User Manual

UE-48LI150T-1C-3UG

MANUAL EXPLANATION

CONTENT EXPLANATION

UE-48LI150T-1C-3UG series is Lithium iron phosphate battery module which designed for Telecom and energy storage applications. This battery module integrated with intelligent BMS inside, has big advantages on safety, cycle life, energy density, temperature range and environmental protection. This product user manual describes the type, size, structure, battery module and BMS characteristics, module installation details.

Chapters	Contents
1. Overview	Background, Applications and Advantages
2. Structure and principle	Structure and operating principle
3. Parameters	All parameters of battery module
4. Installation	Installation and operation
5. PC Software	PC software connection and monitoring
6. Shipping, Storage, and Disposal	Shipping, Storage, Maintenance And Disposal
7. Symbols and precautions	Symbols and safety instructions
8. Anti-theft Gyroscope Module	Gyroscope anti-theft function and operation

BEFORE YOU START

Read all the safety information provided in this document prior to installing and/or operating the equipment. Contact Customer Support immediately for a free consultation, if you have any questions about the handling, operation and safe use of the battery.

To handle or operate with battery system:

- You must be qualified for electrical work;
- Before you operate the battery module, you should be better trained and read the manual carefully;
- Remove any possible metallic shorting risk of Jewel, Watches, Pens. Metal bars and frames;
- All tools must be insulated

CONTENTS

1. OVERVIEW

1.1 BACKGROUND AND APPLICATIONS

Lithium-ion batteries are a new generation of green energy batteries. In recent years, with the rapid development of lithium ion battery technology, the pace of lithium ion batteries to replace the traditional lead-acid batteries are also gradually accelerate in various power fields. Compared with the traditional lead-acid batteries, lithium ion batteries boast with high energy density, small volume, light weight, long life, wide applicable temperature range and other advantages, particularly the advantages of lithium iron phosphate (LiFePO4) battery are comprehensive more prominent. At present, the lithium iron phosphate battery technology is very mature, with the cost is gradually lowered, it is widely used in mainstream and high-end standby power supply solutions.

UE-T Series are the first Lithium Battery systems for Telecom and energy storage equipment applications. LFP battery with intelligent BMS have big advantages in safety, energy density, applicable temperature range, service life and environmental protection, and can be widely applied in various conditions for Telecom equipment. Especially in 5G era and home energy applications, LFP battery module has become the preferred battery scheme for communication backup power supply.

1.2 ADVANTAGES

1. Packed with high performance LFP single cell, long life, safety and wide temperature range.
2. High energy density, small size, light weight, no pollution.
3. Packing with single cell container, fire retardant wire and copper connecting bar, stable and safe.
4. Built-in BMS, with battery voltage, current, temperature, and health management.
5. LED indicate the battery SOC and operating status.
6. Intelligent balance module, to ensure that the consistency of battery capacity, to extend the service life.
7. Optional heating function, can be used in low temperature area.
8. Optional integrated SNMP communication module, support access to dynamic environment monitoring system.
9. 19 inches metal module container rack, simple installation and expand capacity by parallel.
10. Flexible customization of dimensions.
11. Long service life, Stable performance, maintenance free.

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2. PRINCIPLE AND STRUCTURE

2.1 OPERATING PRINCIPLE

The principle of work of the UE-48LI150T-1C-3UG series battery system. Under normal condition, grid AC power, generator, or solar system supply to the loads (the load of figure showed below) and charge battery pack; When these power sources fail and stop power supply, the battery serves for load equipment, to ensure the equipment runs normally; when these power sources are switched on again, recover power supply and charge the battery pack back.

2.2 CONNECTING STRUCTURE

Battery system working principle of UE-T series is shown in Figure 2.1.

