

PU 80&160 series V1.0

User Manual

(Short-time Backup)



ANHUI LEOCH RENEWABLE ENERGY DEVELOPMENT CO., LTD.

Version
Release period

V 1.0
2024-07-30

Copyright © ANHUI LEOCH RENEWABLE ENERGY DEVELOPMENT CO., LTD.

Without the written permission of our company, no organization or individual may excerpt or copy part or all of the contents of this document without authorization, and may not disseminate it in any form.

Notice

The products, services or features you purchase are subject to the commercial contracts and terms of Leoch New Energy Development Co., Ltd. All or part of the products, services or features described in this document may not be within the scope of your purchase or use. Unless otherwise agreed in the contract, Leoch New Energy Development Co., Ltd. does not make any express or implied statements or warranties regarding the contents of this document.

Due to product version upgrades or other reasons, the content of this document will be updated from time to time. Unless otherwise agreed, this document is only used as a guide, and all statements, information and suggestions in this document do not constitute any express or implied warranty.

ANHUI LEOCH RENEWABLE ENERGY DEVELOPMENT CO., LTD.

Address: No. 32 , Wutong Avenue, Economic Development Zone, Huaibei

City, Anhui Province, 235000

Website: <http://www.leoch.cn>

Preface

Overview

This manual introduces the product introduction, transportation and storage, installation and wiring, startup and debugging , product maintenance, etc. of PU 80&160 V1.0 (short-time backup power) , so that readers can master the use and maintenance of the product.

The pictures in this article are for reference only. Please refer to the actual product for details.

Target Audience






This document is mainly intended for the following engineers:

- Technical Support Engineer
- Hardware installation engineer
- Debugging Engineer
- Maintenance Engineer

Symbol Conventions

The following symbols may appear in this document and their meanings are as follows

The following s

Symbol	Description
 DANGER	Indicates a hazardous situation 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, may result in minor or moderate injury.
 NOTICE	Used to convey equipment or environmental safety warning information. If not avoided, it may cause equipment damage,data loss, equipment performance degradation, or other unpredictable consequences. This symbol does not involve personal injury.
 INTRO	Supplementary information to the main text. This symbol is not a safety warning and does not involve personal injury, equipment or environmental damage.

Modification Record

Document Version	release date	Modification Notes
01	2024-07-30	First version released

Table of contents

User Manual	1
(Short-time Backup)	1
Preface	3
Overview	3
Target Audience	3
Symbol Conventions	3
The following symbols may appear in this document and their meanings are as follows	3
Modification Record	3
Table of contents	4
1. Safety precautions	1
1.1 Personal safety	3
1.2 Battery safety	5
1.3 Electrical safety	12
1.4 Environmental requirements	17
1.5 Machinery Safety	18
2. Product Introduction	22
2.1 PU 80&160 Series Model Description	22
2.2 PU 80&160 Series Cabinet Introduction	23
2.3 Product Configuration Description	23
2.4 Components Introduction	25
2.4.1 Display and control module	25
2.4.2 SBMS master control module	26
2.4.3 U PS communication adapter board	28
2.4.4 High voltage control module	30
2.4.5 Battery Module	32
2.4.6 Cabinet fire protection system	33
2.4.7 Battery module fire protection	34
3 Technical parameters	35
4 Transport and storage	39
4.1 General requirements	39
4.2 Battery Module Transportation Requirements	40
4.3 Battery Module Storage Requirements	41
4.4 Battery module storage time and supplementary charging recommendations	42
4.5 Battery module supplementary power	42
5 Installation and wiring	44

5.1 Installation space requirements	44
5.2 Preparation before installation	45
5.2.1 Tool Preparation	45
5.2.2 Communication cable preparation	49
5.2.3 Power Cable Preparation	50
5.3 Transportation and unpacking inspection	50
5.4 Installation Process.....	54
5.5 Install the cabinet	54
5.5.1 Fastening installation.....	54
5.5.2 Cabinet Installation	56
5.6 Installing the battery module	56
5.7 Installing the high voltage box (R BMS)	60
5.8 Install copper busbars and cables	61
5.8.1 Install cabinet grounding wire	62
5.8.2 Install copper busbar	62
5.8.3 Installing power cables	63
5.8.4 Installing slave communication harness.....	67
5.8.5 Installing Cabinet Fire Protection System Cables	68
5.8.6 Installing the main control power cable and communication cable	68
5.8.7 Installation of incoming cables in the cabinet	69
5.8.8 Connect the communication line	70
5.9 Post-installation check	72
6 APP Instructions	76
6.1 Overview	76
6.2 Display and control APP software menu introduction	76
6.3 Environment Configuration	77
6.4 Home Page	79
6.5 Battery Data	80
6.5.1 Battery Data - Real- time Data - All	80
6.5.2 Battery Data - Real-time Data - Battery Cluster	81
6.5.3 Battery data - real- time data - cell details.....	81
6.5.4 Battery Data - Historical Data - All.....	82
6.5.5 Battery Data - Historical Data - Battery Cluster.....	83
6.5.6 Battery Data - Historical Data - Battery Cells	83
6.6 Alarm Query.....	84
6.6.1 Alarm Query - Real-time Alarm - All	84
6.6.2 Alarm Query - Real- time Alarm - Battery Cluster	85
6.6.3 Alarm Query - Historical Alarms - All	86
6.6.4 Alarm Query - Historical Alarm - Details.....	86
6.6.5 Alarm Query - Alarm Statistics - All	87

6.6.6 Alarm Query - Alarm Statistics - Battery Cluster	88
6.7 Event Log.....	88
6.8 Device Management	90
6.8.1 Master control equipment	90
6.8.2 Master control device	91
6.9 System Management.....	93
6.9.1 System Management - System Information	94
6.9.2 System Management - Parameter Settings	94
6.9.3 System Management - User Management.....	95
6.10 Host computer communication	96
6.10.1 Introduction to the main control module host computer menu	96
6.10.2 Environment Configuration	97
6.10.3 Home Page	99
6.10.4 Parameter settings	100
6.10.5 Battery Information	110
6.10.6 Data Query.....	111
6.11 Program Upgrade	113
7. Startup and commissioning.....	114
7.1 Pre power-up check.....	114
7.2 Battery Power-up	114
7.3 First Startup	116
7.4 Low battery recharge requirements	118
8Product Maintenance.....	119
8.1 Routine maintenance.....	120
8.2 Lift truck	123

1. Safety precautions

statement

Before transporting, storing, installing, operating, using and maintaining the equipment, please read this manual first, operate strictly in accordance with the contents of the manual, and follow the markings on the equipment and all safety precautions in the manual. In this manual, "equipment" refers to the products, software, components, spare parts and/or services related to this manual; "the company" refers to the manufacturer (producer), seller and service provider of the equipment . "You" refers to the subject of transporting, storing, installing, operating, using and/or maintaining the equipment.

The "Danger", "Warning", "Caution" and "Notice" items in this manual do not represent all the safety items that should be followed. You must also comply with relevant international, national or regional standards and industry practices. The company does not assume any responsibility for any violation of safety operation requirements or violation of safety standards for design, production and use of equipment .

This equipment should be used in an environment that meets the design specifications. Otherwise, it may cause equipment failure, equipment malfunction or component damage, which is not within the scope of the equipment quality assurance; it may also cause personal injury, property loss, etc., and the company does not bear any compensation liability.

All operations including transportation, storage, installation, operation, use and maintenance must comply with applicable laws, regulations, standards and specifications.

It is prohibited to reverse engineer, decompile, disassemble, adapt, implant or other derivative operations on the device software, study the internal implementation logic of the device, obtain the source code of the device software, infringe intellectual property rights in any way, and disclose the results of any device software performance test.

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

- Equipment damage caused by earthquake, flood, volcanic eruption, mudslide, lightning strike, fire, war, armed conflict, typhoon, hurricane, tornado, extreme weather, or force majeure;
- Not operated within the conditions of use described in this manual;
- The installation and use environment does not comply with relevant international, national or regional

standards;

- Failure to follow the operating instructions and safety warnings in the product and documentation;
- Unauthorized disassembly, modification of the product or modification of the software code;
- Damage caused by transportation by you or a third party you entrust;
- Damage caused by storage conditions not meeting the requirements of product documentation;
- The materials and tools you bring with you do not meet the requirements of local laws, regulations and relevant standards;
- Damage caused by your or a third party's negligence, intent, gross negligence, improper operation or reasons not attributable to our company.

1.1 Personal safety

 **danger**

It is strictly forbidden to operate with power on during the installation process. It is forbidden to install or remove cables with power on. When the cable core contacts the conductor, arcs or sparks will be generated, which may cause fire or personal injury.

 **danger**

When the equipment is energized, irregular or incorrect operation may cause fire or electric shock, resulting in personal injury or property loss.

 **danger**

During operation, it is strictly forbidden to wear watches, bracelets, rings, necklaces and other conductive objects to avoid electric shock and burns.

 **danger**

Special insulating tools must be used during the operation to avoid electric shock or short circuit failure. The insulation withstand voltage level must meet the requirements of local laws, regulations, standards and specifications.

 **notice**

Special protective equipment must be used during the operation, such as protective clothing, insulating shoes, goggles, safety helmets, insulating gloves, etc.

Figure 1-1 Special protective equipment



CZ00000108

General requirements

- Do not disable equipment protective devices and ignore warnings, cautions, and precautions in the manual and on the equipment.
- During equipment operation, if a fault is found that may cause personal injury or equipment damage, the operation should be stopped immediately, reported to the person in charge, and effective protective measures should be taken.
- Do not power on the device before the installation is completed or the device has not been confirmed by a professional.
- It is prohibited to directly touch, use other conductors to touch, or indirectly touch the power supply equipment through wet objects. Before touching any conductor surface or terminal, measure the voltage at the contact point to confirm that there is no risk of electric shock.
- It is strictly forbidden to touch the running fan with fingers, parts, screws, tools or boards to avoid injury to hands or damage to the equipment.
- If a fire occurs, evacuate the building or equipment area and press the fire alarm or call the fire alarm. Under no circumstances should you re-enter the burning building or equipment area.

Personnel requirements

- Personnel who operate the equipment include professionals and trained personnel.
- Professionals: People who are familiar with the principles and structure of the equipment, have experience in training or operating the equipment, and are aware of the various potential sources of danger and the magnitude of danger during the installation, operation, and maintenance of the equipment.
- Trained personnel: Personnel who have received appropriate technical and safety training and have the necessary experience, are aware of the dangers that may be brought to them when performing a certain operation, and can take measures to minimize the dangers to themselves or other people.
- Personnel responsible for installing and maintaining the equipment must first undergo rigorous training, master the correct operating methods, and understand various safety precautions and relevant standards of the country/region where they are located.
- Only qualified professionals or trained personnel are allowed to install, operate and maintain the equipment.
- Only qualified professionals are allowed to remove safety features and repair equipment.
- Personnel involved in special scenarios such as electrical operations, high-altitude operations, and special equipment operations must have special operation qualifications required by the local country/region.
- Replacement of equipment or parts (including software) must be performed by authorized professionals.
- Except for those who are operating the equipment, no one else should approach the equipment.

1.2 Battery safety

Danger

It is strictly forbidden to short-circuit the positive and negative poles of a single battery or battery string, otherwise it will cause a battery short circuit. A battery short circuit will instantly generate a large current and release a large amount of energy, causing the battery to leak, smoke, release flammable gas, thermal runaway, catch fire or explode. To avoid battery short circuit, the battery is not allowed to be maintained with power on.

Danger

Do not expose the battery to high temperature environments or around heat-generating devices, such as high temperature sunlight, fire sources, transformers, heaters, etc. Overheating of the battery may cause leakage, smoke, release of flammable gas, thermal runaway, fire or explosion.

Danger

The battery is strictly prohibited from being subjected to mechanical vibration, falling, collision, puncture by hard objects and pressure shock, otherwise it may cause battery damage or fire.

Danger

It is strictly forbidden to disassemble, modify or damage the battery (such as inserting foreign objects, squeezing with external force, immersing in water or other liquids) to avoid battery leakage, smoking, release of flammable gas, thermal runaway, fire or explosion.

Danger

Using or replacing the wrong battery type may cause fire or explosion. Please use the battery type recommended by the manufacturer.

Danger

Battery electrolyte is toxic and volatile. When electrolyte leakage or abnormal odor occurs, avoid contact with leaking liquid or gas. Non-professionals should not approach, please contact professionals immediately. Professionals should wear goggles, rubber gloves, gas masks, protective clothing, etc., promptly power off the device, remove the leaking battery, and contact technical engineers for processing.

Danger

The battery is a closed system and no gas will be released under normal operation. If it is subjected to extreme abuse, such as fire, puncture, extrusion, lightning strike, overcharging or other severe conditions that may cause thermal runaway of the battery, it may cause battery damage or abnormal chemical reactions inside the battery, resulting in electrolyte leakage or the generation of gases such as CO and H₂. The site should ensure that the flammable gas emission measures are normal to avoid combustion or corrosion of equipment.

Danger

The gas produced by battery combustion will irritate the eyes, skin and throat, so please take precautions.

warn 

The battery should be installed in an area away from liquids. It is strictly forbidden to install it under air-conditioning vents, ventilation holes, machine room outlet windows, water pipes and other places prone to water leakage to prevent liquid from entering the equipment and causing equipment short circuit or malfunction.

warn 

When installing and debugging the battery, fire-fighting facilities such as fire sand, carbon dioxide fire extinguishers, etc. must be equipped in accordance with construction standards and specifications. Before being put into operation, it is necessary to ensure that the battery room has a fire-fighting system that complies with local laws, regulations and specifications, has been built and debugged, and is in automatic control and manual control mode.

warn 

Before removing the battery packaging, during storage and transportation, ensure that the outer packaging box is intact and undamaged, and place it correctly according to the packaging box markings. It is strictly prohibited to place it upside down, sideways, upright, or tilted. When stacking, comply with the stacking requirements on the outer packaging to avoid any impact or fall that may cause damage to the battery and make it scrapped.

warn 

After removing the battery from the packaging, place it in the required direction. It is strictly prohibited to place it upside down, sideways, upright, tilted or stacked to avoid any impact or falling that may cause the battery to be damaged and scrapped.



Tighten the fastening screws of the copper busbar or cable according to the torque specified in the text, and regularly check whether they are tightened, whether there is rust, corrosion or other foreign matter, and clean them. Otherwise, loose connection of the screws will cause excessive voltage drop in the connection, and even generate a lot of heat and burn the battery when the current is large.



After the battery is discharged, it should be charged in time, otherwise the battery may be damaged due to over-discharge.

statement

The company is not responsible for damage or other consequences of the batteries provided by the company caused by the following reasons:

- Battery damage caused by earthquake, flood, volcanic eruption, mudslide, lightning strike, fire, war, armed conflict, typhoon, hurricane, tornado, extreme weather, force majeure;
- Direct damage to the battery due to the on-site equipment operating environment or external power parameters not meeting the environmental requirements for normal operation, including but not limited to the actual operating temperature of the battery being too high or too low, unstable power grid conditions and frequent power outages, etc.;
- Battery damage, falling, leakage, rupture, etc. caused by improper operation or failure to connect the battery as required;
- The battery is installed on site and connected to the system. If it is not powered on in time due to your fault, the battery is over-discharged and damaged;
- The battery is damaged due to your failure to accept the product in time;
- You have not set the battery operation management parameters correctly;
- You mix the batteries provided by our company with other batteries, causing accelerated capacity decay, including but not limited to: mixing with other brands of batteries, mixing with batteries of different rated capacities, etc.; your improper maintenance causes frequent over-discharge of the batteries, you expand the capacity on site or cannot fully charge the batteries for a long time, etc.;
- You fail to properly maintain the battery according to the operating manual of the supporting equipment, including but not limited to: failing to regularly check whether the battery terminal screws are tightened;
- Battery damage caused by failure to store the battery in accordance with storage requirements (such as storage in a humid or rainy environment);
- The battery is not charged in time due to your fault, resulting in over-storage, resulting in capacity loss

or irreversible damage to the battery;

- Battery damage caused by you or a third party, including but not limited to: unauthorized relocation or installation of the battery without following the Company's requirements;
- You change the battery usage scenario without informing the Company;
- You connect additional loads to the battery yourself;
- The battery has exceeded the maximum storage period;
- The battery has expired.

General requirements

Things to know

C3battery products are intended for commercial and industrial use in the second environment and may require installation restrictions or additional measures to suppress interference.

- Please use the battery within the specified temperature range. Do not charge when the ambient temperature is below the lower limit of the operating temperature to avoid internal short circuit of the battery due to low temperature charging.
- Do not connect the positive and negative poles of the battery in reverse. This may cause a battery alarm and risk damaging the battery.
- Before removing the battery from the packaging, check whether the packaging is intact. Batteries with damaged packaging cannot be used. If damaged, please notify the transporter and manufacturer immediately.
- After unpacking the battery for indoor scenarios, it is recommended to power it up within 7 days. If it cannot be powered up in time, the battery needs to be placed indoors in a dry environment without corrosive gases.
- Do not use faulty or damaged batteries (batteries that have been dropped, collided, swollen or have dents on the outer shell, etc.). Battery damage may cause the release of flammable gas. Do not store damaged batteries near other equipment and flammable materials. Non-professionals are not allowed to approach.
- Before operating the battery, make sure there is no irritation, burnt smell, etc. around the battery.
- It is strictly forbidden to place installation tools, metal parts and sundries on the battery during installation. After installation, clean up the battery and surrounding objects in time.
- If the battery is accidentally exposed to water, do not continue to install it, transport it to a safe isolation point and contact a technical engineer in time.
- Determine if the positive and negative battery terminals are accidentally grounded. If so, disconnect the battery terminals from the ground.
- Do not perform welding, grinding or other similar work around the battery to avoid sparks, arcs or

other hazards that may cause fire.

- If the battery is not used for a long time, it needs to be stored and recharged according to the battery requirements.
- It is prohibited to use equipment that does not comply with local laws, regulations and specifications for charging and discharging.
- During installation and maintenance, the battery circuit should remain disconnected.
- During storage, damaged batteries should be monitored to ensure there are no signs of smoke, flame, electrolyte leakage or heat.
- When the battery fails, the surface temperature may be too high and you should avoid contact to avoid burns.
- **Short circuit protection**
- When installing and maintaining the battery, you need to wrap the exposed cable terminals on the battery with insulating tape.
- Prevent foreign matter (such as conductive objects, screws, liquids, etc.) from entering the battery and causing a short circuit.

Leakage treatment

Things to know

Electrolyte overflow may cause potential harm to the equipment. The overflowed electrolyte may corrode metal objects and boards, causing damage to the boards.

The electrolyte is corrosive and contact may cause skin irritation and chemical burns. If you come into contact with battery electrolyte, you will need to take the following actions.

- Inhalation: Evacuate the contaminated area, breathe fresh air immediately and seek medical help immediately.
- Eye contact: Immediately flush eyes with plenty of water for at least 15 minutes without rubbing and seek medical help immediately.
- Skin contact: Wash exposed area immediately with plenty of water and soap and seek medical help.
- Ingestion: Get medical help immediately.

Battery room fire prevention and control safety

Fire safety in the battery room should comply with local laws and regulations, and refer to the following standards (including but not limited to):

NFPA855-2020, NEN-1010 or GB50016, and meet the following requirements:

- It is strictly forbidden to build a battery room in an environment where explosive gas may exist or in an area where explosive gas may be released.
- It is strictly prohibited to build battery rooms near or below water reservoirs, water landscapes, water towers, and other areas where there is accumulated water or risk of water leakage.
- It is recommended to equip a separate battery room. When the total battery capacity exceeds 600kWh (e.g. the battery capacity of a single cabinet is
- 80kWh (more than 7 cabinets), an independent battery room must be equipped.
- The indoor layout of the battery room should comply with local fire protection laws, regulations and specifications, such as various production scenarios, safe distances and layout of buildings and materials.
- Combustible materials should not be stored in the battery room, and the distance between combustible materials and the battery room should not be less than 3m.
- The outdoor battery room should be no less than 3.0m away from the following places: municipal red lines, combustible warehouses, hazardous materials, high-stack warehouses, power infrastructure, public roads, and buildings.
- The battery room and adjacent areas must be separated by fire partitions, through holes should be fireproofed and blocked, and the fire resistance and insulation strength should be consistent with that of the partition walls.

- The battery room should be equipped with fire extinguishers, such as halogenated fire extinguishers, heptafluoropropane fire extinguishers, perfluorohexanone fire extinguishers, or carbon dioxide fire extinguishers, dry powder fire extinguishers. Each fire protection unit should be equipped with no less than 2 fire extinguishers, and they should be inspected and replaced regularly.
- The battery room should be equipped with cabinet-level or room-level CO sensors, smoke sensors, and temperature sensors. It is recommended to configure H₂ sensors and open flame sensors. The number of each sensor should be no less than 2, and the automatic fire alarm system should be turned on.

- The battery room should be equipped with independent air conditioning and ventilation ducts. It is prohibited to share air conditioning and ventilation ducts with other equipment areas or office areas. If air conditioning and ventilation ducts are shared, the battery room must be equipped with fire separation valves. The ventilation and exhaust system must be linked with the fire alarm system, and the ventilation capacity should ensure that the concentration of combustible gas is less than 25% LFL .
- The battery room should be equipped with a halogenated hydrocarbon or perfluorohexanone gas fire extinguishing system and linked with the fire alarm system. After the agent is sprayed, the battery room will meet the fire extinguishing concentration requirements within 10 minutes .
- The battery room should be equipped with fire-fighting facilities such as dry water sprinklers or fine water mist pipe networks to deal with the risk of fire reignition or spread after the battery fire is extinguished.
- The battery room should be equipped with a pressure relief and explosion-proof device or a pressure relief channel of equivalent area (such as glass windows, electromagnetic lock doors, etc.), referring to the requirements of NFPA68 or GB50016 standards. If side pressure relief is used, a protective fence or protective wall must be set up on the outside of the pressure relief channel , and the fence or wall must be no less than 12 meters away from the pressure relief wall.
- The fire alarm system should be linked with the ventilation and exhaust system and the automatic fire extinguishing system, and should be able to trigger the energy storage system to disconnect the charging / discharging circuit.
- Fire-related alarms in the battery room should be able to be automatically reported to the fire monitoring center; for unmanned scenarios, an automatic fire alarm system should be configured and the fire alarm signal should be reported to the remote management center.

Recycling

- Please dispose of used batteries in accordance with local laws and regulations. Do not dispose of batteries as household waste. Improper battery disposal may cause environmental pollution or explosion.
- If the battery leaks or is damaged, please contact technical support or a battery recycling company for disposal.
- When the battery has exceeded its service life and is unusable, please contact a battery recycling company for disposal.
- Avoid exposing used batteries to high temperatures or direct sunlight.
- Avoid exposing used batteries to high humidity or corrosive environments.

1.3 Electrical safety

Danger

Before making electrical connections, make sure the device is not damaged, otherwise it may cause electric shock or fire.

Danger

Irregular or incorrect operation may cause accidents such as fire or electric shock.

Danger

During operation, foreign objects must be prevented from entering the equipment, otherwise it may cause equipment short circuit failure or damage, load power supply reduction or power failure, and personal injury.

Warn

When installing equipment that needs to be grounded, the protective ground wire must be installed first; when dismantling the equipment, the protective ground wire must be removed last.

Notice

No cables are allowed to pass through the air inlet and outlet of the equipment.

Notice

Considering the impact of electrochemical corrosion between copper and aluminum, it is strictly forbidden to use aluminum wire for direct access.

Notice

When making cables, be sure to stay away from the equipment to prevent cable debris from accidentally entering the equipment and causing fire, personal injury and equipment damage.

General requirements

- Installation, operation and maintenance must be carried out in the order of steps in the manual. Do not modify, add or change the equipment without authorization, and do not change the installation sequence without authorization.
- Install temporary fences or warning ropes in the work area and hang a "No Entry" sign. Non-staff are strictly prohibited from entering.
- Before installing or removing power cables, the device itself and its front and rear switches must be disconnected.
- If you find liquid has entered the device, please turn off the power immediately and do not continue to use it.
- Before operating the equipment, you need to carefully check that the tools used meet the requirements and register them in the book; after the operation, collect them according to the number to prevent them from being left inside the equipment.
- Before installing power cables, make sure that the cable labels are correctly marked and the cable terminals are well insulated.
- When installing the equipment, you need to use a torque tool with a suitable range to tighten the screws. When tightening with a wrench, make sure the wrench is not skewed and the torque value 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.)
- When diagnosing and troubleshooting a fault, if a power outage is required, the following safety measures must be completed: power outage > electrical test > install grounding wire > hang signs and install barriers.
- To avoid the risk of electric shock, do not connect safety extra low voltage (SELV) circuits to communication network voltages.(TNV) circuit
- After installation, ensure that all electrical component protective covers, insulating sleeves and other devices are in place to avoid the risk of electric shock.
- When maintaining the power consumption or distribution equipment at the downstream of the power supply equipment, it is necessary to disconnect the output switch corresponding to the power supply equipment
- When maintaining the equipment, hang a "Do Not Close" sign on the upstream and downstream sw

- Please check the terminal screws of the equipment regularly to make sure they are tightened and not loose.
- If the cable is damaged, it must be replaced by a professional to avoid risks.
- It is strictly forbidden to artificially alter, damage or cover the logos and nameplates on the equipment, and the logos that become unclear due to long-term use must be replaced in a timely manner.
- Do not use water, alcohol, oil or other solvents to clean the electrical parts inside and outside the equipment.

- The grounding impedance of the equipment should meet the requirements of local electrical standards.
- The equipment should be permanently connected to the protective ground. Before operating the equipment, check the electrical connection of the equipment to ensure that the equipment is reliably grounded.
- The protective grounding of the equipment and the grounding screw of the metal casing should have a reliable electrical connection (the grounding resistance should not be greater than 0.1 ohms).
- Do not operate the equipment without an installed grounding conductor.
- Do not damage the grounding conductor.

Wiring requirement

- The selection, installation and routing of cables must comply with local laws, regulations and specifications.
- The flame retardant grade of the cable should not be lower than the requirements of VW-1 in UL1581 or IEC 60332-3-22 (ZB).
- When laying the power cord, it is strictly forbidden to make loops or twists. If the power cord is found to be insufficient, it must be replaced. It is strictly forbidden to make joints or welding points in the power cord.
- All cables must be securely connected, well insulated, and of appropriate specifications.
- Cable troughs and wire holes should have no sharp edges, and the cable conduits or wire holes must be protected to prevent the cables from being damaged by sharp edges, burrs, etc.
- If the cable is connected to the cabinet from the top, it needs to be bent in a U shape outside the cabinet before entering the cabinet.
- Cables of the same type should be bundled together, with a straight and neat appearance and no outer skin damage; cables of different types should be separated at least
- The cables should be laid at 30mm and should not be entangled or crossed.
- When external conditions (such as laying method or ambient temperature) change, it is necessary to refer to IEC-60364-5-52 or local regulations and specifications to verify cable selection, such as whether the current carrying capacity meets the requirements.
- Using cables in high temperature environments may cause aging and damage of the insulation layer. The distance between the cables and the heating device or the heat source area should be at least 30 mm.
- When the temperature is too low, severe impact and vibration may cause the plastic sheath of the cable to crack. To ensure construction safety, the following requirements should be followed

- All cables should be laid and installed above 0°C. When moving cables, especially when working in low temperature environments, they should be handled with care.
- If the storage temperature of the cables is below 0°C, they must be moved to room temperature and stored for more than 24 hours before being laid.
- It is prohibited to perform irregular operations such as pushing the cables directly off the vehicle to avoid cable damage that may lead to degradation of cable performance, affecting current carrying capacity and temperature rise, etc.

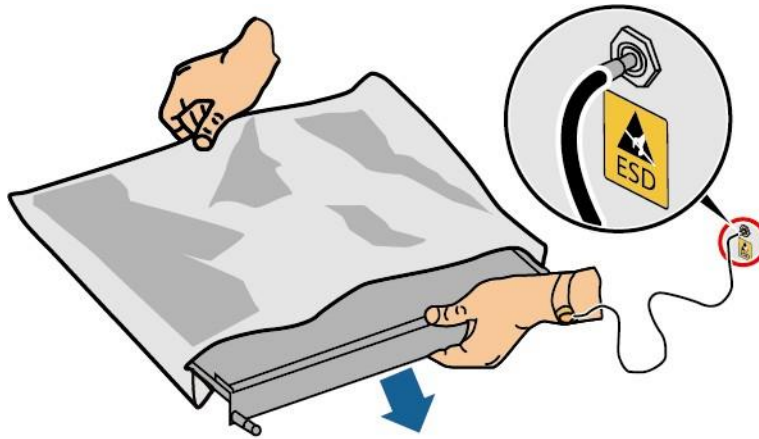
Antistatic requirements

Things to know

The static electricity generated by the human body can damage static-sensitive components on the board, such as large-scale integrated circuits.

When touching the equipment, before holding a single board, a module with an exposed circuit board, or a dedicated integrated circuit chip, etc., please comply with the electrostatic protection regulations. You should wear anti-static work clothes, anti-static gloves or a wrist strap, and the other end of the anti-static wrist strap should be well grounded.

- **Figure 1-2** Schematic diagram of wearing an anti-static wrist strap



DC15000001

- When holding a single board or a module with an exposed circuit board, you must hold the edge of the board or module without components. Do not touch the components with your hands.
- The disassembled boards or modules must be packed with anti-static packaging materials before they can be stored or transported.

1.4 Environmental requirements

Danger

It is strictly forbidden to place the device in an environment with flammable or explosive gas or smoke, and it is forbidden to perform any operation in such an environment.

Danger

It is strictly forbidden to store flammable and explosive items in the equipment area.

Danger

It is strictly forbidden to place the device near heat or fire sources, such as fireworks, candles, heaters or other heating devices. Heat to the device may cause damage to the device or cause a fire.

Warn

The equipment should be installed in an area away from liquids. It is strictly forbidden to install it under water pipes, air outlets and other locations where condensation water is likely to be generated. It is strictly forbidden to install it under air conditioning outlets, ventilation outlets, computer room outlet windows and other locations prone to water leakage to prevent liquid from entering the equipment and causing equipment failure or short circuit.

Warn

When the device is running, do not block the ventilation openings, cooling system or cover them with other objects to prevent high temperature from damaging the device or causing a fire.

General requirements

- The temperature and humidity environment for storing the equipment should be appropriate. It should be stored in a clean, dry, well-ventilated area and protected from dust and condensation.
- It is strictly forbidden to install and operate the equipment beyond the scope specified by the technical indicators, otherwise it will affect the performance and safety of the equipment.
- It is strictly prohibited to install, use and operate outdoor equipment and cables (including but not limited to handling equipment, operating equipment and cables, plugging and unplugging signal interfaces connected to the outdoors, aerial operations, outdoor installation, opening doors, etc.) in severe weather such as lightning, rain, snow, and gale force 6 or above.
- It is strictly forbidden to install the device in an environment with direct sunlight, dust, smoke, volatile gas, corrosive gas, infrared and other radiation, organic solvents or excessive salt.
- It is strictly forbidden to install the equipment in an environment with metallic conductive dust or magnetic dust.
- It is strictly forbidden to install the equipment in areas prone to the growth of microorganisms such as fungi and mold.
- It is strictly forbidden to install the equipment in areas with strong vibration, strong noise source and strong electromagnetic field interference.
- The site selection should comply with local laws, regulations and relevant standards.
- The installation environment must have a solid ground surface without rubber soil, soft soil or soil that is prone to sinking. It is strictly forbidden to choose low-lying areas or areas prone to water accumulation. The site level should be higher than the historical highest water level in the area.
- During installation, operation and maintenance, you must first clean up the accumulated water, ice, snow or other debris on the top before opening the door to prevent debris from falling into the equipment.
- When installing the device, make sure the mounting surface is sturdy and meets the load-bearing requirements of the device.
- The computer room must have good thermal insulation, and the walls and floors must be moisture-proof.
- Add rat-proof baffles at the door of the computer room to prevent rodents and insects from entering. After installing the equipment, empty packaging materials such as cartons, foam, plastic, cable ties, etc. should be removed from the equipment area

1.5 Machinery Safety

Danger

When working at heights, you must wear a safety helmet, safety belt or waist rope and tie it to a firm and sturdy structure. It is strictly forbidden to hang on moving unstable objects or metal with sharp edges to prevent the hook from slipping and causing a fall accident.

Warn

Tools must be fully prepared and inspected by professional organizations. It is prohibited to use tools that have scars, fail inspections, or have exceeded the inspection validity period. Ensure that the tools are firm and not overloaded.

Warn 

Before installing the equipment in the cabinet, first, make sure that the cabinet has been fixed firmly to prevent the cabinet from tilting and collapsing due to an unstable center of gravity, which could cause the installers to be injured or the equipment to be damaged.

Warn 

When pulling the equipment out of the cabinet, be careful with the equipment that may be unstable or heavy installed in the cabinet to avoid being crushed or hit.

Warn 

It is strictly forbidden to drill holes on the device. Drilling will damage the sealing, electromagnetic shielding performance, internal components and cables of the device. The metal chips generated by drilling will enter the device and cause a short circuit on the circuit board.

General requirements

- Paint scratches that occur during equipment transportation and installation must be repaired in a timely manner, and it is strictly forbidden to expose the scratched parts for a long time.
- Without our company's evaluation, it is prohibited to perform arc welding, cutting and other operations on the equipment.
- It is prohibited to install other equipment on top of the equipment without evaluation by our company.
- When working in the space above the top of the equipment, additional protection should be provided on the top of the equipment to prevent damage to the equipment.
- Please use the right tools and know how to use them correctly.

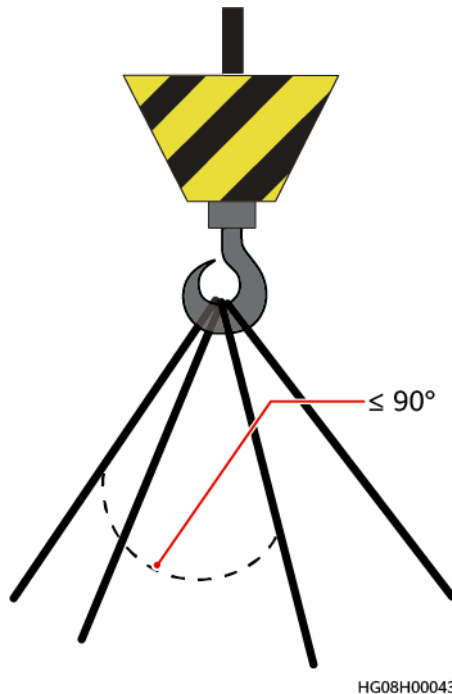
Height safety

- Any work performed more than 2 meters above the ground is considered high-altitude work, and a supervisor must be present during high-altitude work.
- You must undergo relevant training and obtain relevant qualifications before you can take up your post and perform high-altitude operations.
- High-altitude operations should be stopped if the steel pipes are not dry due to rain or other dangerous situations. After the above situation, various operating equipment must be checked by the safety person in charge and relevant technical personnel to confirm safety before operations can be resumed.

- Dangerous restricted areas should be marked out at high-altitude work sites, with clear signs set up to strictly prohibit unauthorized personnel from entering.
- Guardrails and signs should be installed at the edges and holes of high-altitude operations to prevent people from falling into empty space.
- It is strictly forbidden to pile up scaffolds, springboards or other sundries on the ground below the high-altitude working area. Ground personnel are strictly prohibited from staying or passing directly below the high-altitude working area.
- Carry operating equipment and tools carefully to prevent tools from falling and causing equipment damage or personal injury.
- It is strictly forbidden for workers working at heights to throw objects from high altitudes to the ground, and it is strictly forbidden to throw objects from the ground to high altitudes. Objects should be transported by slings, hanging baskets, overhead cranes or cranes.
- It is necessary to avoid working on the upper and lower floors at the same time. If it cannot be avoided, a special protective shed must be set up between the upper and lower floors or other protective measures must be taken, and it is strictly forbidden to stack tools and materials on the upper floor.
- When dismantling the scaffolding after the work is completed, it should be done layer by layer from top to bottom. It is strictly forbidden to dismantle the upper and lower layers at the same time. When dismantling a certain part, the collapse of other parts should be prevented.
- Workers working at heights must strictly follow the high-altitude safety regulations when performing their work. The company is not responsible for any accidents caused by violation of the high-altitude safety work regulations.

Lifting safety

- Personnel performing lifting operations must undergo relevant training and be qualified before they can take up their posts.
- Temporary warning signs or fences must be erected in the lifting area to isolate it.
- The foundation for lifting operations must meet the load-bearing requirements of the crane.
- Before lifting, ensure that the lifting tools are firmly fixed to a fixed object or wall that meets the load-bearing standards.
- During hoisting, it is strictly forbidden to walk under the boom or the hoisted object.
- During lifting, it is prohibited to drag the wire rope or lifting equipment, and it is prohibited to use hard objects to hit.
- During the lifting process, ensure that the angle between the two cables is no greater than 90° , as shown in the figure below.



