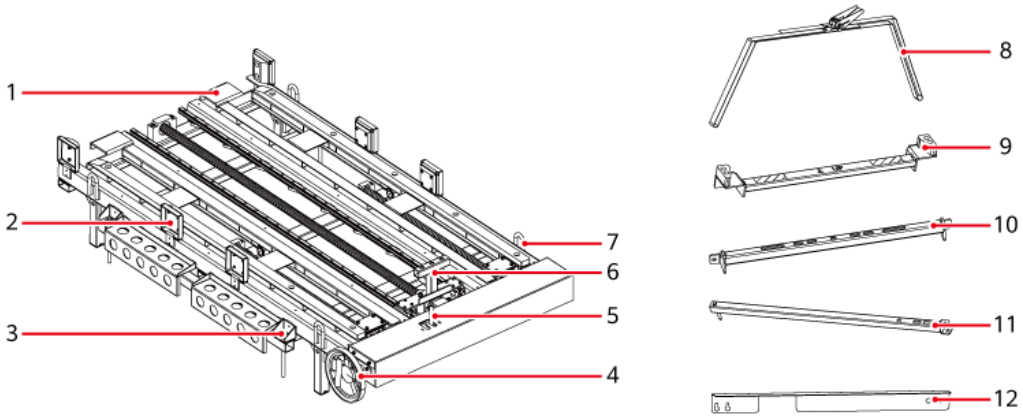
Maintenance Fixture

Figure 3-1 Components



(1) Drawer handle	(2) Distance block	(3) Long bolt
(4) Handwheel	(5) Shifter	(6) Battery connecting rod retainer
(7) Fixture lifting lug	(8) Binding strap	(9) Cabinet connecting rod
(10) Battery connecting rod	(11) Extension arm	(12) Panel maintenance fixture

3.2 Replacing an Entire Battery Pack

Context

NOTE

- The Company is responsible for maintaining and transferring abnormal battery packs within the warranty scope. For battery packs whose warranty periods have expired, contact a local recycling agency for handling.
- The battery pack appearance may vary. The figures in this section are for reference only.

Prerequisites

- Tools: insulated torque socket wrench (including 7#, 8#, 10#, 13#, 17#, and 19# sockets, including the extension rod ≥ 80 mm), battery pack maintenance fixture (purchased on the configurator), step ladder, forklift (load-bearing capacity ≥ 500 kg), crane (optional, load-bearing capacity ≥ 500 kg), Phillips insulated torque screwdriver (M4), PV terminal removal tool (delivered with spare parts), wrench, coolant, and coolant filling/drainage machine (purchased on the configurator)
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.
- Before replacing the top-layer battery pack, remove the heat detector by referring to **8.3 Replacing a Heat Detector** and remove the smoke detector by referring to **8.2 Replacing a Smoke Detector**.

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- At least four persons are required to replace the battery pack.

Procedure

Step 1 Check the battery pack status.

- Use an infrared tester to measure the temperature of the general power ports (BAT+ and BAT–) on the front panel of the battery pack and balancing DCDC module ports (DC+ OUT, DC– OUT, DC+ IN, and DC– IN). If the temperature is too high (the operating temperature should be lower than 55°C), wait until the temperature cools down before performing the next step.
- If any irritating odor, leakage, bulging, or damage is present, contact service engineers for handling.
- If signs of sparks or burn marks are found on the general power ports (BAT+ and BAT–) on the front panel of the battery pack and balancing DCDC module ports (DC+ OUT, DC– OUT, DC+ IN, and DC– IN), contact service engineers for handling.
- If the battery pack appears normal and has no irritating odor, remove the faulty battery pack.
- If leakage occurs at the coolant inlet and outlet of the battery pack, replace the valves at the inlet and outlet after draining the coolant. If leakage occurs at the liquid cooling bottom plate of the battery pack, remove the faulty battery pack.

Step 2 Determine subsequent operations based on the ambient temperature.

- If the ambient temperature is higher than –10°C, skip this step and go to the next step.
- If the ambient temperature is less than or equal to –10°C, drain all the coolant from the cabinet and then go to the next step. For details about how to drain coolant, see **D.1 Draining Coolant from the LTMS**.

Step 3 Remove the general power cables, balancing bus, communications cable, coolant inlet and outlet, PACK extinguishant port, and ground cable from the front panel of the battery pack in sequence, label the cables, and properly keep the cables and pipes.

1–3: Disconnect the power cables and communications cable.

4: Remove the coolant inlet and outlet of the liquid cooling pipe: Remove the branch liquid cooling pipe and the old female connector of the stop valve. Retain the old male connector.

5: Remove the PACK extinguishant port.

6: Remove the ground cable.

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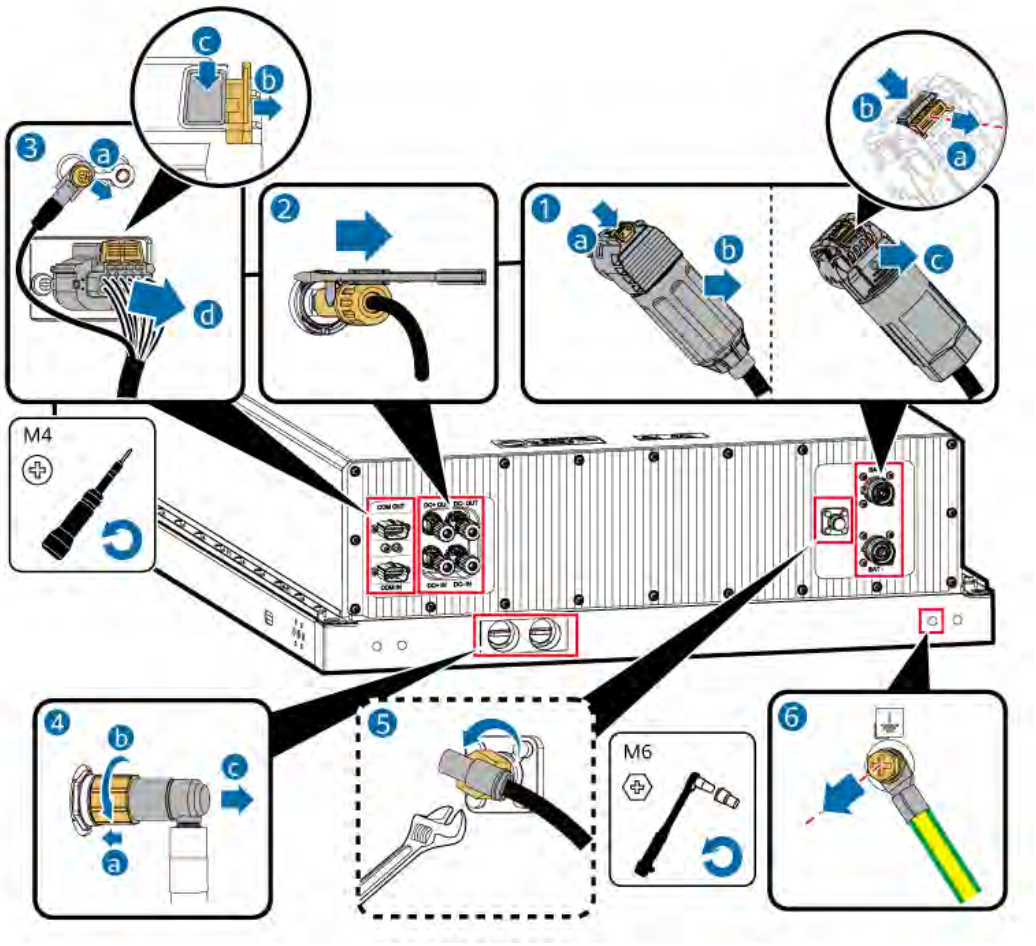
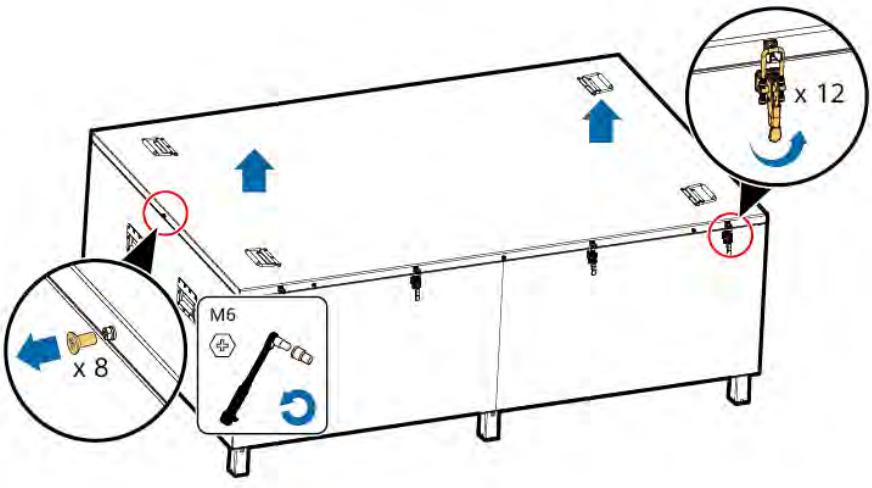
Figure 3-2 Removing cables and pipes from the panel



Step 4 Use a forklift or crane to transport the fixture packing cases to a place near the ESS, and unpack the fixtures.

Figure 3-3 Unpacking the fixtures



Step 5 Take out the PCS maintenance fixture and battery pack fixture in sequence.

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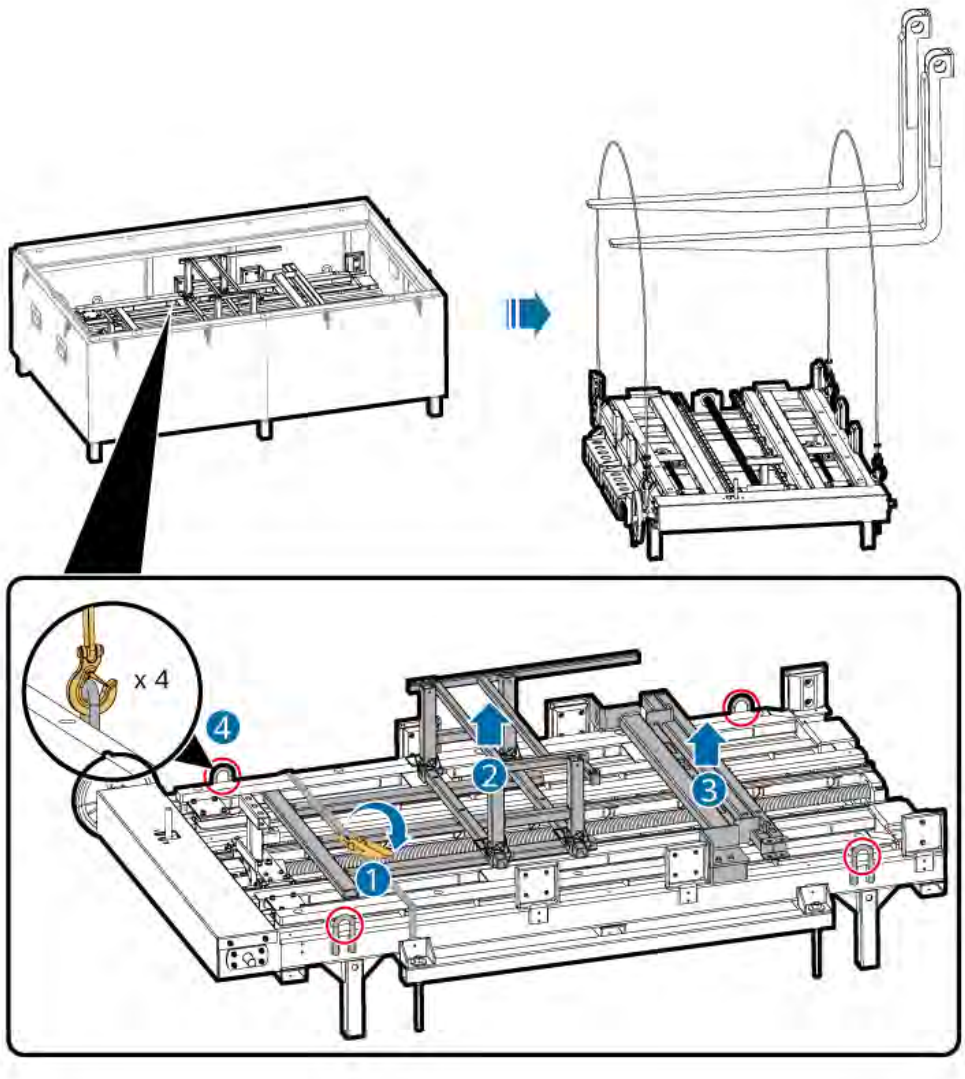
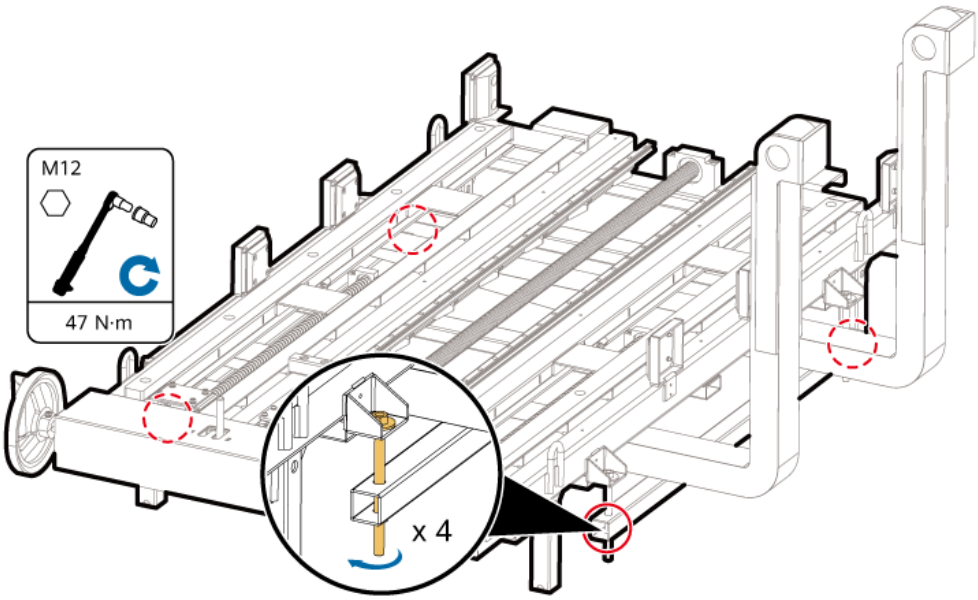
1. Remove the binding straps from the fixtures.
2. Take out the PCS fixture and place it on the ground.
3. Take out the cabinet connecting rod and battery connecting rod.
4. Hook the lifting lug of the battery pack fixture, and use the forklift to lift the battery pack fixture and place it on the ground.

Figure 3-4 Taking out the fixture



Step 6 Insert the forklift tynes into the fixture, adjust the tightness of the long bolt, and secure the battery pack fixture to the forklift.

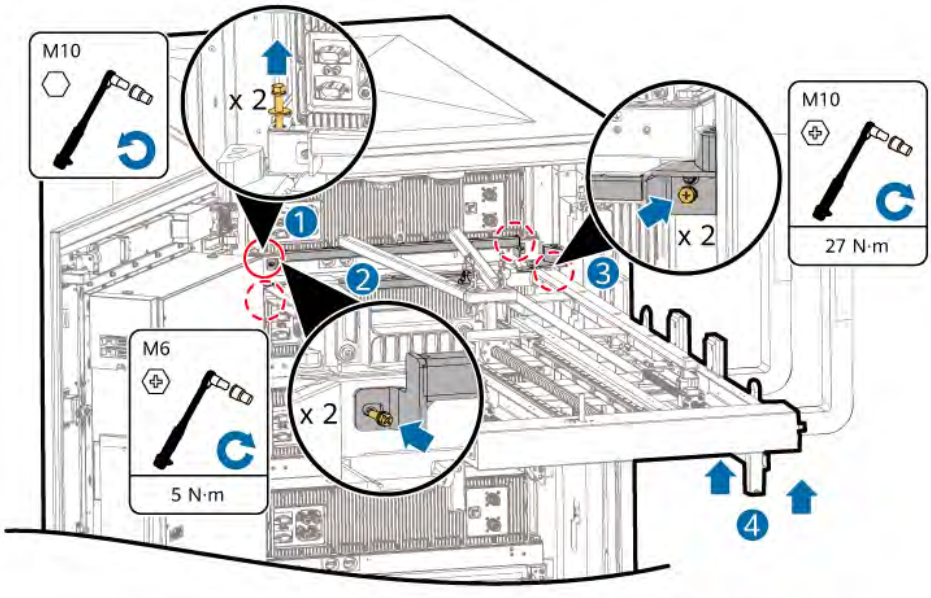
Figure 3-5 Securing the fixture



Step 7 Prepare for taking out the battery pack to be replaced.

1. Remove the screws that secure the battery pack to the cabinet.
2. Install the battery connecting rod.
3. Install the cabinet connecting rod. Ensure that the side with the silkscreen faces upward.
4. Use the forklift to lift the battery pack fixture slightly higher than the cabinet connecting rod. Adjust the forklift until the fixture is parallel with the cabinet.

Figure 3-6 Installing the battery pack fixture



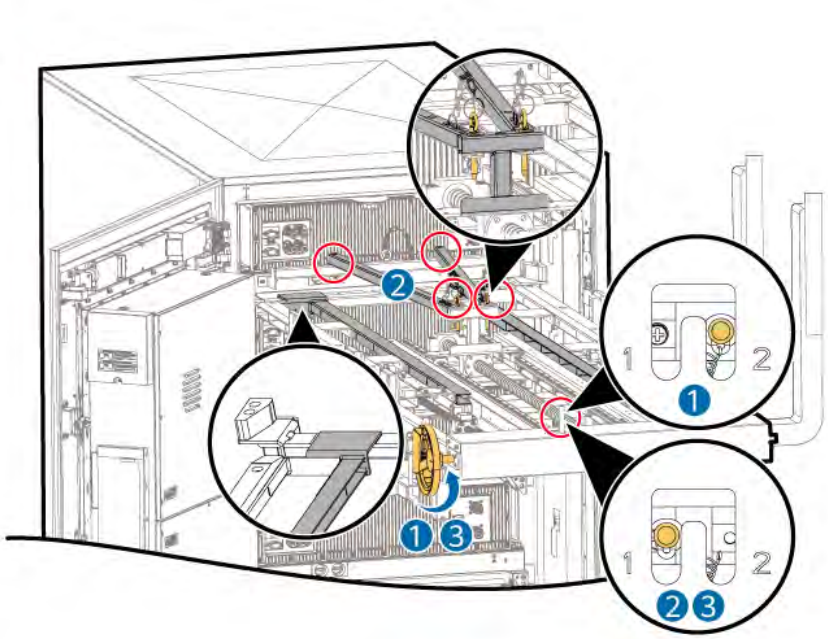
Step 8 Remove the battery pack.

1. Switch to position 2, rotate the handwheel counterclockwise, push the drawer handle to the top of the cabinet connecting rod, adjust the left and right

tynes of the forklift to align the handle with the mark on the cabinet connecting rod, and lower the tynes of the forklift until the drawer handle comes in contact with the marked position on the cabinet connecting rod.

2. Switch to position 1. Place the extension arm on the fixture, secure one end of the extension arm to the cabinet connecting rod using the pin, rotate the handwheel clockwise, align the hole on the other end of the extension arm with the hole on the battery connecting rod retainer, and insert the pin to secure the extension arm.
3. Keep the position at 1 and rotate the handwheel counterclockwise to pull out the battery pack to be replaced.

Figure 3-7 Adjusting the fixture position



Step 9 Keep the position at 1 and take out the battery pack.

1. Pull the retainer near the initial position (close to the gear), and then take out the extension arm.
2. Rotate the handwheel clockwise, align the hole on the battery connecting rod retainer with the hole on the battery connecting rod, and insert the pin.
3. Rotate the handwheel counterclockwise to pull the battery pack out of the ESS.

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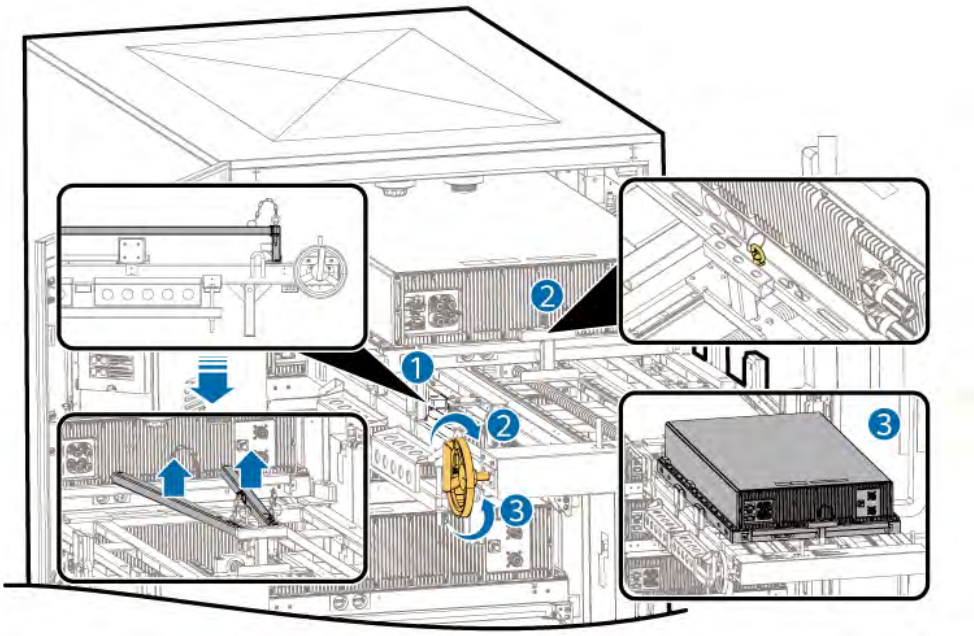
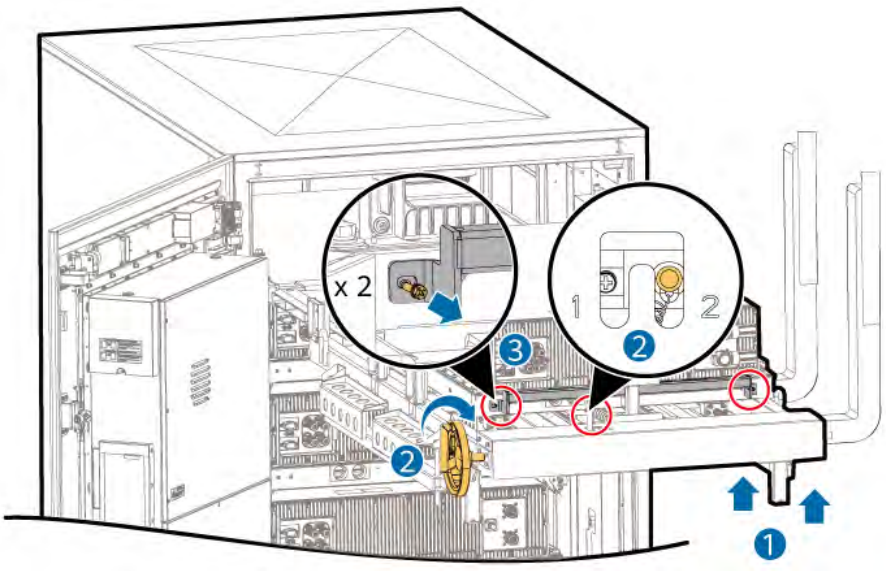
Figure 3-8 Installing the battery connecting rod



Step 10 Move the battery pack to a safe place.

1. Use the forklift to lift the fixture slowly until the drawer handle is slightly higher than the cabinet connecting rod.
2. Switch to position 2. Rotate the handwheel clockwise until the drawer handle is fully retracted. Move the battery pack to a safe place and place it on the ground.
3. Remove the battery connecting rod.

Figure 3-9 Taking out the battery pack



Step 11 Place the new battery pack and secure it to the battery pack fixture.

1. Secure the battery connecting rod to the new battery pack.

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2. Install the battery pack hoisting kit.
3. Install the lifting rope, hook the hoisting kit using the hook, lift the battery pack using the forklift, and place the battery pack in the middle of the fixture.
4. Switch to position 1, rotate the handwheel, adjust the battery connecting rod retainer and battery connecting rod to overlap with the pin hole, and insert the pin.
5. Insert the forklift tynes into the fixture, adjust the tightness of the long bolt, and secure the battery pack fixture to the forklift.

Figure 3-10 Securing the battery pack to the battery pack fixture (1)

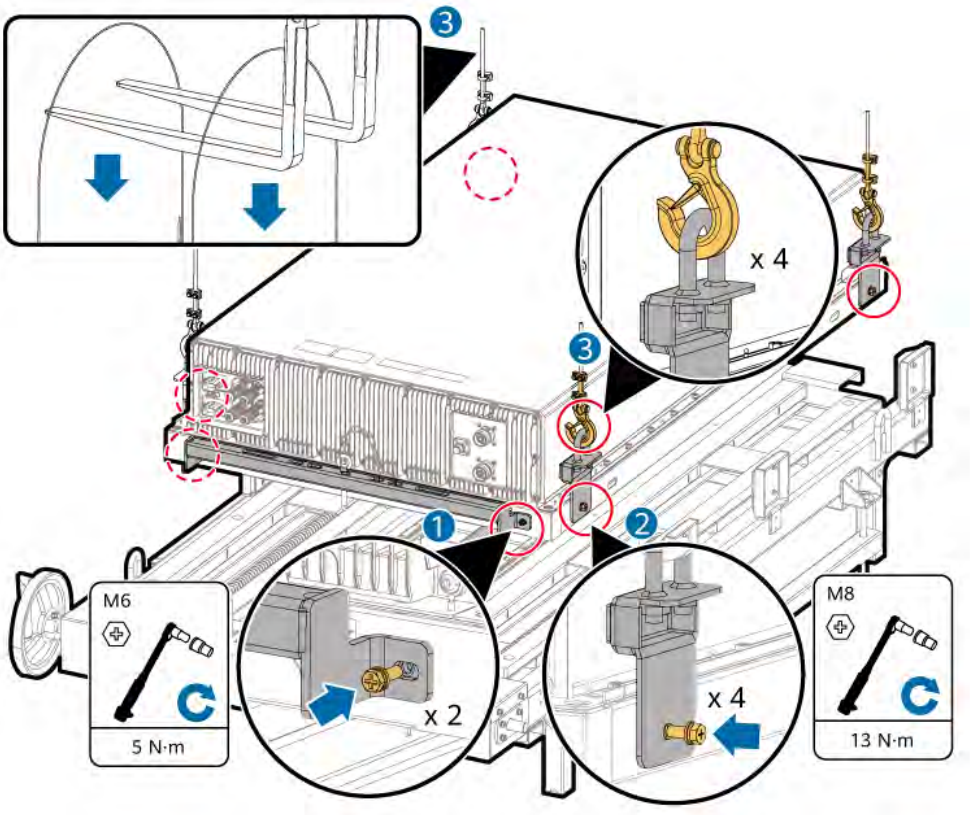
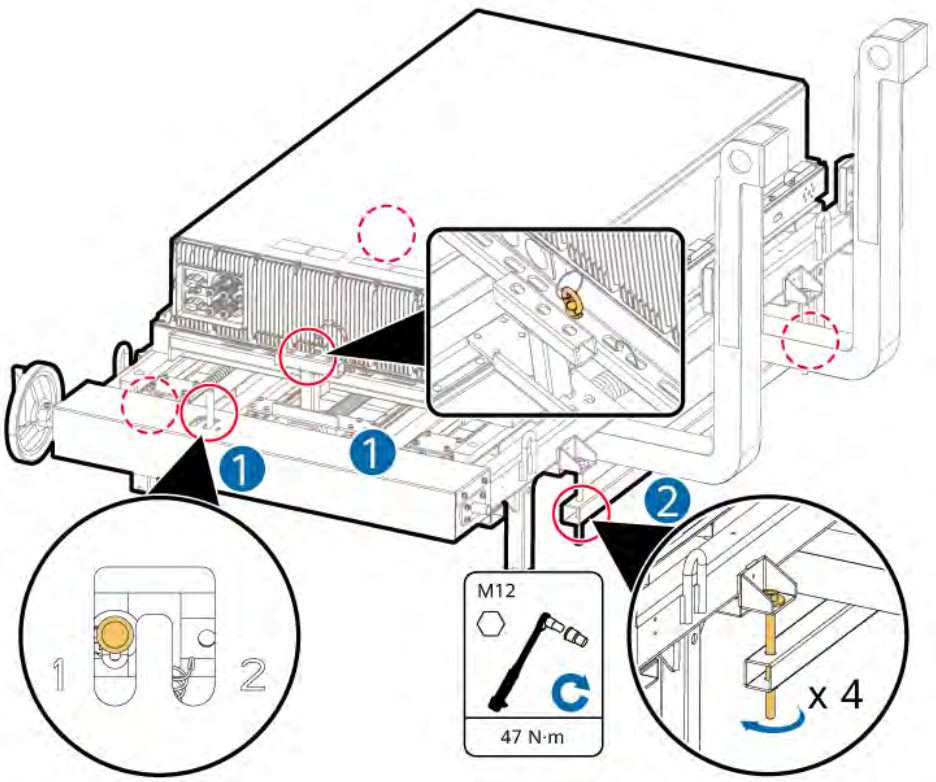


Figure 3-11 Securing the battery pack to the battery pack fixture (2)



Step 12 Install the new battery pack.

1. Use the forklift to lift the battery pack fixture slightly higher than the cabinet connecting rod. Adjust the forklift until the fixture is parallel with the cabinet.
2. Switch to position 2, rotate the handwheel counterclockwise, push the drawer handle to the top of the cabinet connecting rod, adjust the left and right tynes of the forklift to align the handle with the mark on the cabinet connecting rod, and lower the tynes of the forklift until the drawer handle comes in contact with the marked position on the cabinet connecting rod.
3. Switch to position 1, rotate the handwheel clockwise, and push a part of the battery pack into the cabinet.

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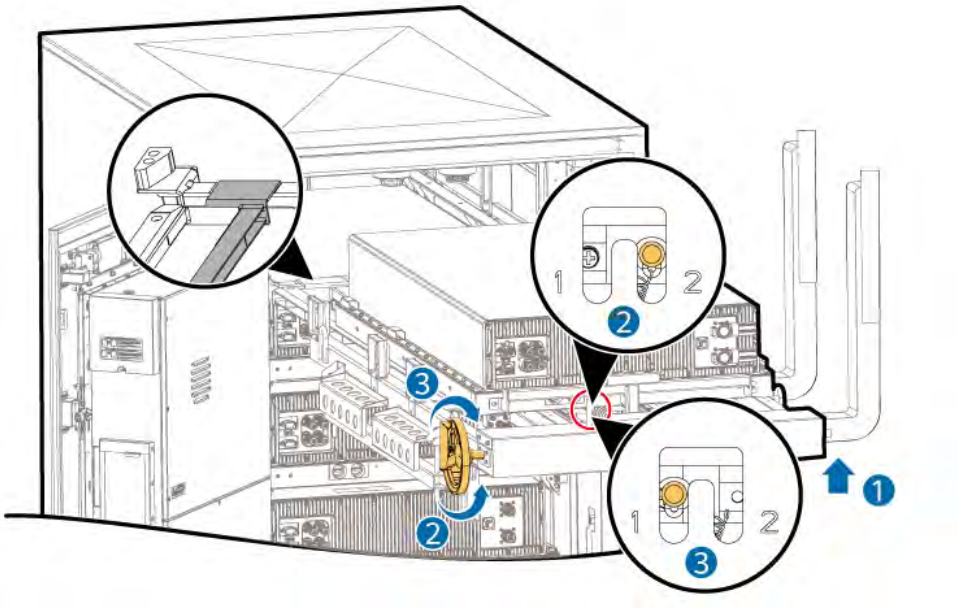
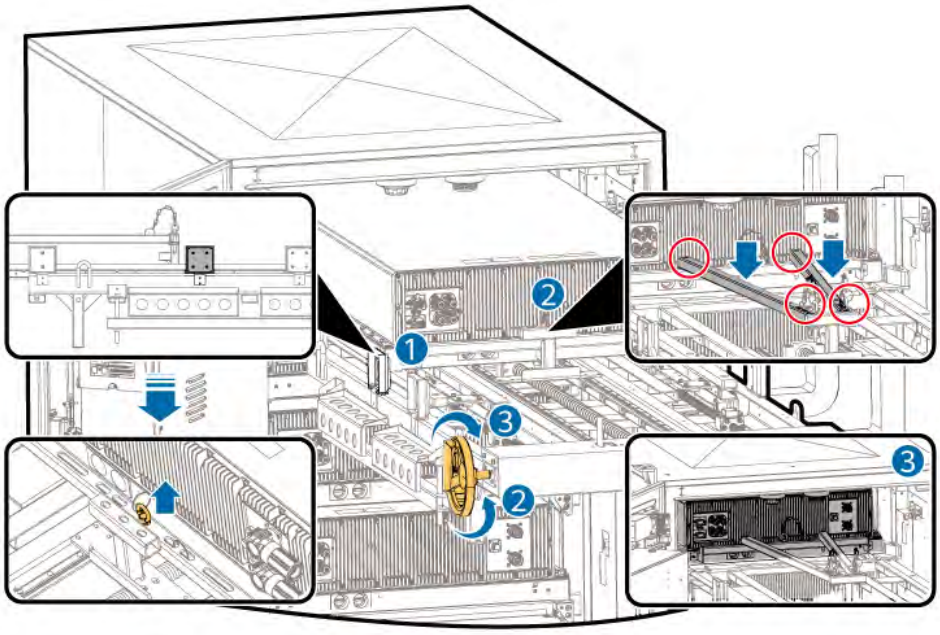
Figure 3-12 Pushing a part of the new battery pack into the cabinet



Step 13 Keep the position at 1 and push the battery pack completely into the ESS.

1. Push the battery connecting rod retainer until it exceeds the distance block, as shown in the following figure. Pull out the battery connecting rod pin.
2. Place the extension arm on the fixture, secure one end of the extension arm to the cabinet connecting rod using the pin, rotate the handwheel counterclockwise, align the hole on the other end of the extension arm with the hole on the battery connecting rod retainer, and insert the pin to secure the extension arm.
3. Rotate the handwheel clockwise to push the battery pack completely into the ESS.

Figure 3-13 Installing the battery connecting rod



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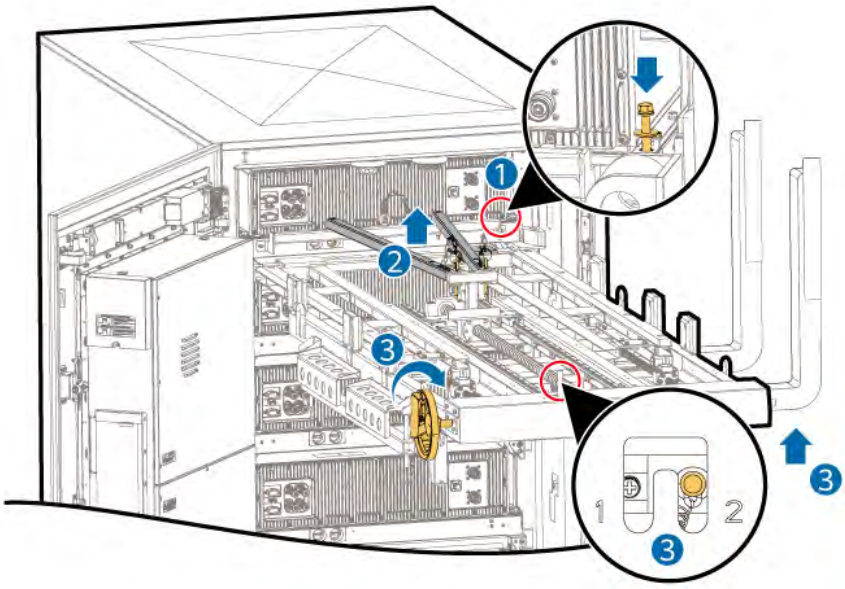
Step 14 Move the fixture to a safe place.

1. When the front end of the battery pack is aligned with the guide rail of the cabinet and the gap between the fixture and the guide rail of the cabinet is exposed, partially tighten the screws on the battery pack on the forklift side.
2. Pull out the pin and take out the extension arm.
3. Use the forklift to lift the fixture slowly until the drawer handle is slightly higher than the cabinet connecting rod. Ensure that the drawer handle does not contact the battery connecting rod. Switch to position 2, rotate the handwheel clockwise until the drawer handle is fully retracted, and drive the forklift to move the fixture to a safe place.

Figure 3-14 Moving the fixture to a safe place



Step 15 Secure the new battery pack.

1. Install the battery pack screws on the LTMS side, and use a socket wrench to tighten the screws on both sides.
2. Remove the cabinet connecting rod.
3. Remove the battery connecting rod.

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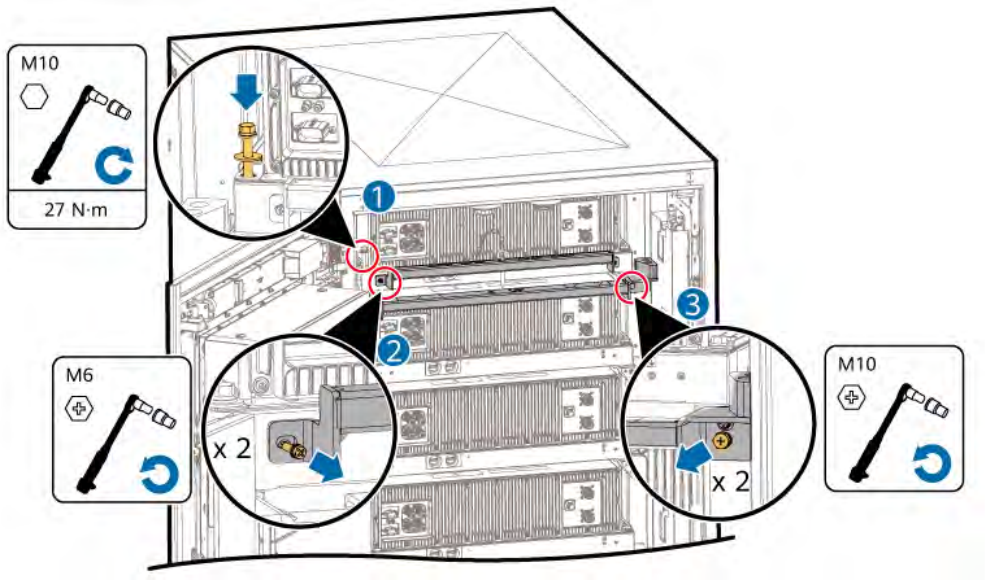
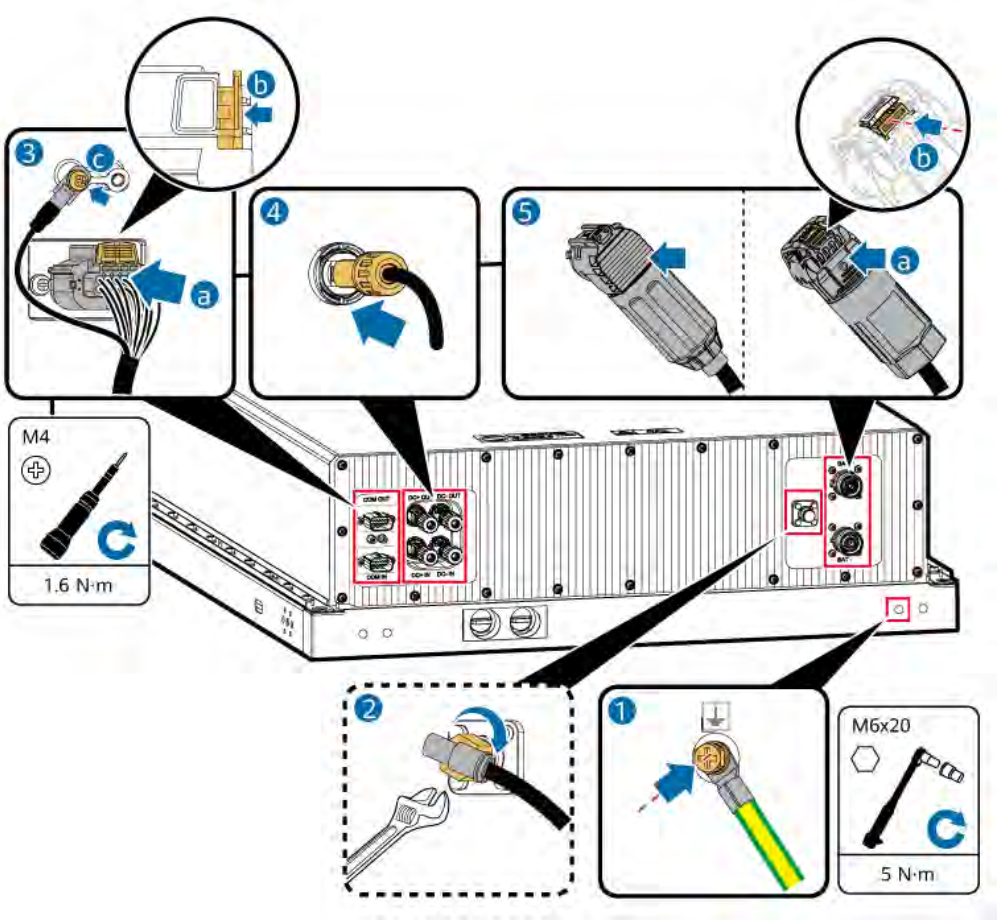
Figure 3-15 Securing the battery pack



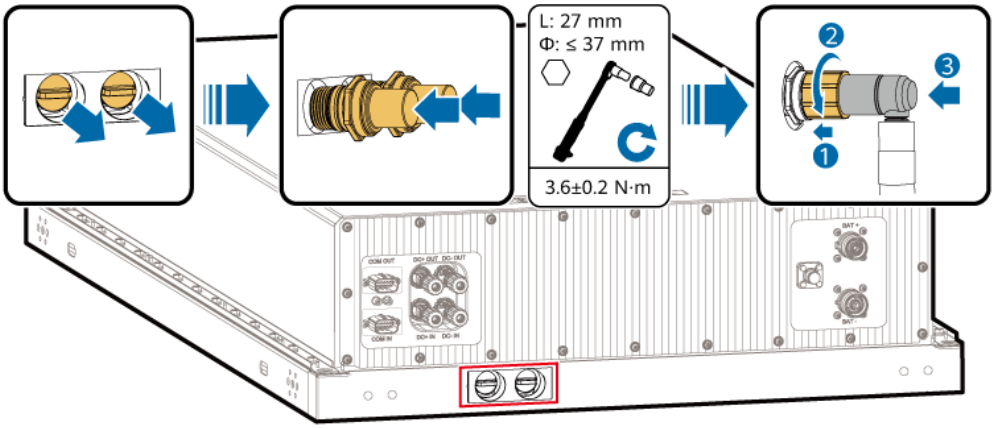
Step 16 Reinstall the cables and PACK extinguishant port on the front panel of the battery pack.

Figure 3-16 Installing the cables and PACK extinguishant port



Step 17 Connect the new male connector of the stop valve to the new battery pack, and connect the old female connector to the new male connector.

Figure 3-17 Installing the liquid cooling pipe



Step 18 Perform operations based on the installation status.

- If coolant has been drained from the cabinet before the faulty component is removed, add coolant to the cabinet. For details, see **D.3 Adding Coolant to the LTMS**.
- If coolant has not been drained from the cabinet before the faulty component is removed, add an appropriate amount of coolant. For details, see **D.3 Adding Coolant to the LTMS**.

Step 19 Hoist the fixture back to the toolbox and keep it properly.

----End

3.3 Replacing a BMU Collection Board

Context

BMU boards are numbered from 1 to 4 from left to right.

Prerequisites

- Tools: insulation tape, insulated gloves, panel maintenance fixture (purchased on the configurator), PV terminal removal tool (delivered with spare parts), wrench, insulated torque socket wrench (including 10# insulated socket), Phillips insulated torque screwdriver (M4/M6), and cable cutter
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

Step 1 Remove the general power cables, balancing bus, communications cable, coolant inlet and outlet, PACK extinguishant port, and ground cable from the front panel of the battery pack in sequence, label the cables, and properly keep the cables and pipes.

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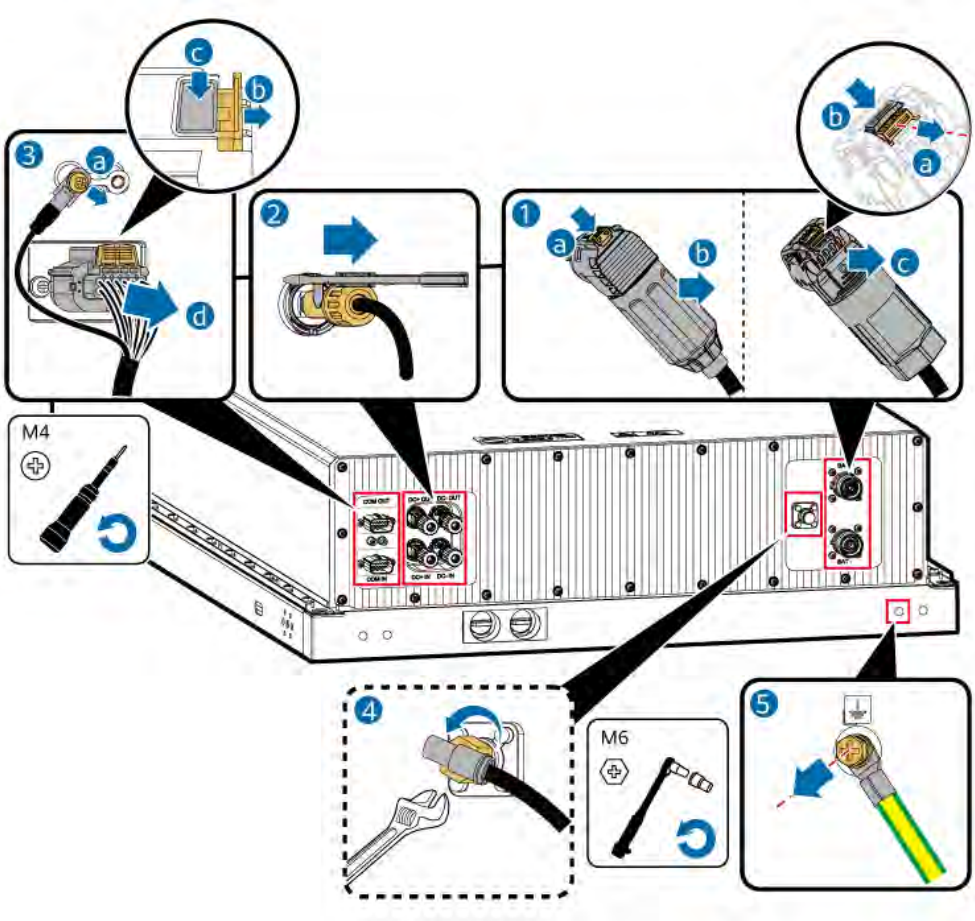
1–3: Disconnect the power cables and communications cable.

4: Remove the PACK extinguishant port.

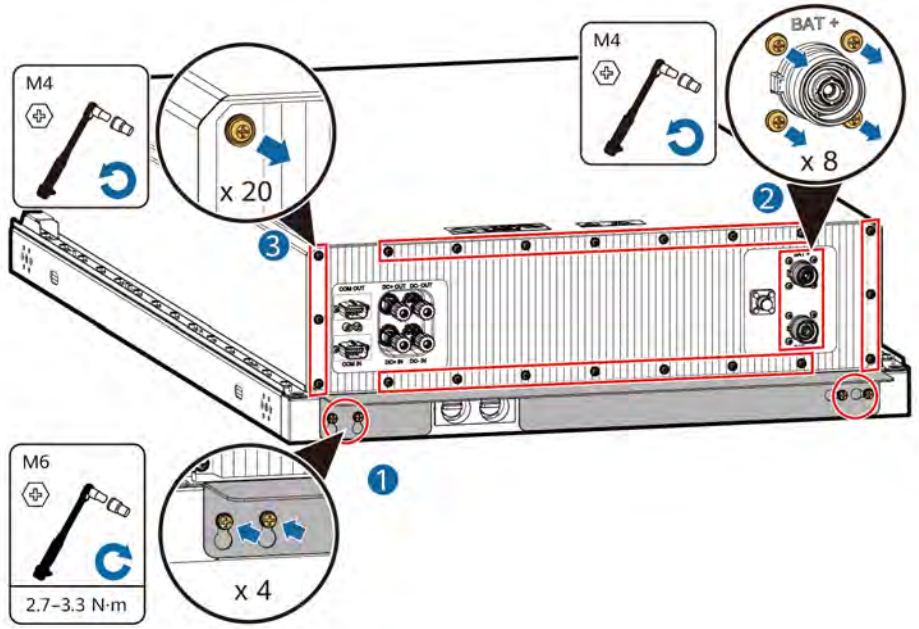
5: Remove the ground cable.

Figure 3-18 Removing cables and pipes from the panel



Step 2 Install the maintenance fixture, and remove the screws securing the general power ports and panel in sequence.

Figure 3-19 Installing the fixture



Step 3 Remove the cable harness on the right side of the battery pack.

WARNING

Take insulation measures and exercise caution when performing operations with power on.

CAUTION

Exercise caution when cutting cable ties and avoid damaging cables.

1. Slowly pull out the battery pack panel until the general power terminals are removed from the panel.

2–3: Cut off cable ties.

4–6: Remove the cable harness.