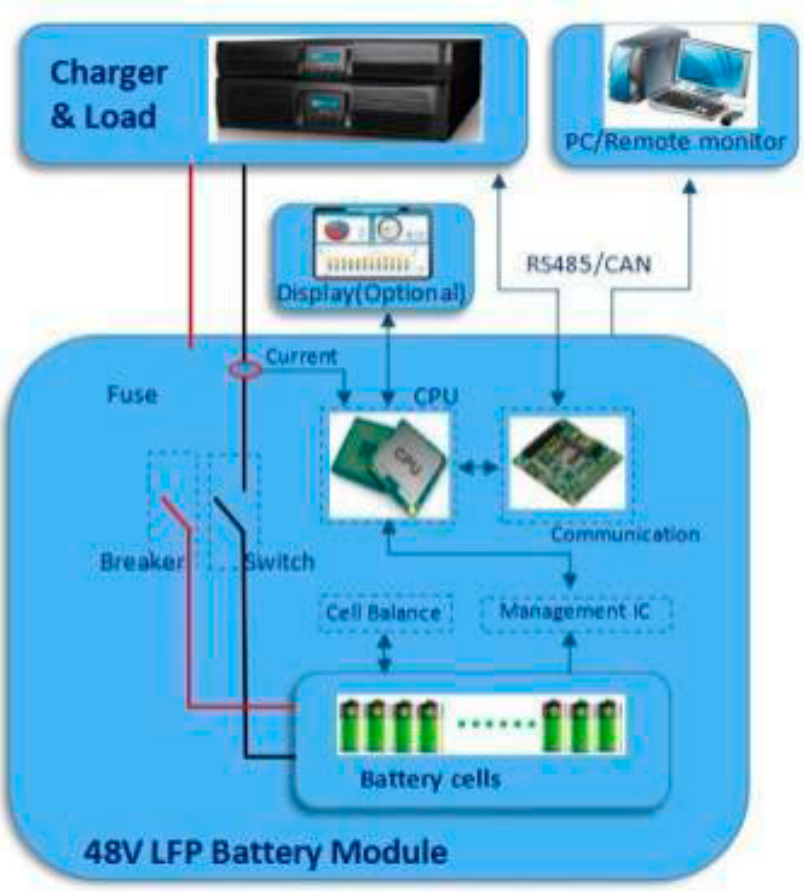

Figure 2.1 Connecting structure of the battery system

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3. PARAMETERS

3.1 MODELS

UE-T series products specifications are in Table 3.1

Model Type	Voltage(V)	Capacity	Energy	Length	width	Height	Weight(Kg)
UE-48LI150T-1C-3UG	48	100Ah	4800 Wh	442 mm	560 mm	133 mm	38.1

Table 3.1 UE-48LI150T-1C-3UG series products

3.2 CONTROL PANEL

UE-T series battery system is shown in figure 3.2

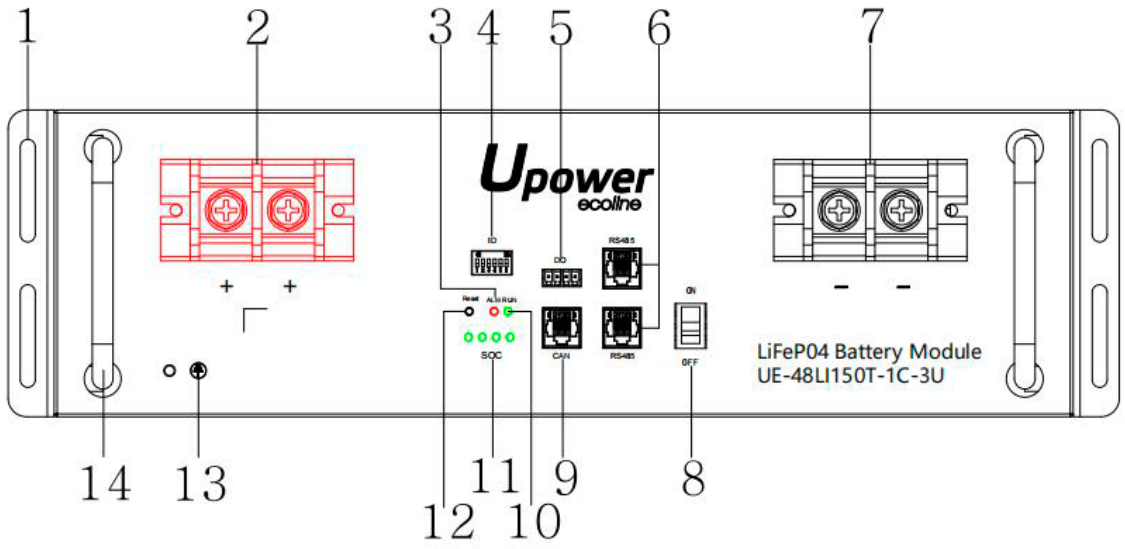

Figure 3.2 UE-48LI150T-1C-3UG battery system

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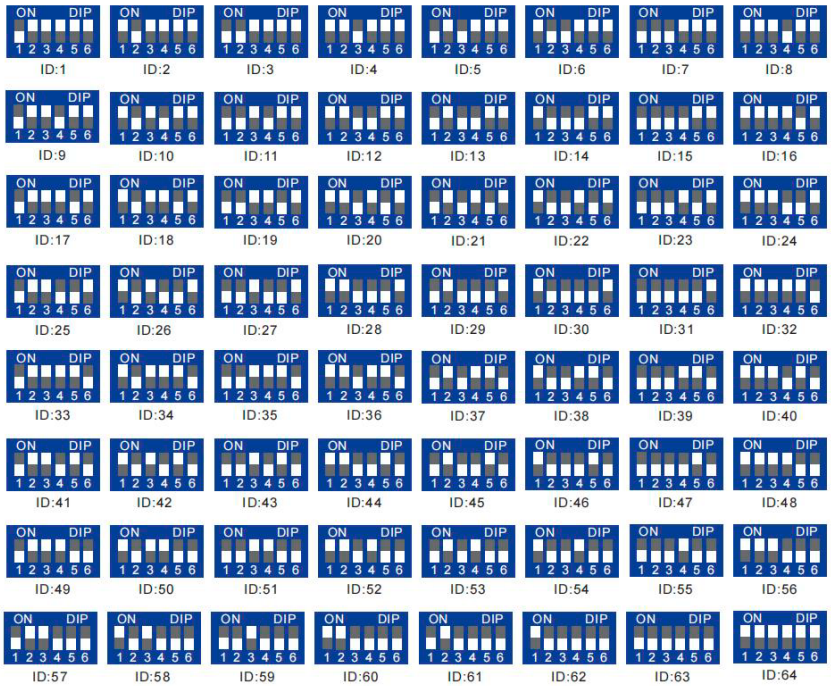
No.	Item	Description	Remarks
1	Rack Mount ear	For battery rack mounting	
2	Battery +	Terminal M6/M8	Positive
3	ALM	LED display	
4	ID	Assign address of every model	
5	DO	Dry Contact	DO
6	RS485	RS485	RJ45
7	Battery -	Terminal M6/M8	Negative
8	switch	OFF/ON	switch
9	CAN	CAN Communication interface	
10	RUN	LED display	
11	SOC	The state of charge	
12	Reset	On/OFF /Reset	
13	GND	GND	
14	Handle	For carrying handling	

