

# **Lithium-ion Battery Pack**

**Model: LFP50-48 & LFP100-48**

## **User manual**

**MERITSUN<sup>®</sup>**  
**Lithium Energy Solution**



**Please comply with all warnings and operating instructions in this manual strictly. Save this manual properly and read carefully the following instructions before installing the unit. Do not operate this unit before reading through all safety information and operating instructions carefully.**

## Safety Precaution

### 1. When Using battery

#### **Danger of High Voltage :**

The high voltage power supply offer the equipment power, wet object contact high voltage power supply directly or indirectly, can cause fatal danger.

#### **Using a special tool :**

Working in high voltage and ac power, be sure to use a special tool instead of individual tools.

#### **Static- free :**

Static electricity would damage veneer on the electrostatic sensitive components, before touching the plug- in, circuit board or chips, be sure to use correct electrostatic prevention measures.

#### **Disconnect the power supply in operation:**

When operate the power supply, you must first cut off power supply, power operation is prohibited.

#### **Dc short circuit dangerous :**

Power system provides dc regulated power supply. Dc short circuit could cause fatal damage to the equipment.

## 2. While Charging

### CAUTION

The temperature range over which the battery can be charged is 0°C to 45°C. Charging the battery at temperatures outside of this range may cause the battery to become hot or to break. Charging the battery outside of this temperature range may also harm the performance of the battery or reduce the battery's life expectancy.

## 3. When Discharging the Battery

### DANGER

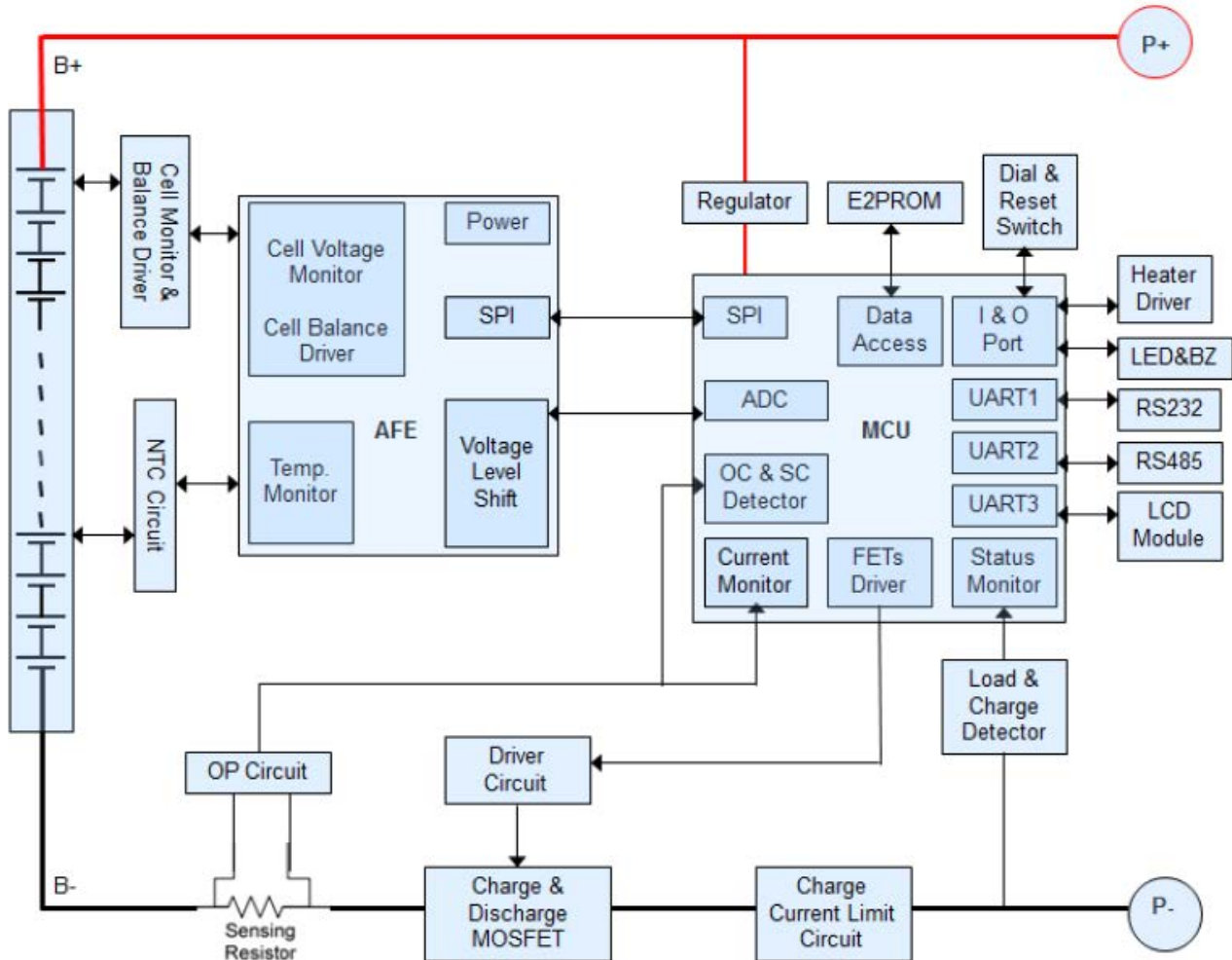
Do not discharge the battery using any device except for the specified device. When the battery is used in devices aside from the specified device it may damage the performance of the battery or reduce its life expectancy, and if the device causes an abnormal current to flow, it may cause the battery to become hot and cause serious injury.

### CAUTION

The temperature range over which the battery can be discharged is -20°C to 60°C. Use of the battery outside of this temperature range may damage the performance of the battery or may reduce its life expectancy.

## 1. Basic Block Diagram

- There are Battery cells and BMS board inside, before connecting the terminal, please read the diagram, and make sure the output is no short or other abnormal connection.



**Fig1 Battery Block Diagram**

## 2. Installation and Operation

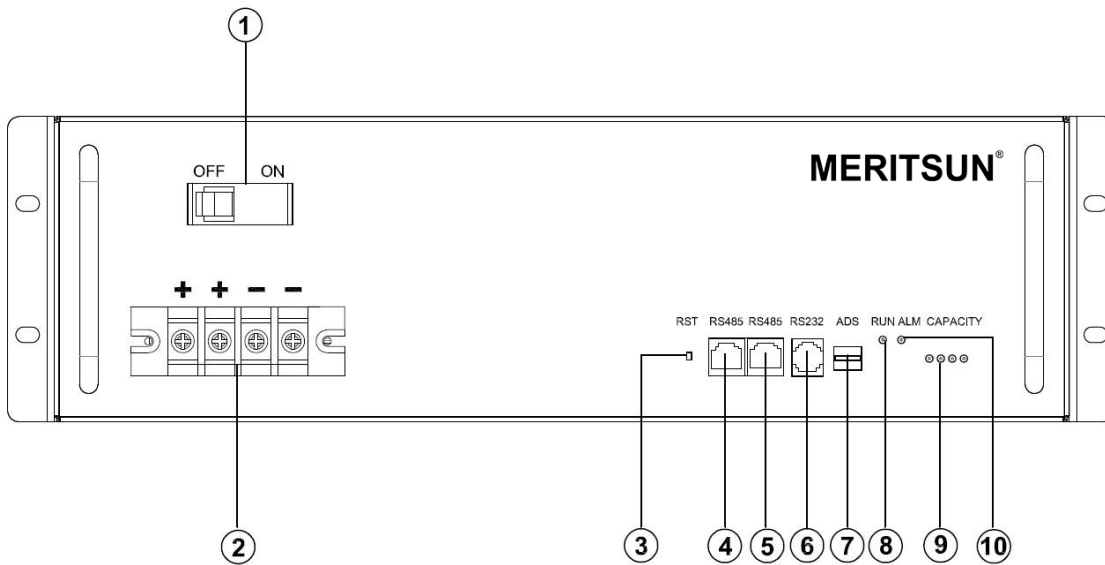
### 2-1. Unpacking and Inspection

Unpack the package and check the package contents. The shipping package contains:

- One Battery
- Two mounting bracket
- A small bag of screws and nuts

**NOTE:** Before installation, please inspect the unit. Be sure that nothing inside the package is damaged during transportation. Do not turn on the unit and notify the carrier and dealer immediately if there is any damage or lacking of some parts. Please keep the original package in a safe place for future use.