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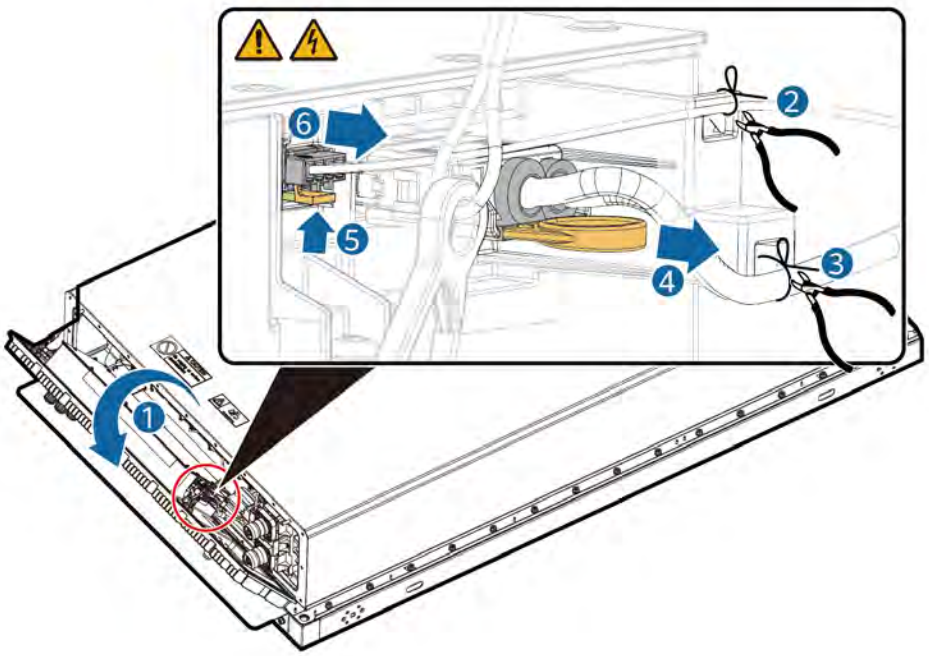
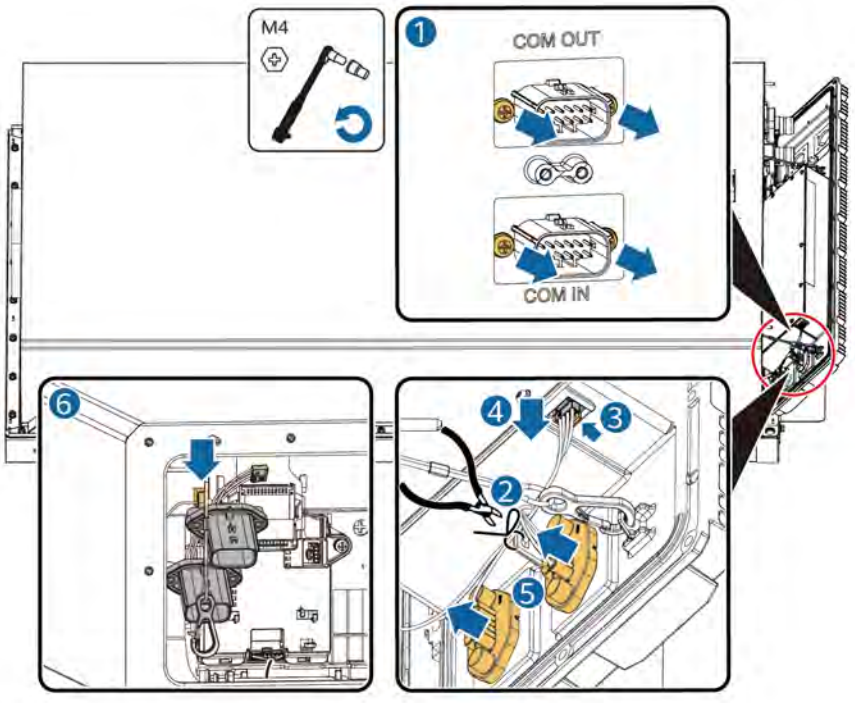
Figure 3-20 Removing the cable harness on the right



Step 4 Remove the cable harness on the left side of the battery pack: Slowly remove the communications terminals from the panel, remove the cable harness on the left side of the battery pack, and mount the cable harness to the cable clip.

Figure 3-21 Removing the cable harness on the left



Step 5 Remove the two cable clips from the front panel and slowly remove the panel.

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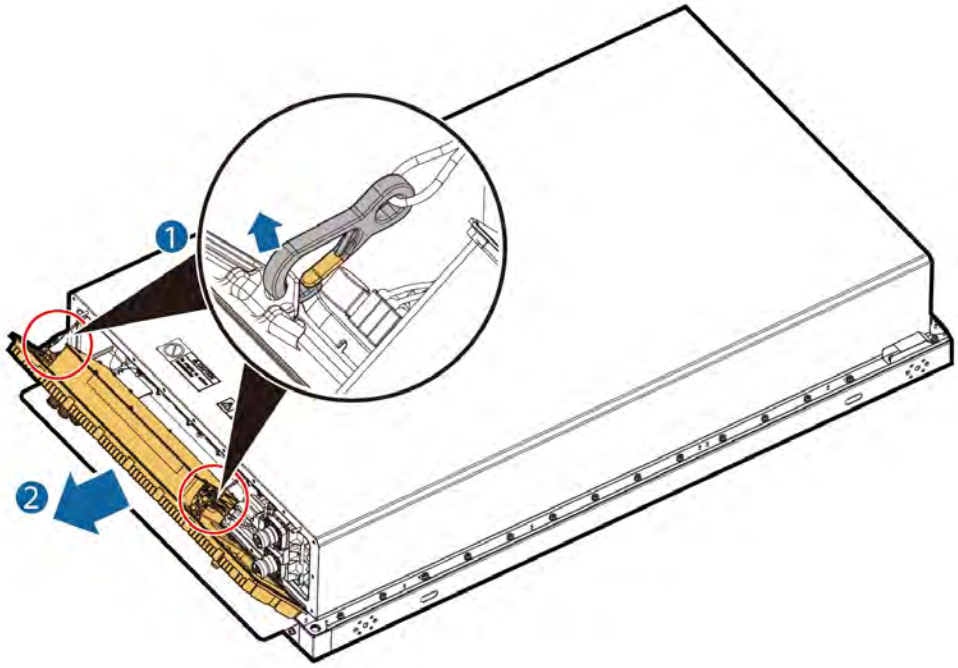
CAUTION

Exercise caution when removing the panel from the battery pack to prevent dropping the panel or damaging the wiring terminals.

Figure 3-22 Removing the front panel



Step 6 Remove the BMU collection board to be replaced.

WARNING

- During operations, wear personal protective equipment and use dedicated insulated tools to prevent electric shocks or short circuits.
- During operations, ensure that the tool, battery pack enclosure, and general positive and negative power component do not contact to prevent short circuits between the general positive and negative power component and the enclosure.
- For removed cables, wrap cable terminals with insulation materials, and prevent short circuits and falling off of foreign matter.

NOTICE

Any BMU collection board can be replaced separately. When removing a BMU collection board, remove the FPC module and cable harness from the BMU collection board on the left.

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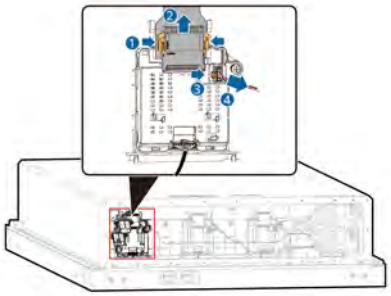
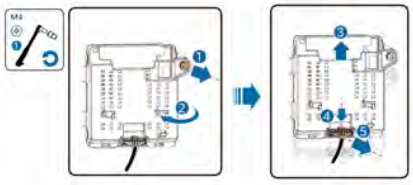
Position of the BMU Collection Board	Step		Diagram
Left 1	Step 1	1–2: Press both ends of the FPC connector and remove it in the FPC flat cable direction. 3–4: Remove the cable harness plug.	
	Step 2	1: Remove the screw. (M4 screw with a torque of 1.6 N·m) 2: Gently remove the BMU collection board from the clip. 3: Tilt the BMU collection board upward to reserve space for inserting and removing the cable harness at the bottom. 4–5: Remove the cable harness plug from the bottom of the BMU collection board.	
Left 2	Step 1	Remove the cable harness from the first BMU collection board on the left.	See the figures of the first BMU collection board on the left.

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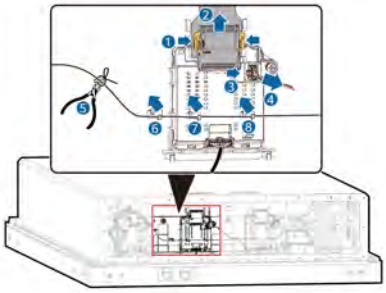
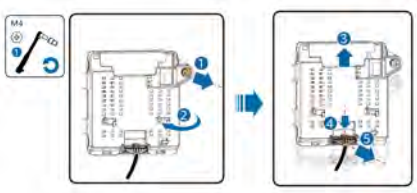
Position of the BMU Collection Board	Step		Diagram
	Step 2	1–2: On the second BMU collection board on the left, press both ends of the FPC connector and remove it in the FPC flat cable direction. 3–4: Remove the cable harness plug. 5–8: Remove the mounting cable as shown in the figure.	
	Step 3	1: Remove the screw. (M4 screw with a torque of 1.6 N·m) 2: Gently remove the BMU collection board from the clip. 3: Tilt the BMU collection board upward to reserve space for inserting and removing the cable harness at the bottom. 4–5: Remove the cable harness plug from the bottom of the BMU collection board.	
Left 3	Step 1	Remove the cable harness from the second BMU collection board on the left.	See the figures of the second BMU collection board on the left.

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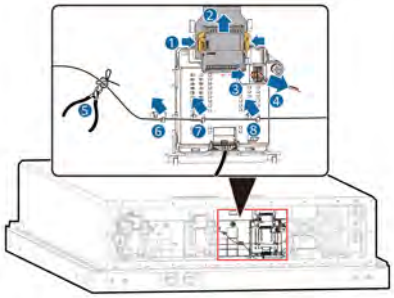
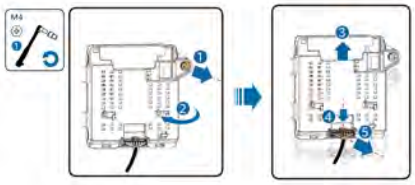
Position of the BMU Collection Board	Step		Diagram
	Step 2	1–2: On the third BMU collection board on the left, press both ends of the FPC connector and remove it in the FPC flat cable direction. 3–4: Remove the cable harness plug. 5–8: Remove the mounting cable as shown in the figure.	
	Step 3	1: Remove the screw. (M4 screw with a torque of 1.6 N·m) 2: Gently remove the BMU collection board from the clip. 3: Tilt the BMU collection board upward to reserve space for inserting and removing the cable harness at the bottom. 4–5: Remove the cable harness plug from the bottom of the BMU collection board.	
Right 1	Step 1	Remove the cable harnesses from the second and third BMU collection boards on the left in sequence.	See the figures of the second and third BMU collection boards on the left.

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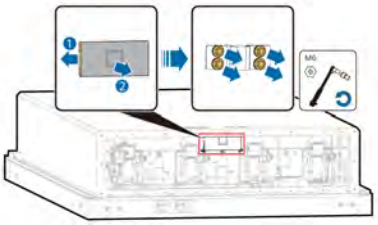
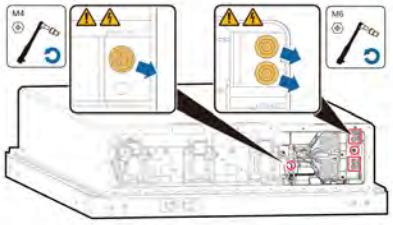
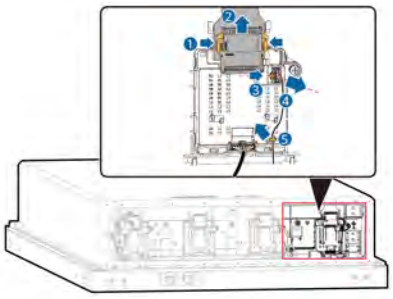
Position of the BMU Collection Board	Step		Diagram
	Step 2	Remove copper bars between battery packs.	
	Step 3	Remove the general positive and negative power component. (M4 screws with a torque of 1.6 N·m; M6 screws with a torque of 5 N·m)	
	Step 4	1–2: Press both ends of the FPC connector and remove it in the FPC flat cable direction. 3–4: Remove the cable harness plug. 5: Remove the cable shown in the figure.	

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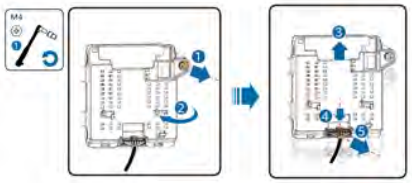
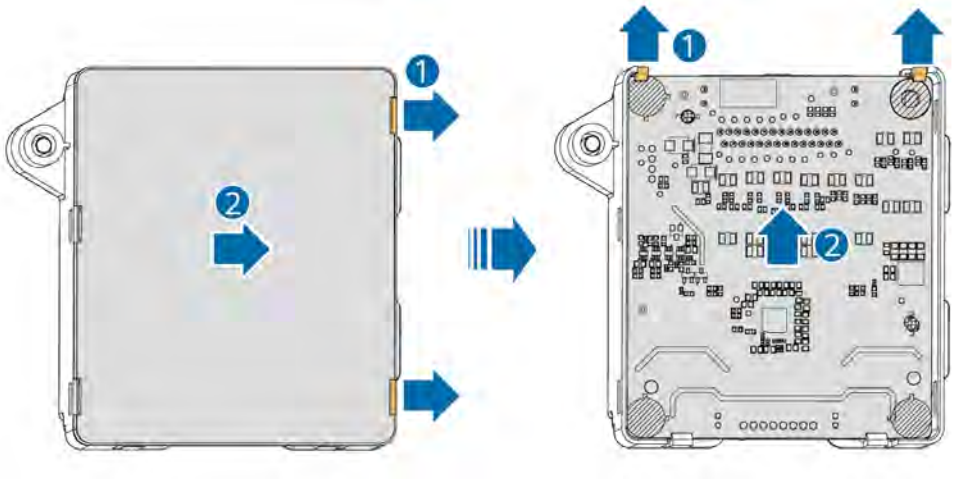
Position of the BMU Collection Board	Step		Diagram
	Step 5	1: Remove the screw. (M4 screw with a torque of 1.6 N·m) 2: Gently remove the BMU collection board from the clip. 3: Tilt the BMU collection board upward to reserve space for inserting and removing the cable harness at the bottom. 4–5: Remove the cable harness plug from the bottom of the BMU collection board.	

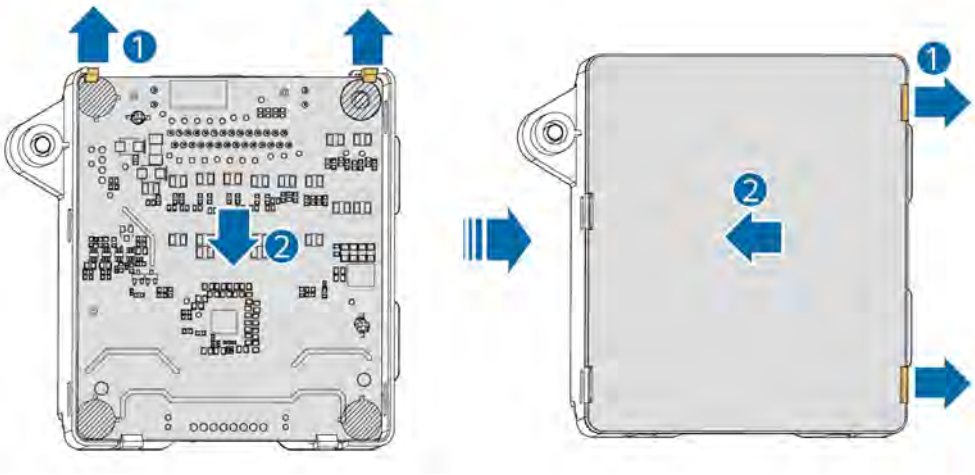
Step 7 Remove the plastic cover from the BMU collection board and remove the faulty BMU board.

Figure 3-23 Removing the BMU board



Step 8 Remove the plastic cover from the new BMU collection board, take out the new BMU board, and install it.

Figure 3-24 Installing the BMU board



Step 9 Install the BMU collection board, cable harness, and FPC connector by referring to step **Step 6** in the reverse order.

NOTICE

When installing the cable harness, arrange the cable harness and properly secure the cable harness back to the original position using cable clips.

Step 10 Install the panel. Place the panel on the lower edge of the opening at the front end of the cover, tilt the panel, and fasten the two cable clips to the die-casting panel.

NOTICE

- Before installing the panel, temporarily mount and secure the cross-door cable harness to prevent the cables from being clamped during installation.
- Check that the sealing rings on the left and right sides of the connectors are intact.

Step 11 Install the internal cable harness and close the battery pack panel. Tighten the left cable harness using M6 screws to 2.7–3.3 N·m.

Step 12 Install the communications terminals and bus terminal on the front panel, install the panel on the large window on the top cover using guide pins, and secure the panel.

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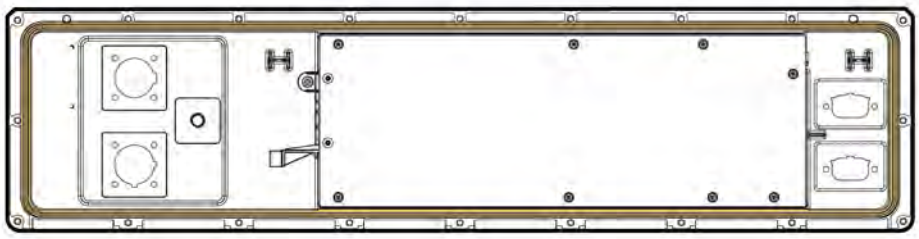
CAUTION

To ensure the air tightness of the battery pack:

1. Ensure that all the communications terminals and panel screws are securely installed.
2. Before installing screws, check that the sealing strip is intact.
3. Ensure that the installation is supervised by two persons, and take photos after the replacement.

Figure 3-25 Position of the sealing strip



Step 13 Install the screws that secure the general power ports and panel, and remove the panel maintenance fixture.

Step 14 Reinstall the cables, pipes, and PACK extinguishant port on the front panel of the battery pack.

Step 15 Close the cabinet door.

----End

3.4 Replacing a Balancing DCDC Module

Prerequisites

- Tools: insulation tape, insulated gloves, panel maintenance fixture (purchased on the configurator), wrench, insulated torque socket wrench (including 10# socket), Phillips insulated torque screwdriver (M4/M6), cable cutter, and PV terminal removal tool (delivered with spare parts)
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

Step 1 Remove the general power cables, balancing bus, communications cable, coolant inlet and outlet, PACK extinguishant port, and ground cable from the front panel of the battery pack in sequence, label the cables, and properly keep the cables and pipes.

1–3: Disconnect the power cables and communications cable.

4: Remove the PACK extinguishant port.

5: Remove the ground cable.

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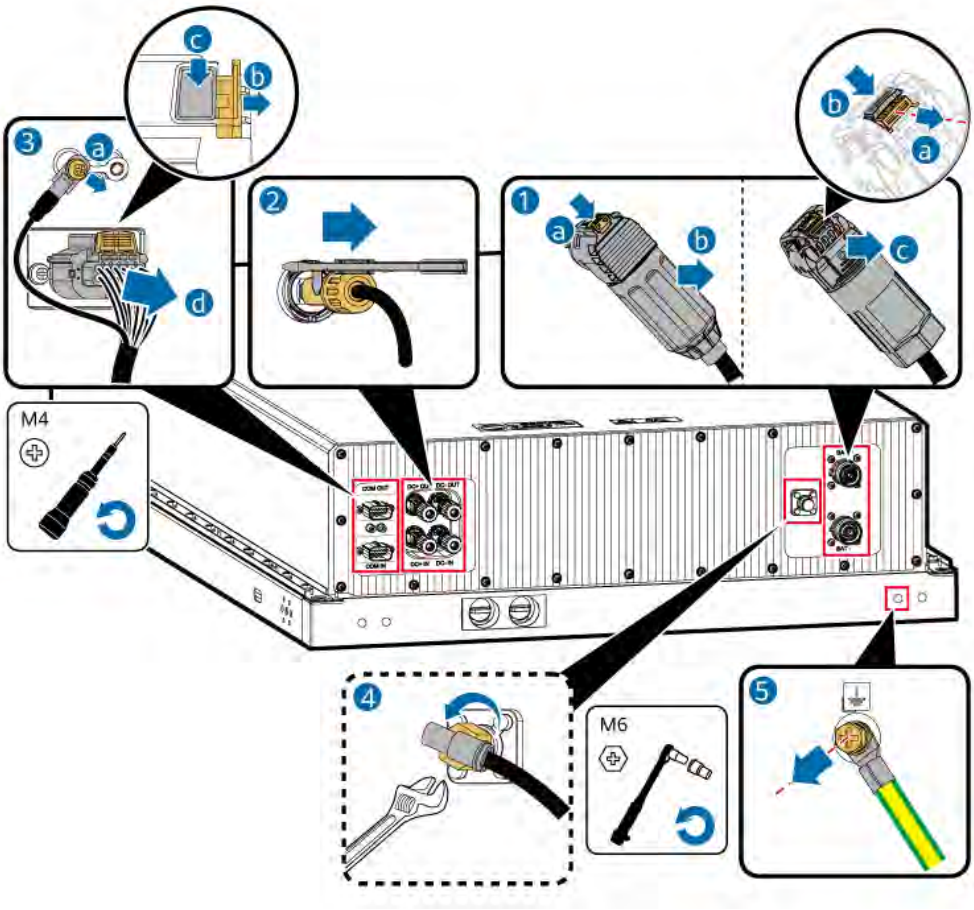
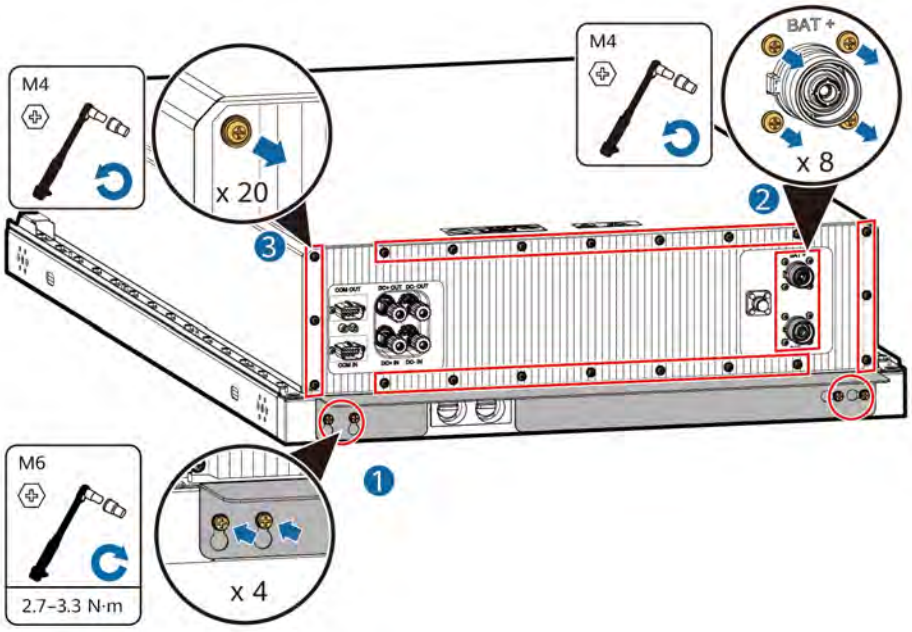
Figure 3-26 Removing cables and pipes from the panel



Step 2 Install the maintenance fixture, and remove the screws securing the general power ports and panel in sequence.

Figure 3-27 Installing the fixture



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Step 3 Remove the cable harness on the right side of the battery pack.

WARNING

Take insulation measures and exercise caution when performing operations with power on.

CAUTION

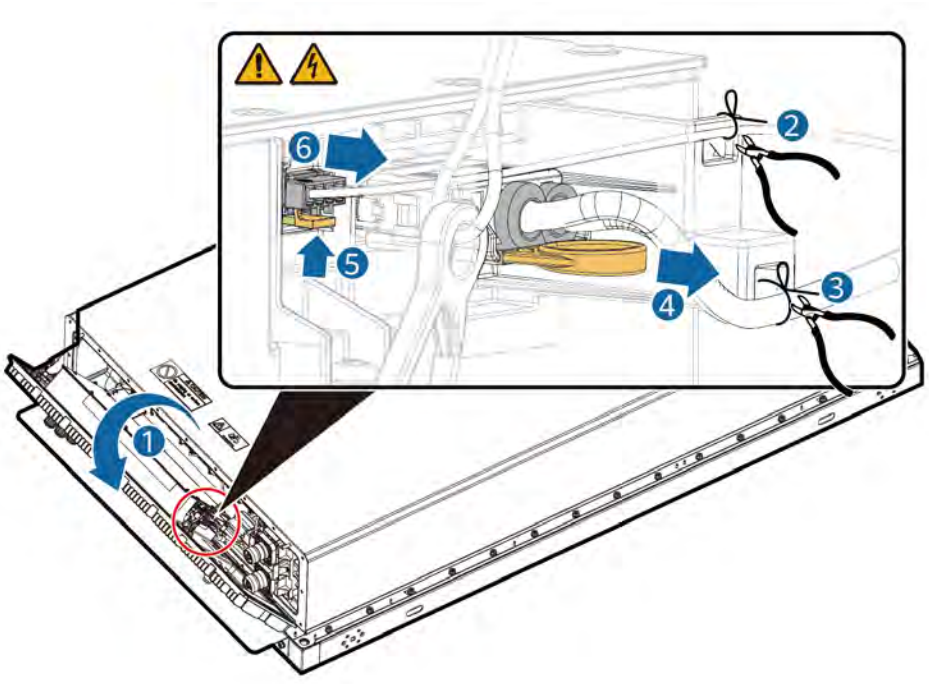
Exercise caution when cutting cable ties and avoid damaging cables.

1. Slowly pull out the battery pack panel until the general power terminals are removed from the panel.

2–3: Cut off cable ties.

4–6: Remove the cable harness.

Figure 3-28 Removing the cable harness on the right



Step 4 Remove the two cable clips from the front panel and slowly remove the panel.

CAUTION

Exercise caution when removing the panel from the battery pack to prevent dropping the panel or damaging the wiring terminals.

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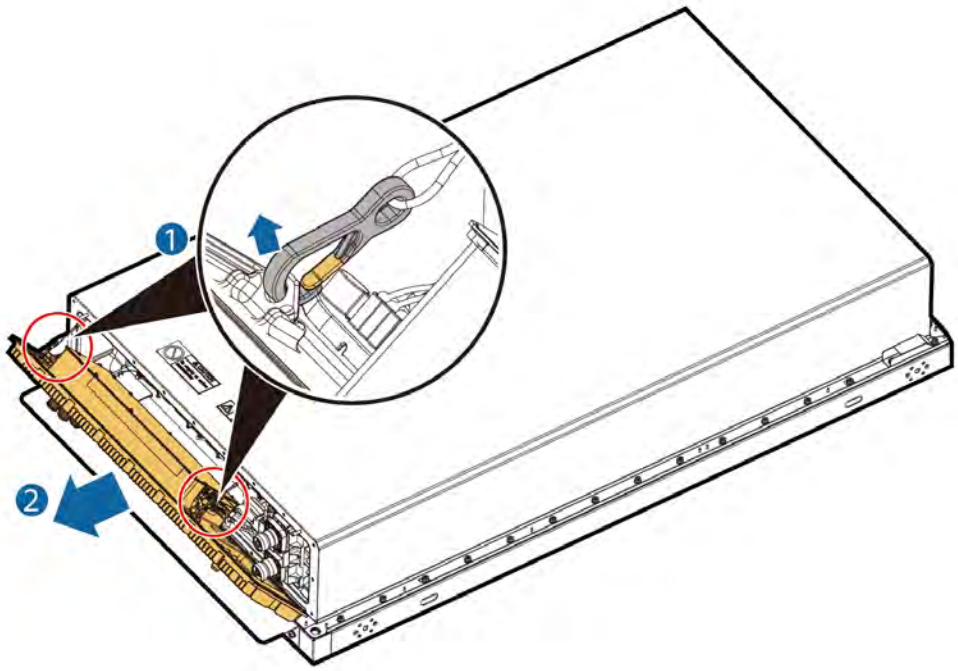
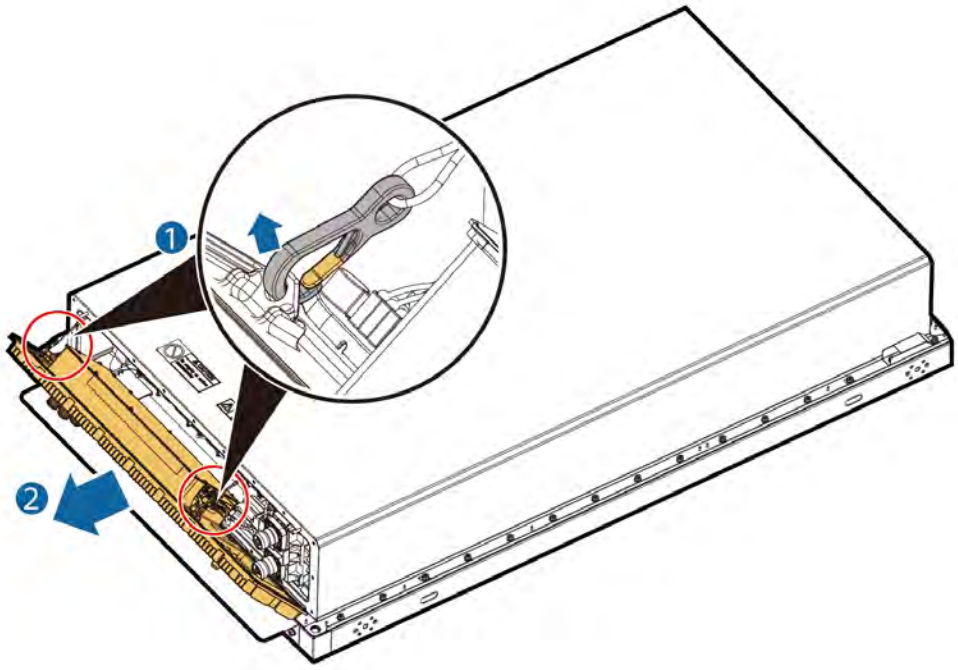
Figure 3-29 Removing the front panel



Step 5 Remove the two cable clips from the front panel, and remove the panel (that is, the balancing DCDC module).

Figure 3-30 Removing the front panel



Step 6 Install the panel. Place the panel on the lower edge of the opening at the front end of the cover, tilt the panel, and fasten the two cable clips to the die-casting panel.

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NOTICE

- Before installing the panel, temporarily mount and secure the cross-door cable harness to prevent the cables from being clamped during installation.
- Check that the sealing rings on the left and right sides of the connectors are intact.

Step 7 Install the internal cable harness and close the battery pack panel. Tighten the left cable harness using M6 screws to 2.7–3.3 N·m.

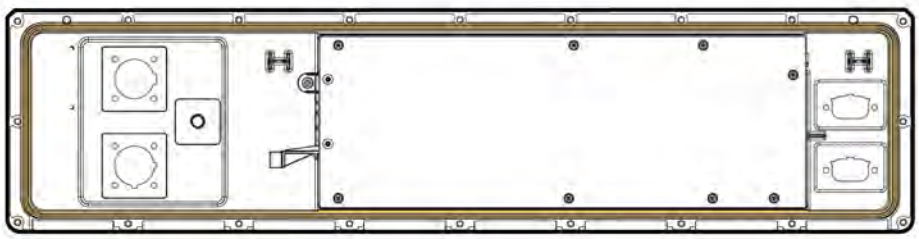
Step 8 Install the communications terminals and bus terminal on the front panel, install the panel on the large window on the top cover using guide pins, and secure the panel.

⚠ CAUTION

To ensure the air tightness of the battery pack:

1. Ensure that all the communications terminals and panel screws are securely installed.
2. Before installing screws, check that the sealing strip is intact.
3. Ensure that the installation is supervised by two persons, and take photos after the replacement.

Figure 3-31 Position of the sealing strip



Step 9 Install the screws that secure the general power ports and panel, and remove the panel maintenance fixture.

Step 10 Reinstall the cables, pipes, and PACK extinguishant port on the front panel of the battery pack.

Step 11 Close the cabinet door.

----End

3.5 Replacing an NTC Cable Harness in the Battery Pack

NOTICE

There are four NTC harnesses in the battery pack. Two NTC cable harnesses are secured to the copper bar, and another two are secured to the general positive and negative power component.

3.5.1 Replacing an NTC Cable Harness on the Copper Bar

Prerequisites

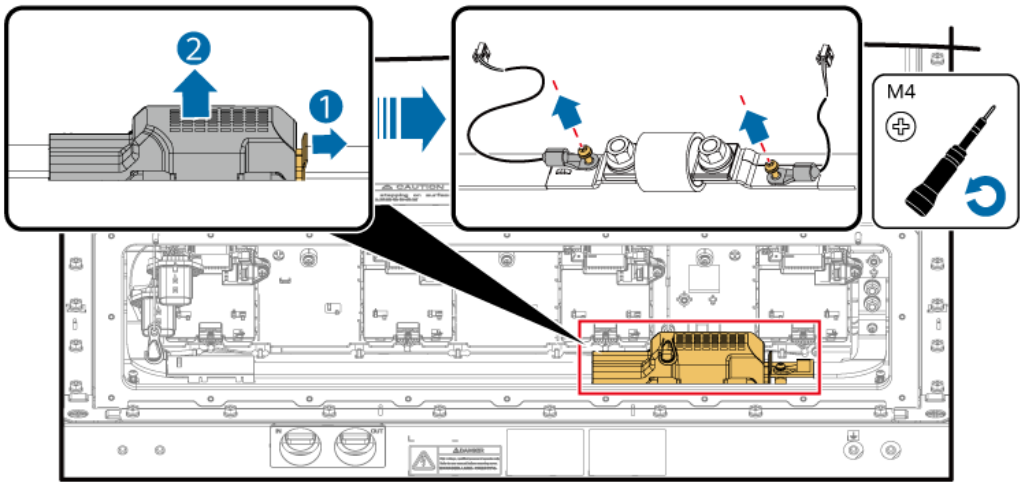
- Tools: insulation tape, insulated gloves, panel maintenance fixture (purchased on the configurator), PV terminal removal tool (delivered with spare parts), wrench, and mini Phillips screwdriver (M4, length < 100 mm)
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

Step 1 Remove the general positive and negative power component from the first BMU collection board on the right. For details, see **3.3 Replacing a BMU Collection Board**.

Step 2 Remove the NTC cable harness.

Figure 3-32 Removing the NTC cable harness



WARNING

Do not pull or scratch the FPC connector during operations. Otherwise, the FPC connector may be damaged.

Step 3 Install a new NTC cable harness and tighten the M4 Phillips screws to 1.6 N·m.

Step 4 Install the cable harness, FPC connector, and battery components from right to left. For details, see **3.3 Replacing a BMU Collection Board**.

----End

3.5.2 Replacing an NTC Cable Harness on the General Positive and Negative Power Component

Prerequisites

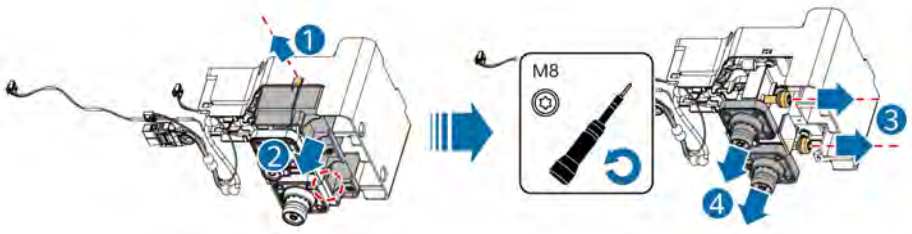
- Tools: insulated gloves, Phillips insulated torque screwdriver (M4/M8), and mini Phillips screwdriver (M4, length < 100 mm)
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

Step 1 Remove the general positive and negative power component from the first BMU collection board on the right. For details, see **3.3 Replacing a BMU Collection Board**.

Step 2 Remove the assemblies and general power ports from the general positive and negative power component.

Figure 3-33 Removing the NTC cable harness from the general positive and negative power component (1)



Step 3 Remove the faulty NTC cable harness from the general positive and negative power component.

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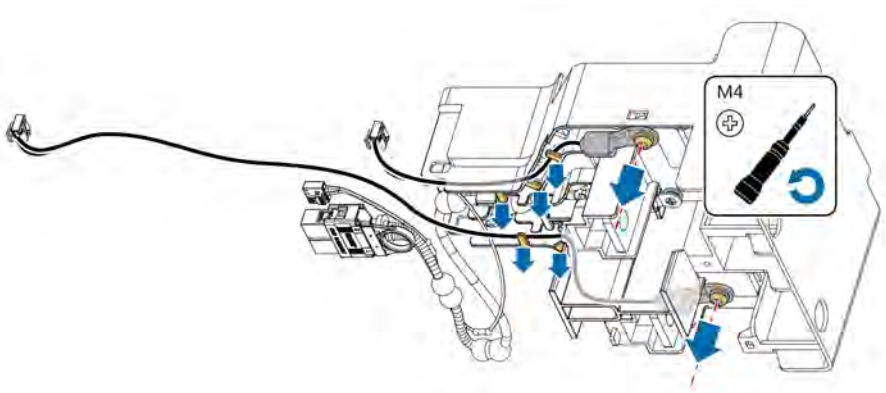
Figure 3-34 Removing the NTC cable harness from the general positive and negative power component (2)



Step 4 Install a new NTC cable harness and tighten the M4x20 screws to 1.6 N·m.

Step 5 Install the general power ports and assemblies and tighten the M8x20 screws to 13 N·m.

Step 6 Install the general positive and negative power component. For details, see **3.3 Replacing a BMU Collection Board**.

----End

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4 Replacing a PCS

Prerequisites

- Tools: insulated torque socket wrench (including 13# socket), PCS maintenance fixture (purchased on the configurator), lifting handle (delivered with spare parts), coolant filling/drainage machine (purchased on the configurator), and coolant
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.
- At least two persons are required to replace the component.

Procedure

Step 1 Determine subsequent operations based on the ambient temperature.

- If the ambient temperature is higher than –10°C, skip this step and go to the next step.
- If the ambient temperature is less than or equal to –10°C, drain all the coolant from the cabinet and then go to the next step. For details about how to drain coolant, see **D.1 Draining Coolant from the LTMS**.

Step 2 Remove the branch liquid cooling pipe and the old female connector of the stop valve. Retain the old male connector.

Step 3 Disconnect the cables connected to the faulty PCS, and check whether the labels are intact. If not, confirm cables and prepare new labels.

Step 4 Take out the PCS fixture and switch it to the PCS position. For details, see **3.2 Replacing an Entire Battery Pack**.

Step 5 Move the faulty PCS to the fixture.

1. Remove the screws that secure the faulty PCS to the ESS.
2. Remove the pins, raise the fixture outside the ESS, place the fixture into the ESS, and insert the pins in the positions, as shown in the figure.
3. Secure the fixture to the ESS.
4. Hold the handles on both sides of the faulty PCS and pull the PCS to the fixture.

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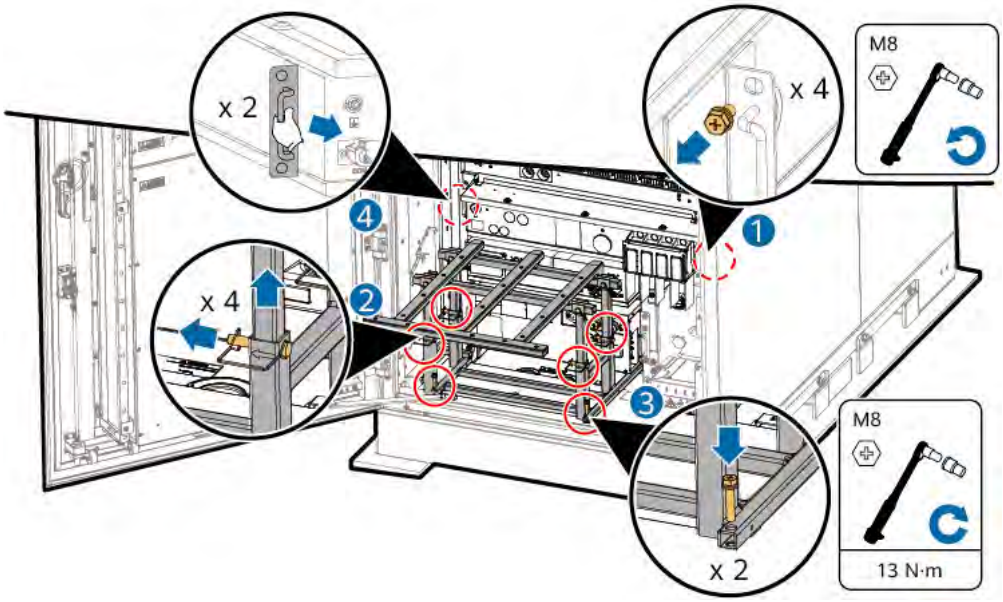
Figure 4-1 Moving the PCS to the fixture

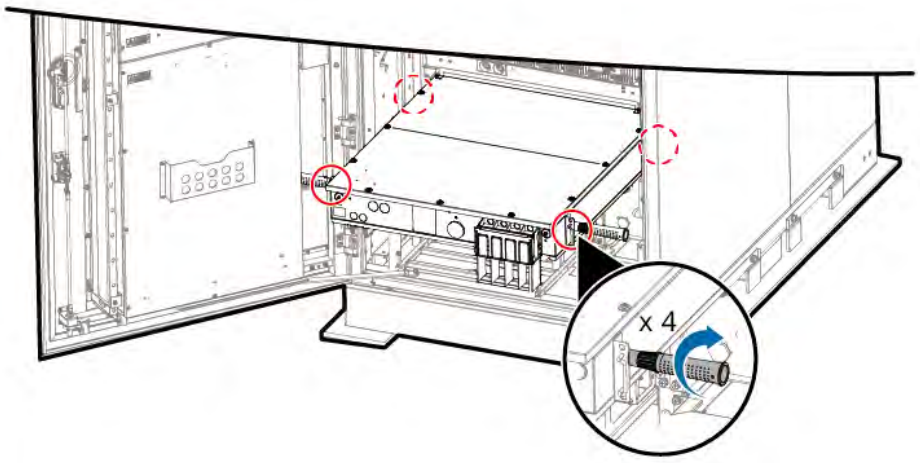


WARNING

- When placing the PCS on the fixture, ensure that most of the weight of the PCS is on the fixture to avoid damage caused by falling.
- Exercise caution when moving the PCS to prevent it from colliding with the lead-acid battery box and hurting your hands.

Step 6 Install the lifting handles and lift the PCS to a safe ground.

Figure 4-2 Installing the lifting handles



Step 7 Push the PCS inward.

1. Take out a new PCS and install the lifting handles.
2. One person stands on each side of the PCS to lift the PCS onto the fixture to avoid falling, and then remove the lifting handles.

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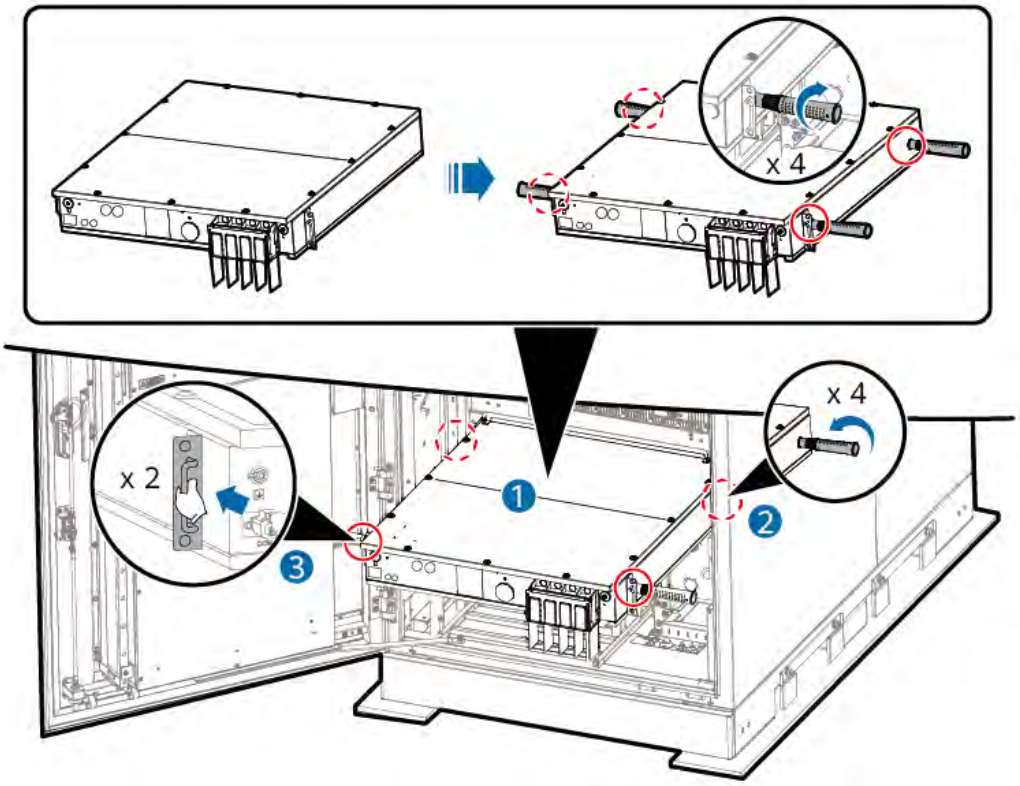
3. Hold the handles on both sides and slowly push the PCS into the ESS.

Figure 4-3 Pushing the PCS inward



Step 8 Complete PCS replacement.

1. Push the new PCS completely into the ESS and tighten the screws.
2. Remove the screws from the PCS fixture, remove the fixture, and close the ESS door.
3. After taking out the PCS fixture, remove the pins, lower the fixture, and insert the pins.

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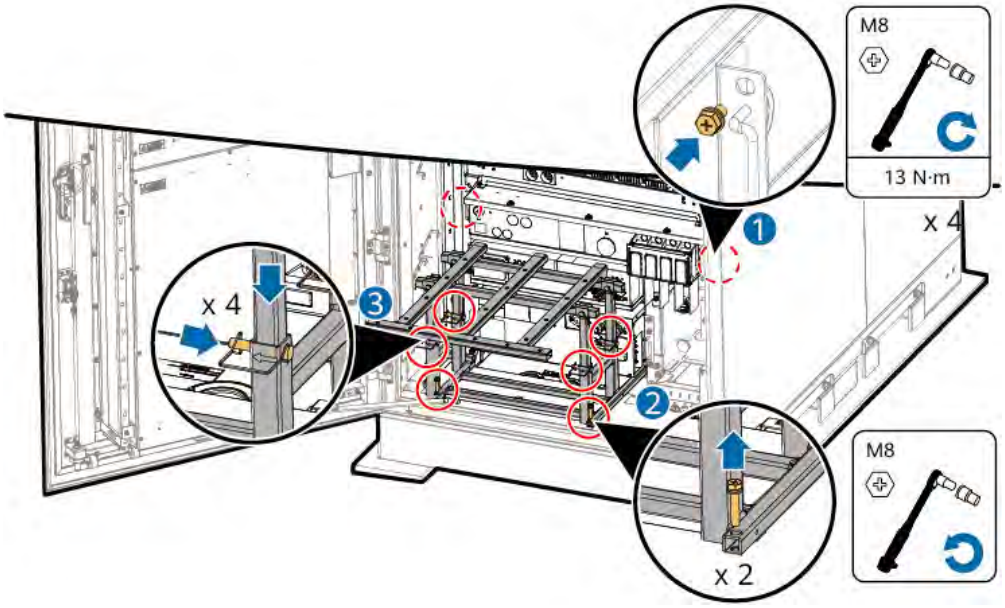
Figure 4-4 Completing PCS replacement



WARNING

When placing the PCS on the fixture, ensure that most of the weight of the PCS is on the fixture to avoid damage caused by falling.

Step 9 After removing the fixture and restoring it to the DCDC position, place the fixture back to the toolbox and secure it.

Step 10 Connect the cables based on the labels.

Step 11 Connect the new male connector of the stop valve to the new PCS, and connect the old female connector to the new male connector.

Step 12 Perform operations based on the installation status.

- If coolant has been drained from the cabinet before the faulty component is removed, add coolant to the cabinet. For details, see **D.3 Adding Coolant to the LTMS**.
- If coolant has not been drained from the cabinet before the faulty component is removed, add an appropriate amount of coolant. For details, see **D.3 Adding Coolant to the LTMS**.

----End

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5 Replacing the RCM

NOTICE

The figures in this chapter are for reference only. The appearance of each component (such as a power meter) inside the RCM may vary.