Table 3.3 Descriptions

Table 3.4 Assignments of ID address



Notes:

1. The ID code bits correspond to binary digits, with down for "ON" and up for "OFF". The left side of the code bit is the low bit, while the right side is the high bit. The code ranges from 1 to 64, and in communication mode, it can support up to 64 modules in parallel.

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2. Reset the battery while configuring the dial code for standalone battery operation or parallel operation.

Table 3.5 LED indicator description

Status	Normal/Alarm/ Protection	RUN	ALM	SOC Indicate LED	Notes
Shutdown / Sleep		OFF	OFF	OFF	
Stand by	Normal	ON	OFF	Based on battery indicator (Each LED indicators 25% SOC)	
	Alarm	ON	Flash		According to the state before standby
Charge	Normal	Short flash	OFF		
	Alarm	Short flash	Short flash		
	End-off Voltage	OFF	ON		
	Over-Temp Protection	OFF	Short flash		
	Over-current transfer limit-current	Short flash	Short flash/OFF		Over-current flash, limit-current OFF
Discharge	Normal	Long Flash	OFF	Based on battery indicator	
	Alarm	Long Flash	Long Flash		
	End-off Voltage	OFF	OFF		Go to sleep
	Over-Temp/Over-current Protection	OFF	ON		
BMS Fault		OFF	Flash	All OFF	

Notes: Shutdown: All LED lights are off; Power on: RUN light is always on; System failure: ALM light is always on; each SOC light represents 25% capacity; Long flash: flash once every 2.4 seconds; Short flash: flash once every 1.2 seconds.

Table 3.6 Communication interface definition

RS485-interface		CAN-interface	
Pin No.	**Definition**	**Pin No.**	**Definition**
Pin-1, Pin-8	RS485 B-(T/R-)	PIN-4	CAN_H
Pin-2, Pin-7	RS485 A+(T/R+)	PIN-5	CAN_L
Others	NC	Others	NC

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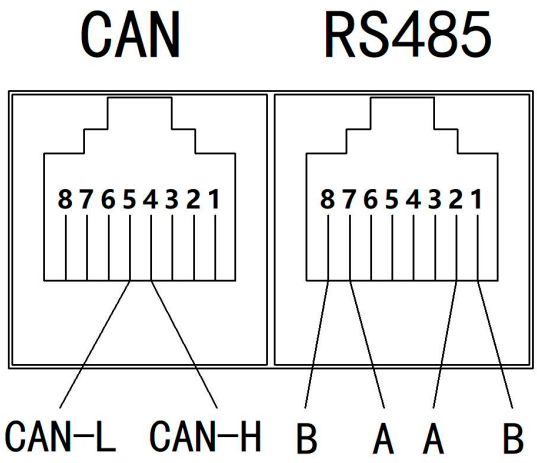

Figure 3.7 Interface on battery panel

3.3 BATTERY MANAGEMENT SYSTEM (BMS)

3.3.1 VOLTAGE PROTECTION

Over Charge Protection

During charging, if the voltage of any cell exceeds the setting for cell protection or total voltage of the system is greater than the setting for the system, the BMS stop charging. And when all voltage of each cell and total voltage of the battery drop to the recovering-set values, the protection removes automatically.

Over Discharge Protection

During discharge, if the voltage of any one cell or total voltage of the battery is lower than the protection settings, the BMS stops discharge. And when all cell voltage and total voltage go up to recovering-setting, the protection remove automatically.

3.3.2 CURRENT PROTECTION

Charging Current limitation

During charging, if the charging current is greater than the setting value, the BMS will limit the charging current to less than the setting value, this is charging current limitation.

Discharging Over Current Protection

During discharge, if the discharging current is bigger than the setting value, the BMS will stop discharging, this is discharging over current protection. Remove the load or charge the battery, it will recover.

Short Circuit Protection

During discharging, if the current is so much bigger than the normal working current, it's considered as a short circuit, the BMS will stop working.

