NO: JK/J.JK-B2A8S20P.01
Ver: V1.1

JK Smart BMS

JK-B1A8S20P/JK-B2A8S20P

User Manual

Translated by Energiepanda.com from JK's original Chinese version

1 Overview

Li-ion battery intelligent BMS is a management system tailored for large-capacity series Li-ion battery pack, with functions of voltage acquisition, high-current active balancing, over-charge, over-discharge, over-current and over-temperature protection, coulomb meter, Bluetooth communication, GPS remote, etc. It can be applied to Li-ion, lithium iron phosphate (LiFePO4), LTO and other battery types.

JK BMS relies on the energy transfer type active balancing technology with independent intellectual property rights, which can achieve a maximum continuous 2A balancing current.
The high-current active balancing technology can maximize battery consistency, improve battery range and slow down battery aging.

JK BMS has smart Android and IOS APPs. APP can be connected to the BMS via Bluetooth to check the working status of the battery, modify the working parameters of the board, control the charging and discharging switches, etc. JK BMS is small in size, simple to operate and full-featured, and can be widely used in small sightseeing vehicles, mobility scooters, shared cars, high-power energy storage, base stations, backup power, solar power plants, etc.

2 Main technical specifications

2.1 The main technical specifications of JK-B2A8S20P are shown in Table 1.

Table 1 JK-B1A8S20P/JK-B2A8S20P specifications

Technical Specifications	Model
	B1A8S-20P/B2A8S-20P
Li-ion battery strings	3~8
LiFePO4 battery strings	4~8
LTO battery strings	Not support
Balancing Mode	Active Balancing
Balancing Current	1A(JK-B1A8S20P)/2A(JK-B2A8S20P)
The Main Circuit Resistance	0.3mΩ
Continuous Discharge Current	200A

Maximum Discharge Current	350A
Overcurrent Protection (Adjustable)	10~200 A
Other Interfaces	RS485(customized)/CAN(customize d)/ Heating(customized)/ LCD display
Port Type	Common Port
Single Cell Voltage Range	1~5 V
Voltage Acquisition Accuracy	±5 mV
Overcharge Protection Voltage	1.2~4.35 V Adjustable
Overcharge Release Voltage	1.2~4.35 V Adjustable
Overcurrent Release Time	2~120S Adjustable
Over-discharge Protection Voltage	1.2~4.35 V Adjustable
Over-discharge Recovery Voltage	1.2~4.35 V Adjustable
Temperature Detection Ports	3
Temperature Protection	Yes
Short Circuit Protection	Yes
Coulometer	Yes
Bluetooth	Support android phone / iPhone
Gps ports	Support

2.2 Environmental conditions of use

    a)   Operating Temperature Range：-20℃～70℃；

    b)   Power requirements：10~40V。

    c)   Power consumption: 25mA@40V in balanced state, 20mA@40V in unbalanced state

3 Connector and interface decription
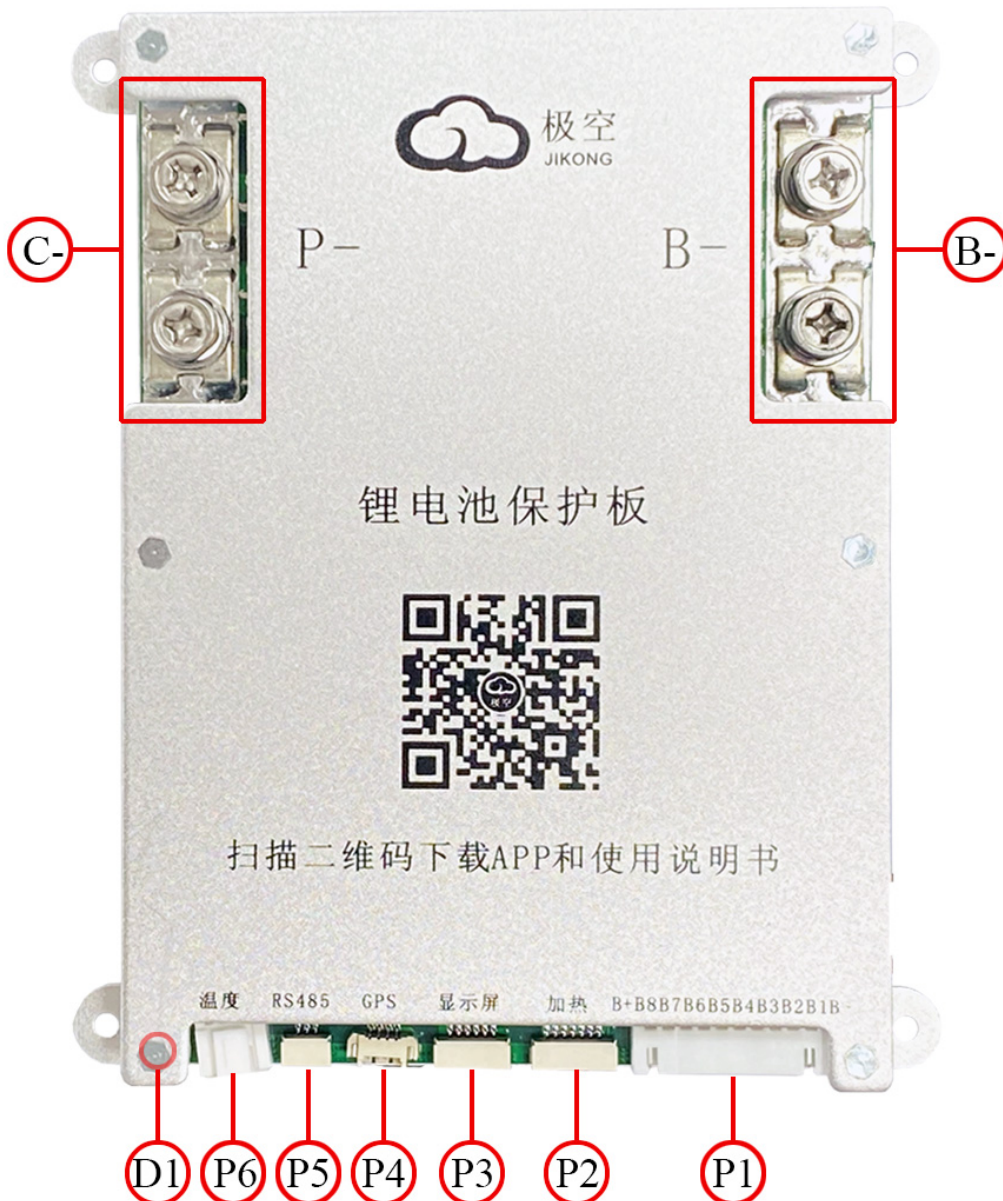
3.1 Connectors, LED light location description