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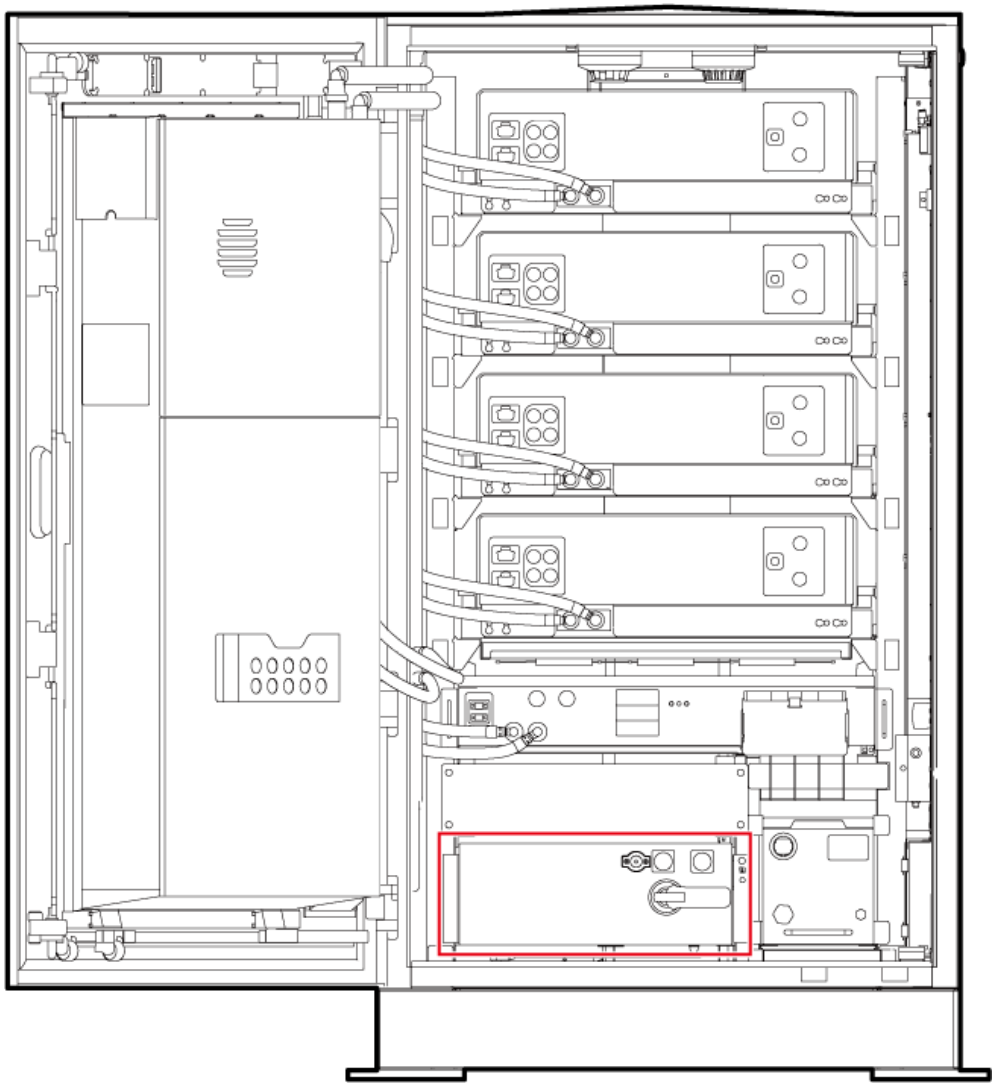
5.1 Replacing an Entire RCM

Prerequisites

Figure 5-1 Position of the RCM



- Tools: insulated torque socket wrench (13# socket, including the extension rod) and Phillips insulated torque screwdriver (M3 and M6)
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

Step 1 Remove the maintenance compartment cover and cable protective cover.

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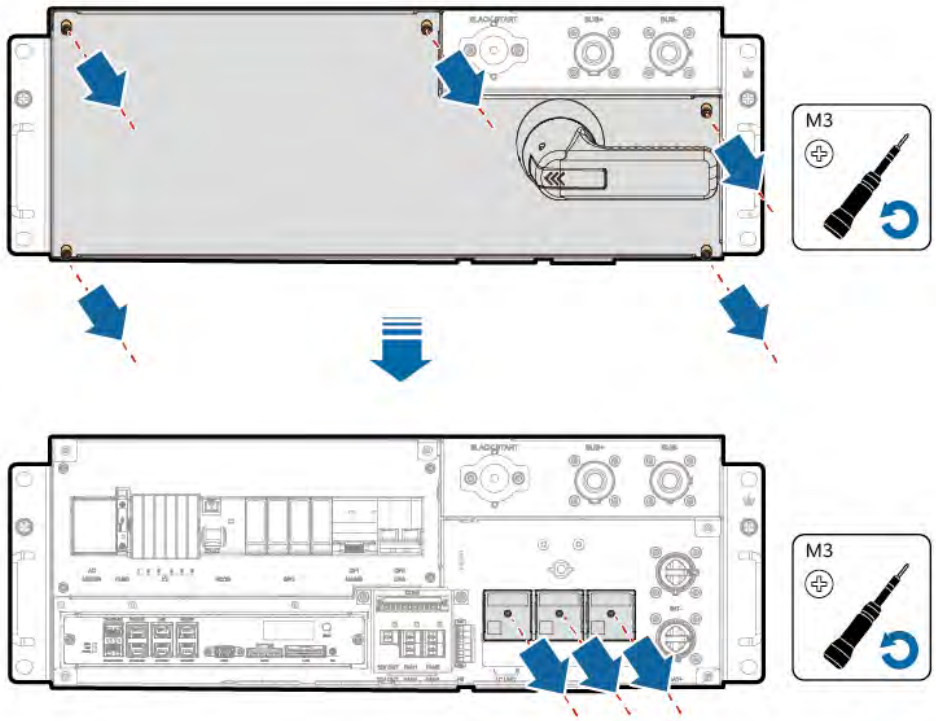
Figure 5-2 Removing the maintenance compartment cover and cable protective cover



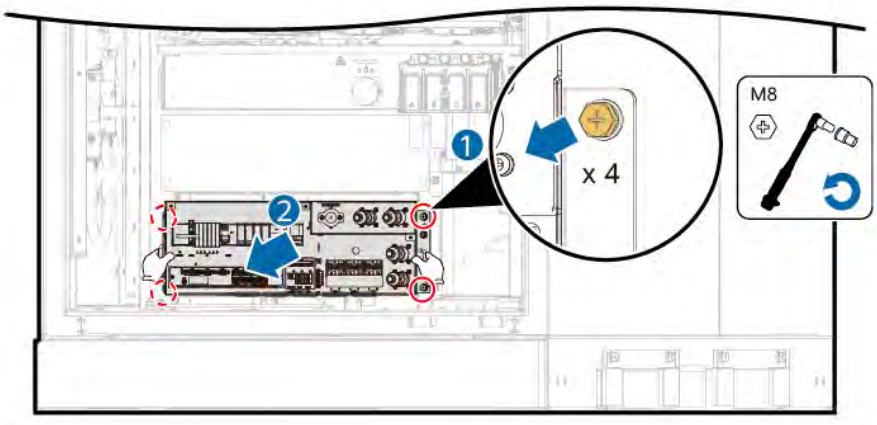
Step 2 Disconnect the cables and check whether the labels are intact. If not, confirm cables and prepare new labels.

NOTE

Remove the cables under the cable protective cover using an insulated torque socket wrench (including 10# socket).

Step 3 Remove the faulty RCM.

Figure 5-3 Removing the faulty RCM



Step 4 Remove the BCU from the faulty RCM. For details, see **5.5 Replacing a BCU**.

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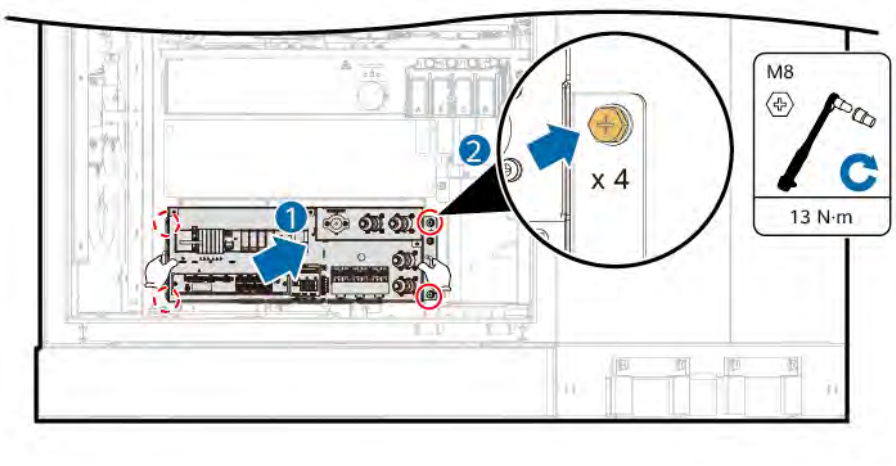
Step 5 Install the removed BCU in the new RCM. For details, see **5.5 Replacing a BCU**.

CAUTION

When replacing the RCM, you must use the original BCU. Otherwise, data will be lost.

Step 6 Install the RCM.

Figure 5-4 Installing the RCM



Step 7 Connect cables according to the cable labels and port silk screens

CAUTION

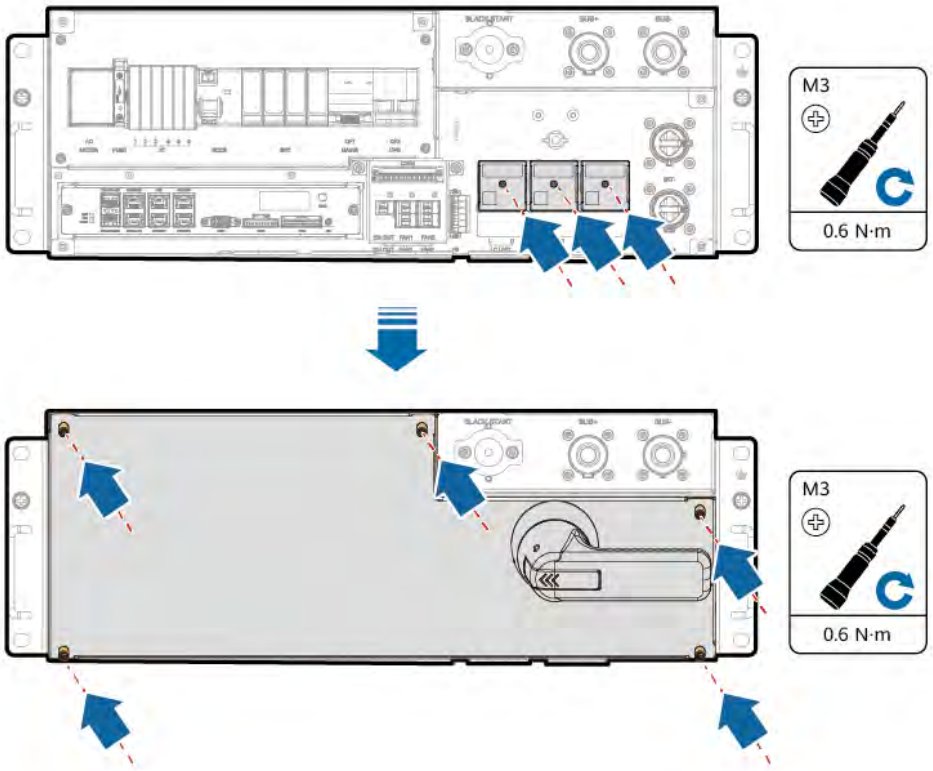
Connect cables according to the cable labels and port silkscreens. Otherwise, the device may be damaged.

NOTE

Install the cables to a torque of 5 N·m under the cable protective cover using an insulated torque socket wrench (including 10# socket).

Step 8 Install the cable protective cover and maintenance compartment cover.

Figure 5-5 Installing the cable protective cover and maintenance compartment cover



----End

5.2 Replacing a Power Meter

Prerequisites

- Tools: Phillips insulated torque screwdriver (M3) and flat-head insulated torque screwdriver (M2.5)
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

Step 1 Remove the maintenance compartment cover and the upper left cover inside.

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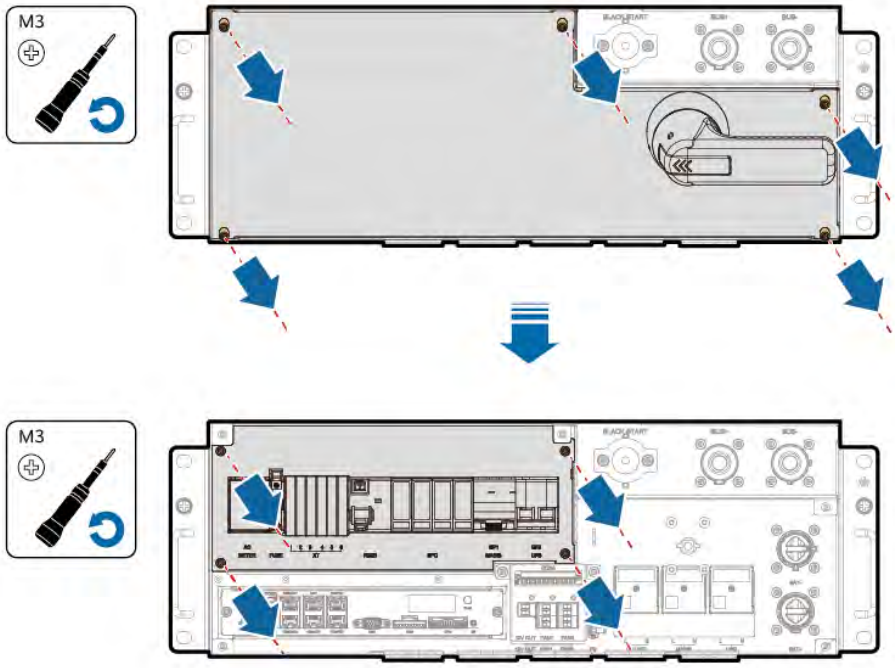
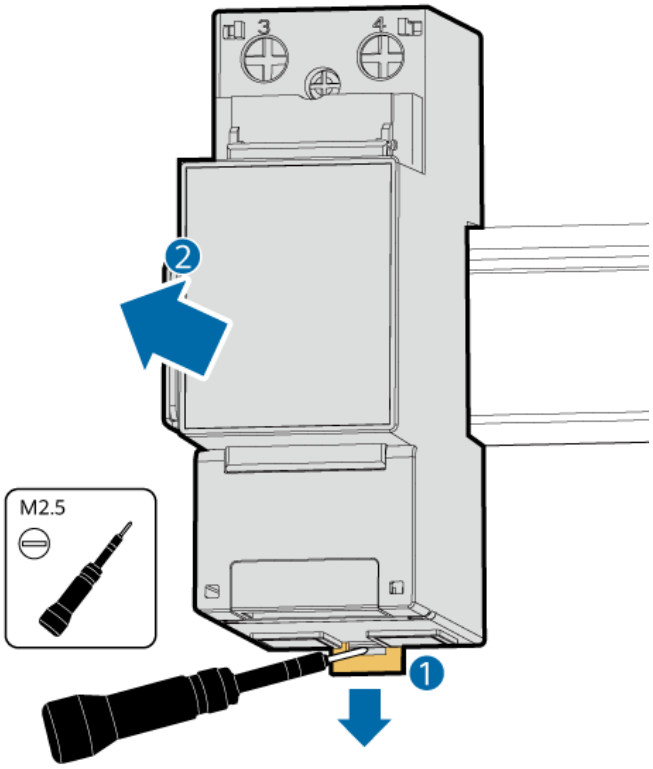
Figure 5-6 Removing the maintenance compartment cover and the upper left cover inside



Step 2 Remove the faulty power meter.

Figure 5-7 Removing the faulty power meter



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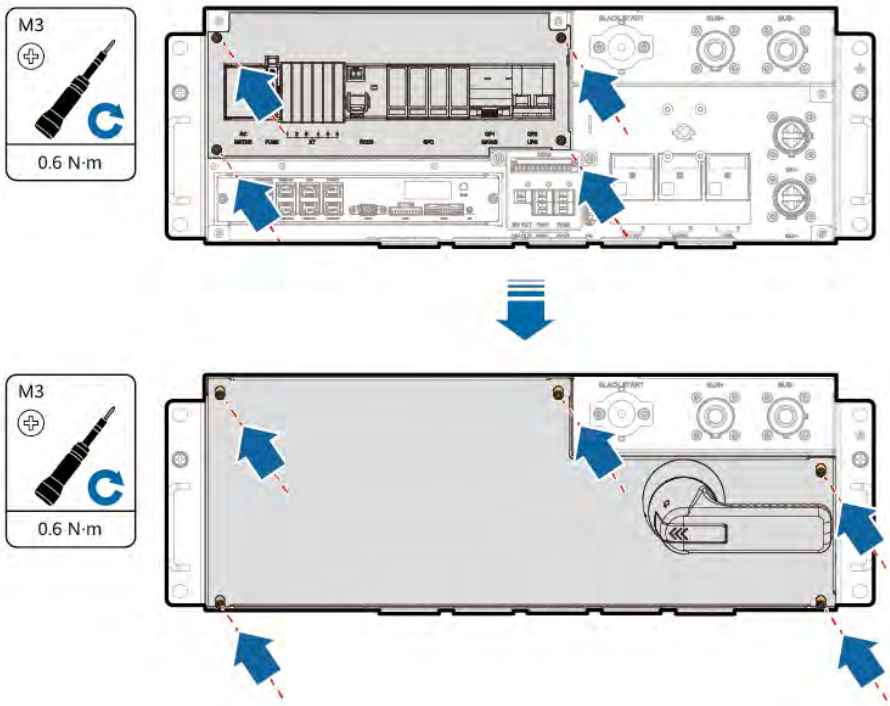
Step 3 After taking the faulty power meter out of the RCM, disconnect the cables from the faulty power meter and check whether the labels are intact. If not, confirm cables and prepare new labels.

Step 4 Connect the cables to a new power meter based on the cable labels and tighten the M5 Phillips screws to 1.6 N·m.

Step 5 Arrange the cables and properly put them back inside the RCM. Fasten the meter to the upper part of the guide rail, push the meter, and clamp it to the guide rail.

Step 6 Install the upper left cover inside and cover of the maintenance compartment.

Figure 5-8 Installing the upper left cover inside and cover of the maintenance compartment



----End

5.3 Replacing a Power Meter Fuse

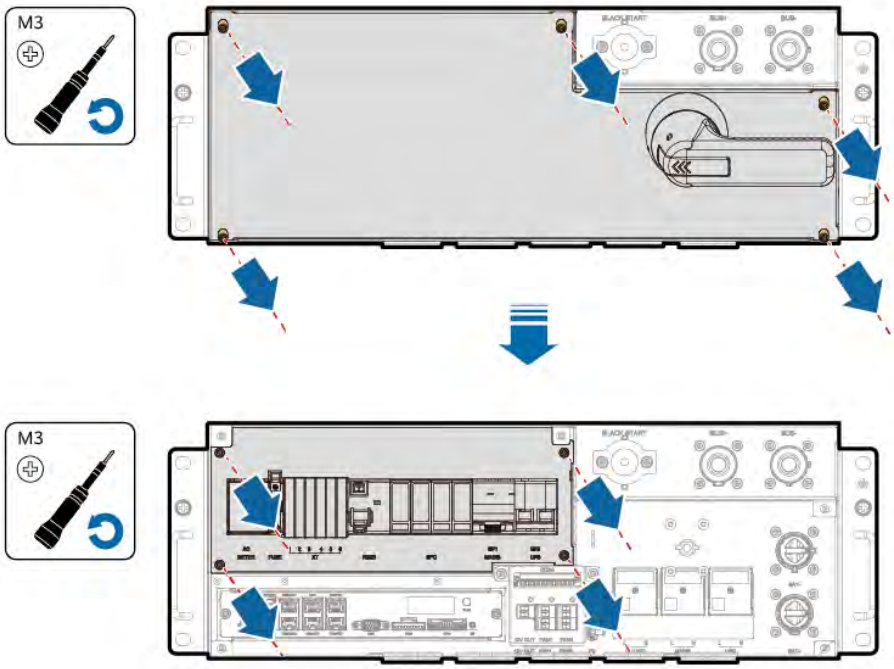
Prerequisites

- Tool: Phillips insulated torque screwdriver (M3)
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

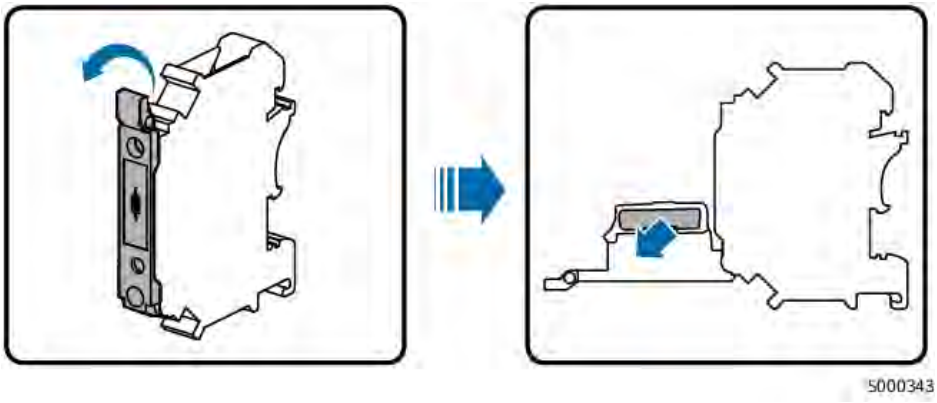
Step 1 Remove the maintenance compartment cover and the upper left cover inside.

Figure 5-9 Removing the maintenance compartment cover and the upper left cover inside



Step 2 Open the fuse cover of the power meter and remove the faulty fuse.

Figure 5-10 Removing the fuse



Step 3 Install a new fuse and close the fuse cover of the power meter.

Step 4 Install the upper left cover inside and cover of the maintenance compartment.

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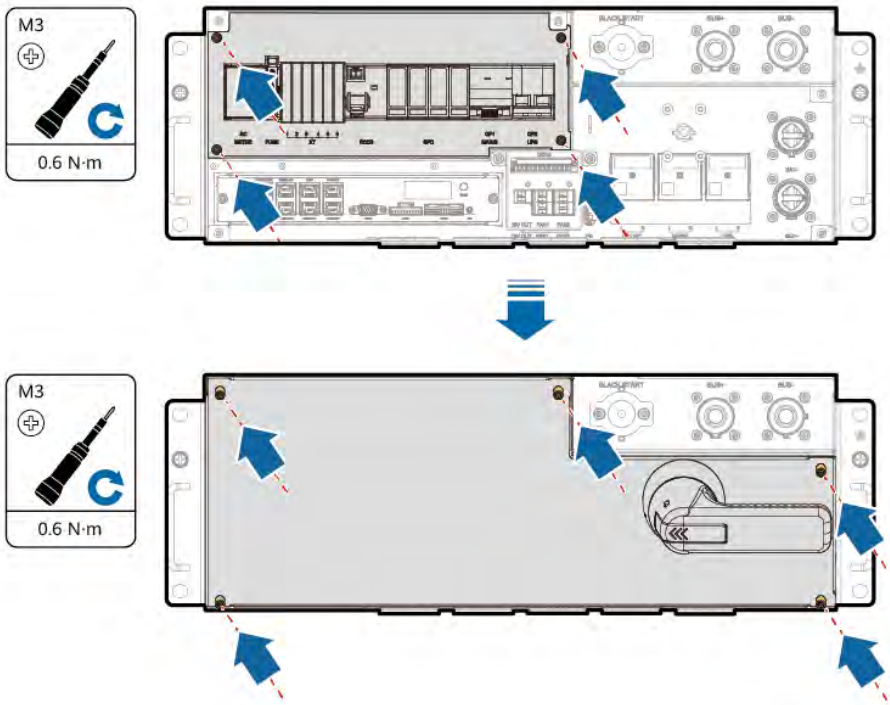
Figure 5-11 Installing the upper left cover inside and cover of the maintenance compartment



----End

5.4 Replacing an SPD

Prerequisites

- Tools: Phillips insulated torque screwdriver (M3) and surge protection module removal and insertion tool (delivered with spare parts)
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

DANGER

Do not replace the AC SPD during a thunderstorm.

Procedure

Step 1 Remove the maintenance compartment cover and the upper left cover inside.

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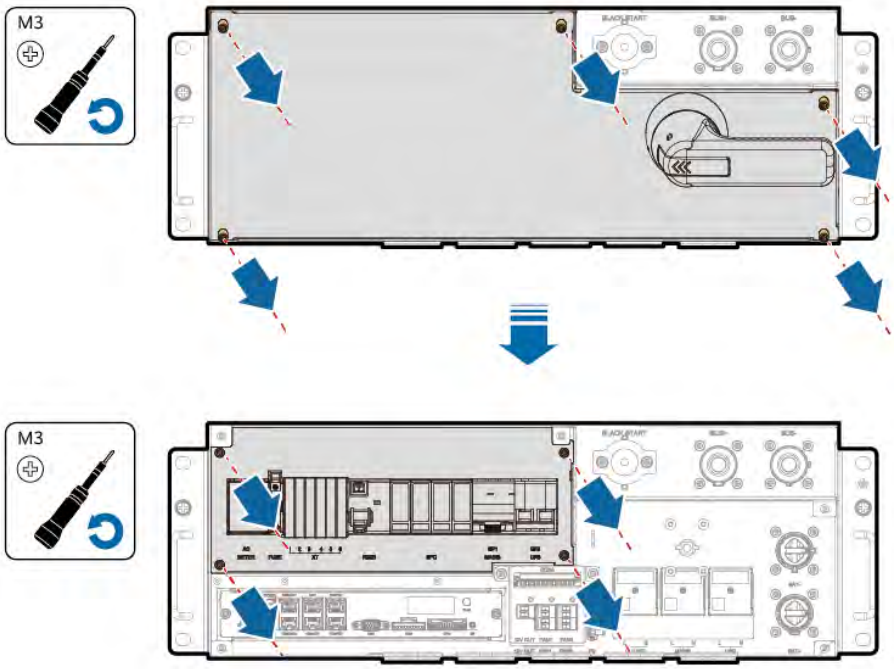
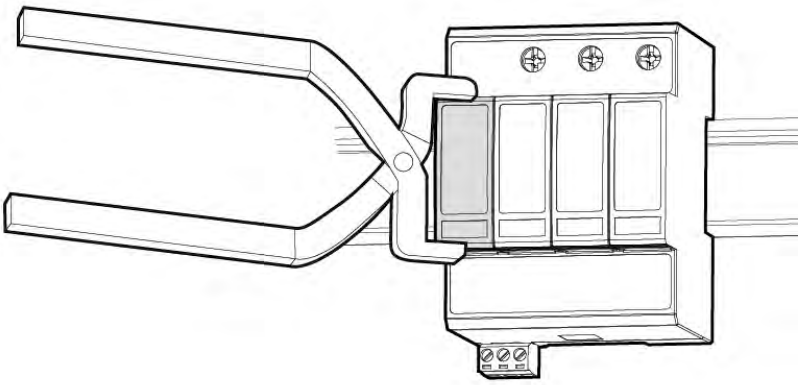
Figure 5-12 Removing the maintenance compartment cover and the upper left cover inside



Step 2 Remove the faulty surge protection module from the AC SPD. If the indication window of a surge protection module turns red, the module is faulty.

Figure 5-13 Removing the faulty surge protection module



Step 3 Install a new surge protection module.

Step 4 Install the upper left cover inside and cover of the maintenance compartment.

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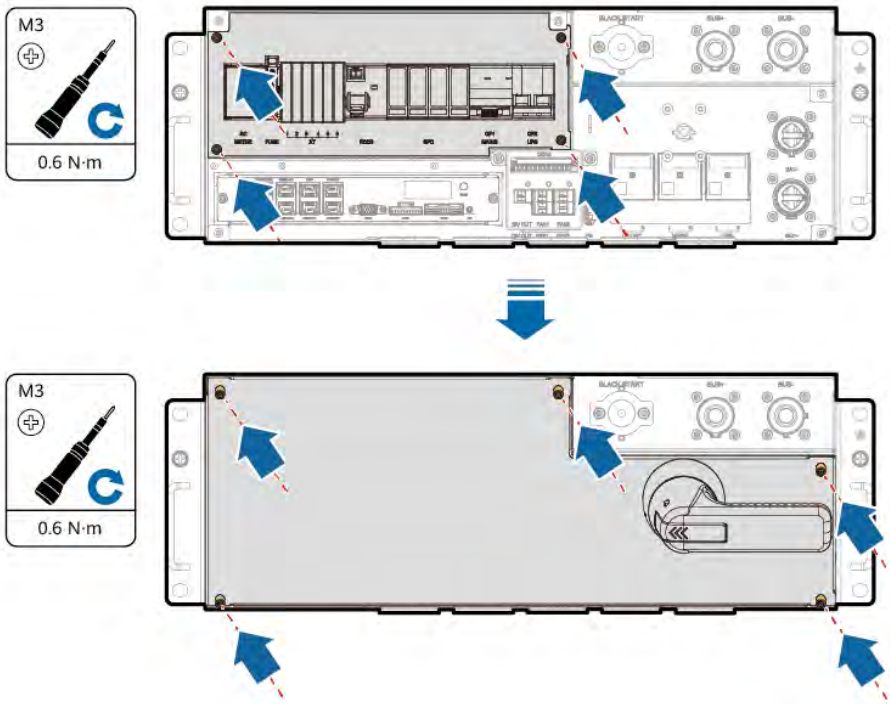
Figure 5-14 Installing the upper left cover inside and cover of the maintenance compartment



----End

5.5 Replacing a BCU

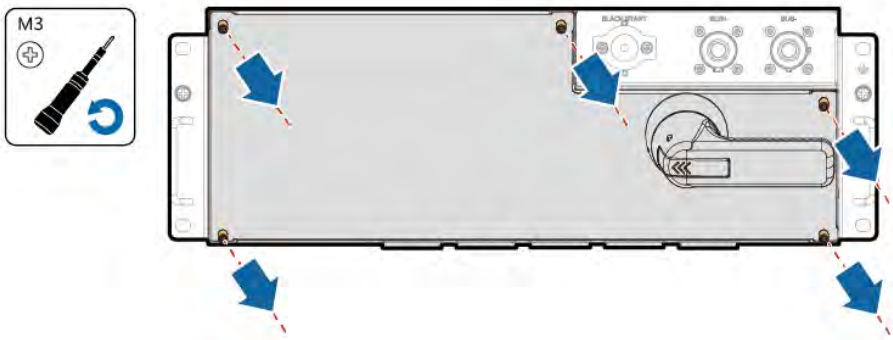
Prerequisites

- Tool: Phillips insulated torque screwdriver (M3)
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

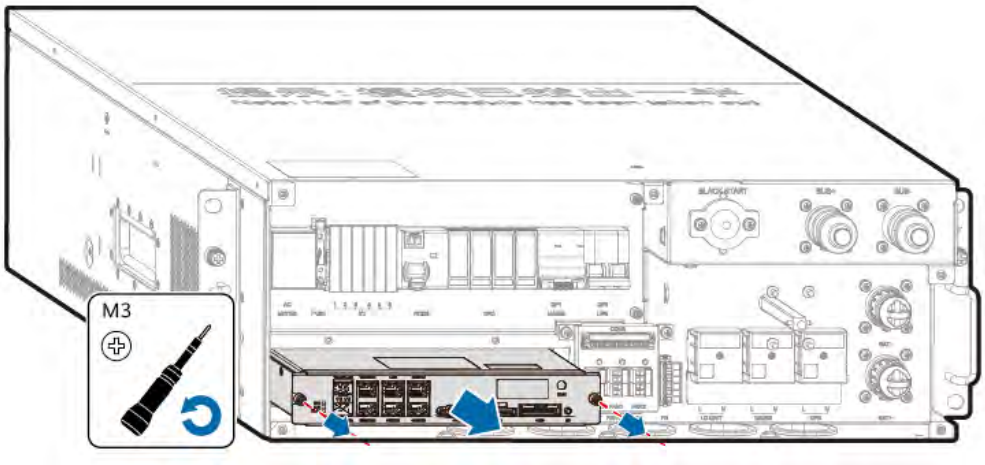
Step 1 Remove the maintenance compartment cover.

Figure 5-15 Removing the maintenance compartment cover



Step 2 Remove the faulty BCU.

Figure 5-16 Removing the faulty BCU

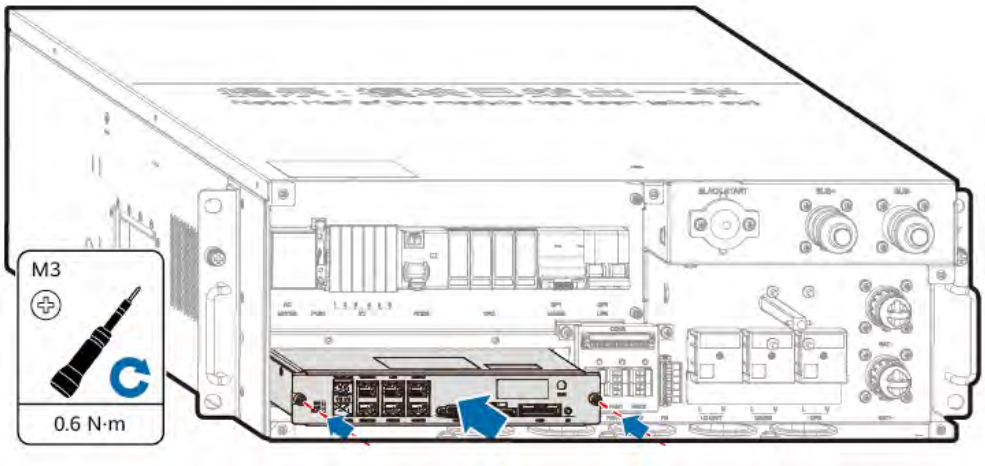


Step 3 Disconnect cables from the faulty BCU, and label the cables.

Step 4 Connect the cables to a new BCU based on the cable labels.

Step 5 Install the new BCU.

Figure 5-17 Installing the new BCU



Step 6 Install the RCM maintenance compartment cover.

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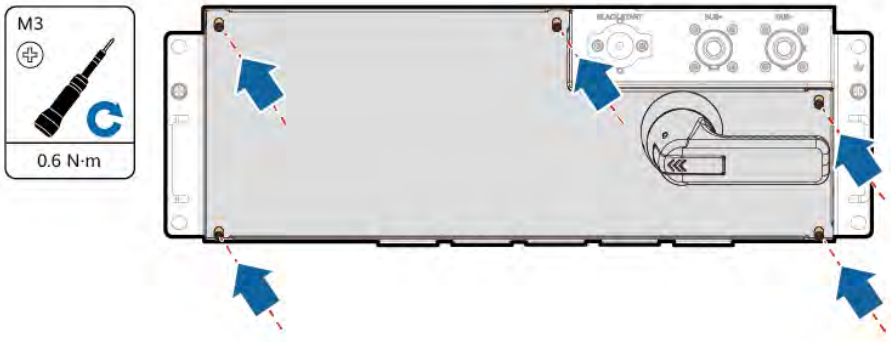
Figure 5-18 Installing the maintenance compartment cover



----End

5.6 Replacing an RCM Fan

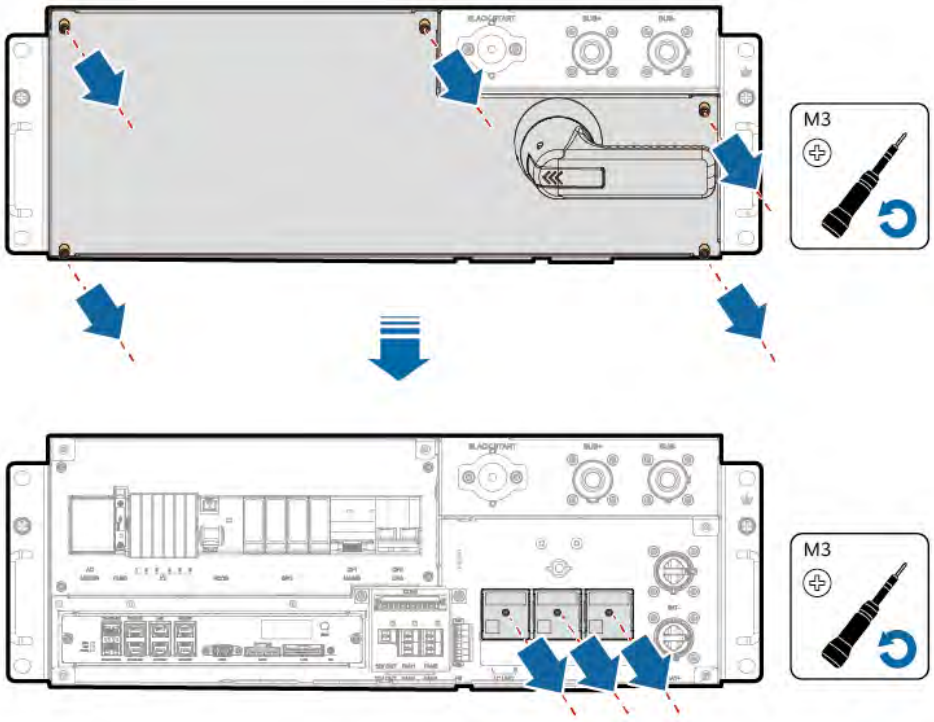
Prerequisites

- Tools: Phillips insulated torque screwdriver (M3 and M4) and insulated torque socket wrench (including 13# socket)
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

Step 1 Remove the maintenance compartment cover and cable protective cover.

Figure 5-19 Removing the maintenance compartment cover and cable protective cover



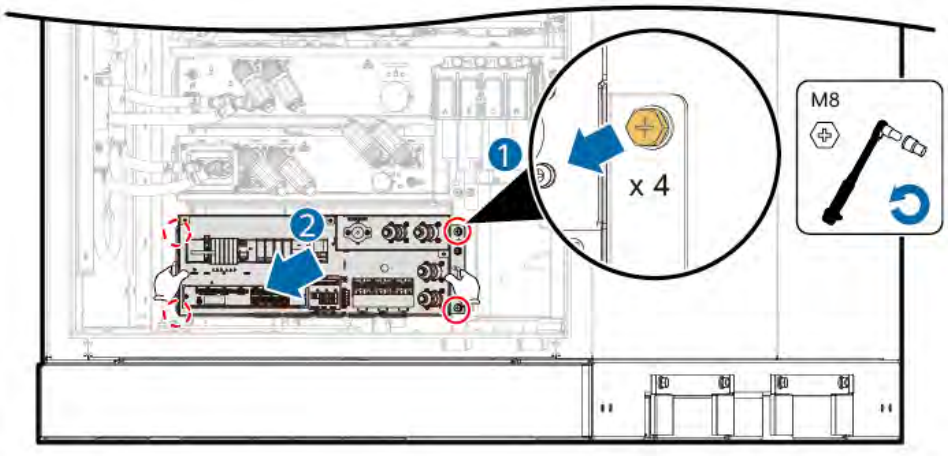
Step 2 Disconnect the cables and check whether the labels are intact. If not, confirm cables and prepare new labels.

NOTE

Remove the cables under the cable protective cover using an insulated torque socket wrench (including 10# socket).

Step 3 Take the RCM out of the cabinet.

Figure 5-20 Taking the RCM out of the cabinet



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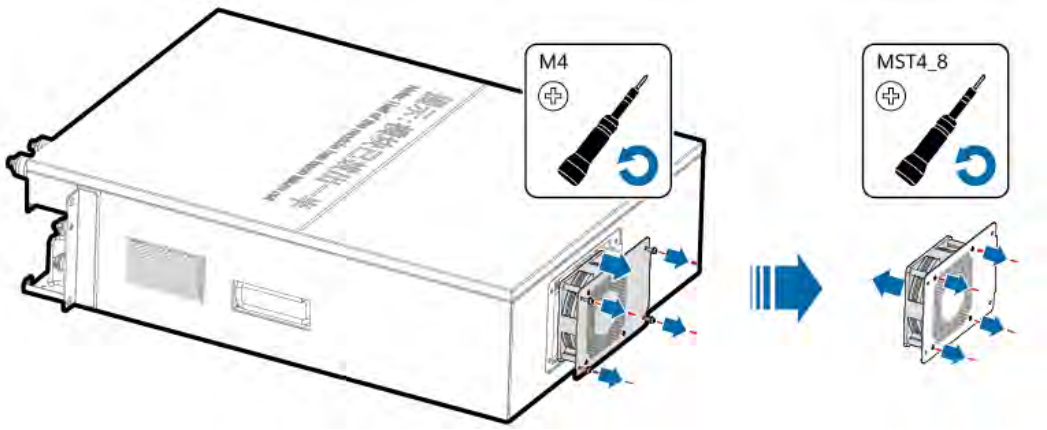
Step 4 Remove the faulty RCM fan.

Figure 5-21 Removing the faulty RCM fan

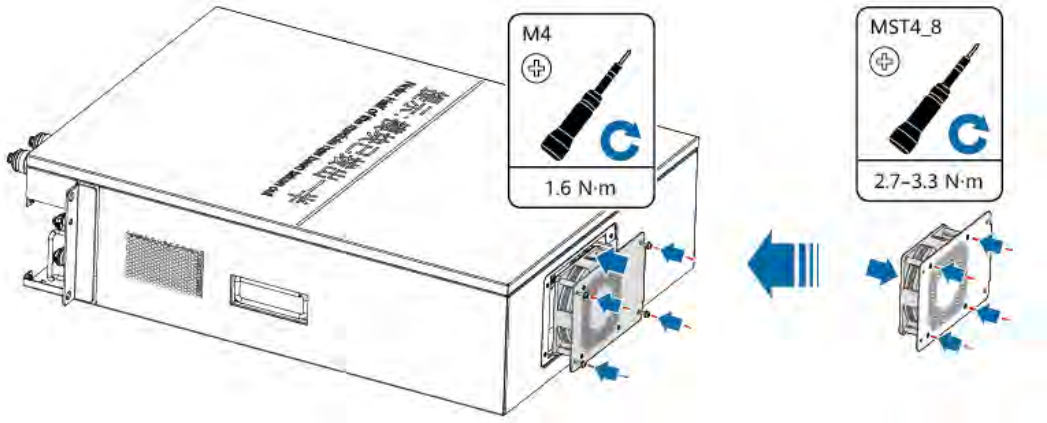


Step 5 Disconnect cables from the faulty RCM fan, and label the cables.

Step 6 Connect the cables to a new RCM fan according to the cable labels.

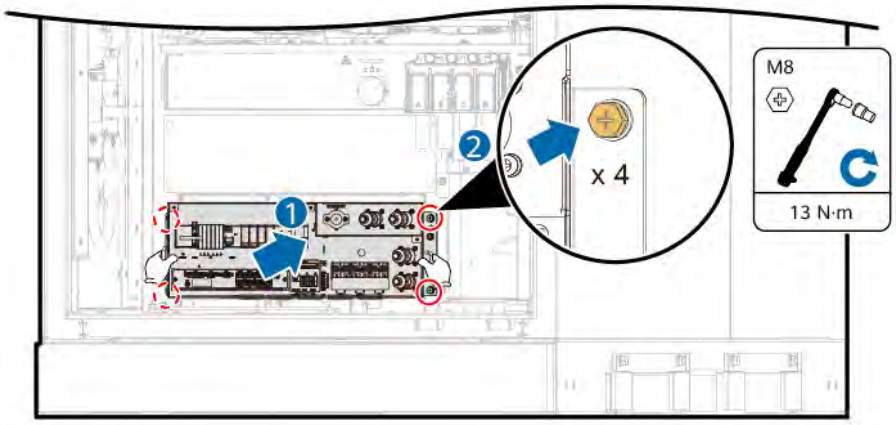
Step 7 Install the new RCM fan.

Figure 5-22 Installing the new RCM fan



Step 8 Install the RCM.

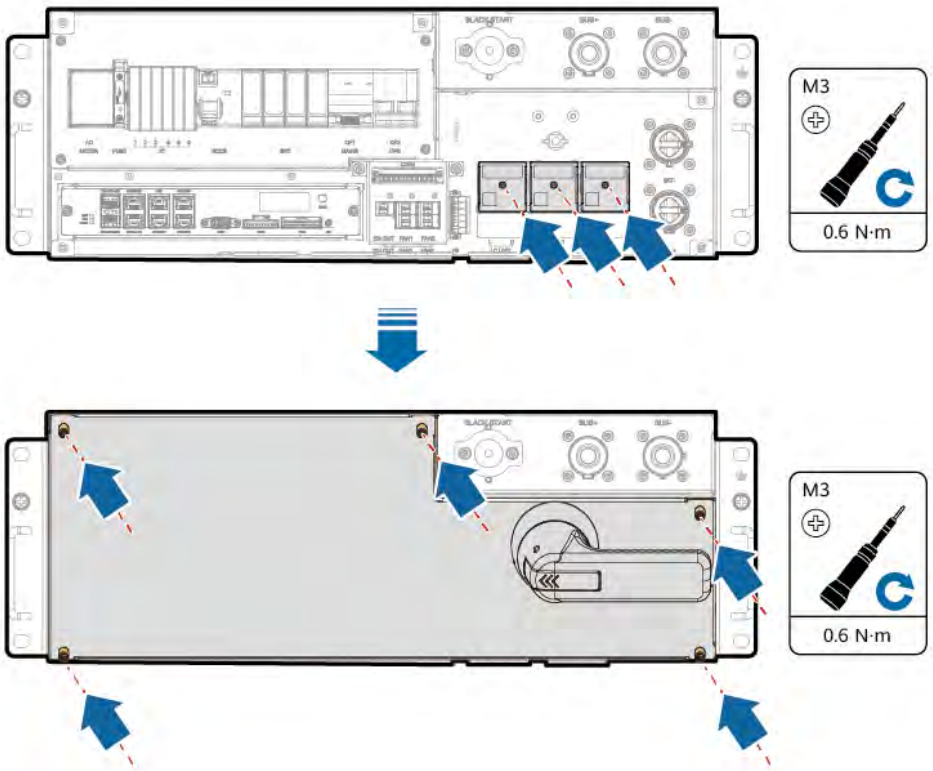
Figure 5-23 Installing the RCM



Step 9 Connect the RCM cables based on the labels.

Step 10 Install the cable protective cover and maintenance compartment cover.

Figure 5-24 Installing the cable protective cover and maintenance compartment cover



----End

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6 Replacing an LTMS

WARNING

- Wear personal protective equipment. Prevent waste from contacting the soil or flowing into the drainage ditch. Use transportation tools, recycling devices, and treatment or storage devices approved by authoritative departments for waste turnover or storage. Heating in an empty container may cause an explosion.
- Wear personal protective equipment because coolant can irritate your eyes, skin, and throat.

NOTICE

- Prevent nuts from falling off during removal and installation. After removing nuts, ensure that no residue is left to avoid short circuits.
- For removed cables, wrap cable terminals with insulation materials, and prevent falling off of foreign matter.

6.1 Replacing an LTMS

CAUTION

- When moving and transporting the LTMS, keep it upright. Do not place it horizontally or upside down. If the package of the LTMS is damaged or the tilt indicator on the package has changed color, contact the Company's service engineers.

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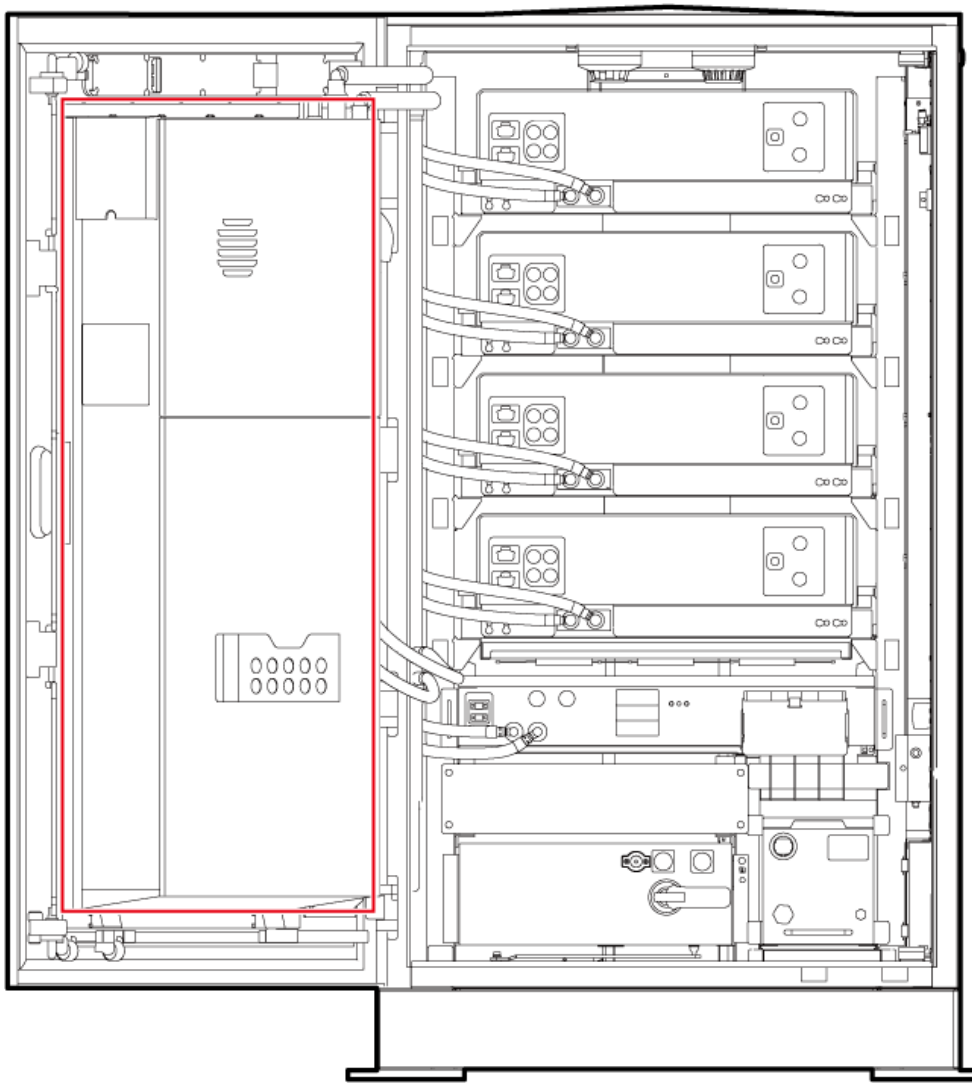
NOTICE

Before installing a new LTMS, check the following items:

- Check whether the door frame is deformed.
- Check whether there is any rubber strip residue on the sealing surface of the door. If yes, clear it.
- Check whether the sealing rubber strips for LTMS flanges are intact.