Drilling safety

- The client and contractor should agree before drilling.
- Safety equipment such as goggles and protective gloves should be worn when drilling.
- Please avoid pre-buried pipes or lines when drilling to avoid short circuits or other hazards.
- The equipment should be shielded and protected when drilling to prevent debris from falling into the equipment. The debris should be cleaned up in time after drilling.

2. Product Introduction

2.1 PU 80&160 Series Model Description

Product series number: PU , product capacity: 80AH or 160AH , please refer to the table below for specific product models

Table 2-1 Product Models

Cabinet Type	PU 80 & 160 Series Main Cabinet	PU 80 & 160 Series Slave Cabinet
model	<ul style="list-style-type: none"> ● PU512V160-S-2 ● PU512V160-S ● PU448V160-S-2 ● PU384V160-S-2 ● PU384V160-S ● PU512V80-S-2 ● PU512V80-S ● PU448V80-S-2 ● PU384V80-S-2 ● PU384V80-S 	<ul style="list-style-type: none"> ● PU512V160-2 ● PU512V160 ● PU448V160-2 ● PU384V160-2 ● PU384V160 ● PU512V80-2 ● PU512V80 ● PU448V80-2 ● PU384V80-2 ● PU384V80

Figure 2-1 Product model identification

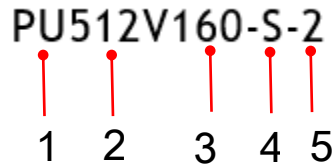
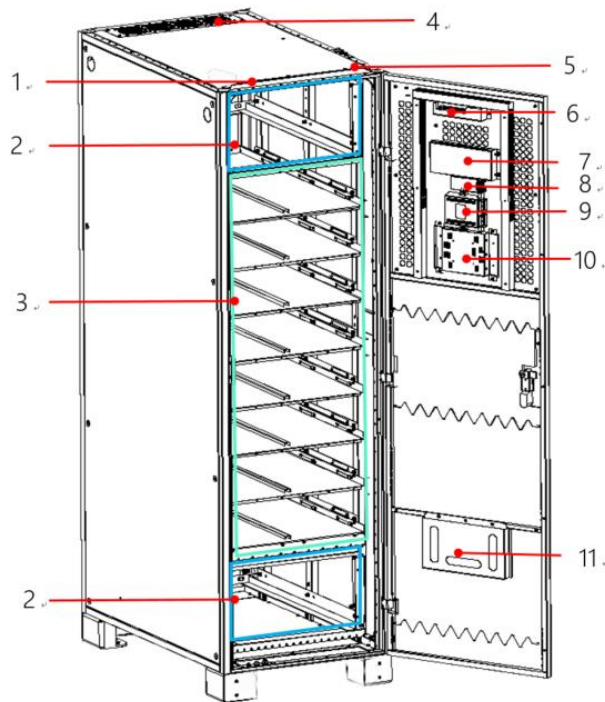


Table 2-2 Model Description

NO	meaning	illustrate
1	Product Type	PU : High power type
2	Rated voltage	<ul style="list-style-type: none"> ● 512V : Voltage level 512V ● 448V : Voltage level 448V ● 384V : Voltage level 384V
3	Nominal capacity	<ul style="list-style-type: none"> ● 160 Ah : Battery cabinet capacity 160 Ah ● 80 Ah : Battery cabinet capacity 80 Ah
4	Configuration Type	<ul style="list-style-type: none"> ● With S: With monitoring display module (main cabinet) ● Without S: No monitoring display module (from cabinet)
5	Match UPS type	<ul style="list-style-type: none"> ● Band 2 : Two-wire ● Without 2 : three-wire system

2.2 PU 80&160 Series Cabinet Introduction

Figure 2-2 PU 80 & 160 Series Cabinet Introduction



- (1) Communication/weak current line position (2) High voltage box installation slot (3) Battery module installation slot
- (4) Cabinet fan outlet (5) Power line inlet location (6) UPS communication adapter
- (7) SCU master control (8) Smoke sensor (optional) (9) Fire controller (optional)
- (10) Monitoring and display module (only for main cabinet) (11) Folder

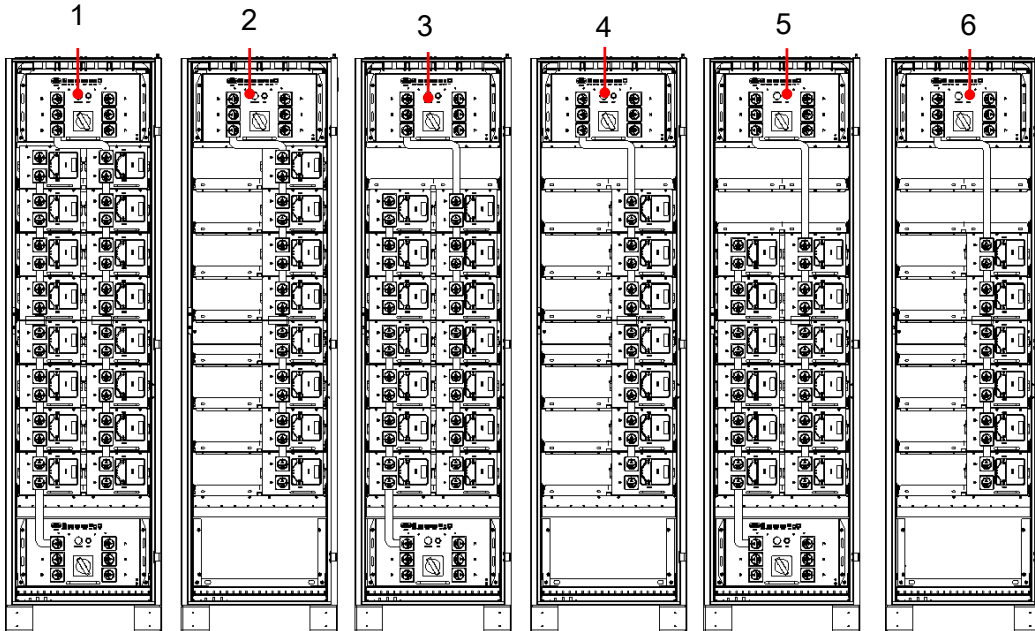
2.3 Product Configuration Description

Table 2-3 Product Configuration

category	Configuration	Configuration Instructions
PU 80&160 Series	The main cabinet is mandatory, and the slave cabinet is optional	The PU 80&160 series master cabinet supports the connection with up to 15 slave cabinets (full cabinet) .

category	Configuration	Configuration Instructions
Battery Module	Required	The number of battery modules configured in the system must be a multiple of 6 , 7 or 8. The number of battery modules in a single PU 80&160 series can be configured in only six configurations: 8+8 , 7+7 , 6+ 6 , 8+0 , 7+0 and 6+0. Among them: <ul style="list-style-type: none"> • 8+8 or 7+7 or 6+6 is called a full cabinet. • 8+0 or 7+0 or 6+0 is called a half cabinet.
High voltage box	Required	Full cabinet is equipped with 2 high-voltage boxes, half cabinet is equipped with 1 high-voltage box
Module-level fire protection	Optional	The fire extinguishing agent is perfluorohexanone or aerosol, including fire extinguisher and bracket, hot start, no communication feedback
Cabinet-level fire protection	Optional	When selecting aerosol fire extinguisher, only fire extinguisher, hot start, no communication feedback When choosing HFC-227ea, it includes fire extinguisher, smoke sensor, fire controller, corresponding wiring harness, bracket, etc., electric start, and communication feedback.
Cabinet base front and rear baffles	Optional	

Figure 2.3-1 Typical scenario of PU 80&160 series equipped with battery module



(1) Full cabinet (8+8 scenario)	(2) Half cabinet (8+0 scenario)	(3) Full cabinet (7+7 scenario)
(4) Half cabinet (7+0 scenario)	(5) Full cabinet (6+6scenario)	(6) Halfcabinet(6+0scenar)

2.4 Components Introduction

2.4.1 Display and control module

The display and control module is the display core of the energy storage system. It communicates with the master control module through an isolated LAN, and receives, displays and sets the information collected by the master control module, including UPS equipment information, EMS system information, fire protection/air conditioning/access control information, and all battery (single cell, module, cluster, stack) information in the system. It stores the operation, failure, alarm, and data of the battery stack, which is convenient for local inspection personnel to monitor and maintain the site. The monitoring display module (MDU) is combined with the monitoring interface unit to realize the battery management function, communicate with the UPS and network management, and provide human-computer interaction, communication interface and permission management functions for local operation. By operating the monitoring display module, you can view the battery voltage, current, SOC, SOH and temperature data reported by the battery control unit, and support local storage of data and alarm information.

 **illustrate**

The display and control module interfaces are mainly distributed on the side of the display screen.

Figure 2.4.1-1 Monitoring and display module

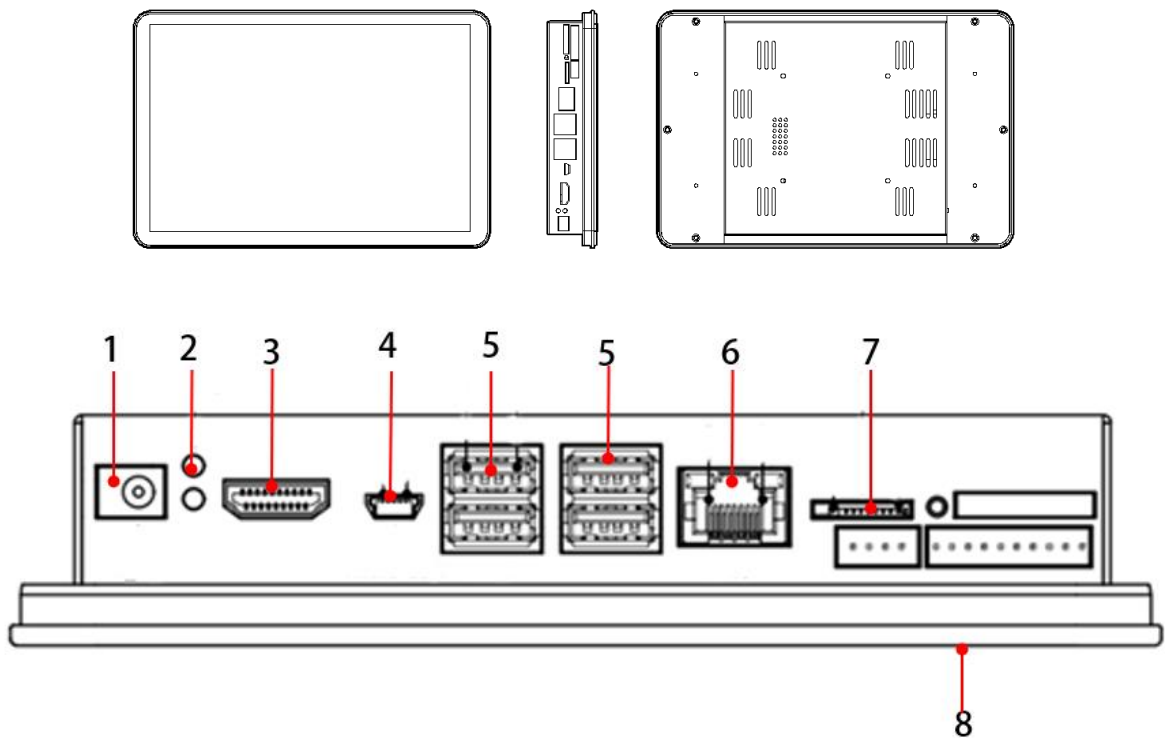


Table 2.4.1-1 Monitoring and display module indicator lights and interface description

Serial number	Indicator lights and ports	illustrate
1	power supply	Display screen power supply port
2	HDMI interface	Reserve

Serial number	Indicator lights and ports	illustrate
3	Micro USB	Reserve
4	USB	Reserve
5	LAN	Communication, connection master control
6	TF card holder	Reserve
7	LCD display	Human-computer interaction interface

2.4.2 SBMS master control module

The master control module is the control and management core of the battery stack of the energy storage system. It collects, analyzes, judges and stores the battery information (voltage, temperature, current and other parameters) of all battery clusters in the battery stack. The core CPU adopts ARM single-core A7, and the operating speed supports 528MHz, which can quickly analyze and convert the battery stack data. At the same time, it can monitor and analyze the dynamic environment (air conditioning , fire protection, flooding, etc.) data through RS485, RS232, DO, DI interfaces .

The master control module communicates with the main control module through 2-way isolated CAN to collect battery data, issue commands, receive faults, etc.; communicates with the display and control module through 1-way isolated LAN to report data; communicates with the EMS system through 2-way isolated LAN to report information and respond to dispatch commands; communicates with PCS equipment and dynamic environment monitoring equipment (fire protection/air conditioning/access control) through isolated RS485 (CAN/DO); and communicates with the UPS power supply through isolated RS232.

Figure 2.4.2-1 Master control module interface

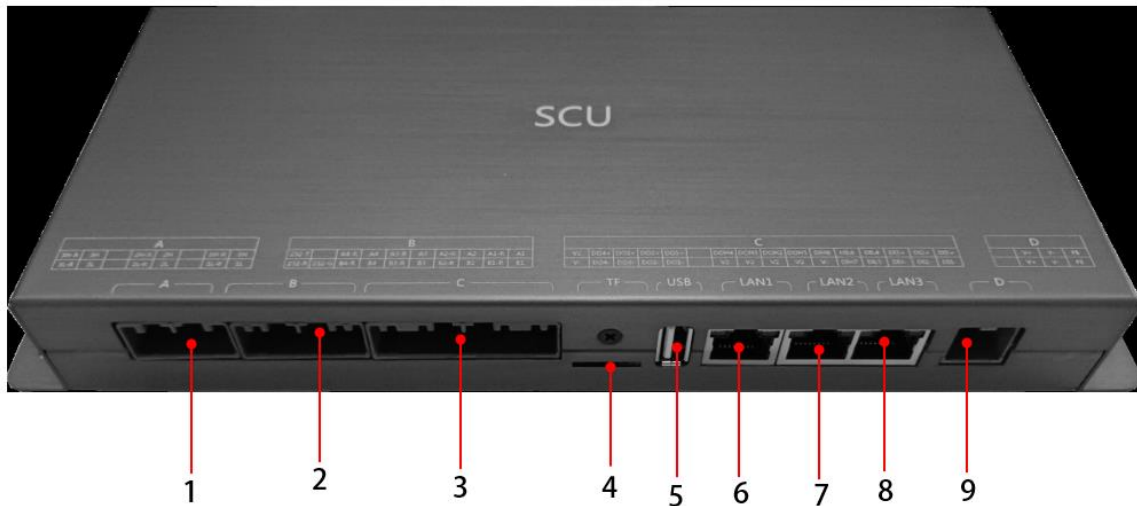


Table 2.4.2-1 Interface Description

Serial number	interface	Interface Description	describe
1	A port	Communication port	
2	B port	Communication port	
3	C -mount	Communication port	
4	TF	Reserve	
5	USB	Reserve	
6	LAN1	Communication port	Connect with display control
7	LAN2	Reserve	
8	LAN3	Reserve	
9	D -port	Power supply port	

2.4.3 UPS communication adapter board

Figure 2.4.3-1 UPS communication adapter board

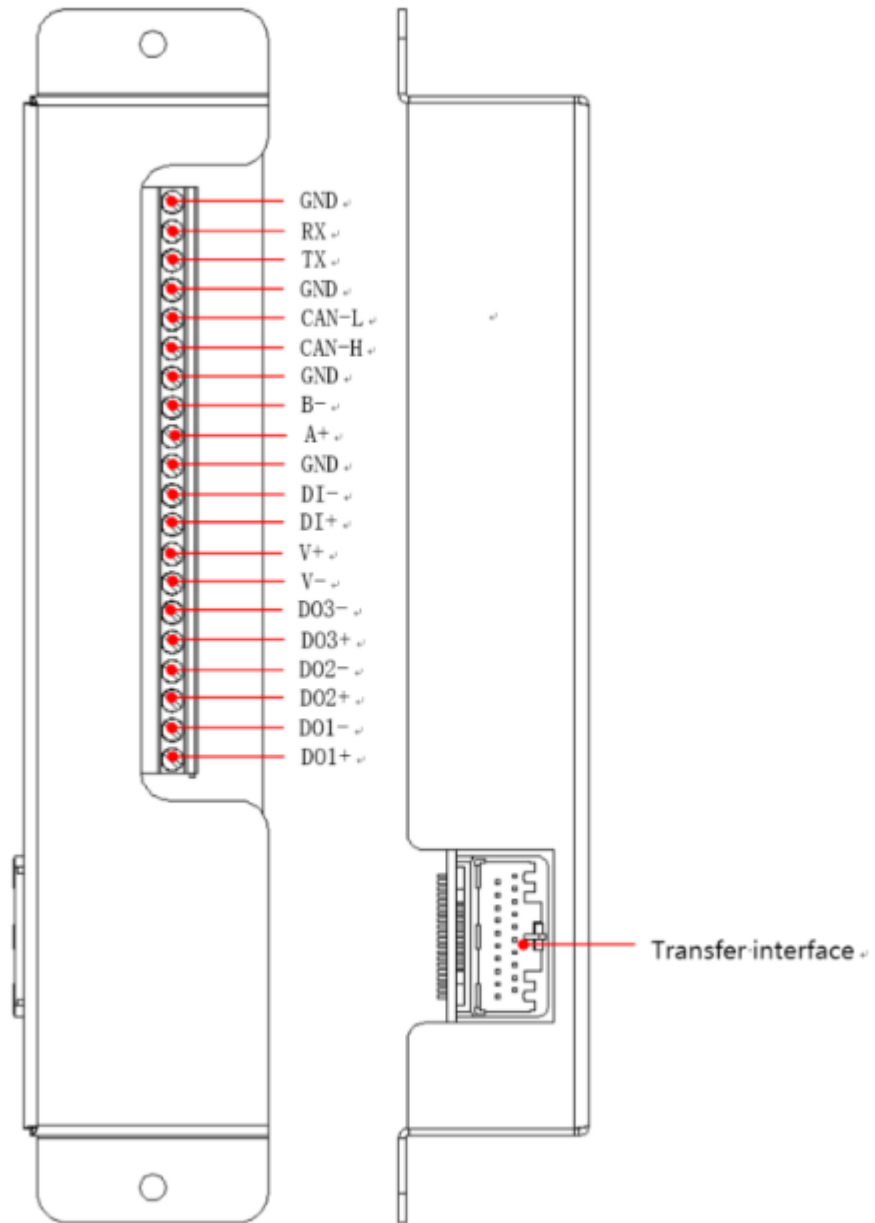


Table 2.4.3-1 Interface Description

Serial number	interface	Interface Description	describe
1	GND	Communication port	Serial communication reference ground
2	RX	Communication port	Serial port receiving
3	TX	Communication port	Serial port sending
4	GND	Communication port	C AN communication reference ground
5	CAN-L	Communication port	C AN communication low
6	CAN-H	Communication port	C AN communication high
7	GND	Communication port	485 communication reference ground
8	B-	Communication port	4 85 Communications +
9	A+	Communication port	4 85 Communications -
10	G	Reserved	
11	D I-	Input Contact -	E PO input low/active
12	D I+	Input contact +	E PO input high/active
13	V +	Power output +	spare
14	V -	Power supply output-	spare
15	D O3-	Output dry contact 3 -	
16	D O3+	Output dry contact 3 +	
17	D O2-	Output dry contact 2-	
18	D O2+	Output dry contact 2+	
19	D O1-	Output dry contact 1-	
20	D O1+	Output dry contact 1+	
twenty one	Adapter	Communication port	Connection Master

2.4.4 High voltage control module

The high-voltage control module includes RBMS battery control unit , circuit breakers, fuses, contactors, Hall and other electrical components, which can realize battery cluster management functions and support plug-in and unplug maintenance.

picture 2.4.4-1 High voltage control module

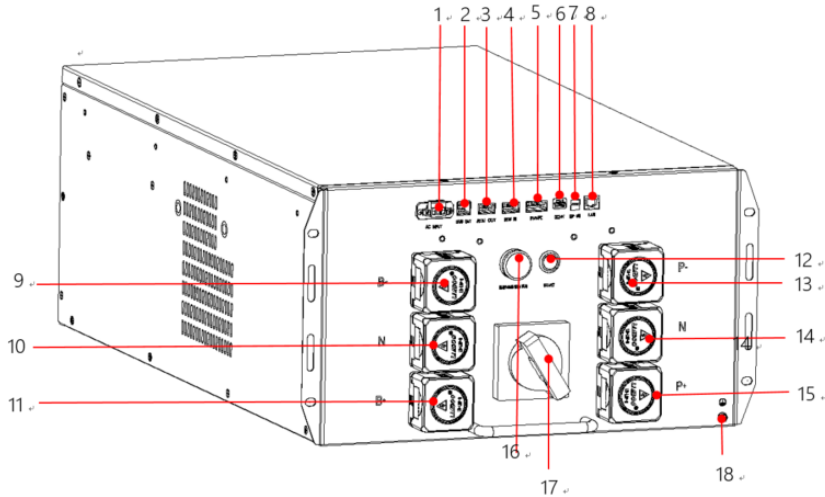


Table 2.4.4-1 High Voltage Control Module Panel Description

NO	name	Silk screen content	describe
1	A C power input	A C INPUT	
2	BMU Output	BMU OUT	Connect from control
3	RCU Output	RCU OUT	High voltage box parallel output interface
4	RCU Input	RCU IN	High voltage box parallel input interface
5	Fan/fire protection interface	FAN/FC	Connect fans and fire protection
6	DC24V output	DC24V OUT	Power supply for S BMS and M DU
7	Dip switch	DIP SW	Terminal resistance setting
8	Network port	LAN	Reserve
9	Battery negative terminal	B -	Connect to the negative terminal of the battery cluster
10	Battery neutral connection terminal	N	Connect to the middle of the battery cluster (7+7 and 7 +0 scenarios do not have a neutral connector)
11	Battery positive connection terminal	B +	Connect to positive terminal of battery cluster
12	switch	START	

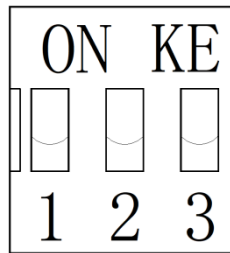
NO	name	Silk screen content	describe
1 3	External negative connection terminal	P -	Battery cabinet negative pole
1 4	External neutral connection terminal	N	Connect to the middle of the battery cluster (7+7 and 7 +0 scenarios do not have a neutral connector)
1 5	External positive connection terminal	P +	Battery cabinet positive pole
16	Indicator Lights	WARNING/STATUS	
1 7	Molded case circuit breaker switch		ON -OFF two states
1 8	External positive connection terminal		High voltage box grounding

Table 2.4.4-2 Panel indicator light status description

Indicator status description				
NO	Work title	Operative mode	Indicator statuses	Description
1	Shutdown /BMS power off	The shunt or start switch of the circuit breaker is not enabled	●	System not working
2	Standby (standing)	Normal	●	Static
3		Primary alarm	●	Static
4		Level 2 and Level 3 alarms	●	Static
5	Charging	Normal	●/	The green light flashes at intervals of 2 seconds
6		Primary alarm	●/	The yellow indicator blinks at intervals of 2 seconds
7		Level 2 alarm (cell pressure difference, large temperature difference, low SOC) Level 3 alarm (SOC low)	●/	The red light blinks at intervals of 2 seconds
8		Level 2 and Level 3 alarms (except for individual pressure difference, large temperature difference and low SOC)	●	Static
9	Electric discharge	Normal	●//	The green light blinks at a interval of 1S
10		Primary alarm	●//	The yellow indicator blinks at a interval of 1S

11		Level 2 alarm (cell pressure difference, large temperature difference, low SOC) Level 3 alarm (SOC low)	●//	The red light blinks at a interval of 1S
12		Level 2 and Level 3 alarms (except for individual pressure difference, large temperature difference and low SOC)	●	Static
13	Precharge	Normal	●///	The green is blinking at intervals of 0.5 seconds
14		An alarm indicating that precharge is allowed exists	●///	The yellow indicator blinks at intervals of 0.5 seconds
15		Alarms indicating that precharge is not allowed exist	●	Static

picture 2.4.4-1 DIP switch description



The corresponding position dial upward indicates that the terminal resistance is effective. In normal circumstances, please keep the default value (downward). Only under the last cabinet, the R BMS (high-voltage box) needs to adjust the dial position. Please note that the functions of the corresponding positions are as follows:

- The No. 1 dial is the high voltage box CAN communication terminal resistance, and the terminal resistance is enabled when it is turned up;
- The No. 2 dial is the high voltage box RS485 communication terminal resistance, and the terminal resistance is enabled when it is turned up;
- The No. 3 dial is the cabinet fire controller (optional) communication terminal resistance, and the terminal resistance is enabled upward;

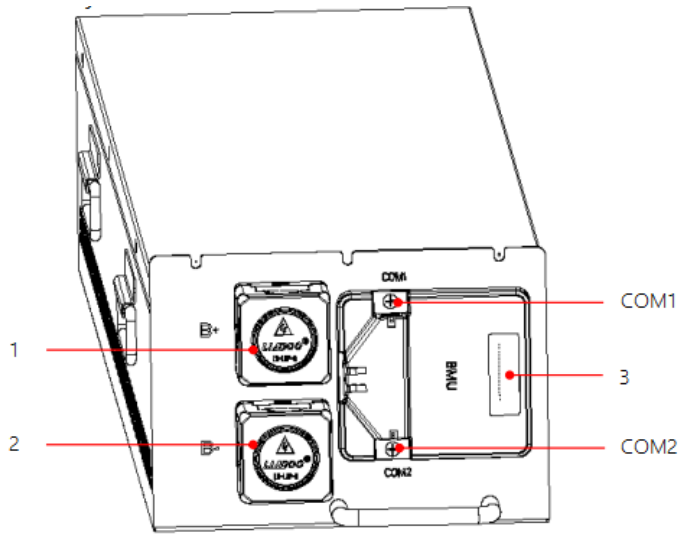
2.4.5 Battery Module

The battery module is composed of 40 cells (2 in parallel and 20 in series), and the cell type is lithium iron phosphate. Built-in fire extinguishing device (optional) All external interfaces of the module are located at the front for easy installation and maintenance.

Each battery module has a built-in BMU management unit, which mainly provides routine parameter monitoring and alarm such as battery voltage and temperature, battery balancing management and other functions as follows:

- Battery voltage measurement.
- Battery temperature measurement.
- Battery voltage balancing.
- CAN communication between battery modules .

Figure 2.4.6-1 Battery module



(1) Module positive electrode

(2) Module negative pole

(3) BMU slave control

2.4.6 Cabinet fire protection system

Used to detect thermal runaway in the cabinet and perform fire extinguishing actions

The fire extinguishing system is an optional accessory. You can choose perfluorohexanone or aerosol fire extinguishing device as needed.

Perfluorohexanone fire extinguisher

The perfluorohexanone fire extinguishing device consists of a fire extinguisher, a smoke sensor, a fire controller and related wiring harness components. It is started electrically and requires communication with the RBMS .



Aerosol fire extinguisher

The aerosol fire extinguishing device is started by hot start, and the hot start temperature is not communicated with the RBMS .



2.4.7 Battery module fire protection

The module-level fire protection uses perfluorohexanone fire extinguishing agent, which is started by hot start. It has high fire extinguishing efficiency and low fire extinguishing concentration, and can extinguish Class B, C, and E fires.

This fire extinguishing device is a passive fire extinguishing equipment and does not communicate with the BMS .



3 Technical parameters

For technical parameters, refer to the following tables:

Table 3-1 Physical parameters

project	parameter
Routing method	Support up and down line in and out
Protection level	IP20
Fire extinguishing plan	Optional accessories, cabinet-level fire protection (perfluorohexanone or aerosol) + Module-level fire protection (perfluorohexanone)
Product size (height x width x depth)	2200mm×600mm×1000mm
Product Weight	≤ 12 5 0kg
Service life	≥3 000 times (standard charge and discharge, @ 80%DOD)
Circuit breaker specifications	1000V DC, 750A , 4P
Fuse specifications	1000V DC , 800A

Table 3-2 Environmental parameters

project	parameter
temperature	Discharge: -10 °C ~ 55 °C , Charge: 0-45 °C , Storage : -20 - 60 °C Note: If the range is exceeded, the capacity will be reduced.
Relative humidity	5% RH ~ 95% RH (no condensation)
Altitude	0m ~ 2 000m (0m ~ 2 000m without derating, above 2 000m , refer to IEC62040-3 standard derating)

Table 3-3 Electrical parameters

project	8+8 Scenario	7+7 Scenario	6+6 Scenario	8+0 Scenario	7+0 Scenario	6+0 Scenario
Nominal capacity (how much charge the battery can store)	160 Ah			80 Ah		
Battery rated voltage (3.2 V/cell)	512V	448V	384V	512V	448V	384V
Rated power	81.9 kWh	71.7 kWh	61.4 kWh	41.0 kWh	35.8 kWh	30.7 kWh

project		8+8 Scenario	7+7 Scenario	6+6 Scenario	8+0 Scenario	7+0 Scenario	6+0 Scenario
Discharge capacity	Maximum load power supported by a single cabinet	512 kW	448 kW	384 kW	256 kW	224 kW	192 kW
	Power backup time	10Min	10Min	10Min	10Min	10Min	10Min
Battery charging cut-off voltage		69 V DC×N Note: N is the number of battery modules connected in series, which can be 6 , 7 or 8 .					
Battery discharge cut-off voltage		56 V DC×N Note: N is the number of battery modules connected in series, which can be 6 , 7 or 8 .					
Standard charging current		80 A			40 A		
Maximum charging current		160 A			80 A		
Rated discharge current		10 0 0A			5 0 0 A		
Maximum continuous discharge current		1100A (≤5min)			550A (≤5min)		
Maximum number of cabinets		1 5					
Number of battery modules		16	14	12	8	7	6

Table 3-4 Protection functions

project	parameter
Battery overvoltage warning	<ul style="list-style-type: none"> Battery: ; First level warning: ≥ 3.65 V ; Second level warning: ≥ 3.7 V , Third level warning: > 3.8 V Battery pack (8pack): First level alarm: ≥ 576 V ; Second level alarm: ≥ 584 V , Third level alarm: ≥ 592 V Battery pack (7pack): First level alarm: ≥ 504 V ; Second level alarm: ≥ 511 V , Third level alarm: ≥ 518 V Battery pack (6pack): First level alarm: ≥ 432 V ; Second level alarm: ≥ 438 V , Third level alarm: ≥ 444 V
Battery low voltage warning	<ul style="list-style-type: none"> Battery: First level warning: ≤ 2.7 V ; Second level warning : ≤ 2.5 V ; Third level warning : < 2.3 V Battery pack (8pack): First level alarm: ≤ 448 V ; Second level alarm : ≤ 424 ; Third level alarm : < 400 V Battery pack (7pack): First level alarm: ≤ 392 V ; Second level alarm : ≤ 371 V ; Third level alarm : < 350 V Battery pack (6pack) : First level alarm: ≤ 336 V ; Second level

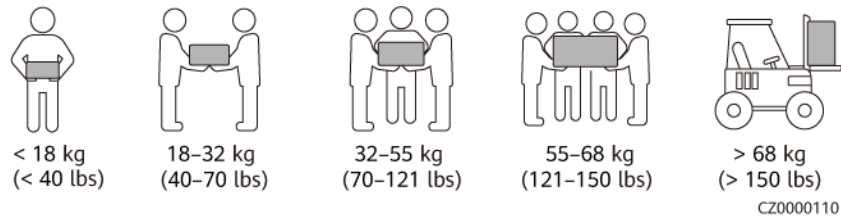
project	parameter
	alarm : ≤ 318 V ; Third level alarm : < 300 V
Over temperature alarm	<ul style="list-style-type: none"> ● Charging : First level alarm: > 45 °C ; Second level alarm: > 50 °C ; Third level alarm : < 65 °C ● Discharge: First level alarm: > 65 °C Second level alarm: > 70 °C ; Third level alarm : < 75 °C
Low temperature alarm	<ul style="list-style-type: none"> ● Charging : First level alarm: < 3 °C ; Second level alarm: < 0 °C; Third level alarm : < -5 °C ● Discharge: First level alarm: < 0 °C Second level alarm: < -10 °C ; Third level alarm : < -15 °C
Overcurrent alarm	<p>Full cabinet (8+8 scenes):</p> <ul style="list-style-type: none"> ● Charging: First level alarm: > 200 A ; Second level alarm: > 220 A ; Second level alarm : > 240 A ; ● Discharge: First level alarm: > 1160 A ; Second level alarm: > 1200 A ; 3 alarm : > 1300 A ; <p>Full cabinet (7+7 scenario):</p> <ul style="list-style-type: none"> ● Charging: First level alarm: > 200 A ; Second level alarm: > 220 A ; Second level alarm : > 240 A ; ● Discharge: First level alarm: > 1160 A ; Second level alarm: > 1200 A ; 3 alarm : > 1300 A ; <p>Full cabinet (6+6 scenario):</p> <ul style="list-style-type: none"> ● Charging: First level alarm: > 200 A ; Second level alarm: > 220 A ; Second level alarm : > 240 A ; ● Discharge: First level alarm: > 1160 A ; Second level alarm: > 1200 A ; 3 alarm : > 1300 A ; <p>Half cabinet (8+0 scenario):</p> <ul style="list-style-type: none"> ● Charging: First level alarm: > 100 A ; Second level alarm: > 110 A ; Second level alarm : > 120 A ; ● Discharge: First level alarm: > 580 A ; Second level alarm: > 600 A ; 3 alarm : > 650 A ; <p>Half cabinet (7+0 scenario):</p> <ul style="list-style-type: none"> ● Charging: First level alarm: > 100 A ; Second level alarm: > 110 A ; Second level alarm : > 120 A ; ● Discharge: First level alarm: > 580 A ; Second level alarm: > 600 A ; 3 alarm : > 650 A ; <p>Half cabinet (6+0 scenario):</p> <ul style="list-style-type: none"> ● Charging: First level alarm: > 100 A ; Second level alarm: > 110 A ;

project	parameter
	<p>Second level alarm : > 120 A ;</p> <ul style="list-style-type: none"> ● Discharge: First level alarm: > 580 A ; Second level alarm: > 600 A ; <p>3 alarm : > 650 A ;</p>
<p>Emergency shutdown protection</p>	<p>With communication scenario: protection can be achieved through the emergency shutdown action of the UPS , or emergency shutdown can be achieved through its own dry contacts</p> <p>No communication scenario: Emergency shutdown can be achieved through its own dry contact</p>

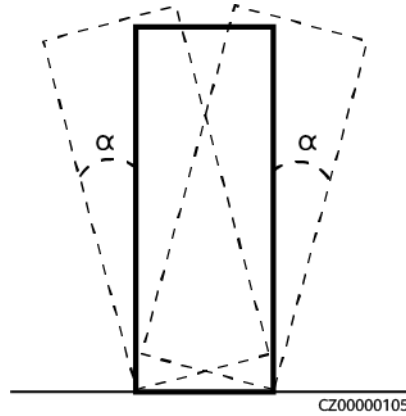
4 Transport and storage

4.1 General requirements

- When carrying heavy objects, you should be prepared to bear the weight to avoid being crushed or sprained by the heavy objects.



- When multiple people are carrying heavy objects at the same time, they need to consider factors such as height, make reasonable personnel matching and division of labor, and ensure balanced weight distribution.
- When two or more people are carrying heavy objects together, one person should be in charge and they should lift or put down the equipment at the same time to ensure a unified pace.
- When moving equipment by hand, you should wear protective gloves, work shoes and other safety protection equipment to avoid injury.
- When carrying equipment by hand, first get close to the object, squat down, and use the strength of your straight legs (not your back) to lift the object slowly and steadily. It is strictly forbidden to lift it suddenly or twist your torso.
- When moving or lifting the device, hold the device by its handles or by its bottom edge, not by the handles of installed modules.
- Do not quickly lift heavy objects above waist height. Place the heavy object on a workbench at half waist height or in a suitable place first, adjust the position of your palms, and then lift it.
- When moving heavy objects, you must use balanced and steady force; the moving speed must be uniform and slow; positioning requires stability and slowness, avoiding any impact or falling that may scratch the surface of the equipment or damage the components and cables of the equipment.
- When carrying heavy objects, you should be especially careful on workbenches, slopes, stairs and places where it is easy to slip. When carrying heavy objects over thresholds, make sure the door is wide enough for the equipment to pass through to prevent bumps or scratches on your fingers.
- When transferring heavy objects, move your feet instead of twisting your waist. When you need to lift and transfer heavy objects at the same time, point your feet in the direction you want to move them before carrying them.
- When using a forklift to transport the equipment, the forklift must be in the middle position to prevent it from tipping over. Before moving, please fasten the equipment to the forklift with ropes; during moving, special personnel are required to supervise.
- The tilt angle of the cabinet should comply with the requirements shown in the diagram. The tilt angle with packaging is $\alpha \leq 15^\circ$, and the tilt angle after removing the packaging is $\alpha \leq 10^\circ$.