Figure 1 - JK-B1A8S20P/JK-B2A8S20P Connector

3.2 Connectors and LED definition description

Table 2 Connectors, LED Definition

Connector	Pin Number	JK-B2A8S20P	
		Name	Definition
P1	1	B-	Negative battery terminal
	2	B1	Positive pole of #1 cell
	3	B2	Positive pole of #2 cell
	4	B3	Positive pole of #3 cell
	5	B4	Positive pole of #4 cell
	6	B5	Positive pole of #5 cell
	7	B6	Positive pole of #6 cell
	8	B7	Positive pole of #7 cell
	9	B8	Positive pole of #8 cell
	10	B+	BMS power supply
P2	Heating port		
P3	Display connector		
P4	External GPS module connector		
P5	RS485/CAN connector(Choose one of two)		
P6	1	T1A	The first temperature sensor A pin
	2	T1B	The first temperature sensor B pin
	3	T2A	The second temperature sensor A pin
	4	T2B	The second temperature sensor B pin
D1	Bluetooth connection indicator. The indicator light is always on when the Bluetooth is connected to the BMS, and the indicator light flashes when the connection is disconnected.		
C-	Connect to external load or negative pole of charger		
B-	Connect the negative pole of the battery		

3.3 Product appearance

Figure 2 JK-B1A8S20P/JK-B2A8S20P Appearance

3.4 Product size

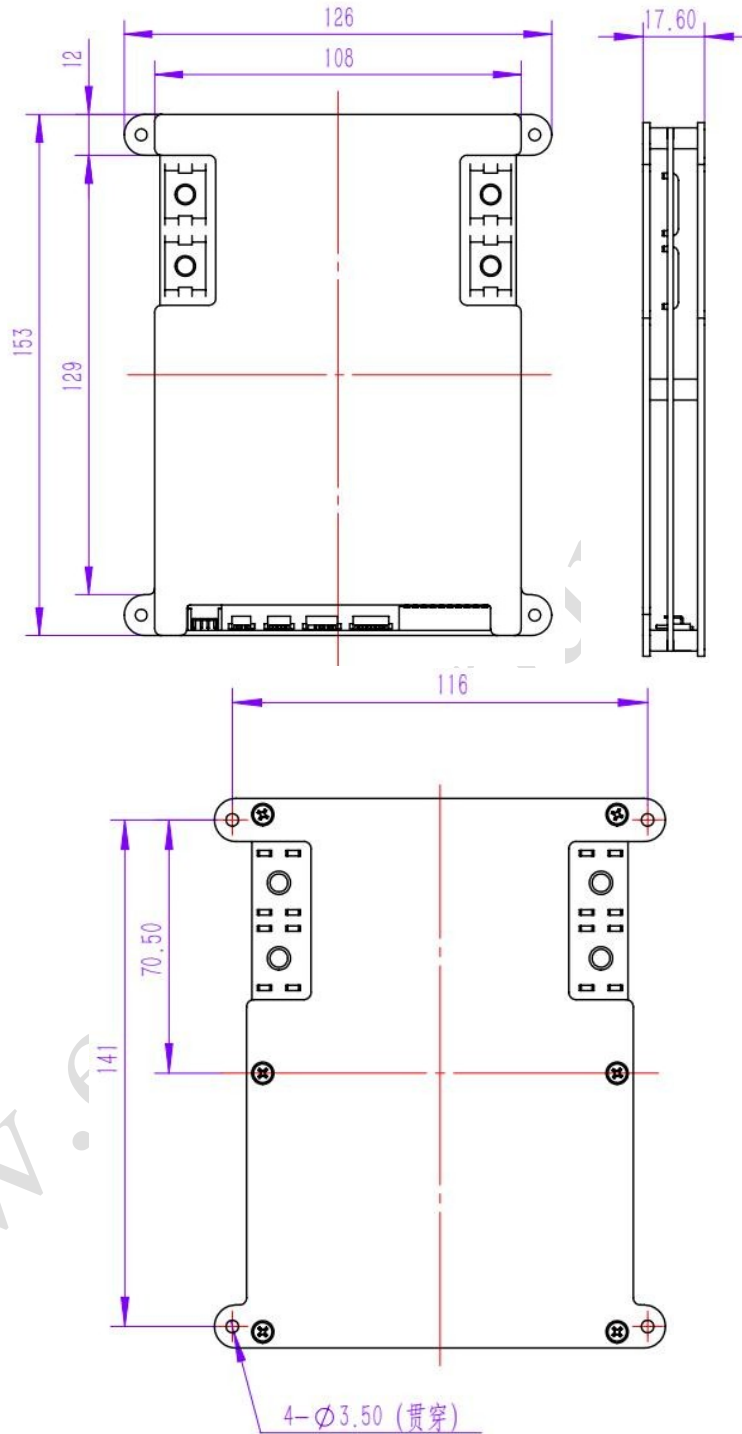The dimensions of JK-B2A8S20P is 153 mm x 126 mm x 17.6 mm.