Prerequisites

Figure 6-1 Position of the LTMS



- Tools: insulated torque socket wrench (including 10# socket), M12 lifting lug (delivered with spare parts), flat-head insulated torque screwdriver, coolant filling/drainage machine (purchased on the configurator), and coolant
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

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- Load-bearing capacity of the forklift ≥ 500 kg

Procedure

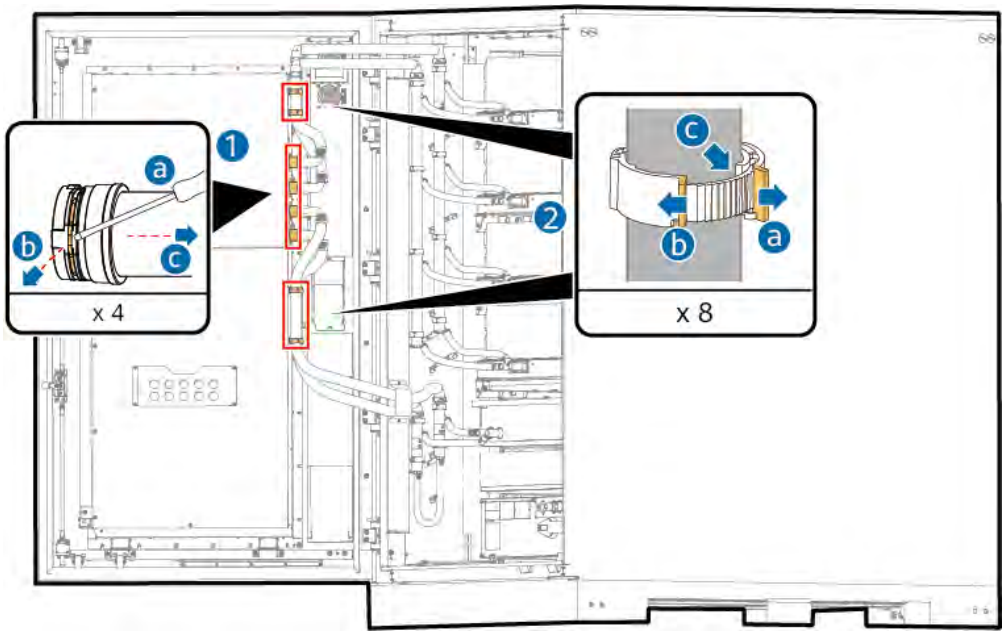
Step 1 Disconnect the cables from the faulty LTMS and check whether the labels are intact. If not, confirm cables and prepare new labels.

Step 2 Drain all the coolant from the cabinet. For details, see **D.1 Draining Coolant from the LTMS**.

Step 3 Remove the pipes connected to the LTMS.

1. Disconnect the LTMS from the male connectors of the liquid cooling pipes.
2. After removing the liquid cooling pipes from the pipe clamps, rotate the pipe clamps counterclockwise until they are removed from the cabinet, and record the installation positions of the pipe clamps.

Figure 6-2 Disconnecting the LTMS from the pipes



Step 4 Hoist the faulty LTMS and remove it.

1. Install the lifting lugs and lifting sling, and cross the lifting sling over the forklift tynes. Slowly raise the tynes to bear the weight of the LTMS until the lifting sling is tightened.
2. Remove the protective cover from the main control module.
3. Remove the screws that secure the LTMS.
4. Stably hold the LTMS, with one person standing on each of the left and right sides. Slowly raise the tynes to lift the faulty LTMS and slowly reverse the forklift to move the LTMS to a safe place.

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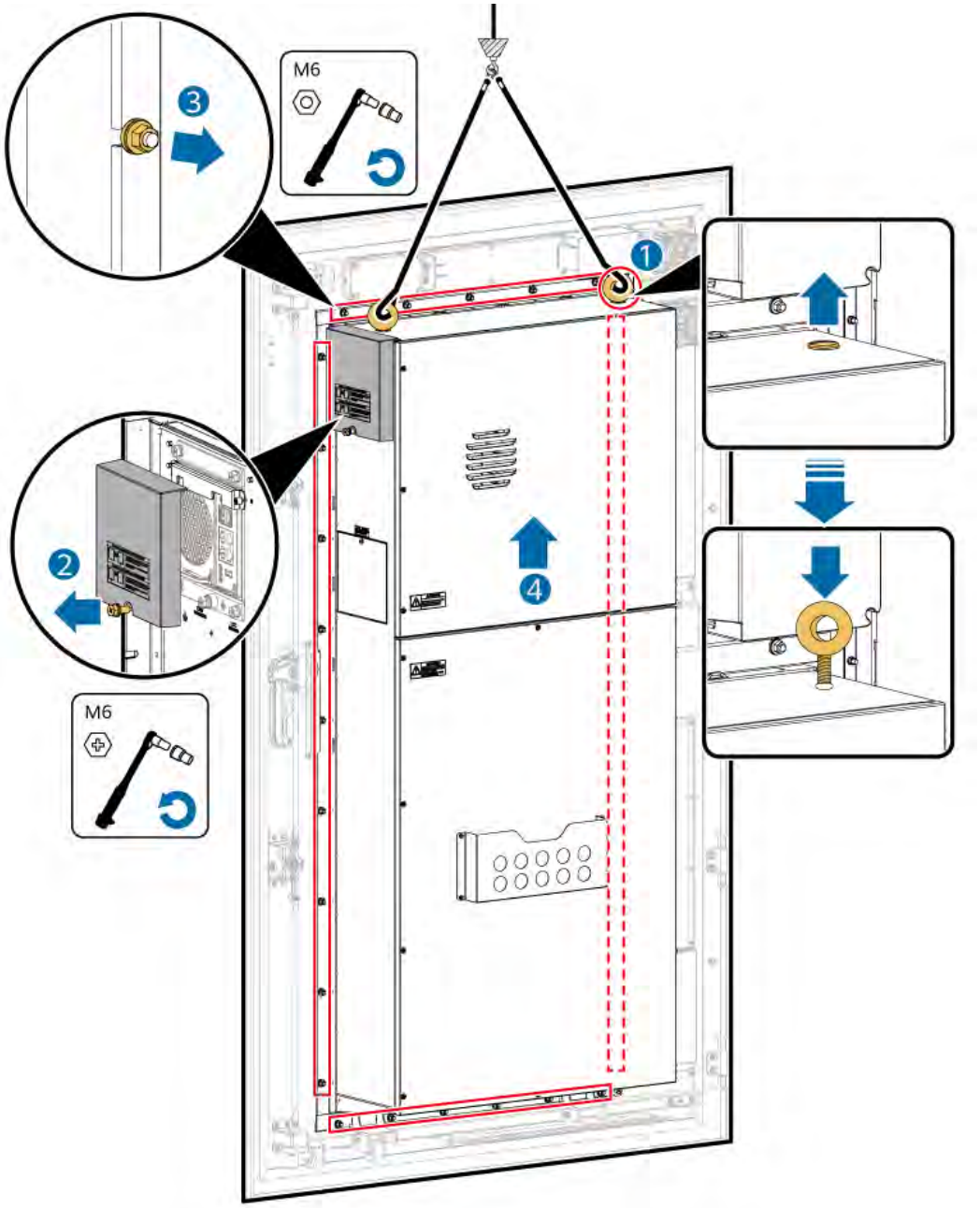
Figure 6-3 Removing the faulty LTMS



Step 5 Hoist the new LTMS and install it.

1. Hoist the new LTMS to the installation position. Stably hold the new LTMS, with one person standing on each of the left and right sides.
2. Roughly align the LTMS with the installation position using the forklift, move the LTMS, slowly align it with the screw installation positions using the forklift, and install the screws.
3. Remove the lifting lugs and install the plugs for the hoisting positions.
4. Reinstall the protective cover for the main control module.

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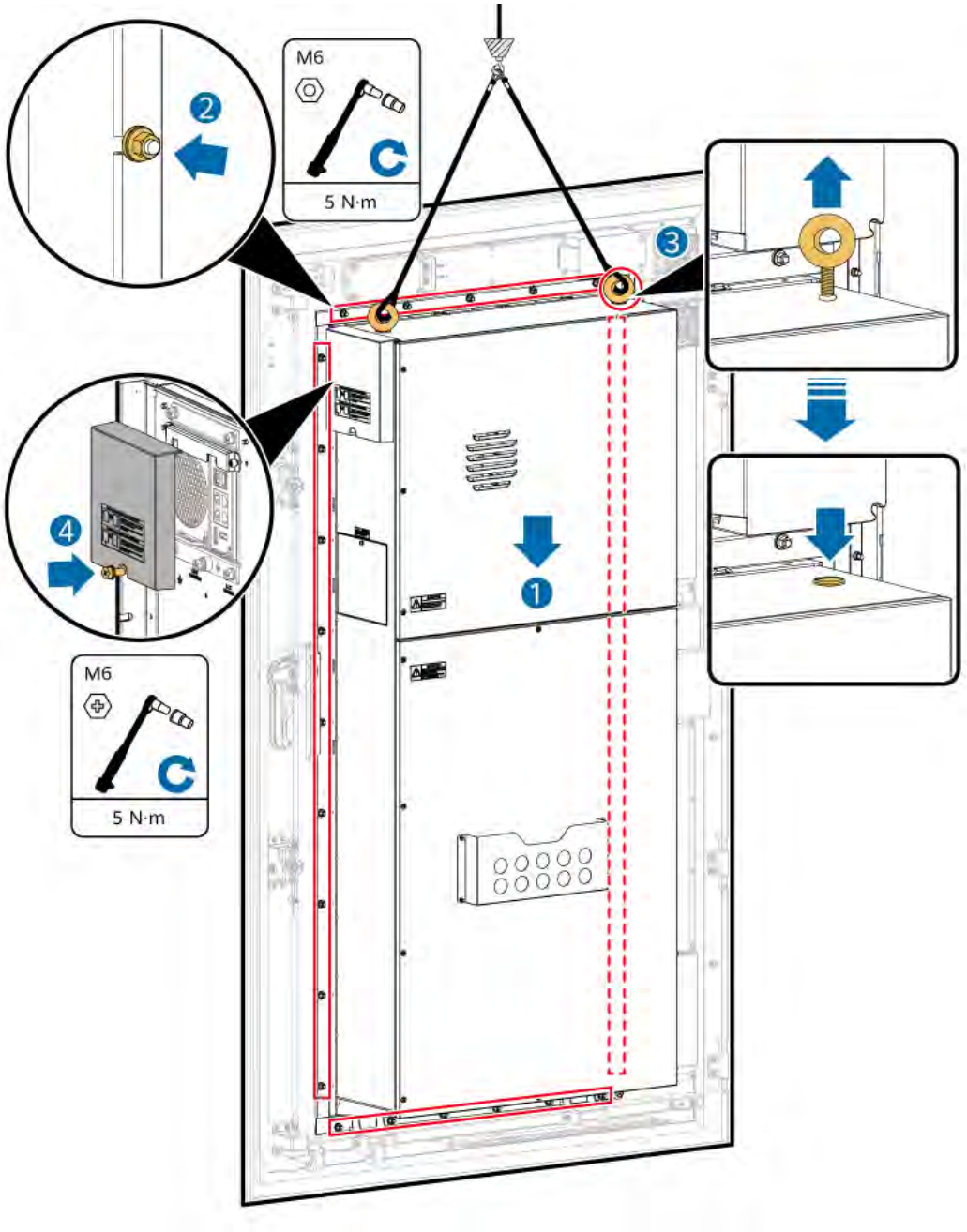
Figure 6-4 Installing the new LTMS



Step 6 Connect cables, pipe clamps, and liquid cooling pipes based on labels.

Step 7 Add coolant. For details, see **D How Do I Use the Coolant Filling/Drainage Machine to Add or Drain Coolant?**

----End

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6.2 Replacing an LTMS Dehumidifying Fan

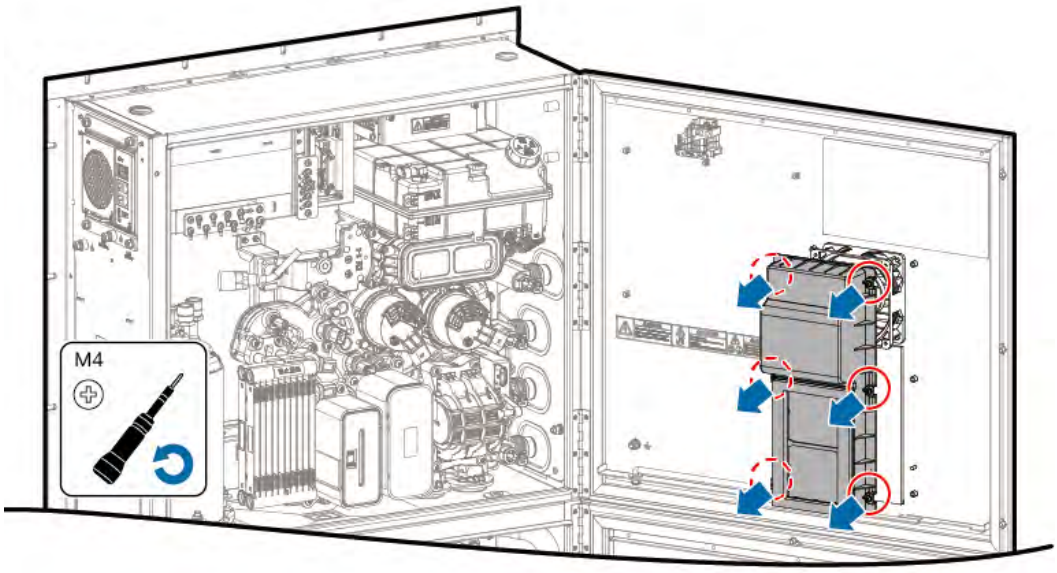
Prerequisites

- Tool: Phillips insulated torque screwdriver (M4)
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

Step 1 Remove the protective cover from the dehumidifying fan.

Figure 6-5 Removing the protective cover from the dehumidifying fan



Step 2 Disconnect the quick connector of the dehumidifying fan and check whether the labels are intact. If not, confirm cables and prepare new labels.

Step 3 Remove the faulty dehumidifying fan.

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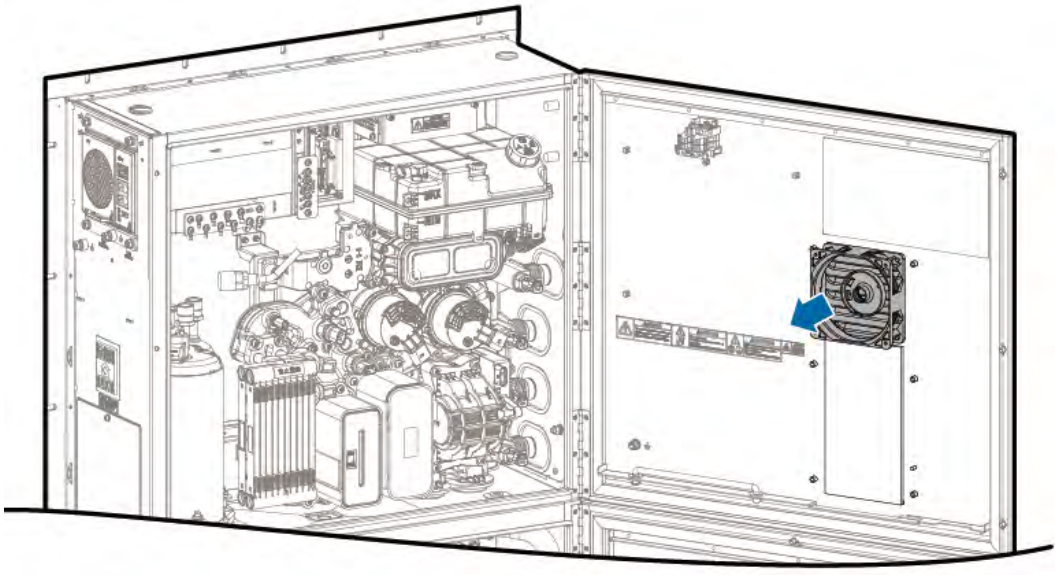
Figure 6-6 Removing the dehumidifying fan



Step 4 Install a new dehumidifying fan

NOTICE

Ensure that the fan label faces the door panel.

Step 5 Connect the cables based on the labels.

Step 6 Install the protective cover for the dehumidifying fan and tighten the M4 Phillips screws to 0.6 N·m.

----End

6.3 Replacing an LTMS Outdoor Fan

Prerequisites

- Tool: insulated torque socket wrench (including 10# socket)
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

Step 1 Disconnect the quick connector of the outdoor fan and check whether the labels are intact. If not, confirm cables and prepare new labels.

Step 2 Remove the faulty outdoor fan.

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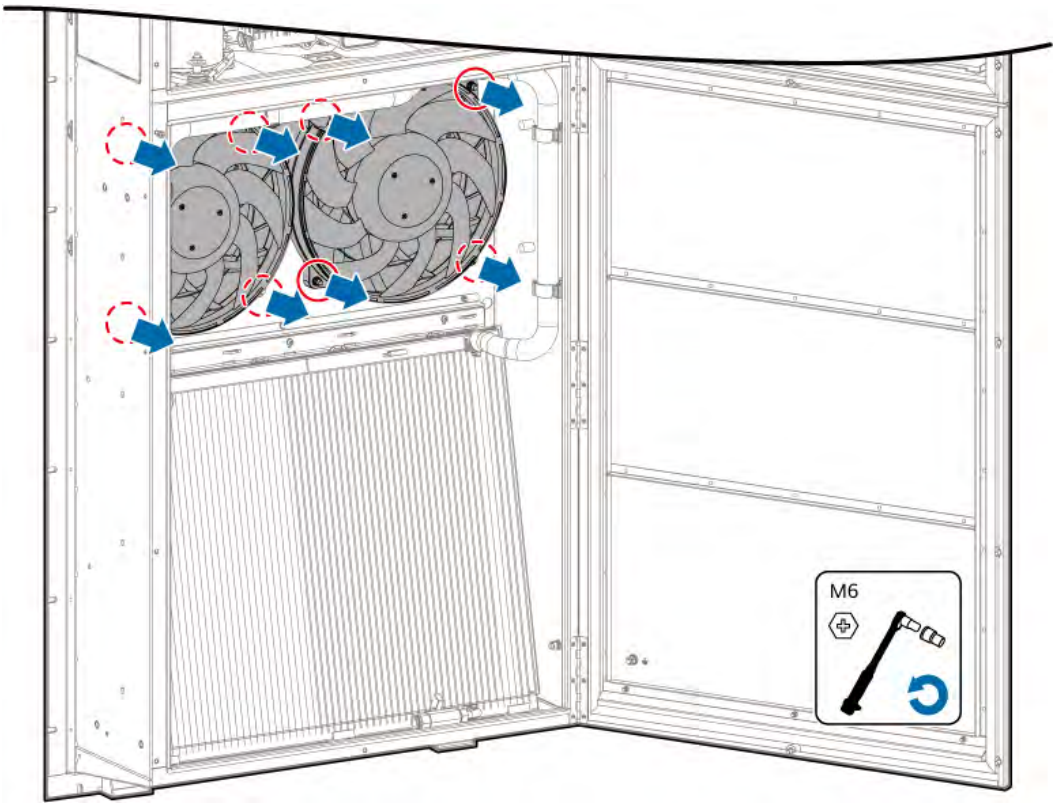
Figure 6-7 Removing the faulty outdoor fan



Step 3 Install a new outdoor fan and tighten the M6 screws to 3 N·m.

NOTICE

When installing the new outdoor fan, place the end of the cable in the lower left corner and reserve sufficient slack in the cable.

Step 4 Connect the cables based on the labels.

Step 5 Properly bind the cables back to their original positions.

----End

6.4 Replacing an LTMS Main Control Module

Prerequisites

- Tool: insulated torque socket wrench (including 10# socket)
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

Step 1 Remove the protective cover from the LTMS main control module.

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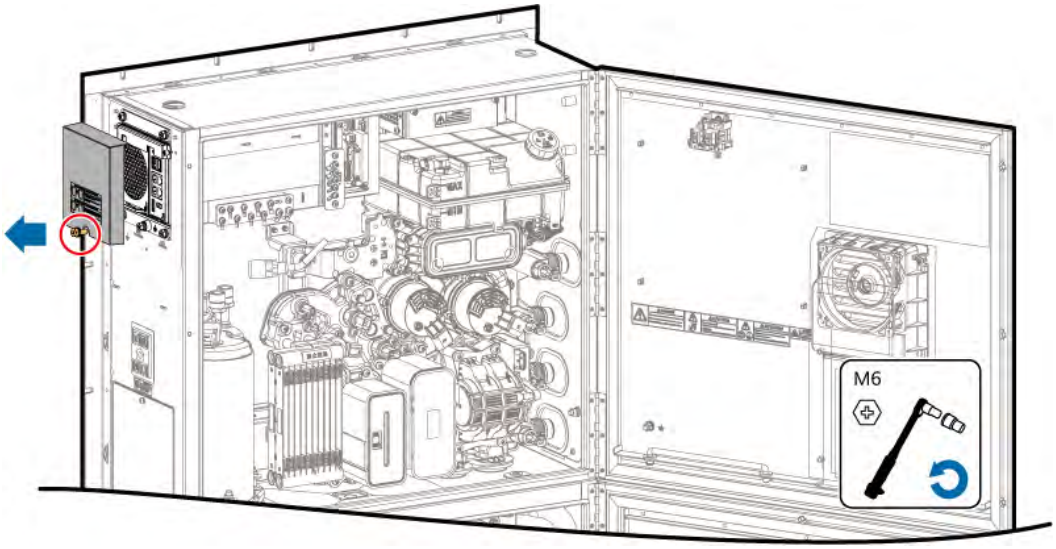
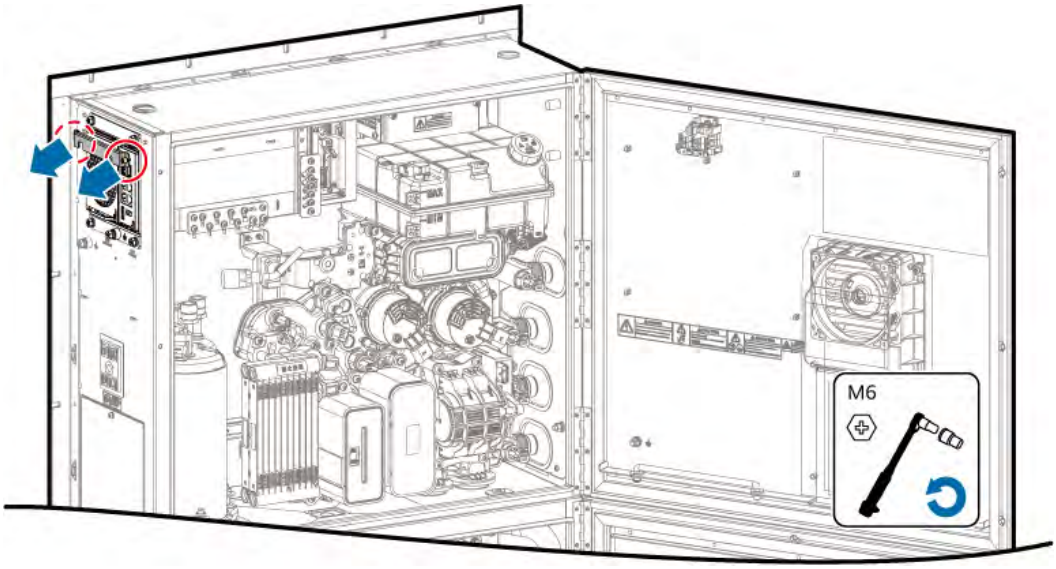
Figure 6-8 Removing the protective cover from the main control module



Step 2 Remove the fixing bracket from the LTMS main control module.

Figure 6-9 Removing the fixing bracket from the main control module



Step 3 Disconnect the cables from the faulty main control module and check whether the labels are intact. If not, confirm cables and prepare new labels.

Step 4 Turn the locking switch upward to unlock the faulty main control module, and remove the faulty main control module.

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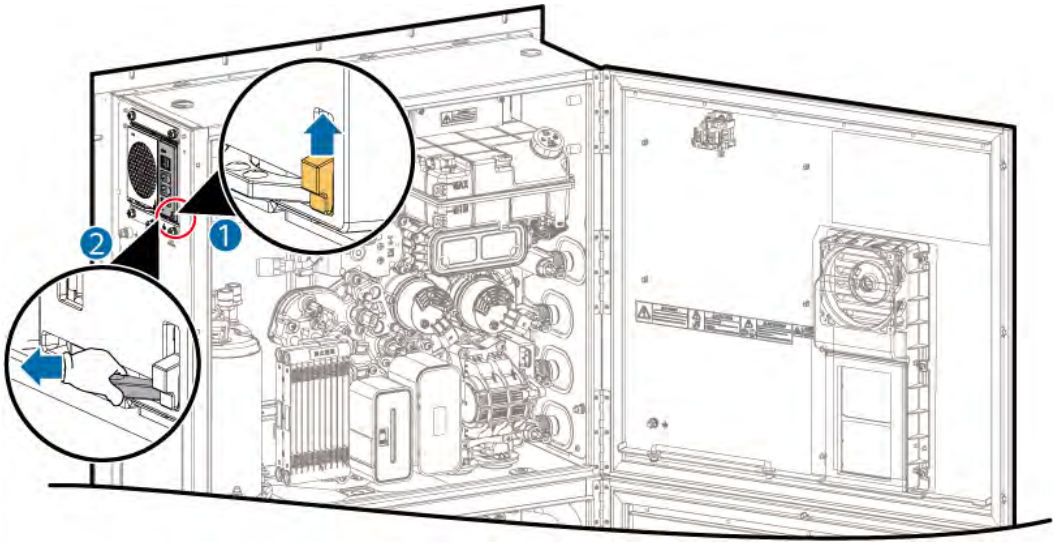
Figure 6-10 Taking out the faulty module



Step 5 Insert and lock a new main control module.

Step 6 Connect the cables based on the labels.

Step 7 Install the fixing bracket and protective cover for the LTMS main control module and tighten the M6 Phillips screws to 5 N·m.

----End

6.5 Replacing an LTMS Main Control Backplane

Prerequisites

- Tool: Phillips insulated torque screwdriver (M3)
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

Step 1 Remove the main control module from the LTMS. For details, see **6.4 Replacing an LTMS Main Control Module**.

Step 2 Remove the cover from the main control backplane.

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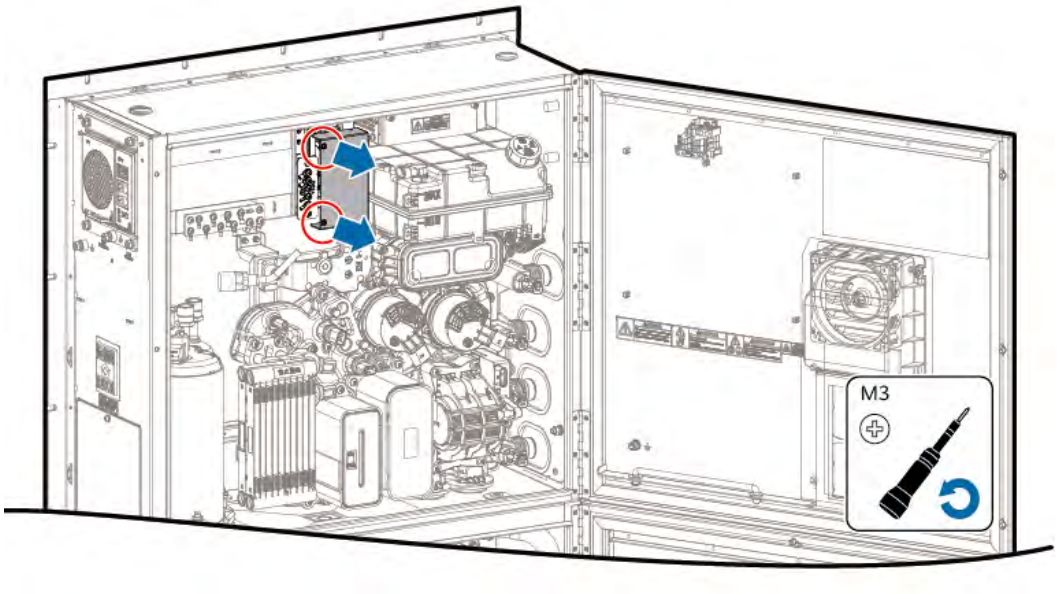
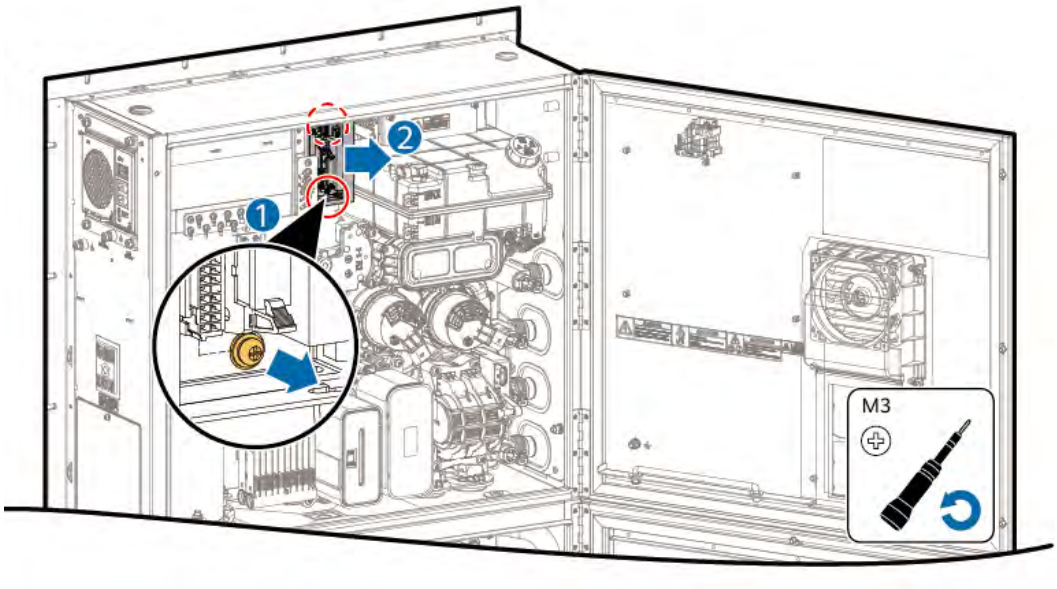
Figure 6-11 Removing the cover from the main control backplane



Step 3 Disconnect the cables from the faulty main control backplane and check whether the labels are intact. If not, confirm cables and prepare new labels.

Step 4 Remove the faulty main control backplane.

Figure 6-12 Removing the faulty main control backplane



Step 5 Install a new main control backplane and tighten the M3 Phillips screws to 0.6 N·m.

Step 6 Connect the cables based on the labels.

Step 7 Install the cover for the main control backplane and tighten the M3 Phillips screws to 0.6 N·m.

Step 8 Insert the LTMS main control module.

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Step 9 Install the fixing bracket and protective cover for the LTMS main control module and tighten the M6 Phillips screws to 5 N·m.

----End

6.6 Replacing a Drive and Auxiliary Power Module of the LTMS

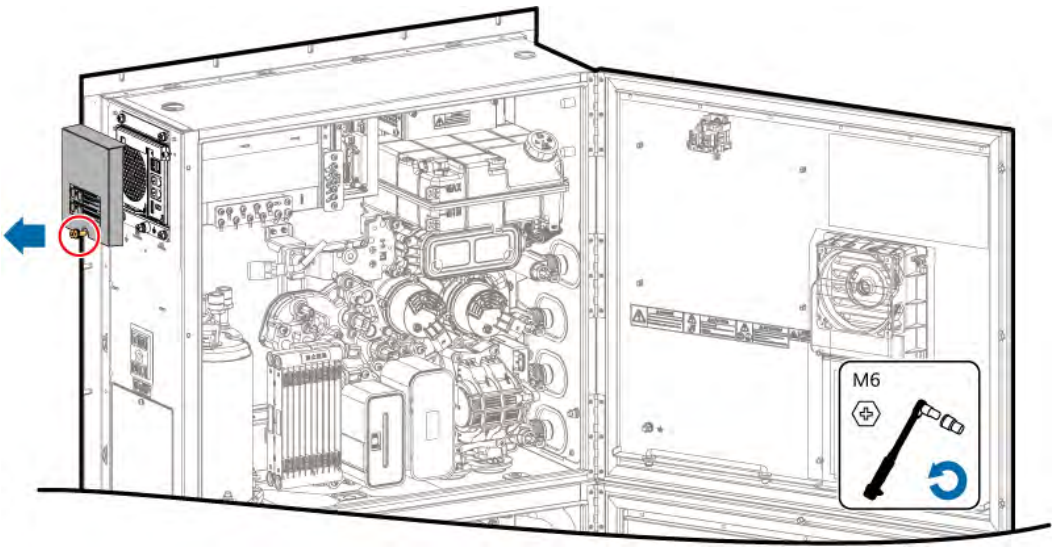
Prerequisites

- Tool: insulated torque socket wrench (including 10# socket)
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

Step 1 Remove the protective cover from the LTMS main control module.

Figure 6-13 Removing the protective cover from the main control module



Step 2 Remove the fixing bracket from the LTMS main control module.

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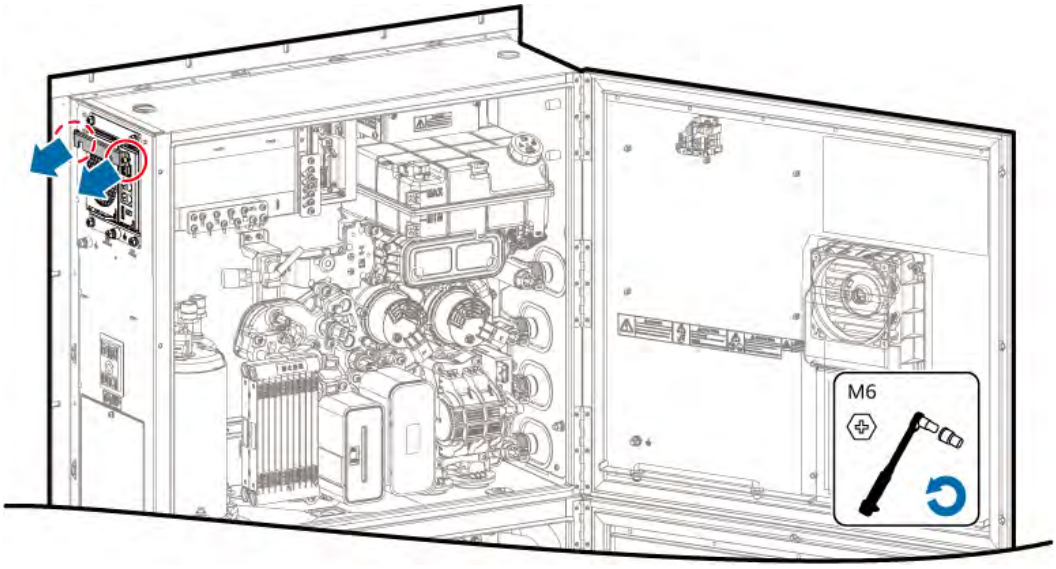
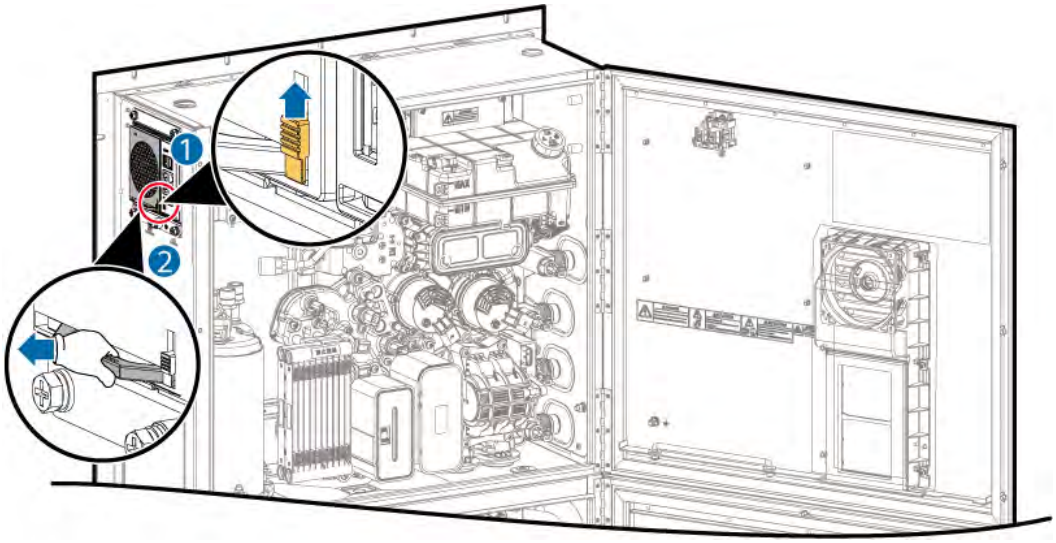
Figure 6-14 Removing the fixing bracket from the main control module



Step 3 Turn the locking switch upward to unlock the faulty drive and auxiliary power module, and remove the module.

Figure 6-15 Removing the faulty drive and auxiliary power module



Step 4 Insert and lock a new drive and auxiliary power module.

Step 5 Install the fixing bracket and protective cover for the LTMS main control module and tighten the M6 Phillips screws to 5 N·m.

----End

6.7 Replacing an LTMS Outdoor Heat Exchanger

Prerequisites

- Tools: Phillips insulated torque screwdriver (M6), cable ties, clamp pliers (purchased by the customer; applicable to QC/T 621-compliant space-saving

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clamps), coolant filling/drainage machine (purchased on the configurator), flat-head insulated torque screwdriver, and coolant

- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

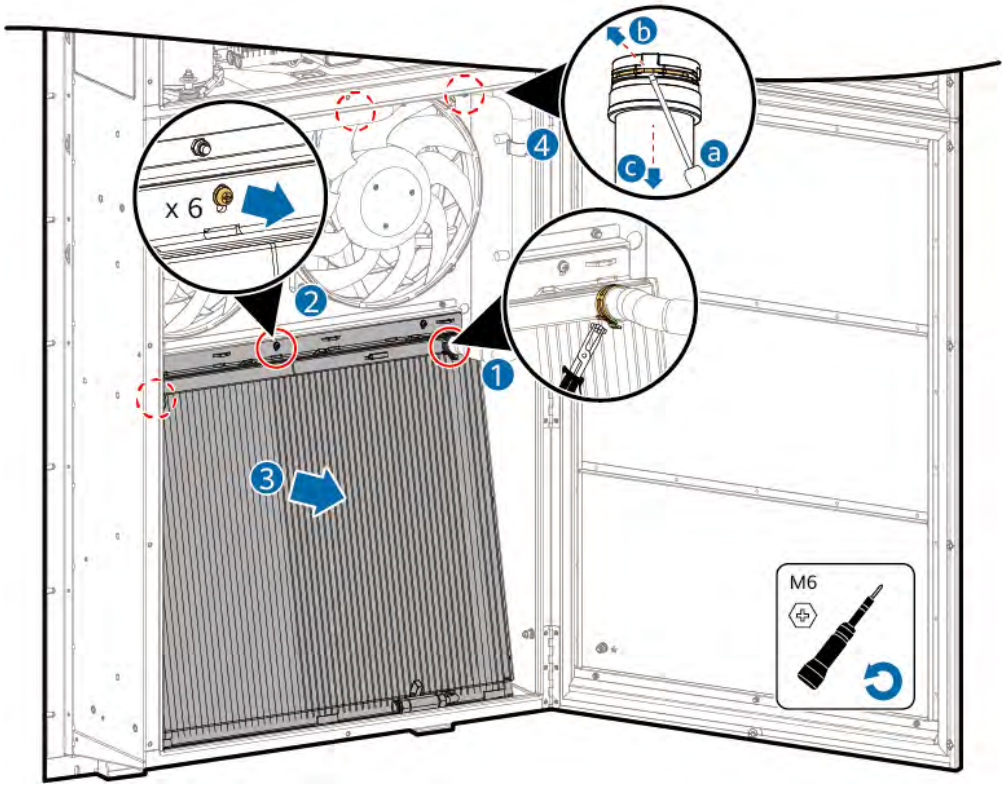
Step 1 Drain all the coolant from the cabinet. For details, see **D.1 Draining Coolant from the LTMS**.

Step 2 Remove the outdoor fan cable and heat exchanger NTC cable harness bound to the outdoor heat exchanger. For details about how to remove the NTC cable harness, see **6.9 Replacing an LTMS NTC Cable Harness**.

Step 3 Remove the faulty outdoor heat exchanger and pipes.

1. Disconnect the heat exchanger pipe from the heat exchanger using clamp pliers.
2. Remove the screws from the outdoor heat exchanger using the Phillips insulated torque screwdriver.
3. Remove the faulty outdoor heat exchanger.
4. Disconnect the liquid cooling pipe of the heat exchanger from the LTMS, and remove the liquid cooling pipe.

Figure 6-16 Removing the heat exchanger and pipes



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CAUTION

When connecting pipes to and removing pipes from a heat exchanger, avoid cuts or scratches from the fins.

NOTE

If it is difficult to pull out the snap spring, use the flat-head screwdriver to pry out the spring carefully. Use one hand to pinch the spring to prevent it from falling into the cabinet and use the other hand to pull out the spring.

Step 4 Install the new outdoor heat exchanger and new pipes and tighten the M6 Phillips screws to 5 N·m.

Step 5 Properly bind the outdoor fan cable and heat exchanger NTC cable harness to the outdoor heat exchanger. For details, see **6.9 Replacing an LTMS NTC Cable Harness**.

Step 6 Add coolant. For details, see **D How Do I Use the Coolant Filling/Drainage Machine to Add or Drain Coolant?**

----End

6.8 Replacing an LTMS Filter Board

NOTICE

- Prevent nuts from falling off during removal and installation. After removing nuts, ensure that no residue is left to avoid short circuits.
- For removed cables, wrap cable terminals with insulation materials, and prevent falling off of foreign matter.

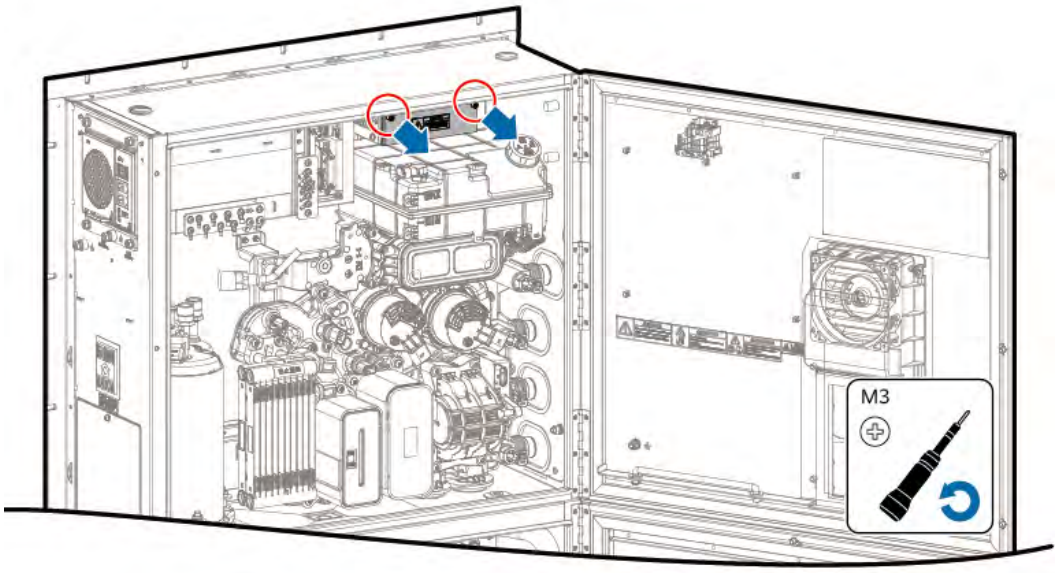
Prerequisites

- Tool: Phillips insulated torque screwdriver (M3 and M5)
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

Step 1 Remove the front baffle plate of the filter board.

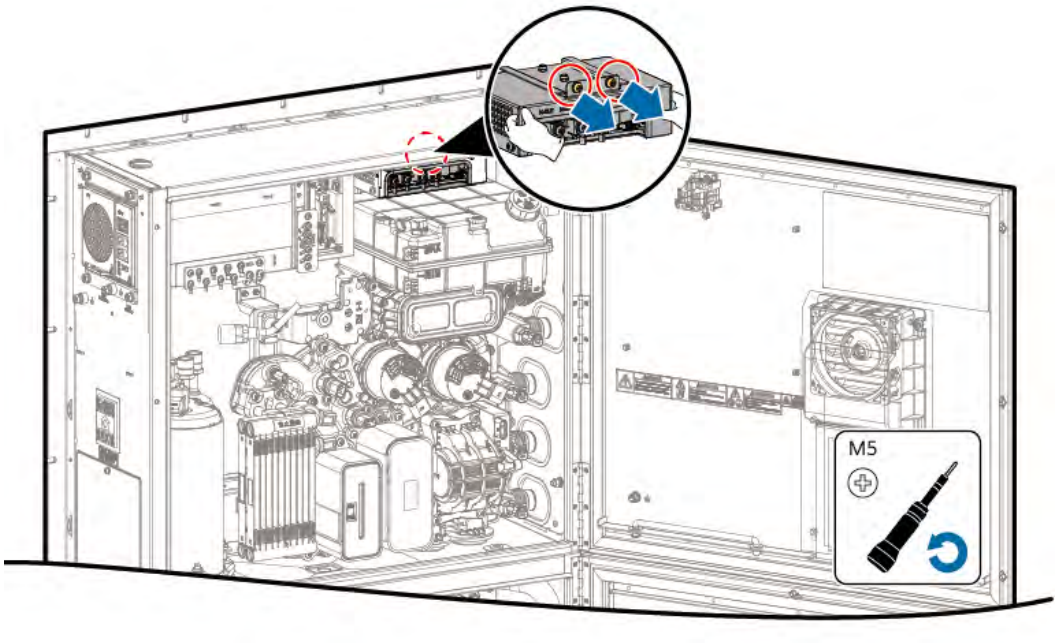
Figure 6-17 Removing the front baffle plate of the filter board



Step 2 Disconnect the cables and check whether the labels are intact. If not, confirm cables and prepare new labels.

Step 3 Remove the filter board fasteners.

Figure 6-18 Removing the filter board fasteners



Step 4 Remove the faulty filter board.

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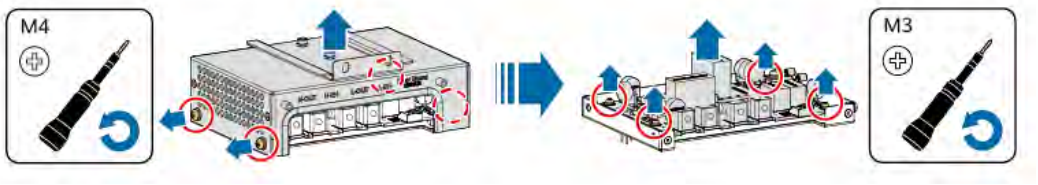
Figure 6-19 Removing the faulty filter board



Step 5 Install a new filter board and tighten the M3 Phillips screws to 0.3 N·m.

Step 6 Connect the cables based on the labels.

Step 7 Install the sheet metal of the filter board and tighten the M4 Phillips screws to 1.6 N·m.

Step 8 Install the filter board and front baffle plate and tighten the M3 Phillips screws to 0.3 N·m.

Step 9 Install the filter board in the LTMS and tighten the M5 Phillips screws to 3 N·m.

----End

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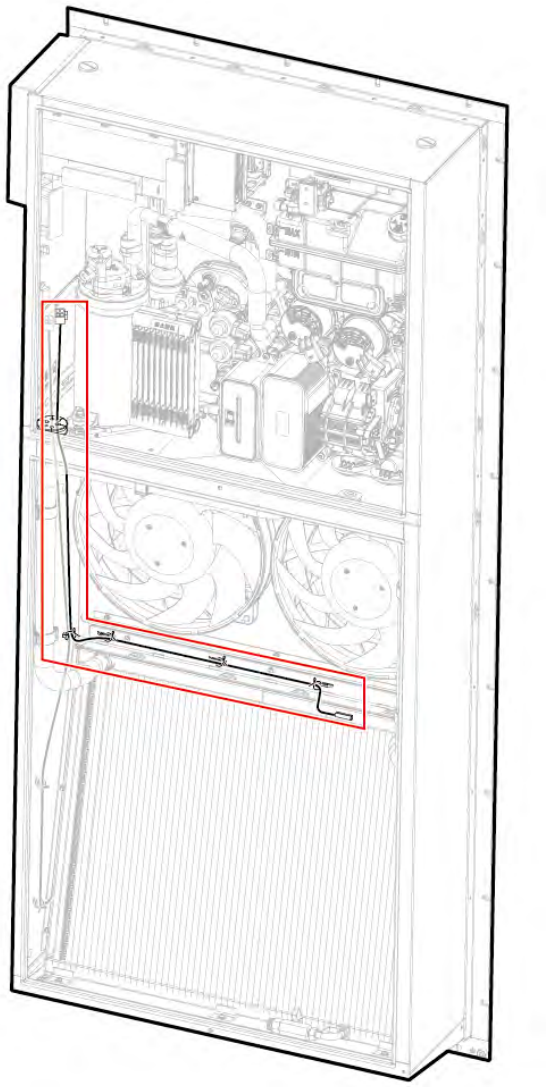
6.9 Replacing an LTMS NTC Cable Harness

Prerequisites

Figure 6-20 Position of the NTC cable harness for the heat exchanger



- Tools: protective gloves, glass cement, and flat-head insulated torque screwdriver
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

Step 1 Remove the cylindrical cable routing tool.

Step 2 Use the flat-head screwdriver to pry up a corner of the glass cement, and then remove the glass cement by hand.