4.2 Battery Module Transportation Requirements

Danger

Rough loading and unloading is prohibited, otherwise it may cause battery short circuit, damage (leakage, rupture, etc.), fire or explosion, etc.

Warn

Batteries must be transported separately. For cabinets with installed batteries, it is prohibited to transport them with batteries. If the cabinet needs to be transported or moved, the batteries must be removed first.

Warn

Do not carry the battery by its terminals, bolts or cables to avoid damaging the battery.

Warn

The battery should be transported in the direction required. It is prohibited to invert, tilt, drop, mechanically impact, be exposed to rain or snow, or drop into water.

- Pass UN38.3 (UN38.3: Section 38.3 of the sixth Revised Edition of the Recommendations on the Transport of Dangerous Goods: Manual of Tests and Criteria) and SN/T 0370.2-2009 "Export Dangerous Goods Packaging Inspection Procedure Part 2 Performance Inspection", this product belongs to the ninth category of dangerous goods.
 - The battery can be directly delivered on site to meet the transportation requirements of cars, ships, etc.
 - Comply with international dangerous goods transportation regulations and meet the regulatory requirements of transportation regulatory authorities in the country of departure, transit and destination.
 - When transporting, choose sea transportation or roads with good road conditions. Railway and air transportation are not supported. Bumping and tilting should be minimized during transportation.
 - Sea transportation complies with the transportation requirements of the International Maritime Dangerous Goods Code (IMDG Code).
 - Land transportation shall comply with ADR or JT/T 617 transportation requirements.
 - Before transportation, check that the battery packaging is intact and has no odor, leakage, smoke,
-

fire, etc. Otherwise, transportation is prohibited.

- The transport packaging box must be sturdy and should be handled with care and moisture-proof measures during loading, unloading and transportation.
- When moving batteries, be careful to handle them with care, avoid bumping or bumping them, and pay attention to personal safety.
- Unless otherwise specified, dangerous goods cannot be mixed with goods containing food, medicines, animal feed and their additives in the same vehicle or container.
- Unless otherwise specified, when dangerous goods packages are loaded with ordinary goods in the same vehicle or container, they should be isolated in one of the following ways:
 - Use spacers that are the same height as the package
 - Keep at least 0.8m distance on all sides

4.3 Battery Module Storage Requirements

Warn

The battery should be stored indoors. No direct sunlight or rain, dry and well ventilated, clean surroundings, no large amounts of infrared radiation, no organic solvents or corrosive gases, no metal conductive dust, etc., away from heat and fire sources.

Warn

If the battery is swollen, deformed, damaged or leaking, it must be scrapped regardless of the storage time.

Warn

When storing batteries, they should be placed correctly according to the packaging box labels. It is strictly prohibited to place them upside down, sideways, or tilted. When stacking, they must comply with the stacking requirements on the outer packaging.

Warn

When storing batteries, please store them separately and avoid mixing them with other equipment or stacking them too high. Firefighting facilities that meet the requirements must be available on site, such as fire sand, fire extinguishers, etc.

Notice

It is recommended to use the battery in time. For batteries stored for a long time, please recharge them regularly, otherwise the battery may be damaged. The storage environment temperature is $-5^{\circ}\text{C} \sim 35^{\circ}\text{C}$ (constant humidity and heat are recommended to avoid condensation), and the recommended storage environment temperature is $20^{\circ}\text{C} \sim 30^{\circ}\text{C}$.

- When the storage environment temperature is $0^{\circ}\text{C} \sim 40^{\circ}\text{C}$ (recommended storage environment temperature is $20^{\circ}\text{C} \sim 30^{\circ}\text{C}$), the storage cycle can reach
- ≥ 2 months, long-term storage of the battery is not recommended, and the battery should be used promptly or recharged in accordance with the lithium battery recharge cycle.

- When the storage environment temperature is 40°C~60°C, the storage period is required to be less than 2 months. If it exceeds 2 months, the battery status needs to be checked and the battery module needs to be placed in an environment of 0°C~40°C.
- Relative humidity ≤95% RH.
- The battery module packaging box should be intact and undamaged.
- Do not remove the battery packaging. If the battery needs to be recharged, it must be done by a professional according to the requirements, and the battery must be put back into the packaging after the recharging is completed.
- The warehouse manager should keep statistics on battery storage every month and report the battery inventory status regularly. For batteries stored for a long time, they must be recharged in a timely manner.
- When batteries are shipped, the first-in-first-out principle should be followed.
- If the battery storage period has expired, it should be reported promptly.

4.4 Battery module storage time and supplementary charging recommendations

The longer the battery module is stored, the greater the attenuation of the battery capacity. When the battery module is stored for a certain period of time, the battery module needs to be recharged. It is recommended to confirm whether to recharge or scrap the battery module according to Table 4-1 .

Table 4.4-1 Battery module storage time and supplementary power recommendations

Storage time (months)	Supplementary power recommendation	illustrate
0 to 9	No action is required, activate the battery module as soon as possible	Things to know <ul style="list-style-type: none"> • the storage environment temperature is 0 °C ~40 °C and the interval from the last recharge is 0 to 12 months, the irreversible storage decay of the battery capacity is about 3% to 10% . • The interval between two recharges shall not exceed 12 months.
9 to 12	First time to charge	
18~24	Second recharge	
27~36	The third recharge	
3rd recharge + 12 months later	Recommended to scrap	

4.5 Battery module supplementary power

Notice

- Supplementary power operation must be performed by professionals who have received skill training. During the operation, they need to wear insulating gloves and use special insulating tools.
- During the recharging process, someone must be on site to observe so that abnormalities can be dealt with in a timely manner.

- During the charging process, if the battery swells or emits smoke, stop charging immediately and scrap it.

PU 80&160 Series Cabinet supplementary power

Step 1 Check the battery module to be charged to ensure that the model meets the requirements and there is no deformation, damage or leakage on the appearance.

Step 2: Confirm that the battery module to be charged is discharged.

Step 3: Switch the battery circuit breaker on the top of the PU 80&160 series cabinet to "OFF" to put the PU 80&160 series cabinet in the disconnected state.

Step 4: Install the battery module and its cables.

Step 5 Turn the circuit breaker to "ON" and press the "START" button on the battery control unit.

Step 6 On the touch screen of the PU 80&160 series cabinet, complete the parameter settings in Quick Settings.

Step 7 : Click on the display control to recharge the cluster .

Step 8 : Observe the charging status of the battery module in real time until charging is completed (the battery module SOC displayed on the touch screen just reaches 50%).

Step 9 : After the charging is completed, power off the PU 80&160 series cabinet. Turn the battery circuit breaker on the top of the PU 80&160 series cabinet to "OFF" .

Step 10 Measure the voltage of the battery module to check whether the supplementary power is qualified.

Step 11: Remove the connecting cables of the battery module, put the battery module back into the original packaging box, and refresh the original packaging box .

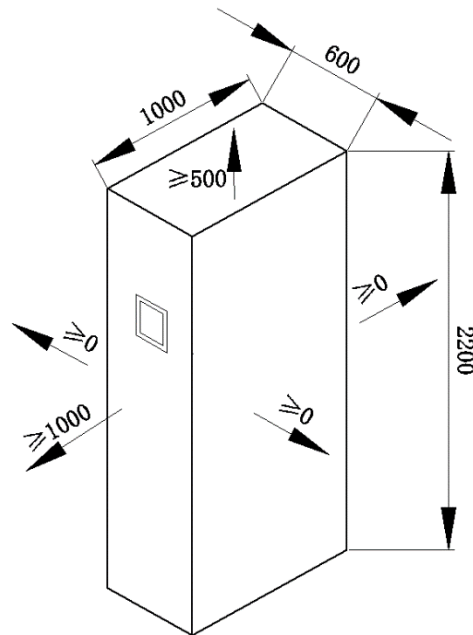
The last charging time and the next charging time on the battery label should be checked , and the battery should be used as soon as possible .

5 Installation and wiring

5.1 Installation space requirements

A certain amount of operating and ventilation space must be reserved around the cabinet:

- At least 1000mm of ventilation and operation space must be reserved in front.
- At least 500mm of operating space must be reserved at the top.
- Supports back-to-wall installation, no space is required behind. Figure 5.1-1 Reserved space (unit: mm)



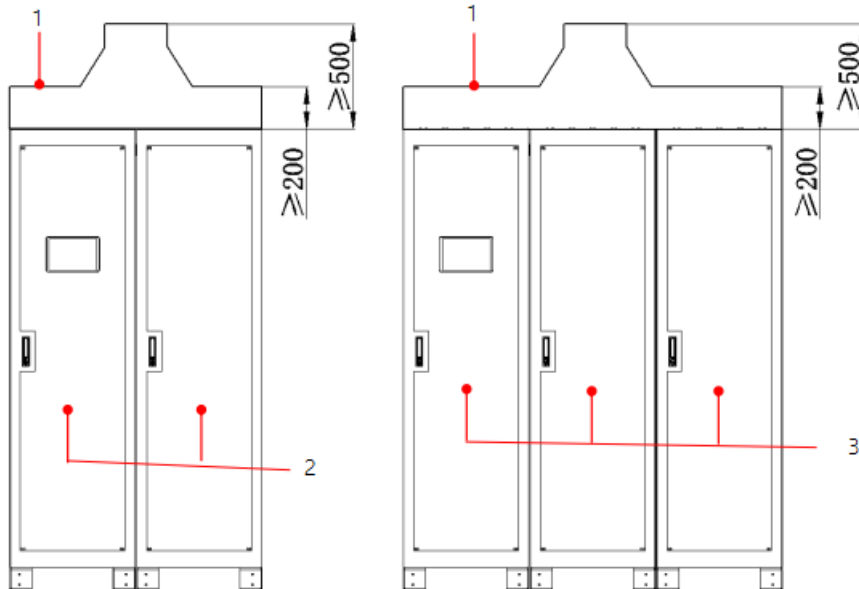
 **illustrate**

The side of the cabinet supports wall installation. It is recommended that the side of the cabinet be at least 400mm away from the wall .

The wiring rack and cable entry duct on the top of the cabinet need to be at a certain height:

- It is recommended that the cable tray and cable entry duct face the cable outlet position on the top of the cabinet. If multiple cabinets share one cable entry duct, the size and angle of the cable entry duct must meet the minimum bending radius requirements for laying cables. For the minimum bending radius, refer to the cable technical specification.
- The wiring rack and cable duct are provided by the customer. The appearance shown in the figure is for reference only. The specific appearance shall be subject to the actual site survey data.

Figure 5-2 Requirements for cable trays and cable ducts in parallel cabinet scenarios (unit: mm . For the requirements for cable clamps and cable ducts when more than three cabinets are connected in parallel, refer to the requirements for three cabinets in parallel)






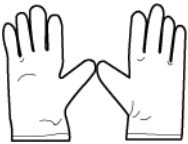


- (1) Cable tray and cable entry duct (2) 2 cabinets combined scenario (3) 3 cabinets combined scenario

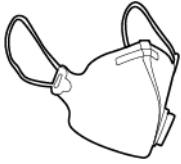

5.2 Preparation before installation

5.2.1 Tool Preparation




On-site operators can add or reduce tools as appropriate based on the specific construction conditions.

Protective equipment








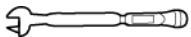
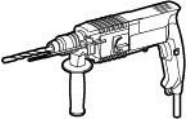
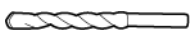

 helmet	 Goggles	 Safety shoes	 Reflective vest
 Anti-static gloves	 Insulating gloves	 Protective gloves	 seat belt







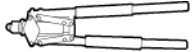

 <p>Dust masks</p>	 <p>Insulated shoes</p>	-	-
---	--	---	---

Handling tools

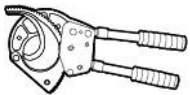
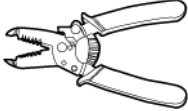
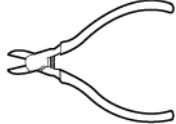
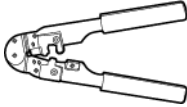

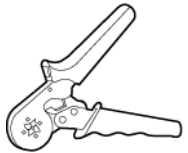

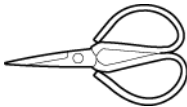
 <p>Electric forklift</p>	 <p>Manual forklift</p>	 <p>Lifting car</p>	-
--	--	---	---

Hardware Installation Tools




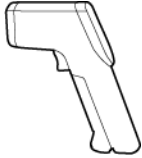
  <p>Slotted insulated torque screwdriver (M2.5)</p>	  <p>Cross insulated torque screwdriver (M4/M5/M6)</p>	 <p>Insulated torque socket wrench with extended socket (M8/M10/M12/M16)</p>	  <p>Hexagon wrench</p>
 <p>Torque adjustable wrench</p>	 <p>Impact drill</p>	 <p>Impact drill bit (Φ1 2 mm)</p>	 <p>Claw hammer</p>

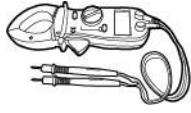





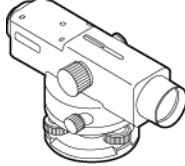



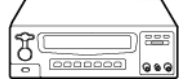

 Electric Screwdriver	 Herringbone ladder	 Vise	 Rubber hammer
 Utility knife	 Marker pen	 Rivet gun	 Insulation ladder

Cable Installation Tools

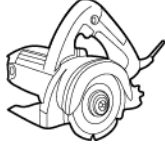

 Wire cutters	 Wire strippers	 Diagonal pliers	 Crystal head crimping pliers
 Electric hydraulic pliers	 Cold Press Terminal Crimping Pliers	 Heat Gun	 Scissors

Measuring instruments

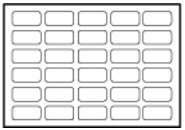

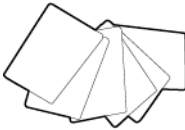

 Altimeter	 Laser positioning device	 Electric pen	 Thermometer
--	---	--	--

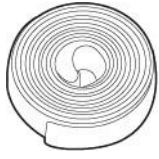
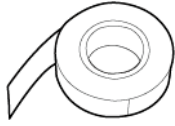
 <p>Clamp Meter</p>	 <p>Leather measuring tape</p>	 <p>Steel measuring tape</p>	 <p>Square</p>
 <p>Level</p>	 <p>Laptop</p>	 <p>Level</p>	 <p>multimeter</p>
 <p>Network Tester</p>	 <p>Phase sequence table</p>	 <p>Withstand pressure tester</p>	 <p>Megaohmmeter</p>

Construction Machinery




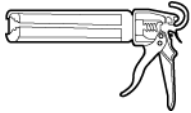

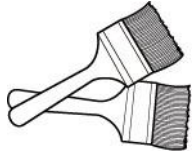

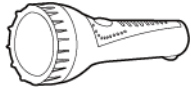
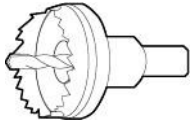


 <p>Small cutting machine</p>	 <p>Cable reels</p>	<p>-</p>	<p>-</p>
--	--	----------	----------

Engineering auxiliary materials

 <p>Label paper</p>	 <p>Cable Ties</p>	 <p>cotton</p>	 <p>sandpaper</p>
--	---	--	--

		-	-
Heat shrink tubing	Insulation tape		

Other Tools

			
Electrician's knife	Hacksaw	Powder Hopper	Glue gun
			
brush	Paint brush	Vacuum cleaner	flashlight
			-
Hole opener	Insulation pad	Lightning arrester module extraction tool	

5.2.2 Communication cable preparation

Table 5.2.2-1 Communication cable description

Cable Name	Cable Description
Parallel communication line	: 5m , 10m and 15m , select according to the distance between the parallel cabinets.
UPS communication line	Customers should prepare according to actual situation
Battery module communication line	Delivered with the cabinet.

5.2.3 Power Cable Preparation

Things to know

- The bolt specifications in the table are only suitable for one end of the PU 80&160 series cabinet cable. For the bolt specifications suitable for the other end of the cable, refer to the corresponding UPS manual for selection.
- The selection, connection and routing of cables must comply with local laws and regulations.
- When external conditions change, such as the laying method or ambient temperature, it is necessary to refer to IEC-60364-5-52 or local relevant specifications for verification.
- Cable type: 90°C copper conductor flexible cable, single core.
- It is recommended that the cable length between the PU 80&160 series cabinet and the UPS should not exceed 50 m. In the PU 80&160 series parallel scenario, the length and specification of the power cables of each unit should be as similar as possible.
- When the number of PU 80&160 series cabinets connected in parallel is greater than 8, a maximum of four 15m parallel communication cables are supported.

cabinet connection : + /N/- . Customers should prepare them according to actual needs.
The recommended cable diameter is $\geq 185 \text{ mm}^2$.

Connection method: cable crimping DT terminal

+ /N/- bolt specifications: M8x20mm (12N·m), PE bolt specifications: M6 , M8 , M10
(8N ·m , 12N·m , 20N·m)

N line : only needs to be configured when the UPS has N line model

5.3 Transportation and unpacking inspection

Things to know

- To prevent the equipment from tipping over, secure the box containing the equipment to the forklift with ropes before moving it. Be careful when moving the equipment; impact or falling may cause damage to the equipment.
- Once the device is positioned, remove the packaging carefully to avoid scratching the device. Keep the device stable during the unpacking process.
- Before removing the battery from the packaging, check whether the packaging is intact. Batteries with damaged packaging cannot be used. If damaged, please notify the transporter and manufacturer immediately.
- After unpacking, please check whether the fastening components and detachable parts are loose. If so, please notify the transporter and manufacturer immediately.
- If the installation environment is poor, please take dust and condensation prevention measures after removing the packaging (such as using a dust cover, plastic film or textile cover) to prevent condensation or dust corrosion inside the battery.


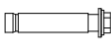

Step 1 Use a forklift to transport the cabinet to the designated location.



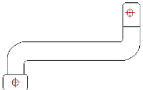
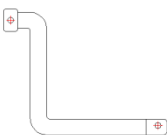


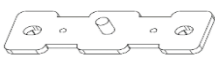


Step 2 Remove the outer packaging and dust cover, and keep the dust cover and accessories






Step 3 Check the integrity of the cabinet.

1. Check the appearance of the cabinet to confirm whether it is damaged during transportation. If it is damaged, please take photos and contact the carrier.
2. Check the delivery packing list to see if the equipment accessories are complete and correct. If you find that the accessories are missing or the models are not consistent, please make on-site records in time and contact the supplier immediately.

Table 5.3-1 List of Attachments

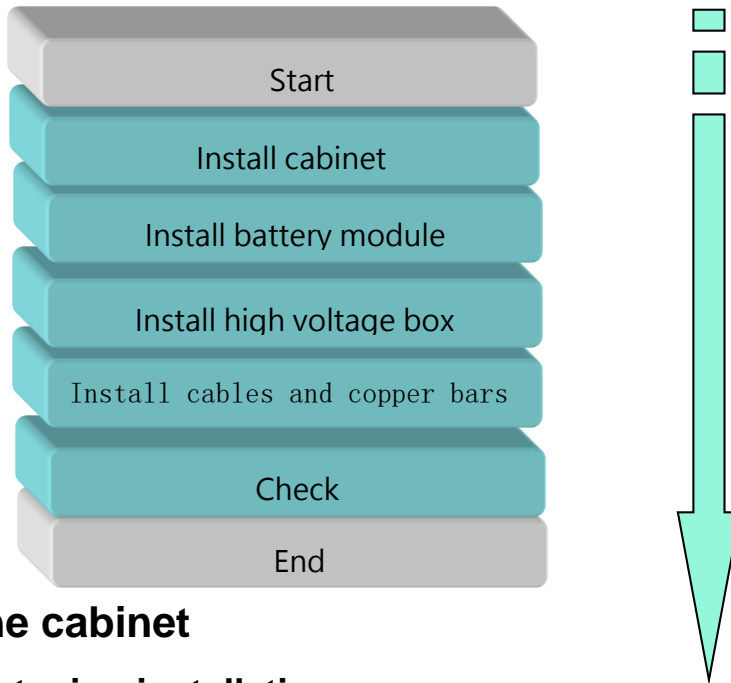
Appearance Style	name	quantity
	B+_2 Cable	8+8 scenario: 1PCS
	B+_4 Cable	7+7 scenario: 1PCS
	B+_6 Cable	6+6 scenario: 1PCS
	N_1 cable	8+8 scenario: 1PCS 8+0 scenario: 1PCS
	N_2 Cable	8+8 scenario: 1PCS
	N_3 Cable	6+6 scenario: 1PCS 6+0 scenario: 1PCS
	N_4 Cable	6+6 scenario: 1PCS
	B-_1 cable	8+8 scenario: 1PCS 8+0 scenario: 1PCS 7+7 scenario: 1PCS 7+0 scenario: 1PCS 6+6 scenario: 1PCS 6+0 scenario: 1PCS
	M12X100 expansion bolt assembly	4pcs each
	M4x12 combination screw	8+8 scenario: 52PCS, 8+0 scenario: 26PCS 7+7 scenario: 42PCS, 7+0 scenario: 21PCS 6+6 scenario: 40PCS, 6+0 scenario: 20PCS
	M6x16 combination screw	8+8 scenario: 8PCS, 8+0 scenario: 4PCS 7+7 scenario: 8PCS, 7+0 scenario: 4PCS 6+6 scenario: 8PCS, 6+0 scenario: 4PCS

Appearance Style	name	quantity
	M8×20 combination screw	8+8 scenario: 44PCS, 8+0 scenario: 22PCS 7+7 scenario: 40 PCS, 7+0 scenario: 20 PCS 6+6 scenario: 36PCS, 6+0 scenario: 18PCS
	M 8 hexagon flange nut	8+8 scenario: 2PCS, 8+0 scenario: 1PCS 6+6 scenario: 2PCS, 6+0 scenario: 1PCS
	Copper busbar 1	8+8 scenario: 1PCS 7+7 scenario: 1PCS 6+6 scenario: 1PCS
	Copper busbar 2	8+8 scenario: 1PCS, 8+0 scenario: 1PCS
	Copper busbar 3	7+7 scenario: 1PCS, 7+0 scenario: 1PCS
	Copper busbar 4	6+6 scenario: 1PCS, 6+0 scenario: 1PCS
	Copper busbar 5	8+8 scenario: 12PCS, 8+0 scenario: 6PCS 7+7 scenario: 12PCS, 7+0 scenario: 6PCS 6+6 scenario: 8PCS, 6+0 scenario: 4PCS
	Copper busbar 6	8+8 scenario: 2PCS, 8+0 scenario: 1PCS 6+6 scenario: 2PCS, 6+0 scenario: 1PCS
	Center line end cap	8+8 scenario: 2PCS, 8+0 scenario: 1PCS 6+6 scenario: 2PCS, 6+0 scenario: 1PCS
	Master control-slave control harness 1	8+8 scenario: 1 PCS, 8+0 scenario: 1 PCS 7+7 scenario: 1PCS, 7+0 scenario: 1PCS 6+6 scenario: 1PCS, 6+0 scenario: 1PCS

Appearance Style	name	quantity
	Master control-slave control harness 2	8+8 scenario: 1PCS 7+7 scenario: 1PCS 6+6 scenario: 1PCS
	Slave terminal harness	8+8 scenario: 2 PCS, 8+0 scenario: 1 PCS 7+7 scenario: 2PCS, 7+0 scenario: 1PCS 6+6 scenario: 2PCS, 6+0 scenario: 1PCS
	Slave control series wiring harness	8+8 scenario: 14 PCS, 8+0 scenario: 7 PCS 7+7 scenario: 12PCS, 7+0 scenario: 6PCS 6+6 scenario: 10PCS, 6+0 scenario: 5PCS
	High voltage box series wiring harness	Single cluster has no such line Single cabinet 2 clusters cable length 2.5 m Multiple cabinets can customize line length and quantity according to actual needs
	CAN port debugging line	1 PCS each

5.4 Installation Process

Figure 5.4-1 Installation process

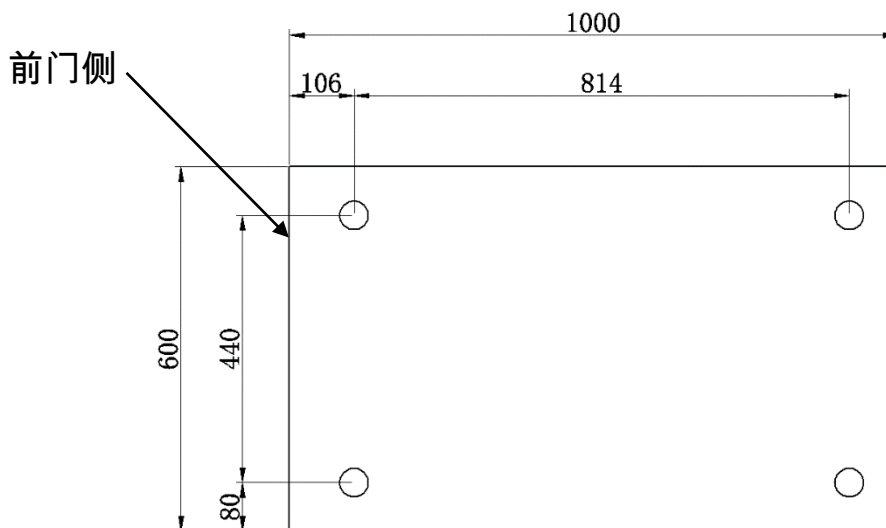


5.5 Install the cabinet

5.5.1 Fastening installation

Step 1 Determine the cabinet installation location and draw the installation holes on the installation surface according to the drawing.

Figure 5.5.1-1 Installation hole position (unit: mm)



Step 2: Use an impact drill to drill holes in the installation holes for the expansion bolts, and then install the expansion tubes into the installation holes.

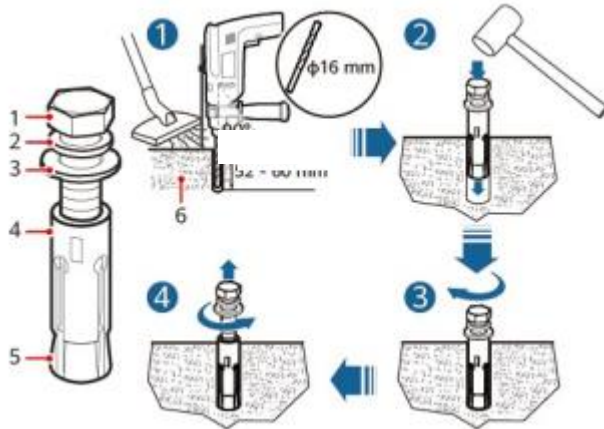
1. Use an impact drill to drill holes in the cement floor to a depth of 90 mm to 100 mm .
2. Slightly tighten the expansion bolt and place it vertically into the hole. Use a rubber hammer to hit the expansion bolt until the expansion tube is completely in the hole.

3. Pre-tighten the expansion bolts.
4. Unscrew the bolts and remove the spring washers and flat washers.

Things to know

The depth of the expansion bolts should be such that the expansion tube is fully inserted into the hole. The expansion tube should not be higher than the ground to avoid affecting the subsequent cabinet installation.

Figure 4.3.1-2 Drilling and installing expansion pipe



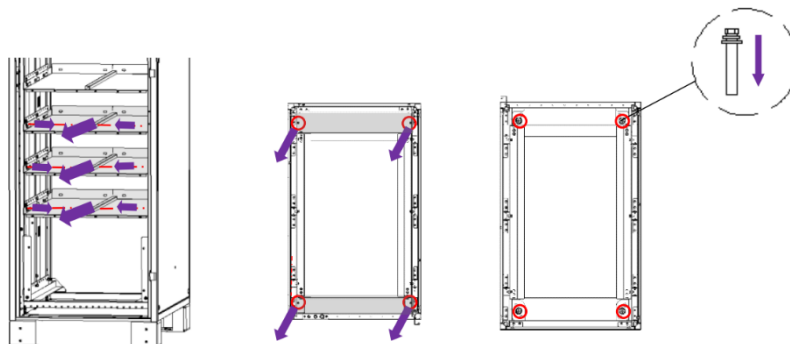
(1) M12 bolt	(2) Spring washer	(3) Flat washer
(4) Expansion tube	(5) Expansion nut	(6) Cement floor

Step 3 Move the cabinet to the installation location.

Step 4 Secure the cabinet.

- a. Remove the screws on both sides of the tray (6 pieces in total, M4 x12 screws) , and then pull out the tray . Remove the fixing screws of the front and rear covers 1 and 2 at the bottom of the cabinet (4 pieces in total , M 4X12 screws) , and remove the covers .
- b. Insert the expansion bolts (4 PCS, M12×100, with flat washers and spring washers) into the expansion bolt installation holes on the ground and tighten the expansion bolts with a torque of 4 2 N • M.
- c. Replace the bottom cover and battery tray and secure with the 4 X12 hex screws removed previously , with a torque of 2.5 N·m .

Figure 4.3.1-3 Tightening expansion bolts

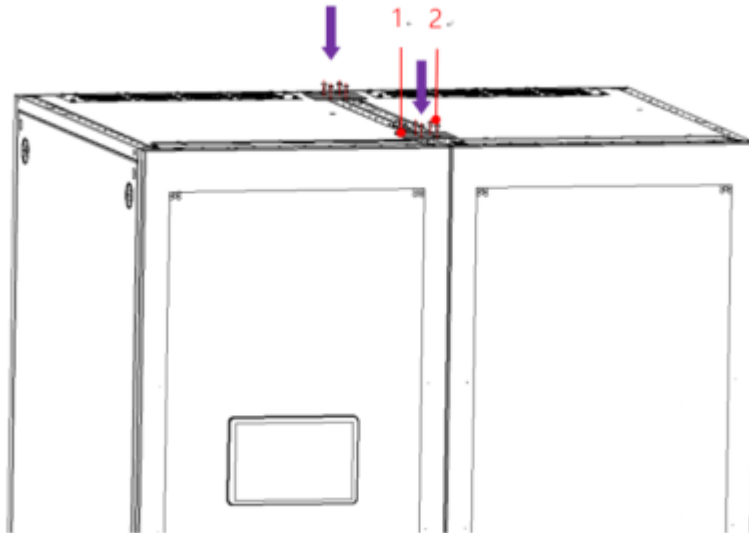


5.5.2 Cabinet Installation

Step 1 Install each cabinet in sequence according to the single cabinet installation method.

Step 2: Combine the cabinets. (2pcs of parallel brackets, 8pcs of M5X10 self-tapping screws)

Figure 4.5.2-1 Installing cabinet components



(1) Parallel bracket (2) M5X10 self -tapping screws

---- Finish

5.6 Installing the battery module

Danger

Pay attention to the positive and negative poles during battery installation. It is strictly forbidden to short-circuit the positive and negative poles of a single battery or battery string, otherwise it will cause a battery short circuit.

Danger

It is recommended that fire-fighting facilities that meet the requirements be available on site, such as fire sand, carbon dioxide fire extinguishers, etc.

Danger

During installation, you need to wear insulating gloves and use insulating tools to avoid electric shock or short circuit failure.

Danger

A single battery module must be carried by more than three people or using a lift. When using a lift to enter the aisle to carry the battery module, the angle of the lift can be flexibly adjusted to facilitate installation.

- When using a lift to install the battery module, when the battery module is pushed in beyond the prompt line, the center of gravity of the battery module is on the pallet. At this time, the height of the lift table can be appropriately lowered to separate the battery module from the lift table. Pushing the battery module in again can avoid collision between the battery module front cover and the lift.
- When using a lift to remove the battery module, when the battery module is pulled out beyond the prompt line, the center of gravity of the battery module is on the lift. At this time, the height of the lift table can be appropriately raised to separate the battery module from the tray. Pulling out the battery module can avoid the rear end of the battery module from colliding with the front cover of the lower battery module.

Warn

Tighten the fastening screws of the copper busbar or cable according to the torque specified in the text, and regularly check whether they are tightened, whether there is rust, corrosion or other foreign matter, and clean them. Otherwise, loose connection of the screws will cause excessive voltage drop in the connection, and even generate a lot of heat and burn the battery when the current is large.

Warn

It is strictly forbidden to place installation tools, metal parts and sundries on the battery during installation. After installation, clean up the battery and surrounding objects in time.

Notice

- When transporting batteries, it is prohibited to remove protective parts on the battery terminals, such as protective covers or waterproof caps.
- When transporting the battery module, it is prohibited to lift it by the battery terminal.
- The installed batteries should be of the same manufacturer and model, and batteries from the same batch are recommended.
- When installing the battery, please install it horizontally from bottom to top and from left to right to prevent it from tipping over due to excessive center of gravity.
- When tightening the battery connection, ensure that the screw spring washer is flat, the protruding part of the terminal on the cable faces outward, and the cable is not damaged.
- Please place the battery properly to avoid vibration and shock.

Things to know

- Before installing the battery, please read the electrical safety precautions carefully.
- After tightening the screws, the operator needs to mark them. After the inspection, the inspector will mark the screws with different colors.
- If the battery is not powered on after installation, please take measures to prevent dust and condensation (such as using a dust cover, plastic film or textile cover) to prevent condensation or dust accumulation inside the battery and corrosion. Please remove the protective equipment when putting it into operation.

- When there is only one cluster in the cabinet, it can only be installed on the right side.

Step 1 Before installing , check whether the battery module meets the requirements in the table below. If so, proceed to the next step of installation. If not, please contact our technical staff.