Figure 3 B2A8S20P Size

3.5 Weight

The weight of JK-B1A8S20P/JK-B2A8S20P BMS is 349g.

4 Installation method and precautions

4.1 Open box inspection and precautions are as follows.

a) The boxes and BMS should be handled lightly and not inverted as much as possible.

b) Before opening the box, pay attention to whether the packaging is intact, such as whether there are signs of impact, whether there is damage, etc.；

4.2 Wiring Diagram

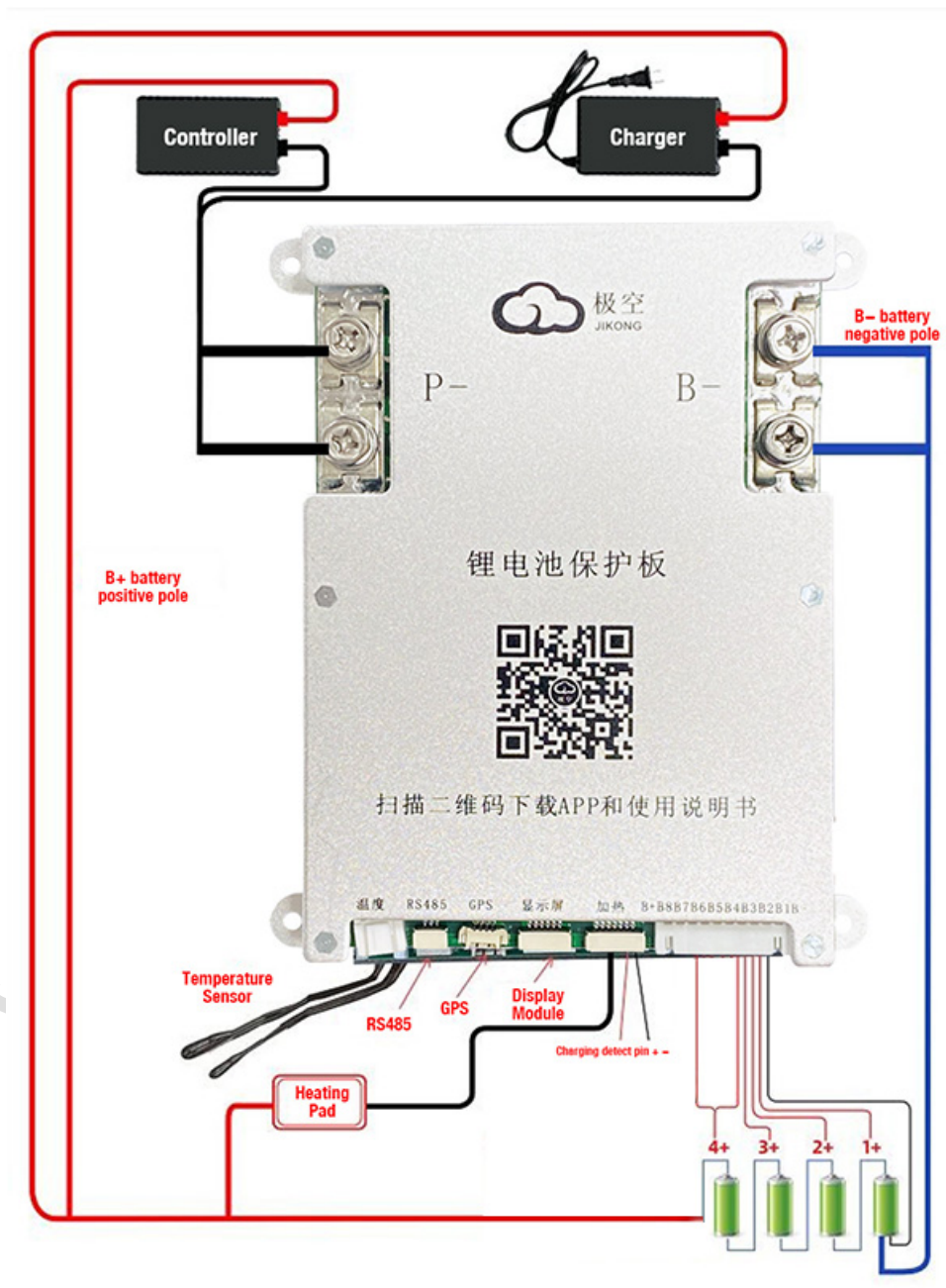The wiring of 4S and 8S is shown in Figure 4 and Figure 5.
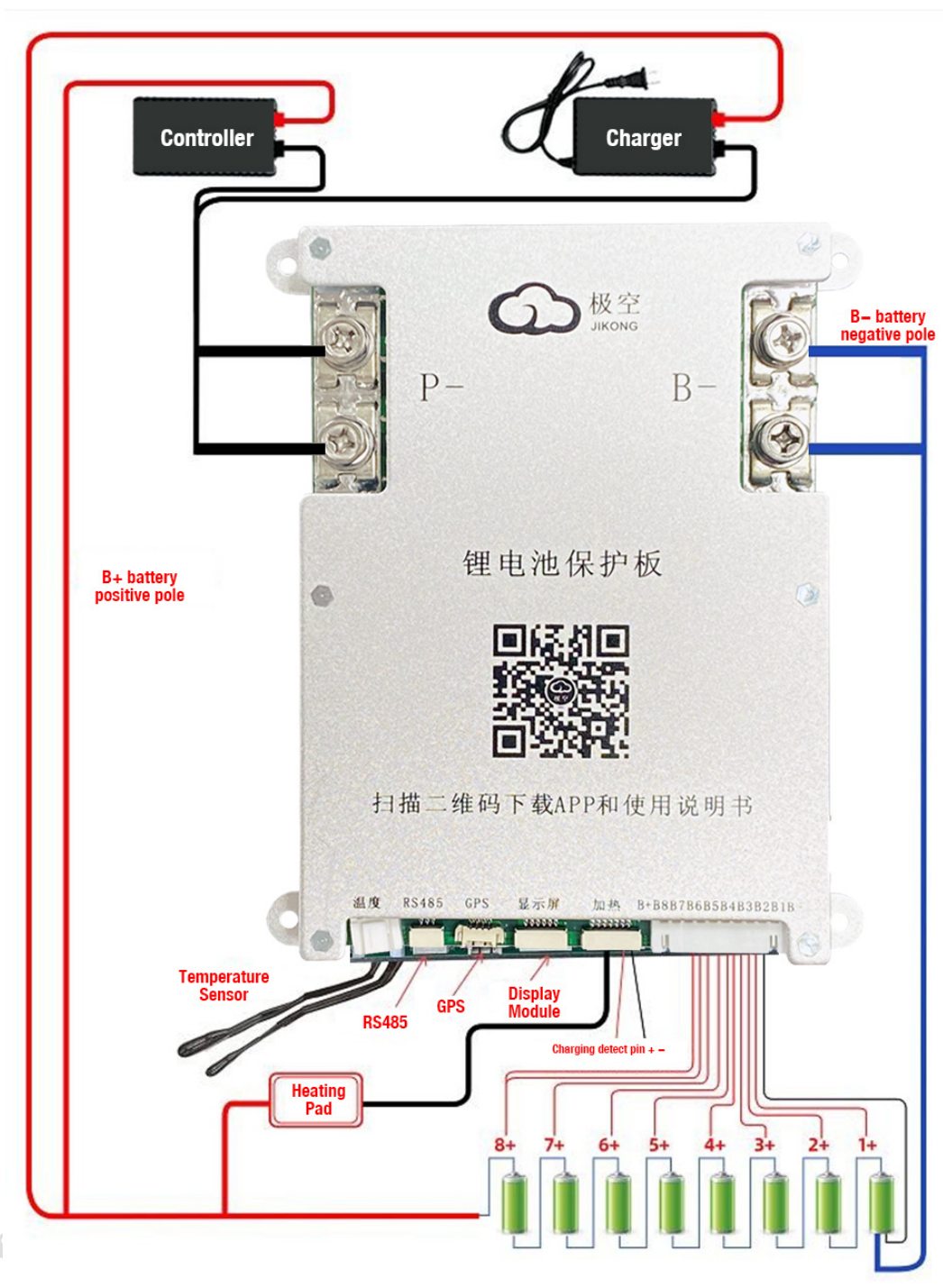