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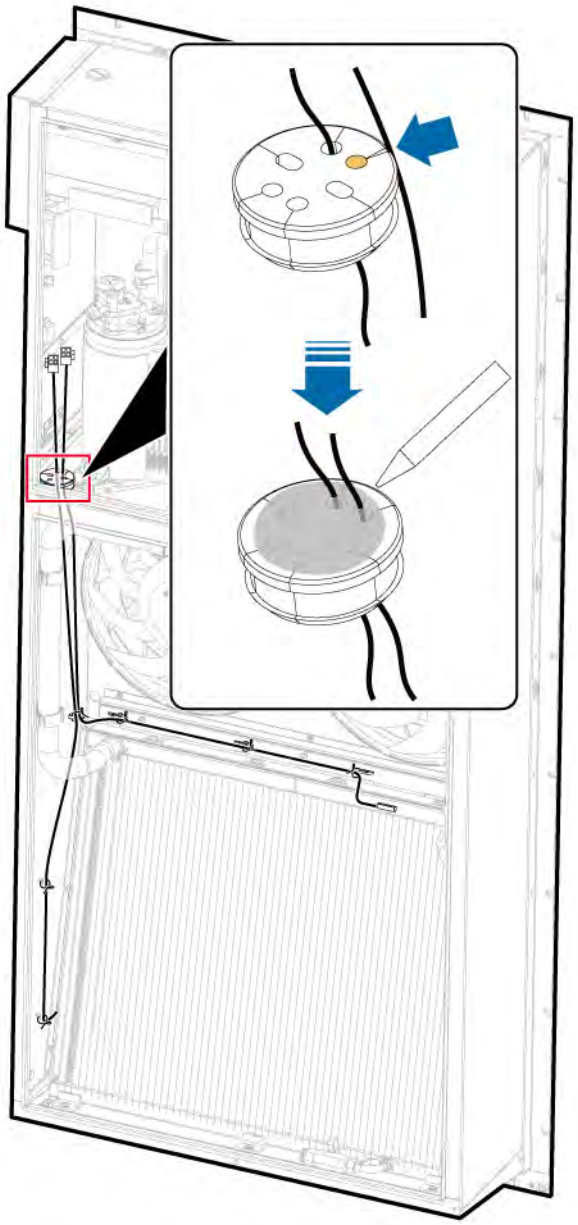
Step 3 Cut off the cable ties, remove the faulty NTC cable harness, and check whether the labels are intact. If not, confirm cables and prepare new labels.

Step 4 Insert the new NTC harness according to the cable labels.

Step 5 Bind the NTC cable harness properly.

Step 6 After routing the NTC cable harness through the cylindrical cable routing tool, fill the cable holes with glass cement.

Figure 6-21 Filling cable holes with glass cement



Step 7 Reinstall the cylindrical cable routing tool in the cabinet.

----End

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7 Replacing LTMS Pipes

WARNING

- Wear personal protective equipment. Prevent waste from contacting the soil or flowing into the drainage ditch. Use transportation tools, recycling devices, and treatment or storage devices approved by authoritative departments for waste turnover or storage. Heating in an empty container may cause an explosion.
- Take protective measures because coolant can irritate your eyes, skin, and throat.

CAUTION

- The coolant drained from the ESS needs to be centrally disposed of by a waste collector that is recognized by relevant regulations.
- Uncontaminated containers can be reused. Containers that cannot be cleaned need to be centrally disposed of by a waste collector that is recognized by relevant regulations.

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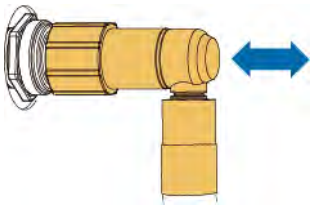
NOTICE

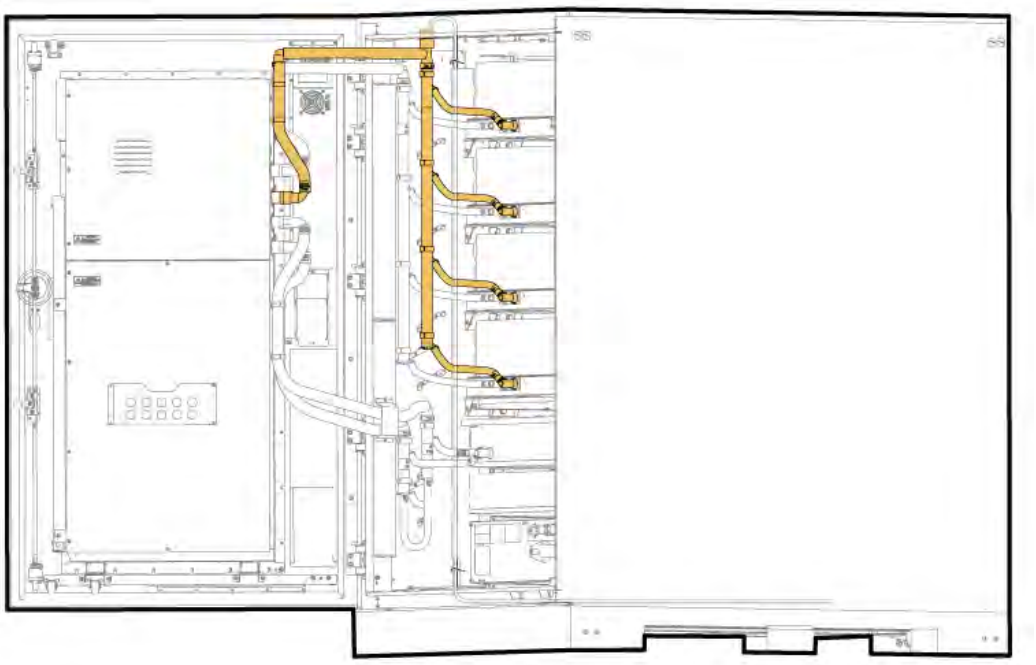
- Before installing a new liquid cooling pipe, scan the QR code to check that the pipe has passed the airtightness check.
- A small amount of coolant may flow out when you remove or insert a pipe, which is normal. Prepare tissues to wipe away the coolant.
- If a stop valve is not removed and inserted for more than three months, press the stop valve once or twice (you only need to press the stop valve and do not need to remove it) before removing and inserting it.

Figure 7-1 Before the removal and insertion



7.1 Replacing a Battery Pack Coolant Return Pipe

Prerequisites



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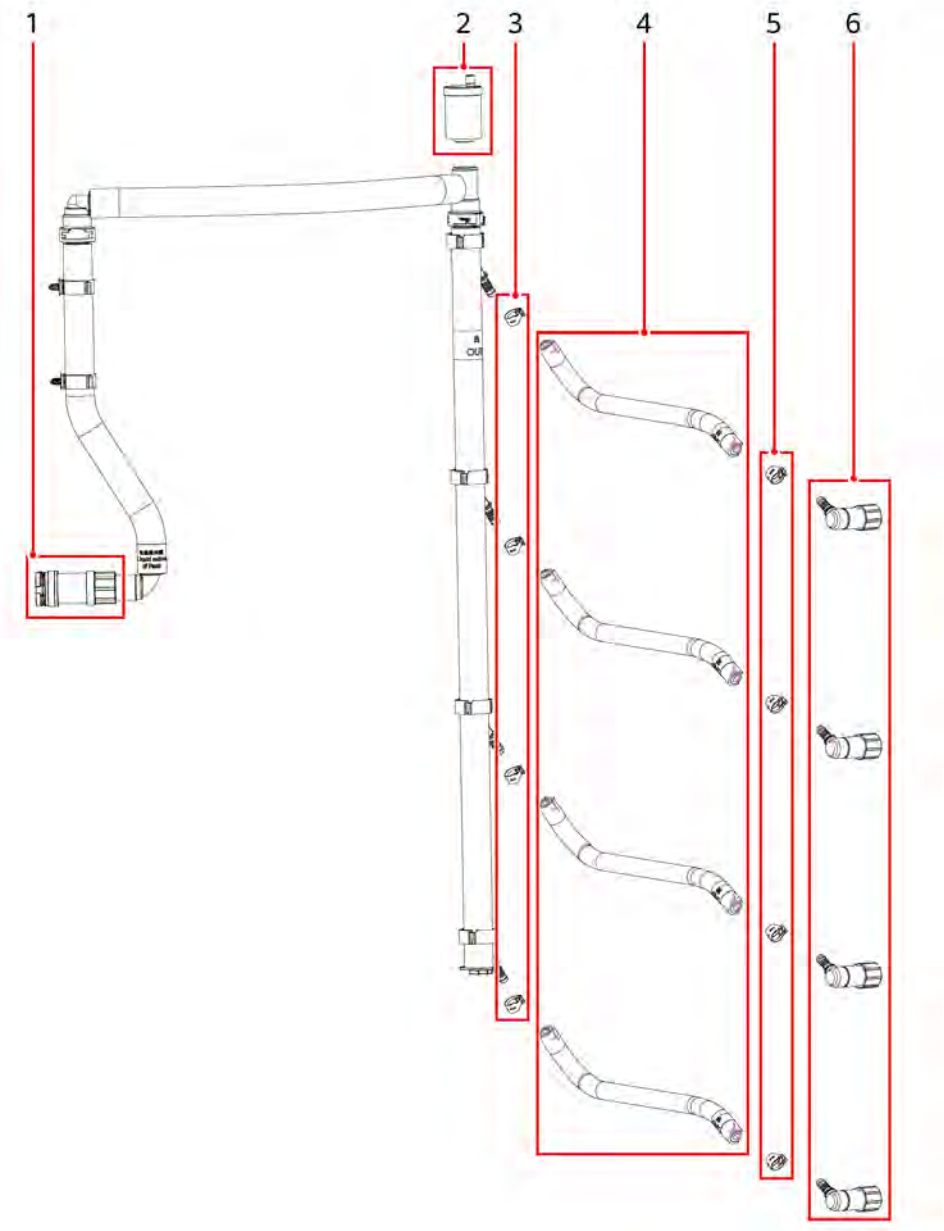

(1) Plastic quick connector of the two-way stop valve for the main pipe (male and female)	(2) Automatic exhaust valve	(3) Clamp	(4) Rubber pipe
(5) Clamp	(6) Plastic quick connector of the two-way stop valve for the branch pipe (female)		

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- Tools: non-absorbent insulated gloves, mask, coolant filling/drainage machine (purchased on the configurator), flat-head insulated torque screwdriver, and coolant
- You have determined the leakage point on a pipe.
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

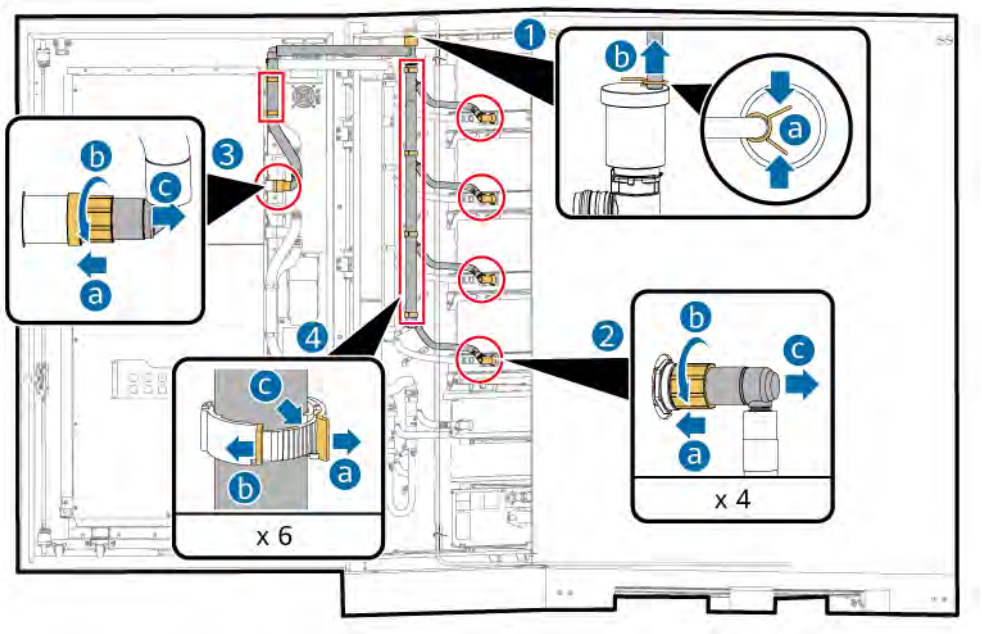
Step 1 Determine subsequent operations based on the ambient temperature.

- If the ambient temperature is higher than –10°C, skip this step and go to the next step.
- If the ambient temperature is less than or equal to –10°C, drain all the coolant from the cabinet and then go to the next step. For details about how to drain coolant, see **D.1 Draining Coolant from the LTMS**.

Step 2 Remove the coolant return pipe from the battery pack.

1. Remove the conduit from the top of the exhaust valve.
2. Disconnect the female connectors of the pipe stop valves from the male connectors on the battery pack.
3. Disconnect the female connector of the pipe stop valve from the male connector on the LTMS.
4. Remove the pipe from the pipe clamps.

Figure 7-2 Removing the coolant return pipe from the battery pack



Step 3 Rotate the pipe clamps counterclockwise until they are removed from the cabinet and LTMS. Dispose of the pipe clamps.

Step 4 Install the coolant return pipe on the battery pack.

1. Connect the conduit to the automatic exhaust valve by referring to step 2 in **7.5 Replacing an Automatic Exhaust Valve**.

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2. Install the new pipe by referring to the pipe position shown in the figure in step 2.

NOTICE

Properly remove the conduit based on site requirements from the automatic exhaust valve.

NOTE

- Pipe clamps have been preinstalled on the pipes. You can directly insert the pipe clamps into the original holes. If the holes cannot be fully aligned, manually adjust the positions of the pipe clamps.
- Install the pipe in strict accordance with the position shown in the figure. Do not install the pipe incorrectly or reversely.

3. Connect the new female connectors of the pipe stop valves to the old male connectors on the LTMS and battery pack.

Step 5 After securing the pipe, insert the conduit into the pipe slot.

Step 6 Perform operations based on the installation status.

- If coolant has been drained from the cabinet before the faulty component is removed, add coolant to the cabinet. For details, see **D.3 Adding Coolant to the LTMS**.
- If coolant has not been drained from the cabinet before the faulty component is removed, add an appropriate amount of coolant. For details, see **D.3 Adding Coolant to the LTMS**.

----End

Follow-up Procedure

Check the running status of the liquid cooling pipe.

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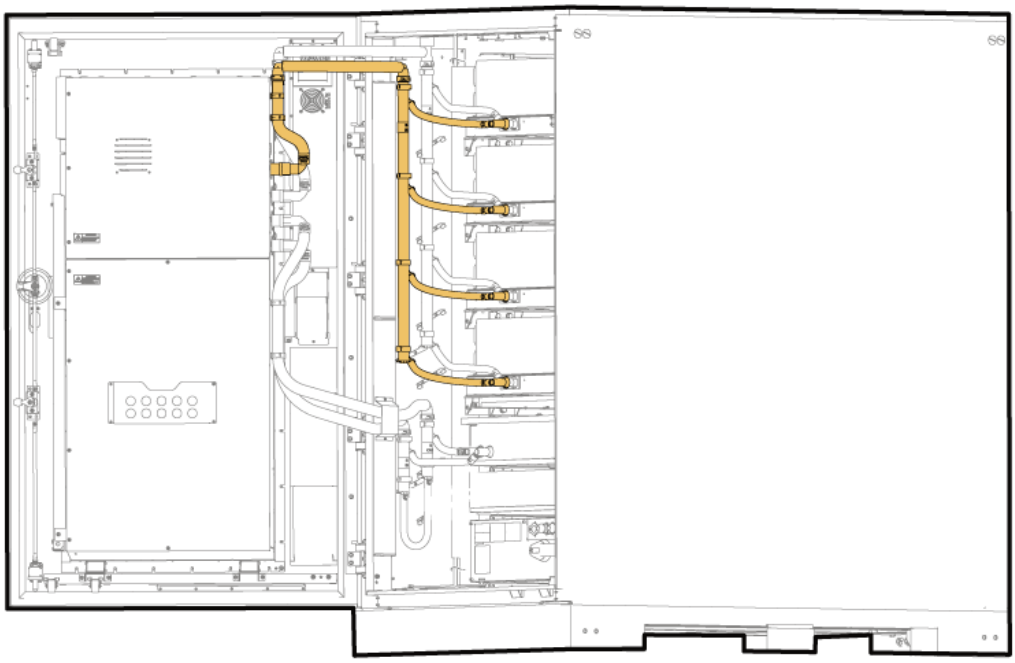
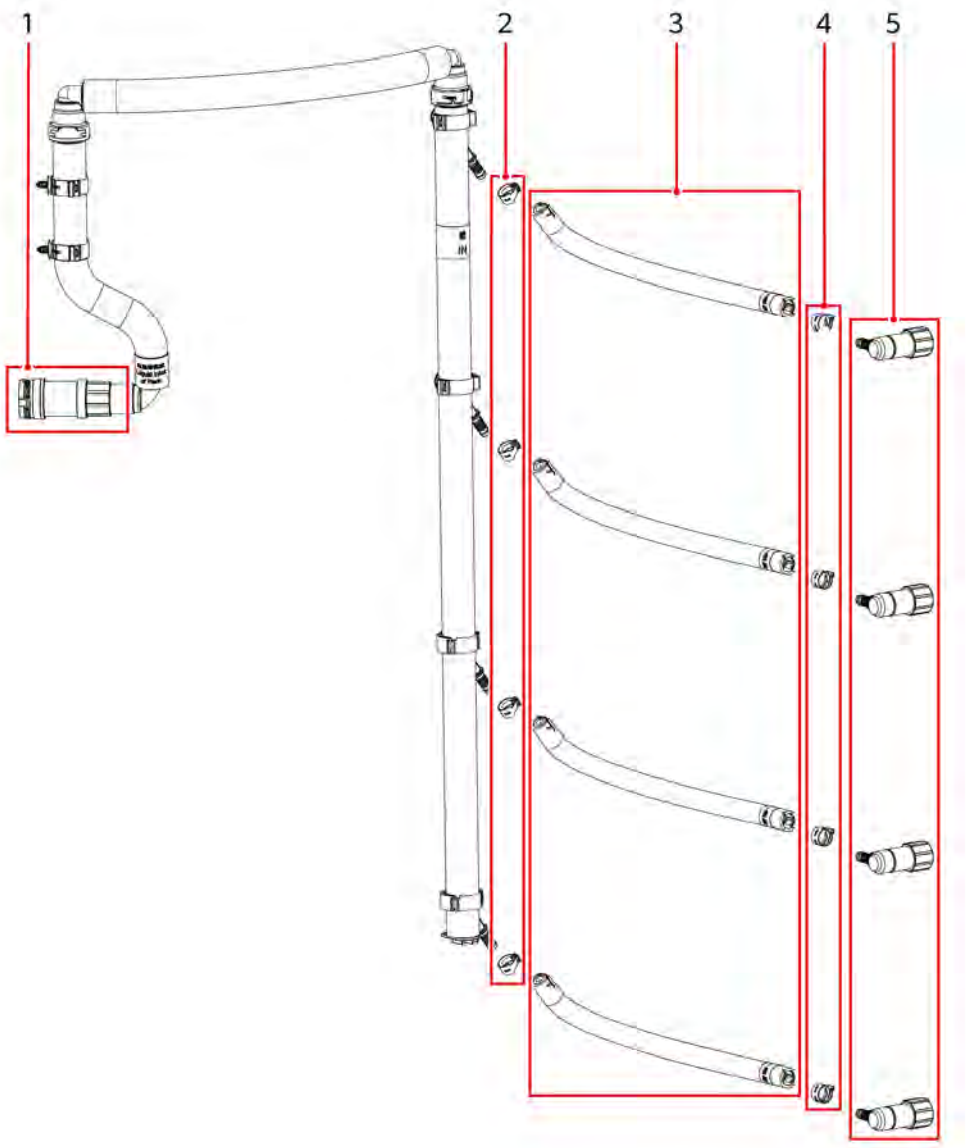
7.2 Replacing a Battery Pack Coolant Supply Pipe

Prerequisites





(1) Plastic quick connector of the two-way stop valve for the main pipe (male and female)	(2) Clamp	(3) Rubber pipe	(4) Clamp
(5) Plastic quick connector of the two-way stop valve for the branch pipe (female)			

- Tools: non-absorbent insulated gloves, mask, coolant filling/drainage machine (purchased on the configurator), and coolant

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- You have determined the leakage point on a pipe.
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

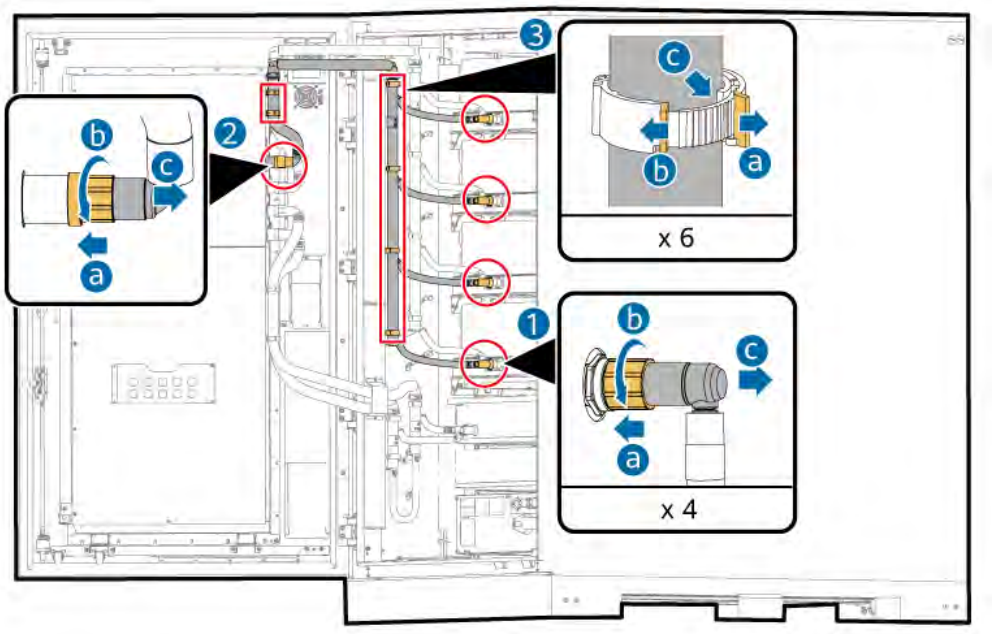
Step 1 Determine subsequent operations based on the ambient temperature.

- If the ambient temperature is higher than –10°C, skip this step and go to the next step.
- If the ambient temperature is less than or equal to –10°C, drain all the coolant from the cabinet and then go to the next step. For details about how to drain coolant, see **D.1 Draining Coolant from the LTMS**.

Step 2 Remove the coolant supply pipe from the battery pack.

1. Disconnect the female connectors of the pipe stop valves from the male connectors on the battery pack.
2. Disconnect the female connector of the pipe stop valve from the male connector on the LTMS.
3. Remove the pipe from the pipe clamps.

Figure 7-3 Disconnecting the pipe



Step 3 Rotate the pipe clamps counterclockwise until they are removed from the cabinet and LTMS. Dispose of the pipe clamps.

Step 4 Install the coolant supply pipe on the battery pack.

1. Install the new pipe by referring to the pipe position shown in the figure in step 2.

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NOTE

- Pipe clamps have been preinstalled on the pipes. You can directly insert the pipe clamps into the original holes. If the holes cannot be fully aligned, manually adjust the positions of the pipe clamps.
- Install the pipe in strict accordance with the position shown in the figure. Do not install the pipe incorrectly or reversely.

2. Connect the new female connectors of the pipe stop valves to the old male connectors on the LTMS and battery pack.

Step 5 Perform operations based on the installation status.

- If coolant has been drained from the cabinet before the faulty component is removed, add coolant to the cabinet. For details, see **D.3 Adding Coolant to the LTMS**.
- If coolant has not been drained from the cabinet before the faulty component is removed, add an appropriate amount of coolant. For details, see **D.3 Adding Coolant to the LTMS**.

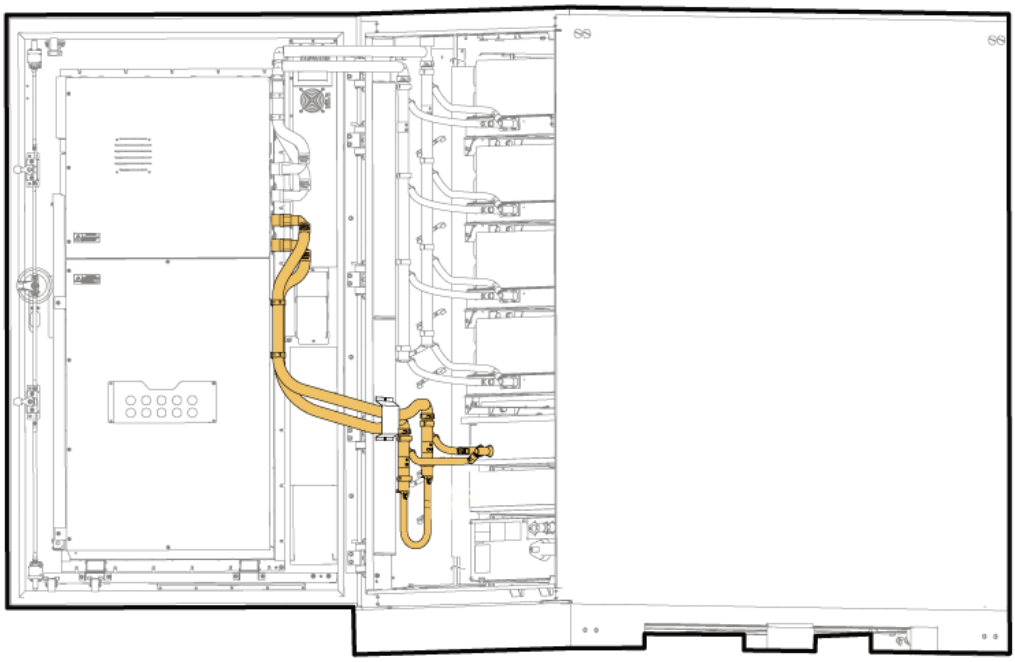
----End

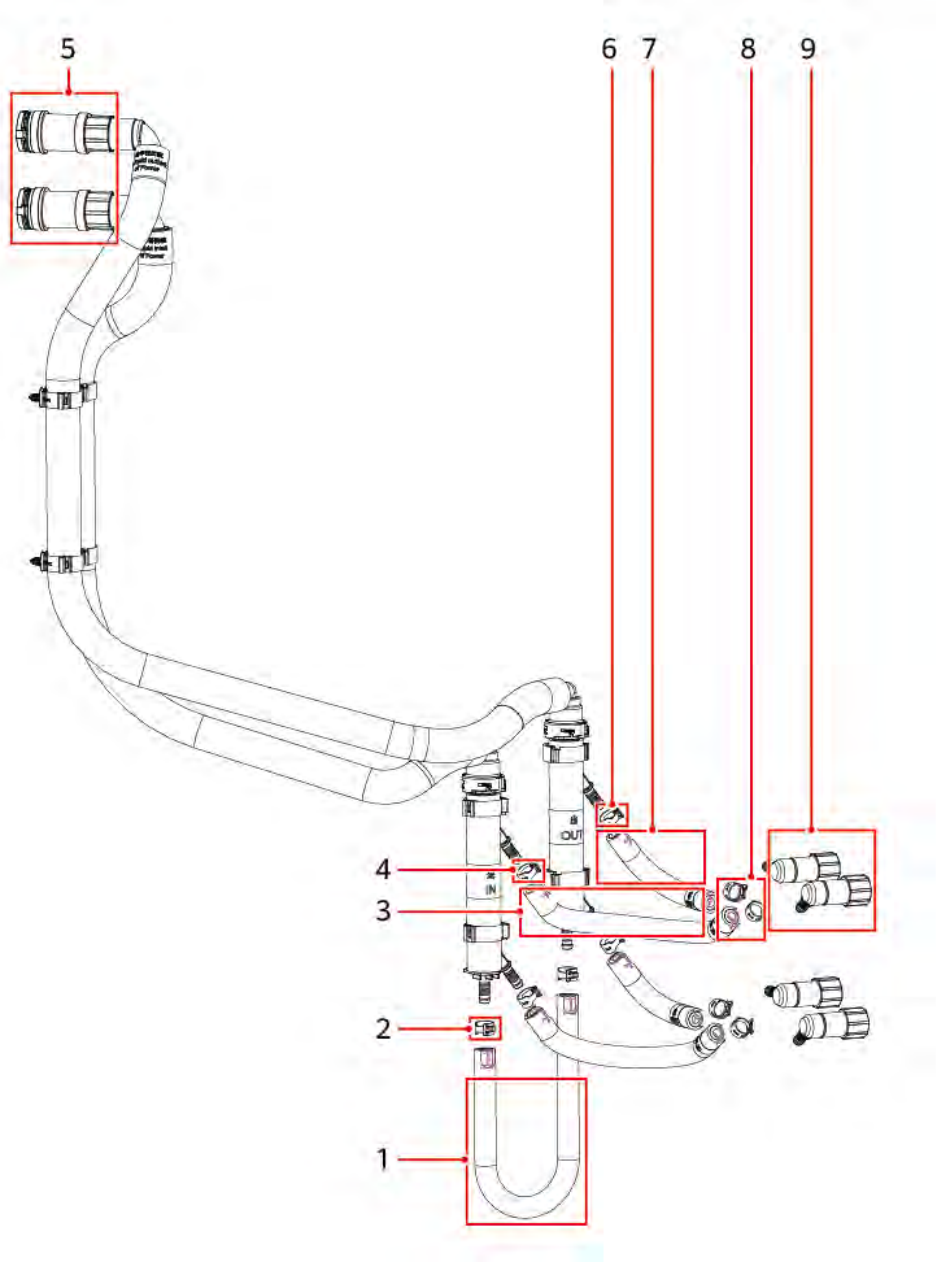
Follow-up Procedure

Check the running status of the liquid cooling pipe.

7.3 Replacing a PCS Pipe

Prerequisites





(1) Rubber pipe	(2) Clamp	(3) Rubber pipe	(4) Clamp
(5) Plastic quick connector of the two-way stop valve for the main pipe (male and female)	(6) Clamp	(7) Rubber pipe	(8) Clamp

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(9) Plastic quick connector of the two-way stop valve for the branch pipe (female)			

- Tools: non-absorbent insulated gloves, mask, Phillips insulated torque screwdriver (M4), coolant filling/drainage machine (purchased on the configurator), and coolant
- You have determined the leakage point on a pipe.
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

Step 1 Determine subsequent operations based on the ambient temperature.

- If the ambient temperature is higher than –10°C, skip this step and go to the next step.
- If the ambient temperature is less than or equal to –10°C, drain all the coolant from the cabinet and then go to the next step. For details about how to drain coolant, see **D.1 Draining Coolant from the LTMS**.

Step 2 Remove the PCS pipe.

1. Disconnect the female connectors of the PCS pipe stop valves from the male connectors on the PCS.
2. Disconnect the female connectors of the PCS pipe stop valves from the male connectors on the LTMS.
3. Remove the positioning sheet metal block for the cross-door pipe (tightened using M4 Phillips screws).
4. Remove the pipe from the pipe clamps.

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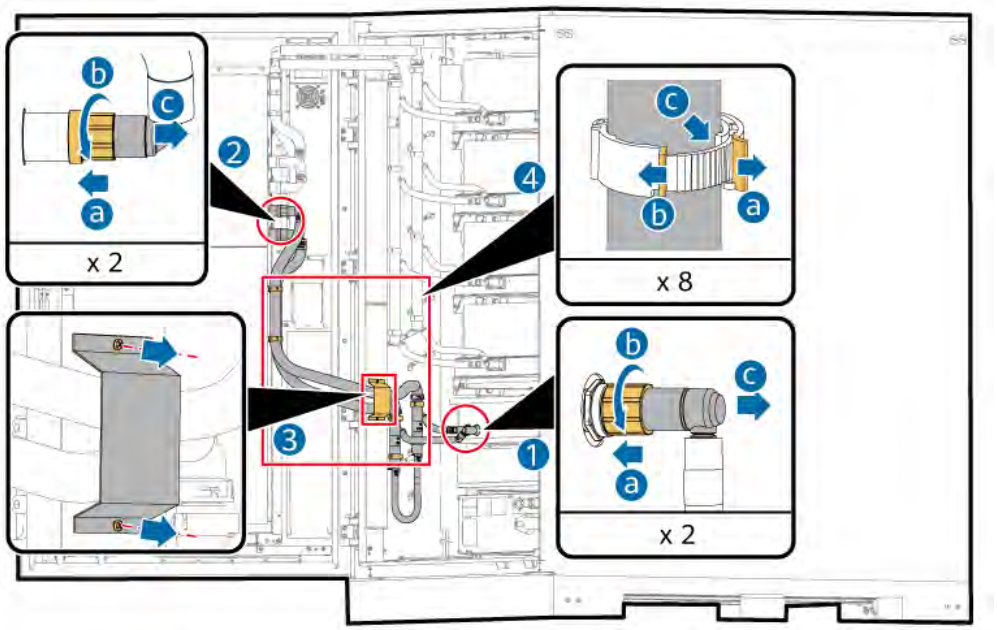
Figure 7-4 Disconnecting the pipe



Step 3 Rotate the pipe clamps counterclockwise until they are removed from the cabinet and LTMS. Dispose of the pipe clamps.

Step 4 Install the PCS pipe.

1. Install the new pipe by referring to the pipe position shown in the figure in step 2.

   NOTE

   - Pipe clamps have been preinstalled on the pipes. You can directly insert the pipe clamps into the original holes. If the holes cannot be fully aligned, manually adjust the positions of the pipe clamps.
   - Install the pipe in strict accordance with the position shown in the figure. Do not install the pipe incorrectly or reversely.

2. Install the positioning sheet metal block for the cross-door pipe and tighten the M4 Phillips screws to 1.6 N·m.
3. Connect the old female connectors of the PCS pipe stop valves to the new male connectors on the LTMS and PCS.

Step 5 Connect the female connectors of the stop valves of the battery pack coolant supply pipe to the male connectors on the LTMS and battery pack.

Step 6 Perform operations based on the installation status.

- If coolant has been drained from the cabinet before the faulty component is removed, add coolant to the cabinet. For details, see **D.3 Adding Coolant to the LTMS**.
- If coolant has not been drained from the cabinet before the faulty component is removed, add an appropriate amount of coolant. For details, see **D.3 Adding Coolant to the LTMS**.

----End

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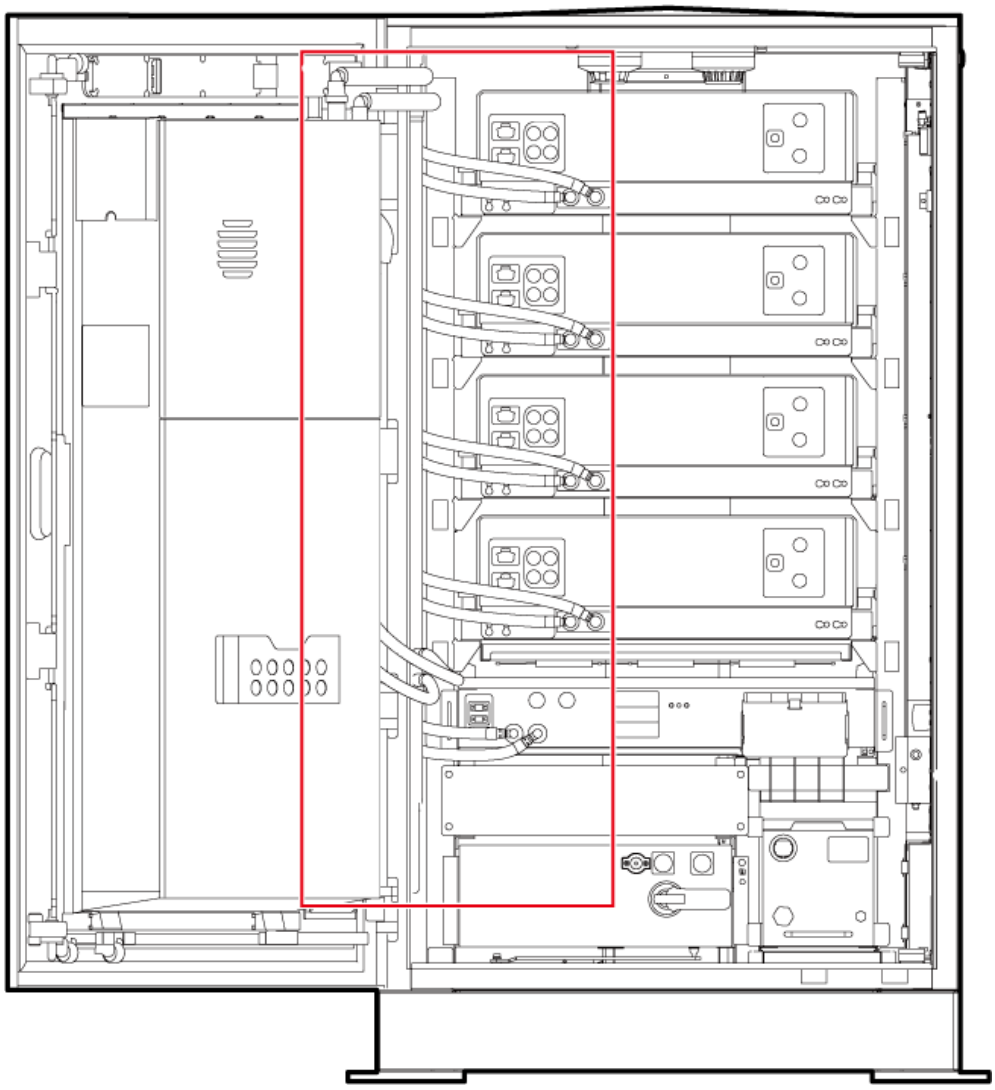
Follow-up Procedure

Check the running status of the liquid cooling pipe.

7.4 Replacing Male Connectors of the Liquid Cooling Pipe Stop Valves

7.4.1 Removing Male Connectors of the Liquid Cooling Pipes

Prerequisites



- Tools: non-absorbent insulated gloves, insulated torque socket wrench (socket specifications: L = 27 mm, Φ ≤ 37 mm), flat-head insulated torque screwdriver, and coolant filling/drainage machine (purchased on the configurator)
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

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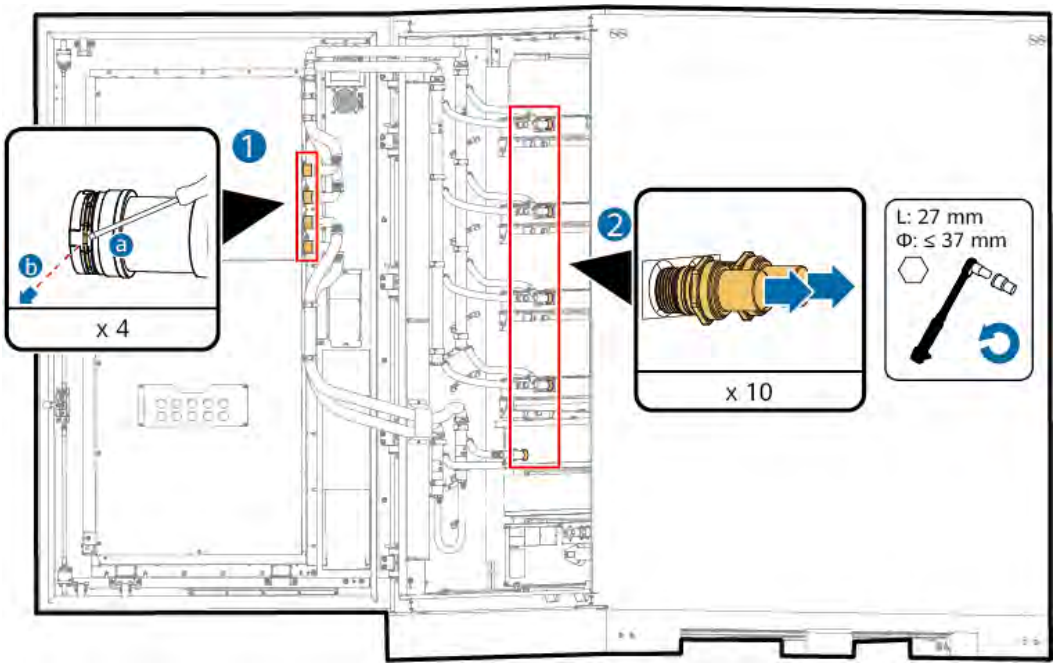
Procedure

Step 1 Drain all the coolant from the cabinet. For details, see **D.1 Draining Coolant from the LTMS**.

Step 2 After disconnecting the female connectors from the male connectors of the liquid cooling pipes, remove the male connectors of the stop valves on the LTMS and PACK/PCS.

Figure 7-5 Removing the male connectors of the stop valves



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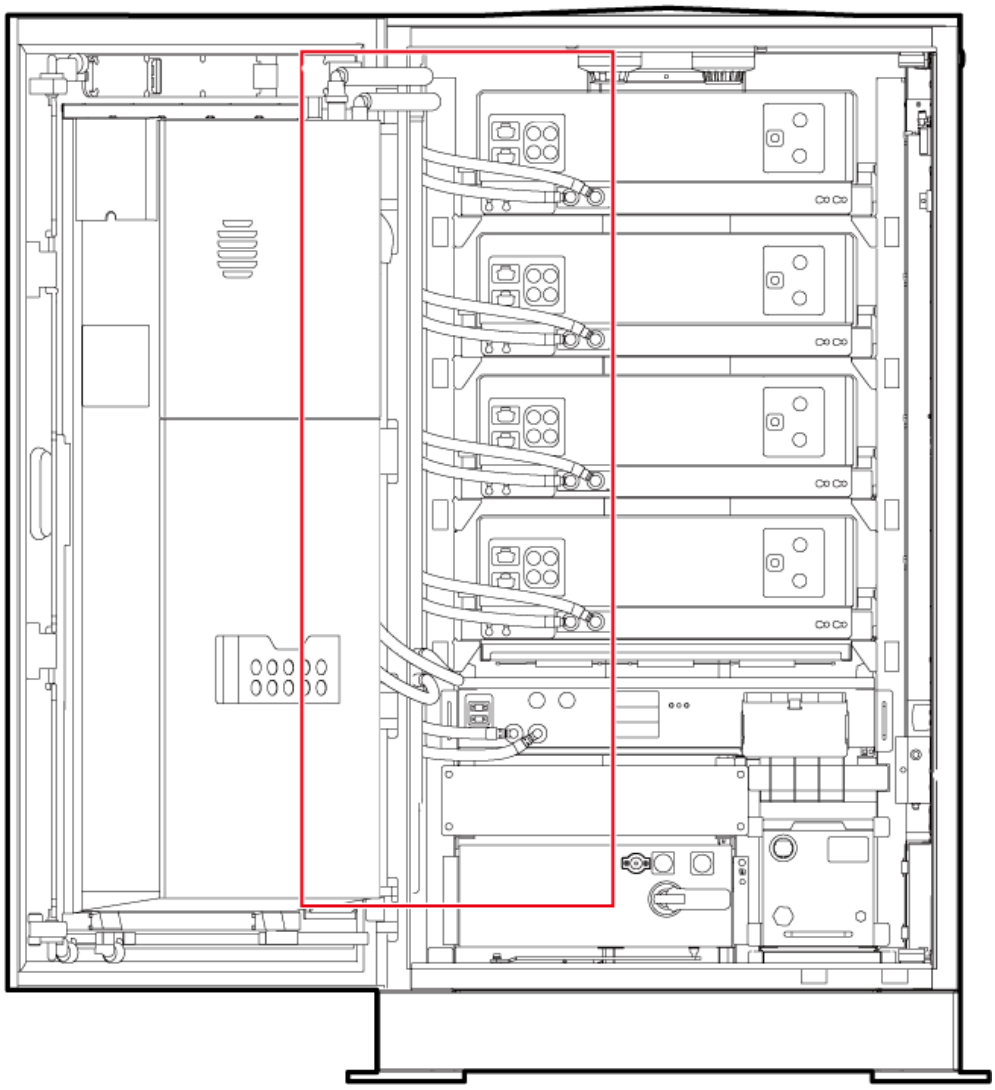
7.4.2 Installing Male Connectors of the Liquid Cooling Pipes

Prerequisites



- Tools: non-absorbent insulated gloves, insulated torque socket wrench (socket specifications: L = 27 mm, Φ ≤ 37 mm), flat-head insulated torque screwdriver, and coolant filling/drainage machine (purchased on the configurator)
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

Step 1 Drain all the coolant from the cabinet. For details, see **D.1 Draining Coolant from the LTMS**.

Step 2 Install the male connectors of the stop valves on the LTMS and PACK/PCS.

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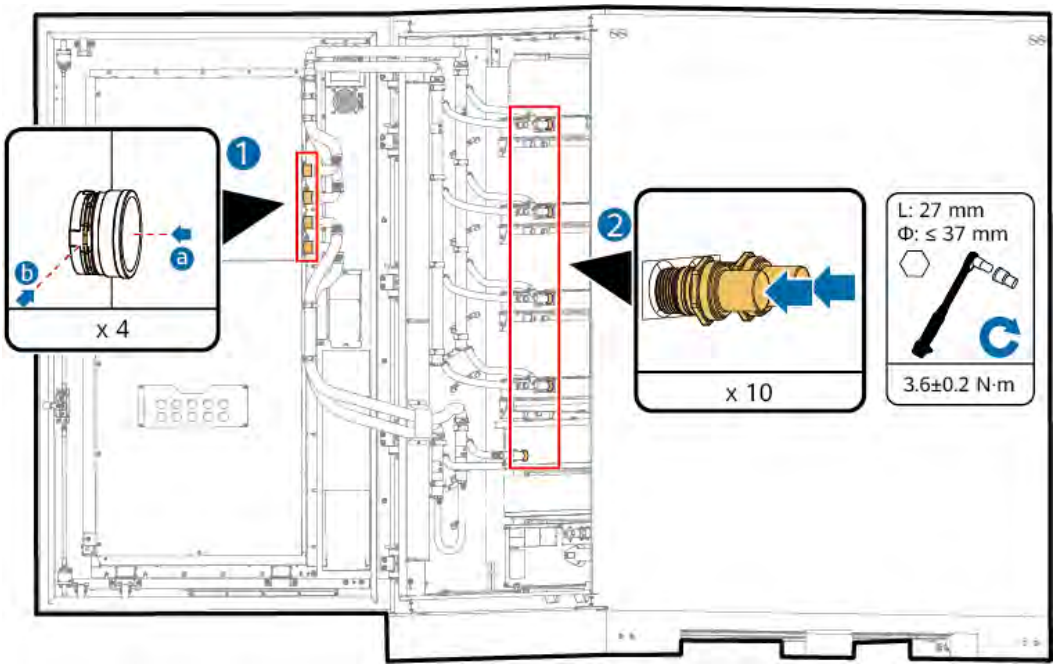
Figure 7-6 Installing the male connectors of the stop valves



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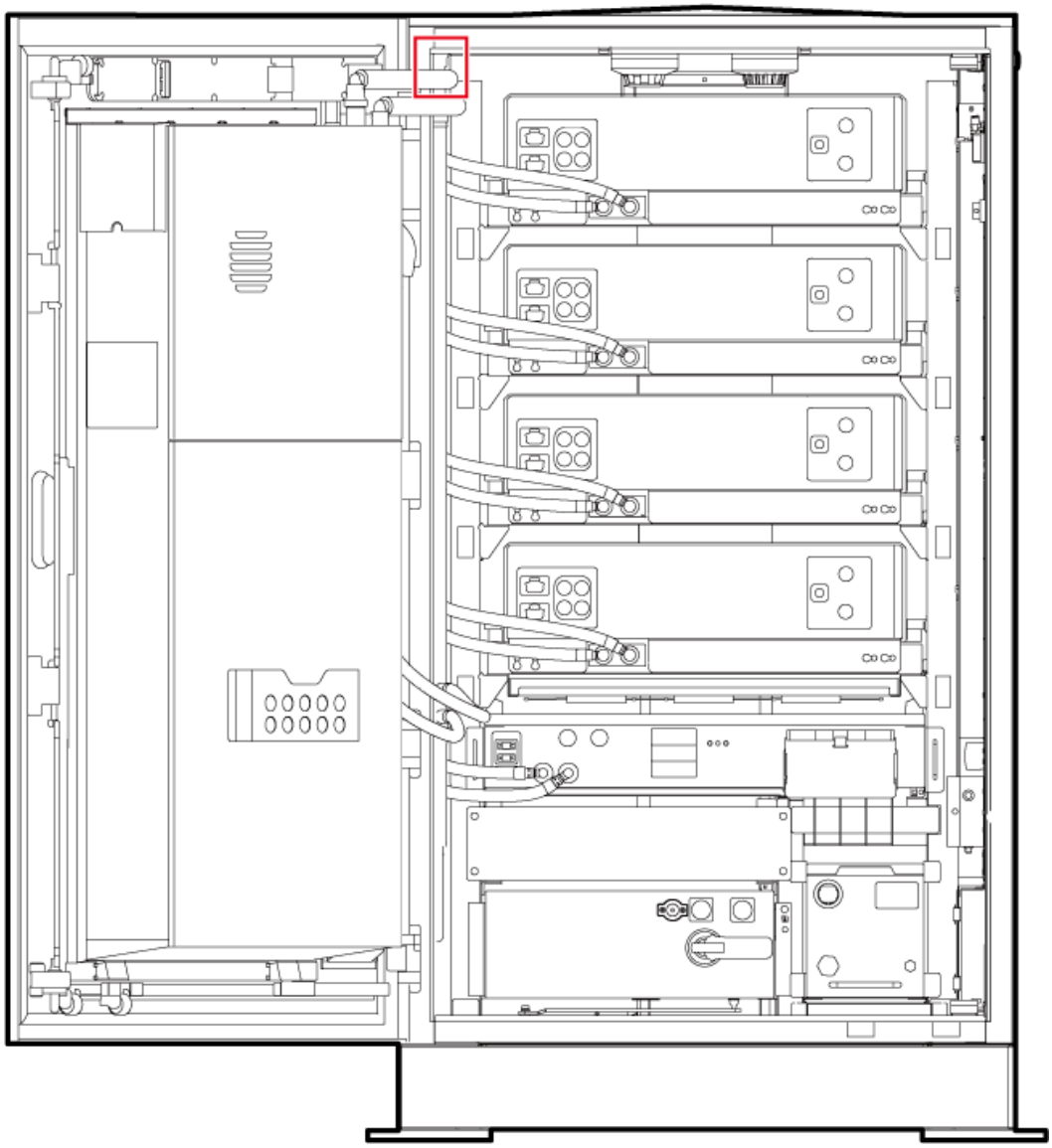
7.5 Replacing an Automatic Exhaust Valve

Prerequisites

Figure 7-7 Position of the automatic exhaust valve



- Tools: non-absorbent insulated gloves, mask, flat-head insulated torque screwdriver, coolant filling/drainage machine (purchased on the configurator), and coolant
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

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Procedure

Step 1 Drain coolant using the coolant filling/drainage machine. For details, see **D.1 Draining Coolant from the LTMS**.