2-2. Panel View



No.	Description	Functional Description
1	Output MCB	Positive terminal
2	Output terminal	+/-
3	Reset key	On/OFF button
4	RS-485connection port-B RS485	RS485 communication interface
5	RS-485connection port-A RS485	RS485 communication interface
6	RS-232 connection port RS232	RS232 communication interface
7	Display connection address	ADS Dialer
8	Red- trouble-light on	Run indicator light OFF
9	Display the battery's capacity	Electricity volume indicator
10	Display state information	ALM alarm indicator light blinking

2-3. Single battery Installation

Installation and wiring must be performed in accordance with the local electric laws/regulations and execute the following instructions by professional personnel.

- 1) Make sure the mains wire and breakers in the building are in compliance with the standard of rated capacity of battery to avoid the hazards of electric shock or fire.

**NOTE:** Do not use the wall receptacle as the input power source for the battery, as its rated current is less than the battery's maximum input current. Otherwise the receptacle may be burned and destroyed.

- 2) Switch off the mains switch in the building before installation.
- 3) Turn off all the connected devices before connecting to the battery.
- 4) Prepare wires based on the following table:

Model	Cables(AWG)	Cables(mm2)
<50Ah	8	6
50Ah	6	16
100Ah	4	25

**Table 1** Output Cables

**NOTE 1:** It is recommended to use suitable wire in above table or thicker for safety and efficiency.

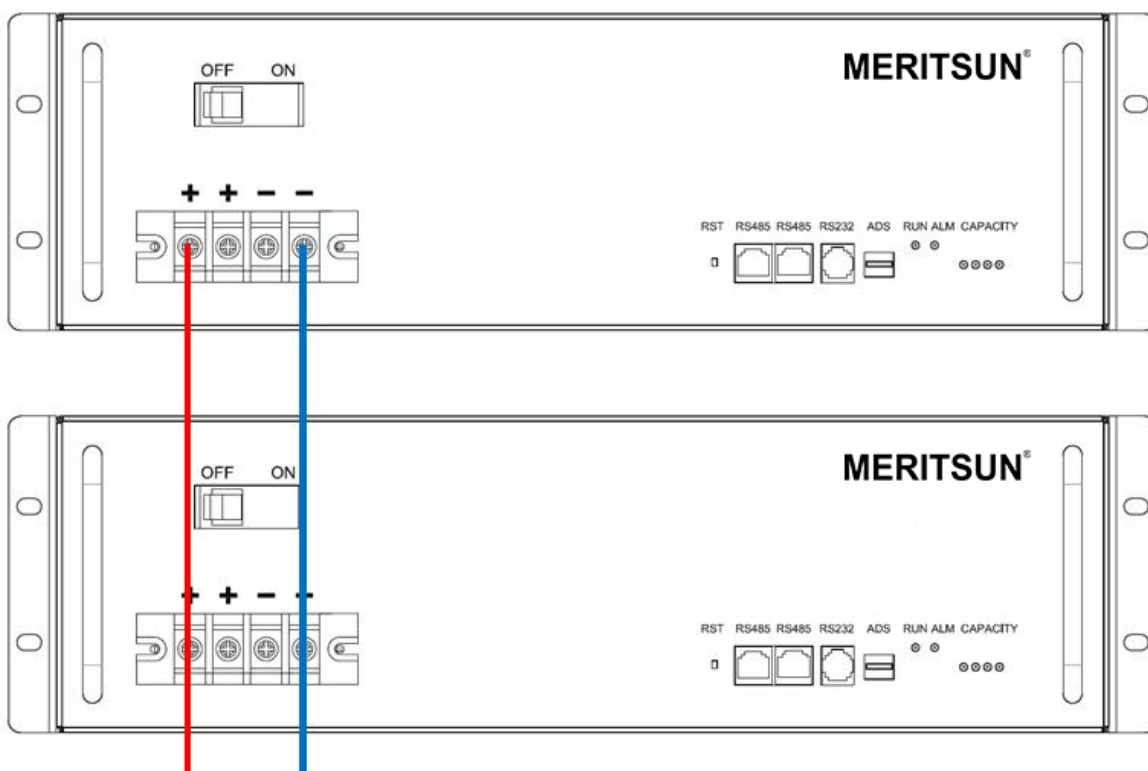
5) Put the terminal block cover back to the front panel of the battery.

**NOTE:** Set the battery pack breaker in "OFF" position and then install the battery pack.

## 2-4. Software Installation

For optional computer system protection, install battery monitoring software to fully configure battery shutdown and other setting value.

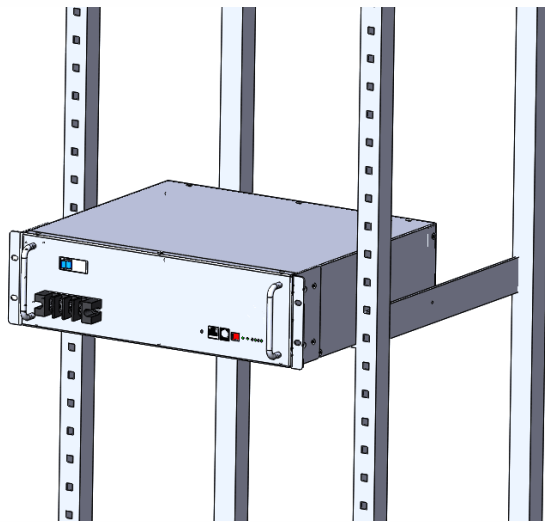
## 2-5. Installation of Battery in Parallel



## 2-6 Installation Precautions

- (1) Prior to installation, unpacking to check the quantity of the parts and battery appearance;
- (2) Install the hanger and handle and measure the battery voltage with a multimeter. The general factory voltage of the battery is 51.5V-53.5V;
- (3) Prior to wiring, check the anode and cathode of the battery and the anode and cathode terminals shall not be connected reversely;

- (4) During battery connection, please wear the protective gloves. When using such metal tools as torque wrench, please perform insulating packaging for them and two end of the metal tools such as torque wrench shall not contact the positive and negative terminals of the battery at the same time to avoid battery short-circuit;
- (5) Before the battery is connected with the externally connected equipment, make the equipment in a disconnected state, check whether the connecting polarity of the battery and total voltage are correct, connect the battery anode with the equipment anode and battery cathode with the equipment cathode and fix the connecting line;
- (6) During handling and placement, the battery must be handled gently. No dropping or impacting. The battery shall not be thrown or beaten to avoid damaging the battery or resulting in potential safety hazard;
- (7) Do not touch the surface of the battery box with the sharp part of the tool to scratch or damage the battery box;
- (8) Do not disassemble the battery box without authorization;
- (9) Do not put any article made of the metal conductive material together with the battery or assemble it into the battery box;
- (10) Install it according to the selected installation mode:



Installation of standard cabinet (rack): Install the matching hanger for the battery pack and fix them in the standard cabinet and the tray protection is added for the battery box.

Installation of wall-mounted box: Prior to installation, please ensure that the wall complies with the wall-mounted requirements; according to the location in the design plan, install the special wall-mounted box of the lithium battery; the battery pack is fixed in the wall-mounted box in a hanger manner;

Installation of integrated indoor and outdoor cabinets (boxes): Install them according to the installation specification for the customized integrated cabinet (box).



