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BP Series

Lithium-Iron Phosphate Battery Backup

Product Manual

Information Version: 1.0

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Introduction

Manual Explains

BP series (V1.3) lithium iron phosphate battery is power module for backup system and energy storage system. In backup power system, the main power provides energy for equipment and charging the battery; when power off, battery provides energy. While in energy storage system, battery charging or discharging can be managed by system, users can choose energy from solar panel, main power or battery, it saves energy cost.

BP series Product Manual exposted the basic processes and methods of the device, includes structure, parameters, installation and operation. The main content following:

Chapter	Abstract
Chapter 1 Introduction	Main application and features of BP48100
Chapter 2 Structure and Parameters	External structure, panel description, management module parameters and others
Chapter 3 Installation and Collocation	Product installation, network usage and requires attention in installation process of BP48100
Chapter 4 Maintenance and Troubleshooting	Common operating state descriptions and Troubleshooting of BP48100

Safety Instructions

This device only be installed, operated and maintained by people who professional trained and qualified. In the process of installation, operation and maintenance, local safety regulations and related procedures must be complied, or it may cause injury or equipment damage. Safety precautions mentioned in manual only as a supplement for local safety regulations. Pylontech does not assume any responsibility for breaching common security operation or equipment safety standards.

Symbols

The following format described some contents need attention for BP series



Note: If warning ignored, the product may malfunction.

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1 Introduction

1.1 Introduction

BP series lithium iron phosphate battery are new energy storage products developed and produced by Pylontech according to market demand, it can be used to provide reliable power for various types of equipment and solar systems. BP series are especially suitable for application scene of high temperature, limited installation space, light load-bearing and long cycle life.

BP series has built-in BMS battery management system, which can manage and monitor cell information including voltage, current and capacity. What's more, BMS can balance cells charging and discharging and extend cycle life. Multiple batteries can be connected for larger capacity in parallel for longer duration backup requirements.

1.2 Product Features

BP series product from Pylontech is using lithium iron phosphate as cathode material, with BMS for effective management of cells. The module has following characteristics:

- New: Updated the MCU and AFE chips, has stronger anti short circuit and reversed connection function. It will lower the fuse or MOSFET failure;
- New: 1 group can maximum 16 batteries connected in;
- New: More memory capacity, now it is 12288 records (before was only 4096 records).
- The whole module is non-toxic, non-polluting and environmentally friendly;
- Cathode material is made from LiFePO₄ which has safety performance and long cycle life;
- Battery management system (BMS) has protection function for over-discharge,

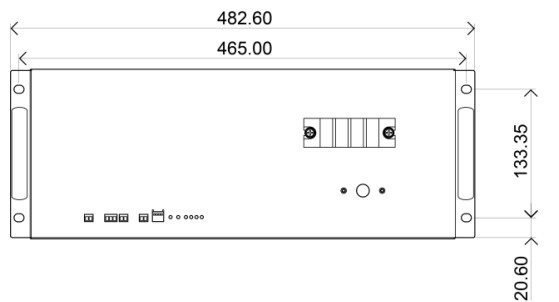
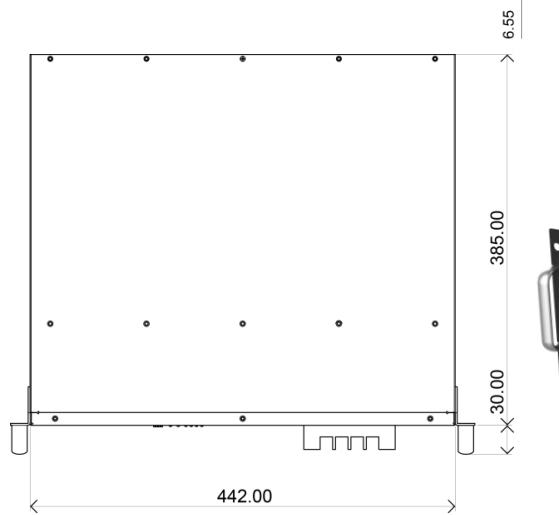
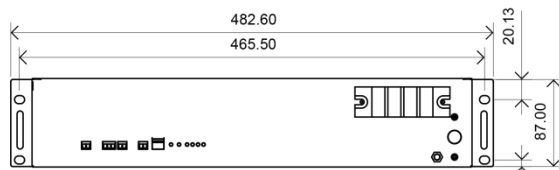
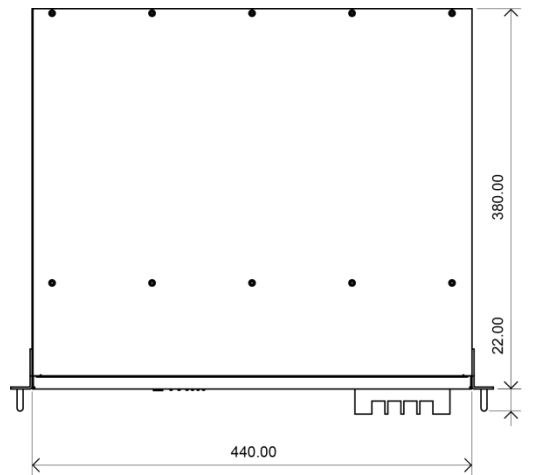
over-charge, over-current and high/low temperature;

