

Active Balance Relay  
Protection Board

( **JK - B2A25S - RP** )

Operation and Maintenance  
Manual

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## 1 Overview

JK - B2A25S - RP The battery management system is a battery management system tailored for large-capacity series lithium battery packs. Should The system is suitable for battery packs of 3 to 25 strings, and has the functions of battery protection, voltage acquisition and voltage equalization.

The balance function of the system uses super capacitors as the medium to achieve active energy transfer balance. implemented when the system works Battery protection functions such as charge, over -discharge protection, and short-circuit protection, with a continuous maximum of 2 A The equilibrium current for energy transfer, The balancing current does not depend on the voltage difference between the series cells in the battery pack. Voltage acquisition range  $1\text{ V} \sim 5\text{ V}$ , with an accuracy of  $\pm 3\text{ mV}$ . right External communication interface can choose RS 485 bus, CAN bus, GPS interface or LCD interface. Applicable to phosphoric acid All types of batteries on the market, such as iron lithium, ternary lithium, titan acid, and lithium lead acid.

The system has bluetooth communication function and is equipped with mobile APP software. You can connect the device system through Bluetooth to check the voltage of the single battery , check the balance status, and modify the setting parameters. Can be used in small sightseeing cars, scooters, forks Battery pack for cars, shared cars, high-power energy storage, base station backup power, solar power plants and other products inside, also available For battery equalization maintenance, repair and other occasions.

## 2 The main technical parameters

### 2.1 Main functions and technical indicators

- ◆ Support  $3 \sim 25$  battery packs;
- ◆ Overcharge, overdischarge voltage protection and overcurrent protection parameters can be accessed through the APP Setting, with short circuit protection function;
- ◆ Real-time , active equalization, equalizing current 2 A , the voltage difference between cells after balancing is  $\leq 5\text{ mV}$ ;
- ◆ Support charge, discharge, discharge precharge relay control function, relay drive voltage 12 V ;
- ◆ Support 3 temperature probes ;

- ◆ Single voltage range 1 V ~ 4.5 V, the accuracy is  $\pm 5$  mV;
- ◆ With coulomb counter function ;
- ◆ Suitable for large-capacity ternary, lithium iron, lithium titanate and other lithium battery packs;
- ◆ Bluetooth communication function, equipped with APP, you can check the battery status in real time;
- ◆ Support external interface: GPS interface, CAN Interface, RS 485 needs to be customized ;
- ◆ Low-voltage shutdown function to prevent battery damage caused by over-discharge;
- ◆ Heating function, maximum support 5 A heating current;
- ◆ Support ACC Ignition switch for key start discharge;
- ◆ The function of shunt specification setting is convenient to replace different shunts.

## 2.2 Use environmental conditions

- a) Operating temperature range:  $-20\text{ }^{\circ}\text{C} \sim 70\text{ }^{\circ}\text{C}$ ;
- b) Power Requirements:  $16\text{ V} \sim 100\text{ V}$ , can use battery self-powered or external power supply.
- c) Power consumption : the maximum power consumption of the protection board is  $1.5\text{ W}$  (Excluding relay power consumption), shutdown power consumption  $20\text{ mW}$ .

## 3 Connector and Interface Description

### 3.1 Front panel connectors, LEDs Lamp Location Description

of the front connector and the lighted switch is shown in Figure 1.



picture 1 Schematic diagram of the connector

### 3.2 Front Panel Connector, Illuminated Switch Definition Description

1 for front panel connector definitions .

Table 1 Connector Definitions

connector device	pin No	name	Definition
P 1	1	B_	Total negative electrode of battery
	2	B 1	The first string of battery positive
	3	B 2	The second string of battery positive
	4	B3_	3rd string battery positive
	5	B4_	4th battery positive pole
	6	B 5	The 5th battery positive pole
	7	B6_	The 6th string of battery positive poles
	8	B7_	7th string battery positive
	9	B 8	The 8th battery positive pole
	10	B 9	The 9th battery positive pole
	11	B 10	10th _String battery positive
	12	B 11	No. 11 String battery positive
	13	B 12	No. 12 String battery positive
	14	B 13	No. 13 String battery positive
	15	B 14	No. 14 String battery positive
P 2	1	B 15	15th _String battery positive
	2	B 16	No. 16 String battery positive
	3	B 17	No. 17 String battery positive