Voltage	Internal resistance	Insulation resistance
6.4V ± 0.4V	4-6mΩ	≥ 1.0GΩ

Step 2 Install the battery module

picture 4.6-1 Installing the battery module (8+8, 8+0 scenario)

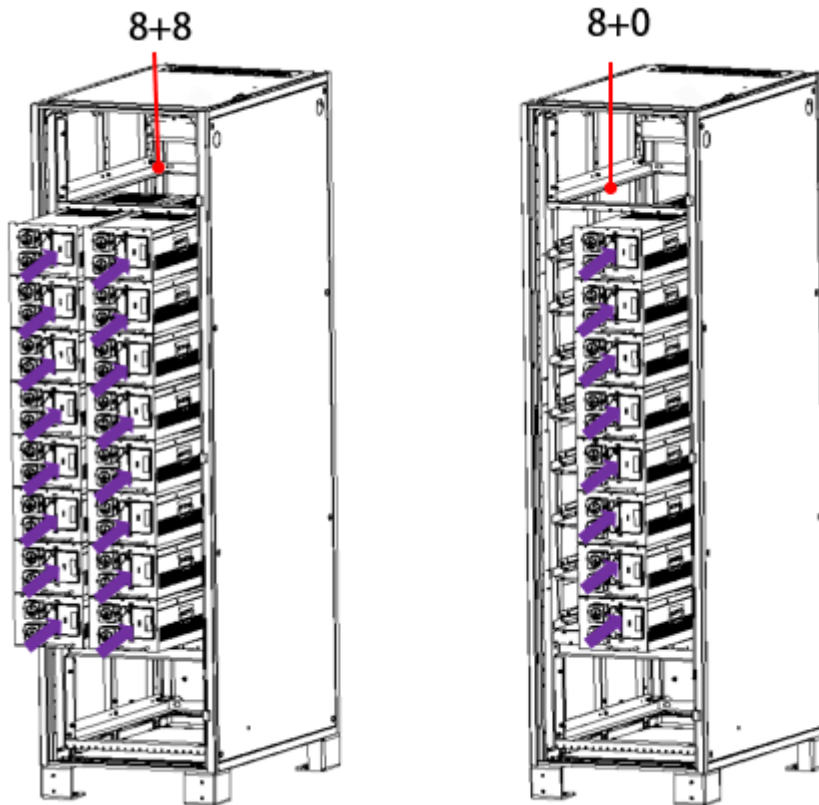


Figure 4.6-2 Installing battery modules (7+7 , 7+0 scenarios)

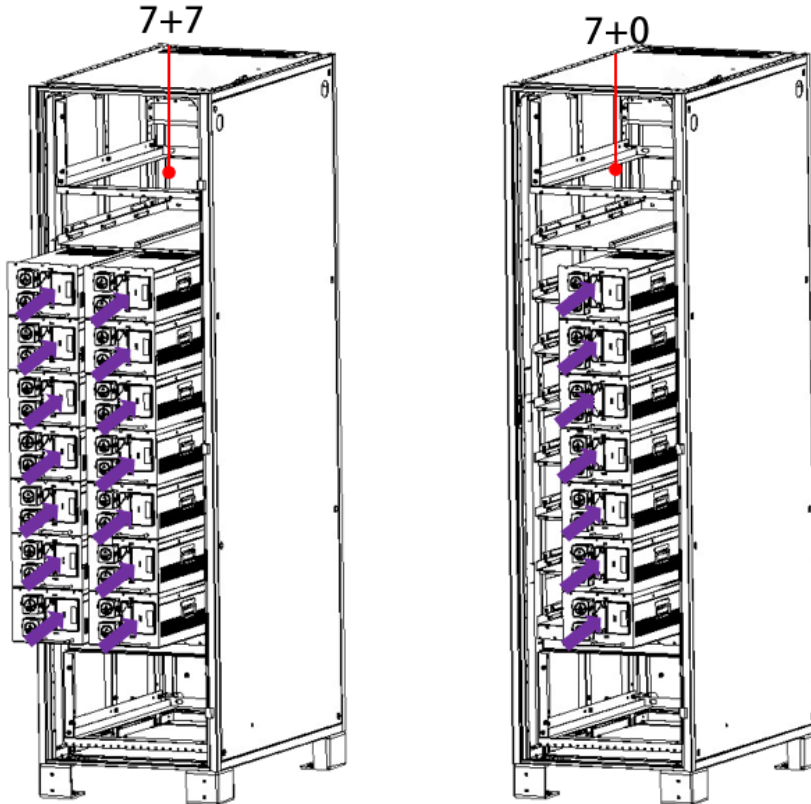
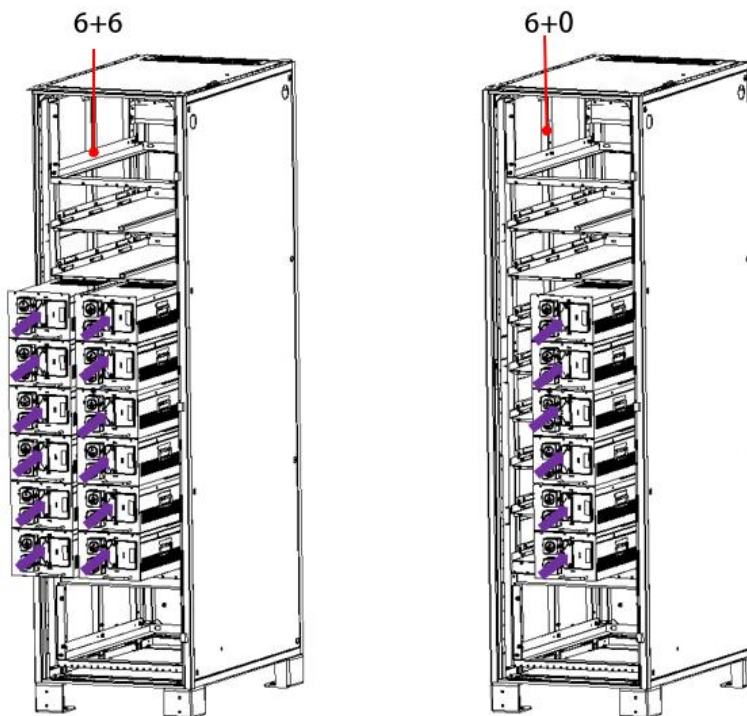
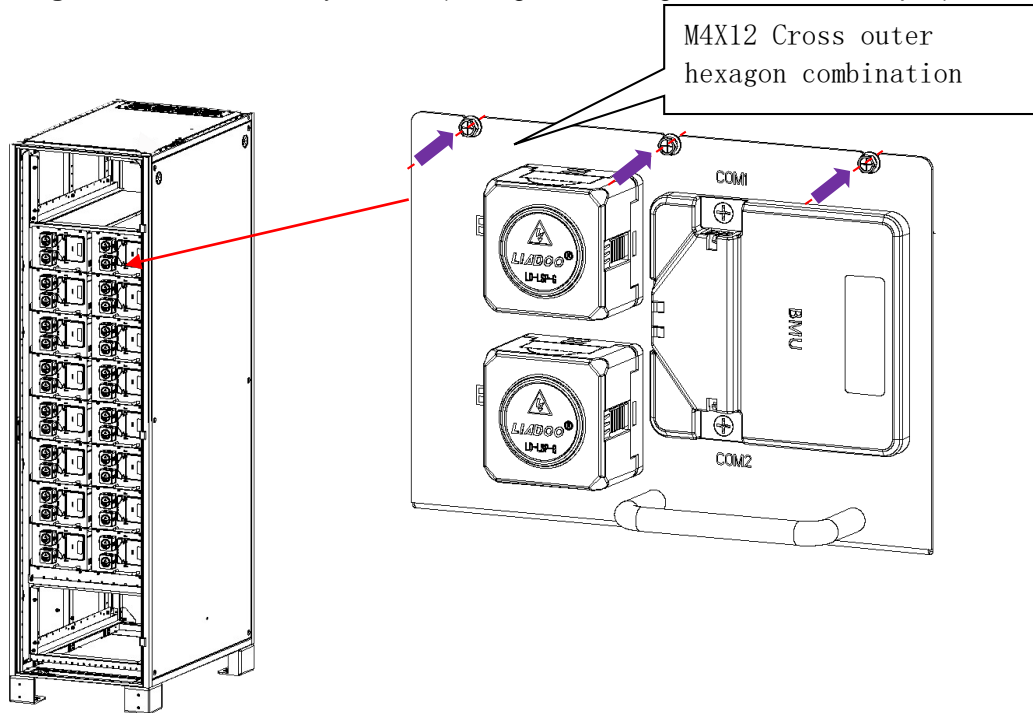


Figure 4.6-3 Installing the battery module (6+6 , 6+0 scenario)



Step 3 Fix all battery modules (fix each module with 3 M 4X12 screws, screw torque $2N \cdot M$).

Figure 4.6-4 Fixed battery module (taking 8 + 8 configuration as an example)



5.7 Installing the high voltage box (R BMS)

A single high-voltage box must be carried by more than three people or using a lift. When using a lift to enter the passage to carry the high-voltage box , the angle of the lift should be flexibly adjusted for easy installation.

- using a lift to install the high-voltage box , after the high-voltage box is pushed in to a certain extent , the center of gravity of the high-voltage box is on the pallet. At this time, the height of the lift table can be appropriately lowered to separate the high-voltage box from the lift table. Pushing the high-voltage box in can avoid collision between the front cover of the high-voltage box and the lift.
- using a lift to remove the high-voltage box , when the high-voltage box is pulled out beyond a certain extent , the center of gravity of the high-voltage box is on the lift. At this time, the height

of the lift table can be appropriately raised to separate the high-voltage box from the pallet, and then the high-voltage box can be pulled out.

Notice

- When transporting the high-voltage box , it is prohibited to lift and transport it by the high-voltage box terminal.
- Please place the high voltage box properly to avoid vibration and shock.

Things to know

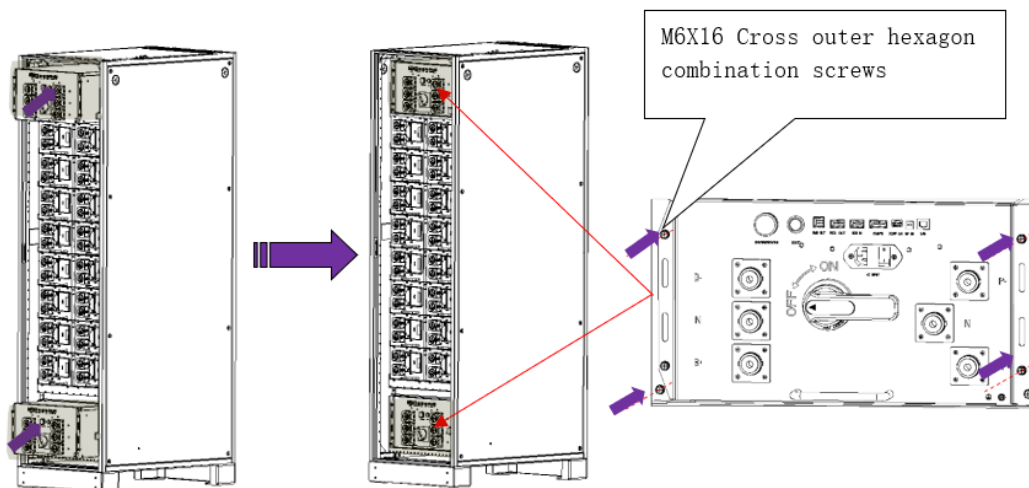
- installing the high voltage box , please read the electrical safety precautions carefully.
- After tightening the screws, the operator needs to mark them. After the inspection, the inspector will mark the screws with different colors.
- the high-voltage box is not powered on after installation, please take measures to prevent dust and condensation (such as using a dust cover, plastic film or textile cover) to prevent condensation or dust accumulation inside the battery and corrosion. Please remove the protective equipment when it is put into operation.

Step 1: Install into high voltage box

 illustrate :

- In half cabinet configuration, the high-voltage box can only be installed at the bottom
- 8+8, 7+7 , and 6 +6 scenarios , install a high-voltage box on the top and bottom. For 8+0, 7+0 , and 6 +0 scenarios , install a high-voltage box on the top. Taking 8 +8 as an example, 4 high-voltage boxes are used for each M 6X16 screw fixing, torque 8 N • M

Figure 4.7-1 Install into high voltage box and fix



5.8 Install copper busbars and cables

Notice

- Before installing the cables, you need to check whether the circuit breaker switch of the high-voltage box is in the disconnected state.

- All cables and copper bars need to be securely fixed, and all screws used to fix the cables need to ensure that the screws meet their respective torque requirements.

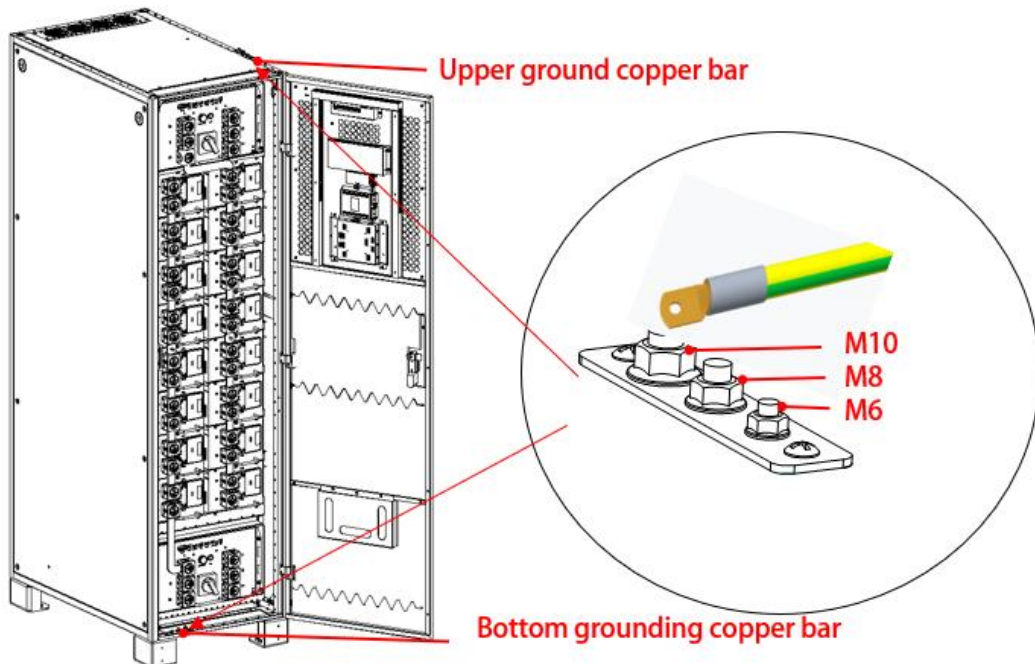
5.8.1 Install cabinet grounding wire

Select the nearest grounding copper busbar according to the line entry method (upper or lower), and select the appropriate screw column to install the ground wire according to the hole size of the external ground wire terminal. The screw torque is: M8 is 1.2 N • M.

illustrate :

- When installing, you need to remove the nut on the stud first.
- It is recommended that the ground wire is at least 70 square meters.
- When the line is connected from the top, lock the ground wire on the upper copper busbar. When the line is connected from the bottom, first pass the ground wire through the brush and then connect it to the copper busbar.

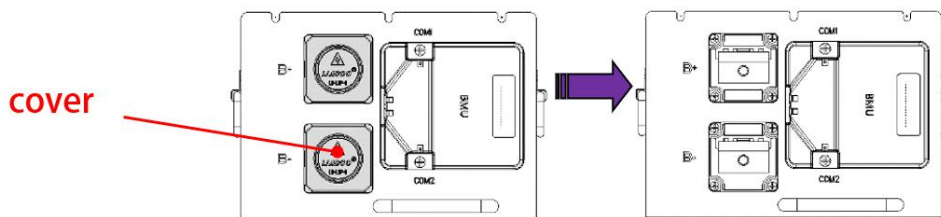
Figure 5.8.1-1 Connect the cabinet ground wire



5.8.2 Install copper busbar

Step 1 Remove the covers of all battery modules and connectors in the high voltage box in the cabinet.

Figure 5.8.2-1 Removing the connector cover (taking the battery module as an example)



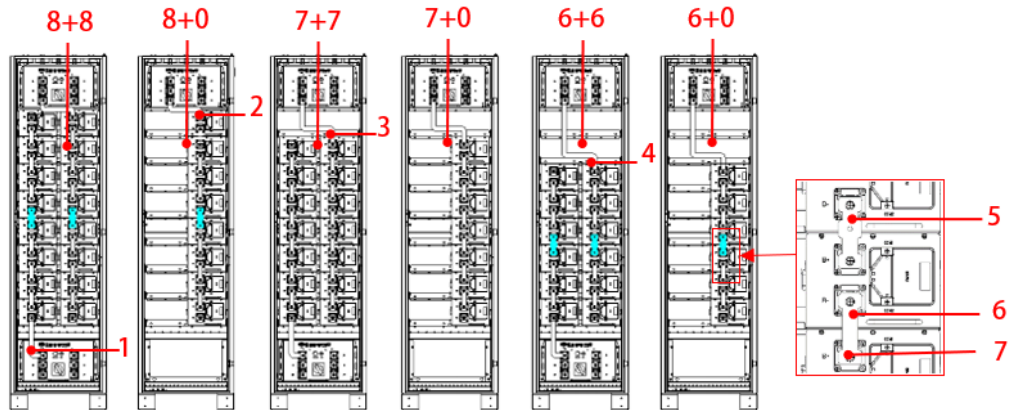
Step 2 Install the copper busbar (fix each copper busbar to the connector with 2 PCS M8X20

hexagon screws, the screw torque is 1 2N • M)

Notice 

The screw torque must meet the requirements, otherwise it may cause excessive contact resistance and severe heating, resulting in damage to related accessories.

Figure 5.8.2-2 Install copper busbar



Serial number	name	The amount of copper bars and screws used in this step (PCS)					
		8 +8	8 +0	7 +7	7 +0	6 +6	6 +0
(1)	Copper busbar 1	1	0	1	0	1	0
(2)	Copper busbar 2	1	1	/	/	/	/
(3)	Copper busbar 3	/	/	1	1	/	/
(4)	Copper busbar 4	/	/	/	/	1	1
(5)	Copper busbar 5	2	1	/	/	2	1
(6)	Copper busbar 6	1 2	6	1 2	6	8	4
(7)	M 8X20 Cross Hexagon Three Combination Screws	18	9	16	8	1 4	7

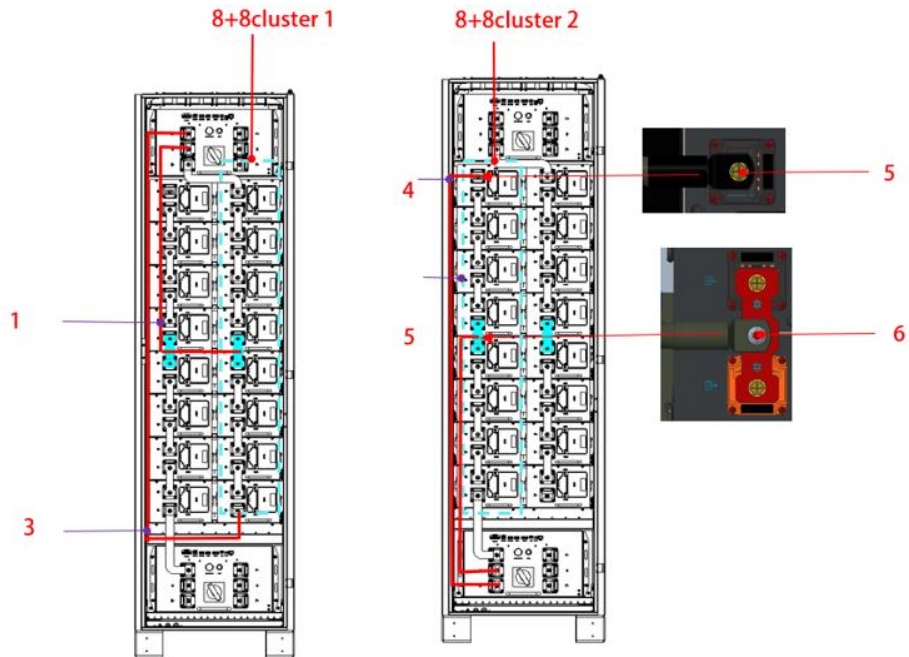
5.8.3 Installing power cables

Step 1 Install the power cable

 **illustrate :**

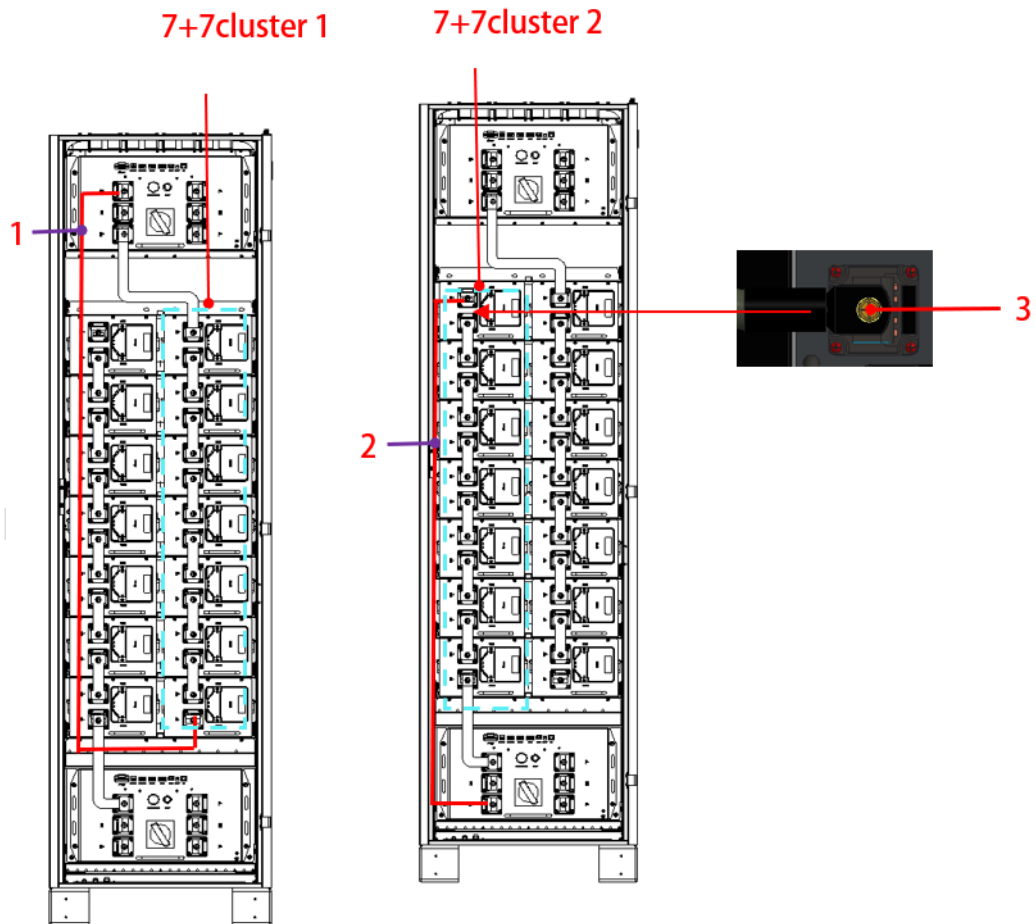
- The wiring direction of each power line terminal is locked on the connector according to actual needs. The following figure is only a wiring diagram and does not represent the specific wiring direction.
- The 7 +7 and 7 +0 scenarios have no center line, while the 8 +8 , 8 +8 , 6+6 , and 6+0 scenarios have a center line.
- After the power cables are fixed, insert the cables into the gaps on both sides of the cabinet and tie them up nearby.

Figure 5.8.3-1 Install power cables (8 +8 scene cluster 1 , 8 +8 scene cluster 2 , 8 +0 scene is the same as 8 +8 scene cluster 1)



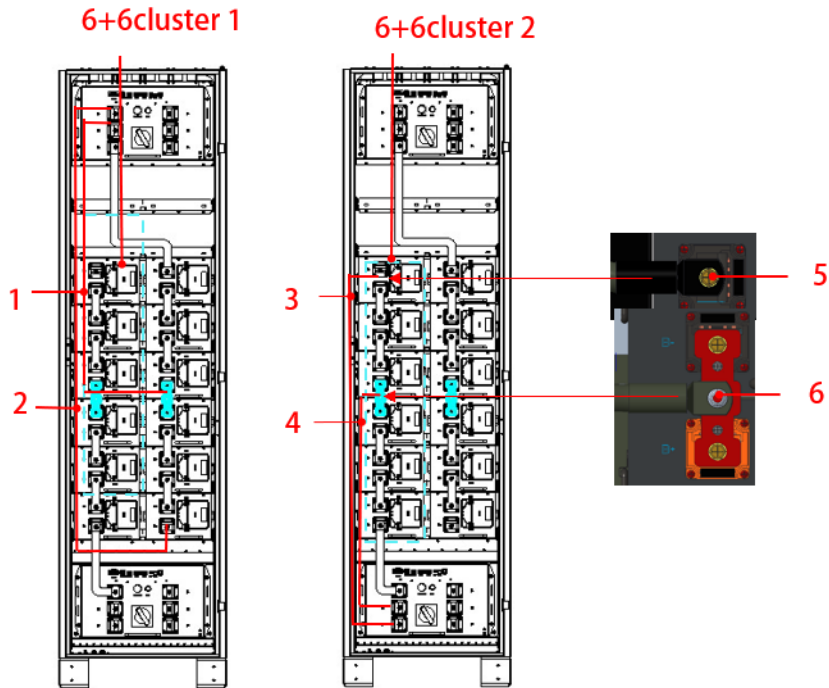
Serial number	name	8+8 scene usage	8+ 0 scene usage	Remark
(1)	Power line (P 1N)	1 PCS	1 PCS	
(2)	Power line (P1-)	1 PCS	1 PCS	
(3)	Power line (P2 +)	1 PCS	/	
(4)	Power line (P2N)	1 PCS	/	
(5)	M 8X20 Cross hexagon combination bolt	This step 4PCS	This step 2PCS	Battery module power line fixing
(6)	M 8 Flange Lock Nut	2 CS	1 PCS	Midline fixation

Figure 5.8.3-3 Installing power cables (7+7 scenario cluster 1, 7+7 scenario cluster 2, 7+0 scenario is the same as 7+7 scenario cluster 1)



NO.	Name	Qty for 7+7	Qty for 7+0	Notes
(1)	Power cable (P1-)	1PCS	1PCS	
(3)	Power cable (P4+)	1PCS	/	
(5)	M8X20 Cross hexagonal combination bolt	4PCS in this step	2PCS in this step	

Figure 5.8.3-4 Installing power cables (6+6 scenario cluster 1, 6+6 scenario cluster 2, 6+0 scenario is the same as 6+6 scenario cluster 1)



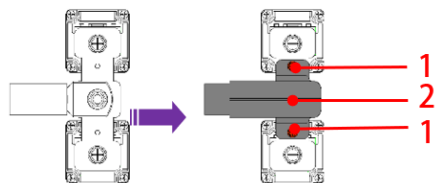
Serial number	name	8+8 scene usage	8+ 0 scene usage	Remark
(1)	Power line (P3N)	1 PCS	1 PCS	
(2)	Power line (P1-)	1 PCS	1 PCS	
(3)	Power line (P4 +)	1 PCS	/	
(4)	Power line (P4N)	1 PCS	/	
(5)	M 8X20 Cross hexagon combination bolt	This step 4PCS	This step 2PCS	
(6)	M 8 Flange Lock Nut	2 CS	1 PCS	

Step 2 Install the centerline end cap

illustrate :

Each center line end cap is fixed to the copper bus 2 with two M4X12 screws. The torque of the screws is 2N •M

Figure 5.8.3-5 Install the centerline end cap



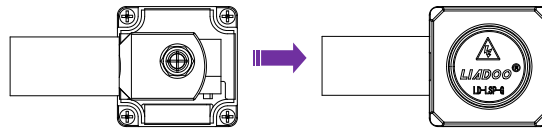
(1) M 4X12 cross hexagon screw (2) Center line end cover

Step 3 Replace the connector plastic cover

illustrate:

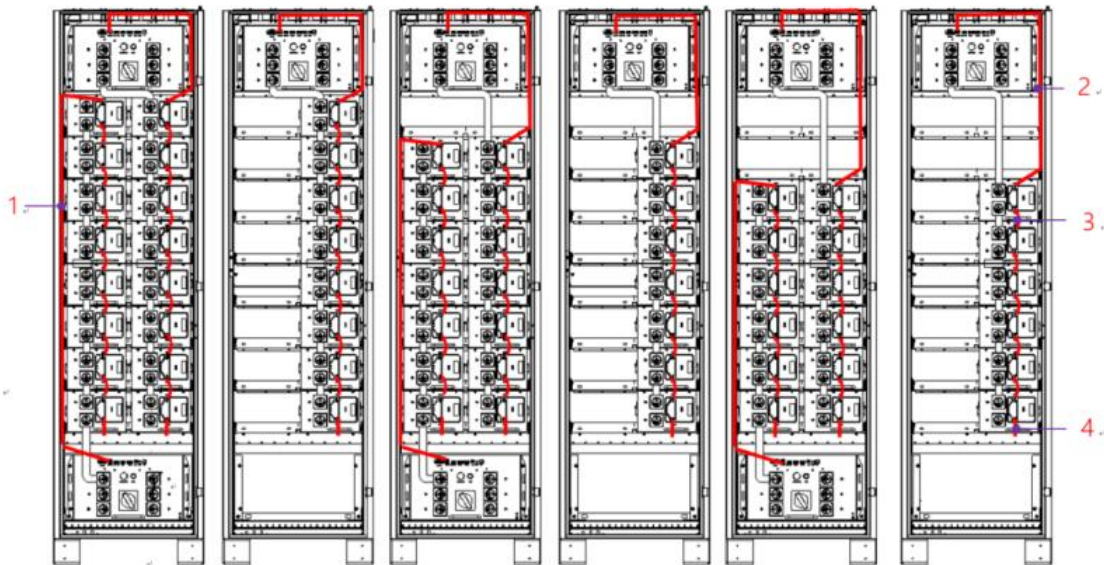
- The wiring terminals in the figure are only for reference. They may be wiring terminals or copper bars in reality. The direction of the wires is not fixed.
- The connector cover of the high voltage box to the USB is not installed for the time being.
- When installing the cover, you need to remove the plastic sheet of the knock-out hole on the cover.

Figure 5.9-4 Installing the Connector Cover



5.8.4 Installing slave communication harness

Figure 5.8.4-1 Installing slave control communication harness (B MU OUT port on the high voltage box)



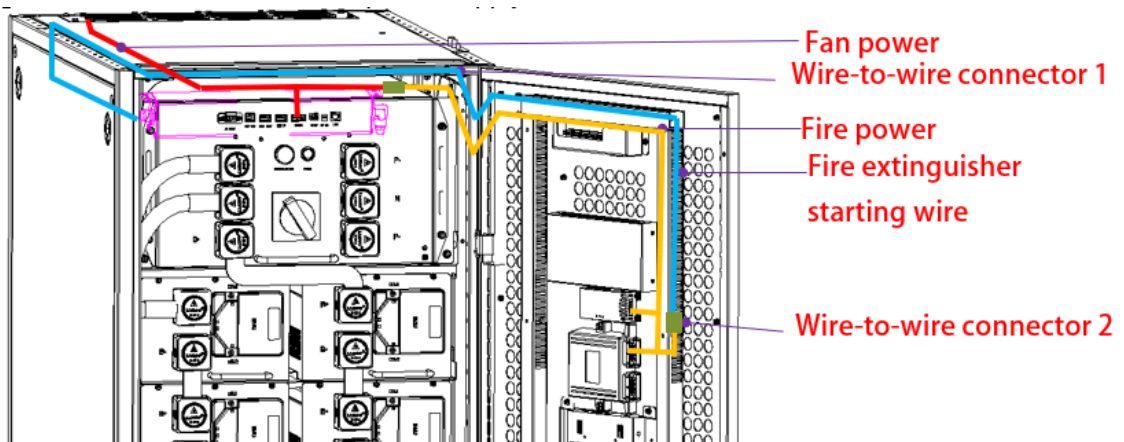
NO	Name	Connection location	The amount of copper bars and screws used in this step (PCS)					
			8 +8	8 +0	7 +7	7 +0	6 +6	6 +0
(1)	Master-slave communication harness 2	From the control and bottom high voltage box	1	/	1	/	1	/
(2)	Master-slave communication harness 1	Slave control and top high voltage box	1	1	1	1	1	1
(3)	Slave control series wiring harness	From control - From control	14	7	12	6	10	5
(4)	Slave terminal harness	Single cluster end	2	1	2	1	2	1

5.8.5 Installing Cabinet Fire Protection System Cables

📖 illustrate:

- Fire protection accessories are optional for customers. If the customer does not need cabinet fire protection, the fire protection related wiring harness does not need to be installed, and the fan power cord needs to be installed as usual.
- In this step, the cables have been pre-installed on the cabinet. You only need to plug the high-voltage box end plug into the corresponding socket (F AN/FC) of the high-voltage box.

Figure 5.8.5-1 Installation of fire power supply cable and fire communication harness

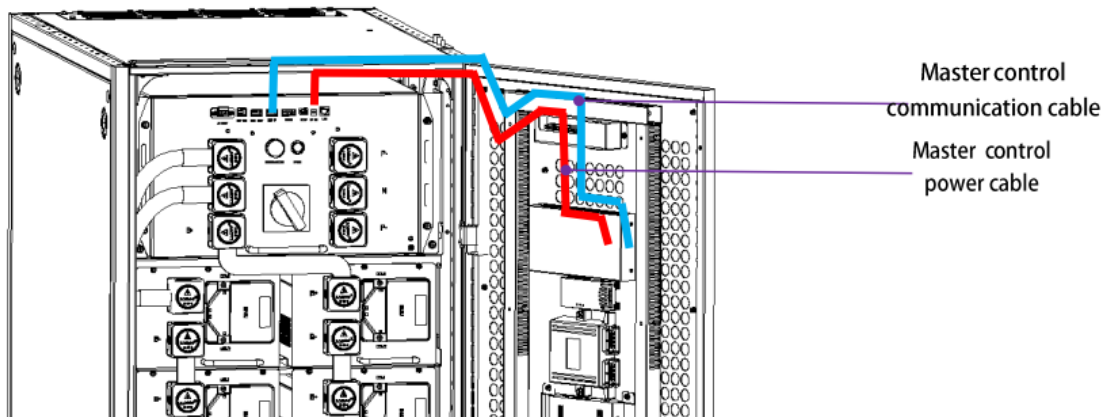


5.8.6 Installing the main control power cable and communication cable

📖 illustrate:

- The main control and display screen are only available in the master cabinet, so this step can be omitted in the slave cabinet.
- In this step, the cables have been pre-installed on the cabinet. You only need to plug the high-voltage box end plug into the corresponding socket of the high-voltage box.

Figure 5.8.6-1 Installing the main control power supply cable and main control communication harness



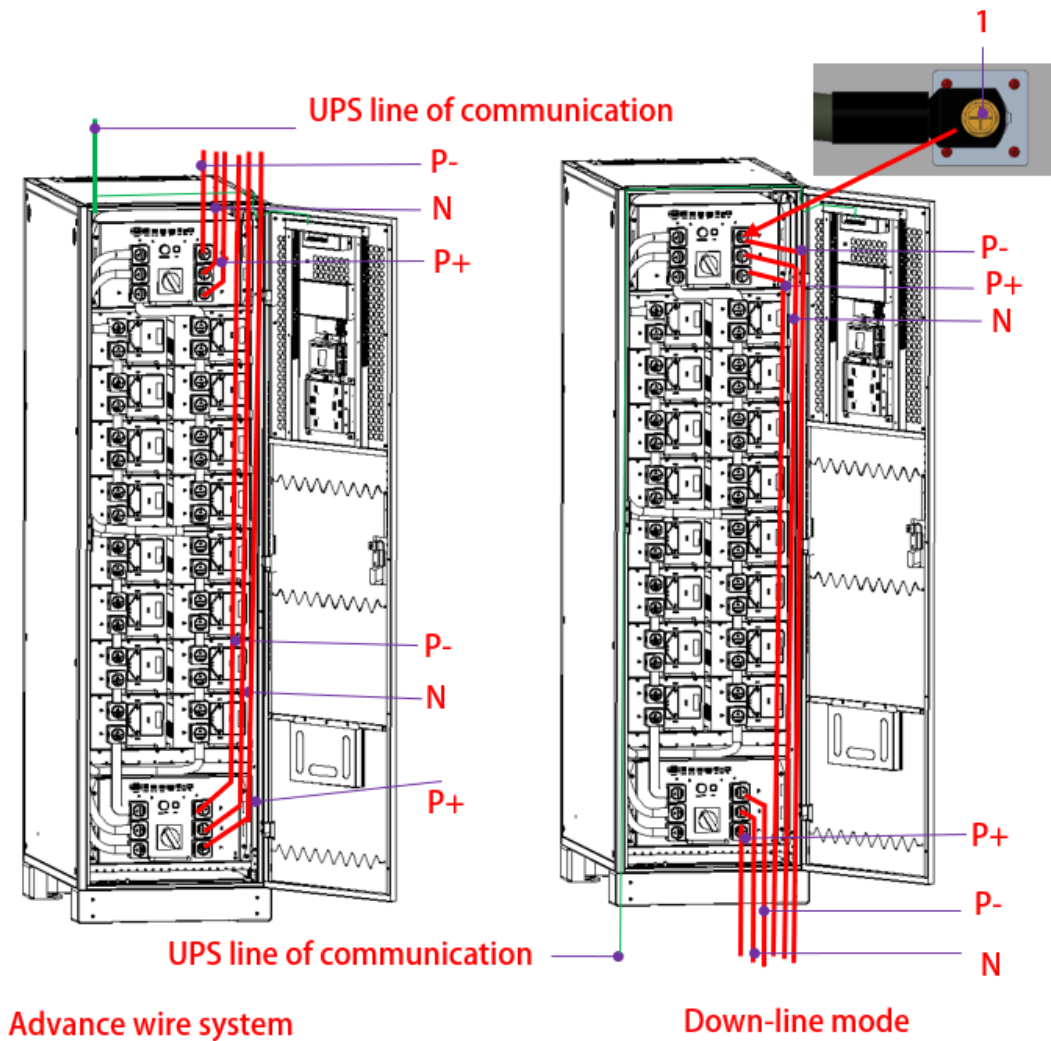
5.8.7 Installation of incoming cables in the cabinet

There are two types of cables in the cabinet: upper cables and lower cables. Taking the 8 +8 scenarios as an example.

📖 illustrate:

- Pass the soft copper power line with the terminal through the incoming brush and fix it to the connector of the high-voltage box with M10X25 bolts according to the position shown in the figure. The bolt torque is 20N*M, and then cover the connector.
- Install the communication line between the main cabinet and UPS as shown in the diagram. There are different communication interfaces on the communication adapter board. Select different wiring ports according to the communication method of UPS (UPS communication line is only available in the main cabinet, not in the slave cabinet).
- Connect cabinets to the UPS needs to be prepared by the customers themselves. The installation bolts are delivered with the cabinet. The specification of the soft copper power line is recommended to be $\geq 180 \text{ mm}^2$.

Figure 5.8.7-1 Cabinet wiring installation



NO	Name	Qty in 8+8/7+7/6+6	Qty in 8+0/7+0/6+0	Notes
(1)	M10X25 Cross external hexagonal combination bolt	6PCS	3PCS	

Notice

Please connect the cables according to the correct polarity, otherwise there is a risk of short circuit and fire in the battery.