## 2-7 Operation Instruction for Installation

### 1) Prior to installation, please check whether the battery is normal.

Press the reset key RST on the front panel for 3S for startup. During startup, 4 capacity indicator lights on the front panel, ALM alarm indicator light (red) and RUN running indicator light lights up. Check whether all indicator lights light up normally; then the ALM alarm indicator light goes out, the RUN running indicator light lights up and the capacity indicator light lights up according to the capacity.

If the ALM alarm indicator light flashes after startup, it means that the battery has an alarm. The newly installed battery seldom has alarm. The common alarm is the battery undervoltage alarm (which is resulted from non-use of the battery for a long time). Such case may be removed after the battery is charged for 30min; if the alarm may not be removed, please press the reset key RST for 10S, until all LEDs light up for reset, execute the battery reset operation and confirm whether the alarm is removed. If the alarm is removed, the battery may be used normally. Otherwise the battery shall be reworked.

### 2) For the battery which is normal after detection, please press the reset key RST for 3S to execute the battery ON/OFF operation.

Instructions of manual operation of the reset key RST	Startup	In the OFF state of BMS, press the key for 3S for startup;
	Shutdown	In the non-standby state of BMS, press the key for 3S for shutdown;
	Reset	In the non-standby state of BMS, press the key for 10S, until all LEDs light up for reset.

Instructions: “Shutdown” and “standby” and “startup” and “activation” in Chinese have the same meaning;

### 3) Installation of the lithium battery, wiring and startup.

Make the battery pack in a standby state, install it in the battery cabinet one by one, the anode and cathode of the battery pack are connected respectively, which are connected to the switching mode power supply or UPS (Please note that the switching mode power supply and UPS shall be disconnected from the AC). Press the reset key RST of one of battery packs for 3S for startup. Such startup battery may activate other batteries which are connected in parallel (or press the reset key RST of each battery pack for 3S successively) and the whole battery pack with high capacity enters the working state. Later, apply AC to the power supply equipment such as switching mode power supply and UPS to make the whole standby system run.

The specification of the connecting line is selected according to the load current, with the common specifications of the connecting line as follows:

1) When the battery pack with the capacity of 200Ah or below is connected in parallel, it is suggested to select 16mm<sup>2</sup> copper wire.

2) When the battery pack with the capacity of 200Ah~300Ah is connected in parallel, it is suggested to select 16mm<sup>2</sup> or 25mm<sup>2</sup> copper wire.

3) When the battery pack with the capacity of 300Ah or above is connected in parallel, it is suggested to select 25mm<sup>2</sup> copper wire.

Note: We do not equip with the battery connecting line by default, which shall be selected according to the total capacity of the battery pack.

Lithium battery	Copper core cable	Copper pigtail	Remarks
48V50Ah	16mm <sup>2</sup> /25mm <sup>2</sup>	16-8/25-8	M8 copper pigtail is used for 48V50Ah sing pack of battery binding post
48V100Ah	16mm <sup>2</sup> /25mm <sup>2</sup>	16-10/25-10	48V100Ah M10 copper pigtail is used for 48V100Ah sing pack of battery binding post

**Introduction to operation steps in detail according to the capacity required:**

- **Battery pack in parallel with the capacity of 200Ah or below (the wiring diagram is shown in Figure 1):**

Step 1: Make the battery pack in the standby state and install it in the battery cabinet successively;

Step 2: Disassemble the anode insulating cap of the neighboring batteries one by one, connect the anodes of up and own neighboring battery packs with the installation connecting line and screw on the anode insulating cap;

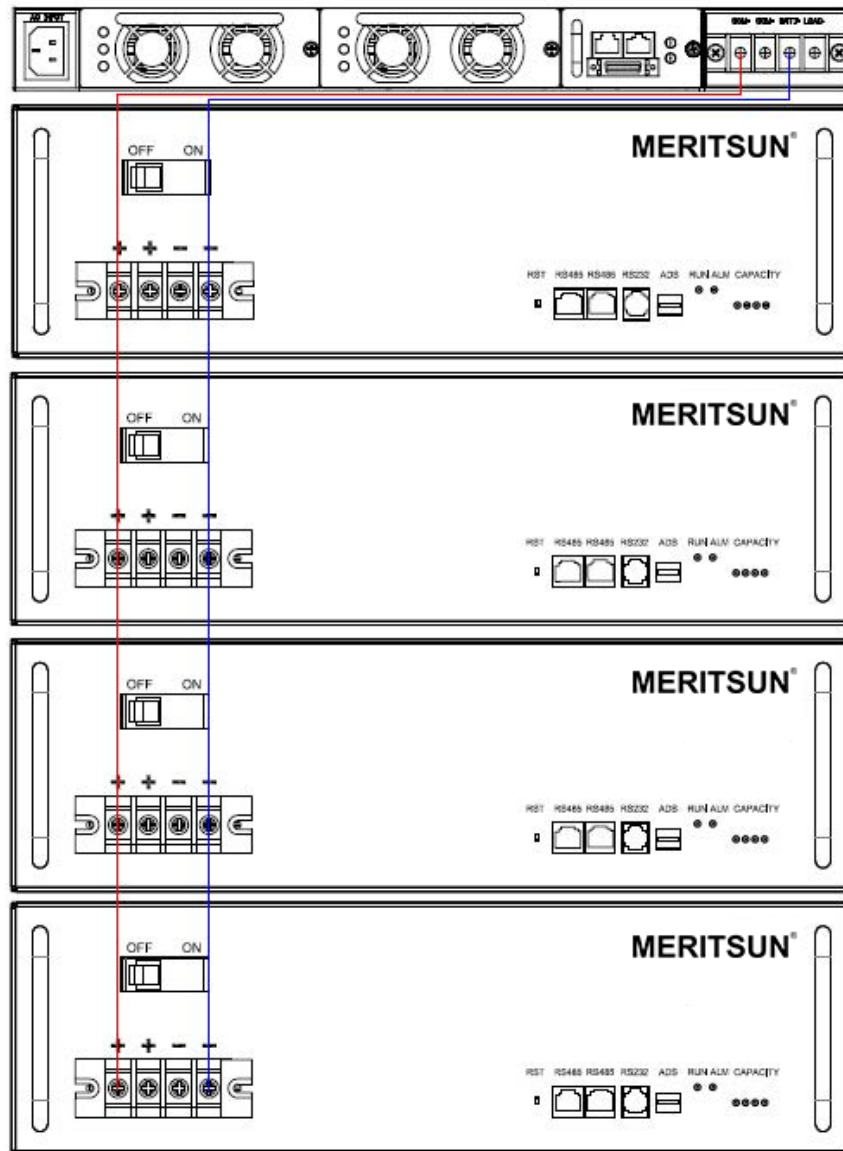
Step 3: According to step 2, connect the cathode of the battery pack;

Step 4: Set the dial-up addresses of all battery modules from top to bottom one by one, which are 1000, 0100, 1100 and 0010 (the dial-up addresses are set according to the number of battery modules actually used) respectively; (this step may be skipped if there is no need to access to the remote monitoring platform);

Step 5: Perform the cascade connection to RS485 communication interface of the battery module with the RS485 connecting line; lead to the collector of the monitoring platform from the RS232 interface of the battery module with the address of 1000 with the RS232 connecting line; (this step may be skipped if there is no need to access to the remote monitoring platform);

Step 6: Draw out two wires from the anode and cathode of a battery pack at the top or in the middle respectively as the main connecting line of the battery pack in parallel, which are connected with the switching mode power supply or UPS.

Step 7: Press the RST key of each battery pack for Reset and the whole battery pack with high capacity enters the working state.