Figure 4   4S battery wiring diagram

Figure 5　8S battery wiring diagram

4.3 APP installation

The QR code shown in Figure 6 can be scanned to obtain the mobile app that accompanies the product.

Figure 6 QR code for APP download

5 Instructions for use

5.1 Preparation and inspection before use

Before turning on the power supply, please make sure again that the cable connection is correct, that the power supply provided to the battery management system is within the required range, that the device is properly placed, that the circuit board is short-circuited, and so on, that the power supply of the battery management system can only be connected after making sure that it is correct, otherwise it may cause serious consequences such as abnormal work or even burning down.

5.2 BMS power up

After confirming the above operation is correct, you can power on the BMS, which has no power-on control switch and is designed for charging and activation mode (charger voltage is 5V higher than the battery voltage).

The BMS has no power-on control switch and is designed for charging activation mode

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(charger voltage is 5V higher than the battery voltage), i.e., after the battery assembly is completed, the charger needs to be connected to make the BMS power on and work.

5.3 APP APP operation instructions

5.3.1 Connect to BMS and set password

a) Connect to BMS

Firstly, turn on the Bluetooth on your phone, then open the app as shown in Figure 7. Click the icon on the top left corner to scan the device, wait until the scanning is finished, then click the name of the device you need to connect, such as "JK-B2A8S20P". When you connect for the first time, the APP will prompt you to input the password, the default password of the device is "1234" (the password of the setting parameter is "123456").

The APP will automatically record the password after the device is connected, so you don't need to enter the password for the next connection, and the device will be connected automatically after the APP is opened.

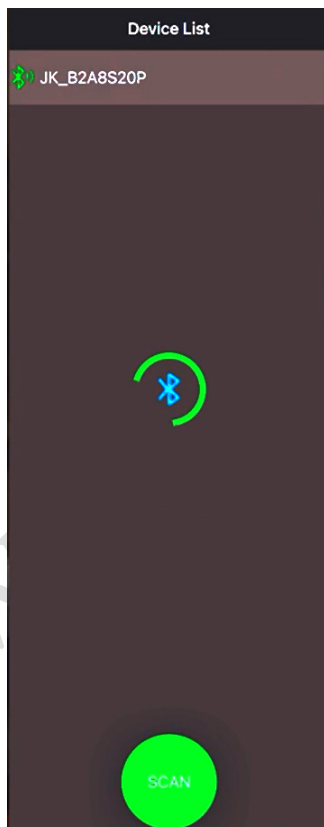The password input interface is shown in Figure 8.