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connect device	pin No	name		Definition
	4	B 18		No. 18 String battery positive
	5	B 19		No. 19 String battery positive
	6	B 20		20th _String battery positive
	7	B 21		21st _String battery positive
	8	B 22		No. 22 String battery positive
P 2	9	B 23		23rd _String battery positive
	10	B 24		No. 24 String battery positive
	11	B 25		25th _String battery positive
	12	B +		battery positive
P 3	Display interface			
P 4	GPS interface			
P 5	superior 1	T1 _		Thermal sensor 1 positive
	superior 2	T 2		Thermal sensor 2 positive
	superior 3	T3 _		Thermal sensor 3 positive
	Down 1	GP		thermal sensor ground
	Down 2	GP		thermal sensor ground
	Down 3	GP		thermal sensor ground
	superior 1	K 2	K 2	reserved pins
	superior 2	H_	Heat -	heating switch negative
	superior 3	H_	Heat -	heating switch negative

P 6	superior 4	I+	I+	shunt positive
	superior 5	I <sub>-</sub>	I <sub>-</sub>	Shunt Negative
	superior 6	P <sub>-</sub>	P <sub>-</sub>	Precharge switch negative
	superior 7	P+	P+	Precharge switch positive
	superior 8	D <sub>-</sub>	D <sub>-</sub>	Discharge switch negative
	superior 9	D+	D+	Discharge switch positive
	superior 10	C <sub>-</sub>	C <sub>-</sub>	charge switch negative
	superior 11	C++	C++	charging switch positive
	superior 12	V+	V+	The power supply of the protection board is positive
	Down	K 1	K 1	reserved pins

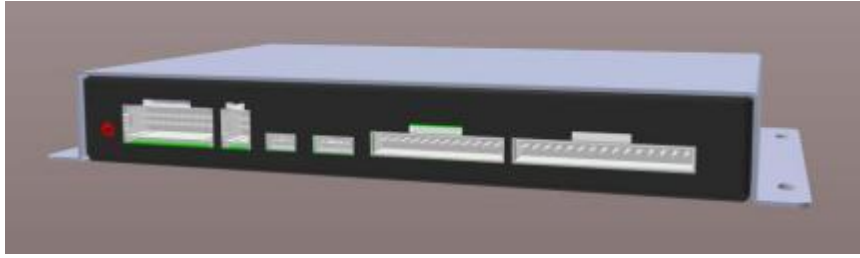


connect device	pin No	name		Definition
	1			
	Down 2	H +	Heat +	heating switch positive
	Down 3	H +	Heat +	heating switch positive
	Down 4	G	GND	Protection board power supply negative
	Down 5	A -	ACC -	ignition switch-
	Down 6	A +	ACC +	ignition switch +
	Down 7	K -	K -	Charge detection-
	Down 8	B	B / L	485_B / CAN_L _____, default CAN_L _
	Down 9	A	A / H	485_A / CAN_H _____, default CAN_L _
	Down 10	G R	GND - TR	RS485 / CAN_ land
	Down 11	K +	K +	charging switch positive
	Down 12	G	GND	Protection board power supply negative
led lamp		indicator light		Power indicator

### 3.3 Product appearance

appearance of the product is shown in Figure 2 .