- The system can automatically manage charge and discharge state and balance current and voltage of each cell;
- The centralized monitoring module is intelligent designed with three remote functions of test, signal and control;
- Flexible configuration achieved that several battery modules can be in parallel for expanding capacity and backup duration;
- Adopted self-cooling mode rapidly reduced system entire noise;
- Battery has less self-discharge, without charge up to 10 months; no memory effect, can be floating charge and discharge;
- Working temperature range is from -10 °C to 50 °C, with excellent discharge performance and cycle life in high temperature;
- Small size and light weight, standard of 19-inch embedded designed module is comfortable for installation and maintenance;

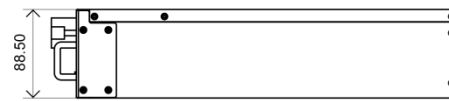
2 Structure and Parameter

2.1 Equipment Structure

2.1.1 Equipment Model



BP4850



BP48100

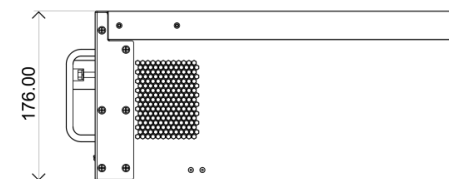


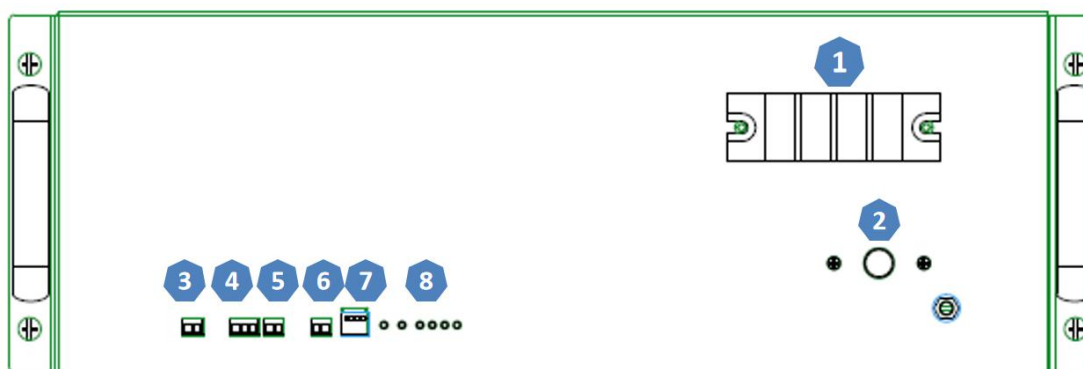
Table2-1 BP Series Equipment Model

Product Series	Model	Rated Voltage	Rated Capacity	Size	Weight
BP Series	BP4850	48V	50Ah	442×380×88.5mm	24kg
BP Series	BP48100	48V	100Ah	442×385×176mm	45kg

2.1.2 Equipment Front Interface Instruction

This section details the front panel of the interface functions.

Figure 2-1 Sketch of BP series Product Front Interface



Power Port (1)

Power cord connection: the same function of two power interface in parallel. Each interface from top to bottom is anode and cathode. For each single cell, any interface can achieve charging and discharging function.

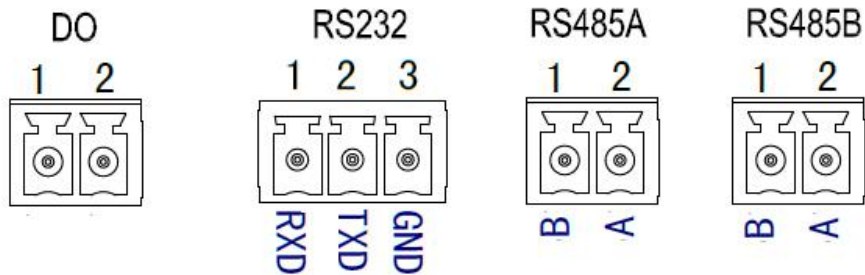
Reset (2)

Shut down button: When the battery is in storage, transportation and other non-using state, press the button to shutdown. If there is no external load or external power supply for 10 hours, it will automatically shutdown.