5.8.8 Connect the communication line

illustrate

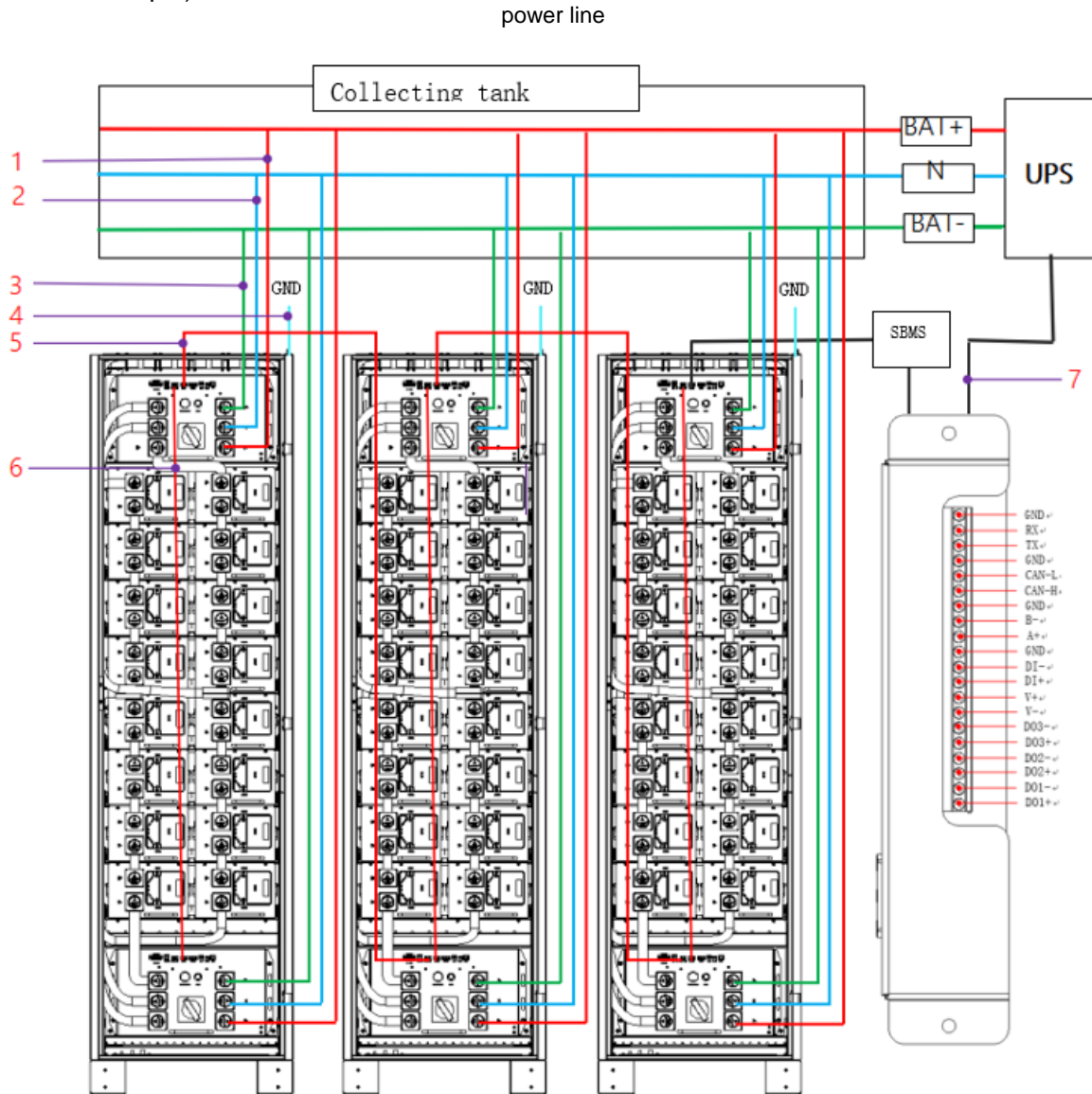
- CAN/RS485/RS232 cables need to be shielded.
- When the number of PU 80&160 series cabinets connected in parallel is greater than 8, a maximum of four 15m parallel communication cables are supported.
- Do not bundle communication cables and power cables together.

Step 1: According to the communication method of UPS, select the appropriate port on

the UPS communication adapter board to connect the master control to the UPS through the UPS communication adapter board , and tie the cables to the cabinet nearby.

Step 2 Use parallel communication lines to connect the high-voltage boxes of each cluster in parallel .

5.8.8. -1 Panoramic wiring diagram is as follows (taking the above wiring as an example):



- (1) Positive power cable (2) Neutral cabl (3) Negtive power cable
- (4) Grounding wire (5) Parallel wire outside the cabinet (customers can order separately as needed)
- (6) Parallel wiring in the cabinet (7) UPS communication line

5.9 Post-installation check

surface 5.9-1 Inspection items and acceptance criteria

NO	Inspection items	Acceptance Criteria
01	Cabinet installation and fastening	The cabinet is firmly installed and will not topple over due to vibration.
02	Neat and tidy cabinets	Adjacent cabinets are arranged neatly and fixed with cabinet brackets.
03	Reasonable cable layout	The cable layout is reasonable to meet user requirements.
04	Cables are clearly marked	Both ends of the cable need to be marked, and the markings should be simple and easy to understand.
05	Cable ties are beautiful	The cable ties should be even and there should be no sharp corners when cut.
06	Cable or copper busbar connection fastening	The battery connection cables or copper busbars are tightly connected. When tightening the screws, ensure that the spring washers are flat and the cables are not damaged.
07	Reliable grounding	The resistance between the cabinet ground bar and the room ground bar is less than 0.1Ω.
08	The battery cable is connected correctly	<ol style="list-style-type: none"> 1. The polarity of the cabinet and UPS connection terminals is correct. 2. The polarity of the connection terminals between the battery cabinets is correct. <p>illustrate</p> <p>confirming that the PU 80&160 series and UPS are not powered on:</p> <ul style="list-style-type: none"> • For cabinets that are installed close together, you can use a multimeter to measure whether the corresponding polarity copper bars of adjacent cabinets are conductive to determine whether the polarity connection is correct. • For parallel cabinets with long installation distances, you can short-circuit any copper

NO	Inspection items	Acceptance Criteria
		<p>busbar and PE (chassis) in one cabinet, and use a multimeter to measure whether the corresponding polarity copper busbar and PE (chassis) are conductive in the other parallel cabinet to determine whether the wiring polarity is correct: before the copper busbar at cabinet 1 is short-circuited with PE, the corresponding polarity copper busbar and PE in cabinet 2 should not be conductive; after the copper busbar at cabinet 1 is short-circuited with PE, the corresponding polarity copper busbar and PE in cabinet 2 are conductive. After the inspection is completed, promptly remove the short-circuited cable between the copper busbar and PE.</p> <p>3. In scenarios with a battery N line, you need to check whether the N line is connected correctly.</p>
		<p>4.</p>
09	<p>Check whether there is short circuit in the power distribution before and after the circuit breaker</p>	<p>Test whether there is a short circuit between the positive/N/negative cables and copper busbars before and after the circuit breaker, and between the cables, copper busbars and the casing. If so, check whether the cables are short-circuited due to broken skin and repair the cables.</p>

NO	Inspection items	Acceptance Criteria
10	Confirm that foreign matter in the cabinet has been removed.	<p>Clean the conductive dust and other debris inside and outside the cabinet.</p> <ol style="list-style-type: none"> 1. Make sure there are no foreign objects (copper wires, screws, etc.) on the top of the cabinet. 2. Make sure there are no foreign objects on the copper busbar connection terminals. 3. Make sure there are no foreign objects near the circuit breaker terminals. 4. Make sure there are no foreign objects on the cabinet floor. 5. Make sure there are no foreign objects in the rear module frame.
11	Replace all covers	After the inspection is complete, replace all covers.
12	Storage Environment	After installation, avoid long-term storage in conditions where the temperature and humidity cannot be controlled to prevent condensation from corroding and damaging the equipment.
13	Output cable insulation resistance	<p>Check that the output cables of the battery cabinet are not damaged. Use a 500V megohmmeter to measure the insulation resistance of the positive, negative, and N -pole output cables to the ground. The insulation resistance is greater than 2MΩ , and the insulation resistance between the positive / negative /N -pole output cables is greater than 2MΩ .</p>
14	Installation protection	<p>If the battery is not powered on after installation, please take measures to prevent dust and condensation (such as using a dust cover, plastic film or textile cover) to prevent condensation or dust accumulation inside the battery and corrosion. Please remove the protective equipment when putting it into operation.</p>

Figure 5.9-1 Dust cover



(1) Top dust cover

(2) Rear dust cover

(3) Front dust cover

6 APP Instructions

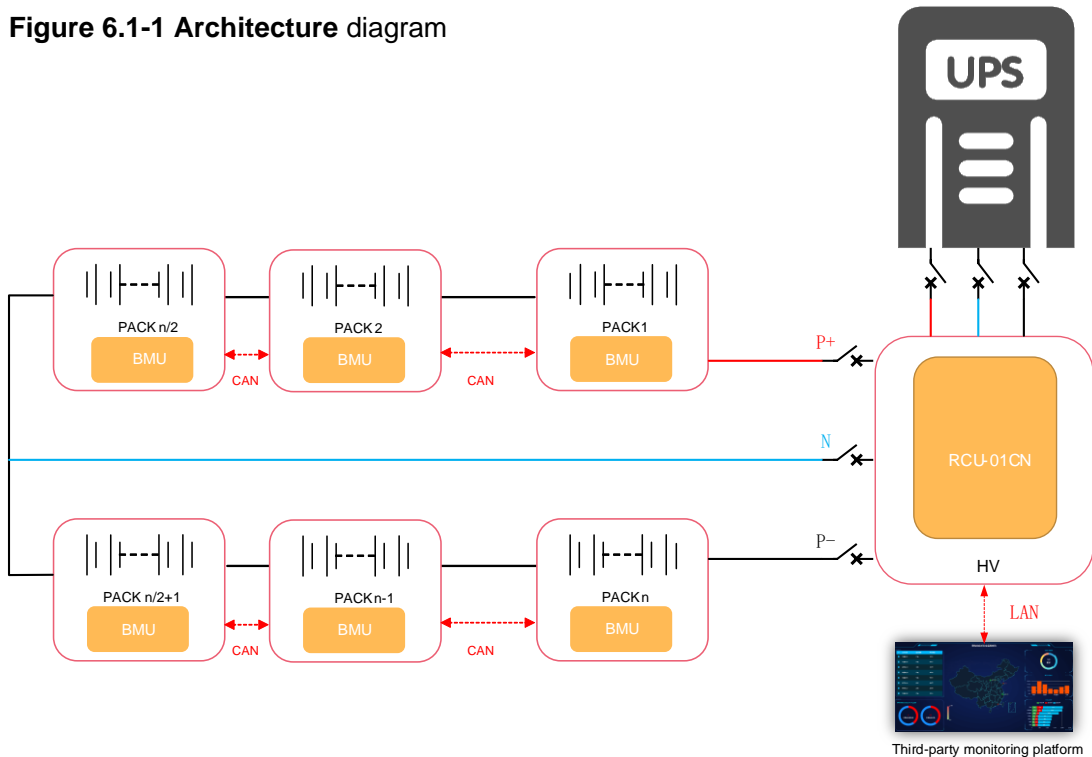
6.1 Overview

The display and control module consists of an Android system display and control screen and APP software , and is used to display data of the energy storage lithium battery management system.

characteristic

- Real-time data, alarm information, historical data query and statistics
- Diversified graphic displays such as curve charts, bar charts, and ring charts
- RJ45 network port /USB port/ Micro USB port / TF card port
- 9~30 Vdc (24 V dc recommended) voltage input
- Flush Mount
- Industrial-grade capacitive touch screen (7-inch and 10-inch optional)

Figure 6.1-1 Architecture diagram



6.2 Display and control APP software menu introduction

Menu Introduction	illustrate
Login screen	After the environment configuration and IP modification of the display and control module communication are completed, log in to the display and control APP software .

Menu Introduction	illustrate
front page	Displays real-time data, including "Master control communication status", "System operation status", "System alarm level", "Electrical operation status", "Battery stack overview", "Real-time data trend chart", "Cluster SOC maximum value", "Cluster SOH maximum value", "Cell voltage maximum value", "Cell temperature maximum value" and "Accumulated power", etc.
Battery data	Displays real-time and historical data of battery clusters and single cells in battery packs, and supports data export.
Alarm query	Query the real-time alarms, historical alarms and alarm statistics of battery clusters and single cells in battery packs, and support data export.
Event Log	Displays the event record details of "Charge and Discharge", "Device Restart", "Closing and Opening", "Cluster Withdrawal", and "Parameter Setting".
Device Management	Equipment can be added according to actual conditions, including "general control equipment", "main control equipment", "PCS", "UPS", "switch power supply", "fire protection", "temperature and humidity sensor", "combustible gas detector", "air conditioning" and "external equipment", and detailed data of the equipment can be viewed.
System Management	Display the "System Information", "Parameter Settings", "User Management" and "System Log" details of the display and control device, where login account information can be added and modified.

Note: The software page and introduction are for reference only. Please refer to the latest APP software interface and related information.

6.3 Environment Configuration

After establishing a connection between the display control and the master control (or main control) module via a standard network cable and the LAN port , plug in the display control power cord.

We need to change the default IP address of the display and control module to the actual IP address assigned on site , and set the "Ethernet Mode" to "Static".

Enter the setting interface of the display and control module, go to "Settings > More > Ethernet > IP Address", and modify the address according to the actual situation.


Then double-click to open  the APP software , enter your username and password on the login page, and click "Login" to enter the homepage.

Figure 6.3-1 Modify the display and control module IP address page

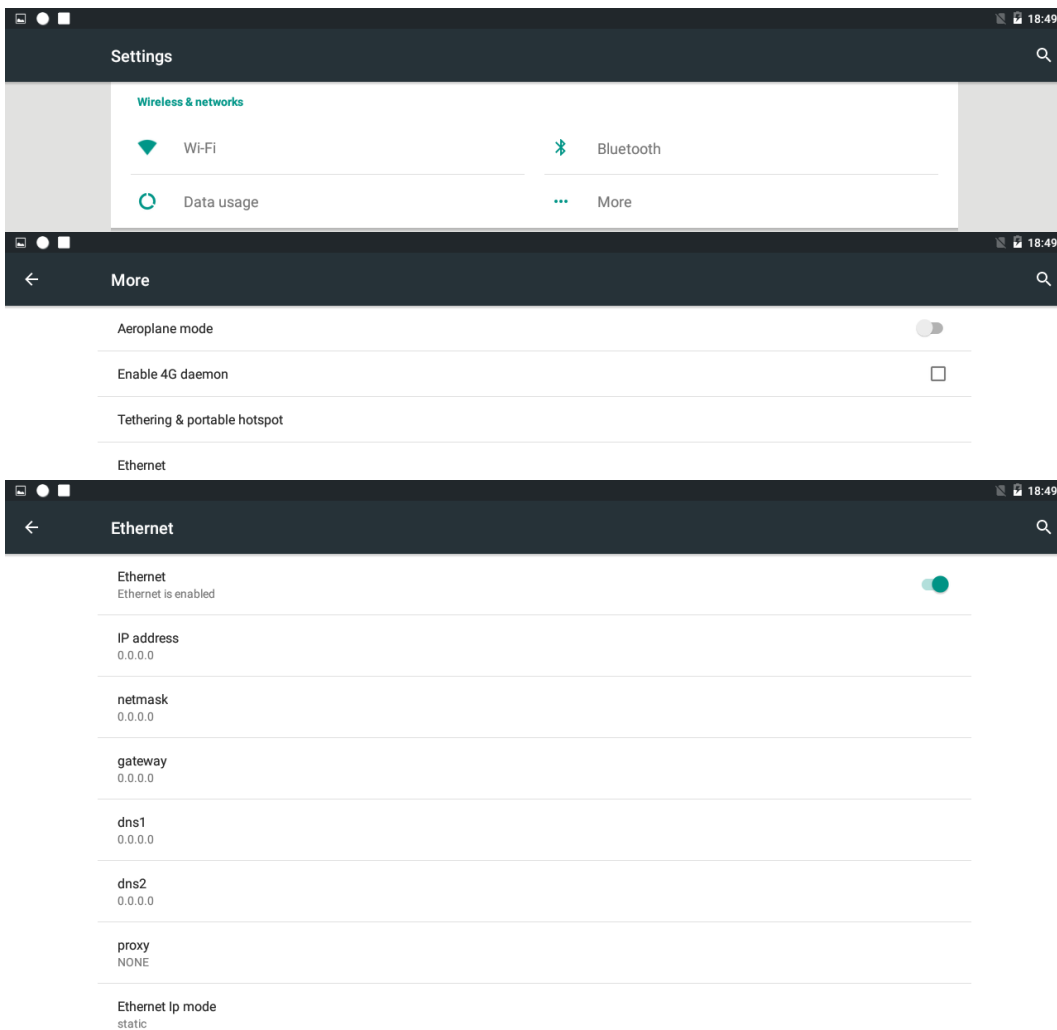
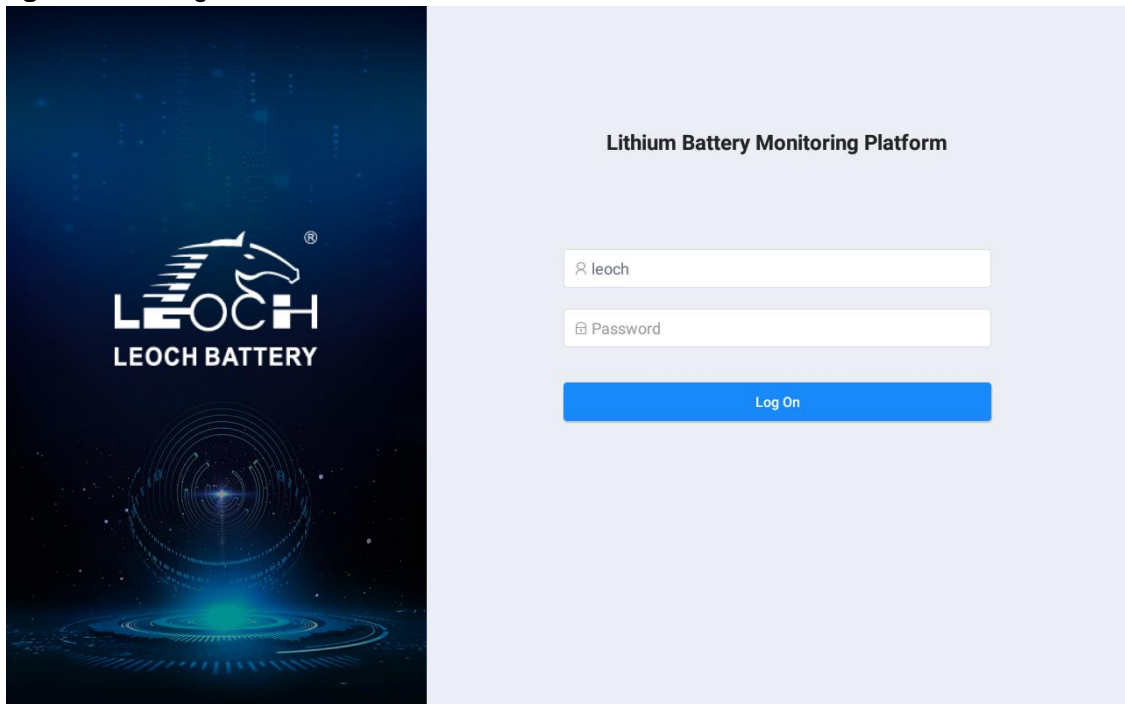


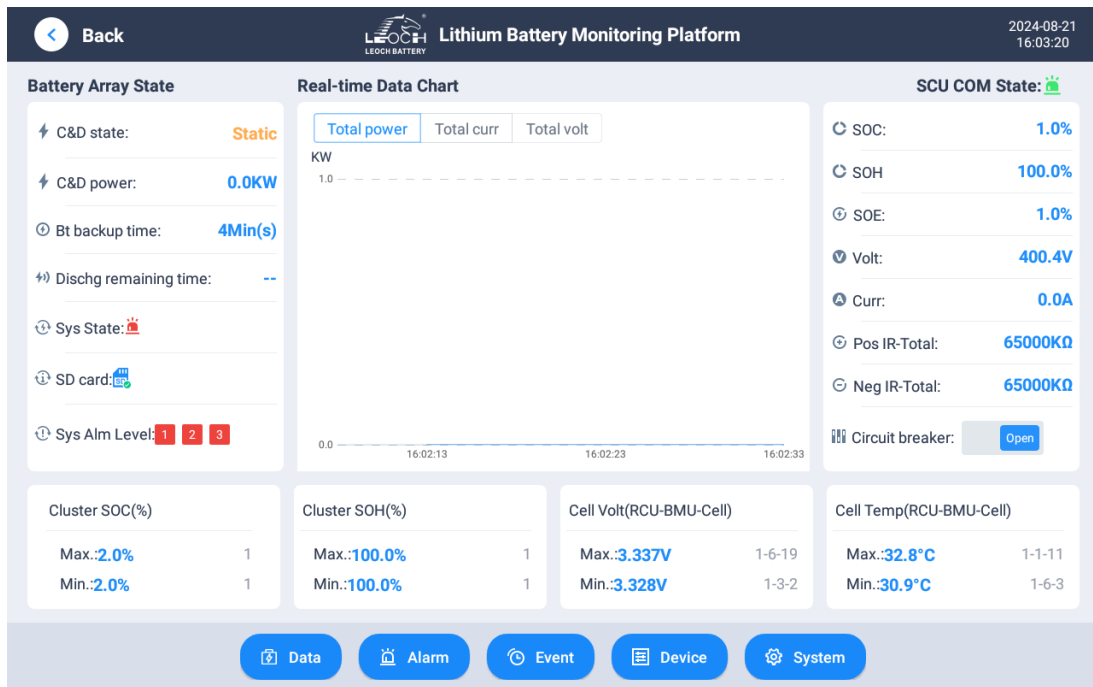
Figure 6.3-2 Login screen



6.4 Home Page

The home page displays real-time data overview, including "Master Control Communication Status", "System Operation Status", "System Alarm Level", "Electrical Operation Status", "Battery Stack Overview", "Real-time Data Trend Chart", "Cluster S OC Maximum Value", "Cluster S OH Maximum Value", "Cell Voltage Maximum Value", "Cell Temperature Maximum Value" and "Accumulated Power", etc. The specific interface is as follows:

Figure 6. 4-1 front page



6.5 Battery Data

Click "Battery Data" in the lower sidebar of the homepage to display the real-time and historical data of the battery cluster and single cells in the battery pack.

6.5.1 Battery Data - Real-time Data - All



6.5.2 Battery Data - Real-time Data - Battery Cluster

Click the target battery cluster in the left column to view the real-time data of the battery cluster.

Cluster	Cluster Volt/Curr	Cluster SOC/SOH	Insulation R	Capacity	Cluster SOE
1#Bt Cluster	Cluster volt:396.7V Cluster curr:11.9A(P) 11.8A(N)	Cluster SOC:100.0% Cluster SOH:100.0%	R (+):65000KΩ R (-):65000KΩ	Rated Cap.:100.0Ah Residual cap.:100.0Ah	Cluster SOE:100.0%
2#Bt Cluster	Volt Diff Deviation:0.013V Range value:0.019V	Max. Cell Volt No1: 3.308V 3-1 No2: 3.307V 1-10	Min. Cell Volt No1: 3.289V 4-6 No2: 3.294V 5-11	Max. Cell Temp No1: 30.5°C 6-19 No2: 30.5°C 6-20	Min. Cell Temp No1: 28.2°C 4-7 No2: 28.2°C 4-8
	RCU Module Module temp:34.5°C Supply volt:23.1V	Dry Contact State 1: ↓ 2: ↓	Relay 01(Total pos) chg:Close/Normal dischg:Close/Normal	Relay 01(Total neg) chg:Close/Normal dischg:Close/Normal	Relay 03 Prechg:Open/Normal Cir breaker:Close/Normal
	DO State 1: ↑ 2: ↑ 3: ↑ 4: ↑ 5: ↓ 6: ↓ 7: ↓ 8: ↓	DI State 1: ↑ 2: ↑ 3: ↑ 4: ↑ 5: ↓ 6: ↑ 7: ↑ 8: ↓	C&D State Pos half clusters:Charge Neg half clusters:Charge	Dischg Time Dischg:8H12Min(s)	C&D Power C&D power:4.6KW

6.5.3 Battery data - real- time data - cell details

In the "Battery Data > Real-time Data > Battery Cluster" interface, click "Cell Details" to view the cell data in each battery pack, including voltage, temperature, SOC , etc., and support bar charts and line charts for data display.

Pack	01#	02#	03#	04#	05#	06#
1#Pack	Collect time:16:06:03 Supply volt:22.8V Module temp:0.0°C 0.0°C					
2#Pack	Volt: 3.335V Temp: 32.4°C	Volt: 3.333V Temp: 32.4°C	Volt: 3.334V Temp: 32.4°C	Volt: 3.334V Temp: 32.4°C	Volt: 3.334V Temp: 32.6°C	Volt: 3.333V Temp: 32.6°C
3#Pack						
4#Pack						
5#Pack	Volt: 3.334V Temp: 32.3°C	Volt: 3.333V Temp: 32.3°C	Volt: 3.334V Temp: 32.3°C	Volt: 3.334V Temp: 32.3°C	Volt: 3.332V Temp: 32.7°C	Volt: 3.330V Temp: 32.7°C
6#Pack						
	Volt: 3.330V Temp: 32.2°C	Volt: 3.330V Temp: 32.2°C	Volt: 3.330V Temp: 32.5°C	Volt: 3.330V Temp: 32.5°C	Volt: 3.331V Temp: -	Volt: 3.331V Temp: -
	Volt: 3.331V Temp: -	Volt: 3.330V Temp: -				



6.5.4 Battery Data - Historical Data - All

Click "Back" to return to the "Battery Data > Real-time Data" page, and click to switch to the "Historical Data" page.

No.	Volt(V)	Curr(A)	SOC(%)	SOH(%)	Pos IR-Total(KΩ)	Neg IR-Total(KΩ)	Time
1	0.0	3000.0	0.0	0.0	0	0	2024-08-09 16:04:59
2	0.0	3000.0	0.0	0.0	0	0	2024-08-09 16:05:29
3	0.0	3000.0	0.0	0.0	0	0	2024-08-09 16:05:59
4	0.0	3000.0	0.0	0.0	0	0	2024-08-09 16:06:29
5	0.0	3000.0	0.0	0.0	0	0	2024-08-09 16:06:59
6	0.0	3000.0	0.0	0.0	0	0	2024-08-09 16:07:29
7	0.0	3000.0	0.0	0.0	0	0	2024-08-09 16:07:59
8	0.0	3000.0	0.0	0.0	0	0	2024-08-09 16:08:29
9	0.0	3000.0	0.0	0.0	0	0	2024-08-09 16:08:59

6.5.5 Battery Data - Historical Data - Battery Cluster

Click the target battery cluster in the left column to view the historical data of the battery cluster.

Check "Battery Cluster" in the device type, select the target time period in the time selector, and click "Query" to query the data.

Time selection column:

取消					起止时间	确认				
2018年	11月	02日	07时	39分	~	2018年	11月	02日	07时	39分
2019年	12月	03日	08时	40分		2019年	12月	03日	08时	40分
2020年	01月	04日	09时	41分		2020年	01月	04日	09时	41分
2021年	02月	05日	10时	42分		2021年	02月	05日	10时	42分

Battery Data - Historical Data - Battery Cluster :

No.	Volt(V)	Curr(A)	SOC(%)	SOH(%)	Pos IR-Total(KΩ)	Neg IR-Total(KΩ)	Time
1	0.0	3000.0	0.0	0.0	0	0	2024-08-09 16:04:59
2	0.0	3000.0	0.0	0.0	0	0	2024-08-09 16:05:29
3	0.0	3000.0	0.0	0.0	0	0	2024-08-09 16:05:59
4	0.0	3000.0	0.0	0.0	0	0	2024-08-09 16:06:29
5	0.0	3000.0	0.0	0.0	0	0	2024-08-09 16:06:59
6	0.0	3000.0	0.0	0.0	0	0	2024-08-09 16:07:29
7	0.0	3000.0	0.0	0.0	0	0	2024-08-09 16:07:59
8	0.0	3000.0	0.0	0.0	0	0	2024-08-09 16:08:29
9	0.0	3000.0	0.0	0.0	0	0	2024-08-09 16:08:59

6.5.6 Battery Data - Historical Data - Battery Cells

Check "Battery Cell" in the device type, select the target time period in the time selector (see Figure 5-5), and click "Query" to query the data.

No.	Volt(V)	Curr(A)	SOC(%)	SOH(%)	Pos IR-Total(KΩ)	Neg IR-Total(KΩ)	Time
1	374.9	0.0	0.0	100.0	65000	65000	2024-08-09 16:12:30
2	374.9	0.0	0.0	100.0	65000	65000	2024-08-09 16:13:00
3	374.9	0.0	0.0	100.0	65000	65000	2024-08-09 16:13:30
4	374.9	0.0	0.0	100.0	65000	65000	2024-08-09 16:14:00
5	374.9	0.0	0.0	100.0	65000	65000	2024-08-09 16:14:30
6	374.9	0.0	0.0	100.0	65000	65000	2024-08-09 16:16:21
7	374.9	0.0	0.0	100.0	65000	65000	2024-08-09 16:16:51
8	374.9	0.0	0.0	100.0	65000	65000	2024-08-09 16:17:21
9	374.9	0.0	0.0	100.0	65000	65000	2024-08-09 16:17:51

6.6 Alarm Query

Click "Back" to return to the home page, and click "Alarm Query" in the lower sidebar of the home page to display the real-time alarms, historical alarms and alarm statistics details of the battery cluster and single battery.

6.6.1 Alarm Query - Real-time Alarm - All

Cluster	Pack	Alm Info	Alm Level	Alm Value	Alm Time
1	-	Low Cluster SOC Alm	Alm level 1	2.0%	2024-08-21 15:59:05
1	-	Low Cluster SOC Alm	Alm level 2	2.0%	2024-08-21 15:59:05
1	-	Low Cluster SOC Alm	Alm level 3	2.0%	2024-08-21 15:59:05
2	-	Cluster Total Volt Overvolt Alm	Alm level 1	395.6V	2024-08-21 15:59:06
2	-	Cluster Total Volt Overvolt Alm	Alm level 2	395.6V	2024-08-21 15:59:06
2	-	Cluster Total Volt Overvolt Alm	Alm level 3	395.6V	2024-08-21 15:59:06
2	1	BMU COM Fault	Alm level 1	-	2024-08-21 15:59:06
2	1	BMU COM Fault	Alm level 2	-	2024-08-21 15:59:06
2	1	BMU COM Fault	Alm level 3	-	2024-08-21 15:59:06
2	1	1#Cell Under-temp Alm	Alm level 1	-50.0°C	2024-08-21 15:59:06

Figure 6-1 Alarm Query-Real-time Alarm-All

6.6.2 Alarm Query - Real- time Alarm - Battery Cluster

Click the target battery cluster in the left column to view the real-time alarms of the battery cluster.

Pack	Alm Info	Alm Level	Alm Value	Alm Time
-	Low Cluster SOC Alm	Alm level 1	2.0%	2024-08-21 15:59:05
-	Low Cluster SOC Alm	Alm level 2	2.0%	2024-08-21 15:59:05
-	Low Cluster SOC Alm	Alm level 3	2.0%	2024-08-21 15:59:05

Pack	Alm Info	Alm Level	Alm Value	Alm Time
-	Cluster Total Volt Overvolt Alm	Alm level 1	395.6V	2024-08-21 15:59:06
-	Cluster Total Volt Overvolt Alm	Alm level 2	395.6V	2024-08-21 15:59:06
-	Cluster Total Volt Overvolt Alm	Alm level 3	395.6V	2024-08-21 15:59:06
1	BMU COM Fault	Alm level 1	-	2024-08-21 15:59:06
1	BMU COM Fault	Alm level 2	-	2024-08-21 15:59:06
1	BMU COM Fault	Alm level 3	-	2024-08-21 15:59:06
1	1#Cell Under-temp Alm	Alm level 1	-50.0°C	2024-08-21 15:59:06
1	1#Cell Under-temp Alm	Alm level 2	-50.0°C	2024-08-21 15:59:06
1	1#Cell Under-temp Alm	Alm level 3	-50.0°C	2024-08-21 15:59:06
1	1#Cell Undervolt Alm	Alm level 1	0.000V	2024-08-21 15:59:06

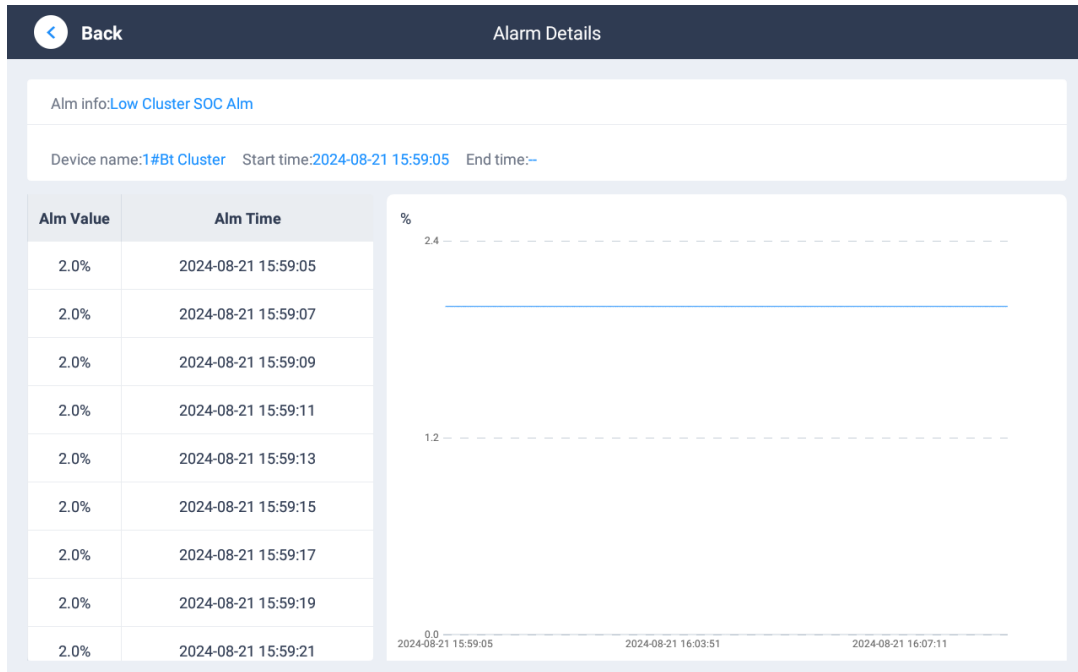
6.6.3 Alarm Query - Historical Alarms - All

Click "Back" to return to the "Alarm Query > Real-time Alarm" page, and click to switch to the "Historical Alarm" page. Select the target time period in the time selector (see Figure 5-5), and click "Query" to query the data. Historical alarms support batch deletion and data export.

Cluster	Pack	Alm Info	Alm Level	Alm Value	Alm Time
1	-	Low Cluster SOC Alm	Alm level 1	2.0%	2024-08-21 15:59:05
1	-	Low Cluster SOC Alm	Alm level 2	2.0%	2024-08-21 15:59:05
1	-	Low Cluster SOC Alm	Alm level 3	2.0%	2024-08-21 15:59:05
2	-	Cluster Total Volt Overvolt Alm	Alm level 1	395.6V	2024-08-21 15:59:06
2	-	Cluster Total Volt Overvolt Alm	Alm level 2	395.6V	2024-08-21 15:59:06
2	-	Cluster Total Volt Overvolt Alm	Alm level 3	395.6V	2024-08-21 15:59:06
2	1	BMU COM Fault	Alm level 1	-	2024-08-21 15:59:06
2	1	BMU COM Fault	Alm level 2	-	2024-08-21 15:59:06
2	1	BMU COM Fault	Alm level 3	-	2024-08-21 15:59:06
2	1	1#Cell Under-temp Alm	Alm level 1	-50.0°C	2024-08-21 15:59:06

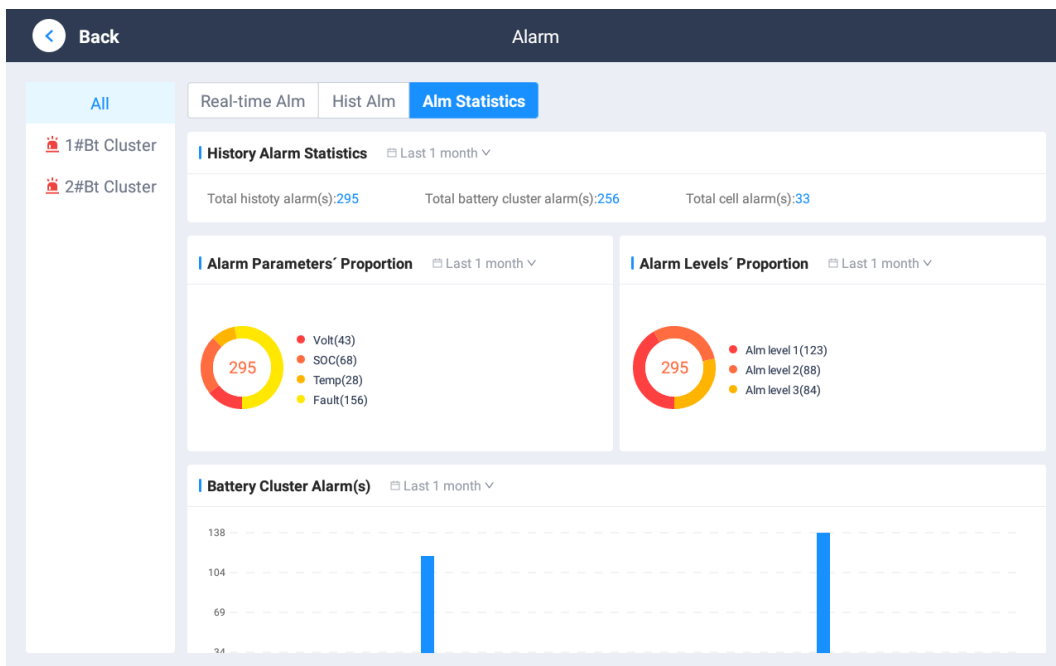
6.6.4 Alarm Query - Historical Alarm - Details

Click "View Details" to view alarm information, alarm time, alarm curve, etc.