Figure 7 Scan Device

Figure 8 Enter Password

b) Change passwords and device name

Click the "pen" icon on the right side of the device list to change the device name and password.

Note that the device name only supports English or numbers.

The interface for changing the password is shown in Figure 9. To change the device password, you must first enter the old password, and only if the current password is correct then you can set the new password. After entering the new password twice, click 'OK' to finish
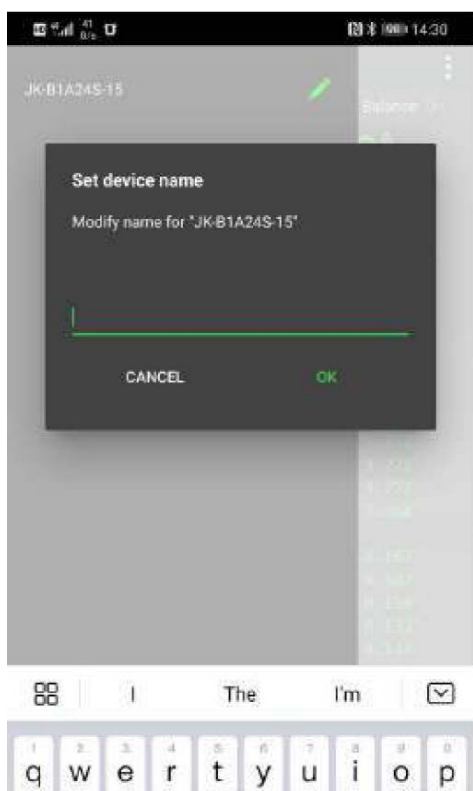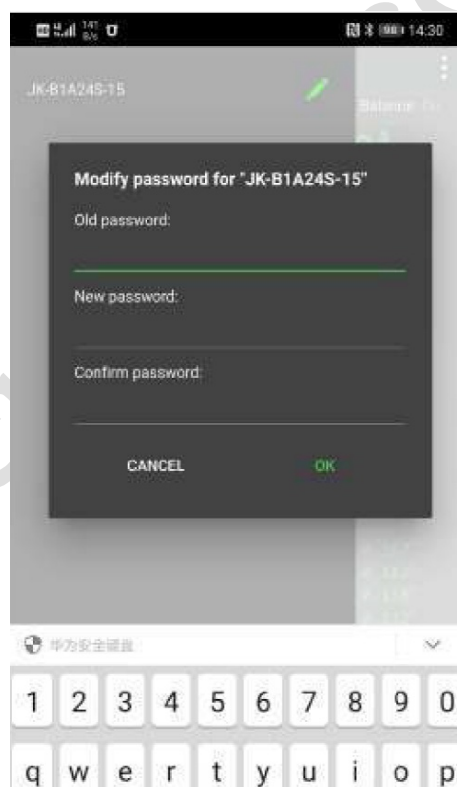
Figure 9 Change the device name   Figure 10 Change the password

5.3.2 Battery status view

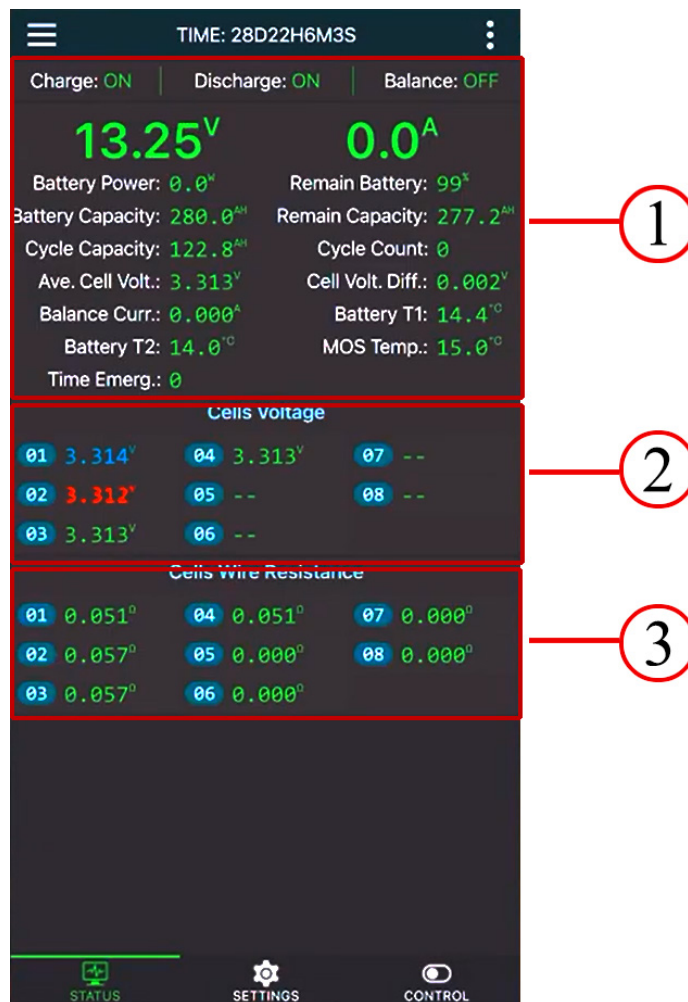The real-time status screen is shown in Figure 11.