Communication Interface (3, 4, 5, 6)

- Dry Contact (DO).
- RS232 port (No. 4, Figure 2-1): The interface is for the local network management, but can also be the docking tube interface of network with ONU equipment from ZTE.

- RS485 A/B port (No. 3, Figure 2-1): when using multiple batteries in parallel, cascade each RS485 interface, information of other packs can be checked from the main pack. The definition of main battery and others please check "ADD Switch Table 2-3."



ADD Switch (7)

- ADD Switch: 4 ADD switches, to definite different address code for each battery module when network cascade multiple batteries, up to 16 addresses. The coding and description see "Table 2-3 ADD Switch."

Table 2-3 ADD Switch

ADD No.	Switch 1	Switch 2	Switch 3	Switch 4
1	OFF	OFF	OFF	OFF
2	OFF	OFF	OFF	ON
3	OFF	OFF	ON	OFF
4	OFF	OFF	ON	ON
5	OFF	ON	OFF	OFF
6	OFF	ON	OFF	ON
7	OFF	ON	ON	OFF
8	OFF	ON	ON	ON
9	ON	OFF	OFF	OFF
10	ON	OFF	OFF	ON
11	ON	OFF	ON	OFF
12	ON	OFF	ON	ON
13	ON	ON	OFF	OFF
14	ON	ON	OFF	ON
15	ON	ON	ON	OFF
16	ON	ON	ON	ON

Note: Recommend is 1111 (ADD No. 16).

LED Status Indicators (8)

- RUN Lamp (No.6 Figure 2-1): green, long lighting when charging and flash when discharging;
- ALM Lamp (No. 7 Figure 2-1 7): red, flashes when alarm and long bright if equipment failure or protected;
- Battery capacity indicator (No. 8 Figure 2-1): 4 green lamps, each light represent 25% of capacity. The four lights lit when capacity is 100%, if 75%, the first left a lamp off, and the right three lights; if 50%, the left two lights out, the right two lights; if 25 %, the left three lights off, the right one lights.

Table 2-4 LED Indicators Instructions

Battery Statuses	Protection / Alarm / Normal	RUN	ALM	Capacity LED				Descriptions
		●	●	●	●	●	●	
Shut Down		Off	Off	Off	Off	Off	Off	All off
Standby	Normal	Flash1	Off	Off	Off	Off	Off	Indicates Standby
	Alarm	Off	Flash3	Off	Off	Off	Off	PACK Low Voltage Directive
Charge	Normal	Light	Off	Based on capacity				the right side indicator LED flashes (flash 2), others lighting
	Alarm	Light	Flash3					
	Protection	Off	Light	Off	Off	Off	Off	Stop charging, ALM lighting
Discharge	Normal	Flash3	Off	Based on capacity				Indicate based on capacity
	Alarm	Flash3	Flash3					
	Protection	Off	Light	Off	Off	Off	Off	Stop discharging, ALM lighting

Note: The flashing instructions, flash 1 - light 0.25s / off 3.75 seconds; flash 2 - 0.5s light / 0.5s off; flash 3 - 0.5s light / 1.5s off

2.2 Battery Management System (BMS)

2.2.1 Voltage Protection

Low Voltage Protection in Discharge:

When discharging, the protection starts if any one of the single cells has lower voltage than the setting value and the power supply stop. When voltages of all single cells return to the normal, protection removed.

High Voltage Protection in Charge

When charging, the system stops charging when the total voltage of the battery or any one cell over the voltage value. When total voltage and cell voltage are restored to the normal, protection removed.

2.2.2 Current Protection

Over-current Protection in Charge:

If the charging current is larger than the guard value, the system stops charging. Protection removed after the system delay time.

Over-current Protection in Discharge:

When the discharge current is greater than the protection value, discharge stopped. Protection removed after the system delay time.

Charging Current Limit:

To ensure the load equipment working, Extra series product sets the maximum charge current limit value; see "Table 2-5 Charging Parameters."

Discharging Current Limit

To protect the load equipment working, Extra series sets the maximum discharge current limit please see "Table 2-6 discharge parameters." In products working, the maximum operating current of electrical load should be less than the maximum battery discharge current.

2.2.3 Additional Protection Features

Short Circuit Protection:

If short circuit occurs, the system starts short circuit protection and lasts 30 seconds.

Automatic Shutdown:

The system will shutdown automatically after 10 hours without power supply

2.3 Charge Parameters

When the device working, reasonable charge voltage you should set, recommended charge voltage range shown in Table 2-5. The BP product sets the maximum charge current to protect the power supply and load equipments.