### Wiring Diagram of Battery Pack in Parallel with Capacity of 200Ah or Below

- **Battery pack with the capacity of 200Ah~300Ah in parallel:**

Step 1: Make the battery pack in the standby state and install it in the battery cabinet successively;

Step 2: Disassemble the anode insulating cap of the battery pack one by one, connect the anode of each battery pack to the anode busbar at the battery cabinet side with the installation connecting line with the same length and screw on the anode insulating cap;

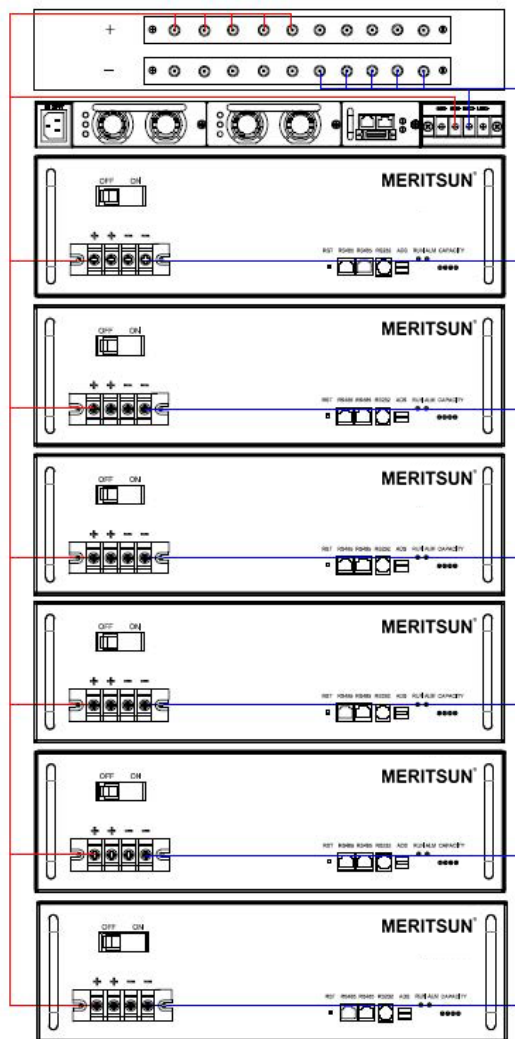
Step 3: According to step 2, connect the cathode of the battery pack;

Step 4: Set the dial-up addresses of all battery modules from top to bottom one by one, which are 1000, 0100, 1100 and 0010 (the dial-up addresses are set according to the number of battery modules actually used) respectively; (this step may be skipped if there is no need to access to the remote monitoring platform);

Step 5: Perform the cascade connection to RS485 communication interface of the battery module with the RS485 connecting line; lead to the collector of the monitoring platform from the RS232 interface of the battery module with the address of 1000 with the RS232 connecting line; (this step may be skipped if there is no need to access to the remote monitoring platform).

Step 6: Draw out two wires from the anode and cathode of a battery pack at the top or in the middle respectively as the main connecting line of the battery pack in parallel, which are connected with the switching mode power supply or UPS.

Step 7: Press the RST key of each battery pack for Reset and the whole battery pack with high capacity enters the working state.

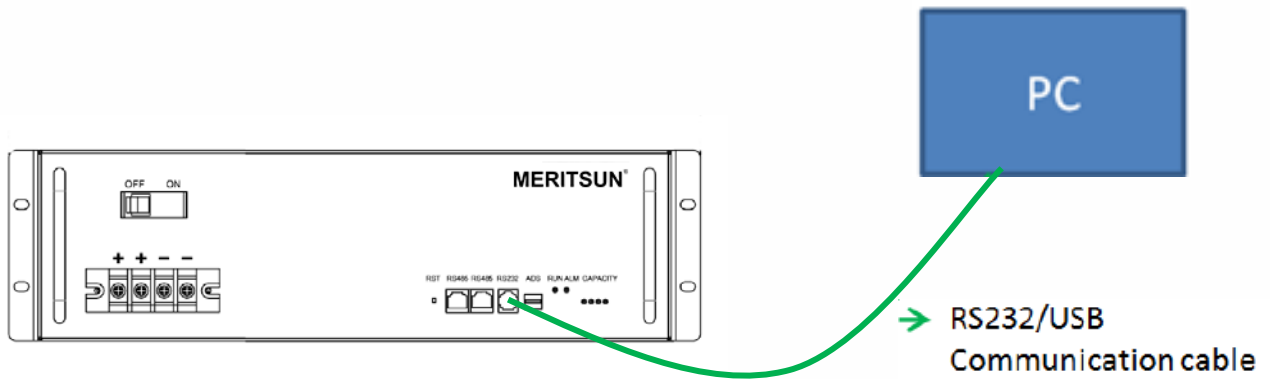


**Wiring Diagram of Battery Pack in Parallel with Capacity of 200Ah~300Ah**

**2-8. Circuit breaker of battery circuit is set to OFF, connect it to switch power supply, and output voltage of switch power supply is set to 52.5-54V/56-57.6V, current set to 0.2C; after all settings done, switch the circuit breaker ON.**