Reverse Polarity Protection

When the battery and rectifier are in reverse connection, BMS will immediately enter the state of polarity protection, to protect battery and rectifier from being damaged by high current.

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3.3.3 TEMPERATURE PROTECTION

Cell Temperature Protection

There are several thermal sensors to monitor the cell temperature， if the temperature of any cell is higher than 70℃ or lower than 0℃ , the BMS will stop charging, this is charge temp. protection If the temperature of any cell is higher than 75℃ or lower than － 20℃ , BMS will stop the discharge. This is the discharging protection.

PCB over-heat Protection

There is a thermal sensor to monitor the PCB temperature, if the PCB temperature is higher than 95ºC, it will trigger the PCB protection and stop charging or discharge until the temperature drop to normal range.

3.3.4 CELL BALANCE

Smart Cell Balance

During charging, If all cell voltages are greater than 3.40V and the voltage difference between cells ΔU > 40 mV, BMS will trigger the balancing process, the balance current is designed base on the capacity of battery pack. ΔU = Max_Cell voltage – Min_Cell voltage

3.3.5 BATTERY HEATING AND THERMAL PRESERVATION

Battery heating (Optional)

When the battery is connected to the rectifier and AC grid is available, if the temperature of battery cell is too low to charge or discharge, the heating circuit will be connected to heat the battery cell, until the temperature is suitable for charging and discharging.

Thermal preservation

After the heating step, the AC grid is still available, if the environment temperature is too low, the heating circuit will keep the battery cell temperature in the range which can discharge. If the rectifier is disconnected or AC grid is not available, the heating circuit will not work.

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4. INSTALLATION AND TESTING

4.1 PREPARE TO INSTALL

Rules Of Safe

The installation, operation and maintenance of UE-T series lithium iron phosphate battery system must be performed by trained and qualified professional personnel. Before installation and use, please carefully read the product safety precautions and related operating rules. Strictly abide by the following safety rules and local safety regulations, otherwise may cause personal injury or damage to the product.

1. Make sure that the load equipment to be connected with the battery system is in good condition and free from defects;
2. Before installation, make sure that the power supply system is under shut down state, while the battery system is also under shut down state;
3. All the electricity cables must have corresponding grade of insulation, Please ensure that no exposed cables;
4. Make sure that the battery and power system are reliable grounding.

4.1.1 INSTALLATION OF ENVIRONMENT

The requirement of installation environment is shown in table 4.2.

Type	Requirement
Working Temperature	Working Range: –20°C ~ +55°C
Storage Temperature	–20°C ~ +60°C
Relative Humidity	<95%
Atmospheric Pressure	86k Pa ~ 106k Pa
Site Requirements	No conductive dust and corrosive gas, no vibration. Keep away from heat and flame

Table 4.2 Requirement Of Environment

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4.1.2 TOOLS AND MATERIALS

May use the tools and information are shown in table 4.3.

Name	Name
User manual	Oblique mouth clamp
Screw driver	Multimeter
Wrench	Ammeter
Pincers	Insulating tape
Wire stripping pliers	Electrostatic prevention Bracelet
Wristband	Clamp band

Table 4.3 Tools And Materials

4.1.3 SITE SURVEY

Equipment Inspection

1. Check that the equipment connected with batteries are right and in good conditions.
2. Check the DC interface position of the equipment. Check and confirm the output voltage is in the range showed in table 3.6, charging voltage.
3. Check DC device interface, make sure the maximum output current is matched with the selected battery.
4. Check the maximal working current of devices backed by the battery, make sure that the current is less than the maximum discharge current of the products.

Ground Check

Check and confirm the electrical grounding position of power system room.

4.1.4 BATTERY CHECK

1. On the installation site, check the battery packaging to make sure it's intact;
2. Check battery box according to the packing list, make sure all the material is complete, if any damaged, please fill in the receipt;
3. Please be careful while handling batteries, avoid any damage.

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4.2 INSTALLATION

4.2.1 CAUTIONS

When begin to install the battery system, you should pay attention to the following matters:

1. Installation space and load bearing. Make sure that there are sufficient fixed components to install the battery system, and to ensure that the battery mounting bracket or the cabinet be strong enough to bear the weight.
2. Cable specifications. To ensure that the use of the connection of the power supply line can match the maximum current requirements of equipment operation.
3. Project layout. Ensure the whole construction process of power equipment, batteries and other reasonable layout.
4. Wiring layout. Ensure that the wiring reasonable, orderly; and consider the moisture-proof, corrosion prevention.
5. The whole installation process should wear anti-static wristband.
6. The installation site should be at least two or more peoples to operate.

CAUTION: Please ensure the installation site safe before installation.

4.2.2 INSTALLATION STEP

Battery installation steps are shown in table 4.4.