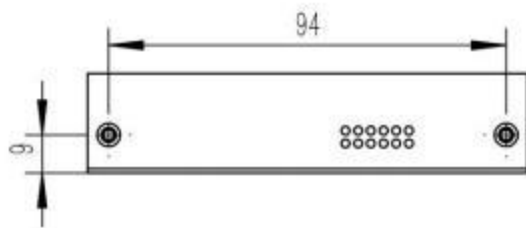
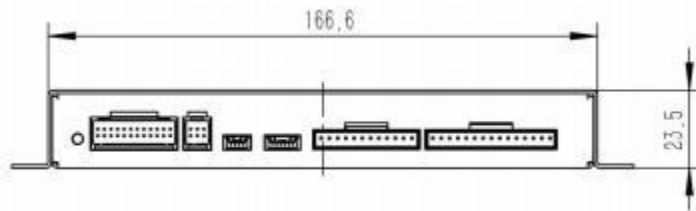
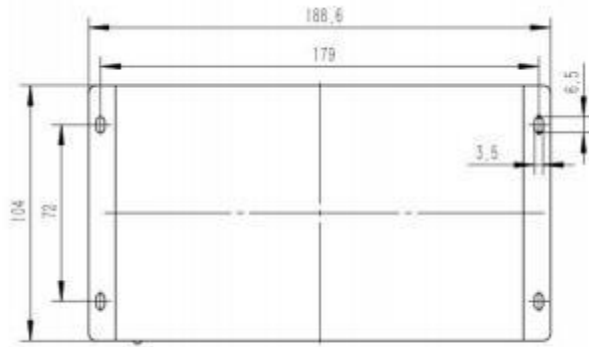
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picture 2 JK - B 2 A 25 S - RP Rendering - front

### **3.4 size**

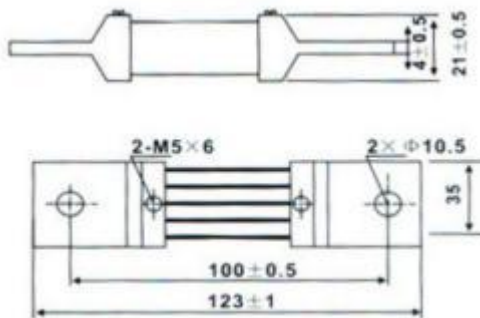
JK - B2A25S - RP The equalizer size is 188.6 mm × 94 mm × 23.5 mm , the shape and size of the mounting hole are shown in the figure 3 shown.



picture 3 JK - B 2 A 25 S - RP Dimensions

### 3.5 Shunt size

Standard shunt uses up to 500 A Current, full scale 75 mv dropout. The dimensions are shown in Figure 4.



picture 4 Outline dimension drawing of shunt

For larger current requirements, you can choose a larger shunt and pass the APP Set the shunt specification.

### 3.6 weight

The battery management system weighs about 700 g.

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## 4 Installation method and precautions

### 4.1 Unpacking inspection and precautions

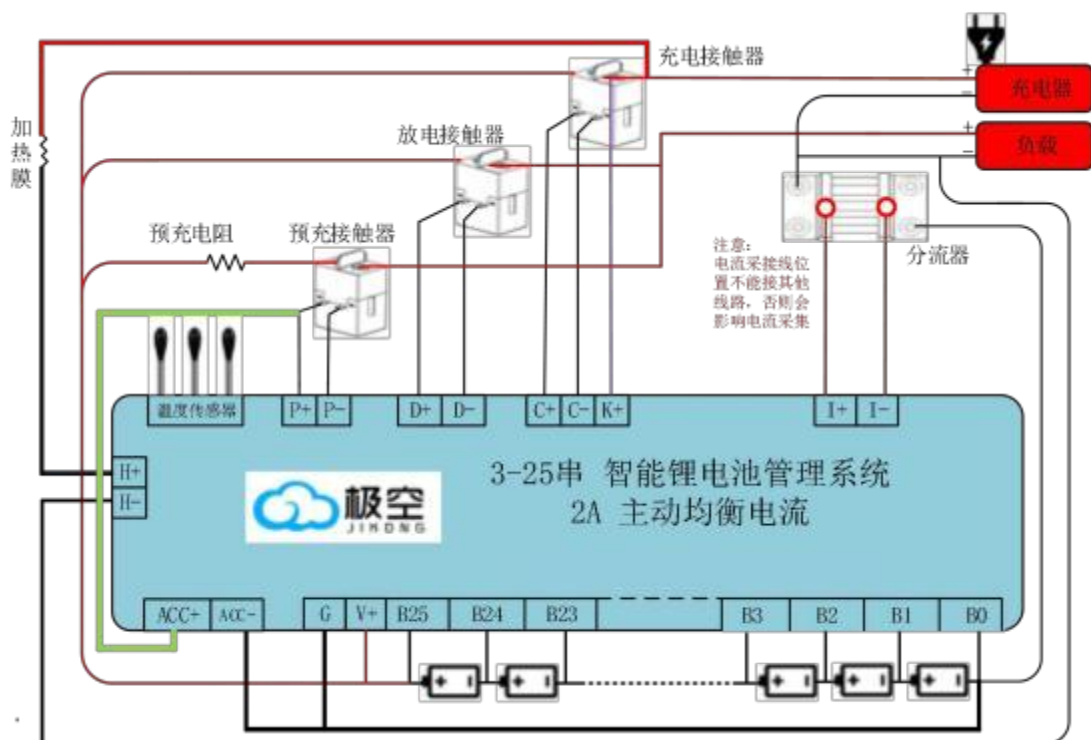
Unpacking inspection and precautions are as follows:

- The packing box, equalizer, etc. need to be handled with care, and try not to be inverted;
- Before unpacking, pay attention to whether the packaging is in good condition, if there is no impact mark, whether there is damage, etc.;
- Take adequate anti-static measures, such as wearing anti-static clothing, anti-static gloves, and anti-static wrist straps. After fully discharging, open the anti-static bag and take out the equalizer to check whether the appearance of the equalizer is in good condition.

### 4.2 Battery management system equipment installation

JK - B2A25S - RP \_\_\_\_\_ The battery management system is suitable for battery packs with 8-25 strings. The wiring method of the 25-string battery pack system is shown in the figure

5 shown.



picture 5 25-string battery system wiring method

20 The wiring method of the battery string system is shown in Figure 6.

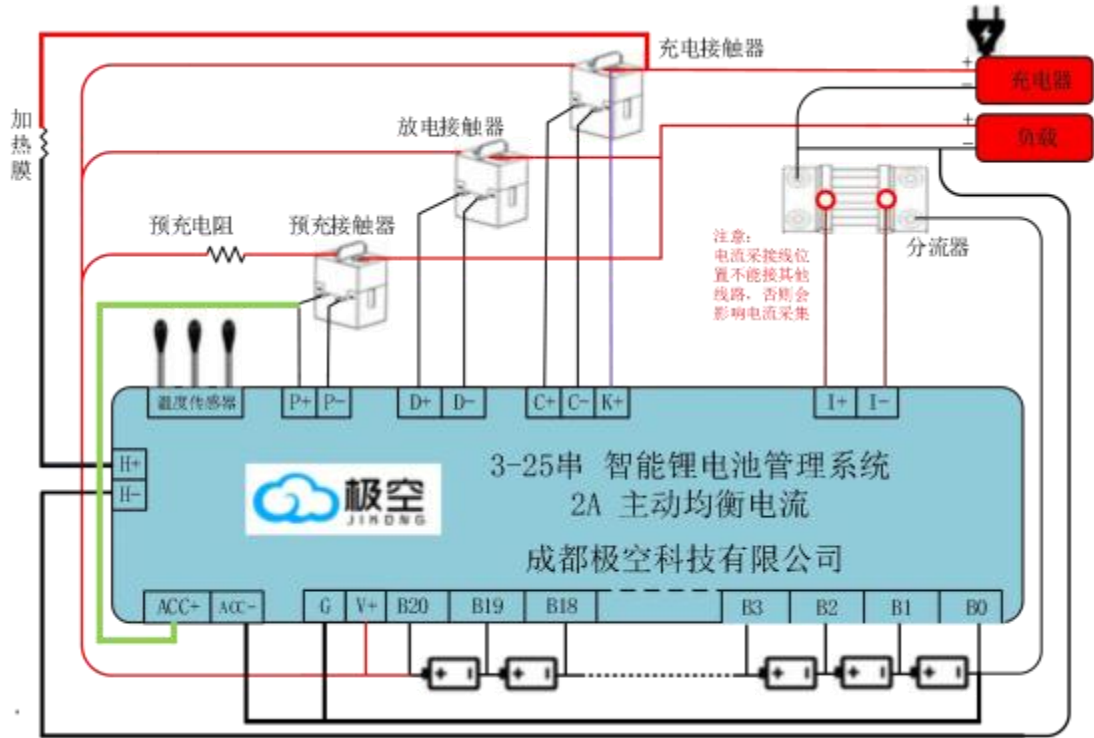


Figure 6 20-series battery wiring diagram

1 6 The wiring method of the battery string system is shown in Figure 7.