Table 2-5 Charging Parameters

Model	Voltage Range in Charging	
	Min	Max
BP 4850	52.5V	53.5V
BP 48100	52.5V	53.5V

2.4 Discharge Parameters

To protect the load equipment, Extra series products limited the maximum discharge current shown in Table 2-6.

Table 2-6 Discharging Parameters

Model	Voltage Range in Discharging		Current Limit in Discharging
	Min	Max	Max
BP 4850	43.5V	53.5	50A
BP 48100	43.5V	53.5	50A



Note: the maximum discharge current of pack should be greater than maximum operating current of electrical load.

3 Installation and Configuration

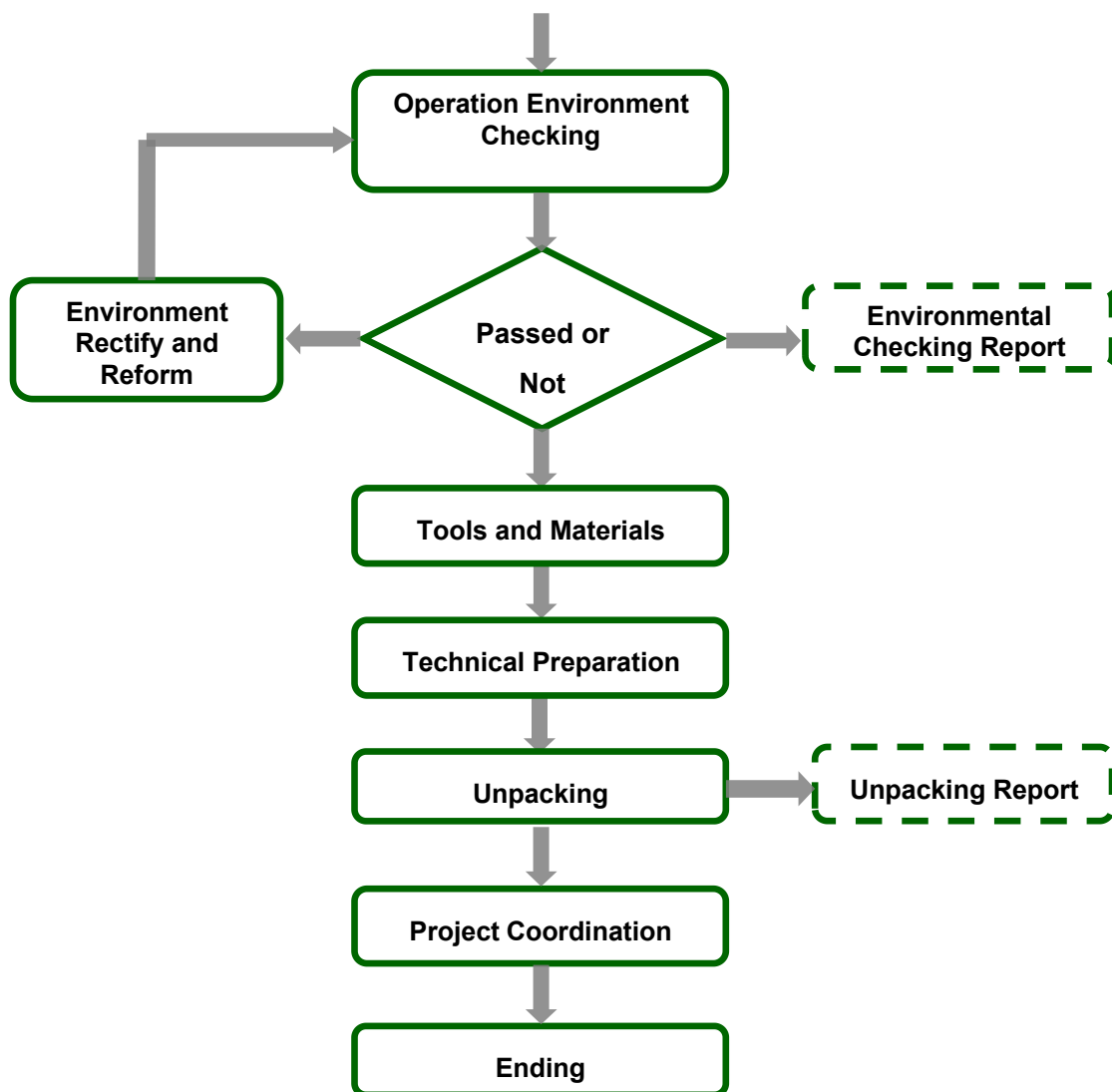
3.1 Installation Preparation

Safety Requirements

Only those who have finished training and knowledge and fully grasp the power system personnel may install the system. During installation process, one must always observe the safety requirements listed below and local safety regulations.