Figure 11 Real-time status screen

Zone 1 in the figure is the comprehensive information column of the battery. The parameters of each parameter are explained as follows.

a) Runtime

The total runtime from when the BMS was first powered on until now.

b) Charge

It's the status of BMS charging MOS. When "On" is displayed, it means the current BMS charging MOS is on and the battery is allowed to be charged; when "Off" is displayed, it means the current BMS charging MOS is off and the battery is not allowed to be charged。

c) Discharge

It's the status of the BMS discharge MOS. When "On" is displayed, it means the BMS discharge MOS is on and the battery is allowed to discharge; when "Off" is displayed, it means the BMS discharge MOS is off and the battery is not allowed to discharge.

d) Balance

It indicates the state of BMS Balance switch. When "On" is displayed, the BMS will balance the battery automatically when the balance trigger condition is reached; when "Off" is displayed, it means the balance is off and the BMS will not balance the battery.

e) Voltage

The voltage displays the total voltage of the battery in real time, and the total voltage is the sum of all individual cell voltages.

f) Current

The current shows the total battery current in real time. When the battery is charging, the current is positive, and when the battery is discharging, the current is negative.

g) Battery Power

Indicates the real-time power of the battery output or input, and its value is the current battery voltage multiplied by the current.

h) Remain Battery

Percentage of remaining battery capacity

i) Battery Capacity

It's the actual battery capacity calculated by the BMS. (This value is updated only after the battery has done a complete discharge and charge cycle).

j) Remain Capacity

It represents the current remaining capacity of the battery. Unit: AH

k) Cycle Capacity

Cycle capacity indicates the cumulative discharge capacity of the battery, unit: AH.

l) Cycle Count

It indicates the number of times the current battery has been charged.

m) Ave. Cell Volt

It indicates the current single cell average voltage of the battery. Unit: V.

n) Cell Volt. Diff

It indicates the difference between the highest cell voltage and the lowest cell voltage of the current whole battery. Unit: V

o) Balance Curr.

When the BMS turns on the balancing function and the balancing condition is reached, the balancing current display area shows the balancing current in real time, unit: A.

When the balancing is in progress, the real-time status of the single unit voltage display area, blue represents the discharged battery, red represents the battery being charged. The negative balance current indicates that the battery is discharging, at this time blue flashes, and the positive balance current indicates that the battery is charging, at this time red flashes.

JK BMS adopts active balancing technology. The principle of balancing is to take power from the high voltage cell, store it in the BMS, and then discharge it to the low voltage cell.。

p) MOS Temp

Display the temperature of MOS in °C.

q) Battery T1

"NA" is displayed if temperature sensor 1 is not installed. If the temperature sensor 1 is installed, it is displayed in real time in °C.

r) Battery T2

"NA" is displayed if temperature sensor 2 is not installed. If the temperature sensor 2 is installed, it is displayed in real time in °C.

Zone 2 in the figure shows the cell voltage area. The voltage data of each cell in the pack is displayed in real time, where red indicates the cell with the lowest voltage and blue indicates the cell with the highest voltage.

Zone 3 of the diagram is to display the resistances of balancing wires. The balance wire resistance is the balance line resistance obtained from the BMS self-test, the value is only a preliminary calculation, the purpose is to prevent the wrong connection or poor contact, when the balance wire resistance exceeds a certain value, the display will be yellow, then can not open the balance.

Parameter Setting
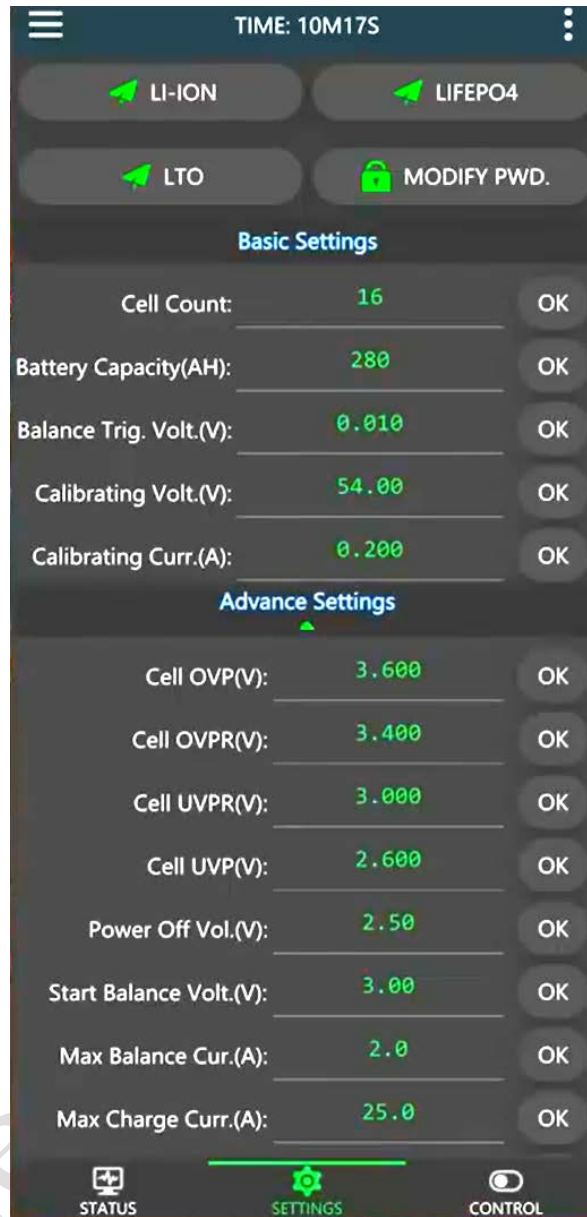
The parameter setting page is shown in Figure 12.