Step NO.	Name	Definition
1	Turn off power supply	The system should be powered off, to ensure that there is no electric in installation process
2	Mechanical installation	1. Mounting lugs installation 2. Battery fixed installation
3	Electrical installation	1. Grounding cable 2. Power cable installation 3. Connecting equipment installation 4. Communication cable installation
4	Electrical commissioning	Power system commissioning

Table 4.4 The installation steps

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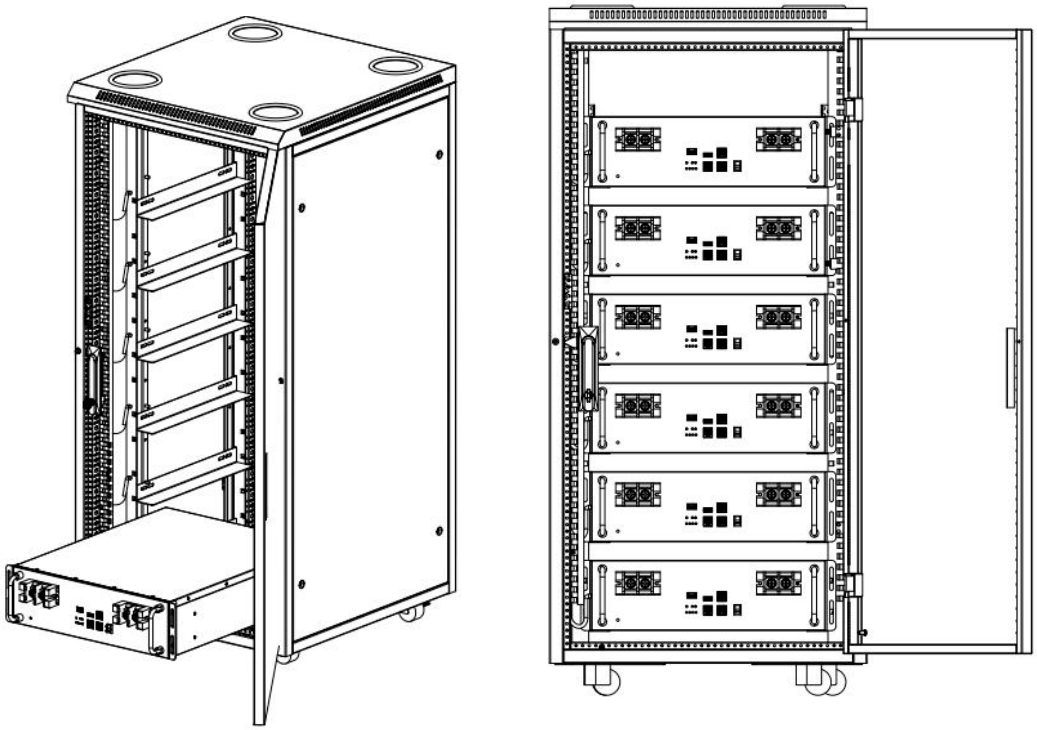
Step 1. Interruption Of Power Supply

Before installation, please ensure the battery is powered off, at the same time, shutdown the equipment which need to connect to the battery.

Step 2. Machinery Installation

1. Mounting lugs installation. Equipment packaging with the chassis mounting lugs, before the installation of equipment, fix the mounting lugs on both sides of the battery box, ensure that the installation strong.

2. Battery installation. Battery module preference mounted in the rack 19 inch (or cabinet), when installed, portable handle arranged in parallel on the frame (or cabinet) supporting plate, push rack (or cabinet), ensure the mounting lugs and frame (or cabinet) edge fixing hole tightly, and then using a screwdriver with screw for fixation screwed into the rack to the mounting holes, to ensure that the battery pack mounted solid.



Step 3. Electrical Installation

1. Grounding cable. The grounding cable end with screw press-fit fixation in the chassis rear grounding hole, the other end is connected to the frame (or cabinet) grounding copper bar. To ensure the stable connection.

2. Power line installation. When using a single battery, battery terminals directly connected to the device or switch power supply terminal, if there are multiple batteries in parallel when in use, please connect all batteries to the copper bus-bar with the power cable.

3. Connect the copper bus-bar to charger/load system with power cable, Be careful not to connect the positive and negative poles wrongly.

4. Communication cable installation. When the battery is used in a single, please skip this step. When multiple batteries are required to operate in parallel, please dial settings for each cell address code (to ensure that no duplicate address code), and then connect the communication interface of RJ45-RS485 one by one. Connect the first or last battery module RS485 interface to the PC monitor or SMPS or UPS controller.