- All the circuit under 48V connected to the external power supply system must meet following criteria defined in IEC60950 SELV Requirements.
- If operation of the power system is in cabinet, it must ensure that the power system is not energized first, at the same time battery device must be turned off.
- Distribution cabling must be reasonable and protective measured to prevent operation of power equipment from touching these cables. Equipment installation preparation process shown in Figure 3-1

Figure 3-1 Schematic of Installation Process



3.1.1 Environmental Requirements

Ambient Temperature: -10°C~+50°C

Relative Humidity:5%~93% RH

Altitude: Under 4000m

Working environment: No conductive dust and corrosive gas

3.1.2 Tools and Information

Hardware

Tools and instruments are shown in Table 3-1:

Table 3-1 Tools and Meters

Name	
Screwdriver (Slotted, Phillips)	Multimeter
Wrench	Clip-on Ammeter
Diagonal Pliers	Insulating Tape
Pliers	Thermometer
Clip Pliers	Antistatic Wrist Ring
Strippers	Ties

Technical Information

"Project Exploration Station Report", "Extra series lithium iron phosphate Standby Power User's Manual" and "installation and inspection reports".

3.1.3 Technical Preparation

Electrical Terminal Checking

The battery module also can be connected directly to user equipments, switching power supply or other power equipments. There are two typical interface devices with power cable:

1. Devices with DC Backup Power Interfaces (such as ZTE9806H, Huawei MA5616)

If the battery directly connects to the user device, following check is necessary:

- To check the user whether the equipment with DC backup power interface and whether the output voltage electrical equipment meets the requirements in voltage range of Table 2-5.
- To confirm the maximum discharge current capability of user interface to the device DC backup power, must be greater than the maximum discharge current products in Table 2-5; if not, the limiting function is required.
- To confirm the maximum operating current by battery-powered user equipment must be less than the maximum discharge current products

mentioned in Table 2-6.

2. Switching Power Supply

If the battery is connected to switching power supply, it must be confirmed the positive and negative switching power connector, and measure whether the output voltage meets the requirements in Table 2-5; and also recognizing the maximum operating current of the battery-powered load devices must be less than the maximum discharge current related products in Table 2-6.

Landing Checking

- The collocation of landing line in engine room should be furnished ground radiation or flat, it requiring three separate parts: DC power distribution systems protection, power system working and lightning protection.
- If the area cannot provide three kinds of ground because space is limited, the three kinds can be merging and grounding resistance must be less than 1Ω .

Security Checking

Fire-fighting equipments must be available near the device such as powder fire extinguishers. For more case of requirement, it should be equipped with automatic fire extinguishing system. No flammable, explosive and other dangerous items placed next to battery.

3.1.4 Unpacking

- When products arrive at the installation site, before unpacking, check whether the box appearance is intact or not, and calculate total number according to freight highlighted list. Avoiding sunshine and rain, installation and disassembly must follow regulatory requirements and handling;
- To open box slightly to protect the object surface coating;
- Reading technical documents and verifying the list firstly before open the box, to ensure object is complete and intact according to the configuration tables and packing slips inventory, if the internal packaging is damaged please scrutinize and record.

3.1.5 Project Coordination

Attention of Previous Work:

- Specifications of Power Cord.
Power cord should meet the requirements of maximum discharge current of each product;
- Installation Space and Load-bearing
To ensure there is enough space for installation, and sufficient load-bearing capacity for battery cabinet and brackets.
- Wiring
Ensure the power cord and ground wiring is reasonable. No short circuit, water and corrosion.

3.2 Equipment Installation

Table 3-2 Installation Steps

Step 1	system powered down	
Step 2	Mechanical Installation	1. Tab Installation
		2. Equipment Installation
Step 3	Electrical Installation	1. Connecting Grounding Cable.
		2. Electrical Installation
		3. Load Connection
		4. Communication Interface Cascade
		5. Communication Interface Collection
		6. Power Supply

3.2.1 Mechanical Installation

Before installation, disconnect the entire device's power directly contact, and recognizing that the battery is turned off (disconnects the battery power cord and press the Reset button), to ensure there is no electrification.