Step 2 Remove the automatic exhaust valve.

CAUTION

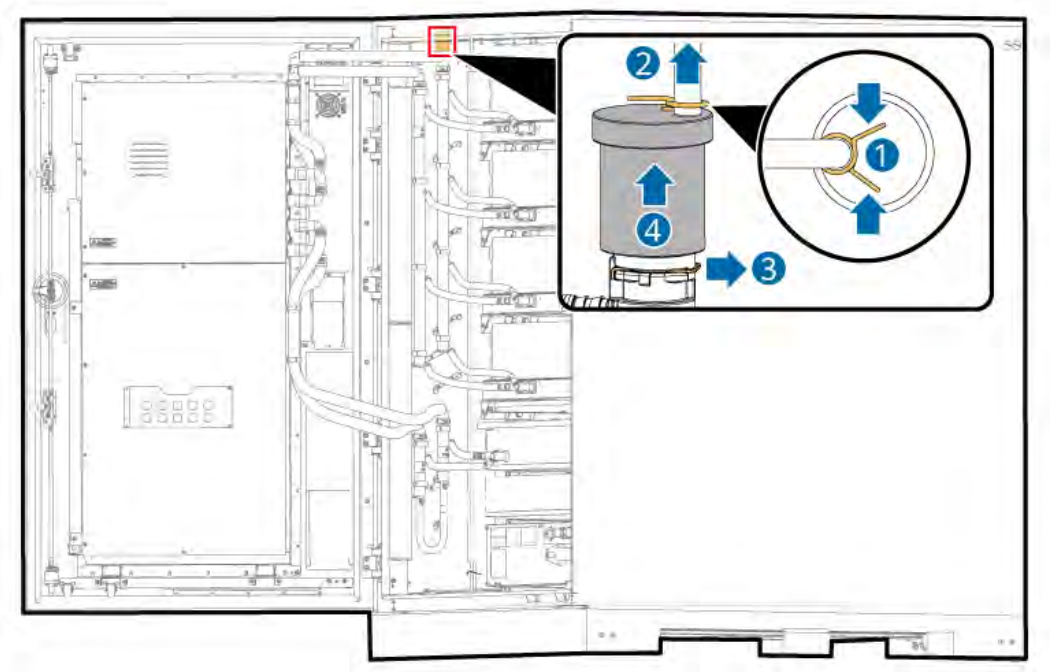
- Wear personal protective equipment before removing the component.
- Before removing the automatic exhaust valve, ensure that the internal and external air pressures are balanced. Directly removing the automatic exhaust valve may cause coolant splash.

1. Press and loosen the clamp.
2. Pull up the conduit clamp and remove the conduit from the automatic exhaust valve.
3. Pull out the snap spring of the automatic exhaust valve.

   NOTE

   If it is difficult to pull out the snap spring, use the flat-head screwdriver to pry out the spring carefully. Use one hand to pinch the spring to prevent it from falling into the cabinet and use the other hand to pull out the spring.
4. Remove the automatic exhaust valve.

Figure 7-8 Removing the automatic exhaust valve



Step 3 Install the automatic exhaust valve.

1. Connect the new exhaust valve to the original conduit by referring to step 2.

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2. Install the automatic exhaust valve.
3. Install the new snap spring in the original position of the automatic exhaust valve.

NOTICE

- When installing the snap spring, confirm the installation position. If the spring is installed in an incorrect position, leakage may occur.
- Use two thumbs to press the spring until you hear a click.

Step 4 Add coolant. For details, see **D.3 Adding Coolant to the LTMS**.

----End

8 Replacing a Fire Suppression System

8.1 (Optional) Replacing a Thermal Runaway Suppression Device (TRSD)

8.1.1 Replacing a TRSD (Including Its Pipes)

NOTICE

The TRSD uses lead-acid batteries for power backup. Lead-acid batteries may be damaged if they are stored at a low temperature (–35°C to –20°C) or stored at a low voltage for more than seven days. If lead-acid batteries are damaged, purchase new ones by yourself.

The specifications of lead-acid batteries are as follows:

- Battery capacity > 2.3 Ah (10 hour-rate)
- Voltage: 12 V
- Dimensions (L x W x H): 70 mm x 48 mm x 98 mm (height: 104 mm with battery terminals included)

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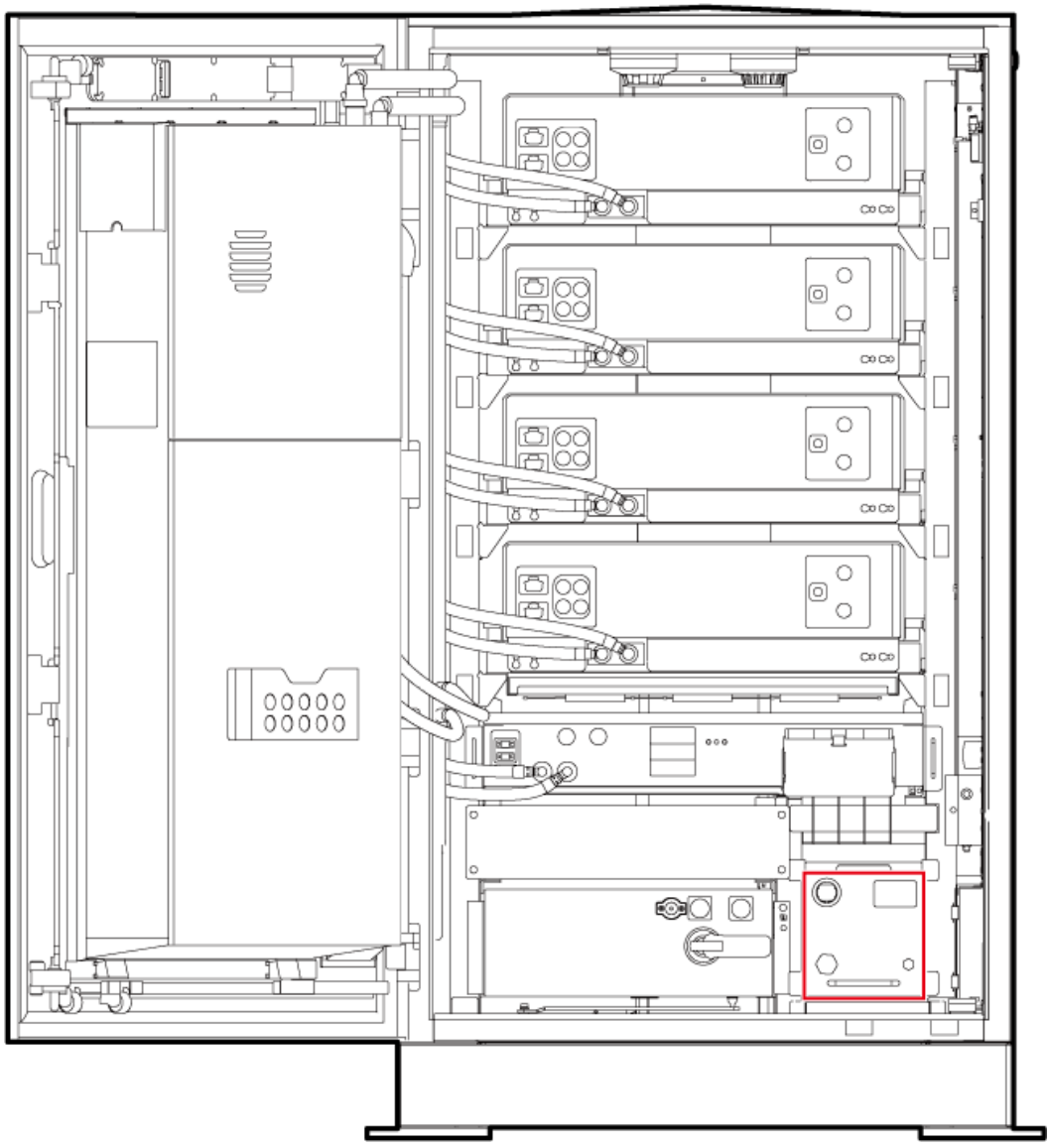
Prerequisites

Figure 8-1 Position of the TRSD



- Tools: insulated torque socket wrench (including 13# socket and extension rod), wrench, and Phillips insulated torque screwdriver (M4)
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

Step 1 Remove the PCS AC power cables and check whether the labels are intact. If not, confirm cables and prepare new labels.

Step 2 Remove the TRSD (including its pipes).

1. Remove the fire sprinkler (using a wrench) and TRSD pipe cover (tightened using M4 screws).

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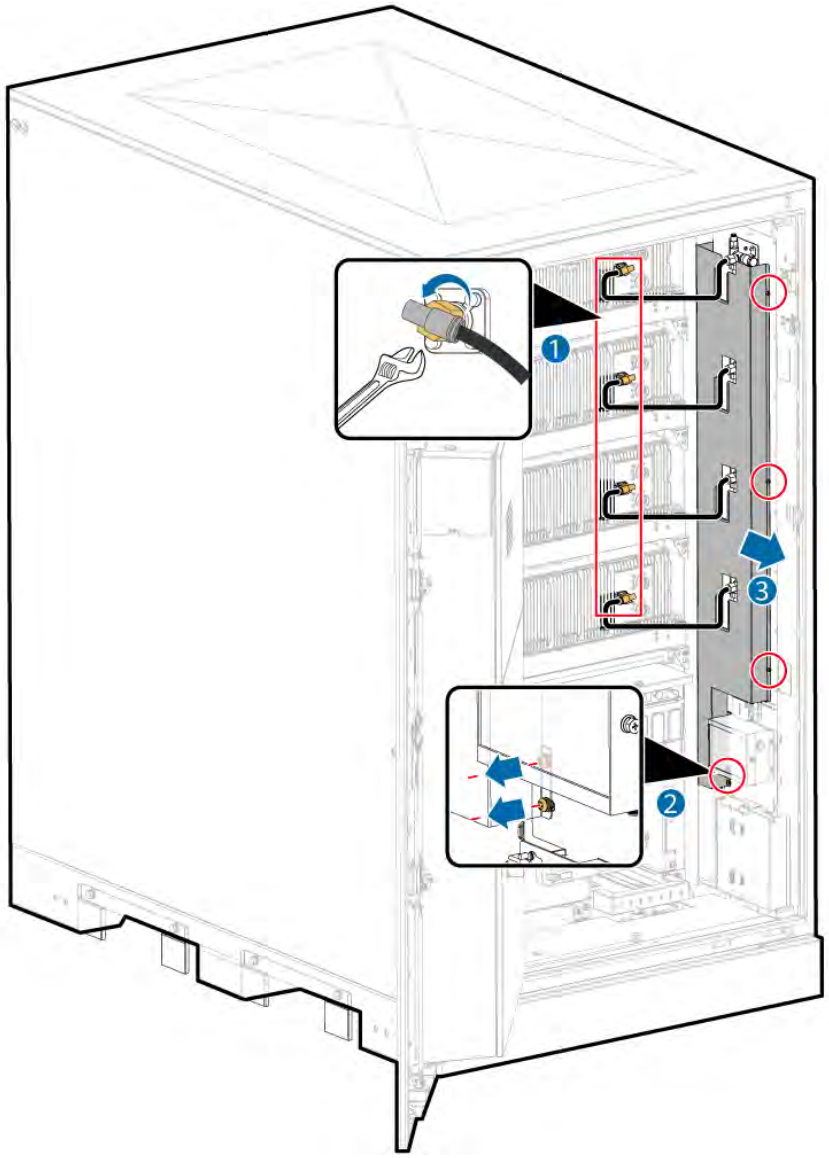
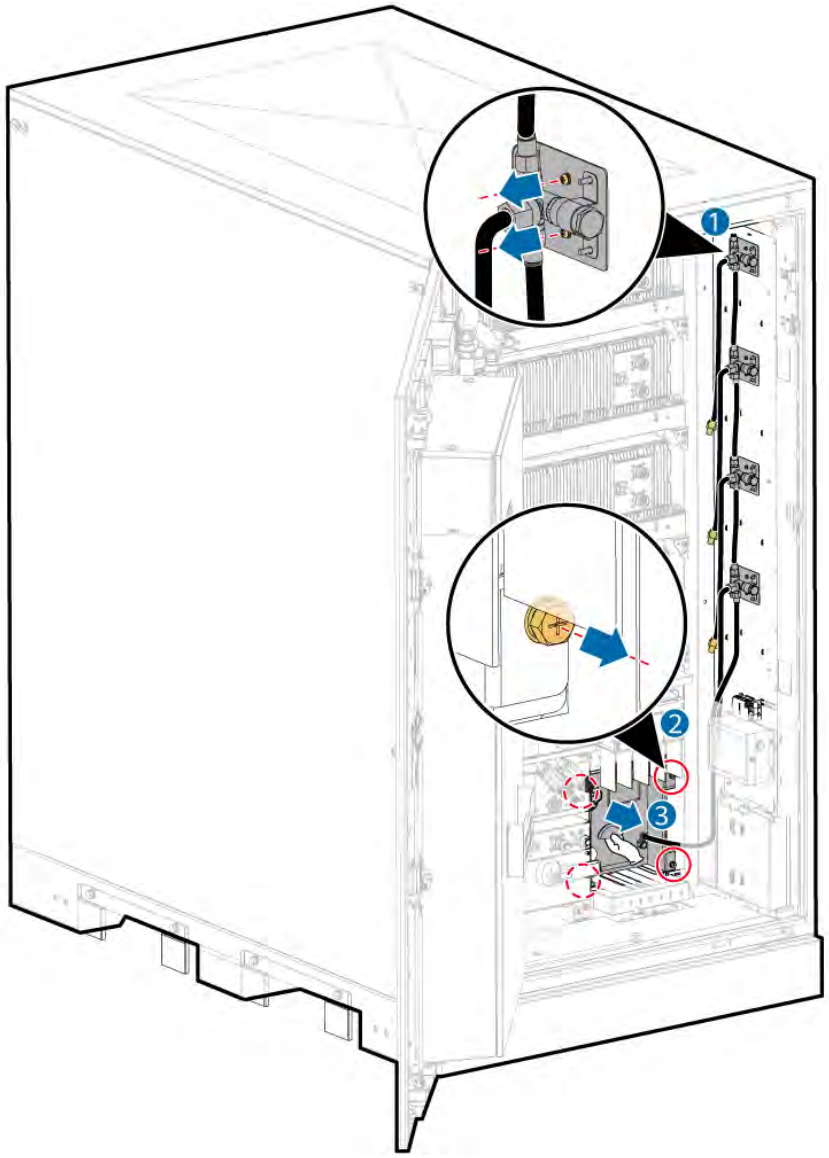
Figure 8-2 Removing the fire sprinkler and pipe cover



2. Remove the TRSD (tightened using M8 screws) and pipes (tightened using M4 screws).

Figure 8-3 Removing the TRSD and pipes



Step 3 Install a new TRSD (including its pipes).

1. Install the new TRSD (M8 screws, tightened to 13 N·m) and pipes (M4 screws, tightened to 1.6 N·m).
2. Install the TRSD pipe cover (M4 screws, tightened to 1.6 N·m) and the new fire sprinkler (using a wrench).

Step 4 Reconnect the PCS AC power cables based on the cable labels.

----End

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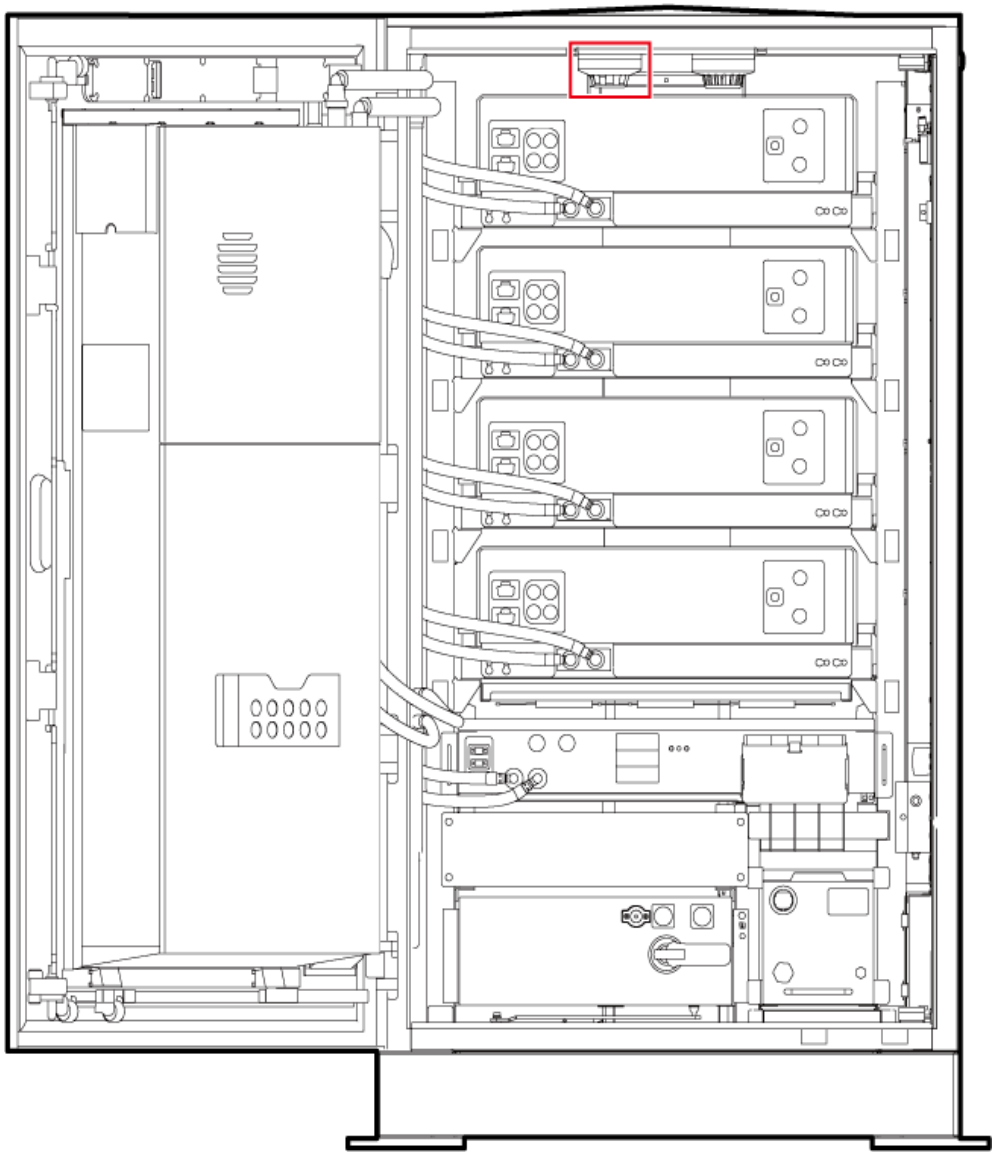
8.2 Replacing a Smoke Detector

Prerequisites

Figure 8-4 Position of the smoke detector



- Tools: Phillips insulated torque screwdriver (M4) and protective gloves
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

Step 1 Hold the faulty smoke detector by hand, and rotate it counterclockwise to remove it from the base.

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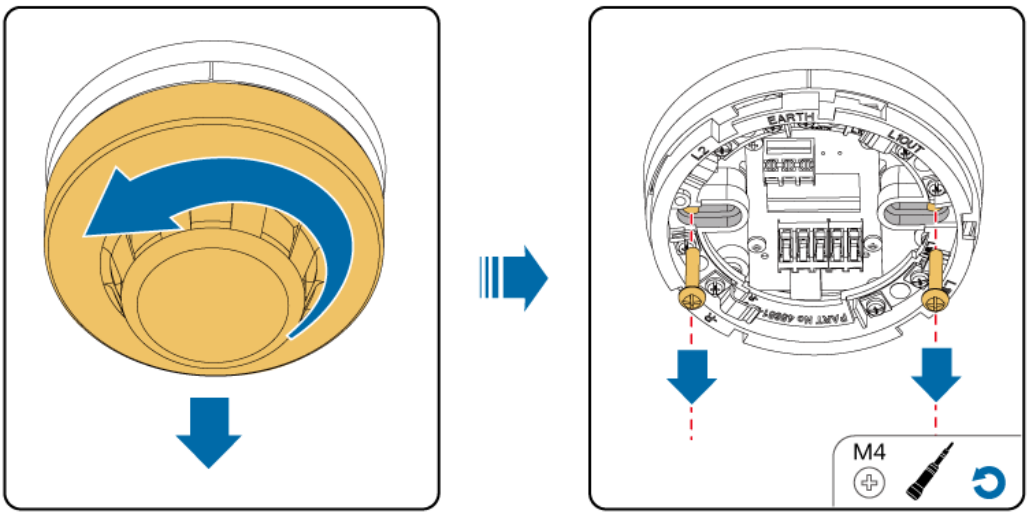
Figure 8-5 Removing the smoke detector



Step 2 Disconnect the cables from the faulty smoke detector and check whether the labels are intact. If not, confirm cables and prepare new labels.

Step 3 Remove the base.

Step 4 Install the base and tighten the M4 Phillips screws to 1.6 N·m.

Step 5 Connect the cables based on the labels.

Step 6 Hold the new smoke detector by hand, and rotate it clockwise until it snaps into place.

----End

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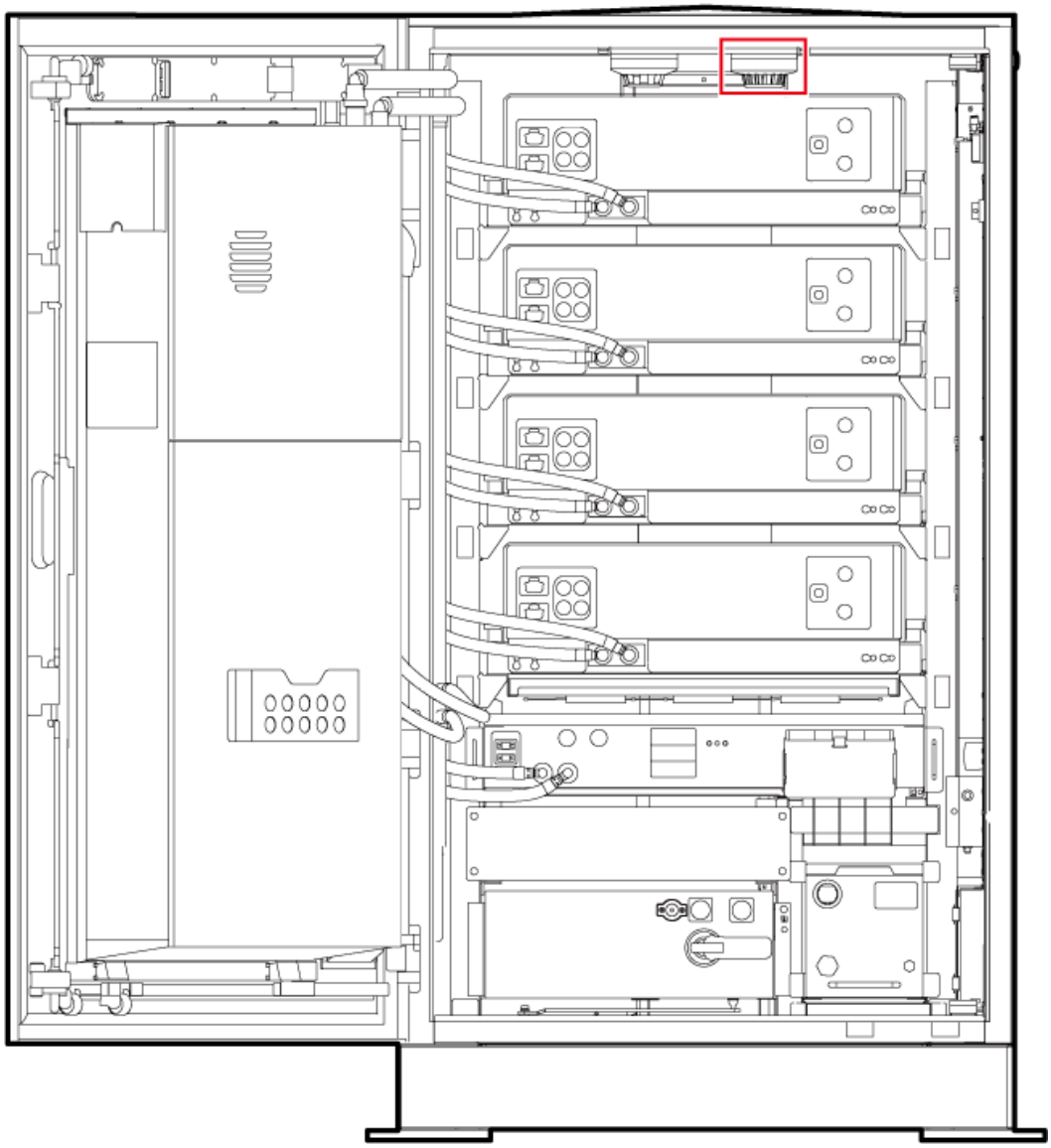
8.3 Replacing a Heat Detector

Prerequisites

Figure 8-6 Position of the heat detector



- Tools: Phillips insulated torque screwdriver (M4) and protective gloves
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

Step 1 Hold the faulty heat detector by hand, and rotate it counterclockwise to remove it from the base.

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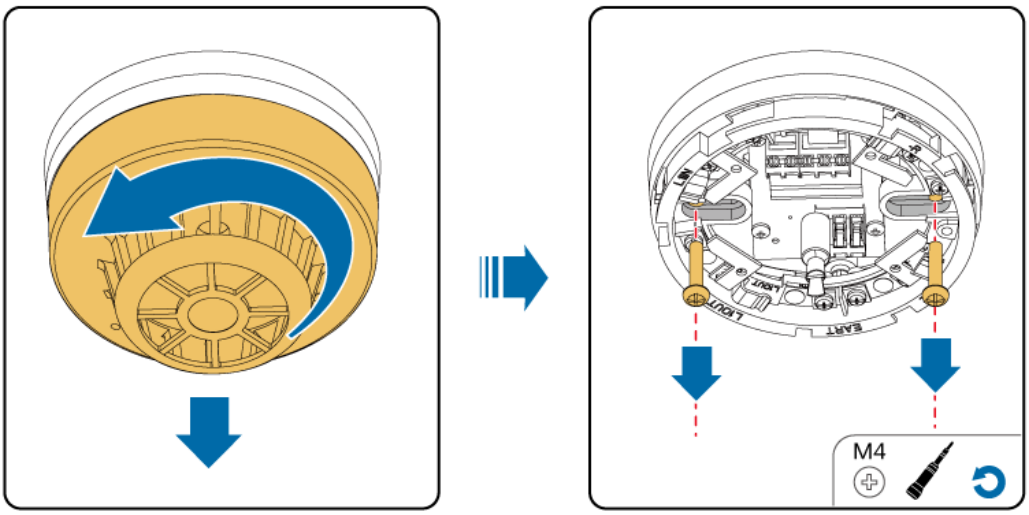
Figure 8-7 Removing the heat detector



Step 2 Disconnect the cables from the faulty heat detector and check whether the labels are intact. If not, confirm cables and prepare new labels.

Step 3 Remove the base.

Step 4 Install the base and tighten the M4 Phillips screws to 1.6 N·m.

Step 5 Connect the cables based on the labels.

Step 6 Hold the new heat detector by hand, and rotate it clockwise until it snaps into place.

----End

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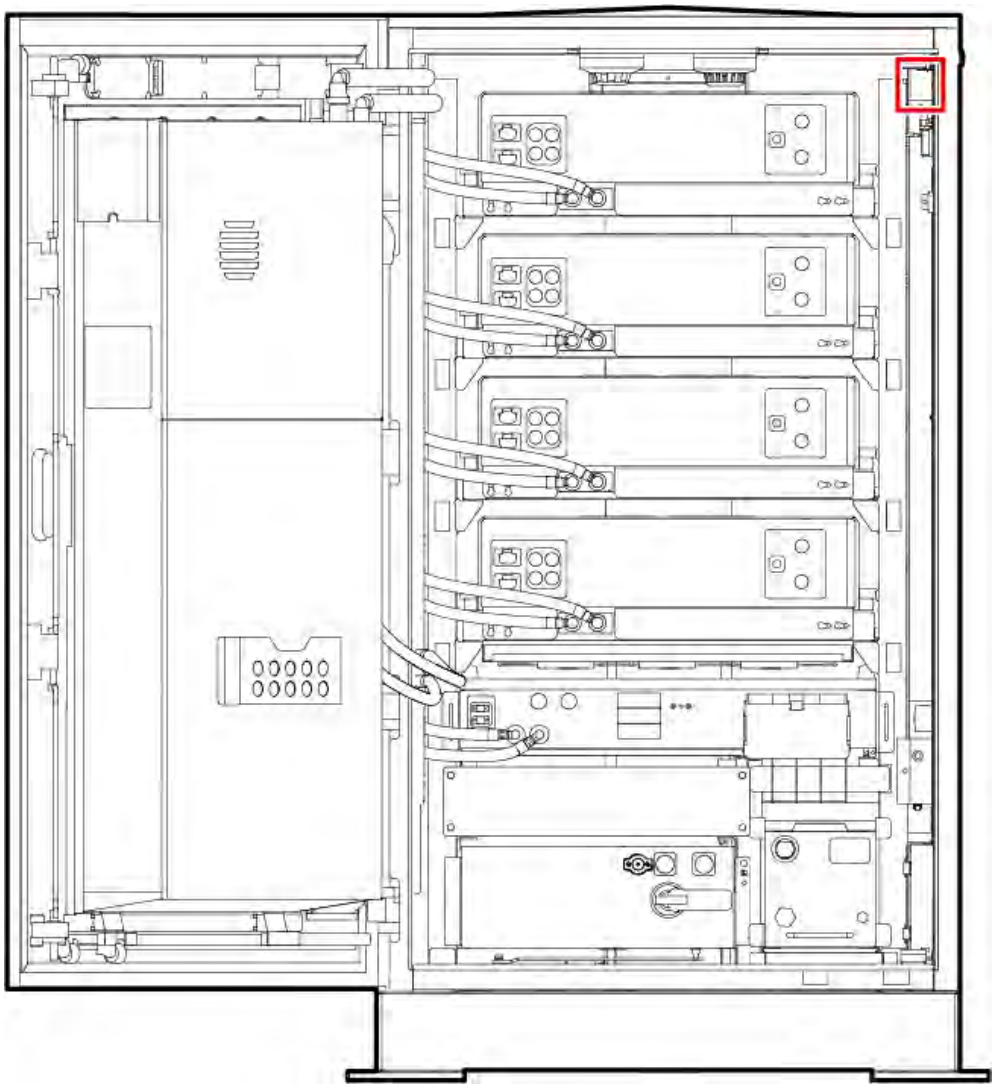
8.4 (Optional) Replacing a CO Sensor

Prerequisites

Figure 8-8 Position of the CO sensor



- Tools: Phillips insulated torque screwdriver (M3) and protective gloves
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

Step 1 Record the DIP switch settings.

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CO Sensor Address	Toggle Switch 1	Toggle Switch 2	Toggle Switch 3	Toggle Switch 4
1	ON	OFF	OFF	OFF

NOTE

If you use an explosion-proof CO sensor, you do not need to set the DIP switches.

Step 2 Disconnect the cables from the faulty CO sensor and check whether the labels are intact. If not, confirm cables and prepare new labels.

Step 3 Remove the faulty CO sensor.

Step 4 Set the DIP switches for a new CO sensor based on the recorded information.

Step 5 Install the new CO sensor and tighten the M3 Phillips screws to 0.6 N·m.

NOTE

If you are using an explosion-proof CO sensor, tighten it using M4 Phillips screws to 1.6 N·m.

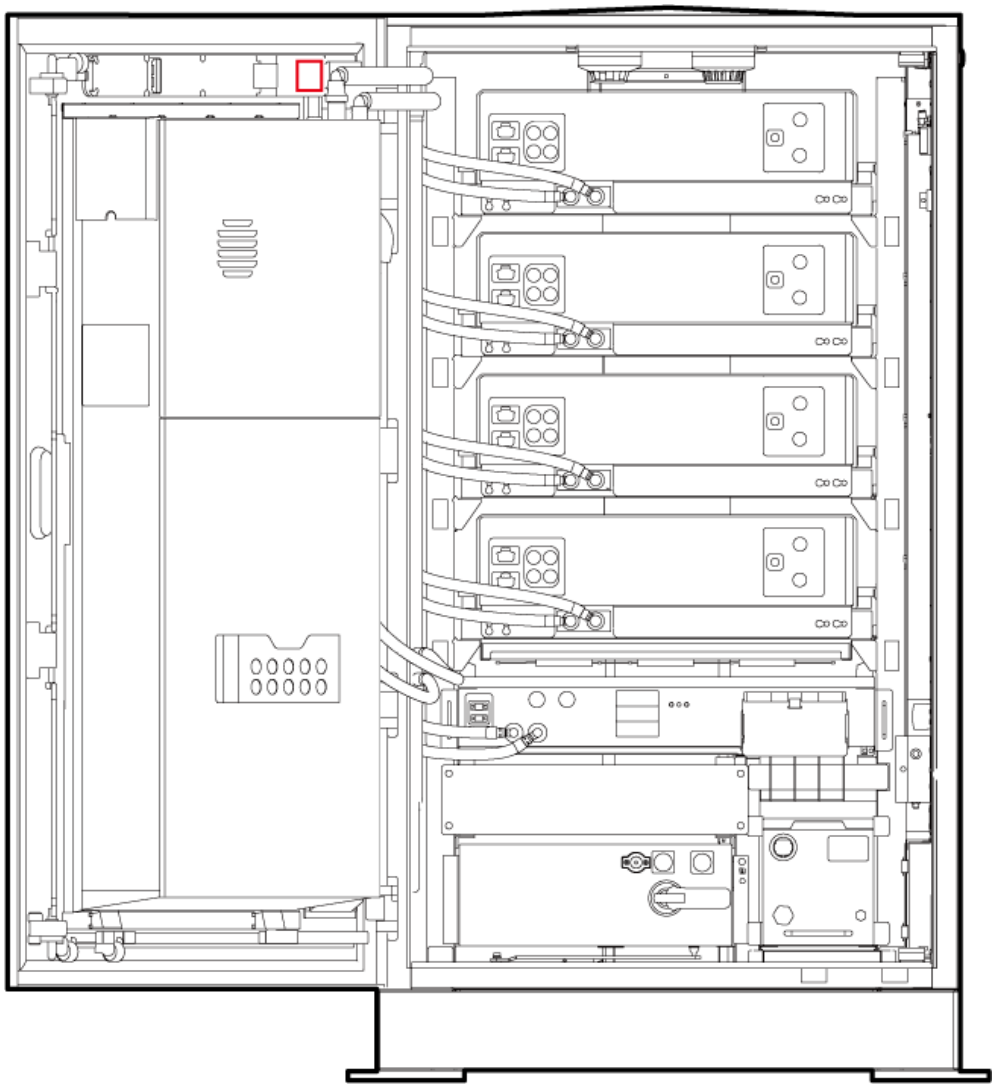
Step 6 Connect the cables based on the labels.

----End

8.5 Replacing a Fire Alarm Horn/Strobe

Prerequisites

Figure 8-9 Position of the fire alarm horn/strobe



- Tools: Phillips insulated torque screwdriver (M3) and protective gloves
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

Step 1 Disconnect cables from the faulty indicator board and fire alarm horn/strobe and check whether the labels are intact. If not, confirm cables and prepare new labels.

Step 2 Remove the liquid cooling pipe shown in the figure from the four pipe clamps, gently pull the pipe outward to leave sufficient space, and remove the rear cover of the indicator board.

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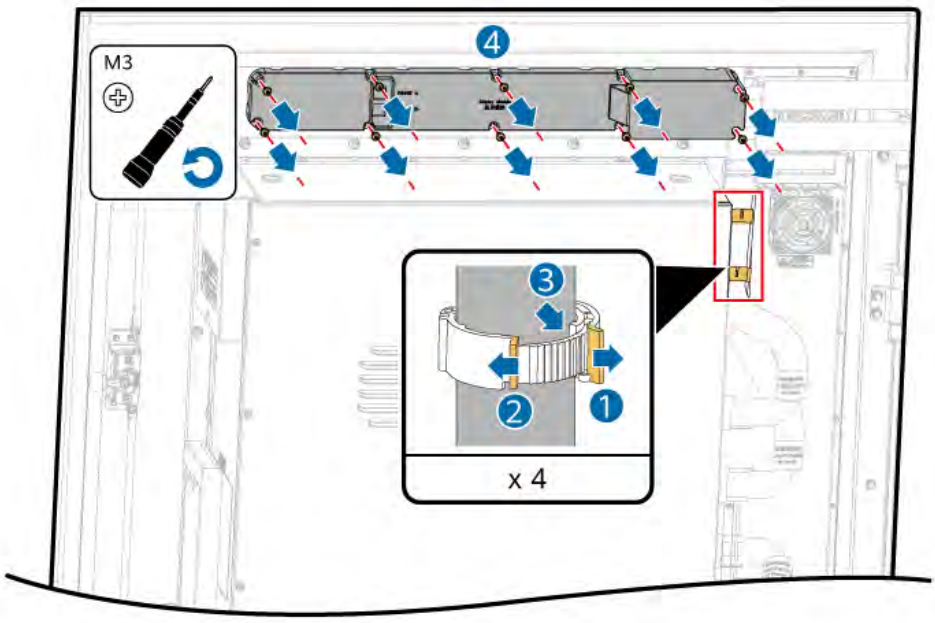
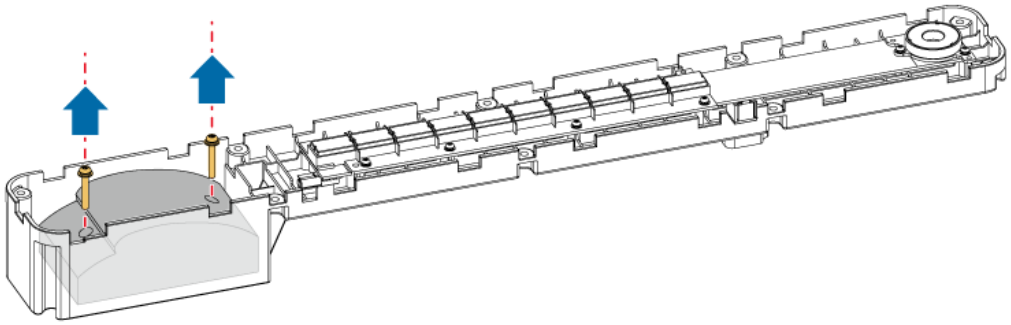
Figure 8-10 Removing the rear cover of the indicator board



Step 3 Remove the faulty fire alarm horn/strobe.

Figure 8-11 Removing the faulty fire alarm horn/strobe



Step 4 Install a new fire alarm horn/strobe and tighten the M3 Phillips screws to 0.6 N·m.

Step 5 Install the rear cover of the indicator board and tighten the M3 Phillips screws to 0.6 N·m.

Step 6 Reinstall the cables.

----End

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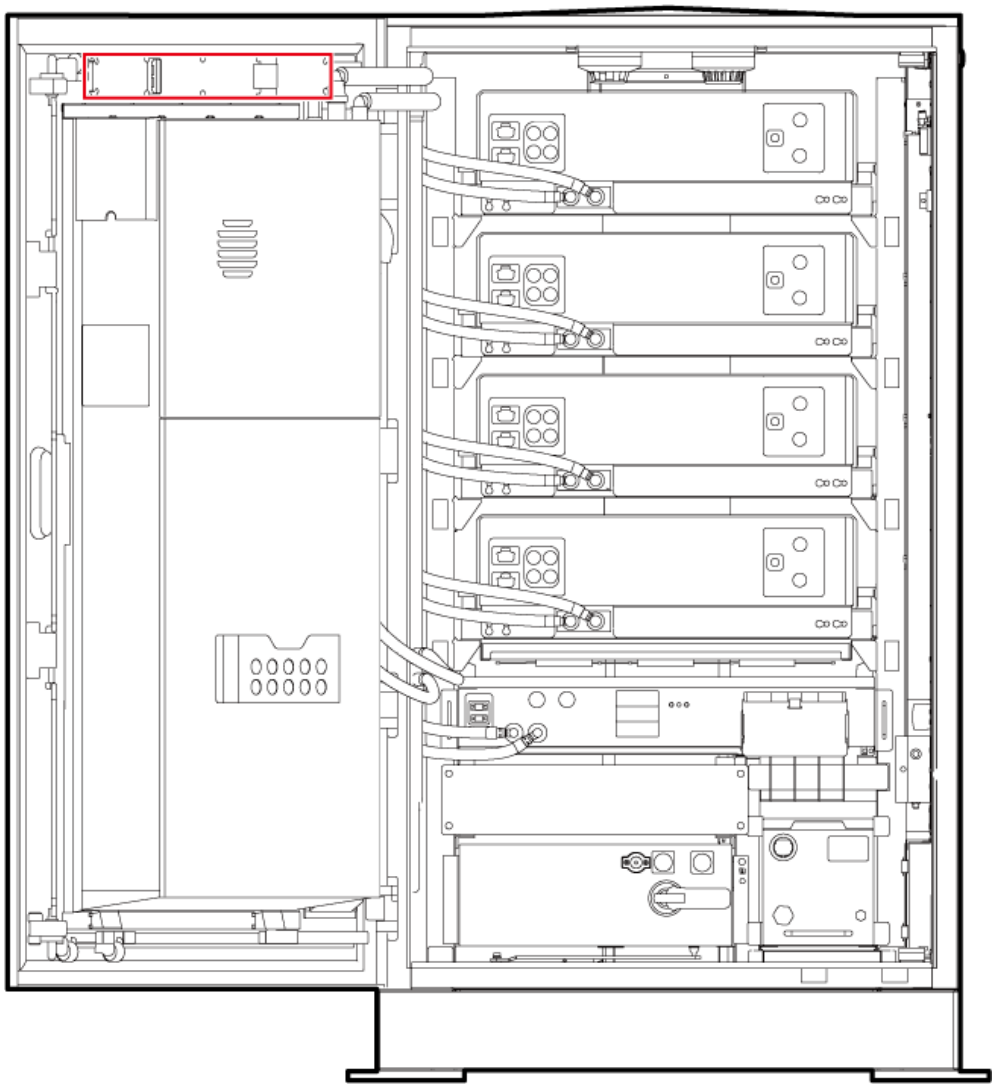
9 Replacing an Indicator Board

Prerequisites

Figure 9-1 Position of the indicator board



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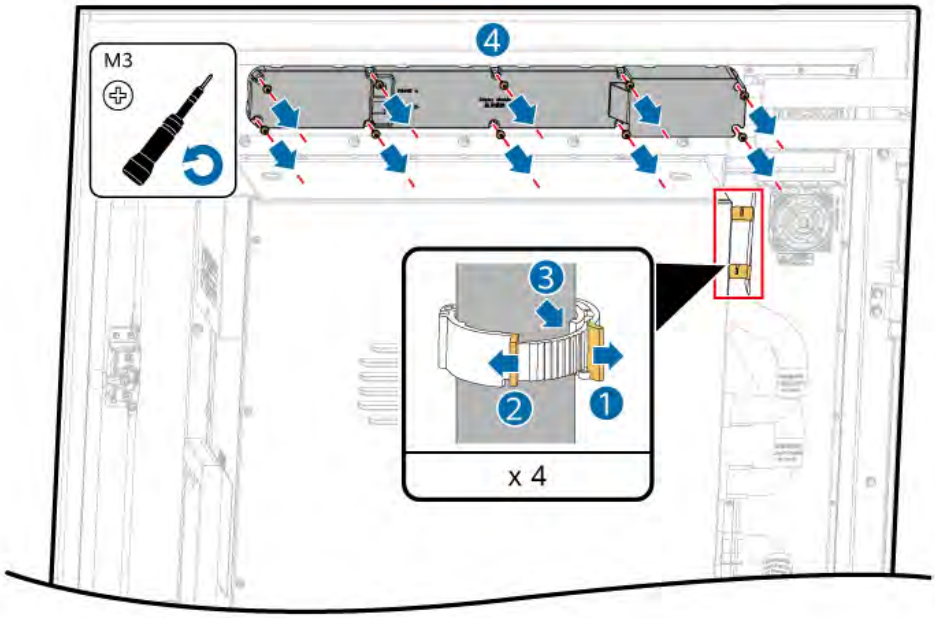
- Tools: Phillips insulated torque screwdriver (M3), protective gloves, and sealant
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

Step 1 Disconnect cables from the faulty indicator board and fire alarm horn/strobe and check whether the labels are intact. If not, confirm cables and prepare new labels.

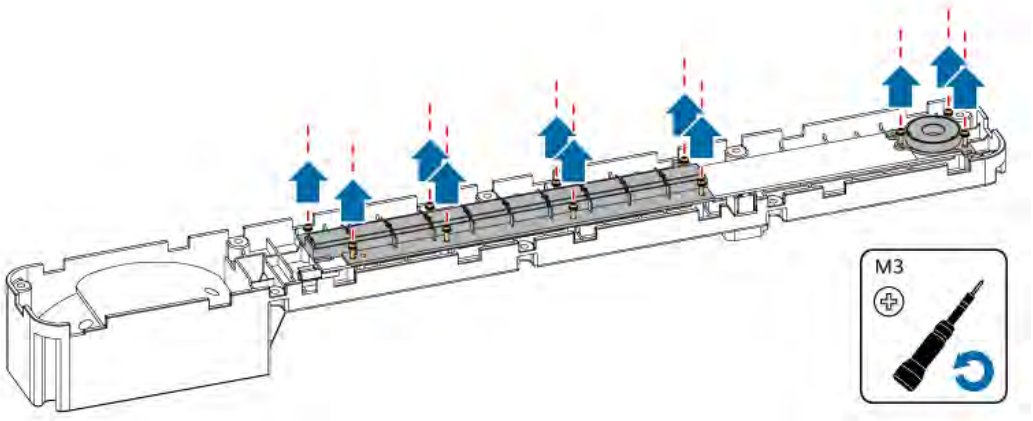
Step 2 Remove the liquid cooling pipe shown in the figure from the four pipe clamps, gently pull the pipe outward to leave sufficient space, and remove the rear cover of the indicator board.

Figure 9-2 Removing the rear cover of the indicator board



Step 3 Remove the light pipe and light pipe support from the indicator board.

Figure 9-3 Removing the light pipe and light pipe support



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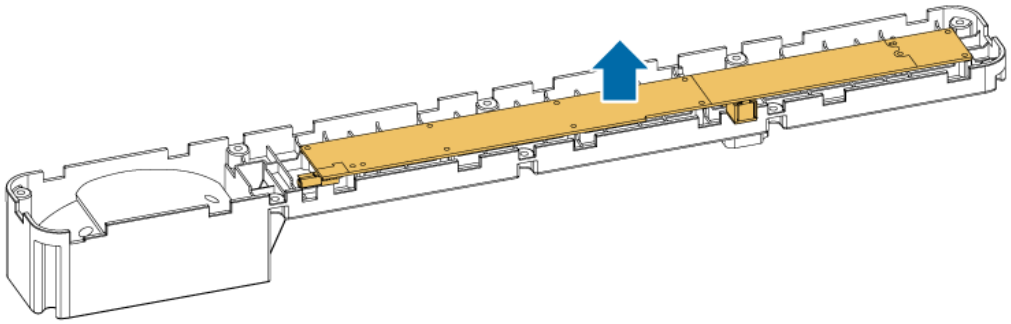
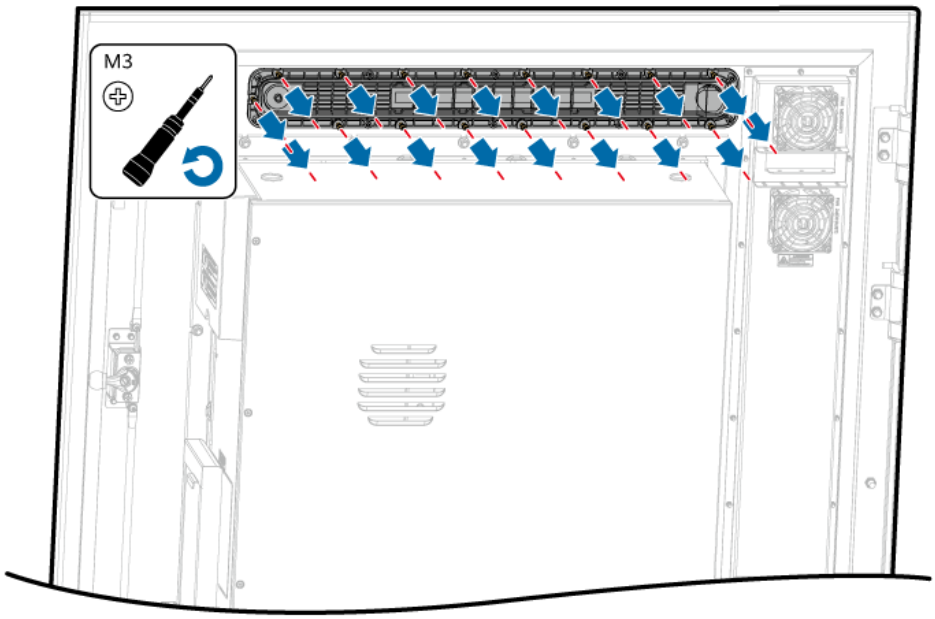
Step 4 Remove the control board of the faulty indicator board.