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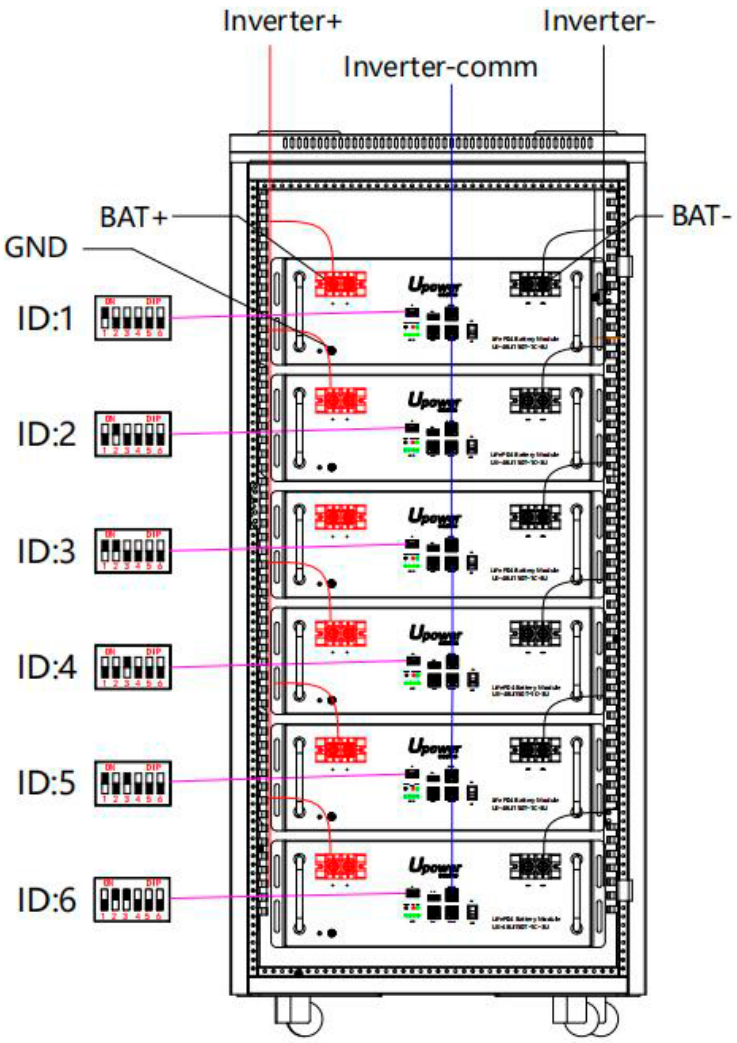

Step 4. Electrical Commissioning

When these steps are completed, turn on air switch to start the battery one by one, then boot on the whole power system, complete the installation.

Caution: If you have any question about the installation, please stop and contact technical support immediately. If the battery does not start or control panel ALM lights, please disconnect the power line inspection and re-install the start, if still cannot

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5. SHIPPING, STORAGE, AND DISPOSAL

5.1 SHIPPING AND STORAGE

Shipping

According to the provisions of the product can be used in general means of conveyance, but should avoid throwing, rain fall, strong radiation and corrosion erosion, during transportation, please prevent the collision and strong vibration.

Storage

Storage device in the indoor storage, the ambient air temperature is 0ºC to +45 ºC, the average monthly relative humidity of not more than 90%, the ambient air without corrosive and flammable and explosive gas; storage warehouse should be ventilated, free of alkaline, acidic substances and other corrosive gases, without a strong mechanical vibration, shock, and without strong electromagnetic field and direct sunlight. Capacity was maintained at 50% to 60% stores, and charging the battery every 6 months.

5.2 WARNING AND DISPOSAL

When the ALM lights, battery has been alarmed or protected, please check fault reasons and take corresponding measures. Table 5.1 below is the main alarm condition.

State	Type	Indicator	Disposal
Charging	Over voltage protection	ALM	Stop charge, check module voltage and charger
	Over current protection	ALM	Stop charge, check the settings and limitation
	Temperature protection	ALM	Stop charge, wait for the temp recovery
Discharging	Low voltage protection	ALM	Stop discharge, turn to charging mode
	Over current protection	ALM	Stop discharge, check if there is an over load
	Temperature protection	ALM	Stop discharge, wait for the temp recovery

Table 5.1 The main alarm and protection

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5.3 COMMON FAULTS AND SOLUTIONS

Common faults and solutions are shown in table 5.2.

NO.	Fault phenomenon	Analysis	Solution
1	No DC output	Low voltage protection	Charge the battery and try again
2	Power supply time is too short	Battery capacity lack or not full power	Maintenance or replacement
3	Battery can not be charged to full	Power system DC output voltage falls below the minimum charge voltage	Regulating DC output voltage of power supply to battery suitable charging voltage
4	ALM LED always lights	Power line connection short circuit	Disconnect the power cable and check all cables
5	The battery output voltage is unstable	Battery management system do not operate normally	Press the reset button to reset the system, then reboot the system
6	Communication lost or data fault	Communication settings fail	Check the communication settings and correct it

Table 5.2 Common faults and solutions

Caution: If the battery cannot operate normally, please do not disassemble the battery without technical instructions.