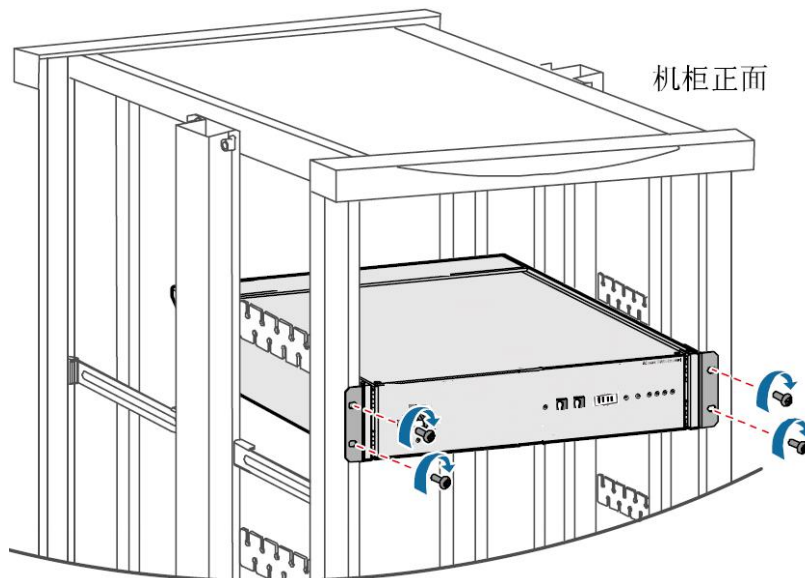
1 Tab Installation

There are tabs and mounting accessories equipment box. Before the equipment fixed, install tabs on both sides of the device, and confirm screws are tightly connected.

2 Equipment Installation

Extra 2000 products using 19-inch rack-mountable, it can be installed in the chassis designed with battery, and also be installed in the cabinet. Put device in parallel on the pallet rack, push it into the cabinet to make a very tight against between tab and the mounting bracket, tighten with screws and floating nuts, it must be ensure that all devices are secure. The position is flexible according to the actual for arrangements device in a cabinet.

Figure 3-2 Schematic of Device Fixed to the Cabinet



3.2.2 Electrical Installation

Before connecting power and landing, using multimeter to measure cable continuity, short circuit, and confirmed anode and cathode, and make the cable labels.

Measuring methods:

- Cable continuity: Select buzz file of multimeter with a probe touch the ends of the same color cable, if buzzer means cable is available.
- Short circuit: Select resistance profile of multimeter, with a probe measuring the same anode and cathode, if the resistance displayed infinite, means

cable is available.

- Anode and cathode: after power cord connected, the battery positive and negative should be connected respectively positive and negative of equipment.

Cables connection order:

1 Ground Cable

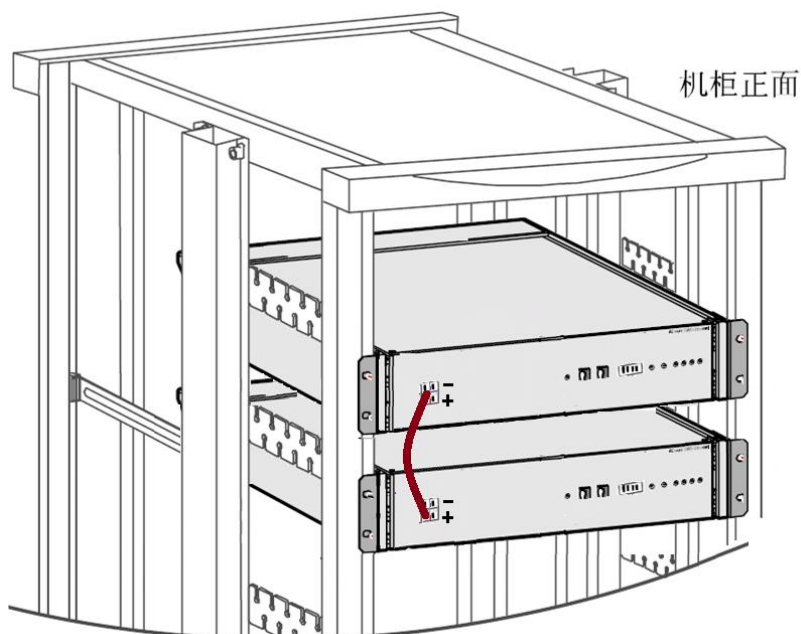
Connect one side of the cable to the copper rafts to ground, and the other side connect to the hole placed on right interface back of battery chassis with 4mm² line connection, make sure connections are tight and well grounded.

2 Batteries in Parallel

Please skip this step and go to Step 3 when using a single battery.

When using multiple batteries in parallel, firstly parallel each station batteries with the power cord. Extra 2000 product has 2 power interfaces on left front panel device, power connector from top to bottom are negative and positive. The 2 interfaces have same function, when multiple batteries in parallel, using parallel power cable to connect each battery. After parallel, any free battery power interface can connect load.

Figure 3-3 Multiple Batteries in Parallel Power Line Connection Diagram:



3 Load Connected

When connect load, connect the user equipment side power line interface first, and then the battery power supply interface.