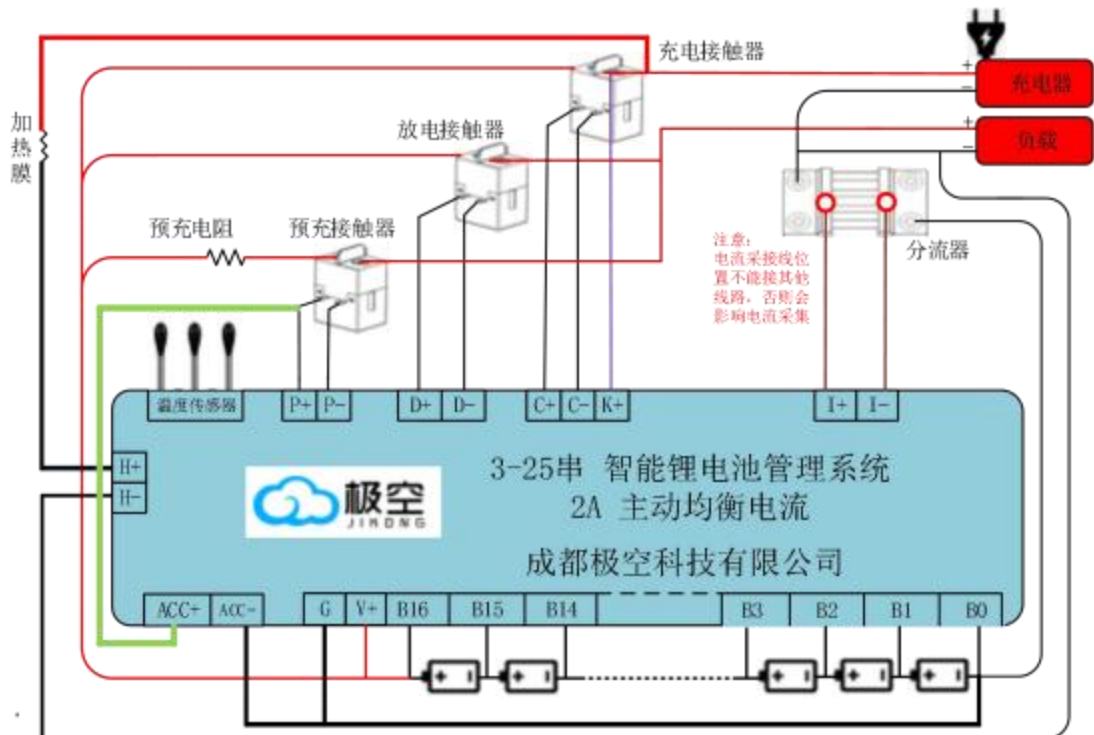


Figure 7 16-series battery wiring diagram

### 4.3 APP Install

By scanning the QR code shown in Figure 8, you can obtain the mobile APP matching the product (Android), IOS mobile phone user

App available directly in the Apple Store Store Search for " Jikong BMS " to download and install.



Figure 8 Mobile APP Connect QR code

## **5 use and operation**

### **5.1 Preparation and inspection before use**

turning on the power for use, please confirm again whether the cables are connected correctly and whether the power provided to the battery management system is Within the required range, check whether the equipment has been placed securely, confirm whether the circuit board is short-circuited, etc., and confirm that it is correct Only then can the battery management system be connected to the power supply, otherwise it may cause serious consequences such as abnormal work or even burning.

### **5.2 Battery management system power-on work**

After confirming that the above operations are correct, you can power on the device. JK - B2A25S - RP\_\_\_\_ type battery management system does not power up Control the switch, after powering on the charging interface of the device, the device will automatically start up and work.

### **5.3 APP Instructions**

#### **5.3.1 Equipment operation**

- a) device connection

First turn on the phone's bluetooth, then open the APP, as shown in Figure 9.