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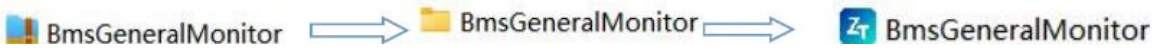
6. PC SOFTWARE

6.1 PC Software Installation

Contact the supplier to get the latest version of the software for free. Run the BMS_tools.exe program directly after unpacking, as shown Figure 6.1:θ



6.2 Software Interface

The software interface is shown as figure 6.2:

1. Switch languages;
2. Select ID: "1";
3. Select COM port;
4. Open the serial port;
5. Start.

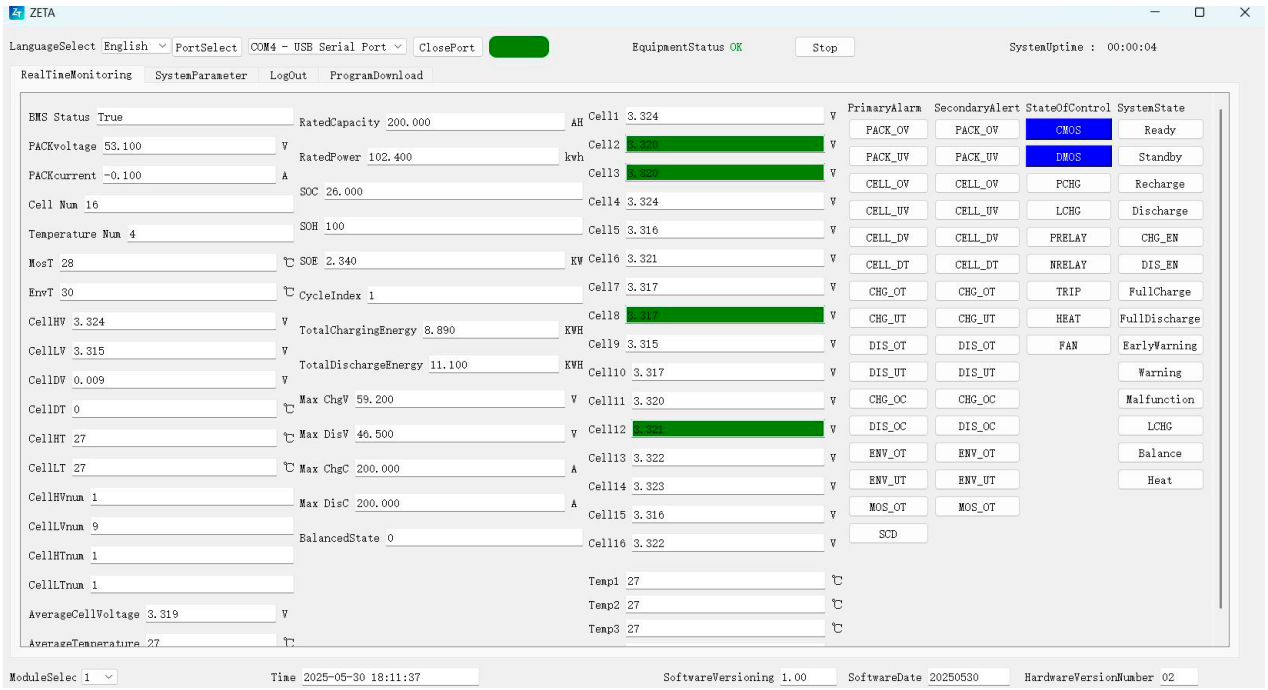


Figure 6.2 Software interface

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7. SAFETY, SYMBOLS AND CAUTIONS

7.1 SAFETY SYMBOLS

Symbol	Definition
	Important safety information will follow.
	DO NOT dispose of battery in a fire.
	Recycle or dispose of Lithium batteries in accordance with local Laws/regulations.
	DO NOT dispose of battery in the trash.

7.2 PRECAUTIONS

Please read and comply with the following conditions of installation and use of the battery, incorrect installation using the battery may cause personal injury or damage to the product.

1. DO NOT throw the battery into water. Store batteries in cool and dry environment when not in use.
2. DO NOT put the battery into fire or heat the battery, so as to avoid explosion or other dangerous events.
3. When charge the battery, please choose specialized charging equipment, and follow the correct procedures, do not use unqualified chargers.
4. DO NOT reverse positive and negative terminals, do not connect the battery directly to AC power, avoid battery short circuit.
5. DO NOT using batteries from different manufacturers or different kinds, types together, and do not mixed use old batteries and new batteries.
6. DO NOT use the battery when it become hot, bulges, deforms or leaks.
7. DO NOT puncture the battery by nail or other sharp objects; Do not throw, stamp on, impact or hit the battery.
8. DO NOT open or try to repair the battery when it is defective. Warranty invalid if the battery repaired or disassembled.
9. Batteries are half charged before shipment, Don't use the battery if it's hot, bulge, or smell abnormal and so on, and report to after-sale dept. immediately.
10. If you need storage the battery for a long time, please charge and discharge the battery every three months to ensure the best performance, and the best state of charge for storage is between 50%~60%.
11. Please use the battery in the temperature range which defined in the manual.
12. The state of charge of batteries is 50% before shipment, please charge the battery before using.