Figure 12 Parameter setting page display

If you need to modify the working parameters of the BMS, you must first click the "Authorize Settings" button and enter the parameter setting password to verify the parameter setting authority. The factory default password for parameter setting is "123456". You can only modify the parameters of the BMS after entering the password correctly. The parameter setting password and the device Bluetooth connection password are independent of each other.

The parameters of the BMS can be modified in the parameter setting page, and the definitions of each parameter are as follows.

a) **Li-ion buttion**

Click this button to change all the working parameters of BMS to Li-ion parameters, and the default values of Li-ion battery parameters are shown in the Appendix.

b) **LiFePO4 button**

Click this button to modify all working parameters of BMS to LiFePO4 battery parameters, the default values of LiFePO4 battery parameters are shown in the appendix.

c) **LTO button**

Click this button can change all the working parameters of BMS to LTO parameters. The default values of LTO battery are shown in the Appendix.

d) **Cell Count**

Cell count indicates the number of cells in the current battery pack, please set the value accurately before use, otherwise the BMS will not work properly.

e) **Battery Capacity(Ah)**

This value is the design capacity of the battery.

f) **Balance Trig. Volt.(V)**

With the balancing function enabled, when the maximum voltage difference of the cell pack exceeds this value and the current cell voltage exceeds the balancing start voltage, the BMS starts balancing the cell until the differential voltage is lower than this value or the cell voltage is lower than the balancing start voltage. For example, if you set the balancing trigger voltage difference to 0.01V, balancing will start when the cell pack voltage difference is greater than 0.01V and end when it is lower than 0.01V.

(It is recommended to set the balancing trigger differential to 0.005V for cells above 50AH and 0.01V for cells below 50AH).

g) **Calibrating Volt.(V)**

The voltage calibration function can be used to calibrate the accuracy of the BMS voltage collection.

When you find an error between the collected voltage and the actual voltage of the battery, you can use the voltage calibration function to calibrate the BMS.

To calibrate, fill in the current manually measured battery voltage, and then click the 'Set' button next to Voltage Calibration to complete the calibration.

h) **Calibrating Curr.(A)**

The current calibration function can be used to calibrate the accuracy of the BMS current collection.

When you find an error between the total current collected by the BMS and the actual current of the battery, you can use the current calibration function to calibrate the BMS.

To calibrate, fill in the current measured battery current, and then click the 'Set' button next to Current Calibration to complete the calibration.

i) **Cell UVP(V), Cell UVPR(V)**

The "Cell UVP(V)" is cell under-voltage protection which refers to the cut-off voltage of the cell. Whenever the voltage of any cell in the battery pack is lower than this value, the 'cell under-voltage alarm' is generated, and the BMS turns off the discharge MOS at the same time, so the battery cannot be discharged and can only be charged. After the alarm is generated, only when all the cell voltage value exceeds the value of "Cell UVPR(V)" which means cell under-voltage protection recovery, BMS will release the 'cell under-voltage alarm' and turn on the discharge MOS.

j) **Cell OVP(V), Cell OVPR(V)**

"Cell OVP(V)" is cell over-voltage protection. As long as the voltage of any cell exceeds this value, the "Battery Over-voltage Alarm" will be generated and the BMS will turn off the charging MOS at the same time, so the battery cannot be charged, but only discharged. After the alarm is generated, only when the voltage of all cells is below the "Cell OVPR(V)" value, the BMS will release the "Battery Over-voltage Alarm" and turn on the charging MOS.

k) **Power Off Vol.(V)**

The "Power Off Vol.(V)" indicates the minimum voltage at which the BMS will operate and the BMS will shut down when the highest voltage of the cell in the battery pack falls below this value. This value must be lower than the "cell under-voltage protection".

l) **Max Charge Curr.(A), Charge OCP Delay(S), Charge OCPR Time(S)**

When charging the battery pack, the current exceeds the "MAX Charge Curr.(A)" and the duration exceeds the "Charge OCP Delay(S)" time, the BMS generates a "charge over-current alarm" and turns off the charging MOS. After the time of "Charge OCPR Time(S)", the BMS will release the charge over-current alarm and turn on the charging MOS again.

Example: Set the "Max Charge Curr.(A)" to 10A, "Charge OCP Delay(S)" to 10 seconds, and "Charge OCPR Time(S)" to 50 seconds. If the charging current exceeds 10A for 10 seconds in a row during charging, the BMS will generate a 'charging over-current alarm' and turn off the charging MOS at the same time. 50 seconds after the alarm is generated, the 'charging over-current alarm' will be released and the BMS will turn on the charging MOS again.

m) Max Discharge Curr.(A), Discharge OCP Delay(S), Discharge OCPR Time(S)

When discharging the battery pack, the current exceeds the "Max Discharge Curr.(A)" and the duration exceeds the "Discharge OCP Delay(S)" time, the BMS generates the "discharge over-current alarm" and turns off the discharge MOS at the same time. After the time of "Discharge OCPR Time(S)", BMS will release the "Discharge Over-current Alarm" and turn on the Discharge MOS again.

Example: Set the " Max Discharge Curr.(A)" to 100A, " Discharge OCP Delay(S) " to 10 seconds, and " Discharge OCPR Time(S)" to 50 seconds. If the discharge current exceeds 100A for 10 seconds, the BMS will generate the 'discharge over-current alarm' and turn off the discharge MOS. 50 seconds after the alarm is generated, the 'discharge over-current alarm' will be released and the BMS will turn on the discharge MOS again.

n) SCP Delay(us), SCPR Time(S)

When short-circuit protection occurs, the short-circuit protection is released after the time set by "SCPR Time(S)"..

o) Start Balance Vol.(V)

The Start Balance Vol.(V) is used to control the voltage phase of balancing. Balancing will be triggered only when the cell voltage exceeds this value and the maximum voltage difference between the cells exceeds the balancing trigger voltage difference.

p) Max Balance Cur.(A)

The balancing current indicates the continuous current of discharging the high-voltage cell and charging the low-voltage cell during the energy transfer. The Max Balance Cur.(A) indicates the maximum current in the energy transfer process, and the maximum balancing current should not exceed 0.1C.