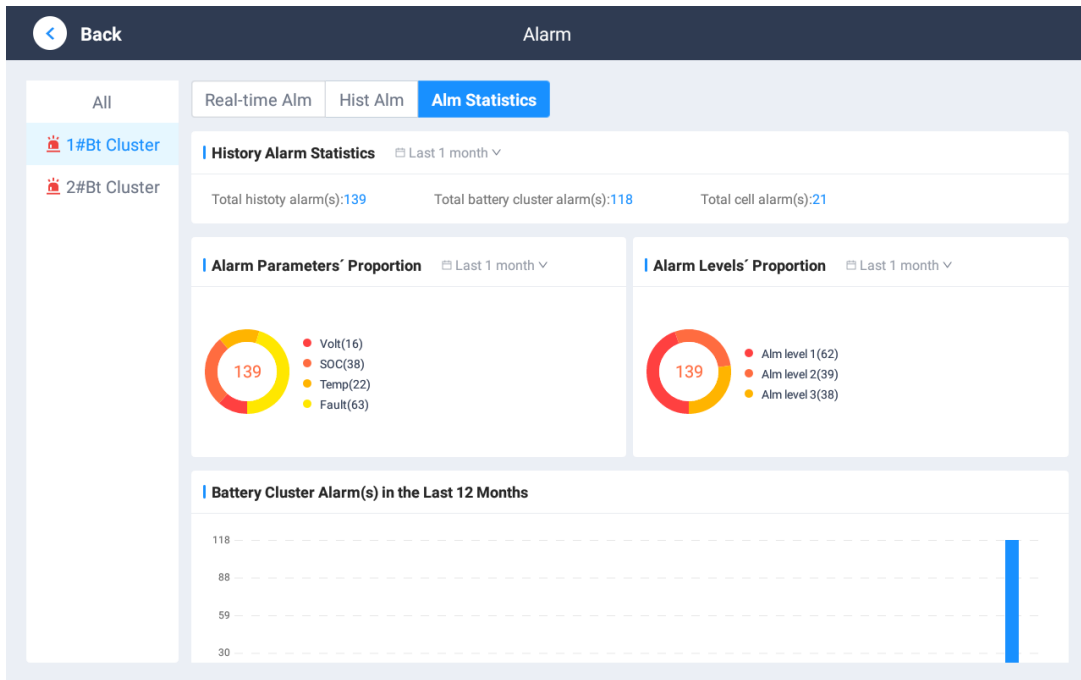


6.6.5 Alarm Query - Alarm Statistics - All

Click "Back" to return to the "Alarm Query > Real-time Alarm" page, and click to switch to the "Alarm Statistics" page. This page displays all "Historical Alarm Statistics", "Alarm Parameter Ratio Statistics", "Alarm Level Ratio Statistics", "Battery Cluster Alarm Times Statistics" and "Device Alarm Times Trend Chart" by default.



6.6.6 Alarm Query - Alarm Statistics - Battery Cluster



Click the target battery cluster in the left column to view the alarm statistics of the battery cluster.

6.7 Event Log

Click "Back" to return to the home page, and click "Event Record" in the lower sidebar of the home page to display the details of "Charge and Discharge", "Device Restart", "Switch on and off", "Cluster Retreat", and "Parameter Setting". Select the target time period in the time selector (see Figure 5-5), and click "Query" to query the event.

Event Record - Charge and Discharge:

Back		Event				
C&D	Breaker Open/Connect	Device Reboot	Cluster Separate/Connect	Param Set	Other	
Start & end time:		2024-07-26 16:51:00	-	2024-08-26 16:51:00	Search	
Cluster	Event Name	Volt(V)	Curr(A)	Pos IR-Total(KΩ)	Neg IR-Total(KΩ)	Max./Min. cell volt (V)
1	Static	400.4	0.0	65000	65000	3.336/3.327
2	Static	395.6	0.0	65000	65000	0/0
1	Discharge	398.8	38.2	65535	65535	3.326/3.313
2	Discharge	397.5	-36.2	65535	65535	3.314/3.29
1	Static	399.2	0.0	65535	65535	3.326/3.317
2	Static	396.7	0.0	65535	65535	3.31/3.303
1	Charge	402.4	-50.0	65000	65000	3.345/3.326
2	Charge	0.0	-3000.0	0	0	0/0
1	Static	402.0	0.0	65000	65000	3.366/3.342

Event Recording-Parameter Setting:

Back		Event				
C&D	Breaker Open/Connect	Device Reboot	Cluster Separate/Connect	Param Set	Other	
Start & end time:		2024-07-21 16:11:00	-	2024-08-21 16:11:00	Search	
Device	Param Name	Unmodified Param	Modified Param	Modified By	Modify Tir	
1	Rated Power	460	480	leoch	2024-08-20 15	
1	UPS Protocol	1	0	leoch	2024-08-20 15	
1	RS232 Port Baud Rate#1	4800	2400	leoch	2024-08-20 15	

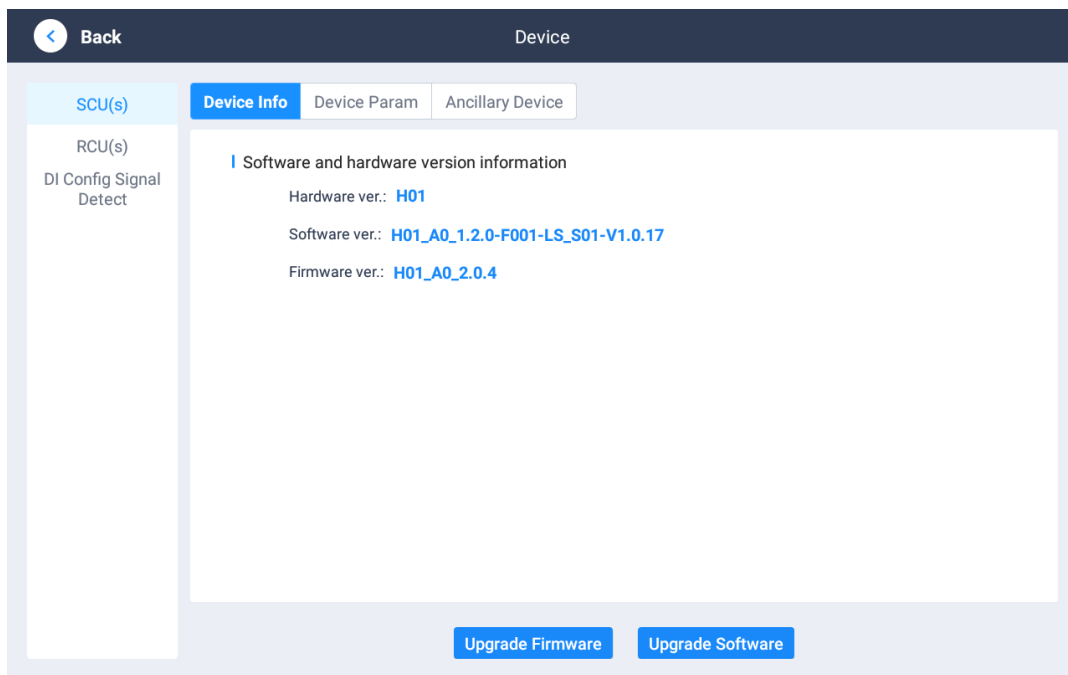
6.8 Device Management

Click "Back" to return to the home page, and click "Device Management" on the lower sidebar of the home page to display the details of "General Control Equipment", "Master Control Equipment", "PCS ", " UPS ", "Switch Power Supply", "Fire Protection", "Temperature and Humidity Sensor", "Combustible Gas Detector", "Air Conditioner" and "External Equipment" . The page will display the corresponding page according to the actual situation.

6.8.1 Master control equipment

The device management page displays the master control device details page by default, which includes three tabs: "Device Information", "Device Parameters" and "Accessory Devices".

Equipment Management-Master Control Equipment-Equipment Information :



Equipment management - master control equipment - equipment parameters :

01#Bt Cluster

Device Info **Device Param** Ancillary Device

No.	Param Name	Param Range	Written Value
1	Cell Overvolt Level 1 Alm Value	0.000 ~ 18.000V	--
2	Cell Overvolt Level 2 Alm Value	0.000 ~ 18.000V	--
3	Cell Overvolt Level 3 Alm Value	0.000 ~ 18.000V	--
4	Cell Overvolt Alm Delay Value	0 ~ 50S	--
5	Cell Overvolt Level 1 Alm Restore Value	0.000 ~ 18.000V	--
6	Cell Overvolt Level 2 Alm Restore Value	0.000 ~ 18.000V	--
7	Cell Overvolt Level 3 Alm Restore Value	0.000 ~ 18.000V	--
8	Cell Overvolt Alm Restore Delay Value	0 ~ 50S	--
9	Cell Undervolt Level 1 Alm Value	0.000 ~ 18.000V	--

Read Param Write Param Restore Reboot RCU

Equipment management - master control equipment - auxiliary equipment :

01#Bt Cluster

Device Info Device Param **Ancillary Device**

BMU(s) Rn. Param Set Other

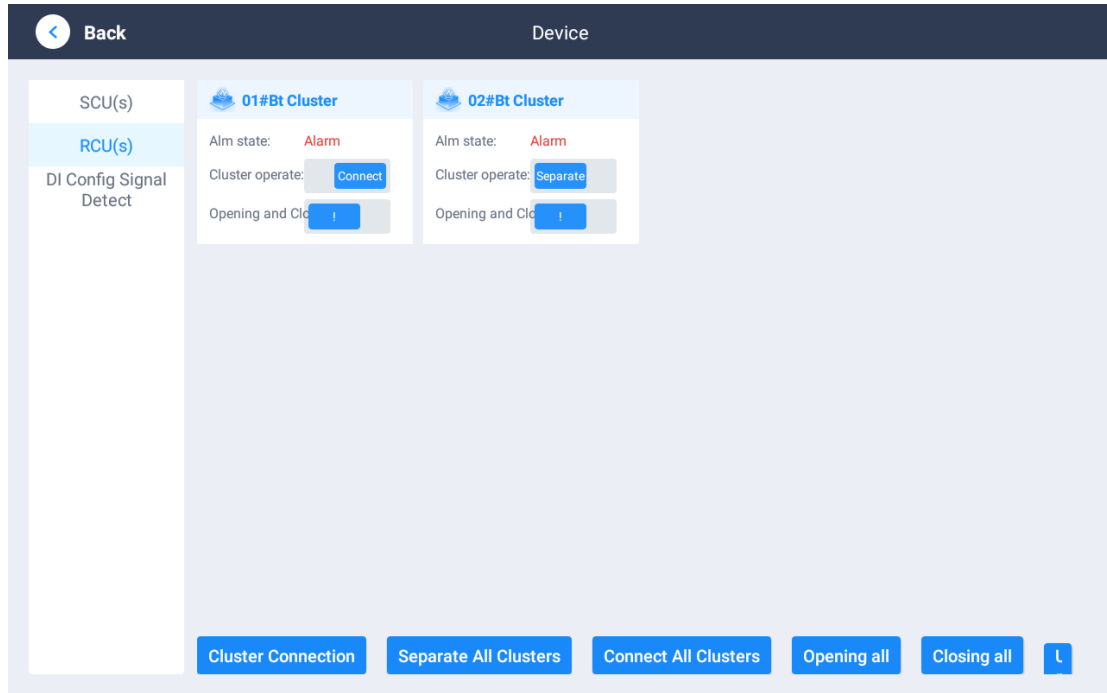
BMU name: BMU1 Cell(s):20 Hardware ver.:0000 Software ver.:0000 CRC:--

No.	Param Name	Param Range	Written Value
1	Cell Volt Channels	--	24
2	Cell Volt Collection Cable	--	<div style="display: flex; flex-wrap: wrap; gap: 5px;"> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">1</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">2</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">3</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">4</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">5</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">6</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">7</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">8</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">9</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">10</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">11</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">12</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">13</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">14</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">15</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">16</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">17</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">18</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">19</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">20</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">21</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">22</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">23</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">24</div> </div>
3	Cell Temp Channels	--	24
4	Cell Temp Collection Cable	--	<div style="display: flex; flex-wrap: wrap; gap: 5px;"> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">1</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">2</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">3</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">4</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">5</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">6</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">7</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">8</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">9</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">10</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">11</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">12</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">13</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">14</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">15</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">16</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">17</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">18</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">19</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">20</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">21</div> <div style="border: 1px solid #ccc; padding: 2px 5px; margin: 2px;">22</div> </div>

Read Param Write Param Restore

6.8.2 Master control device

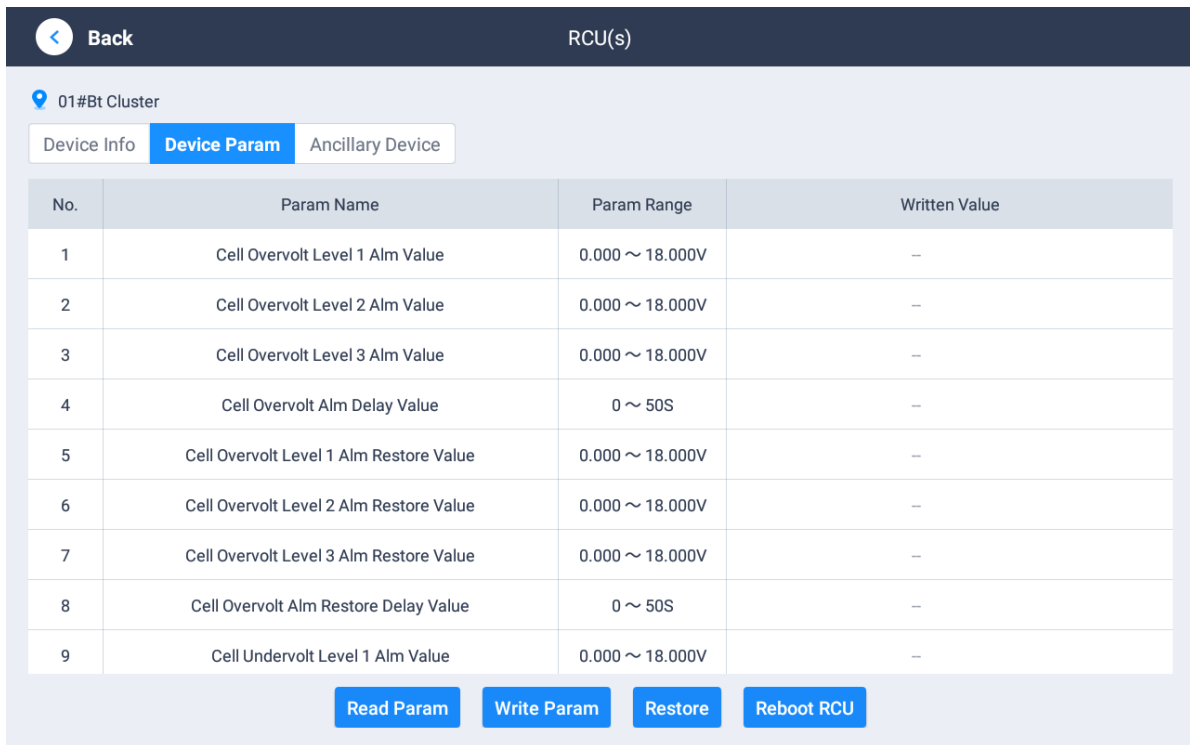
Click "Master Device" on the left column to enter the details page, which includes three tabs: "Device Information", "Device Parameters" and "Accessory Devices".



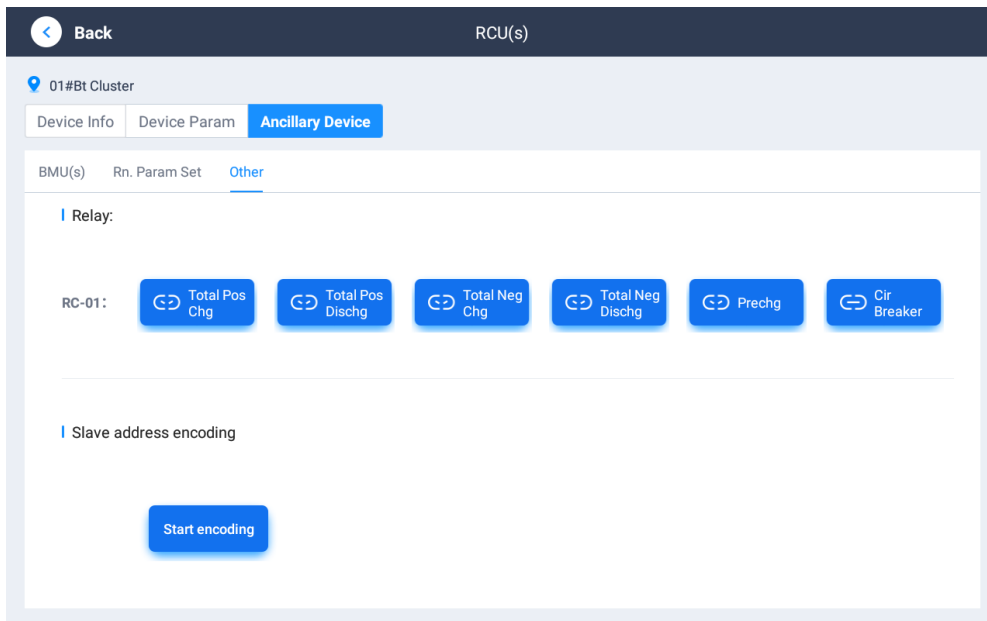
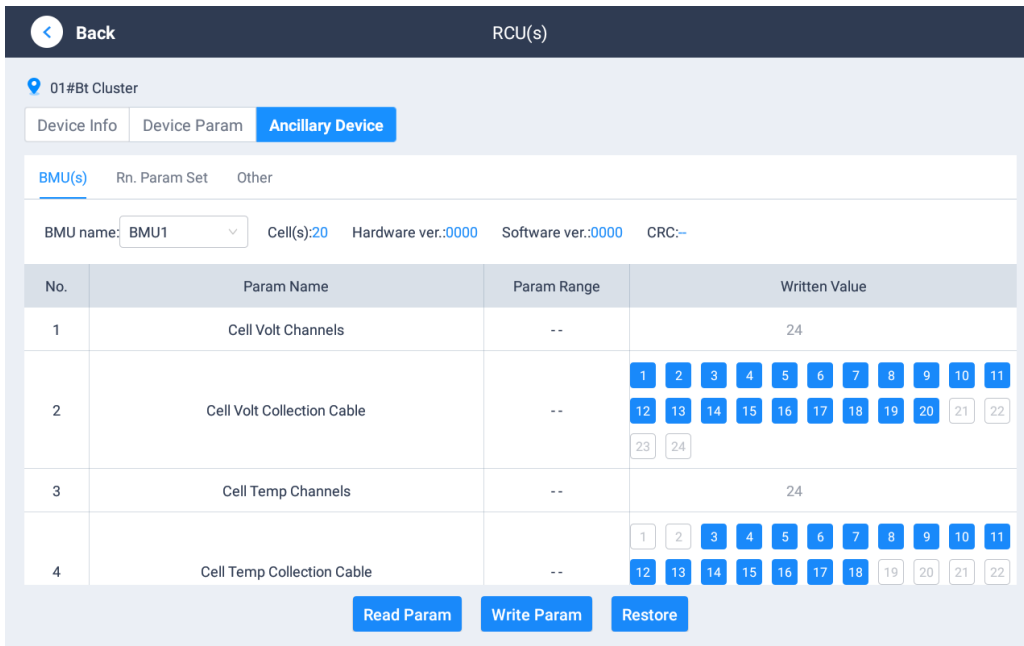
Device Management-Master Device-Device Information:

The device parameter page supports reading and writing parameters, and can restore parameters to default values.

Device Management - Master Device - Device Parameters:



Equipment management - main control equipment - auxiliary equipment:

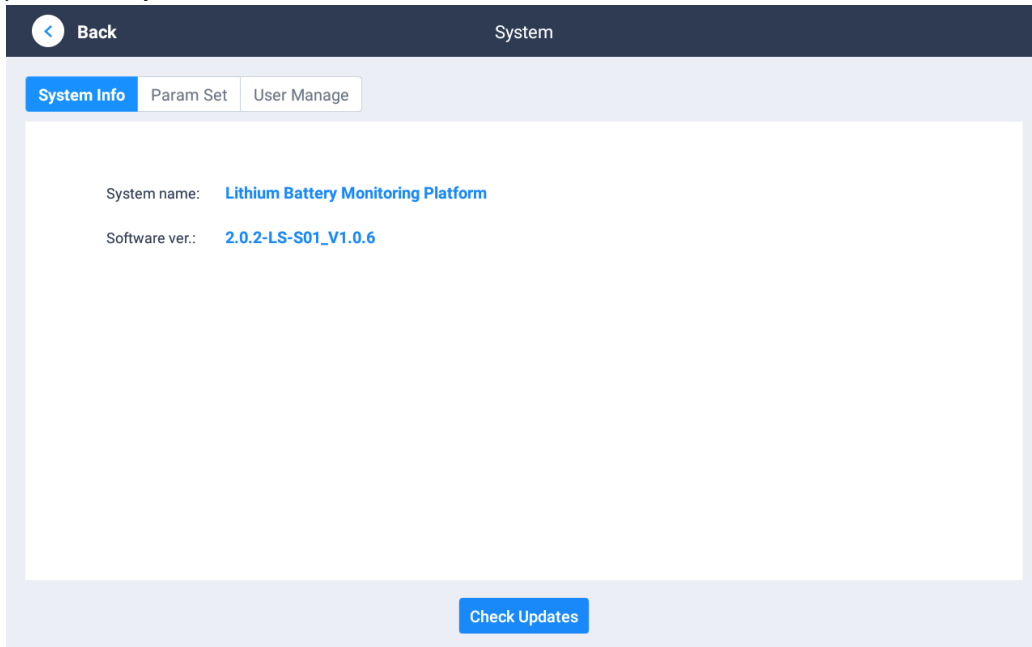


6.9 System Management

Click "Back" to return to the home page, and click "System Management" in the lower sidebar of the home page to display the details of "System Information", "Parameter Settings", "User Management" and "System Log".

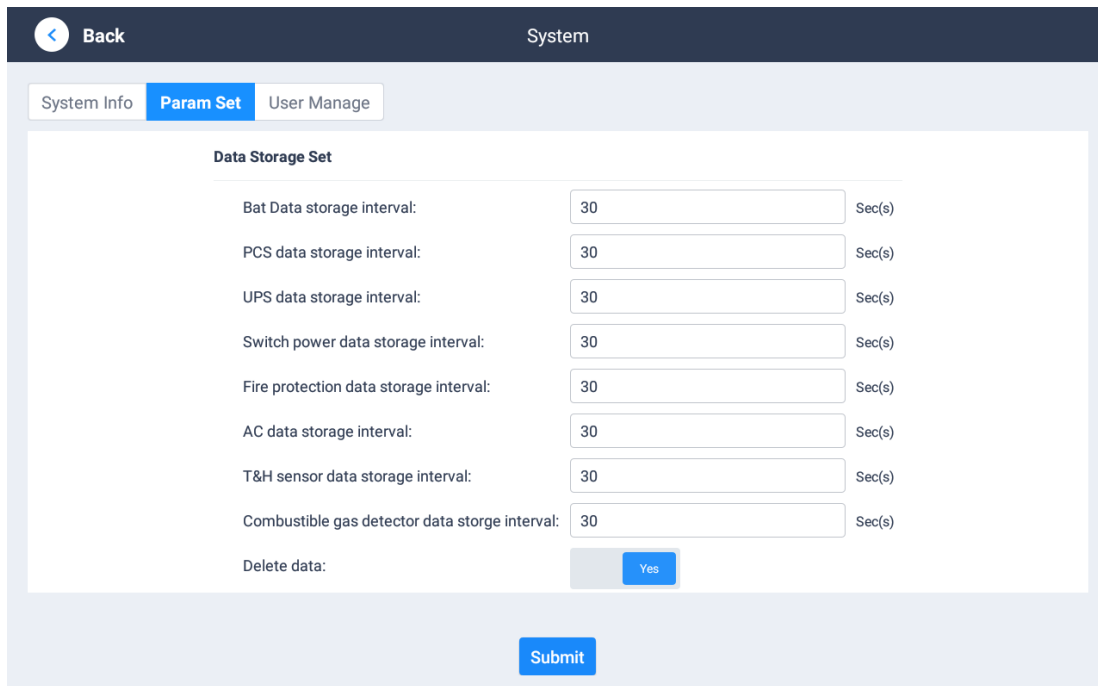
6.9.1 System Management - System Information

Go to the "System Management > System Information" page and click "Check for Updates" to update the system version to the latest version.



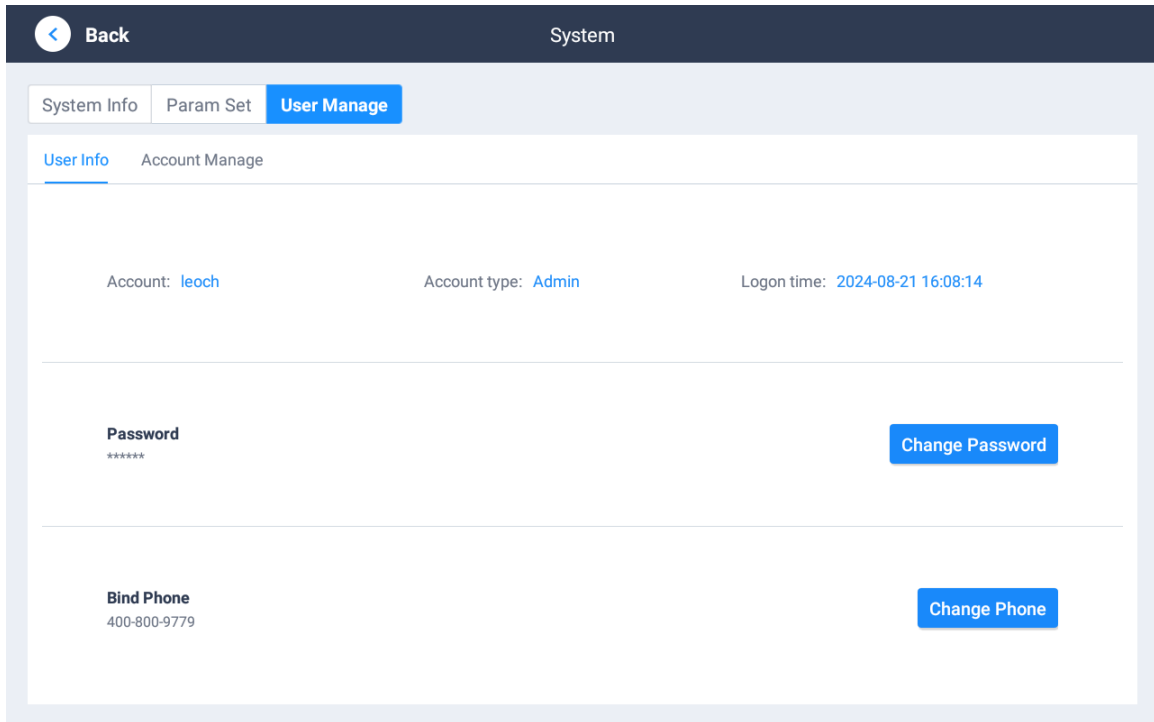
6.9.2 System Management - Parameter Settings

Go to the "System Management > Parameter Settings" page to modify the parameters related to "Local Network Settings" and "Data Storage Settings".

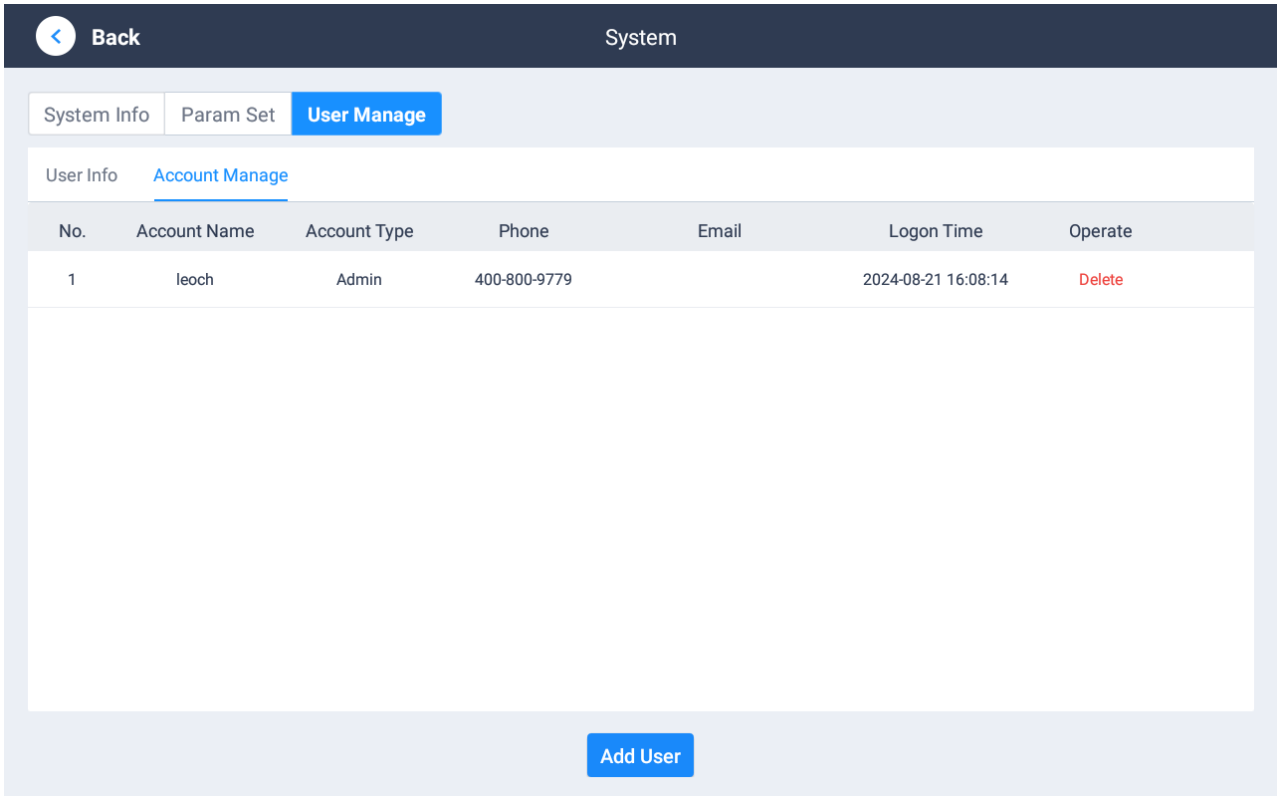


6.9.3 System Management - User Management

Go to the "System Management > User Management > User Information" page to view and modify the login password, bind the mobile phone number and email address.



Go to the "System Management > User Management > Account Management" page and click "Add Person" to add login account related information.



6.10 Host computer communication

6.10.1 Introduction to the main control module host computer menu

Menu Introduction	illustrate
Login screen	Connect the module to the laptop via the CAN box, USB cable and CAN debugging cable, and log in to the host computer software .
front page	Display real-time data, including "battery cluster overview", "real-time data trend", "level 1, 2, 3 alarm content", "cell information" and "main control interface information";
Battery Information	Display the battery pack and the single cell information in the battery pack, including "single cell voltage", "single cell temperature" and "single cell S OC " value;
Parameter settings	Set all operating parameters;
Slave control parameter configuration	Display and set the single cell parameters of the battery pack monitored by the slave control module, including the actual values of "Number of cell voltages", "Number of cell temperatures", "Slave control cell voltage configuration mask" and "Slave control cell temperature configuration mask";
Slave control threshold configuration	Read and write the first, second and third level alarm values and recovery values of parameters such as "cell voltage high", "cell voltage low", "cell temperature high", "cell temperature low", "cell S OC low", "cell S OH low",

	"cell voltage difference too large" and "cell temperature difference too large";
Master control parameter configuration	Display and configure the slave control module parameters monitored by the master control module, including "cell quantity", "slave control quantity", "temperature quantity" and "box temperature configuration", "current sensor", "balanced start configuration", "DO relay configuration", "DI relay configuration", "fan start temperature value", and "forced insulation collection";
Master control threshold configuration	Read and write the first, second and third level alarm values and recovery values of parameters such as "B + overvoltage", "B + undervoltage", " P + overvoltage ", "P+ undervoltage", "overall S OC low", "overall S OH low", "overall voltage difference too large", "charging current too large", "discharging current too large" and "low insulation resistance";
Alarm content configuration	Set the first, second and third level alarms and the corresponding first, second and third level alarm contents of the power failure relay;
Fuzzy search	Query and write some operation parameter values;
K B correction settings	Read and write current correction and total voltage correction related parameters;
Data Query	Query and export corresponding data values of cells, modules and battery clusters;
Program Upgrade	Upgrade the master and slave control software;
I / O Control	Perform addressed I O test and I O control.

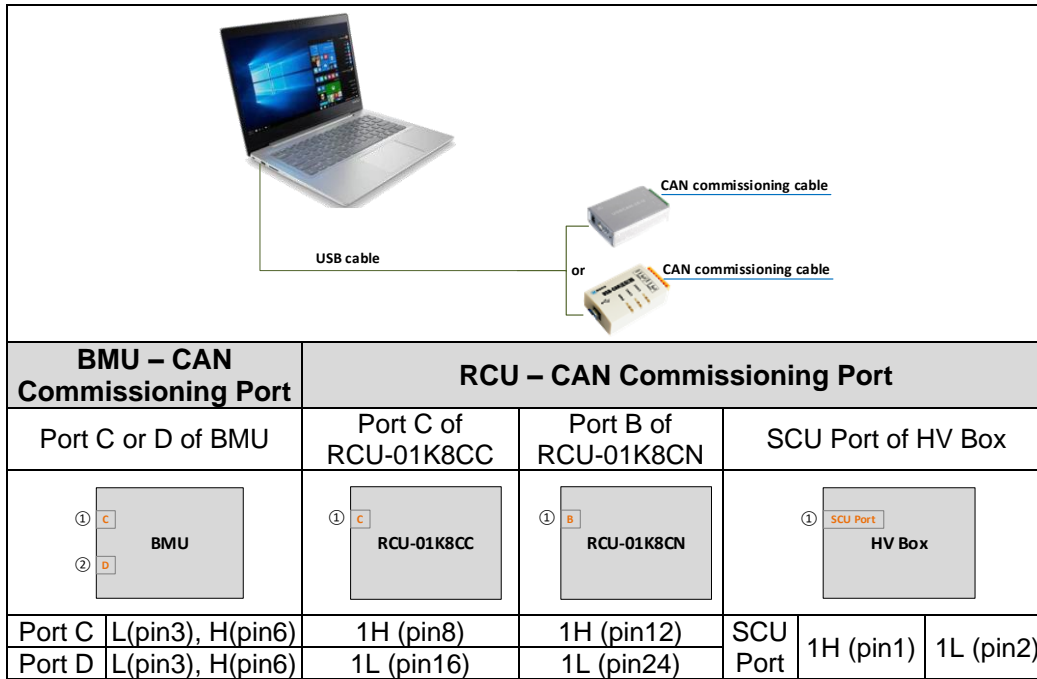
6.10.2 Environment Configuration

The slave control module, master control module and master control module all support host computer communication, among which the slave control module and the master control module communicate with the host computer through the CAN port (the master control module communicates with the host computer through the LAN port).

- 1) According to the project site configuration and application, the slave control module or the master control module (or high-voltage box) is connected to the computer through the CAN box, CAN debugging line, and USB line.

When connected to the slave control module, the CAN box is connected to the C or D interface ; when connected to the master control module (when the high-voltage box is not configured) , the CAN box is connected to the D interface ; when connected to the high-voltage box, the CAN box is connected to the high-voltage box master control interface .

Figure 6.1.2-1 Debug line connection diagram



- 2) Before powering on, confirm that the power input is within the required range (9~32 V dc);
- 3) Before powering on, use a multimeter to check the line sequence of H and L of the CAN box, and whether the resistance between H and L is about 120 Ω ;
- 4) According to the CAN box used, go to the official website to download the corresponding CAN box driver and install it on the computer;
- 5) Because the CAN program only recognizes the " ControlCAN.dll " file in the host computer software folder , different models of CAN boxes are distinguished by file size. It is necessary to confirm the correspondence between the " ControlCAN.dll " file and the CAN box model used (currently the 52k file is for the ZHIYUAN Z LG CAN box, and the 230K file is for the Chuangxin Technology CAN box);

Figure 6.1.2-2 CAN box model corresponding file



- 6) system.ini " file in the folder is the system configuration file, which can set the manufacturer and model of the CAN box actually used, as well as the host computer software corresponding to the master or slave module.