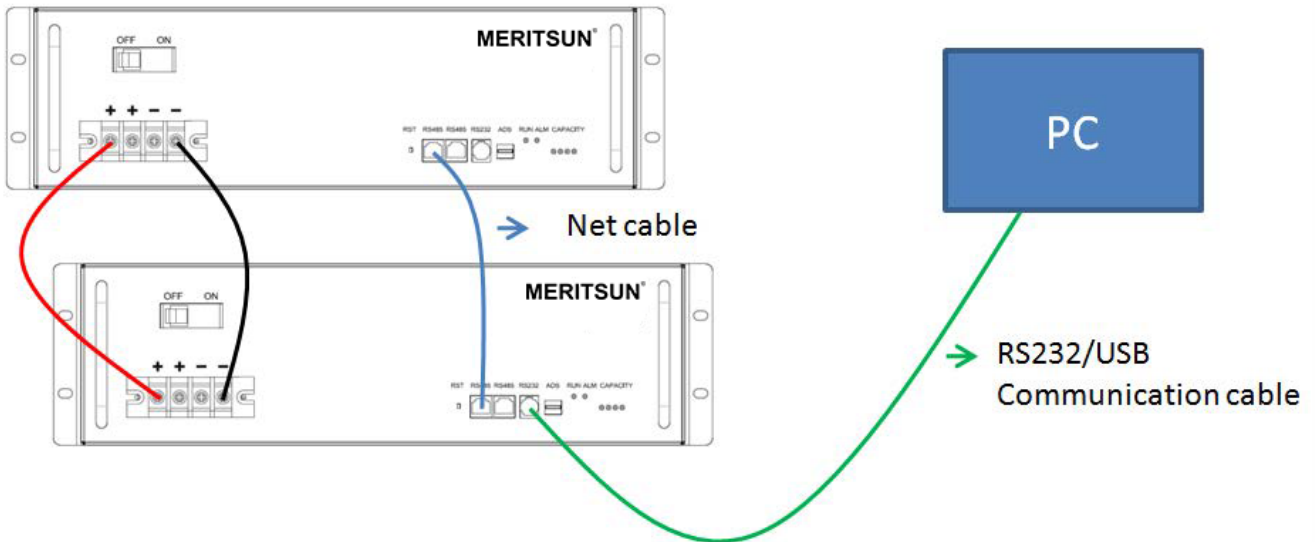
**2-9. Communication of battery**

6-9-1 Single battery communication

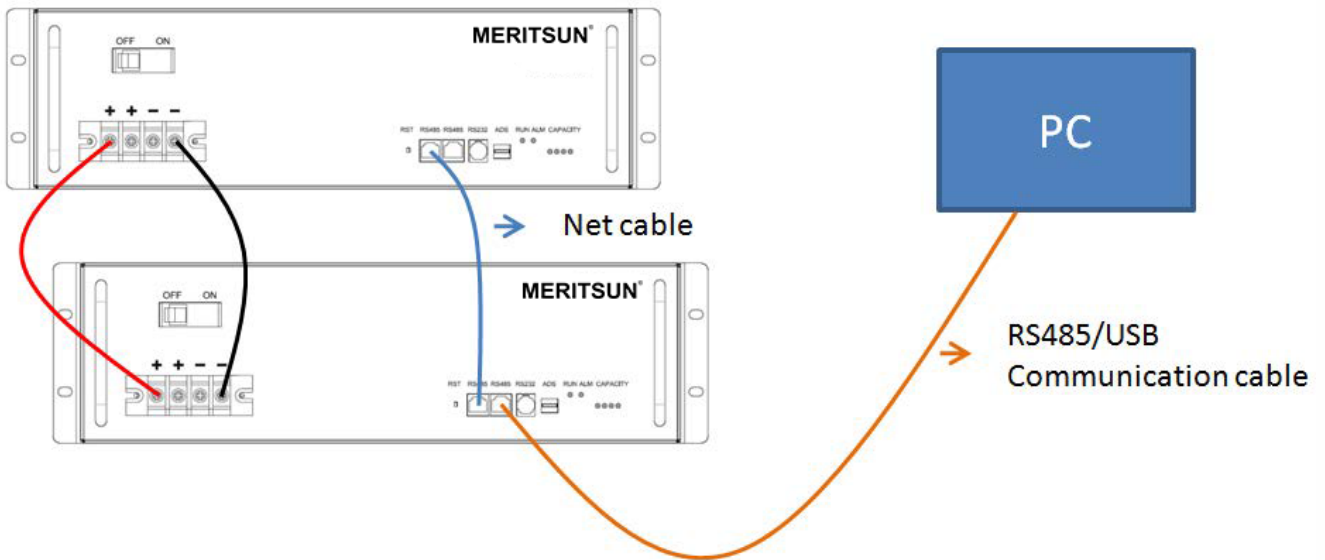


6-9-2 Connection mode for parallel communication

While in parallel communication, dial-up addresses of battery module are 1 , 2,3,4.....14,15,of which 1 stands for host computer, to which other batteries' data is uploaded; host computer conducts unified uploading, and host computer with dial-up code of 1 is required to connect with upper computer; FF polling mode used as consulting mode.

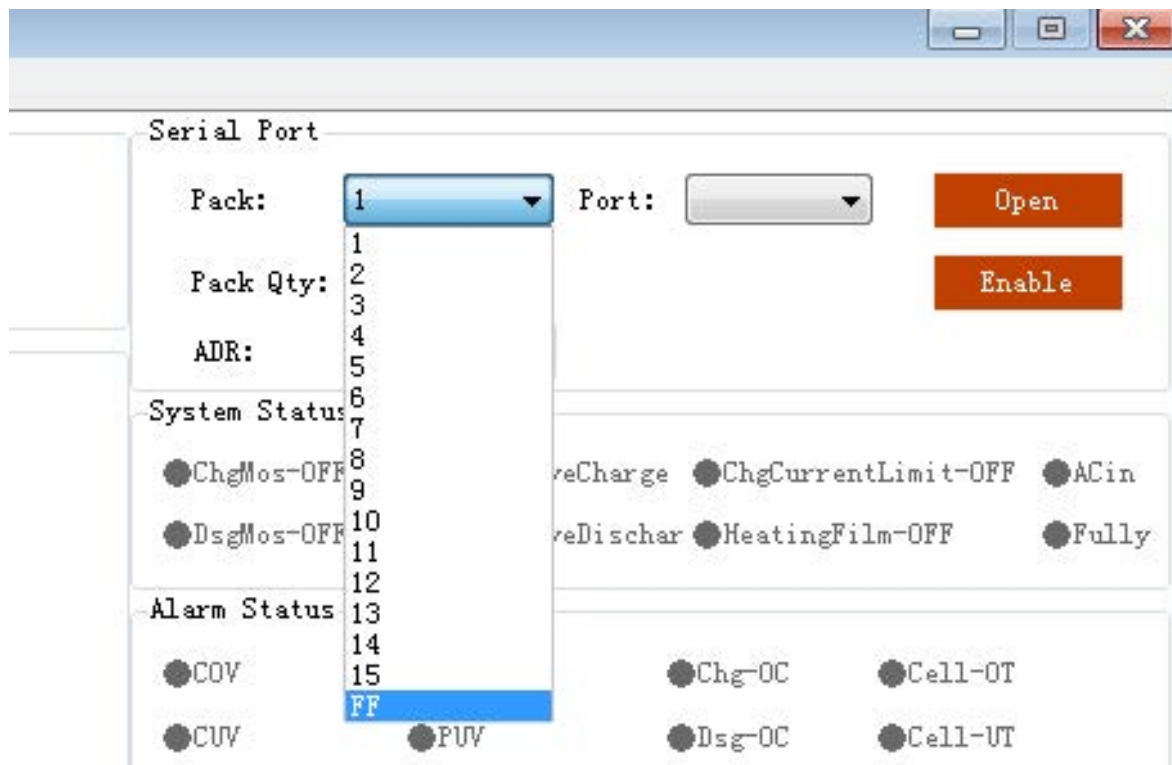


RS232 Parallel Communication



RS485 Parallel Communication

2-10. Monitor Software interface



## 6-11 Upper machine instructions

A、 Software source file :

Name of software source file : BmsTools.exe、 BmsTools.exe.config、 Language.xml、  
LogParams.xml、 MultiLanguage.dll、 ParamSetting.xml six documents in total.

B、 Software running environment :

The software running on the PC and its compatible computer, using WINDOWS operation system.

C、 Software using steps :

( 1 ) Double click BmsTools.exe icon can show the main interface of the software ( As shown in figure A ) .

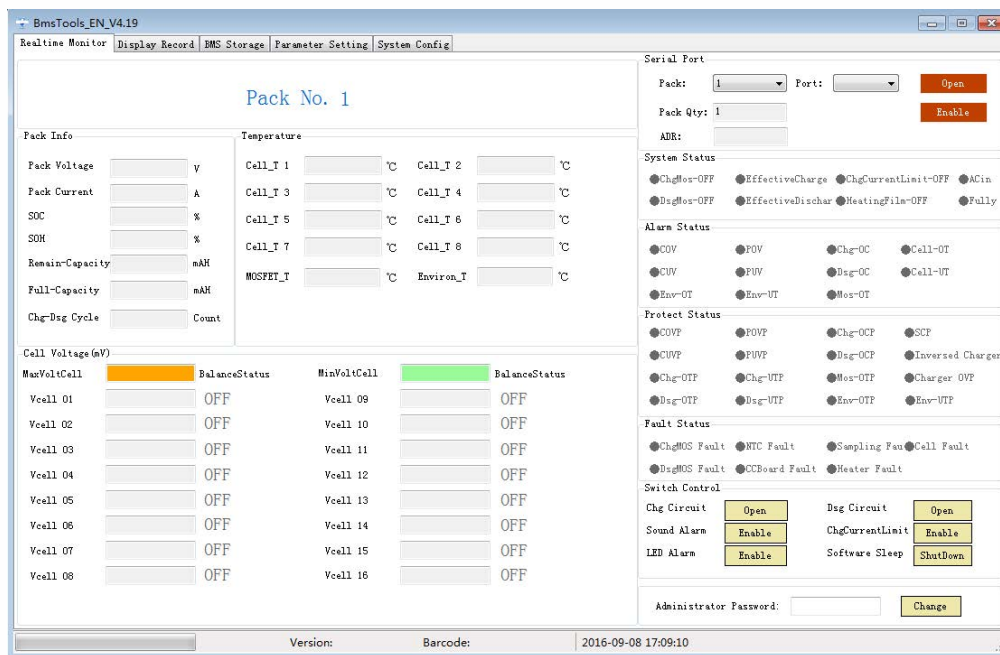
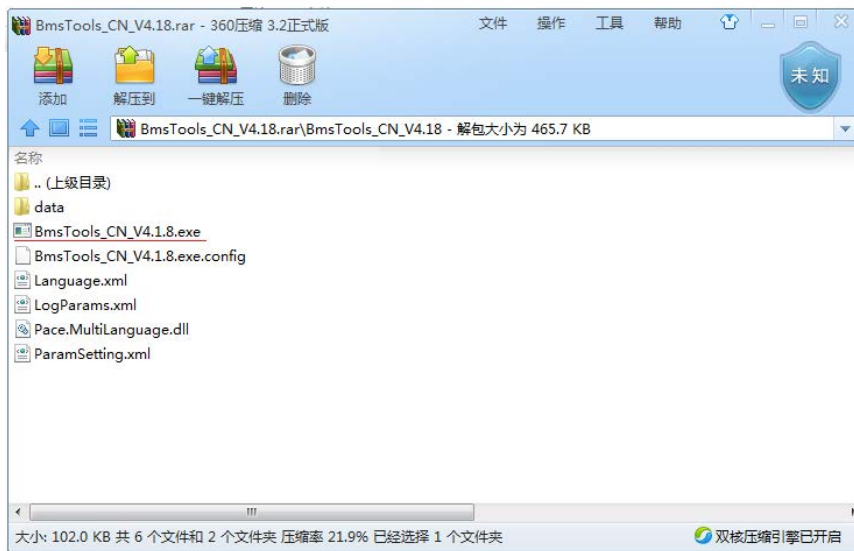


