

# **2-24S 1A 2A Super-Capacitive Balancer**

**(0821/ 0824)**

## **User Manual**

**Heltec Energy**

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## 1. Product Overviews

Super-capacitive Battery Active Equalizer (0821/0824) is a balanced solution for large-capacity series lithium battery packs Management system. The equalizer uses a super-capacitor as a medium to achieve active energy transfer equalization.

The equalizer is suitable for 2 to 24 strings of battery packs with voltage acquisition and equalization. The equalizer works for 1A/2A equalized current is used for energy transfer, and the equalization current does not depend on the voltage difference of the series connected cells in the battery pack. Voltage acquisition range: 1V ~ 5V, accuracy:  $\pm 3\text{mV}$ . Applicable to all kinds of batteries on the market such as lithium iron phosphate, ternary lithium, titan acid, lithium lead acid, etc.

The equalizer has a Bluetooth communication function and is equipped with mobile APP software. Can be viewed via Bluetooth connected equalizer Single cell voltage, view equalization status, modify setup parameters, etc. Can be applied to small sightseeing cars, scooters, sharing car, high power energy storage, base station backup power, solar power station and other products in the battery pack, can also be used for batteries balance maintenance, repair and other occasions.

## 2. Main Technical Parameters

### 2.1 Main Specifications

- ◆ Support 2~24 strings of battery packs;
- ◆ Real-time, active, energy transfer equalization, after the balance is reached, the pressure difference between the cells is  $\leq 3\text{mV}$ ;
- ◆ Single voltage range 1V ~ 5V, accuracy  $\pm 3\text{mV}$ ;
- ◆ Support all battery types such as ternary, iron lithium, lead acid, super capacitor;
- ◆ The equalization current is set independently in the range of 0.1~1A/0.1~2A, independent of the cell voltage difference;
- ◆ Support balanced cascading to apply to more than 24 series of battery packs, in theory, can be cascaded indefinitely;
- ◆ Bluetooth communication function, equipped with APP, to view the state of the battery in

real time;

- ◆ Equilibrium line resistance detection, abnormal contact failure is found in advance;
- ◆ Power supply range: 40V~100V
- ◆ Low voltage shutdown function to prevent battery damage.

## 2.2 Use of Environmental Conditions

- a) Operating temperature range: -20 ° C ~ 70 ° C;
- b) Power requirements: 40~100V, can be self-powered by battery or external power supply.
- c) Power consumption: Equilibrium state 10mA@100V, unbalanced state 6mA@100V.

## 3. Connector and Interface Description

### 3.1 Connector & LED Position Description

The connector and LED position are shown in Figure 1.



Figure 1. Connector Diagram

### 3.2 Connector & LED Definition Description

The connector and LED definition are shown in below table.

Connector	Pin No.	Name	Definition
P1	1	GND	Battery Total Negative pole

	2	B1	Cell 1 positive pole
	3	B2	Cell 2 positive pole
	4	B3	Cell 3 positive pole
	5	B4	Cell 4 positive pole
	6	B5	Cell 5 positive pole
	7	B6	Cell 6 positive pole
	8	B7	Cell 7 positive pole
	9	B8	Cell 8 positive pole
	10	B9	Cell 9 positive pole
	11	B10	Cell 10 positive pole
	12	B11	Cell 11 positive pole
	13	B12	Cell 12 positive pole
	14	B13	Cell 13 positive pole
	15	B14	Cell 14 positive pole
	P2	1	B15
2		B16	Cell 16 positive pole
3		B17	Cell 17 positive pole
4		B18	Cell 18 positive pole
5		B19	Cell 19 positive pole
6		B20	Cell 20 positive pole
7		B21	Cell 21 positive pole
8		B22	Cell 22 positive pole
9		B23	Cell 23 positive pole
10		B24	Cell 24 positive pole
11		PWR	Equalizer power supply, can be connected to the positive for any section of 13~24S ;can also be connected to a 40-100V DC External power supply.