Figure 6.1.2-2 System configuration file

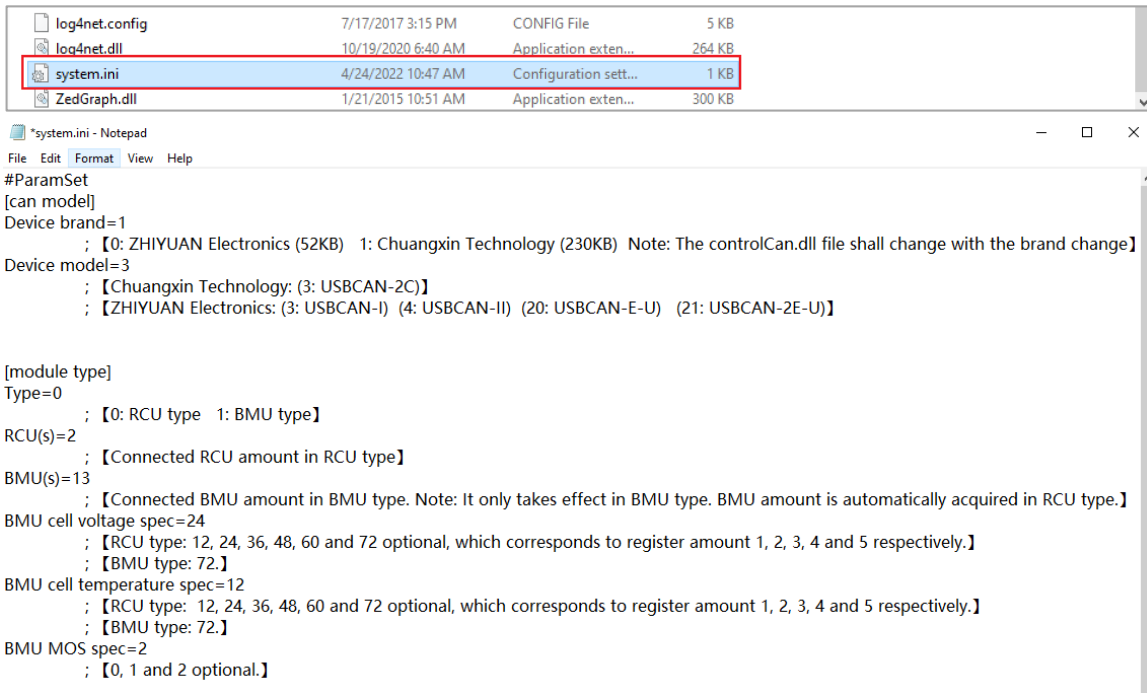


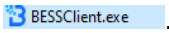
Table 6.1.2-1 System Configuration Settings

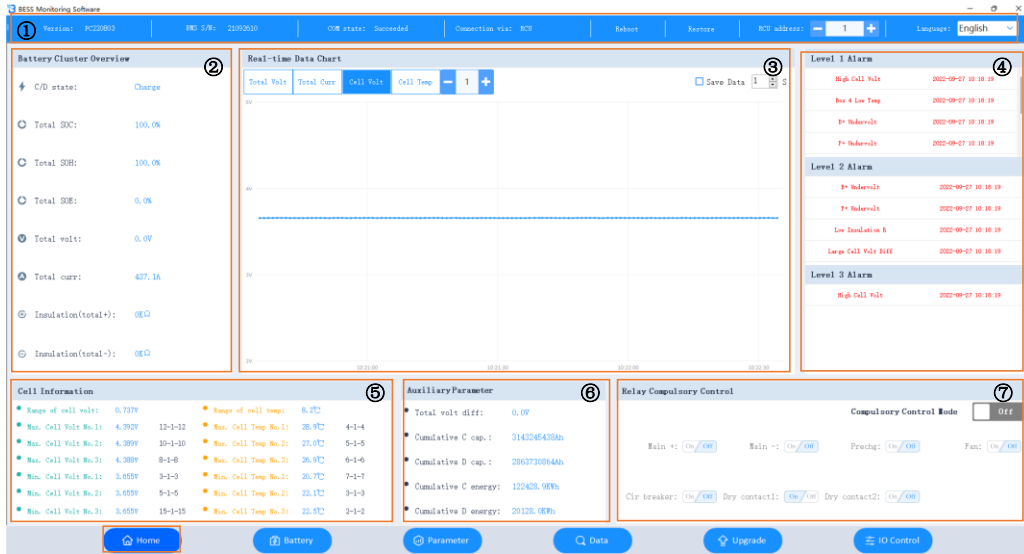
CAN Model	Equipment Brand	0: Zhiyuan Z LG		1: Chuangxin Technology
	Device Model	3: USBCAN -I	4: USBCAN -II	3 : USBCAN -2C
Architecture Patterns		20 : USBCAN -EU	2 1: U SBCAN-2E-U	
		0: Main control module		

Note: The host computer software interface and system configuration files may be updated.

This document is for reference only. The actual product shall prevail.

6.10.3 Home Page

After the host computer communication environment is configured, double-click to open the host computer software  . The home page interface is as follows:



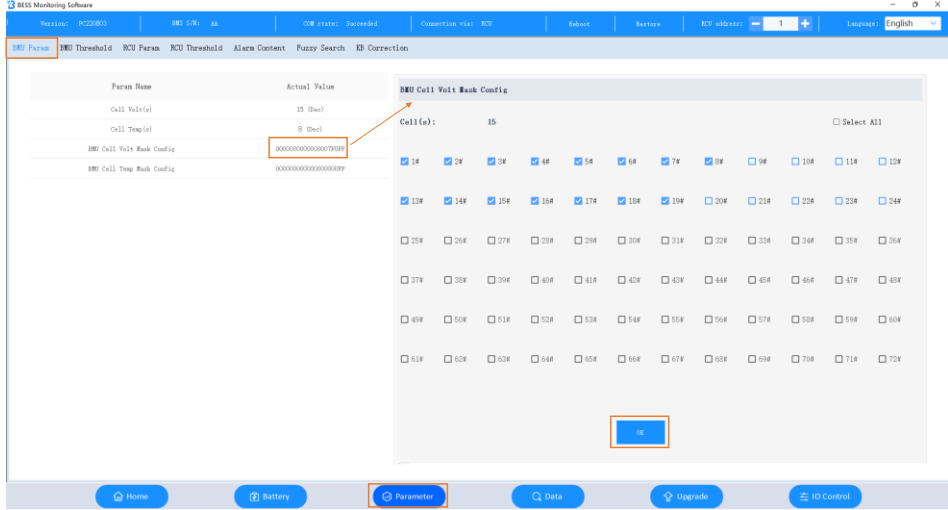
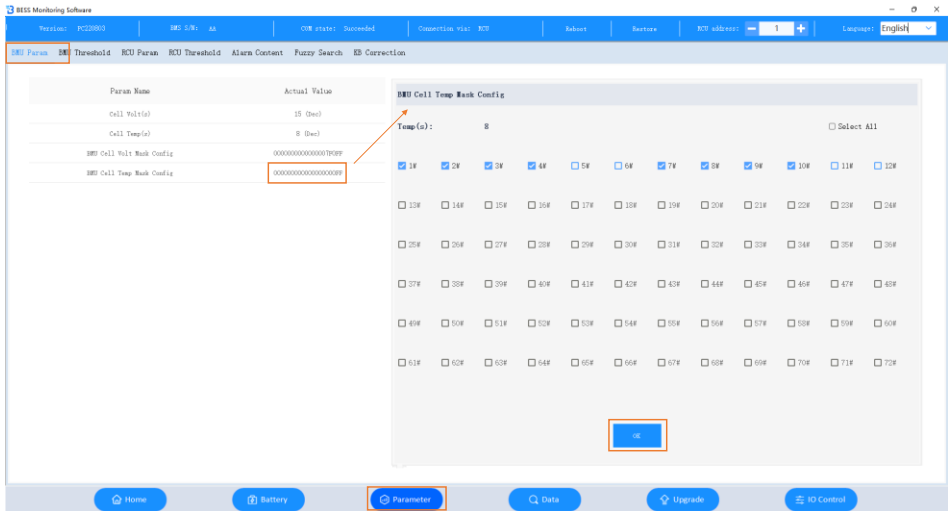
serial number	name	illustrate
①	System Information	Version: Host Communication: Connection: Slave/Master computer version Failure/Success
②	Battery Cluster Overview	Displays cluster charge and discharge status, total SOC , total voltage, total current, and total positive/negative insulation value.
③	Real-time data trend chart	Displays real-time data trend charts of total voltage, total current, single cell voltage, and single cell temperature.
④	Warning information	Displays the alarm name and alarm time of level 1, 2, and 3 alarms.
⑤	Monomer information	Displays the information of the three batteries with the highest voltage, lowest voltage, highest temperature and lowest temperature. 18 - 2 - 3 represents the 18th battery in total, specifically the 3rd battery in the 2nd BMU module .
⑥	Auxiliary parameters	Displays total voltage difference, cumulative charge/discharge capacity and cumulative charge/discharge current parameters.
⑦	Relay strong control	Displays the relay's forced on/off status.

6.10.4 Parameter settings

After logging into the host computer software, you need to set the corresponding parameters according to the actual situation of the project. Click "Parameter Settings" in the lower bar. This page includes "Slave Control Parameter Configuration", "Slave Control Threshold Configuration", "Master Control Parameter Configuration", "Master Control Threshold Configuration", "Alarm Content Configuration", "Fuzzy Search" and "KB Correction Settings".

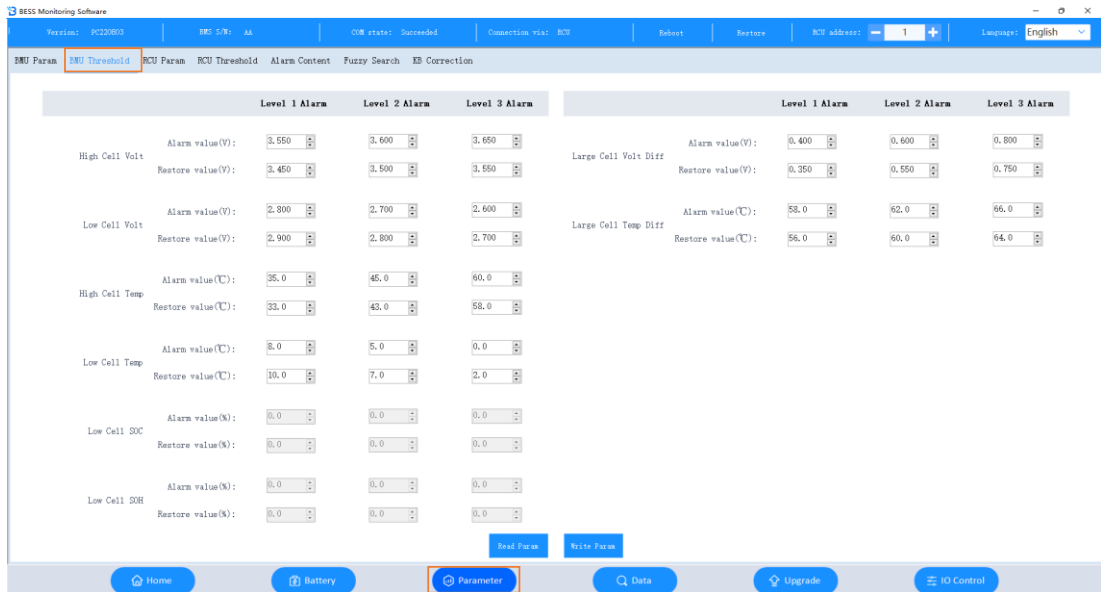
Slave control parameter configuration :

Click to enter the "Parameter Settings > Slave Control Parameter Configuration" page. You can click the actual values of "Slave Control Cell Voltage Configuration Mask" and "Slave Control Cell Temperature Configuration Mask" to make corresponding modifications and configurations. The steps and page operation examples are as follows:

Slave control parameter configuration	
Slave control cell voltage	<p>1) Click the actual value of "Slave Control Cell Voltage Configuration Mask", such as configuring 15 cells to 1-8 and 13-19;</p> <p>2) Click the "Confirm" button, and the actual value of "Number of Cell Voltage" is displayed as 15.</p>  <p style="text-align: center;">Slave cell voltage configuration</p>
Control the battery cell temperature	<p>1) Click the actual value of "Slave Control Cell Temperature Configuration Mask", such as configuring 15 cells as 1-4 and 7-10;</p> <p>2) Click the "Confirm" button, and the actual value of "Number of Cell Temperatures" is displayed as 8.</p>  <p style="text-align: center;">Slave control cell temperature configuration</p>

Slave control threshold configuration

Click to enter the "Parameter Settings > Slave Control Threshold Configuration" page to read and write the first, second and third level alarm values and recovery values of parameters such as "Cell Voltage High", "Cell Voltage Low", "Cell Temperature High", "Cell Temperature Low", "Cell SOC Low", "Cell SOH Low", "Cell Voltage Difference Too Large" and "Cell Temperature Difference Too Large".



Master control parameter configuration

Click to enter the "Parameter Settings > Master Control Parameter Configuration" page, and click the actual values of "Number of Slave Controls", "Box Temperature Configuration", "Current Sensor Configuration", "Balanced Start Configuration", "DO Relay Configuration", "DI Relay Configuration", "Fan Start Temperature Value" and "Forced Insulation Collection" to make corresponding modifications and configurations. The steps and page operation examples are as follows:

Master control parameter configuration

Slave control quantity configuration

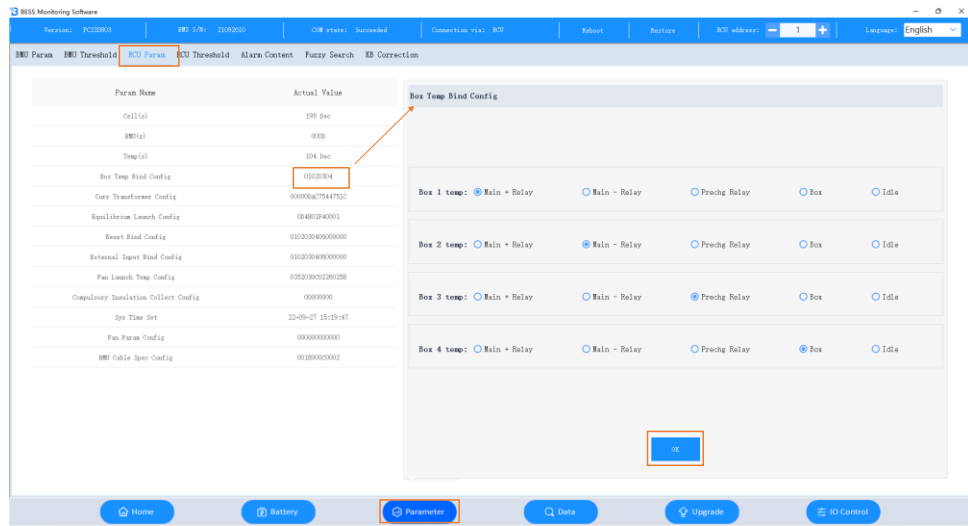
- 1) Click the actual value of "Number of slave controls" and set the number of slave controls for a single cluster to 8 according to the actual situation ;
- 2) Click the "Confirm" button, and the number of cells, number of slave controls, and number of temperatures will be displayed as actual set values.

Slave control quantity configuration

Master control parameter configuration

Box temperature configuration

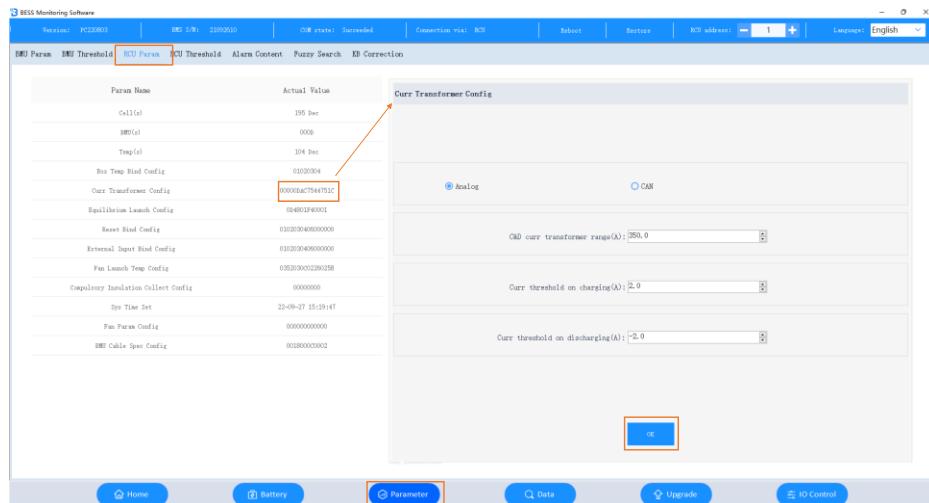
- 1) Click the actual value of "Box Temperature Configuration" and set the relay corresponding to the box temperature according to the actual situation;
- 2) Click the "Confirm" button and the "Temperature Quantity" will be displayed as the actual set value.



Box temperature configuration

Current Sensors

- 1) Click the actual value of "Current Sensor", select analog (Hall sensor) or CAN (digital current loop) according to the actual situation, and set the mutual charge and discharge current transformer range, charging start current threshold and discharge card start current threshold;
- 2) After completing the settings, click the "Confirm" button.

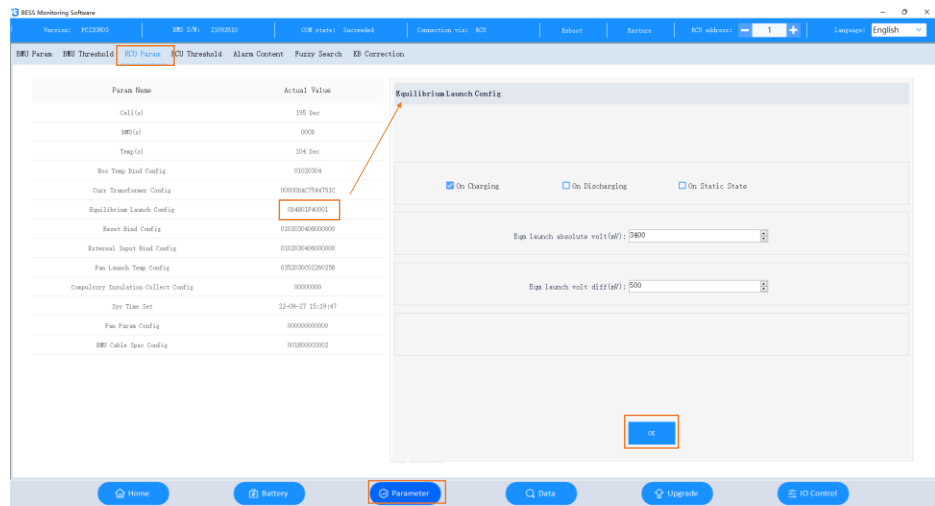


Current sensor configuration

Master control parameter configuration

Balanced start Configuration

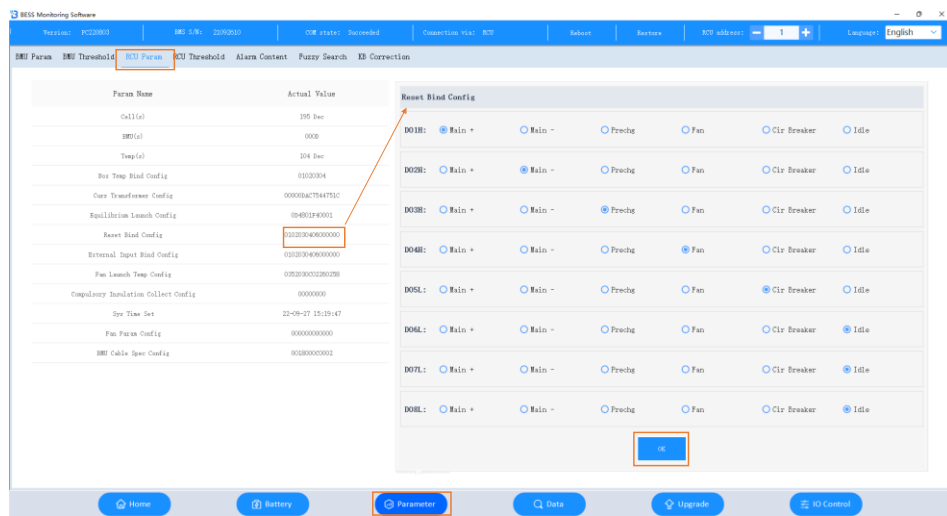
- 1) Click the actual value of "Balanced Startup Configuration" and select according to the actual situation;
- 2) After completing the settings, click the "Confirm" button.



Balanced startup configuration

D O relay configuration

- 1) Click the actual value of " DO relay configuration" and set the corresponding configuration of DO output according to the actual situation ;
- 2) After completing the settings, click the "Confirm" button.

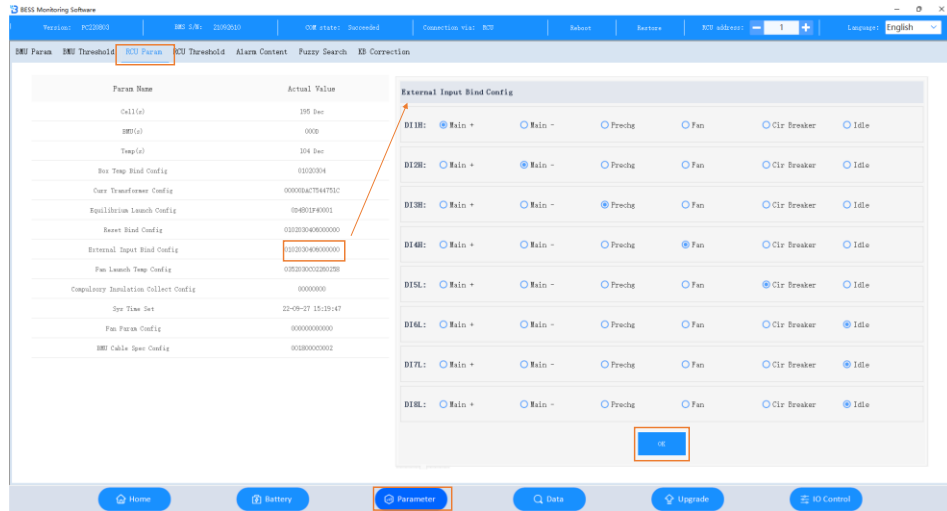


D O relay configuration

Master control parameter configuration

- 1) Click the actual value of " DI relay configuration" and set the corresponding configuration of DI input according to the actual situation. The relays of DI output and DI input feedback of the same serial number should be consistent;
- 2) After completing the settings, click the "Confirm" button.

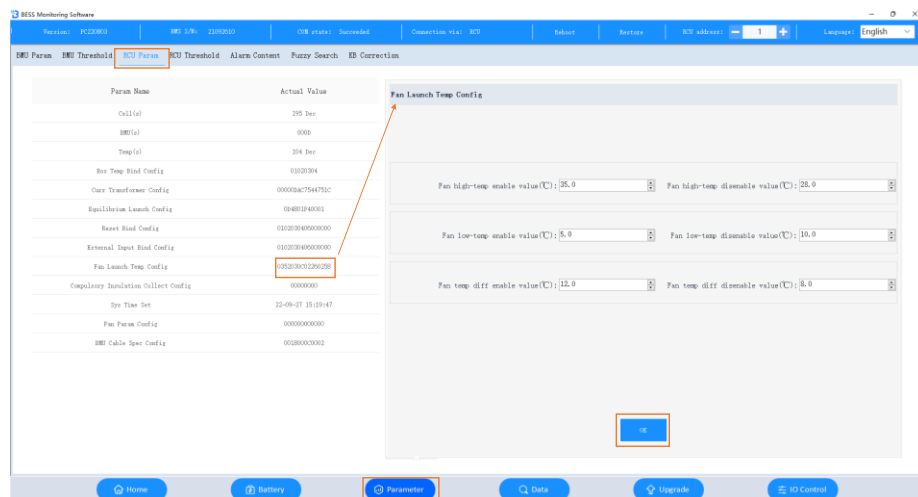
DI relay configuration



DI relay configuration

- 1) Click the actual value of "Fan start temperature configuration" and set the fan high temperature, low temperature, temperature difference opening and closing values according to the actual situation;
- 2) After completing the settings, click the "Confirm" button.

Fan start temperature value Configuration

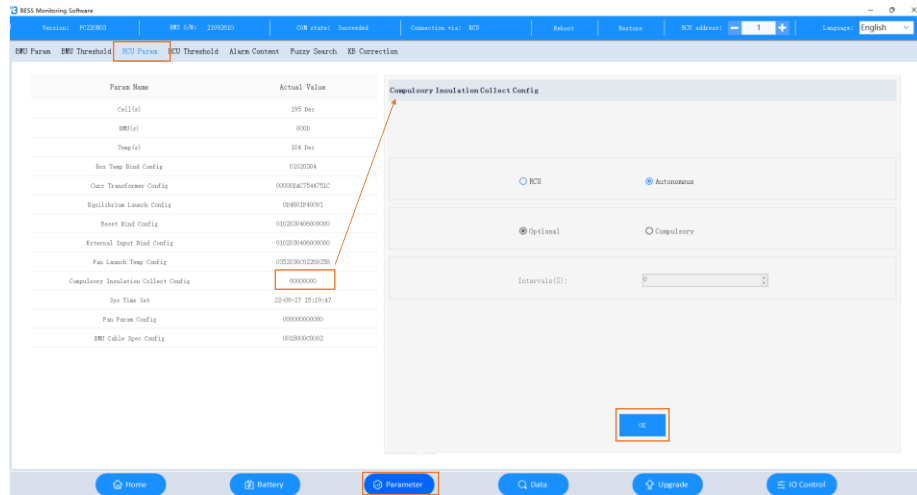


Fan start temperature value configuration

Master control parameter configuration

Mandatory insulation acquisition configuration

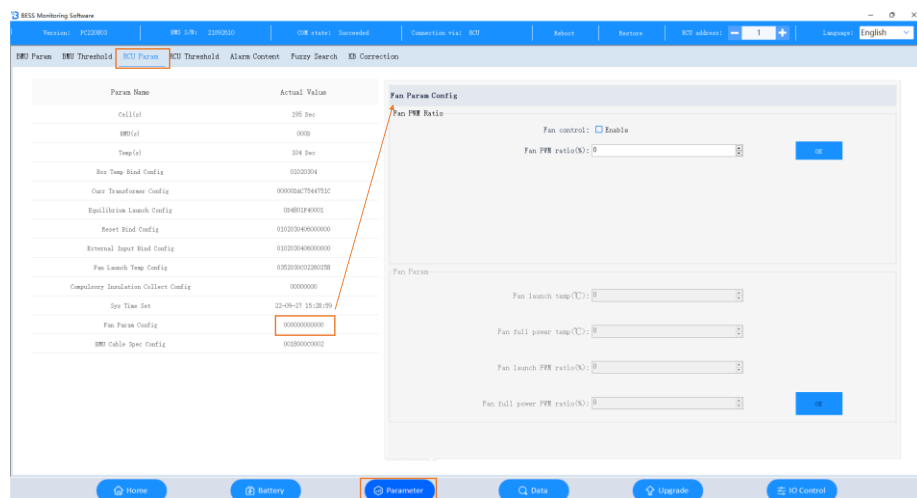
- 1) Click the actual value of "Forced Insulation Collection" and set whether to force collection and the collection interval according to the actual situation;
- 2) After completing the settings, click the "Confirm" button.



Mandatory insulation acquisition configuration

Fan parameters Configuration

- 1) Click the actual value of "Fan Parameter Configuration". According to the actual situation, you can enable fan control and set the fan duty cycle;
- 2) After completing the settings, click the "Confirm" button.

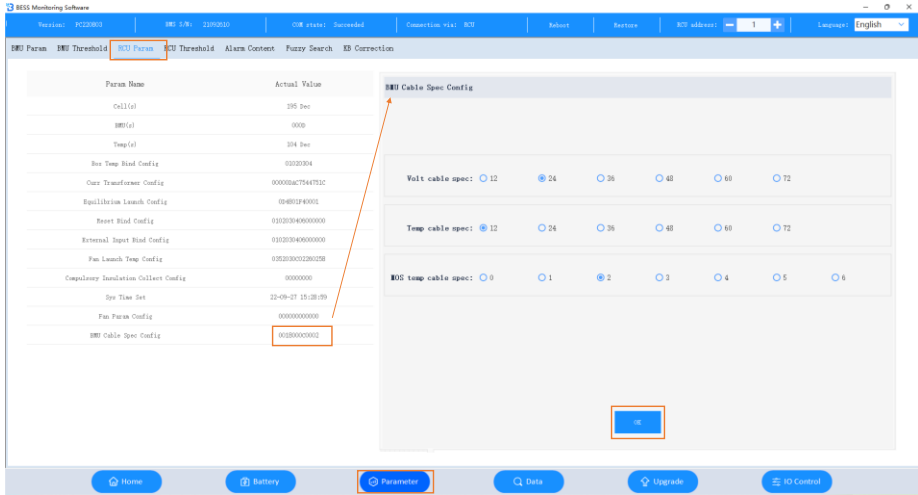


Fan parameter configuration

Master control parameter configuration

Specifications and configuration of slave control harness

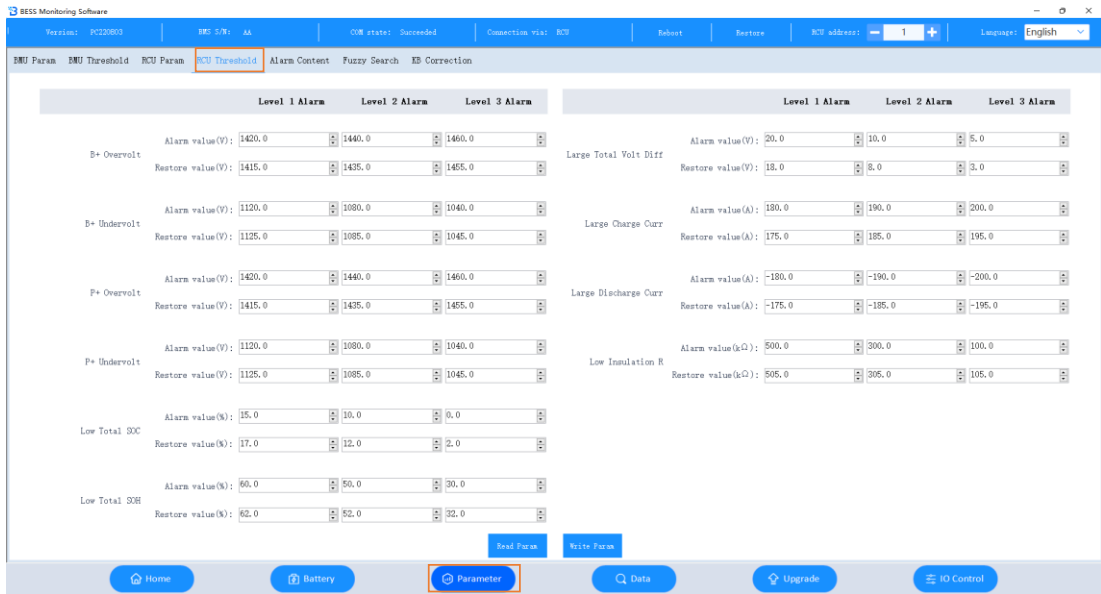
1) Click the actual value of "Slave Control Harness Specification Configuration" and set the voltage, temperature and M OS temperature harness specifications according to the actual situation;
 2) After completing the settings, click the "Confirm" button.



Specifications and configuration of slave control harness

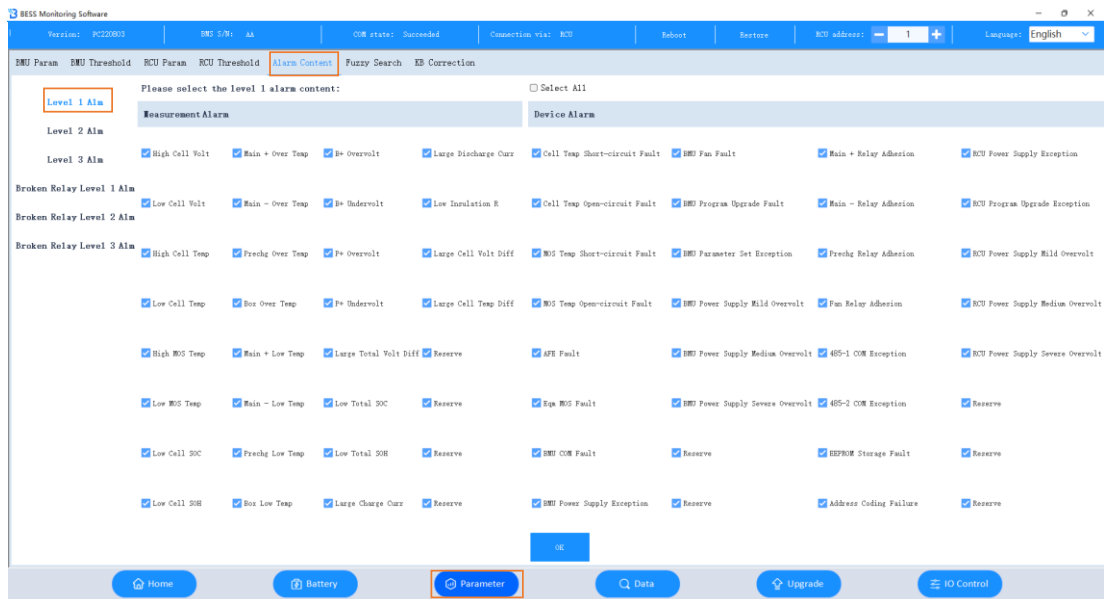
Master control threshold configuration

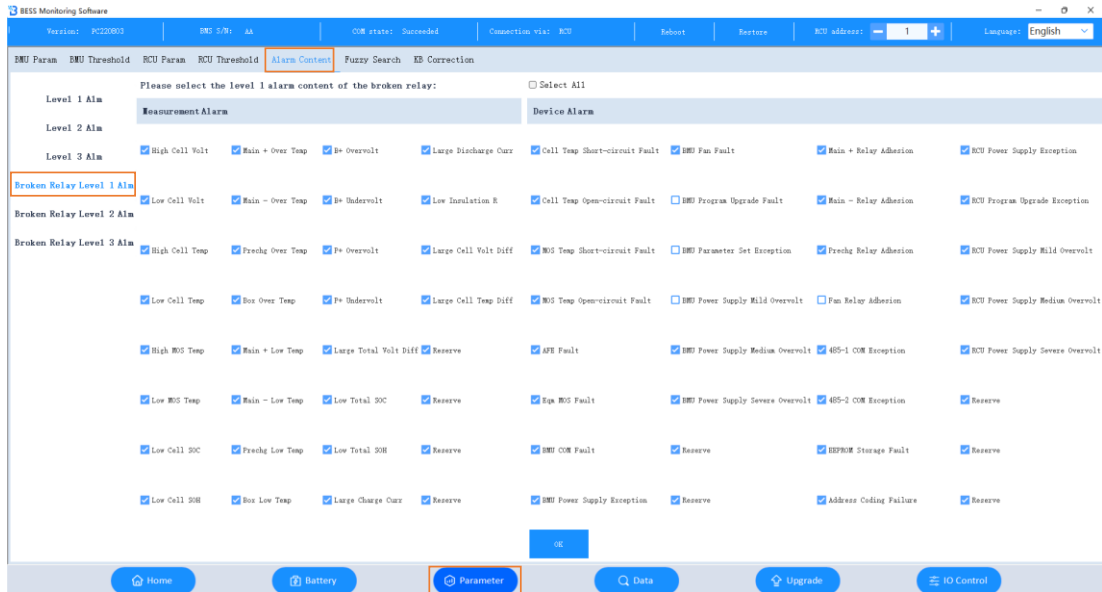
Click to enter the "Parameter Settings > Master Control Threshold Configuration" page to read and write the first, second and third level alarm values and recovery values of parameters such as "B+ Overvoltage", "B+ Undervoltage", "P+ Overvoltage", "P+ Undervoltage", "Overall SOC Low", "Overall SOH Low", "Total Voltage Difference Too Large", "Charging Current Too Large", "Discharging Current Too Large" and "Low Insulation Resistance".



Alarm content configuration

Click to enter the "Parameter Settings > Alarm Content Configuration" page to set the level 1, 2, and 3 alarm parameters displayed on the home page and the level 1, 2, and 3 alarm parameters of the relay.