Figure A : Real-time Monitoring

( 2 ) Open the main interface ( As shown in figure A ) , the software automatically search serial port , and automatically open , real-time read battery voltage, power, temperature, and protection of the state of battery parameters.

Operating authority is divided into general rights and administrator privileges.

( 3 ) In the display record TAB(As shown in figure B),there are two checkboxes, display and automatic storage.

Check the display option, can real-time display the various parameters of the battery.



Check the automatic storage option, can automatically storage the parameters of the battery in the excel table. The file in the software under the current file path of the data folder, storage file name named after pack number and time. 比如 For example packNo1\_20150306145010.xls。

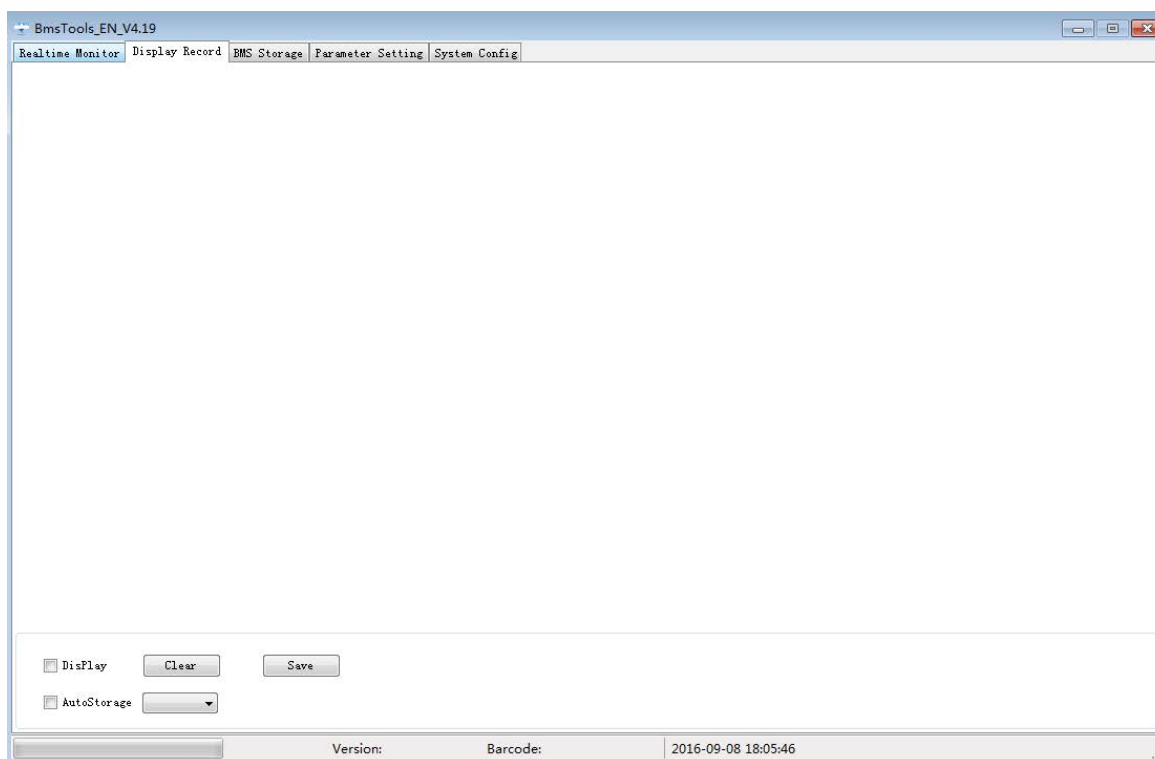


Figure B : Display record

( 4 ) In storage record TAB(As shown in figure C) , can read the battery protective plate storage of records, the records content including record the protection and alarm and restore the category and time of occurrence , records includes fault categories and fault occurs cell voltage, total voltage, charge/discharge capacity, charge/discharge current, temperature, etc. In addition to normal record protection and alarm and recovery information, but by setting, record battery parameters within a certain period of time. : Cell voltage, total voltage, charge/discharge capacity, charge/discharge current, temperature, etc.