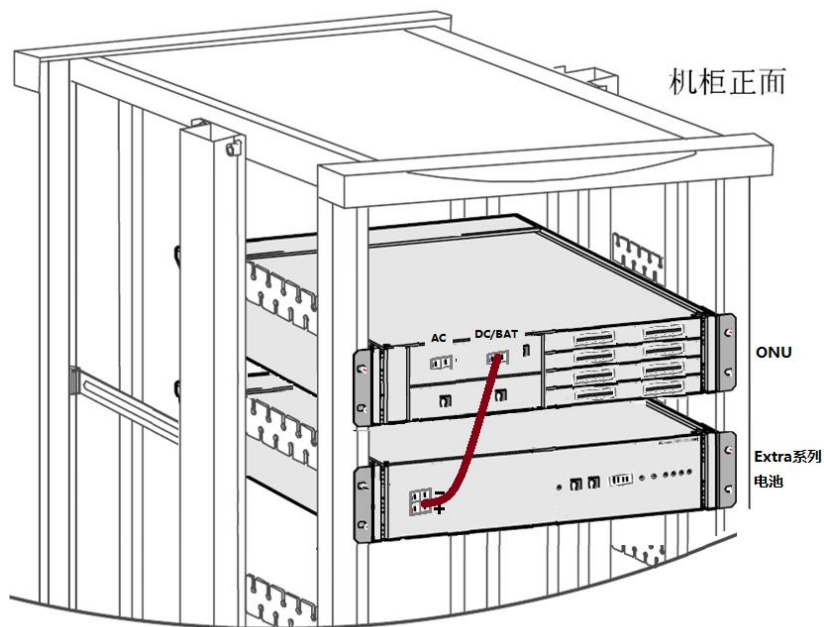
(1) Connection of battery and the load device in DC backup power interface

If the load device has a DC backup power interface, this installation can be used.

Single load equipment: the power cord directly connected to the load equipment DC backup power interface.

Multiple load equipment: use a division multiple power cords and the power cord directly connected to each of the DC backup power load device interface.

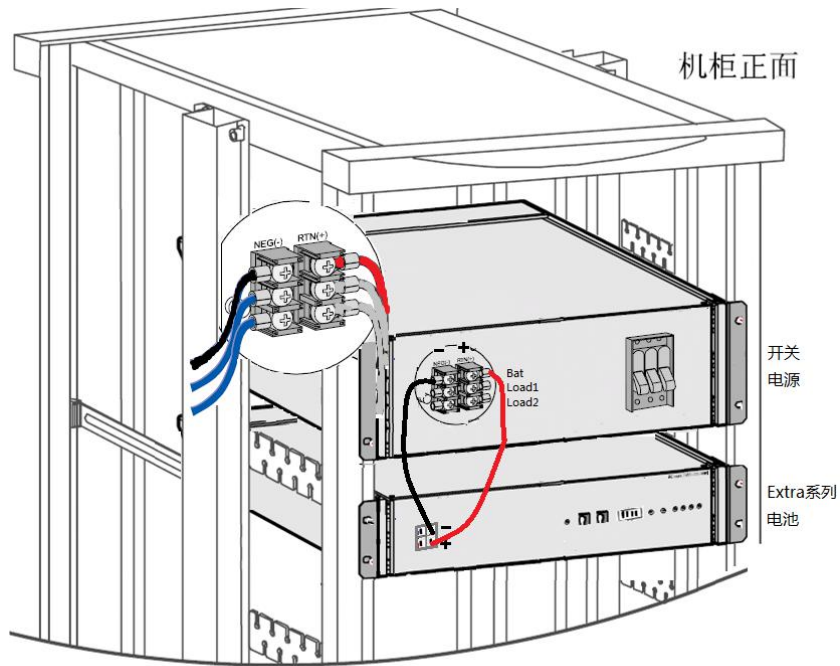
Figure 3-4 Connection Diagram Interface between Battery and Load Equipment of DC Backup Power



(2) Connection of the Battery and Switch Power

This installation method can be used when switching power supply to loads. Installing the battery power cord priority access battery interface first; if switching power supply without a battery interface, the power line can also be inserted interface of load power supply, it should pay attention to that maximum load current should be greater than the maximum discharge current of relevant battery in Table 2-6.