For example: The balancing current for 20AH battery should not exceed 20*0.1=2A.

q) Charge OTP(℃), Charge OTPR(℃)

When the battery temperature exceeds the " Charge OTP(℃)" value during charging, the BMS generates the "Charge Over Temperature Protection" alarm and turns off the charging MOS. When the temperature falls below the " Charge OTPR(℃)", the BMS release the "Charge Over Temperature Protection" alarm and turns on the charging MOS again.

r) Charge UTP(℃), Charge UTPR(℃)

When the battery temperature is lower than the "Charge UTP(℃)" value during charging, the BMS generates the "charge low temperature protection" alarm and turns off the charging MOS. When the temperature is higher than " UTPR(℃)", BMS will release the 'charge low temperature protection' alarm and turn on the charging MOS.

s) MOS OTP(℃), MOS OTPR(℃)

When the MOS temperature exceeds the "MOS OTP(℃)" value, the BMS generates the "MOS over-temperature" alarm and turns off the charging and discharging MOS, so the battery cannot be charged or discharged. After the MOS temperature is lower than the " MOS OTPR(℃)" value, the BMS will release the "MOS over-temperature" alarm and turn on the charging and discharging MOS at the same time (the MOS over-temperature protection value is 75℃ and the MOS over-temperature recovery value is 65℃, these two values are the factory default values and cannot be changed).

Attention.

Any parameter modification, please refer to the manual, inappropriate parameters may make the BMS not work normally, or even burn the BMS. After any parameter modification, you need to click the "Set" button to finish sending the parameter, and the protection board will make a "tick" sound when it receives the parameter successfully.

BMS control page

The BMS control page is shown in Figure 13. The BMS control allows you to switch on/off and restore factory settings for the charging function, discharging function, and balancing function of the BMS.
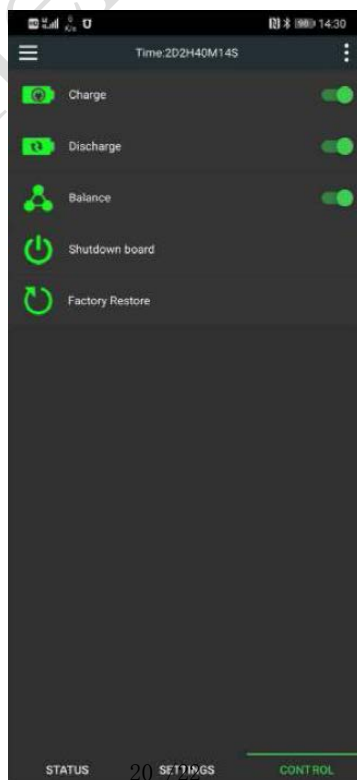
Figure 13 BMS control page

5.4 Safety protection measures and precautions

BMS itself does not exist high voltage, will not cause electric shock injury to the body.

Before use, please read the instruction manual carefully, according to the correct wiring diagram of different strings, connect the balancing wires one by one from the negative pole to the positive pole. Check the connection again with multimeter before plug the balancing wires into the BMS. Do not allow private modification of the BMS power wires, it will cause the BMS overcurrent uneven and burn the BMS.

6 Transportation and Storage

6.1 Transportation

After packing, the products are not directly affected by rain and snow and under violent collision and bumps, and can be transported by usual means of transportation. It is not allowed to be put together with corrosive materials such as acid and alkali during the transportation process.

6.2 Storage

The packaged products should be stored in a permanent warehouse with a temperature of 0℃～35℃ and a relative humidity of not more than 80%, and the warehouse should be free of acid and corrosive gases, strong institutional vibration and impact, and strong magnetic fields.

Appendix Default parameters of "one-click Li-ion", "one-click LiFePO4" and "one-click LTO"

No.	Parameters	Li-ion	LiFePO4	LTO	Unit
1	Cell Under-voltage Protection	2.9	2.6	1.8	V
2	Cell Under-voltage Protection Recovery	3.2	3.0	2.0	V
3	Cell Overcharge Voltage Protection	4.2	3.6	2.7	V
4	Cell Overcharge Protection Recovery	4.1	3.4	2.4	V
5	Voltage Difference of Trigger Balancing	0.01	0.01	0.01	V
6	Auto shutdown voltage	2.8	2.5	1.7	V
7	Charging Over-current Protection Delay	30	30	30	Second
8	Charging Over-current Protection Release Time	60	60	60	Second
9	Discharge Over-current Protection Delay	30	30	30	Second
10	Discharge over-current protection Release Time	60	60	60	Second
11	Short Circuit Protection Release Time	60	60	60	Second
12	Charge Over-temperature Protection	60	60	60	℃
13	Charge over-temperature Recovery	55	55	55	℃
14	Discharge Over-temperature Protection	60	60	60	℃
15	Discharge Over-temperature Recovery	55	55	55	℃
16	Charging Under-temperature Protection	-20	-20	-20	℃
17	Charging Under-temperature Recovery	-10	-10	-10	℃
18	MOS Over-temperature Protection	75	75	75	℃
19	MOS Over-temperature Protection Recovery	70	70	70	℃

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