Figure 9-4 Removing the control board



Step 5 Remove the front panel of the indicator board. (Optional. If the front panel is faulty, perform steps **Step 5** to **Step 7** to replace the front panel.)

Figure 9-5 Removing the front panel of the indicator board



Step 6 (Optional) Apply sealant evenly.

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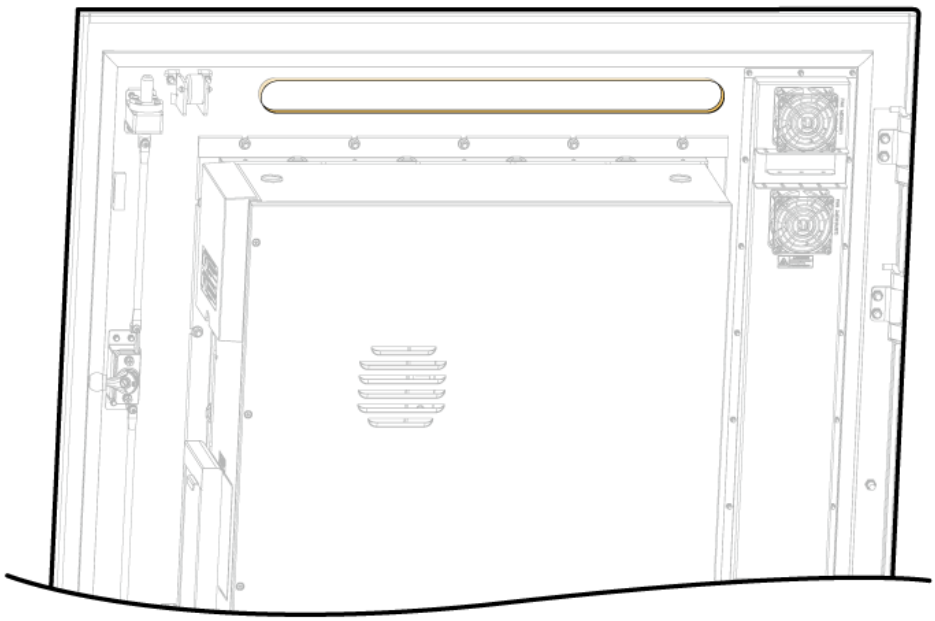
Figure 9-6 Applying sealant evenly



Step 7 (Optional) Install the front panel of the indicator board and tighten the M3 Phillips screws to 0.6 N·m.

Step 8 Apply sealant evenly to the rubber strips on the front panel of the indicator board outside the ESS cabinet door.

NOTICE

After the installation is complete, use lint-free cloth to remove sealant marks and ensure that there is no residual sealant.

Step 9 Install the new control board and light pipe and tighten the M3 Phillips screws to 0.6 N·m.

Step 10 Install the rear cover of the indicator board and tighten the M3 Phillips screws to 0.6 N·m.

Step 11 Reinstall the cables.

----End

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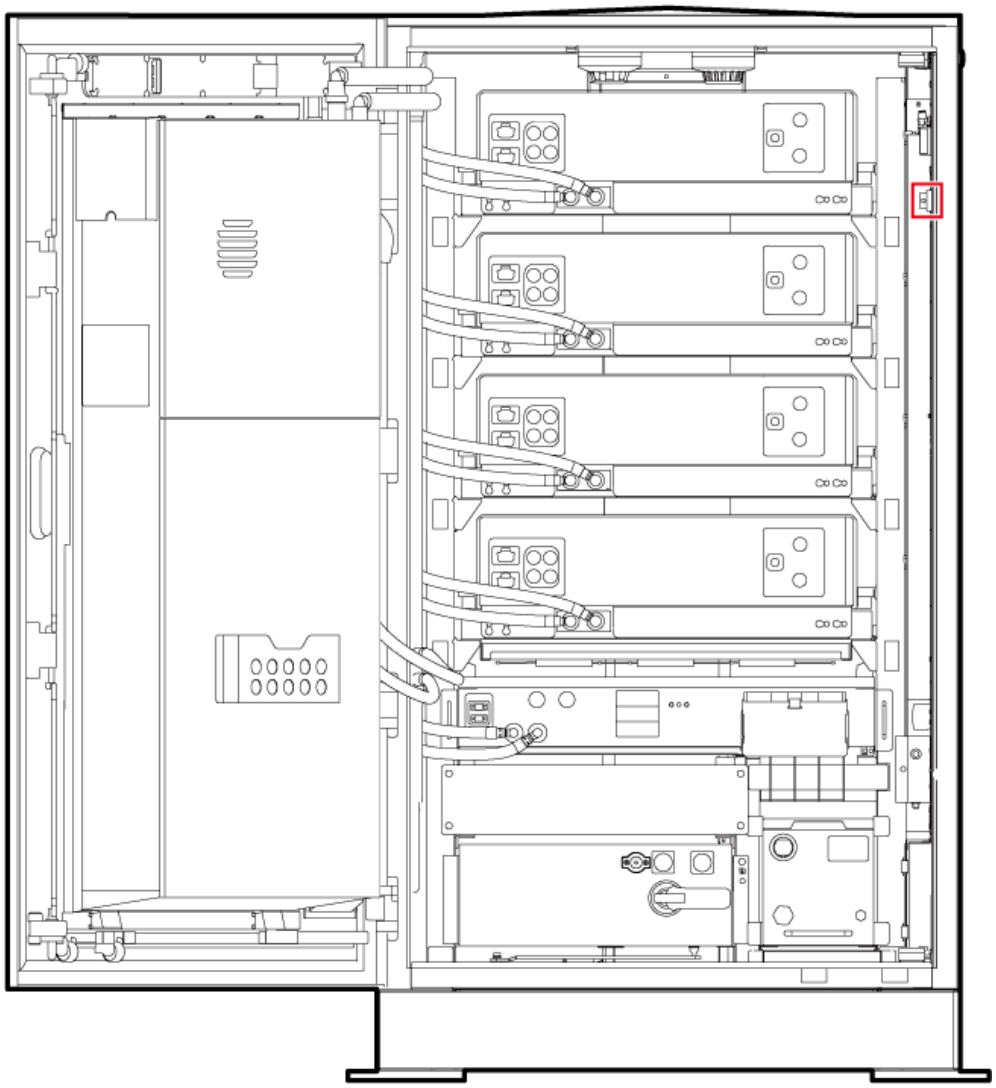
10 Replacing a Travel Switch

Prerequisites

Figure 10-1 Position of the travel switch



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- Tool: Phillips insulated torque screwdriver (M4)
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

Step 1 Disconnect the cables from the faulty travel switch and check whether the labels are intact. If not, confirm cables and prepare new labels.

Step 2 Remove the faulty travel switch.

Step 3 Install a new travel switch and tighten the M4 Phillips screws to 1.6 N·m.

Step 4 Connect the cables based on the labels.

----End

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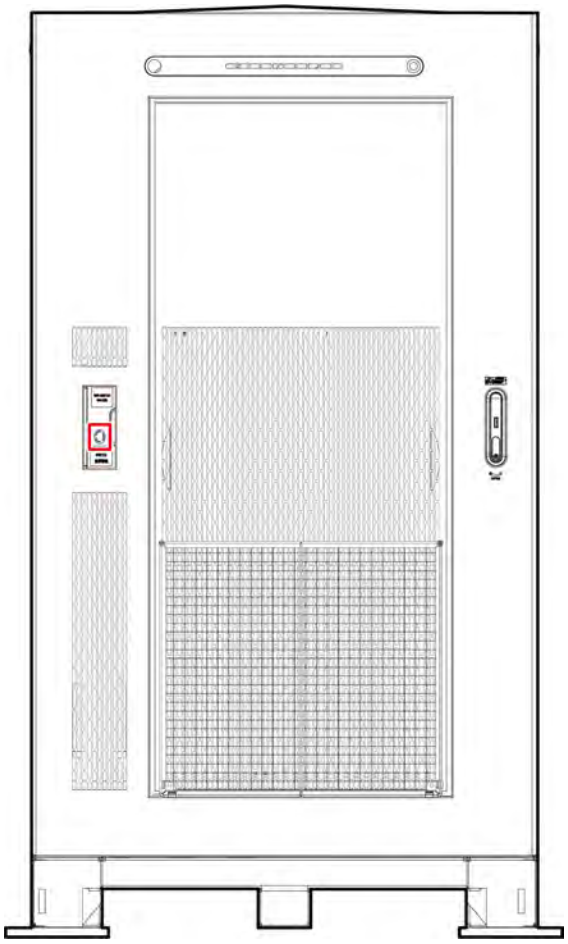
11 Replacing an Emergency Stop Switch

Prerequisites

Figure 11-1 Position of the emergency stop switch



- Tool: emergency stop switch tool (delivered with spare parts)

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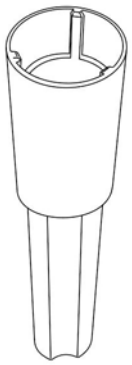
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

Step 1 Disconnect the cables from the emergency stop switch and check whether the labels are intact. If not, confirm cables and prepare new labels.

Step 2 Align the emergency stop switch tool with the latch at the rear of the emergency stop switch, and remove the faulty emergency stop switch counterclockwise.

Figure 11-2 Emergency stop switch tool



Step 3 Use the emergency stop switch tool to install the new emergency stop switch clockwise.

Step 4 Connect the cables based on the labels.

----End

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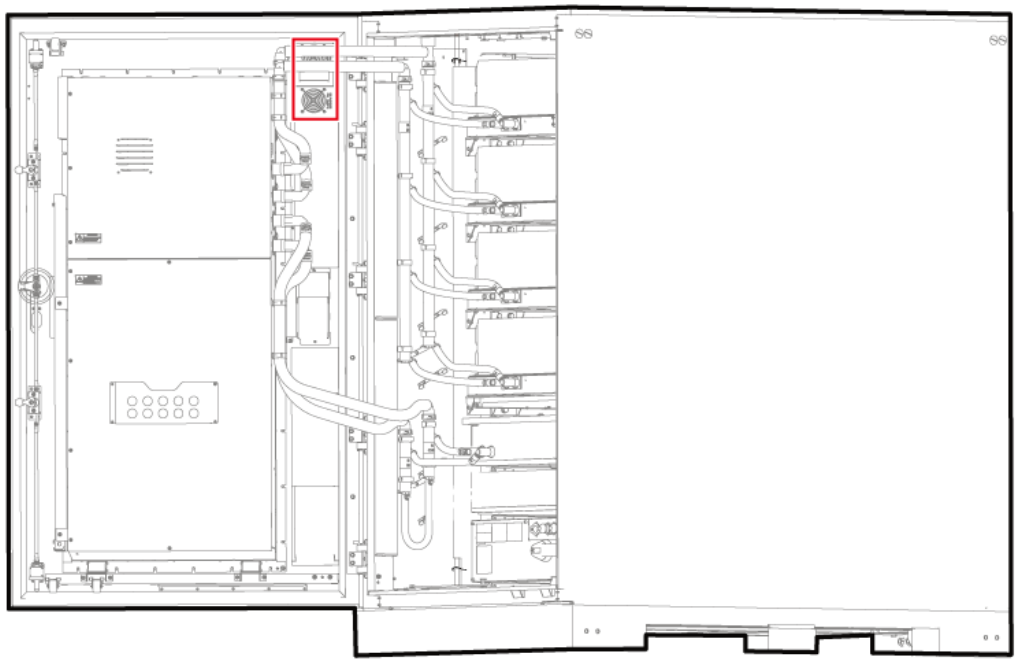
12 (Optional) Replacing an Exhaust Fan

Prerequisites

Figure 12-1 Position of the exhaust fan



- Tool: Phillips insulated torque screwdriver (M4)
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

Step 1 Disconnect the cables from the faulty exhaust fan and check whether the labels are intact. If not, confirm cables and prepare new labels.

Step 2 Remove the faulty exhaust fan.

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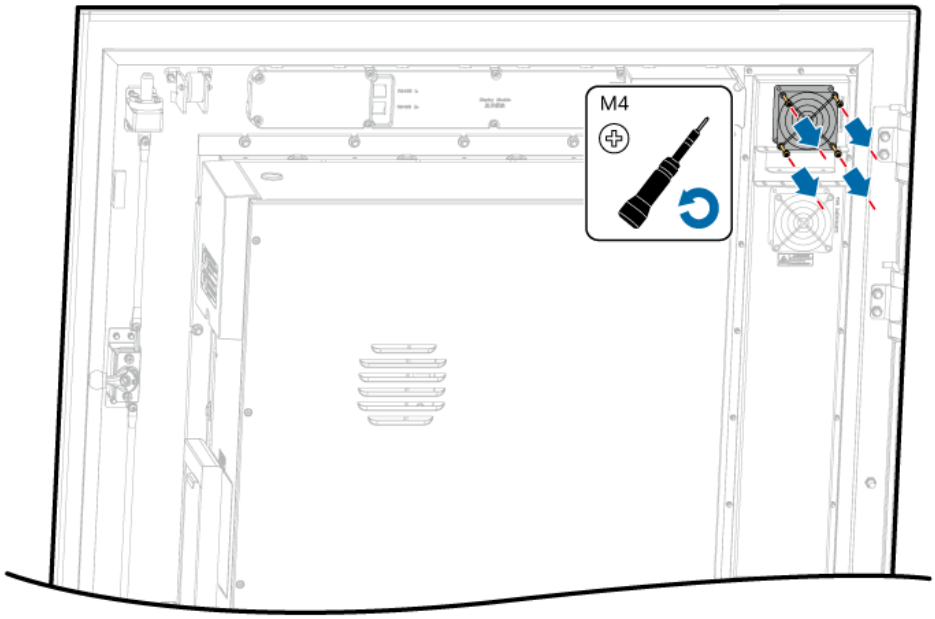
Figure 12-2 Removing the exhaust fan



Step 3 Install a new exhaust fan and tighten the M4 Phillips screws to 1.6 N·m.

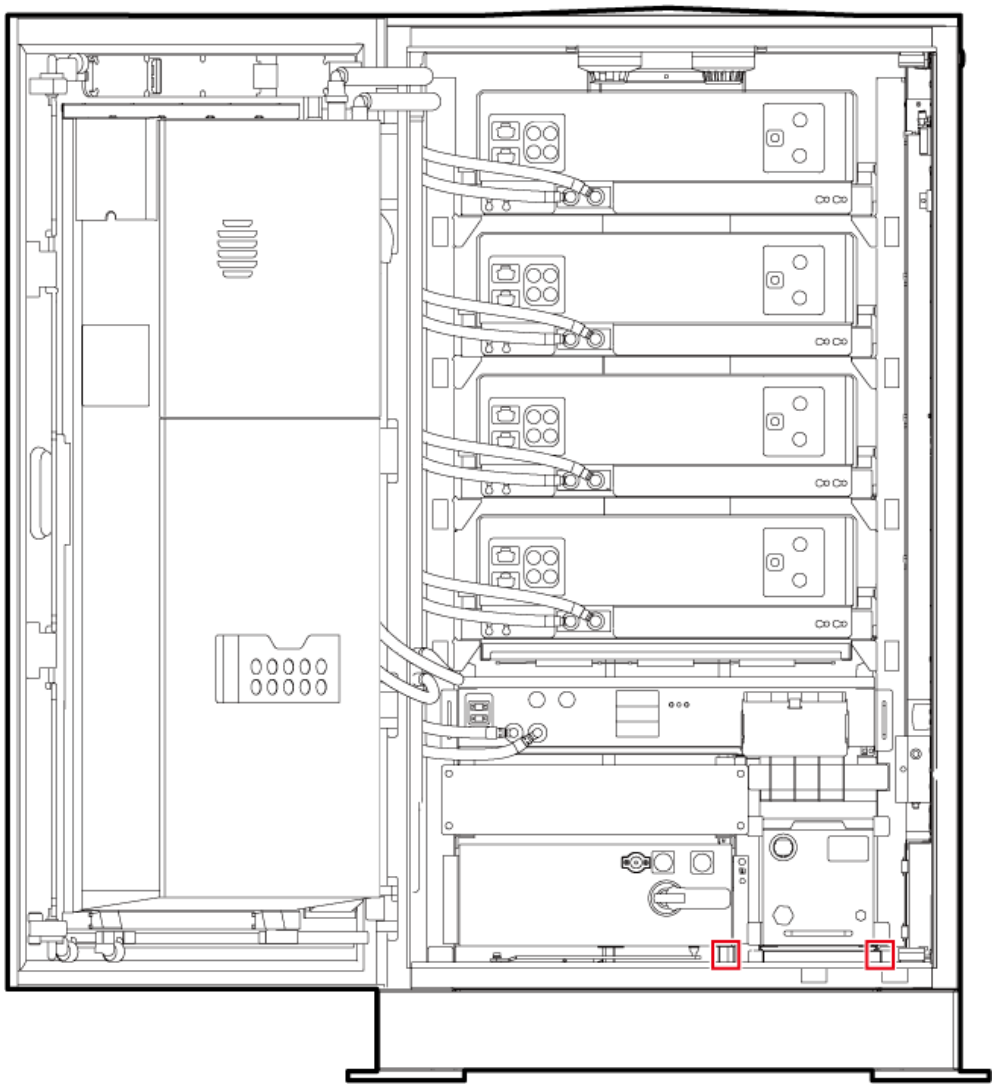
Step 4 Connect the cables based on the labels.

----End

13 Replacing a Water Sensor

Prerequisites

Figure 13-1 Positions of the water sensors



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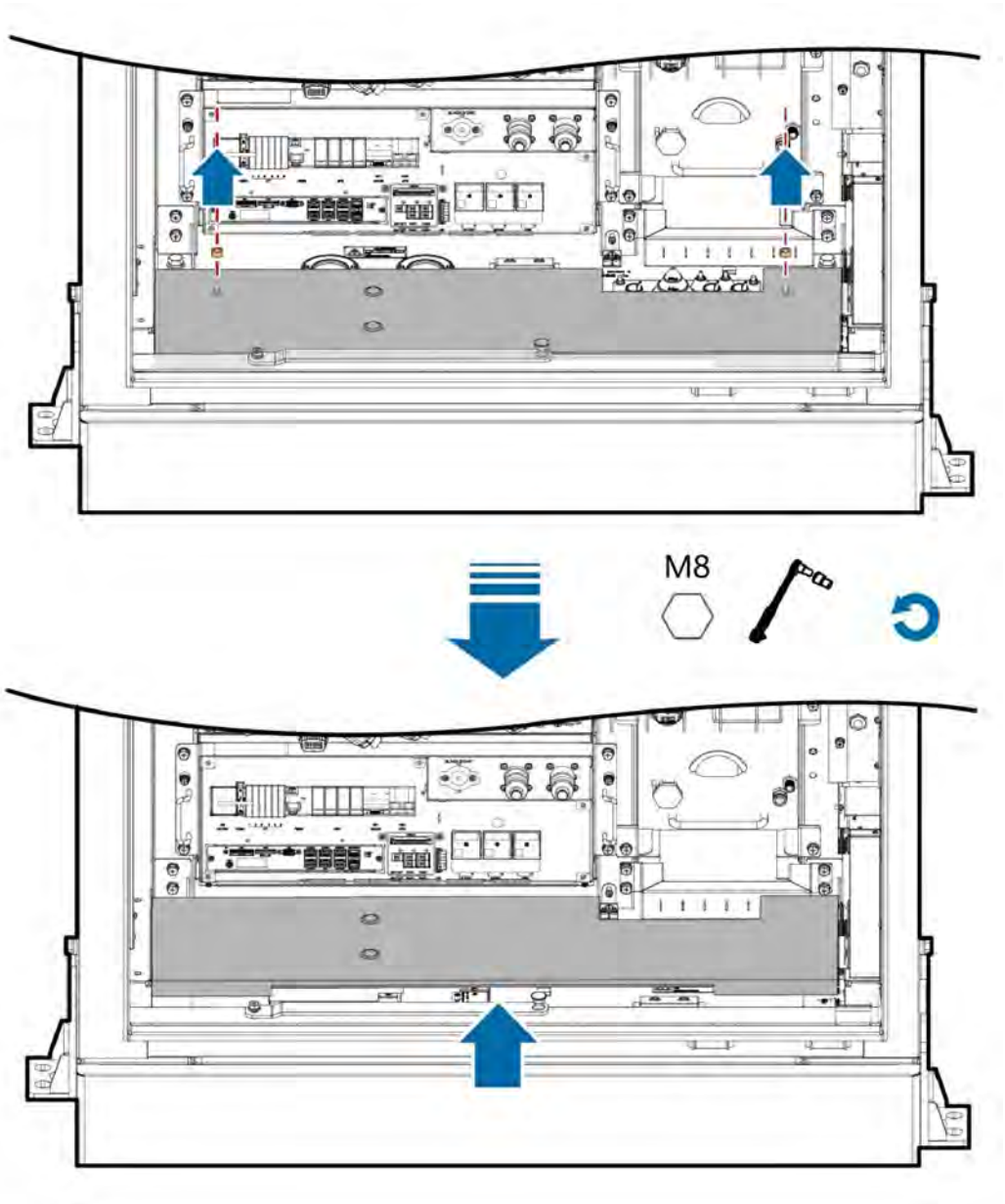
- Tools: Phillips insulated torque screwdriver (M3) and insulated torque socket wrench (including 13# socket)
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

Step 1 Remove the cable baffle plate.

Figure 13-2 Removing the cable baffle plate

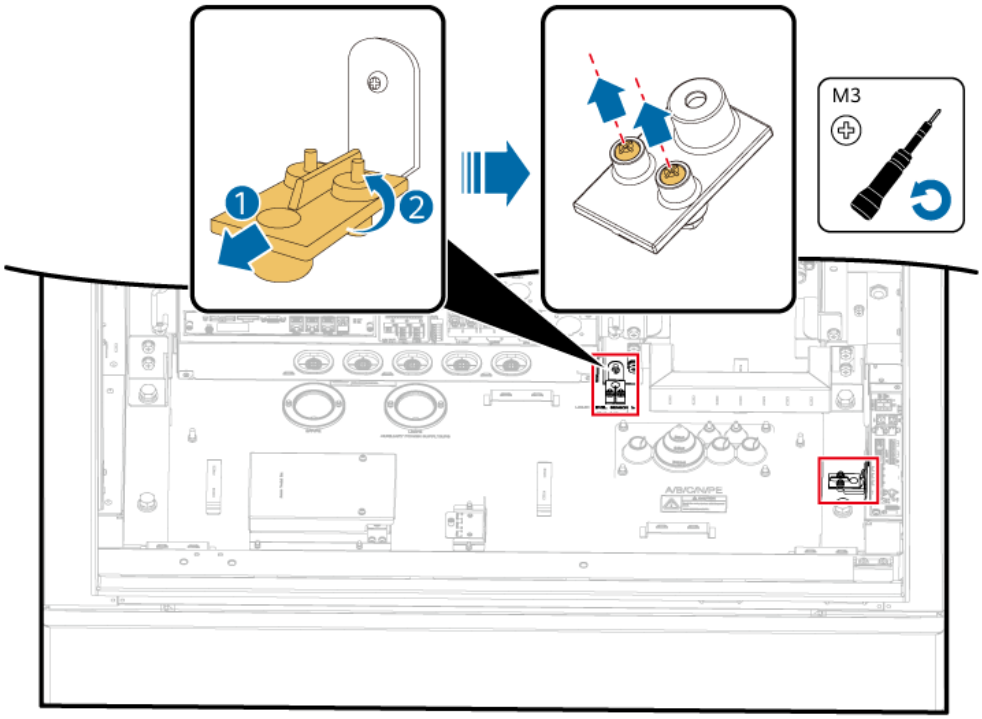


Step 2 Remove the faulty water sensor.

1. Remove the faulty water sensor.
2. Turn over the faulty water sensor.

3. Remove the screws from the faulty water sensor, remove the cables, and label the cables.

Figure 13-3 Removing the faulty water sensor



Step 3 Connect the cables to the new water sensor and tighten the M3 Phillips screws to 0.6 N·m.

Step 4 Install the water sensor.

Step 5 Install the cable baffle plate and tighten the M8 nuts to 13 N·m.

----End

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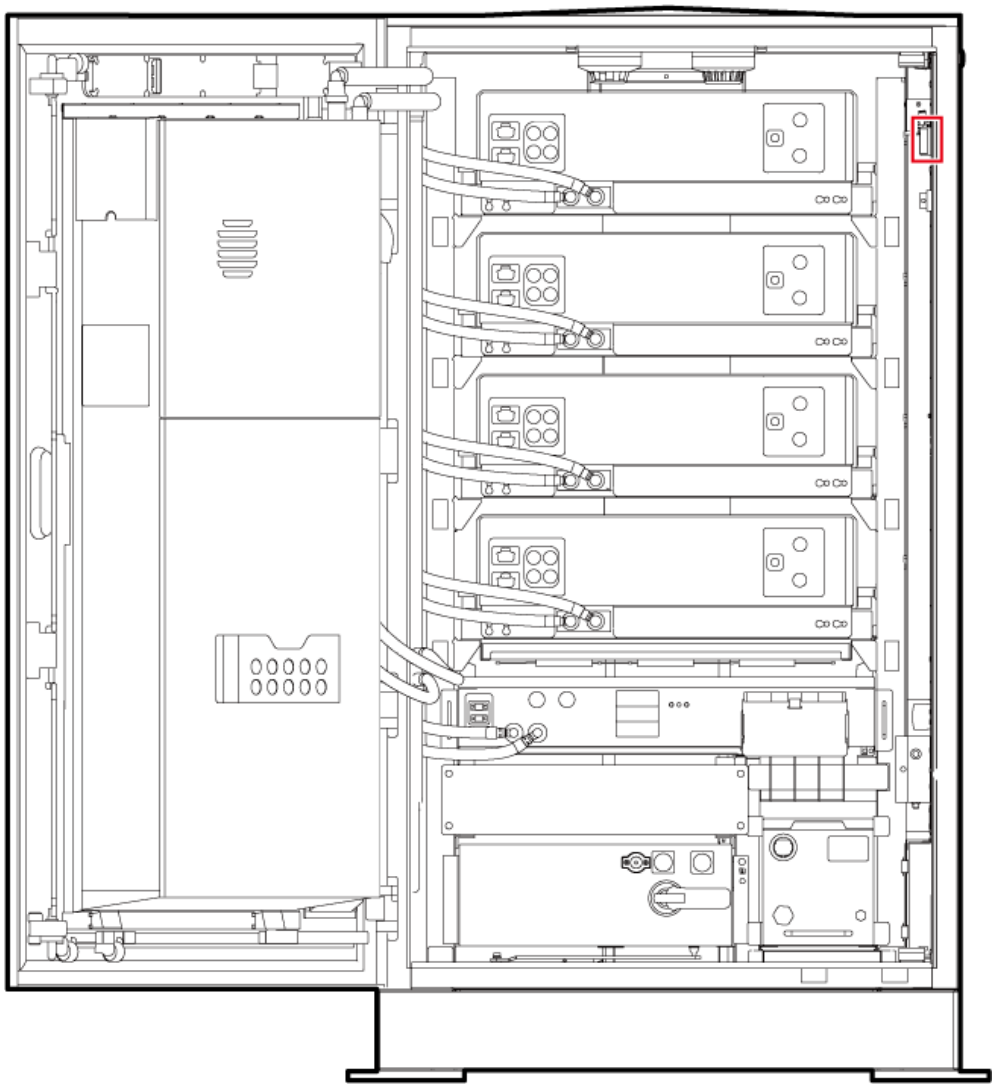
14 Replacing a Door Status Sensor

Prerequisites

Figure 14-1 Position of the door status sensor



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- Tool: Phillips insulated torque screwdriver (M3)
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

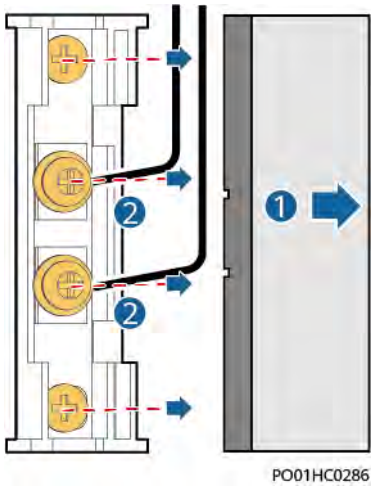
Procedure

Step 1 Remove the enclosure of the faulty door status sensor.

Step 2 Remove the screws that secure the alarm cable, disconnect the alarm cable, and label the cable.

Step 3 Remove the faulty door status sensor.

Figure 14-2 Removing the faulty door status sensor



Step 4 Remove the enclosure of the new door status sensor, and then remove the screws from the alarm cable.

Step 5 Install a new door status sensor and tighten the M3 Phillips screws to 0.6 N·m.

Step 6 Connect the cables based on the labels.

Step 7 Install the enclosure of the new door status sensor.

----End

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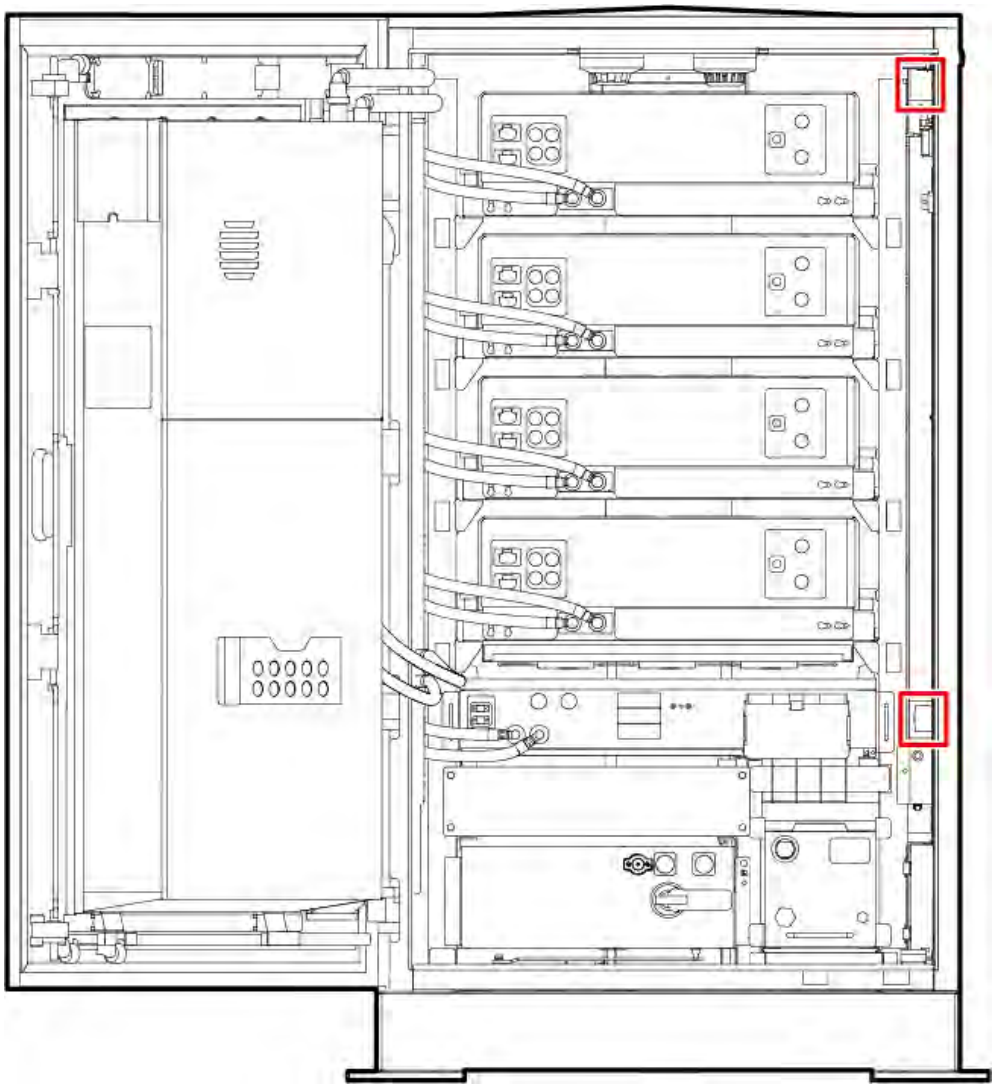
15 Replacing a T/H Sensor

Prerequisites

Figure 15-1 Positions of the T/H sensors



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You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

Step 1 Record the DIP switch settings.

Table 15-1 DIP switch settings

T/H Sensor Address	Toggle Switch 1	Toggle Switch 2	Toggle Switch 3	Toggle Switch 4	Toggle Switch 5	Toggle Switch 6
56	OFF	OFF	OFF	ON	ON	ON

Step 2 Disconnect the cables from the faulty T/H sensor and check whether the labels are intact. If not, confirm cables and prepare new labels.

Step 3 Remove the faulty T/H sensor.

Step 4 Set the DIP switches for a new T/H sensor based on the recorded information.

Step 5 Install the new T/H sensor.

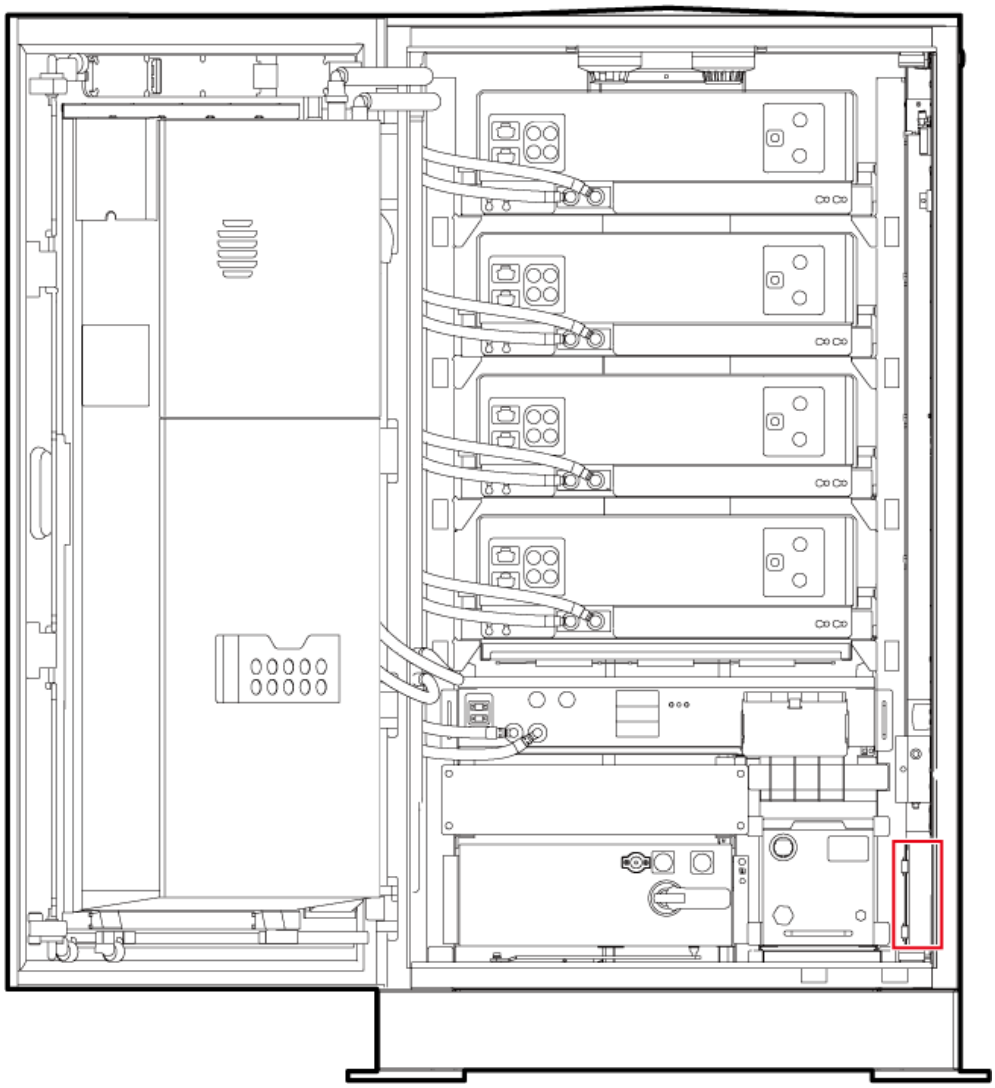
Step 6 Connect the cables based on the labels.

----End

16 (Optional) Replacing a SmartLogger

Prerequisites

Figure 16-1 Position of the SmartLogger



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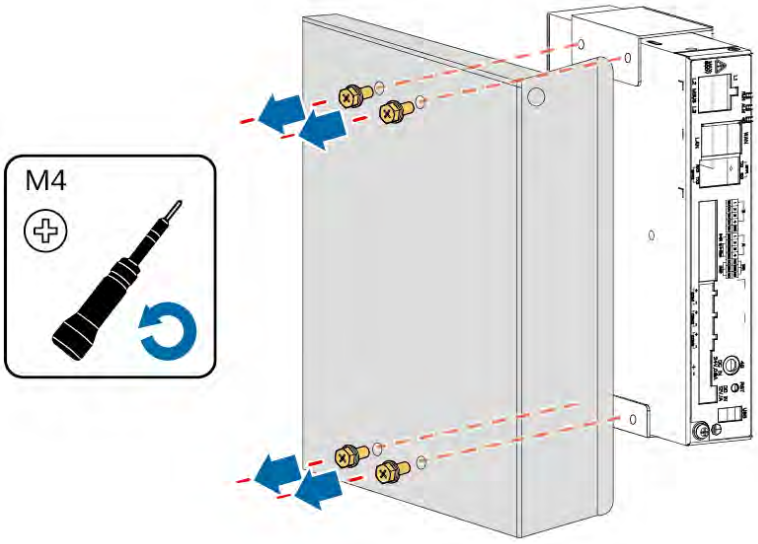
- Tools: Phillips insulated torque screwdriver (M3 and M4) and mini flat-head screwdriver.
- You have shut down the ESS. For details about how to shut down the ESS, see **2.1 Powering Off the ESS**.

Procedure

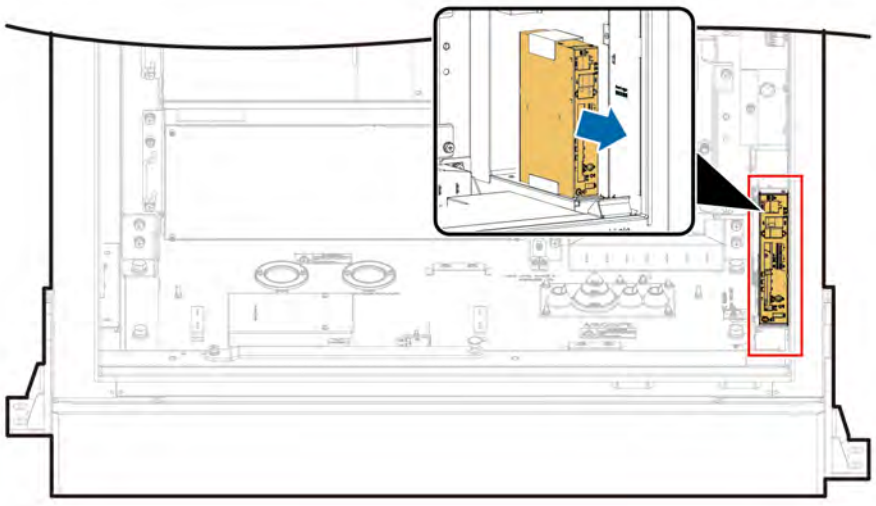
Step 1 Remove the SmartLogger protective cover and cables, and check whether the labels are intact. If not, confirm cables and prepare new labels.

Figure 16-2 Removing the SmartLogger protective cover



Step 2 Remove the faulty SmartLogger.

Figure 16-3 Removing the faulty SmartLogger



Step 3 Remove the conversion brackets from the new SmartLogger.

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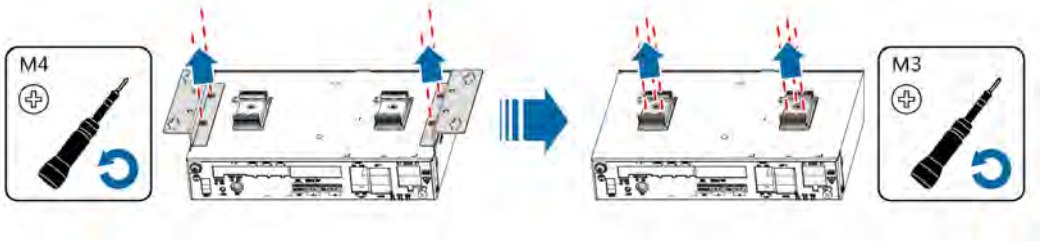
Figure 16-4 Removing the conversion brackets from the new SmartLogger



Step 4 Install the new SmartLogger.

Step 5 Install the SmartLogger protective cover and tighten the M4 Phillips screws to 1.6 N·m.

Step 6 Connect the cables based on the labels.

----End

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17 Emergency Handling

If an accident (including but not limited to the following) occurs on the site, ensure the safety of onsite personnel first and contact the Company's service engineers.

Battery Falling or Strong Impact

- If a battery has obvious damage or abnormal odor, smoke, or fire occurs, evacuate the personnel immediately, call emergency services, and contact the professionals. The professionals shall use fire extinguishing facilities to extinguish the fire under safety protection.
- If the appearance is not deformed or damaged, and there is no obvious abnormal odor, smoke, or fire, ensure safety and perform the following operations:
  - Warehouse: Evacuate personnel, transfer the battery to an open and safe place by professionals using mechanical tools, and contact the Company's service engineers. Leave the battery for an hour and ensure that the battery temperature is within the room temperature range (tolerance: ±10°C) before handling.
  - ESS onsite: Evacuate personnel, close the doors of the ESS, transfer the battery to an open and safe place by professionals using mechanical tools, and contact the Company's service engineers. Leave the battery for an hour before handling.

Flood

- Power off the system if it is safe to do so.
- If any part of the batteries is submerged in water, do not touch the batteries to avoid electric shock.
- Do not use batteries that have been soaked in water. Contact a battery recycling company for disposal.

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Fire

DANGER

- If a fire occurs, power off the system if it is safe to do so.
- Extinguish the fire with carbon dioxide, FM-200 or ABC dry powder fire extinguishers.
- Ask firefighters to avoid contact with high-voltage components during fire fighting to prevent the risk of electric shock.
- Overheating may cause battery deformation, faults, and leakage of corrosive electrolytes or toxic gases. Use respiratory protective equipment and keep a safe distance from the batteries to prevent skin irritation and chemical burns.

Fire Alarm Horn/Strobe

When the alarm indicator on the equipment blinks or buzzes:

- Do not approach.
- Do not open the door.
- Stay away immediately.
- Cut off the power supply remotely only when your safety is guaranteed.

Gas Exhaust

- Onsite personal protection: Do not directly face the exhaust vents.
- Post-disaster product maintenance: Contact the Company's service engineers for evaluation.

Coolant Leakage

1. If the system is running, power it off while ensuing safety.

2. Check for possible leakage points, especially the joints of liquid cooling pipes, bends of moving pipes, connectors of exhaust valves on the top, and connecting points of two-way stop valves.

3. Replace the components (PACK, PCS, DCDC, LTMS, or liquid cooling pipes) at the leakage points.

4. Check whether any coolant contacts the RCM. If yes, replace the RCM promptly.

5. After the fault is rectified, clean the system, power on the system again, and check whether the system is normal. If any exception occurs, contact the Company's service engineers.

Extinguishant Release or Fire

- Suggestions for onsite O&M personnel:
  a. When a fire occurs, evacuate from the building or equipment area, press the fire alarm bell, and immediately call the fire emergency service. Notify the professional firefighters and provide them with relevant

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product information, including but not limited to battery pack types, ESS capacity, and battery pack location and distribution.

b. Do not enter the affected building or equipment area under any circumstances, and do not open the doors of the ESS. Isolate and monitor the site. Keep irrelevant personnel away from the site.

c. After calling the fire emergency service, remotely power off the system while ensuring your own safety.

d. After professional firefighters arrive, provide relevant product information, including but not limited to battery pack types, ESS capacity, battery pack location and distribution, and user manuals.

e. After the fire is extinguished, the site must be handled by professionals in accordance with local laws and regulations. Do not open the doors of the ESS without permission.

f. Post-disaster product maintenance: Contact the Company's service engineers for evaluation.

- Suggestions for professional firefighters:

  a. For product information, see the information provided by O&M personnel, including but not limited to battery pack types, ESS capacity, battery pack location and distribution, and user manuals.

  b. Do not open the doors of the ESS before it is deemed safe by professionals.

  c. Follow local fire fighting regulations.

  d. When a fire occurs, prevent the fire from spreading to nearby ESSs.

A How Do I Recycle Used Batteries?

NOTICE

- The Company does not recycle batteries. Contact local recycling agencies to handle batteries.
- If there are no such agencies in your area, you can contact the nearest foreign recycling agencies.

Step 1 Contact the nearest recycling agencies.

Step 2 Recycling agencies assess the costs.

Step 3 Recycling agencies carry out recycling, which can be done in two ways:

- Onsite recycling: Recycling agencies can visit your sites to recycle lithium batteries, but the price depends on actual conditions such as the distance and transportation expenses.
- Centralized recycling: You can collect all lithium batteries to be recycled in one place for the recycling agencies to handle.

NOTE

You need to cover the related transportation expenses.

Step 4 Recycling agencies handle recycling. The recycled lithium batteries are at the disposal of the recycling agencies.

----End

B How Do I Repair Paint Damage?

Prerequisites

- Do not apply paint in bad weather, such as rain, snow, strong wind, and sandstorm, when there is no shelter outdoors.
- You have prepared the required paint that matches the color palette delivered with equipment.

Paint Repair Description

The equipment appearance shall be intact. If paint has flaked off, repair paint damage immediately.

NOTE

Check the paint damage on the equipment and prepare appropriate tools and materials. The number of materials depends on site requirements.

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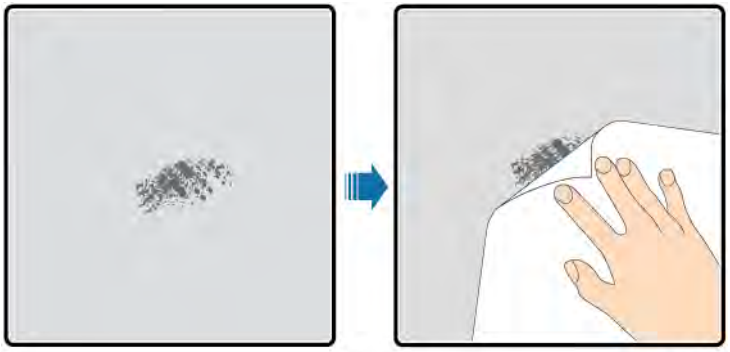
Table B-1 Paint repair description

Paint Damage	Tool and Material	Procedure	Description
Slight scratch (steel base material not exposed)	Spray paint or paint, brush (required for repainting a small area), fine sandpaper, anhydrous alcohol, cotton cloth, and paint spray gun (required for repainting a large area)	Steps 1, 2, 4, and 5	1. For a few scratches, smudges, or rust, manual paint spraying or brushing is recommended. 2. For many scratches or large-area smudges and rusts, use a paint spray gun. 3. The paint coating shall be thin and even. Paint drops are prohibited on the coating. The surface shall be smooth. 4. Leave the repainted area for about 30 minutes before performing any further operation.
Smudges and rust that cannot be removed			
Deep scratch (primer damaged, steel base material exposed)	Spray paint or paint, zinc-rich primer, brush (required for repainting a small area), fine sandpaper, anhydrous alcohol, cotton cloth, paint spray gun (required for repainting a large area)	Steps 1, 2, 3, 4, and 5	
Logo and pattern damage	If a logo or pattern is damaged, provide the logo size and color number. Seek help from a local supplier of advertisement coatings to formulate a repair solution based on the logo size, color, and damage.		
Dent	1. If a dent is less than or equal to 100 mm^2 in area and less than 3 mm in depth, fill the dent with Poly-Putty base and then perform the same operations as those for processing deep scratches. 2. If a dent is greater than 100 mm^2 in area or greater than 3 mm in depth, ask the local supplier for an appropriate repainting solution.		

Procedure

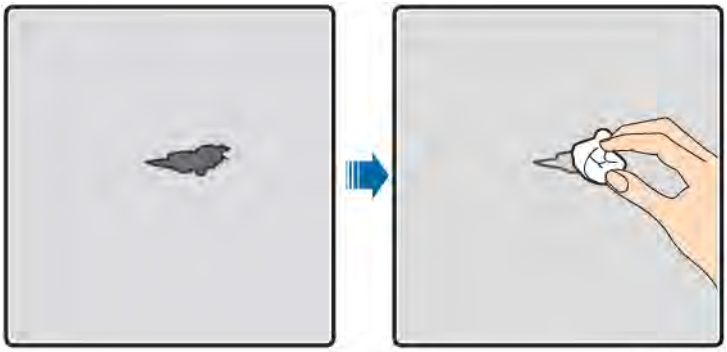
Step 1 Gently polish damaged areas using fine sandpaper to remove smudges or rust.

Figure B-1 Polishing a damaged area using sandpaper



Step 2 Dip a piece of cotton cloth into anhydrous alcohol and wipe the polished or damaged area to remove the dirt and dust. Then wipe off the anhydrous alcohol with a clean and dry cotton cloth

Figure B-2 Wiping a polished or damaged area using anhydrous alcohol



Step 3 Paint zinc-rich primer on the damaged coat using a brush or paint sprayer.

NOTICE

- If the base material is exposed in the area to be repaired, apply epoxy zinc-rich primer, wait until the paint has dried, and then apply acrylic acid top coat.
- Select epoxy zinc-rich primer or acrylic acid top coat with a color the same as the surface coating color of the equipment.

Step 4 Apply paint evenly to the damaged area based on the damage degree of the paint using an aerosol spray, brush, or paint spray gun until all damage traces are invisible.