### 3.3 Product Appearance

The appearance of the product is shown in Figure 2.



Figure 2. 0821/ 0824 Product Appearance

### 3.4 Dimension

0821/ 0824 equalizer size is 162mm × 100mm × 20mm, shape and mounting hole position size as shown in figure 3.

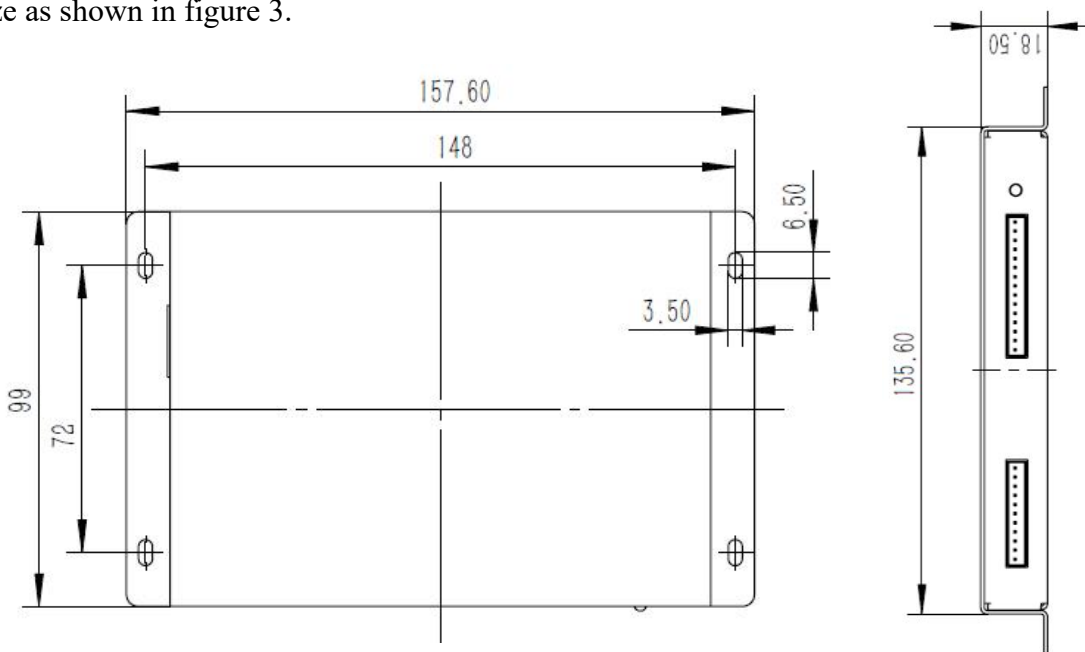


Figure 3. Outline Dimension Drawing of 0821/0824

### 3.5 Weight

The equalizer weighs about 650g.

## 4. Installation Method and Precautions

### 4.1 Unpacking Inspection and Precautions

- a) The packing case and equalizer shall be handled with care and not inverted as far as possible;
- b) Before unpacking, pay attention to whether the package is in good condition, such as whether there are impact marks, damage, etc;
- c) Take sufficient anti-static measures, such as wearing anti-static clothes, wearing anti-static gloves, wearing anti-static wrist strap, and after full discharge, open the anti-static bag and take out the equalizer, and check whether the appearance of the equalizer is in good condition.

### 4.2 Single Equalizer Installation

Single 0821/0824 equalizer is suitable for 2-24 series batteries. However, when the battery voltage is lower than 40 V, the equalizer needs to provide external 40 V ~ 100 V DC power supply.

For a battery pack with 24 strings of batteries connected in series, the wiring method is shown in Figure 4.