Note: *If you have some special technical problems which not mentioned above, please contact technical staff.*

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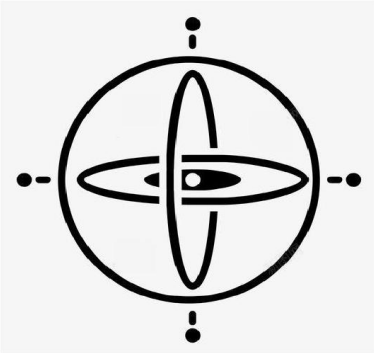
8. ANTI-THEFT GYROSCOPE MODULE

8.1 INTRODUCTION

The gyro can judge whether the battery has been moved or not to know whether the battery has been stolen. If the battery is tilted beyond the set angle in the process of handling or moving, BMS sends control signal to disconnect the discharge MOS FET. When the battery is retrieved and re-installed in a fixed position, the battery is unlocked by a computer or controller. BMS sends control instructions to close the discharge MOS FET, and the battery will return to normal.

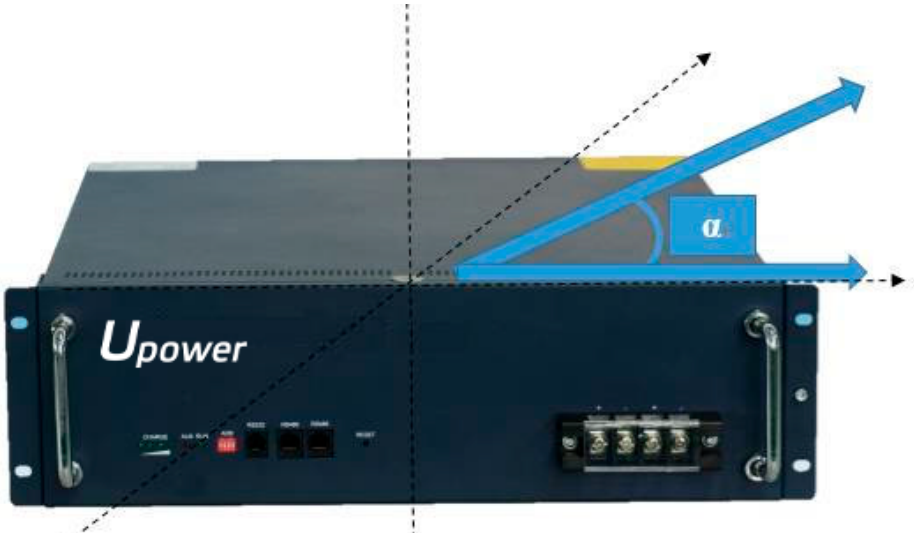
8.2 CHARACTERISTICS

1. Increase cost only slightly
2. User-defined gyroscope definitions (angle, displacement)
3. Customers can use the software after the battery is recovered and unlocked.



8.3 ANTI-THEFT INSTRUCTIONS FOR GYROSCOPE

When the anti-theft function of the battery is turned on (in the direction of Y axis), the deviation angle of the battery exceeds the default value *alpha* of 30°.



Deviation angle detection on the battery module (Y axis)

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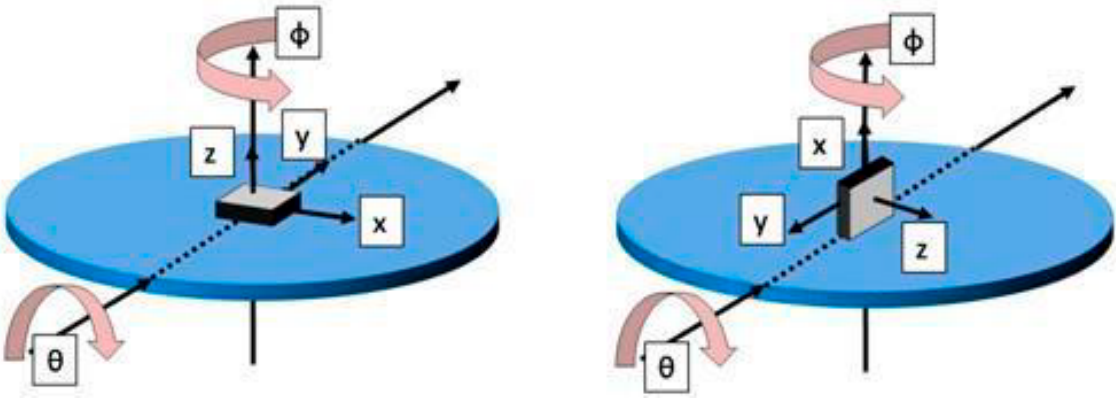
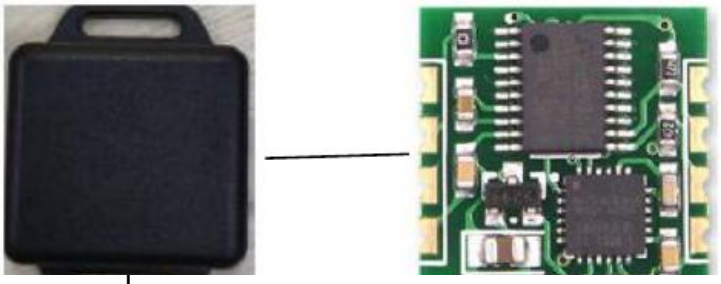


Gyroscope reference axes (X, Y, Z) and rotation angles (theta, phi)



Gyroscope sensor module and internal circuit board

Gyroscope module integrated on the BMS main board

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