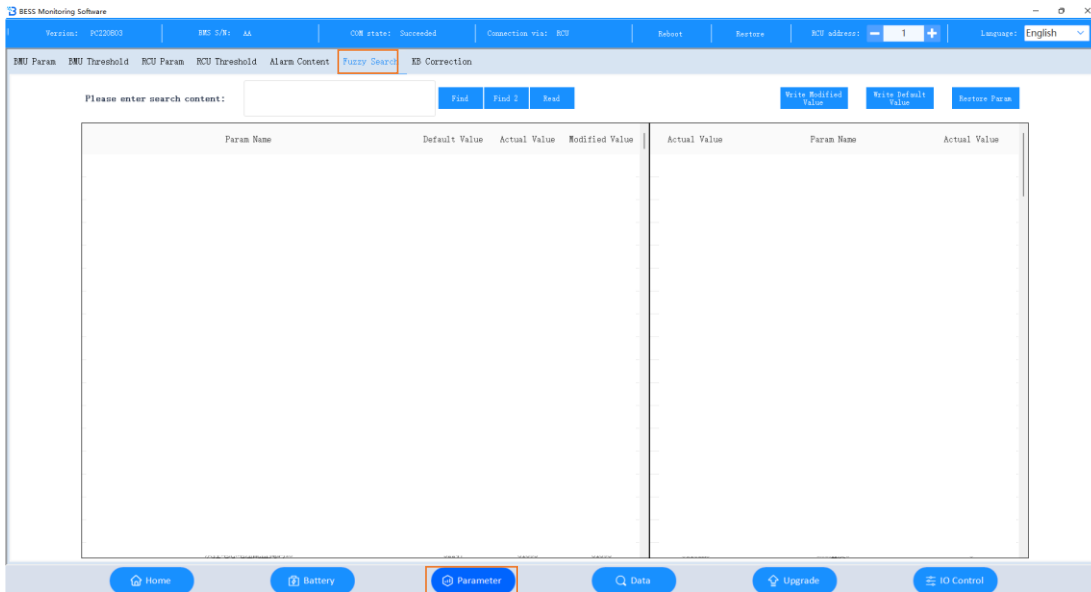


Warning page:

Measurement Alarm	Device Alarm
<p>Measurement Alarm</p> <p><input checked="" type="checkbox"/> High Cell Volt <input checked="" type="checkbox"/> Main + Over Temp <input checked="" type="checkbox"/> B+ Overvolt <input checked="" type="checkbox"/> Large Discharge Curr</p> <p><input checked="" type="checkbox"/> Low Cell Volt <input checked="" type="checkbox"/> Main - Over Temp <input checked="" type="checkbox"/> B+ Undervolt <input checked="" type="checkbox"/> Low Insulation R</p> <p><input checked="" type="checkbox"/> High Cell Temp <input checked="" type="checkbox"/> Prechg Over Temp <input checked="" type="checkbox"/> P+ Overvolt <input checked="" type="checkbox"/> Large Cell Volt Diff</p> <p><input checked="" type="checkbox"/> Low Cell Temp <input checked="" type="checkbox"/> Box Over Temp <input checked="" type="checkbox"/> P+ Undervolt <input checked="" type="checkbox"/> Large Cell Temp Diff</p> <p><input checked="" type="checkbox"/> High MOS Temp <input checked="" type="checkbox"/> Main + Low Temp <input checked="" type="checkbox"/> Large Total Volt Diff <input checked="" type="checkbox"/> Reserve</p> <p><input checked="" type="checkbox"/> Low MOS Temp <input checked="" type="checkbox"/> Main - Low Temp <input checked="" type="checkbox"/> Low Total SOC <input checked="" type="checkbox"/> Reserve</p> <p><input checked="" type="checkbox"/> Low Cell SOC <input checked="" type="checkbox"/> Prechg Low Temp <input checked="" type="checkbox"/> Low Total SOH <input checked="" type="checkbox"/> Reserve</p> <p><input checked="" type="checkbox"/> Low Cell SOH <input checked="" type="checkbox"/> Box Low Temp <input checked="" type="checkbox"/> Large Charge Curr <input checked="" type="checkbox"/> Reserve</p>	<p>Device Alarm</p> <p><input checked="" type="checkbox"/> Cell Temp Short-circuit Fault <input checked="" type="checkbox"/> BMS Fan Fault <input checked="" type="checkbox"/> Main + Relay Adhesion <input checked="" type="checkbox"/> BCU Power Supply Exception</p> <p><input checked="" type="checkbox"/> Cell Temp Open-circuit Fault <input checked="" type="checkbox"/> BMS Program Upgrade Fault <input checked="" type="checkbox"/> Main - Relay Adhesion <input checked="" type="checkbox"/> BCU Program Upgrade Exception</p> <p><input checked="" type="checkbox"/> MOS Temp Short-circuit Fault <input checked="" type="checkbox"/> BMS Parameter Set Exception <input checked="" type="checkbox"/> Prechg Relay Adhesion <input checked="" type="checkbox"/> BCU Power Supply Mild Overvolt</p> <p><input checked="" type="checkbox"/> MOS Temp Open-circuit Fault <input checked="" type="checkbox"/> BMS Power Supply Mild Overvolt <input checked="" type="checkbox"/> Fan Relay Adhesion <input checked="" type="checkbox"/> BCU Power Supply Medium Overvolt</p> <p><input checked="" type="checkbox"/> AFE Fault <input checked="" type="checkbox"/> BMS Power Supply Medium Overvolt <input checked="" type="checkbox"/> 485-1 COM Exception <input checked="" type="checkbox"/> BCU Power Supply Severe Overvolt</p> <p><input checked="" type="checkbox"/> Egm MOS Fault <input checked="" type="checkbox"/> BMS Power Supply Severe Overvolt <input checked="" type="checkbox"/> 485-2 COM Exception <input checked="" type="checkbox"/> Reserve</p> <p><input checked="" type="checkbox"/> BMS COM Fault <input checked="" type="checkbox"/> Reserve <input checked="" type="checkbox"/> EEPROM Storage Fault <input checked="" type="checkbox"/> Reserve</p> <p><input checked="" type="checkbox"/> BMS Power Supply Exception <input checked="" type="checkbox"/> Reserve <input checked="" type="checkbox"/> Address Coding Failure <input checked="" type="checkbox"/> Reserve</p>

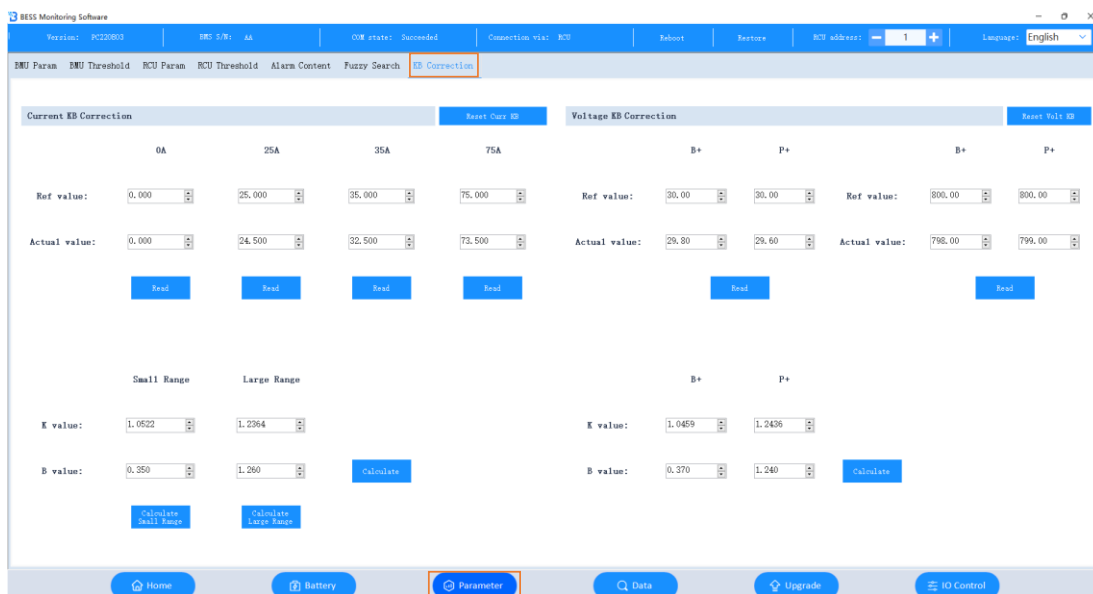
Fuzzy search

Click to enter the "Parameter Settings > Fuzzy Search" page, enter keywords to search for parameters, click to modify the value and right-click "Write", the actual value will be displayed as the modified value, or click the "Write Default Value" button to modify the actual value to the default value.







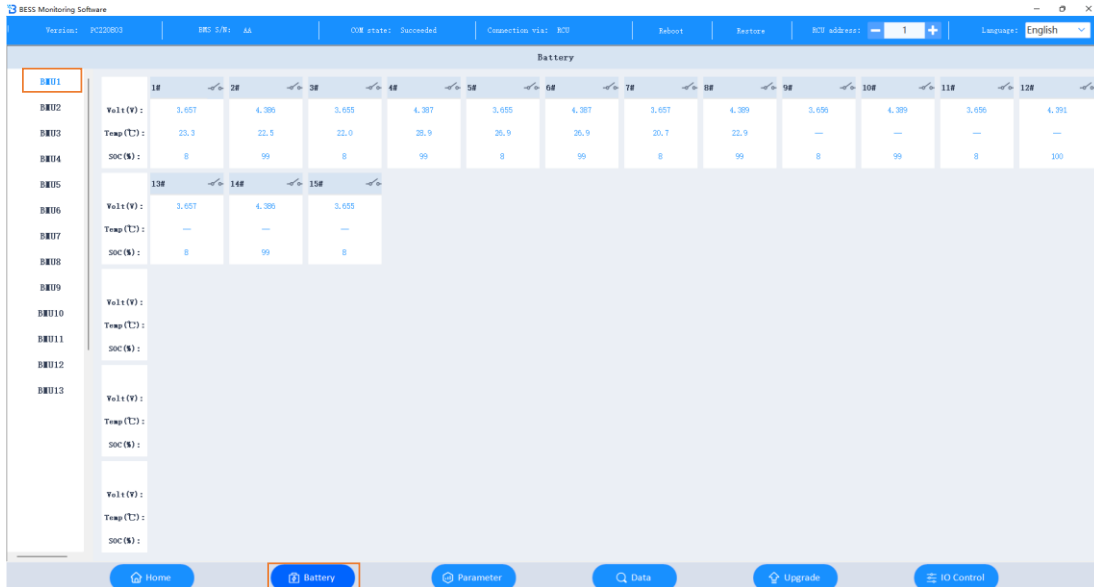
KB correction settings

Click to enter the "Parameter Settings > KB Correction " page to perform current correction and total voltage correction, and read and write corresponding parameters.



6.10.5 Battery Information

Click "Battery Information" in the lower column. This page will display all the cell information in the connected slave control module, including cell voltage, cell temperature, and cell SOC . The upper right corner shows the cell's balancing status .  "" means balancing is not turned on, and  "" means balancing is turned on. Click  the icon to close it (), and the cell is in a balancing state.

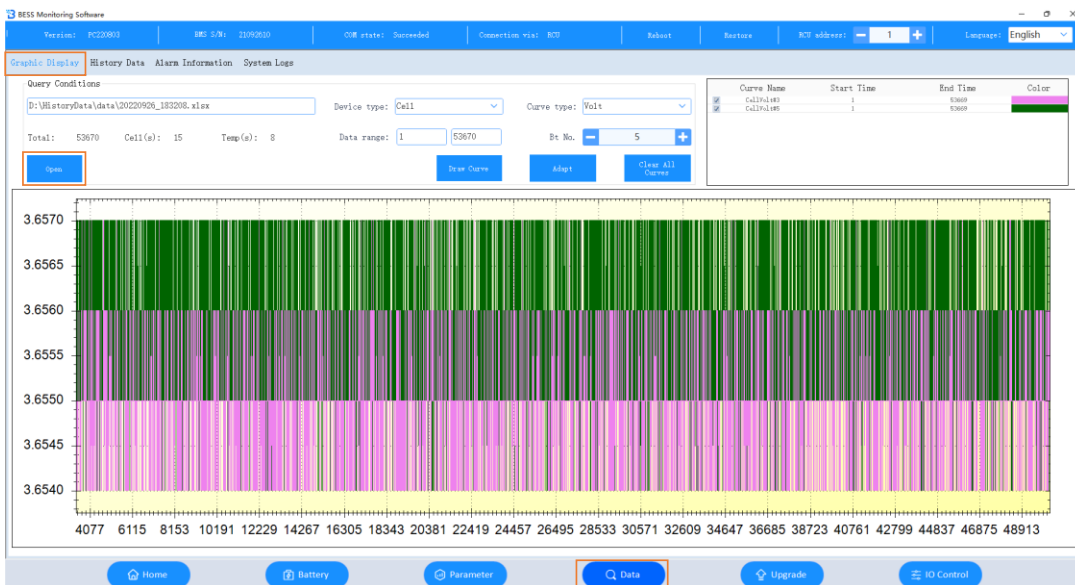


6.10.6 Data Query

Click "Data Query" in the lower bar. This page contains "Graphical Display", "Historical Data", "Alarm Information" and "System Log".

Graphical display

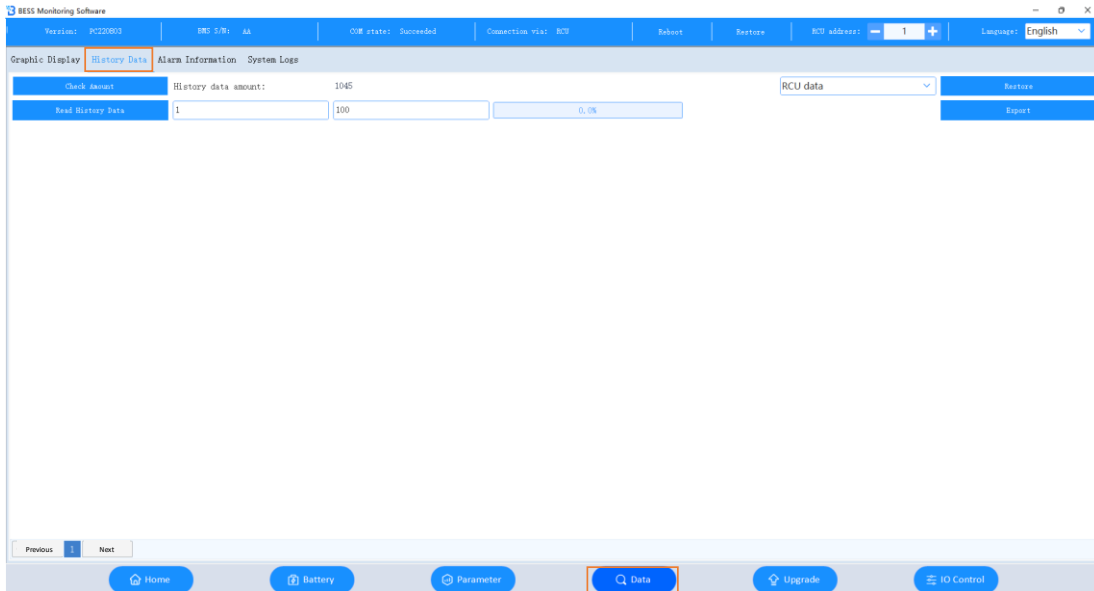
Click to enter the "Data Query > Graphic Display" page to import analysis data or Flash data (Develop > Data folder). Single cells support voltage and temperature curve analysis; slave control modules support voltage and temperature curve analysis of battery packs; group ends support voltage B, voltage P, current, SOC, SOH , insulation positive resistance, and insulation negative



resistance curve analysis.

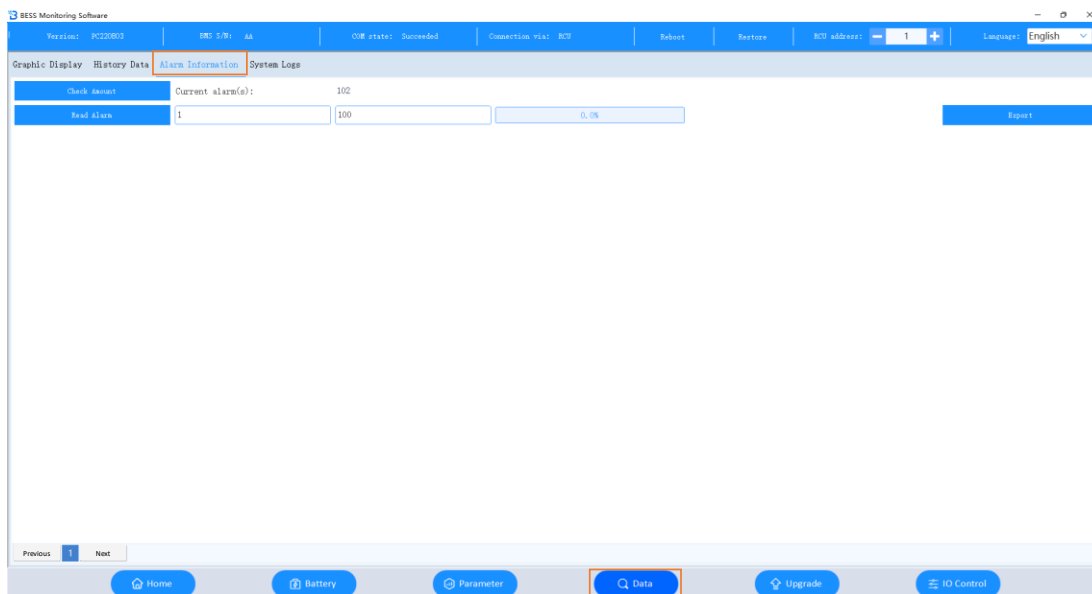
Historical data

Click to enter the "Data Query > Historical Data" page, click the "Query Quantity" button to display the number of historical alarm data, and click the "Read Historical Data" button to display the details of historical data. Click the "Export to Excel" button in the upper right corner to export historical data to an Excel file, and the "Data Restore Factory" button.



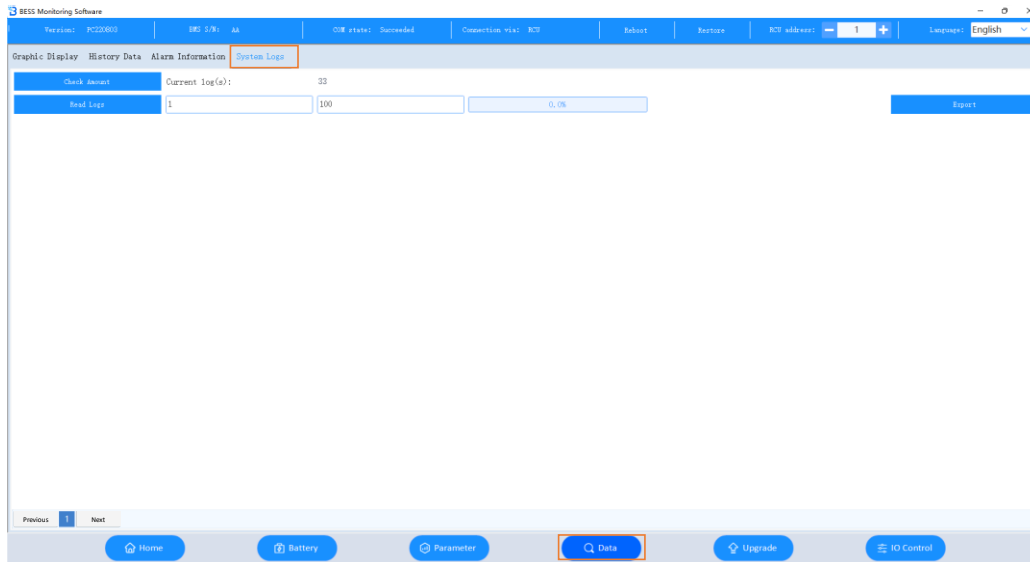
Warning information

Click to enter the "Data Query>Alarm Information" page, click the "Query Quantity" button to display the current alarm information quantity, click the "Read Alarm Information" button to display the alarm information list, and click the "Export to Excel " button to export the alarm information as an Excel file.



System logs

Click to enter the "Data Query > System Log" page, click the "Query Quantity" button to display the current system log quantity, click the "Read Log" button to display the log list, and click the "Export to Excel" button to export the alarm information as an Excel file.

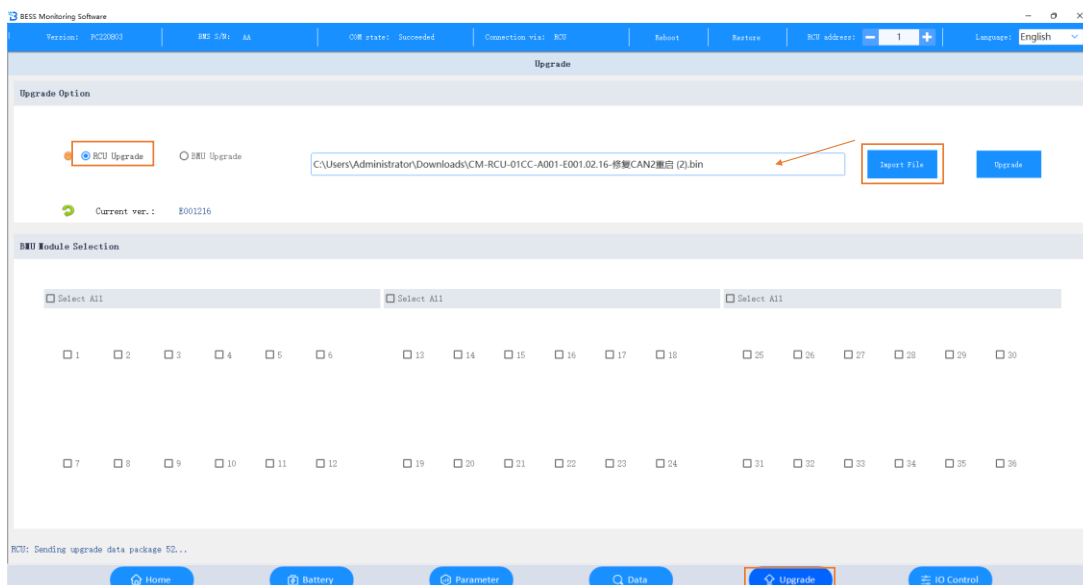


6.11 Program Upgrade

Click "Program Upgrade" in the lower bar. This page contains "Output Control" and "Slave Control Module Selection".

In "Output Control", select "Master Control Upgrade" or "Slave Control Upgrade", select some or all slave control module numbers that need program upgrade, click the "Import File" button to import the corresponding upgrade file (.bin format), and then click the "Upgrade" button.

Figure 6.11-1 Program Upgrade



7. Startup and commissioning

7.1 Pre power-up check

Step 1 Status of circuit breakers and indicator lights .

Step 2 Use a multimeter to check whether there is a short circuit between the positive and negative poles of the battery input terminal (B terminal) and output terminal (P terminal), the positive pole and the neutral line (if any), and the negative pole and the neutral line of each RBMS (high-voltage box) .

7.2 Battery Power-up

Danger

Please wear insulating gloves and use insulating tools to avoid electric shock or short circuit.

Notice

During the power-on process, you should observe while powering on. If you find any abnormal phenomenon, immediately disconnect the battery and find out the cause. You can continue to power on after it is resolved.

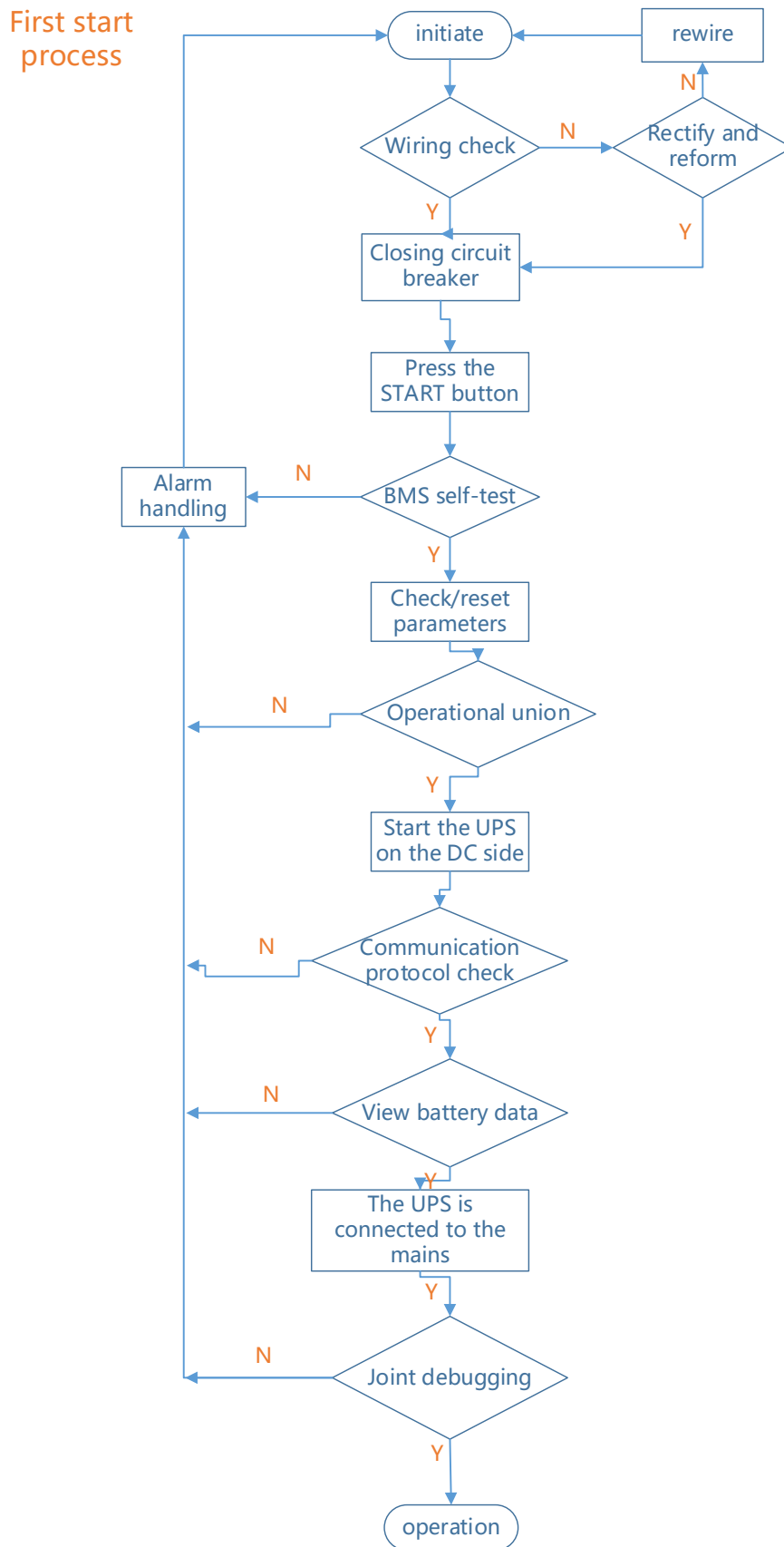
Notice

The battery must be fully charged (SOC reaches 100%) before it is put into use for the first time. After it is put into use, the battery is not allowed to be replaced at will unless there is a battery failure.

Table 7.2-1 Battery Control Unit Indicator Status

Indicator status description				
NO	Work title	Operative mode	Indicator status	Description
1	Shutdown /BMS power off	The shunt or start switch of the circuit breaker is not enabled	●	System not working
2	Standby (standing)	Normal	●	Static
3		Primary alarm	●	Static
4		Level 2 and Level 3 alarms	●	Static
5	Charging	Normal	●/	The green light flashes at intervals of 2 seconds
6		Primary alarm	●/	The yellow indicator blinks at intervals of 2 seconds
7		Level 2 alarm (cell pressure difference, large temperature difference, low SOC) Level 3 alarm (SOC low)	●/	The red light blinks at intervals of 2 seconds
8		Level 2 and Level 3 alarms (except for individual pressure difference, large temperature difference and low SOC)	●	Static
9	Electric discharge	Normal	●//	The green light blinks at a interval of 1S
10		Primary alarm	●//	The yellow indicator blinks at a interval of 1S
11		Level 2 alarm (cell pressure difference, large temperature difference, low SOC) Level 3 alarm (SOC low)	●//	The red light blinks at a interval of 1S
12		Level 2 and Level 3 alarms (except for individual pressure difference, large temperature difference and low SOC)	●	Static
13	Precharge	Normal	●///	The green is blinking at intervals of 0.5 seconds
14		An alarm indicating that precharge is allowed exists	●///	The yellow indicator blinks at intervals of 0.5 seconds
15		Alarms indicating that precharge is not allowed exist	●	Static

7.3 First Startup



Step 1 : Check the communication lines, dry contacts, and power lines for any missing, reverse, or wrong connections. If necessary, make corrections or reconnect the wires.

Step 2 : Manually close each cluster R BMS circuit breaker downwards and point the manual arrow to "ON " ;

Step 3 : Press the " START " button, the BMS will perform a self-test, and the indicator light will be solid green after the self-test passes; if the self-test fails, restart the boot process;

Step 4 : Check the set parameters through the display control (M DU) or the host computer software. If the parameters do not match the actual parameters required on site, you can modify them on the host computer software after connecting the debugging line to the computer; Step 5: Perform cluster parallel operation through the display control (M DU). If the cluster parallel operation is successful, proceed to step 6. Otherwise, you need to handle the alarm information and restart the boot process;

Step 5 : Start UPS

Step 6 : Check the communication protocol between the master control (SBMS) and the UPS . If the handshake is successful, proceed to step 8. If it fails, restart the boot process.

Step 7 : Check the battery cluster related data through the display control (M DU) or the host computer software. If the data is abnormal, handle the alarm information and restart the process. If there is no problem, go to step 9;

Step 8 : UPS is connected to the utility power;

Step 9 : UPS and battery cluster conduct joint basic charge and discharge debugging. If passed, proceed to step 11. Otherwise , the alarm information must be processed and the startup process must be restarted.

Step 10 : Official operation.

7.4 Low battery recharge requirements

Notice 

When the battery is powered off during installation and commissioning or the battery is fully discharged, please recharge the battery in time; otherwise, the battery may be damaged due to over-discharge.

Notice 

Storing the battery in a low-power state may cause over-discharge and damage the battery. Please recharge it in time.

Scenarios that may trigger low battery storage (including but not limited to):

- The battery is powered off after commissioning and cannot be charged.
- The battery is powered off after commissioning and is not charged in time.
- After the battery is discharged, the power grid is out of power for a long time and the battery cannot be charged in time.
- After the battery is discharged, it cannot enter the charging state due to a system failure.
- After the battery EOD, it is not charged immediately.

Table 7.4-1 Correspondence between SOC and charging interval relationship with charging interval

SOC Range	Longest charging interval
SOC ≥ 10%	30 days
8% ≤ SOC < 10%	25 days
6% ≤ SOC < 8%	20 days
4% ≤ SOC < 6%	10 days
SOC < 4%	2 hours

8Product Maintenance

Danger

Please wear insulating gloves and use insulating tools to avoid electric shock or short circuit.

Danger

Do not smoke or use open flames near batteries.

Danger

Do not use a wet cloth to clean exposed copper busbars or other potentially conductive areas.

Danger

Do not use water or any solvent to clean the battery.

Warning

It is prohibited to maintain the battery while it is powered on. Operations such as screw torque verification and tightening, and battery module impedance measurement require the battery to be powered off. These operations can only be performed after the risks have been explained to the customer and the customer's written consent has been obtained, and effective preventive measures have been taken.

Warning

After the battery is discharged, it should be charged in time, otherwise the battery may be damaged due to over-discharge.

Notice

- During installation and maintenance, the battery circuit should remain disconnected.
 - Before installing the maintenance battery, you need to unplug the battery control unit and reinstall the battery control unit after the operation is completed.
 - When moving batteries, be careful to handle them with care, avoid bumping or bumping them, and pay attention to personal safety.
-

Things to know

- Before operating, you must carefully read the user manual and its safety precautions, and all maintenance operations must be performed by professionals.
- Battery software upgrades must be performed when AC input is normal to avoid service interruption.

8.1 Routine maintenance

Table 8.1-1 Work environment inspection

NO	Inspection items	Inspection Standards	Inspection methods and exception handling	Recommended inspection cycle
1	Computer room environment	<ul style="list-style-type: none"> • The fire doors of the computer room are always closed and the air conditioners are working normally and uninterruptedly. • There is no dust or flammable debris in the machine room. 	<ul style="list-style-type: none"> • Inspection method: visual inspection • Exception handling: Repair according to inspection standards 	Monthly
2	Rodent proofing inspection	The computer room has anti-rat measures, such as anti-rat boards, anti-rat traps, etc.	<ul style="list-style-type: none"> • Inspection method: visual inspection • Exception handling: Repair according to inspection standards 	Monthly
3	Fire inspection of computer room	Fire alarm system and fire extinguishing equipment have been installed in the battery room	<ul style="list-style-type: none"> • Inspection method: visual inspection • Exception handling: Repair according to inspection standards 	Monthly
4	Installation location check	There is no air outlet above the lithium battery cabinet, no air conditioning refrigerant copper pipe, and no other water leakage risk.	<ul style="list-style-type: none"> • Inspection method: visual inspection • Exception handling: Repair according to inspection standards 	Monthly
5	Ambient temperature	Measured temperature _____℃ (Normal 0℃~ Within 40℃, 20℃~25℃ is recommended)	<ul style="list-style-type: none"> • Inspection method: Measure. Use a thermometer and hygrometer • Abnormal handling: Check the air conditioner operating status and restore normal operation 	Monthly

6	Ambient humidity	Measured humidity_% (5% RH ~ 95% RH , no condensation)	<ul style="list-style-type: none"> • Inspection method: Measure. Use a thermometer and hygrometer • Abnormal handling: Check the air conditioner operating status and restore normal operation 	Monthly
---	------------------	---	--	---------

Table 7.1-2 Product component inspection

NO	Inspection items	Inspection Standards	Inspection methods and exception handling	Recommended inspection cycle
1	Cabinet appearance inspection	The cabinet appearance is free of dust accumulation (dust screen, fan), rust, deformation, etc.	<ul style="list-style-type: none"> • Inspection method: visual inspection • Exception handling: Repair according to inspection standards 	Monthly
2	Battery appearance inspection	<ul style="list-style-type: none"> • The battery surface is clean and free of stains • Battery terminals intact • The battery shell is intact, without deformation or expansion, and there are no bruises around it. • The battery has no acid or electrolyte leakage (there will be a pungent smell when the electrolyte leaks) 	<ul style="list-style-type: none"> • Inspection method: visual inspection • Exception handling: Please contact the technical engineer for handling 	Monthly
3	Cabinet outlet protection inspection	The wiring holes of the lithium battery cabinet have been sealed with factory-provided sealing sheets or cable glands, and rat-proofing measures are in place	<ul style="list-style-type: none"> • Inspection method: visual inspection • Exception handling: fix as per standard 	Monthly
4	Check if the cabinet air outlet is blocked	The air outlet on the lithium battery cabinet is unobstructed	<ul style="list-style-type: none"> • Inspection method: visual inspection • Exception handling: Repair according to inspection standards 	Monthly

NO	Inspection items	Inspection Standards	Inspection methods and exception handling	Recommended inspection cycle
5	Metal debris inspection in the cabinet	There are no metal copper scraps or other conductive foreign objects in the cabinet.	<ul style="list-style-type: none"> ● Inspection method: visual inspection ● Exception handling: Repair according to inspection standards 	Monthly
6	Check the cabinet grounding wire	The grounding wire of the lithium battery cabinet is reliably connected to the power distribution grounding bar, and the screws are tightened without looseness.	<ul style="list-style-type: none"> ● Inspection method: visual inspection ● Abnormal handling: Tighten the screws (torque 47N·m) 	yearly
7	Power cable and terminal inspection	The screws are tightened without loosening, the cable insulation layer is not damaged, and the power cable connection points are not blackened or have sparks.	<ul style="list-style-type: none"> ● Inspection method: visual inspection ● Abnormal handling: Replace the cable and tighten the loose screws 	yearly
8	Battery connection reliability check (Recommended)	<ul style="list-style-type: none"> ● When the battery pack is powered off, check the reliability of the copper busbars and communication/sampling terminals of each battery module one by one in a fixed order from positive pole (N pole) to negative pole. ● The copper bar fastening inspection requires the use of a torque wrench to check whether the torque of each battery screw meets the requirements of the battery manufacturer; After the 	<ul style="list-style-type: none"> ● Inspection method: (1) Visual inspection. (2) Verification. After the equipment is powered off, use an insulated torque wrench to verify the screw torque. ● Exception handling: Repair according to inspection standards 	yearly

NO	Inspection items	Inspection Standards	Inspection methods and exception handling	Recommended inspection cycle
		battery screw is inspected and qualified, it is required to draw a line mark on the battery screw for subsequent inspection		

8.2 Lift truck

In order to facilitate the maintenance of modules, it is recommended that each site be equipped with a lift truck, and the site can be selected according to the actual equipment situation.

Function : Auxiliary tool for installing or removing module