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**APP** for the first time You will be prompted to enter a password. The default password of the device is " 1234", **APP** after the device is connected The password will be automatically recorded, and you don't need to enter the password for the next connection, open the **APP** after automatic Connection, password input interface as shown in Figure 10.



picture 9 Device Scan



Figure 10 Password input

b) Change password and name

After the device is connected, click the pen icon on the right side of the device list to modify the device name and password.

interface for modifying the device name is shown in Figure 11. Note that the device name only supports English or numbers, not Chinese. Names and Chinese characters.

password modification interface is shown in Figure 12. To change the device password, you must first enter the old password of the device. Only when the password is correct can you enter the new password input option. After entering the new password twice, select Confirm to finish Change the device password.





picture 11 Name Modification



picture 12 Password modification

### 5.3.2 \_\_ Status view

real-time status interface is shown in Figure 13.



picture 13 Real-time status display

On the real-time status page, you can view the switch status, charging current, discharging current, temperature display, protection alarm, single Body voltage , total battery voltage, maximum voltage difference, cell average voltage, balance state, balance current, balance line resistance and other information .

### 5.3.3 \_\_ parameter settings

parameter setting page is shown in Figure 14.

On the parameter setting page, various working parameters of the protection board can be modified. The explanation of each parameter is as follows.

#### a) One-click Lithium Iron

Function This button can modify all the working parameters of the protection board to the parameters of the iron-lithium battery. The default values of the parameters are shown in the appendix.

#### b) One-click ternary

Function This button can modify all the working parameters of the protection board to the parameters of the iron-lithium battery. The default values of the parameters are shown in the appendix.

**c) Number of monomers**

battery . Please set this value accurately before use, otherwise the protection board will not work. works fine.

**d) battery capacity**

This value is the design capacity of the battery .

**e) Trigger equalization differential pressure**

**Triggering the balance pressure difference is the only parameter that controls the balance.** When the balance switch is turned on, when the maximum voltage of the battery pack is Equilibration begins when the difference exceeds this value and ends when the differential pressure falls below this value. For example, if the balance trigger voltage difference is set to 0.01V, when the battery pack voltage difference is greater than 0.01V Equalization begins when below 0.01 V when the equilibrium is ended. ( **recommended 50 AH above battery The equilibrium trigger pressure difference is 0.005 V, 50 AH The following battery settings trigger equalization differential pressure as 0.01 V** ).

**f) Voltage calibration**

The voltage calibration function can be used to calibrate the accuracy of the equalizer voltage acquisition .

When it is found that there is an error between the total voltage collected by the protection board and the total voltage of the battery, the voltage calibration function can be used to Align the protective plate. The calibration method is to fill in the current measured total battery voltage, and then click the 'small' next to the voltage calibration. aircraft ' to complete the calibration.



Figure 14 parameter settings

**g) "Single undervoltage protection" , "Single undervoltage recovery"**

"Cell undervoltage protection" refers to the cut-off voltage of the cell, as long as the voltage of any cell in the battery pack is lower than this value, the 'Single undervoltage alarm' is generated, and the protection board closes the discharge MOS at the same time, the battery cannot be discharged at this time, but can only be charged. when calling the police After generation , only after the voltage value of all cells exceeds the value of "cell voltage recovery", the protection board releases the "cell undervoltage" alarm ', while turning on the discharge MOS.

**h) "Single overcharge voltage" , "Single overcharge recovery"**

"Single overcharge voltage" refers to the saturation voltage of the battery cell. As long as the voltage of any single cell in the battery pack exceeds this value, the 'Single overcharge alarm' is generated, and the protection board turns off the charging MOS at the same time, the battery cannot be charged at this time, but only discharged. when calling the police After generation , only after the voltage value of all cells is lower than the value of "cell overcharge recovery", the protection board will release the "cell overcharge recovery" value. Alarm ' and turn on the charging MOS at the same time .

**i) Automatic shutdown voltage**

The automatic shutdown voltage indicates the lowest voltage at which the protection board works. When the voltage of the highest cell in the battery pack is lower than this value, the The protective plate is closed. This value must be lower than "Cell Undervoltage Protection".