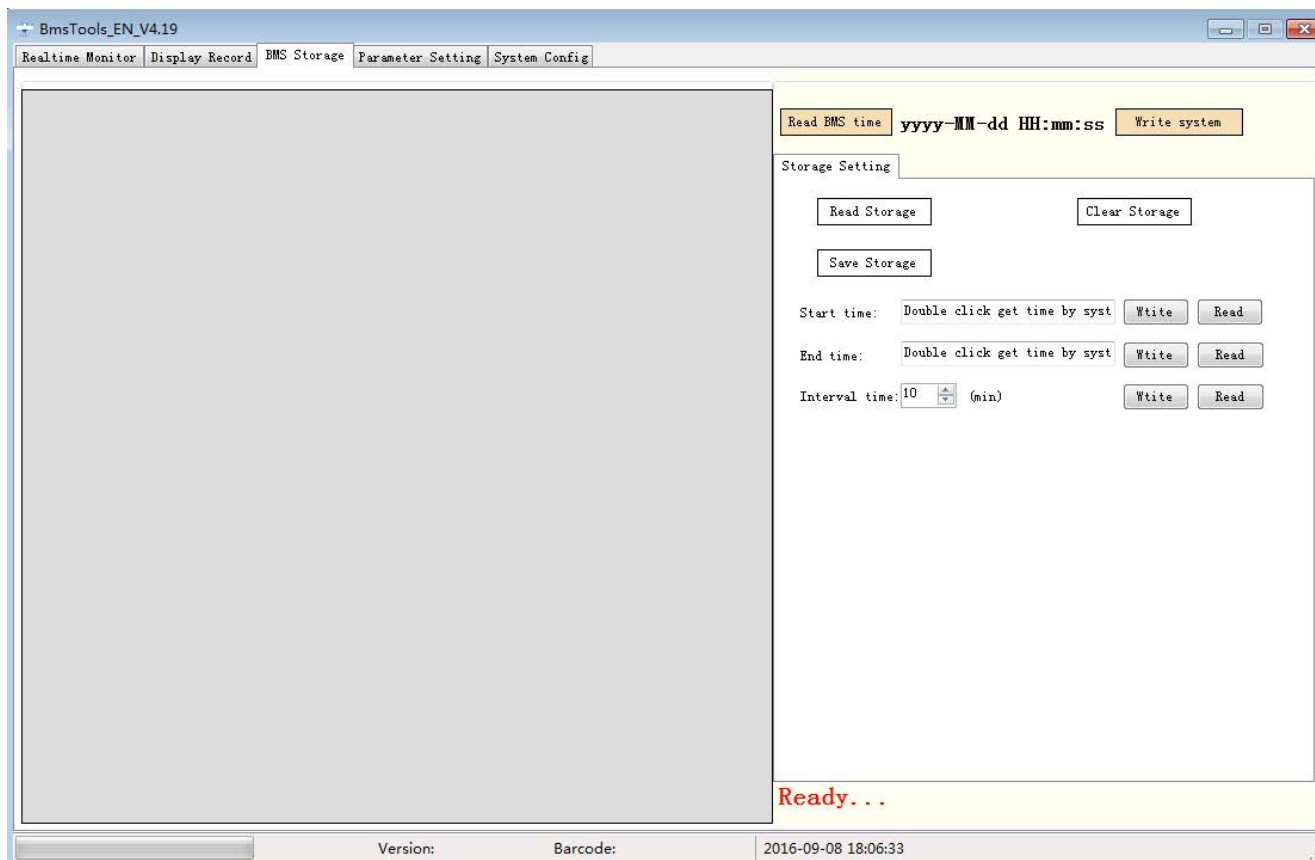


Figure C: Storage record

( 5 ) In the parameter settings TAB(As shown figure D),the TAB for the battery parameters.

Read the parameter I : Read all the parameters of the battery

Write in parameter: Write all the parameters of the battery

Restore default : Restore the default parameters for battery

Import parameters: Export the current battery parameters, for the XML file format.

Expo parameters : The parameters of the import file format for the XML to the current TAB

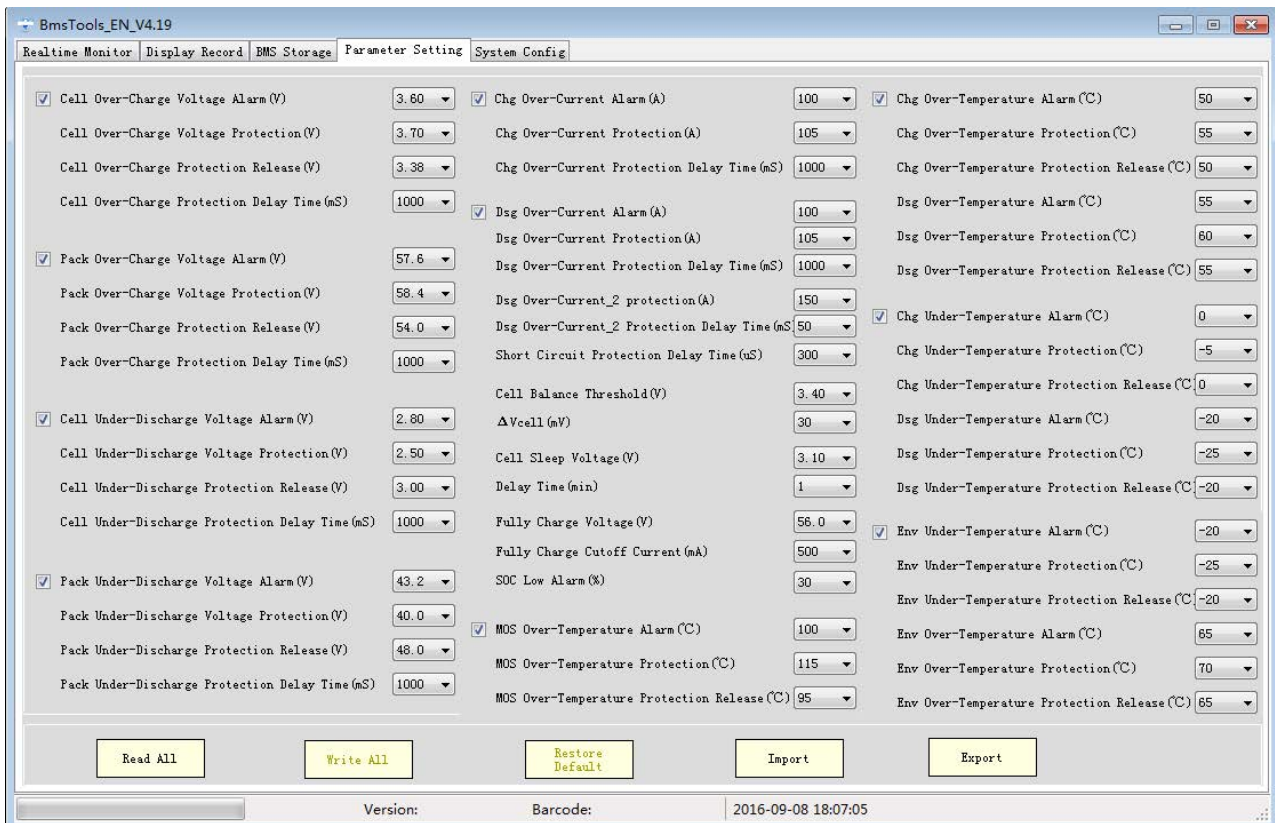


Figure D: Parameter Settings

( 6 ) In the system configuration TAB(As shown in figure E),the TAB for battery calibration, parameters setting, the battery calibration and setting up the battery system parameters need administrator privileges.