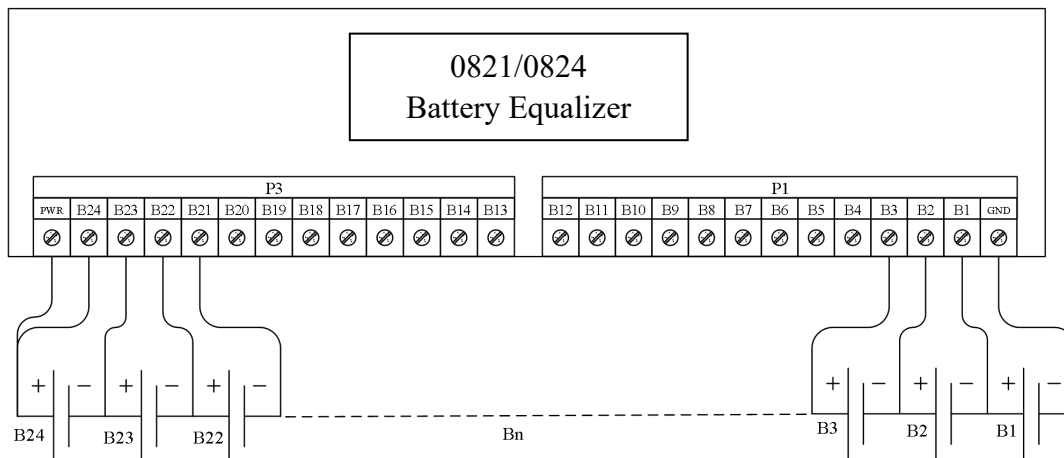


Figure 4. 24S Battery Wiring Diagram

Apply the equalizer to less than 24S cells. The wiring method is shown in Figure 5 (20S shown for example).

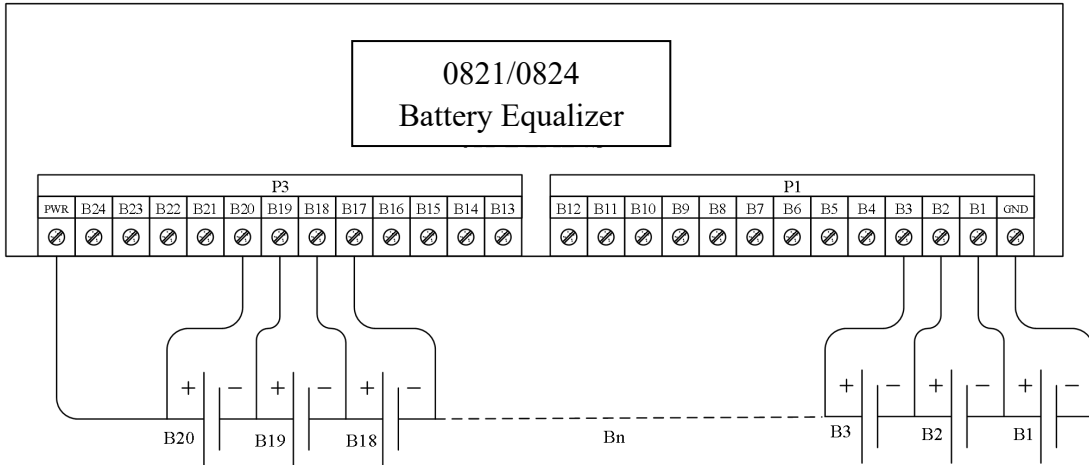


Figure 5. 20S Battery Wiring Diagram

Apply the equalizer to a battery pack with a voltage lower than 40V. The wiring method is shown in Figure 6. (As shown in the figure, 3 series matching boost modules are taken as an example).