**j) "Maximum Charge Current " , "charging overcurrent delay" , "Charge overcurrent release"**

When charging the battery pack, the current exceeds the "Maximum Charge Current" and the duration exceeds the "Charge Overcurrent Delay" time, the protection board generates a 'charging overcurrent alarm' and turns off the charging MOS at the same time . After the alarm is generated, after "charging After the "overcurrent release" time, the protection board releases the charging overcurrent alarm and turns on the charging MOS again .

Example: Set " Maximum Charge Current" to 10A, "Charge Overcurrent Delay" to 10 seconds, and "Charge Overcurrent Release" to 50 seconds. The charging current exceeds 10 A for 10 seconds during the charging process , the protection board will generate a 'charging overcurrent alarm', and turn off the charging MOS at the same time, 50 seconds after the alarm occurs , the 'charging overcurrent alarm' will be released, and the protection board will turn on the charging MOS again .

**k) "Maximum discharge current" , "Discharge overcurrent delay" , "discharge overcurrent release"**

When discharging the battery pack, the current exceeds the "maximum discharge current" and the duration exceeds the "discharge overcurrent delay" time , the protection board generates a 'discharge overcurrent alarm' and turns off the discharge MOS at the same time . After the alarm is generated,

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after the "discharge After the " current release" time, the protection board releases the "discharge overcurrent alarm", and re-opens the discharge MOS .

Example: Set "Maximum Discharge Current" to 100 A , "Discharge overcurrent delay" is 10 seconds , "Discharge overcurrent release" for 50 seconds . The discharge current exceeds 100 A for 10 seconds during the discharge process , the protection board will generate 'discharge overcurrent alarm', At the same time, turn off the discharge MOS ,50 seconds after the alarm occurs , the 'discharge overcurrent alarm' will be released, and the protection board will re-open the discharge MOS .

**l) Short circuit protection released**

After the short-circuit protection occurs, the short-circuit protection will be released after the time set by 'short-circuit protection release'.

**m) Maximum equalizing current**

equalizing current represents the continuous current for the discharge of the high voltage battery and the charge of the low voltage battery during energy transfer.

The maximum balance current represents the maximum current in the energy transfer process, and the maximum balance current should preferably not exceed 0.1C. Such as: 20 AH battery does not exceed  $20 \times 0.1 = 2A$  .

**n) "Charging over-temperature protection" , "Recovery from overheating charging"**

During the charging process, when the battery temperature exceeds the value of "charging over-temperature protection", the protection board will generate 'charging over-temperature protection' Warning while the protection board turns off the charging MOS. After the alarm is generated, when the temperature is lower than "charge over-temperature recovery", the protection The board releases the 'charging over-temperature protection' warning and turns on the charging MOS again .

**o) "Charging Low Temperature Protection" , "charging low temperature recovery "**

During the charging process, when the battery temperature is lower than the value of "charging low temperature protection", the protection board will generate 'charging low temperature protection'

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Warning while the protection board turns off the charging MOS. After the alarm is generated, when the temperature is higher than "charging low temperature recovery", the protection board will release the "charging low temperature protection" warning, and at the same time re-open the charging MOS.

**p) " MOS Over temperature protection" , " MOS Overheat recovery"**

When MOS temperature exceeds the " MOS over-temperature protection" value, the protection board generates ' MOS Over-temperature alarm' turns off at the same time Charge and discharge MOS, the battery can neither be charged nor discharged. After the alarm is generated, the MOS temperature is lower than the " MOS Overheat recovery" After the value of , the protection board lifts the ' MOS Over temperature alarm', at the same time re-open the charge and discharge MOS ( **MOS The over temperature protection value is 100 °C , MOS\_Over temperature recovery value is 80 °C , these two values are factory default and cannot be modified**) .

**Note :**

**any parameter modification, please refer to the manual, inappropriate parameters may make the protection board not work normally, even Burn out the protective plate.**

**After any parameter is modified, you need to click the "Small plane" completes parameter delivery, equalizer After the parameters are successfully received, a beeping sound will be heard.**

#### **5.3.4 \_ BMS control**

BMS The control page is shown in Figure 15.