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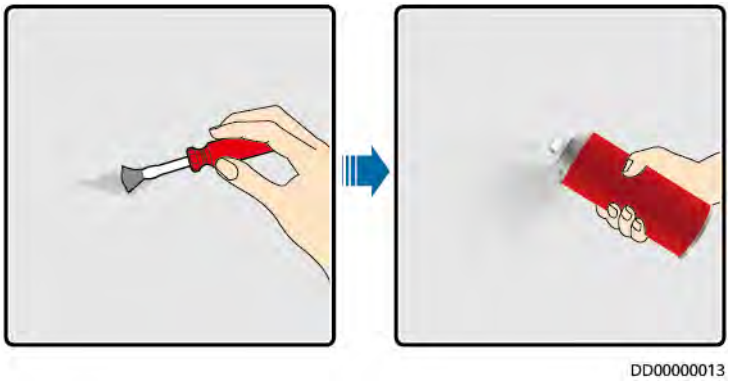
NOTICE

- Ensure that the painting is thin, even, and smooth.
- In the case that an equipment pattern has different colors, to prevent undamaged areas and those with different colors as the damaged area from being contaminated during repainting, cover such areas using white paper and adhesive tape before repairing paint.

Figure B-3 Repainting a damaged area



Step 5 Wait for 30 minutes and check whether the painting meets the requirements.

NOTE

- The color of the repainted area must be consistent with that of the surrounding area. Use a colorimeter to measure the color difference (ΔE), which shall be less than or equal to 3. If a colorimeter is unavailable, ensure that there is no visible edge between the repainted area and the surrounding area. The paint shall also be free of bulges, scratches, flaking, or cracks.
- If you choose to spray paint, it is recommended that you spray paint three times before checking the result. If the color does not meet the requirements, paint more times until the painting meets the requirements.

----End

Paint Supply Information

Table B-2 Paint requirements

Item	Requirement
Primer thickness	60 μm
Intermediate coat thickness	120 μm
Top coat thickness	60 μm
Primer type	Epoxy zinc-rich paint
Intermediate coat type	Zinc-rich paint

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Item	Requirement
Color number of the top coat	Obtain the color number based on the color palette delivered with the product.

NOTE

The following is a paint model list provided by Huawei. The list may be updated from time to time and is for reference only. The cost of paint and technical services is subject to the local pricing standards.

Supplier	Position	Paint Model
Hempel	Equipment surface painting	Zinc-rich primer for pretreatment: HEMPADUR ZINC (shopprimer) 1536C/19830 Zinc-rich primer for the entire container: HEMPADUR ZINC (on line) 1536C/19830 Intermediate coat: HEMPADUR FAST DRY 15560/12170 Top coat: HEMPATHANE 55210/17630 (RAL9003)
	Logo	Red: HEMPATHANE 55210/57200 (RAL3020) Black: HEMPATHANE 55210-19990 (RAL9005)
CMP	Equipment surface painting	Zinc-rich primer for pretreatment: EPICON ZINC SC B-2 M (SHOP PRIMER) Zinc-rich primer for the entire container: EPICON ZINC SC B-2 M (ON LINE ZINC) Intermediate coat: EPICON SC PRIMER GREY CSC-9107 Top coat: UNYMARINE SC FINISH WHITE CSC-9205 (RAL-9003)
	Logo	Red: UNYMARINE SC MARKING RAL-3020 Black: UNYMARINE SC MARKING RAL-9005

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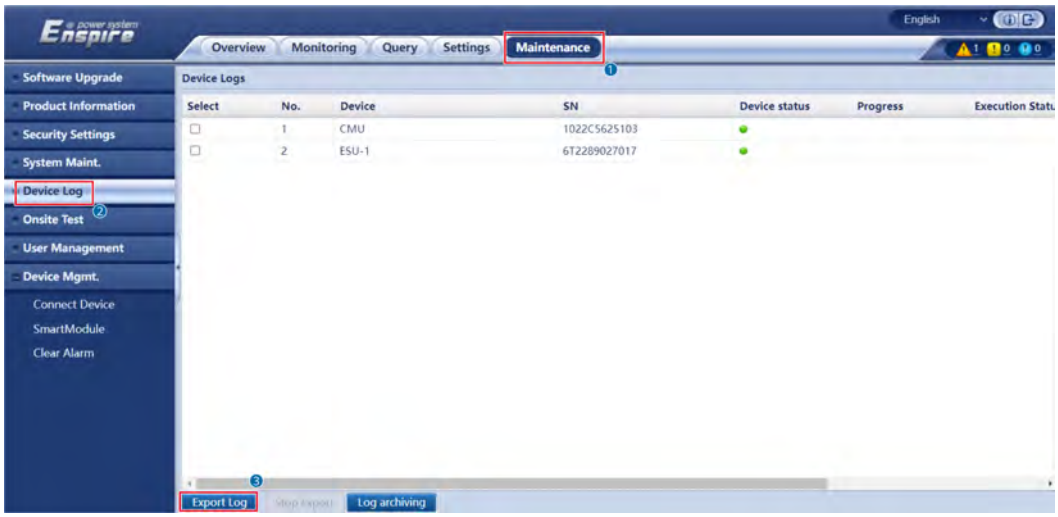
C How Can I Export Device Logs?

Exporting Device Logs from the SmartLogger

Step 1 Access the device log page of the SmartLogger3000.

Figure C-1 Log export



Step 2 Select the target device and click **Export Log**.

NOTE

- Logs of two or more types of devices cannot be exported at a time. For example, you cannot select both **SUN2000** and **MBUS**.
- Logs can be exported for a maximum of six devices of the same type at a time.
- Device log: Select the target device and click **Export Log**. The check box is displayed. You can select a specific log option.
- If the active power control mode is set to **Grid connection with limited power** or **Remote communication scheduling**, and the reactive power control mode is set to **Power factor closed-loop control** or the working mode of **Battery Control** is enabled, you are advised to export logs when inverters and Smart PCSs are disconnected from the grid. Otherwise, power control may be abnormal or the log export may fail.

Step 3 Observe the progress bar and wait until the log export is complete.

Step 4 After the export is successful, click **Log archiving** to save the logs.

----End

D How Do I Use the Coolant Filling/Drainage Machine to Add or Drain Coolant?

The coolant filling/drainage machine is used to add coolant to or drain coolant from the LTMS, battery pack, and PCS. The following table lists the application scenarios.

Table D-1 Application scenarios of the coolant filling/drainage machine

No.	Application Scenario	Machine Involved	Coolant Draining	Coolant Filling
1	The LTMS reaches its end of life (10th year).	Drain coolant from the ESS.	1. **D.1 Draining Coolant from the LTMS** 2. **D.2 Draining Coolant from the PACK/PCS**	**Add coolant to the LTMS.**
2	Coolant reaches its end of life (10th year).	Drain coolant from the ESS.	1. **D.1 Draining Coolant from the LTMS** 2. **D.2 Draining Coolant from the PACK/PCS**	**Add coolant to the LTMS.**
3	The LTMS is faulty.	Replace the LTMS.	**D.1 Draining Coolant from the LTMS**	**Add coolant to the LTMS.**
4	The outdoor heat exchanger of the LTMS is faulty.	Replace the faulty outdoor heat exchanger.	**D.1 Draining Coolant from the LTMS**	**Add coolant to the LTMS.**

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No.	Application Scenario	Machine Involved	Coolant Draining	Coolant Filling
5	Replace a liquid cooling pipe.	Replace the faulty pipe.	N/A (ambient temperature > –10°C) **D.1 Draining Coolant from the LTMS** (ambient temperature ≤ –10°C)	**Add coolant to the LTMS.**
6	The battery pack, PCS, or DCDC is faulty.	Replace the faulty battery pack, PCS, or DCDC.	N/A (ambient temperature > –10°C) **D.1 Draining Coolant from the LTMS** (ambient temperature ≤ –10°C)	**Add coolant to the LTMS.**
7	The LTMS coolant is below the Min scale.	Add coolant.	N/A	**Add coolant to the LTMS.**

WARNING

Connect the power cable of the machine. The **AC 220V** and **DC 12V** ports cannot be connected to the power cable at the same time.

WARNING

- Wear personal protective equipment. Prevent waste from contacting the soil or flowing into the drainage ditch. Use transportation tools, recycling devices, and treatment or storage devices approved by authoritative departments for waste turnover or storage. Heating in an empty container may cause an explosion.
- Take protective measures because coolant can irritate your eyes, skin, and throat.

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⚠ CAUTION

- The coolant drained from the ESS needs to be centrally disposed of by a waste collector that is recognized by relevant regulations.
- Uncontaminated containers can be reused. Containers that cannot be cleaned need to be centrally disposed of by a waste collector that is recognized by relevant regulations.
- Do not mix coolant from different brands without prior permission of the Company. Do not reuse the coolant drained during maintenance.

NOTICE

- After coolant is added or drained, ensure that the inlet and outlet pipes of the machine are cleaned and no coolant remains. Otherwise, the coolant service life may be affected after the residual coolant deteriorates.
- Ensure that the coolant bucket (≥ 20 L) is clean, dry, and free from pollution.

NOTICE

- Before using the coolant filling/drainage machine, configure the power plug based on local laws and regulations and power distribution conditions.
- When the coolant filling/drainage machine is powered by an external power supply, consider the actual environment and local conditions when selecting the external power supply to ensure the charging and use safety of the external power supply.
- When the 12 V DC external power supply is used, the power specifications must meet the following requirements:
  - Maximum output capability ≥ 150 W
  - Output voltage: 12 V DC
  - Maximum current: 15 A
  - Continuous output current ≥ 10 A
  - In the case of coolant filling or drainage for a single ESS, the battery capacity must be less than or equal to 76 Wh.

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Figure D-1 Appearance of the coolant bucket

D.1 Draining Coolant from the LTMS

Prerequisites

- Tools: coolant bucket, non-absorbent insulated gloves, and mask
- You have prepared the coolant filling/drainage machine (including the machine power cable). You may purchase the machine from Huawei.
- You have prepared a clean coolant bucket (≥ 20 L) by yourself.
- You have prepared a 220 V three-phase plug or 12 V power connector for the machine power cable based on the actual power distribution conditions.

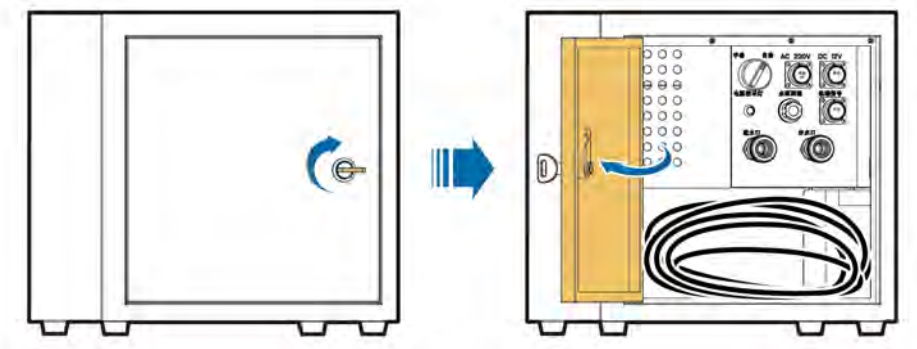
CAUTION

Do not use the same coolant bucket for old and new coolant. Otherwise, the coolant performance may deteriorate.

Procedure

Step 1 Open the machine door and take out the pipes and fittings. The machine door key is delivered with the machine.

Figure D-2 Opening the machine

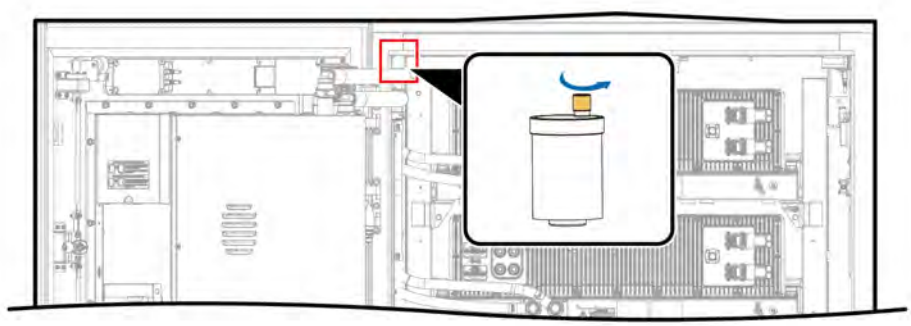


Step 2 Log in to the mobile app or SmartLogger WebUI, set the LTMS to the **Maintenance** mode, and select the **Drain Coolant** mode under the **Maintenance** mode.

Step 3 Open the ESS door and power off the power components in the ESS.

Step 4 Check that the cover of the automatic exhaust valve on the top of the pipe is loose.

Figure D-3 Loosening the exhaust valve cover



Step 5 Open the upper and lower doors of the LTMS.

Step 6 Install the machine.

WARNING

Connect the power cable of the machine. The **AC 220V** and **DC 12V** ports cannot be connected to the power cable at the same time.

CAUTION

When connecting the coolant inlet pipe to the heat exchanger, avoid cuts or scratches from the fins.

1. Open the pressure relief cover of the tank.
2. Set the machine to the **Auto** mode, and rotate the **Pump Speed** knob counterclockwise to the minimum level.
3. Connect the power cable to the **AC 220V** or **DC 12V** port.
4. Connect the coolant filling and drain pipes to the inlet and outlet of the machine. When you hear a click, the connectors snap into place properly.
5. Insert the outlet pipe into the bottom of the coolant bucket.
6. Connect the inlet pipe to the drain valve port at the bottom of the LTMS heat exchanger.
7. Open the ball valve at the inlet pipe.

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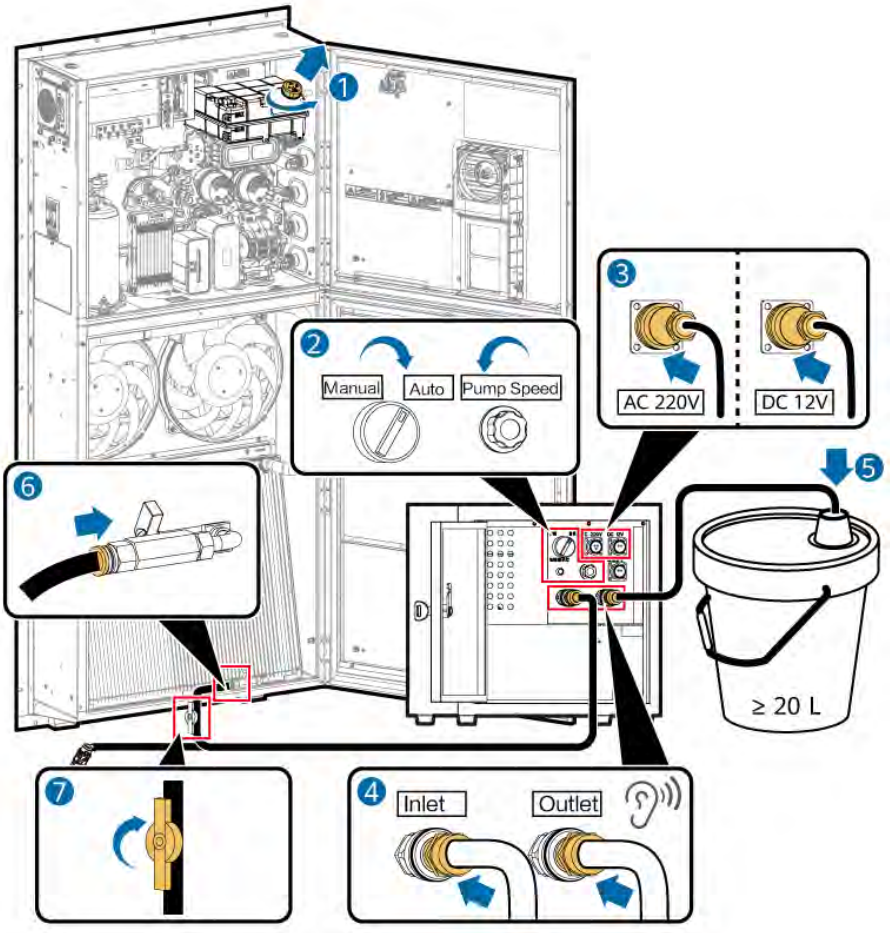
Figure D-4 Installing the machine



Step 7 Drain the LTMS coolant.

1. Set the machine to the **Manual** mode, and rotate the **Pump Speed** knob clockwise to the maximum level.
2. Open the drain valve at the bottom of the heat exchanger to drain coolant. If no coolant is drained from the drain pipe for 30s, the drainage is complete.

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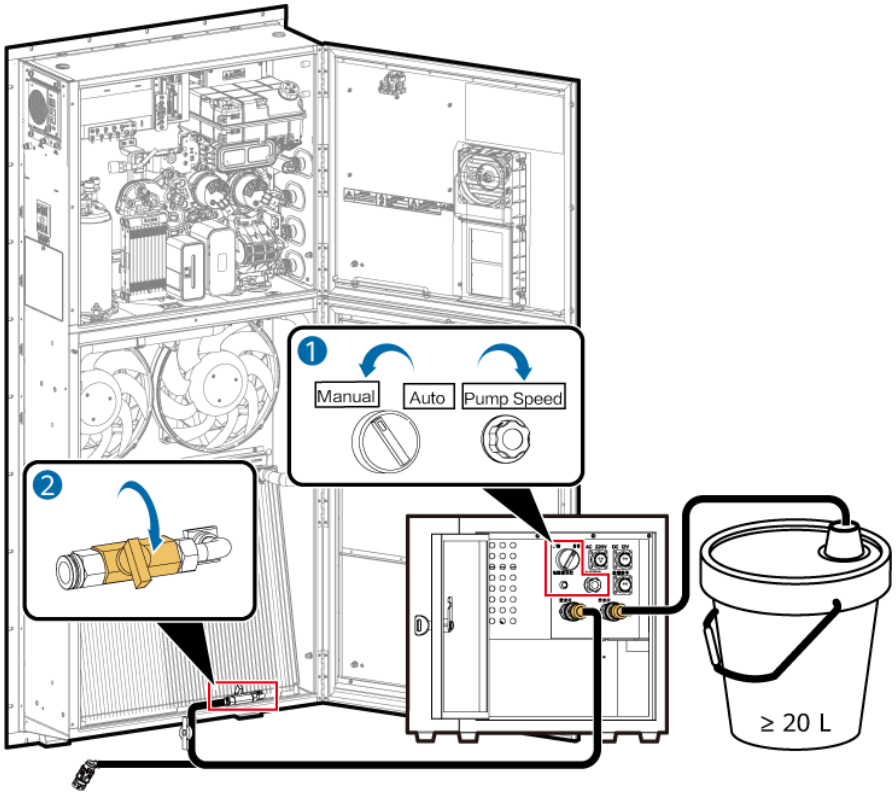
Figure D-5 Draining coolant from the cabinet



Step 8 Remove the machine.

NOTICE

To continue to drain coolant from the battery pack or PCS, perform 1 to 4.

1. Switch the machine to the **Auto** mode.
2. Close the drain valve at the bottom of the LTMS heat exchanger.
3. Close the ball valve at the inlet pipe.
4. Remove the inlet pipe from the drain valve at the bottom of the LTMS heat exchanger.
5. Turn off the power switch that supplies power to the machine and remove the power cable.
6. Remove the coolant filling and drain pipes connected to the machine.
7. Remove the outlet pipe from the coolant bucket.
8. Install the pressure relief cover of the tank.

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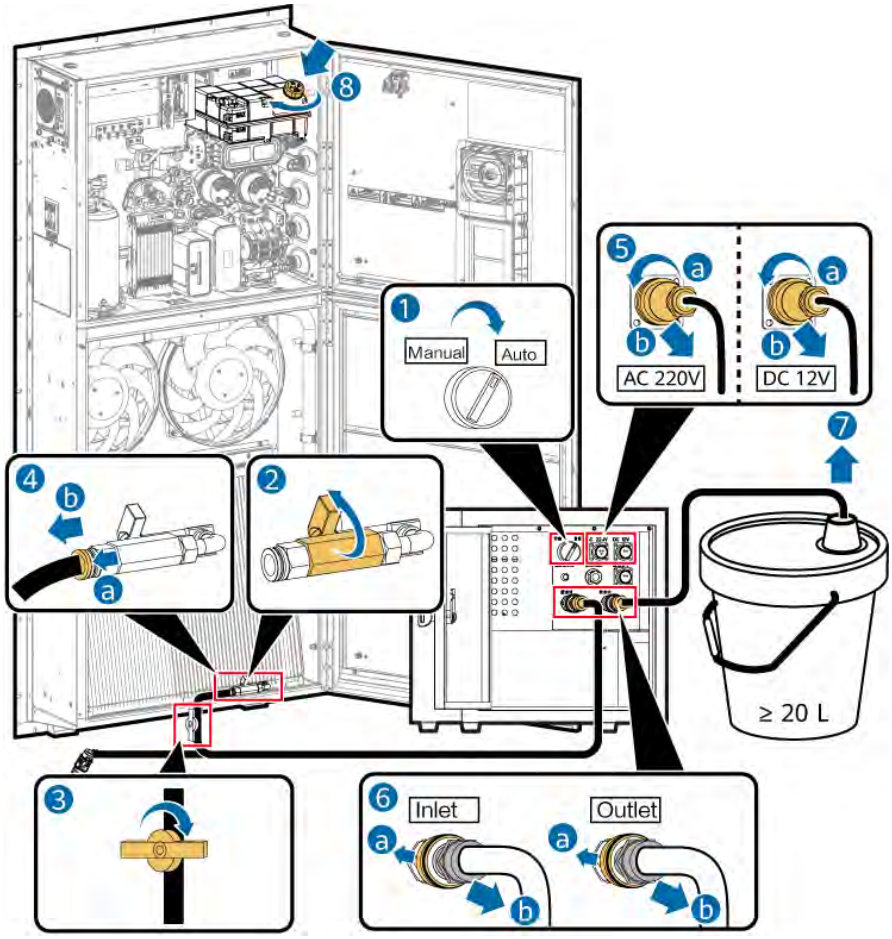
Figure D-6 Removing the machine



Step 9 Drain residual coolant from the inlet and outlet pipes and ensure that no coolant remains. Clean the inlet and outlet pipes and dry the surface.

----End

D.2 Draining Coolant from the PACK/PCS

The coolant filling/drainage machine supports coolant filling and drainage for a single battery pack or PCS.

Prerequisites

- Tools: coolant bucket, non-absorbent insulated gloves, and mask
- You have prepared the coolant filling/drainage machine (including the machine power cable). You may purchase the machine from Huawei.
- You have prepared a clean coolant bucket (≥ 20 L) by yourself.
- You have prepared a 220 V three-phase plug or 12 V power connector for the machine power cable based on the actual power distribution conditions.

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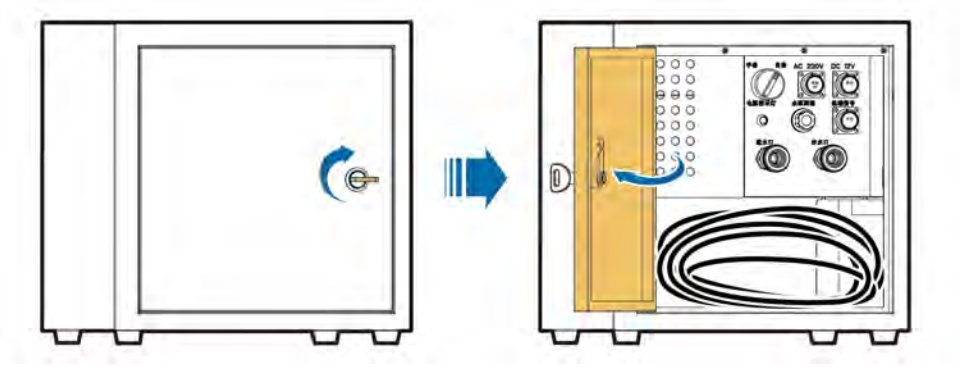
CAUTION

Do not use the same coolant bucket for old and new coolant. Otherwise, the coolant performance may deteriorate.

Procedure

Step 1 Open the machine door and take out the pipes and fittings. The machine door key is delivered with the machine.

Figure D-7 Opening the machine

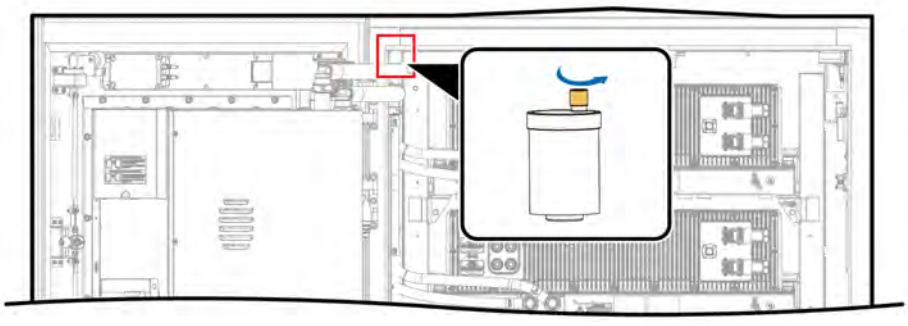


Step 2 Log in to the mobile app or SmartLogger WebUI, set the LTMS to the **Maintenance** mode, and select the **Drain Coolant** mode under the **Maintenance** mode.

Step 3 Open the ESS door and power off the ESS. For details, see **2.1 Powering Off the ESS**.

Step 4 Check that the cover of the automatic exhaust valve on the top of the pipe is loose.

Figure D-8 Loosening the exhaust valve cover



Step 5 Open the upper and lower doors of the LTMS.

Step 6 Open the pressure relief cover of the tank.

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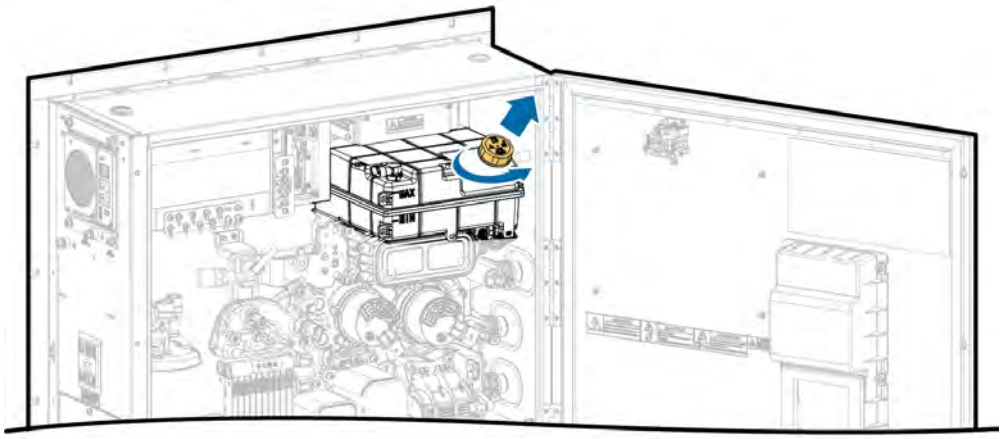
Figure D-9 Opening the pressure relief cover of the tank



Step 7 Install the machine.

1. Set the machine to the **Auto** mode, and rotate the **Pump Speed** knob counterclockwise to the minimum level.
2. Connect the power cable to the **AC 220V** or **DC 12V** port.
3. Connect the coolant filling and drain pipes to the inlet and outlet of the machine. When you hear a click, the connectors snap into place properly.
4. Insert the outlet pipe into the bottom of the coolant bucket.
5. Remove the coolant outlet connector **OUT** of the battery pack or PCS, and connect the quick connector of the machine to the original position. Remove the coolant inlet connector **IN**, and connect the auxiliary pipe connector to the original position.
6. Close the ball valve at the inlet pipe.

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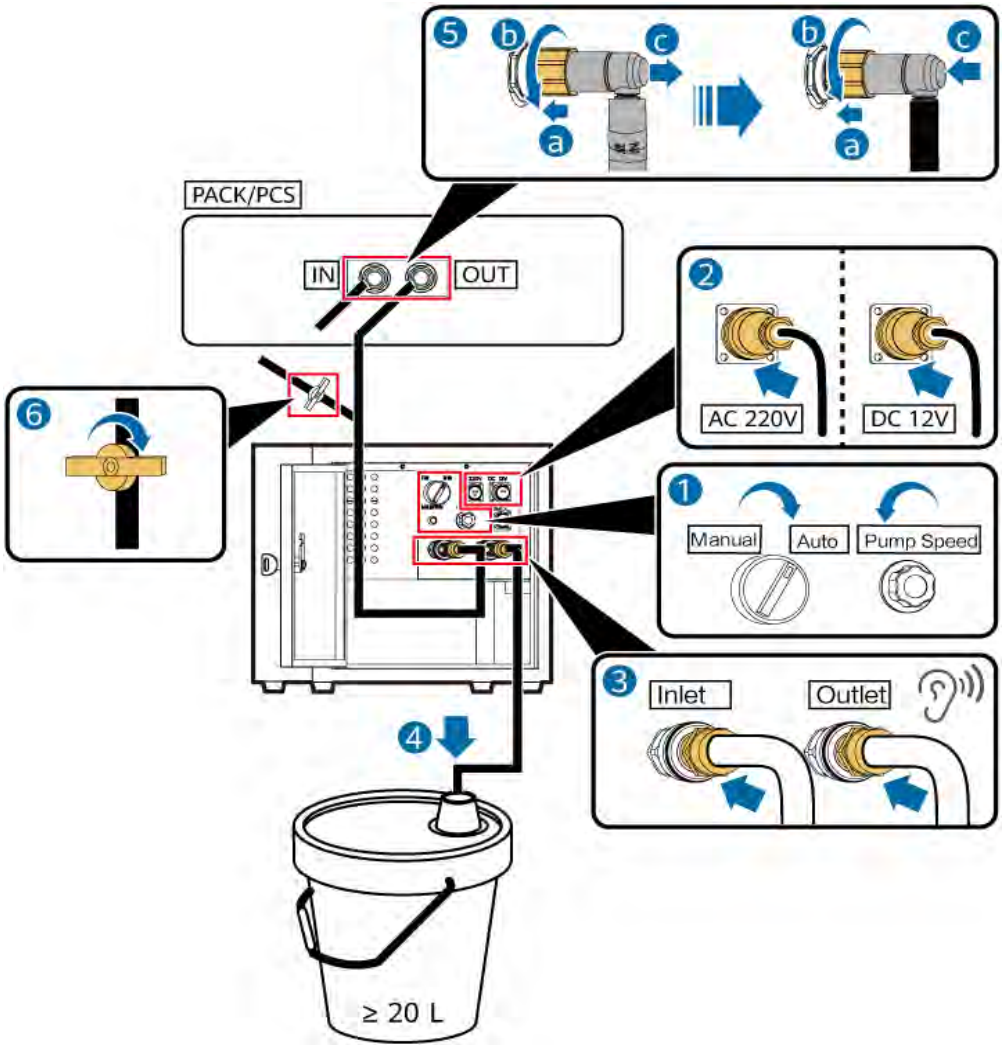
Figure D-10 Draining coolant from the battery pack or PCS



Step 8 Drain coolant from the battery pack or PCS.

1. Keep the machine in the **Manual** mode and rotate the **Pump Speed** knob clockwise to the maximum level.
2. Drain coolant. If no coolant is drained from the drain pipe for 30s, the drainage is complete.

Step 9 If coolant needs to be drained from multiple components, repeat **5** in **Step 7** to **Step 8** to drain coolant from the battery pack or PCS from top to bottom.

Step 10 Remove the machine.

1. Switch the machine to the **Auto** mode.
2. Ensure that the ball valve at the inlet pipe is closed.
3. Remove the pipes, and reinstall the pipe connectors **OUT** and **IN** of the battery pack or PCS.
4. Turn off the power switch that supplies power to the machine and remove the power cable.
5. Remove the outlet pipe from the coolant bucket.

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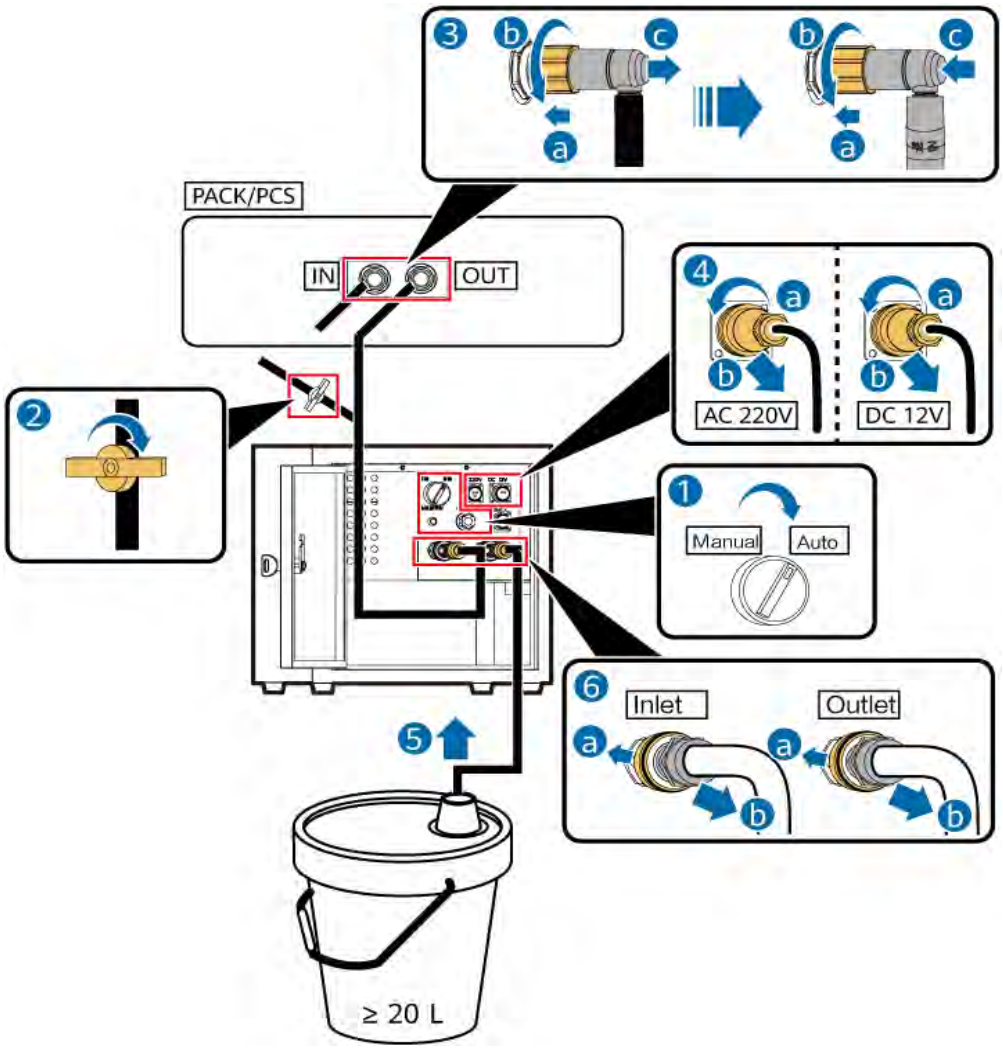
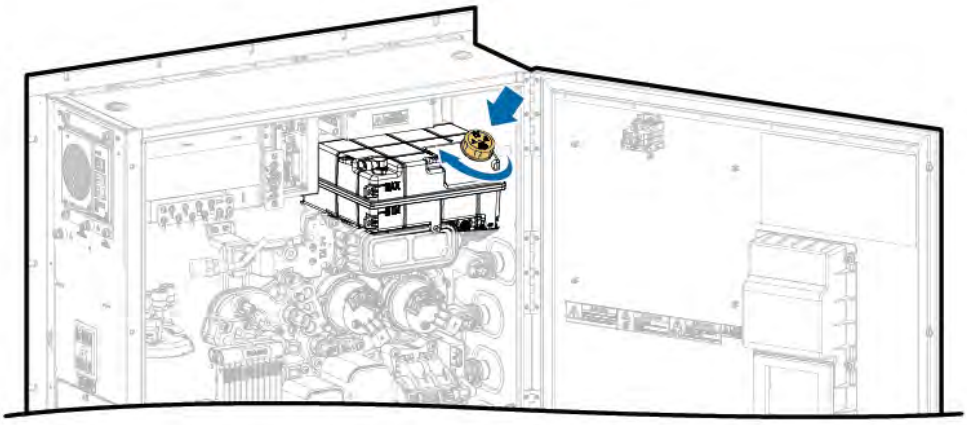
6. Remove the coolant filling and drain pipes connected to the machine.

Figure D-11 Removing the machine



Step 11 Install the pressure relief cover of the tank.

Figure D-12 Installing the pressure relief cover of the tank



Step 12 Add coolant to the LTMS. For details, see **D.3 Adding Coolant to the LTMS**.

----End

D.3 Adding Coolant to the LTMS

⚠ CAUTION

- Do not mix coolant from different brands without prior permission of the Company. Do not reuse the coolant drained during maintenance.

NOTICE

- If the coolant filling process is manually interrupted, the process must be restarted from step 6 when it is resumed.
- During coolant filling, ensure that the pipe port in the coolant bucket can extract coolant in real time and avoid pipe hanging in the bucket.

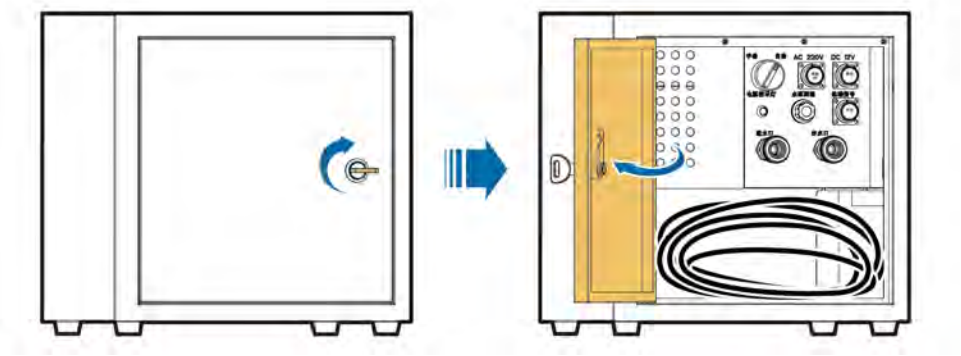
Prerequisites

- Tools: coolant bucket, non-absorbent insulated gloves, and mask
- You have prepared the coolant filling/drainage machine (including the machine power cable). You may purchase the machine from Huawei.
- Prepare an appropriate amount of coolant based on site requirements (all coolant in the ESS ≤ 20 L). Purchase coolant from the Company. Coolant of different brands cannot be used together.

Procedure

Step 1 Open the machine door and take out the pipes and fittings. The machine door key is delivered with the machine.

Figure D-13 Opening the machine



Step 2 Log in to the mobile app or SmartLogger WebUI and set the LTMS to the **Maintenance** mode.

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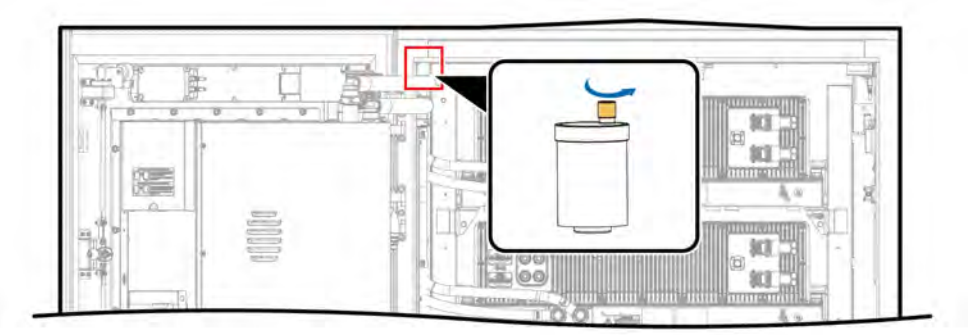
Step 3 Check that the cover of the automatic exhaust valve on the top of the pipe is loose.

Figure D-14 Loosening the exhaust valve cover



Step 4 Open the upper and lower doors of the LTMS.

Step 5 Install the machine.

1. Remove the pressure relief cover from the tank, install the protective tool in the original position, and connect the outlet pipe.
2. Set the machine to the **Auto** mode, and rotate the **Pump Speed** knob counterclockwise to the minimum level.
3. Connect the power cable to the **AC 220V** or **DC 12V** port.
4. Connect the communications cable.
5. Connect the coolant filling and drain pipes to the inlet and outlet of the machine. When you hear a click, the connectors snap into place properly.
6. Insert the inlet pipe into the coolant bucket to ensure that coolant can be extracted.
7. Ensure that the ball valve at the outlet pipe is closed.
8. Connect the other end of the communications cable to the LTMS signal port.

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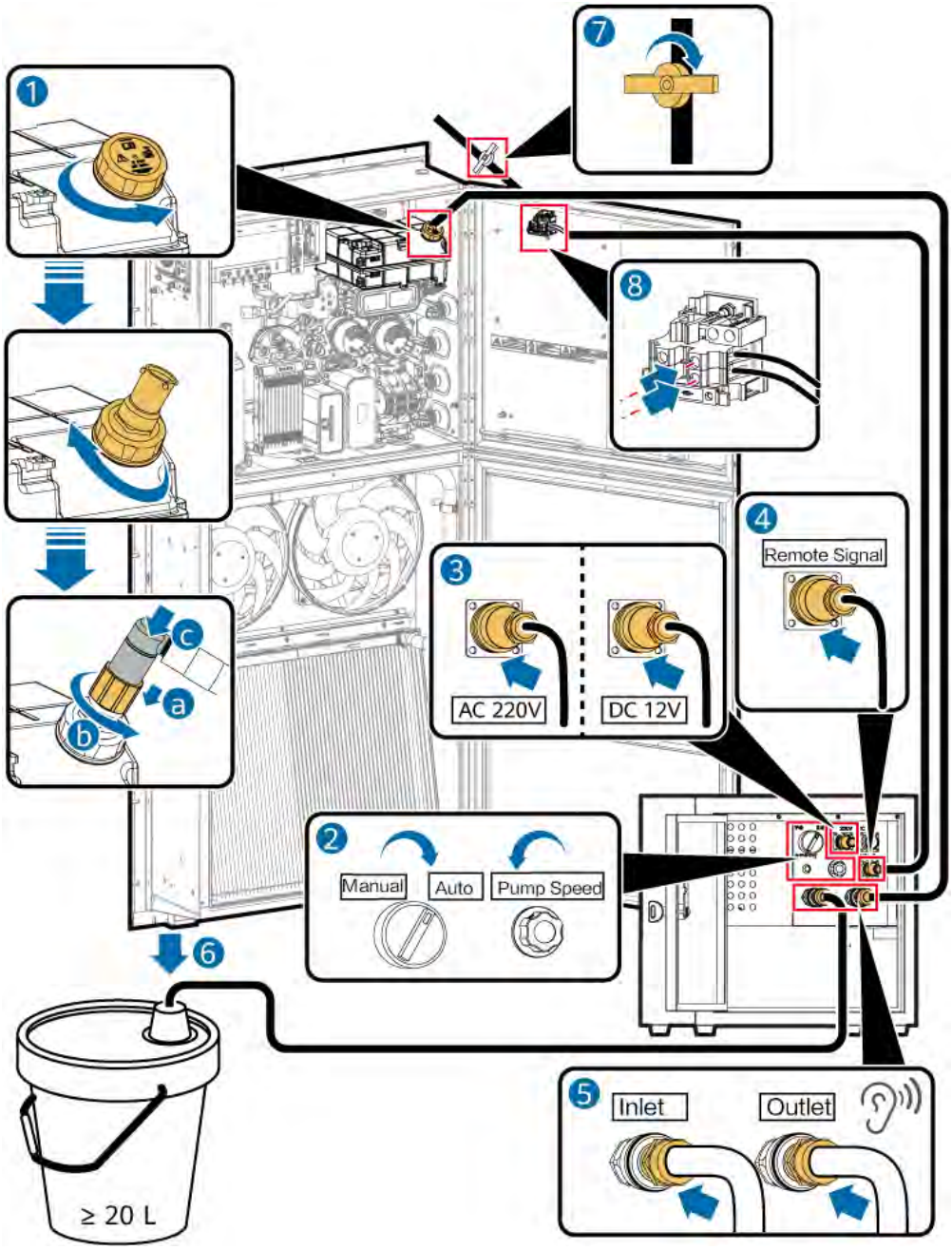
Figure D-15 Installing the machine



Step 6 Set the LTMS to the **Refilling** mode on the mobile app or SmartLogger WebUI to start coolant filling.

Step 7 Rotate the **Pump Speed** knob clockwise to the maximum level.

Step 8 Check whether coolant is being filled properly. The coolant is filled automatically. A complete coolant filling process for a single ESS takes about 45 minutes.

Step 9 After the filling is complete, check that **Coolant Replacement Status** is **Completed**.

Step 10 (Optional) If all coolant in the LTMS is replaced, click **Confirm Coolant Replacement** to update the coolant replacement time.

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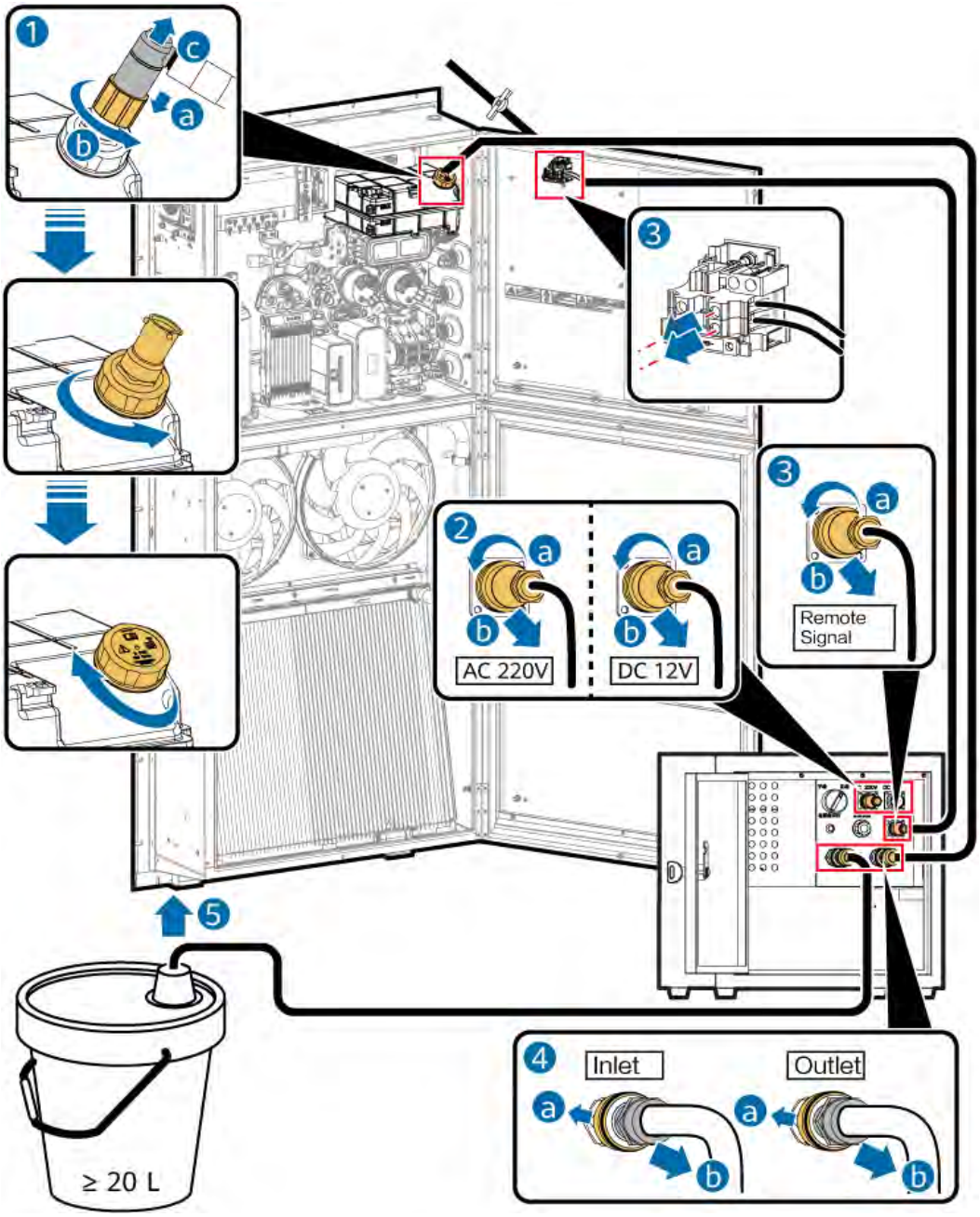
Step 11 Remove the machine.

1. Remove the protective tool and close the pressure relief cover of the tank.
2. Turn off the power switch that supplies power to the machine and remove the power cable.
3. Remove the communications cable from the machine and LTMS signal port.
4. Remove the coolant filling and drain pipes connected to the machine.
5. Remove the outlet pipe from the coolant bucket.

Figure D-16 Removing the machine



Step 12 Drain residual coolant from the inlet and outlet pipes and ensure that no coolant remains. Clean the inlet and outlet pipes and dry the surface.

----End

E Contact Information

If you have any questions about this product, please contact us.

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Path: **About Us** > **Contact Us** > **Service Hotlines**

To ensure faster and better services, we kindly request your assistance in providing the following information:

- Model
- Serial number (SN)
- Software version
- Alarm ID or name
- Brief description of the fault symptom

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G Acronyms and Abbreviations

A

App	application

B

BCU	battery control unit
BMU	battery monitoring unit

C

CO	carbon monoxide

E

EPO	emergency power-off
ESR	battery rack
ESS	energy storage system

F

FPC	Flexible Printed Circuit

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I

I/O	Input&Output

M

MBUS	monitoring bus

N

NTC	negative temperature coefficient

P

PACK	battery pack
PCS	Power Converter System
PTC	positive temperature coefficient

R

RCCB	residual current circuit breaker
RCM	Rack Control Module

S

SOC	state of charge

U

UPS	uninterruptible power system

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