Figure 3-5 Battery and Switch Power Connection Diagram



Note:

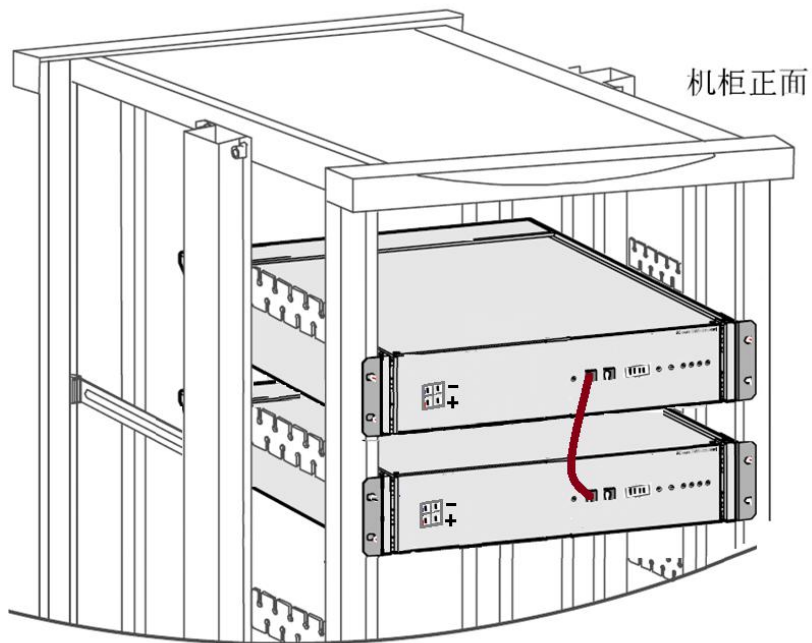
- Confirm the positive and negative of switching power supply before connecting, the red power wire to positive and black one to negative;
- Before connecting, verify the charging parameters of interface switching power supply battery. Voltage and current should satisfy charging parameters in Table 2-5 Battery.

4 Cascade Communication Interface

If using a single station battery, please skip this step and proceed to step 5;
When using more than one battery, please continue with this step. (If not using the net management, this step is not required)

To check network management information of all batteries through one battery, please parallel each battery through RS485 interface. UTP—Unshielded Twisted Pair (line order: 568b) is used to connect two batteries of the RS485 interface. When there are more than two, the junction box is used to parallel each interface. After cascading, ADD switches is used for each battery sequentially assigned address code starting from 1, the ADD switches using refer to the on slip 5 "ADD switch" in manual "2.1.2 Equipment Front Panel".

Figure 3-6 Cascading of Multiple Batteries in Parallel Network Schematic



5 Communication Interface Connection

If using the local network, put the specially equipped RS232 communication cable to connect the battery and computer serial RS232 interface.

If multiple network cascade battery, connect the battery RS232 interface with ADD Address is 1.

6 Powering on Device

After completing these steps, turn on power to the entire system to activate the battery, installation completed.



Note:

After power on, if found ALM indicator in front panel red continuously over 5 seconds, disconnect the power cord to the battery and shutdown the battery, re-check whether the device is properly connected and the positive and negative terminals are correctly connected.

4 Using, Maintenance and Troubleshooting

4.1 Alarm Description and Processing

When protection start or failure, the ALM indicator on the front panel will alarm, through net management can query specific alarm class and take appropriate action.

4.1.1 The Alarm and Countermeasure Influence System Output

Please follow Table 4-1 processing if output of the fault appears such as over-voltage, charge over-current, under-voltage protection, high-temp protection and other abnormalities.

Table 4-1 Major Alarm and Protection

Statue	Alarm Category	Alarm Indication	Processing
Charging	Cell Over-voltage	ALM Lighting	Stop charging and find the cause
	Over-current	ALM Lighting	Stop charging and find the cause
	high-temp	ALM Lighting	Stop charging
Discharging	Over-current	ALM Lighting	Stop charging and find the cause
	high-temp	ALM Lighting	Stop discharging
	Low Total Voltage Protection	ALM Lighting	Start charging
	Cell Voltage Protection	ALM Lighting	Start charging

4.1.2 The Alarm and Countermeasure do not Influence System Output

If it appears the low total voltage alarm or low single cell voltage, the battery system also generates the corresponding alarm signal. Maintenance personnel

should inspect equipment according to prompt information, and determine the fault type and location, and take appropriate measures to ensure the system is in the best working condition, not to affect the system output. Phenomenon and countermeasures are shown in Table 4-2.

Table 4-2 Secondary Alarm

Category	Alarm Indication	Countermeasures
Low Total Voltage Alarm	ALM Flashing	Stop Discharging
Low Cell Voltage Alarm	ALM Flashing	Stop Discharging

4.2 Common Fault Analysis and Solutions

Common fault analysis and solutions shown in table 4-3:

Table 4-3 Common Faults and Solutions

Number	Fault Symptom	Reason Analysis	Solution
1	DC power supply time shorter	Battery capacity reduced	Change storage battery
2	Battery cannot be fully charged	Low voltage in charging	Adjust charging voltage in 52.5V~54V
3	Fire sparkle appeared when power up, alarm lamp lighting	Short circuit	Shutdown system, check the cause and exclusion



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