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picture 15 BMS control page

## 6 General fault analysis and elimination

2 for fault reasons and treatment .

surface 2 Fault causes and solutions

serial number	fault phenomenon	Cause Analysis	Exclusion method	Remarks
1	The power indicator does not light up	The device is not powered properly	Check that the power pins on the P2 connector are connected to power source .	
2	APP Tips for a single device Set quantity and set value does not meet	Wrong number of monomers set up or The connection of the balance line is abnormal	Check whether the number of cells set is the same as the number of connected batteries same.	
3	APP Tip EQ line too high resistance	Wire resistance from battery to connector is too big	Check whether there is a connection between the battery cell and the connector If the contact is not good, please replace the wire.	
4	Inaccurate voltage acquisition	Wiring error or parameter setting set error	Check the connections one by one to eliminate connection errors. through the voltage Set benchmarks for fine-tuning until the acquisition is accurate.	
5	Device does not turn on	The device does not meet the working conditions	Check if the charging cable is connected	

The common faults, possible causes and solutions are listed above . If the fault is still not solved, please contact Chengdu Solved by Jikong Technology Co., Ltd.

## 7 Safety protection measures and precautions

The battery management system itself does not have high voltage and will not cause electric shock to the body.

The battery management system has static-sensitive devices and needs to be protected against static electricity. Improper operation may cause equalizer damage .

bad . If you need to operate the equalizer, please pay attention to the following instructions:

- a) in touch PCB Before, the personnel performing the operation must discharge static electricity by themselves and take anti-static measures;
  - b) The equipment is not allowed to come into contact with electrical insulating materials - plastic films, insulating table tops or clothing made of man-made fibers;
-

- c) When welding on equipment, make sure that the tip of the soldering iron is grounded;
- d) If it is unavoidable to use a non-conductive container, place the PCB Before must be packaged with conductive material, these Materials include, for example, conductive foam rubber or ordinary aluminum foil .

## **8 transportation and storage**

### **8.1 transportation**

packaged products are not directly affected by rain and snow and under severe collisions and bumps, and can be transported by common means of transportation. in transit It is not allowed to be put together with corrosive substances such as acid and alkali in the process of transportation.

### **8.2 storage**

The packaged products should be stored in a permanent warehouse, the temperature of the warehouse is  $0^{\circ}\text{C} \sim 35^{\circ}\text{C}$ , and the relative humidity is not high. At 80%, there should be no acid, alkali and corrosive gas in the warehouse, no strong mechanism vibration and shock, and no strong magnetic field.

**appendix "One-click Lithium Iron" , "one-key ternary" default parameters**

<b>serial number</b>	<b>parameter</b>	<b>Iron lithium default</b>	<b>Ternary default</b>	<b>unit</b>
1	Cell undervoltage protection	2.500 _	2.800 _	V
2	Single unit undervoltage protection recovery	2.650 _	3.200 _	V
3	Cell overcharge voltage	3.6 5	4.2 _	V
4	Cell overcharge protection recovery	3.6 _	4.1 _	V
5	Trigger equalization differential pressure	0.01	0.01	V
6	Automatic shutdown voltage	2.5 _	2.799 _	V
7	Charge overcurrent protection current	10 0.0	10 0.0	A
8	Charge overcurrent protection delay	30	30	second
9	Charging overcurrent protection release time	60	60	second
10	Discharge overcurrent protection current	4 00.0	4 00.0	A
11	Discharge overcurrent protection delay time	30	30	second
12	Discharge overcurrent protection release time	60	60	second
13	Short circuit protection release time	60	60	second
14	Maximum equalizing current	5.0 _	5.0 _	A
15	Charging over temperature protection temperature	70	70	° C
16	Overheating recovery temperature	60	60	° C

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17	Discharge over temperature protection temperature	70	70	° C
18	Discharge over-temperature recovery temperature	60	60	° C
19	Charging low temperature protection temperature	-20	-20	° C
20	Charging low temperature recovery temperature	-10	-10	° C
twenty one	MOS Over temperature protection temperature	100	100	° C
twenty two	MOS Over temperature protection recovery temperature	80	80	° C
twenty three	Number of monomers	25	25	string
twenty four	charging switch	close	close	-
25	Discharge switch	close	close	-
26	Balance switch	close	close	-
27	battery capacity	400	400	AH