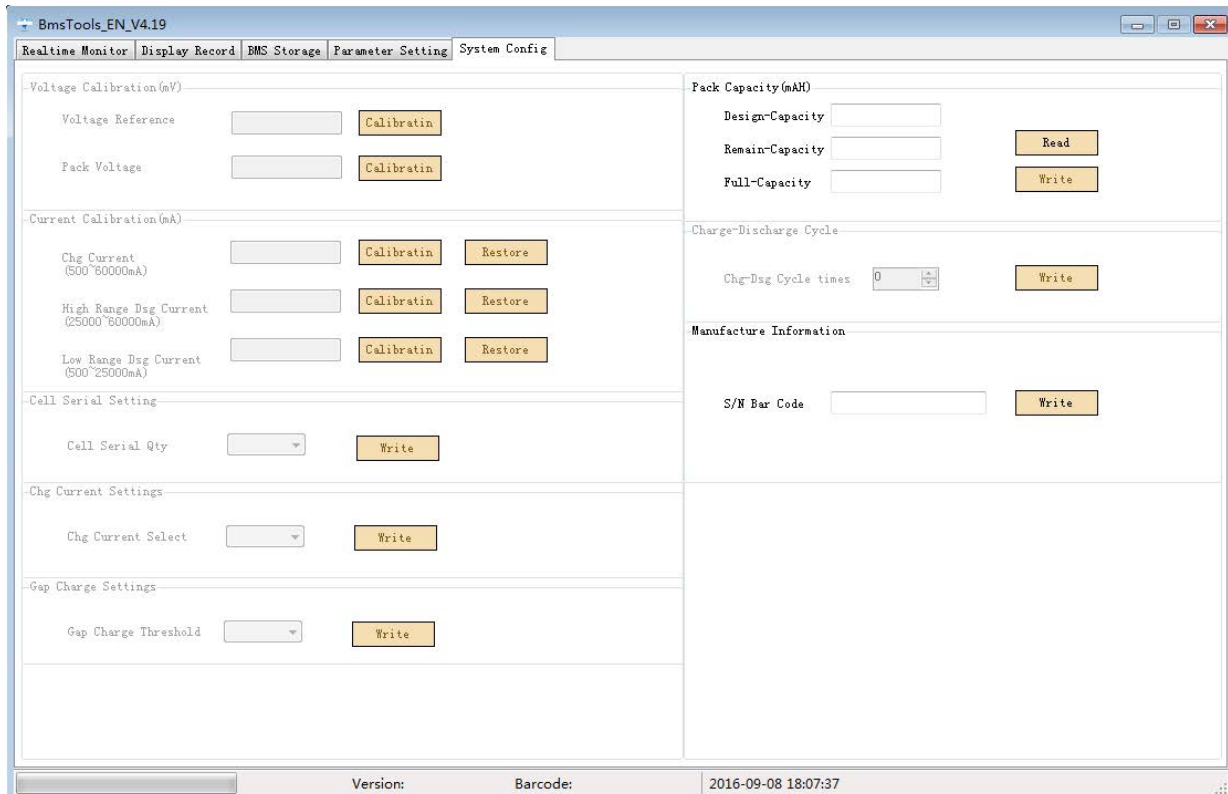


Figure E: System Configuration

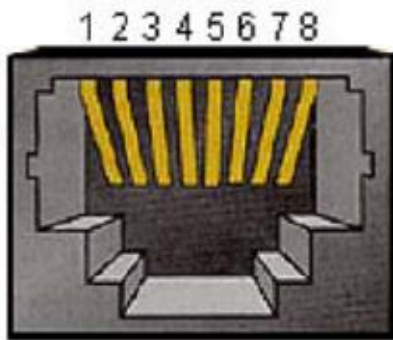
**2-12 Address Switch function(Only in Parallel)**

When battery work in parallel, main pack and slave packs need address as follows:

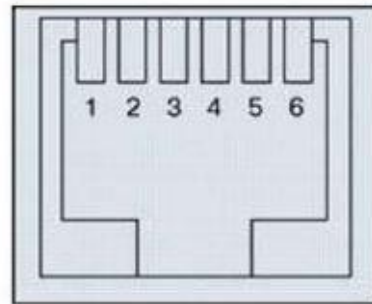


Address	Dial Switch				Remark
	#1	#2	#3	#4	
0	OFF	OFF	OFF	OFF	Slave Pack0
1	ON	OFF	OFF	OFF	Slave Pack1
2	OFF	ON	OFF	OFF	Slave Pack2
3	ON	ON	OFF	OFF	Slave Pack3
4	OFF	OFF	ON	OFF	Slave Pack4
...	...	...	...	...	...
...	...	...	...	...	...
14	OFF	ON	ON	ON	Slave Pack14
15	ON	ON	ON	ON	Slave Pack15

**6-13 Communication Function**



RS485 interface



RS232 interface

Fig8 Communication Port Interface

RS485 Terminal Port	Definition
Pin1,8	RS485_B
Pin2,7	RS485_A
Pin3,6	GND
Pin4,5	NC

RS485 Communication Port Definition

RS232 Terminal Port	Definition
Pin3	BMS Transmit, PC Receive
Pin4	BMS Receive, PC Transmit
Pin2,5	GND
Pin1,6	NC

RS232Communication Port Definition

### 3. Operations

#### 3-1. LED Indicators

##### LED Indicators:

There are 6 LEDs on front panel to show the battery working status:

PACK Status	Normal/Alarm/Protection	RUN	ALM	SOC Indication LEDs				Remark
		●	●	●	●	●	●	
Power Off	Sleep	OFF	OFF	OFF	OFF	OFF	OFF	All off
Standby	Normal	Flash 1	OFF	Indication by SOC (The top SOC Led Flash 2)				Standby state
	Alarm	Flash 1	Flash 3	Indication by SOC (The top SOC Led Flash 2)				Cell low voltage
Charge	Normal	ON	OFF	Indication by SOC (The top SOC Led Flash 2)				ALM Led on when Cell over-charge voltage Alarm
	Alarm	ON	Flash 3	Indication by SOC (The top SOC Led Flash 2)				ALM Led on when Cell over-charge voltage Alarm
	Over Charge Protection	ON	OFF	ON	ON	ON	ON	If no mains supply, LED as standby
	Temperature. Over-current Fault Protection	OFF	ON	OFF	OFF	OFF	OFF	Close charge
Discharge	Normal	Flash3	OFF	Indication by SOC				
	Alarm	Flash3	Flash 3	Indication by SOC				
	Under Discharge Protection	OFF	OFF	OFF	OFF	OFF	OFF	Close discharge
	Temperature. Over-current. Short Circuit Fault Protection	OFF	ON	OFF	OFF	OFF	OFF	Close discharge
Fault		OFF	ON	OFF	OFF	OFF	OFF	Close charge Close discharge

Fig7 LED Operating Status

Flash	ON	OFF
Flash1	0.25Sec	3.75Sec
Flash2	0.5Sec	0.5Sec
Flash3	0.5Sec	1.5Sec

**NOTE:** LED function can be set by monitor software, the default if on.

**3-2. Buzzer Operation(Optional)**

Model	Description and Status
Fault	Buzzing 0.25S per 1Sec
Protection	Buzzing 0.25S per 2Sec(expect for over-charge protection)
Alarm	Buzzing 0.25S per 3Sec(expect for over-charge alarm)

**NOTE:** Buzzer function can be set by monitor software, the default if off.

**3-3. Reset key function**

Mode	Pressing and Holding time		
	0-3Sec	3-6Sec	>6Sec
Normal	Indication by SOC	Transfer to Sleeping mode	Reset
Sleeping Mode	Wake up from Sleeping mode		

**4. Troubleshooting**

If the battery does not operate correctly, please solve the problem by using the table below.

Symptom	Possible cause	Remedy
No indication and alarm in the front display panel	Sleeping mode	Press Reset to normal mode
No indication and alarm in the front display panel even Reset still no	Battery voltage too low	Charge battery immediately
Red LED Flashing when Standby	Battery cell low voltage	Charge battery immediately
Red LED Flashing when charging	Alarm for protection when charging	BMS show alarm, protect and adjustment
Red LED Flashing when Discharging	Battery too low and will shutdown	Charge battery immediately
RED LED Lighting continuous	Battery wrong	Need to repair

## 5. Storage and Maintenance

### 5-1. Storage

Before storing, charge the battery at least 7 hours. Store the Battery covered and upright in a cool, dry location. Recommend long-term storage temperature is 15°C -25°C . During storage, recharge the battery in accordance with the following table:

Storage Temperature	Recharge Frequency	Charging Duration
0°C - 40°C	Every 3 months	1-2 hours

### 5-2. Maintenance



The battery system operates with hazardous voltages. Repairs may be carried out only by qualified maintenance personnel.



Even after the unit is disconnected from the mains, components inside are still connected to the battery cells which are potentially dangerous.



Before carrying out any kind of service and/or maintenance, disconnect the batteries and verify that no current is present and no hazardous voltage exists in the terminals.



Only persons are adequately familiar with batteries and with the required precautionary measures may replace batteries and supervise operations. Unauthorized persons must be kept well away from the batteries.



Verify that no voltage between the battery terminals and the ground is present before maintenance or repair. In this product, the battery circuit is not isolated from the input voltage. Hazardous voltages may occur between the battery terminals and the ground.



Batteries may cause electric shock and have a high short-circuit current. Please remove all wristwatches, rings and other metal personal objects before maintenance or repair, and only use tools with insulated grips and handles for maintaining or repairing.



When replace the batteries, install the same number and same type of batteries.



When replace the parallel batteries, make sure the new battery is full charged.



Do not open or destroy batteries. Escaping electrolyte can cause injury to the skin and eyes. It may be toxic.



Please replace the fuse only with the same type and amperage in order to avoid fire hazards.



Do not disassemble the battery system.