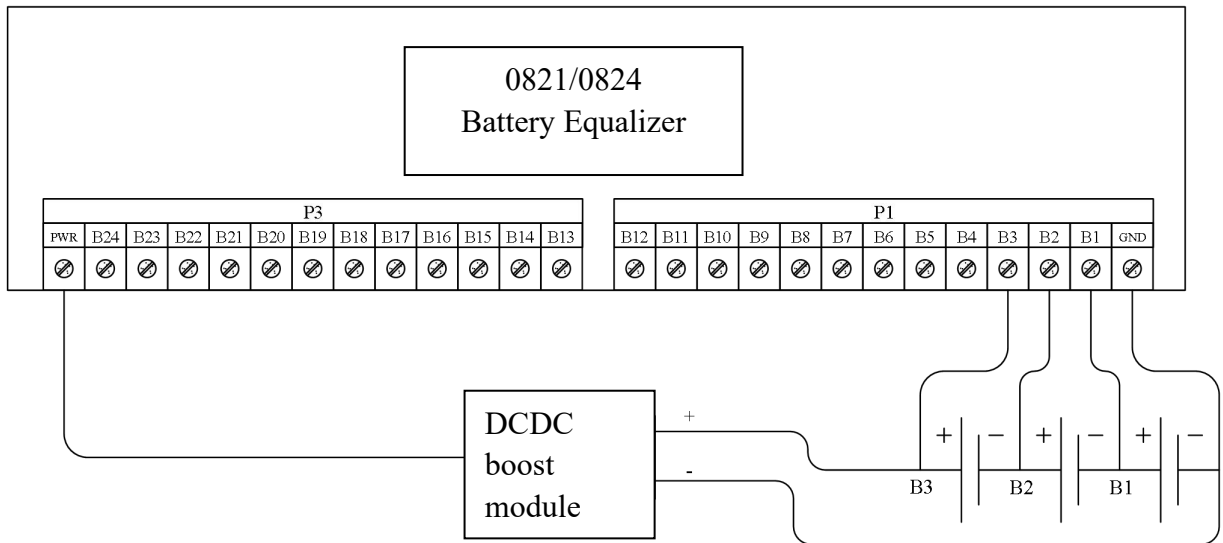


Figure 6. Wiring Diagram of Booster Module



Apply the equalizer to a battery pack with a voltage lower than 40V. The wiring method is shown in Figure 7. (As shown in the figure, 3 series are matched with external power supply as an example).

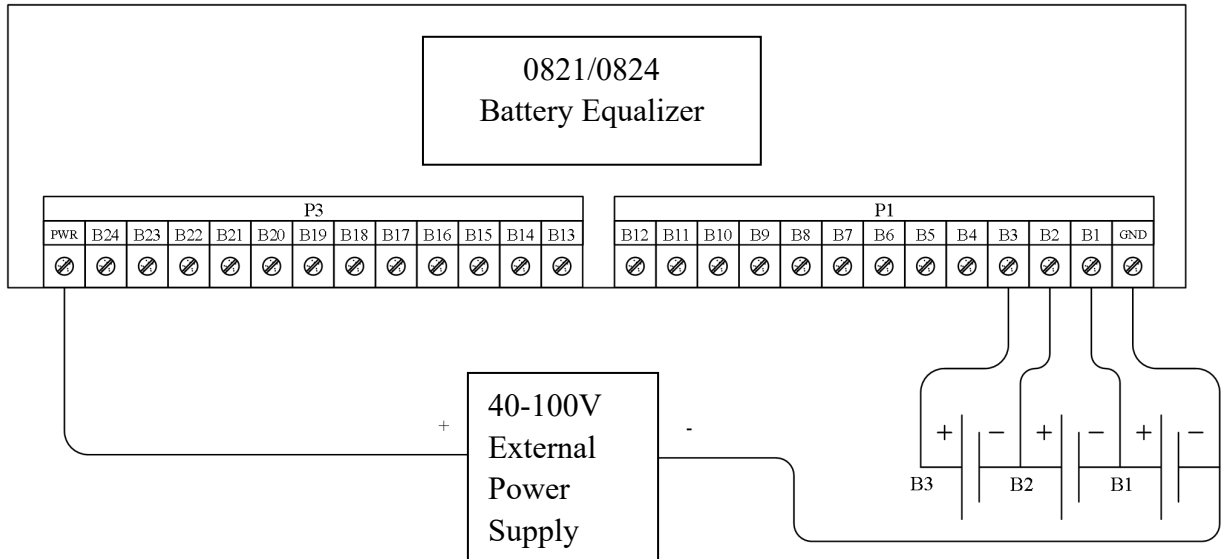


Figure 7. Wiring Diagram of External Power Supply

### 4.3 Multiple Equalizer Cascading Installation

The 0821/ 0824 equalizers support cascading, which allows the equalizer to be applied to more than 24 strings of battery packs. The cascading installation wiring diagram is shown in Figure 8.

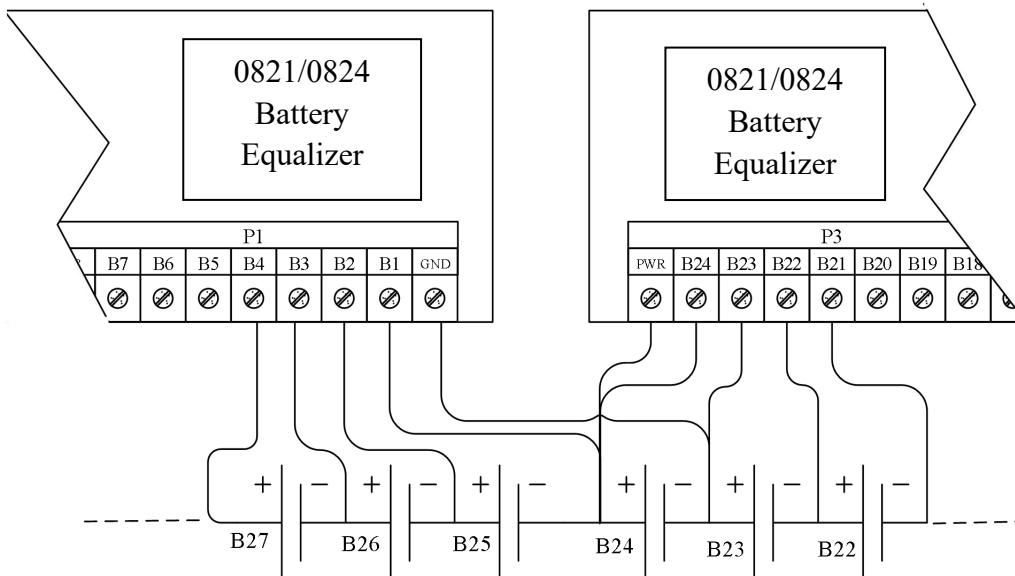


Figure 8. Connection Diagram of Equalizer Cascade

## 4.4 App Installation

By scanning the QR code shown in Figure 9, the mobile app (Android) matching the product can be obtained. IOS mobile phone users can directly search the app store of Apple store for "JK BMS" to download and install.



Figure 9. QR Code of Mobile App

## 5. Use and Operation

### 5.1 Preparation and Inspection before Use

Before turning on the power supply for use, please reconfirm whether the connection of the equalizer line is normal, whether the power supply provided to the equalizer is within the required range, check whether the equalizer has been placed stably, confirm whether the circuit board is short circuited, etc., and connect the equalizer power supply only after confirming that it is correct, otherwise it may cause serious consequences such as abnormal operation, even burning.

### 5.2 Equalizer Power-on Work

After confirming the above operation is correct, power on the equalizer. 0821/ 0824 equalizer does not have power on control switch, only need to connect the power line to the terminal normally, at this time, the equalizer automatically starts to work. The equalizer is designed to work

automatically. The first starting condition is that the voltage of the first battery string of the battery pack is higher than 2.4V.

## 5.3 App Operating Instructions

### 5.3.1 Equipment Operation

#### a) Device connection

First, turn on the Bluetooth of the mobile phone, and then turn on the app, as shown in Figure 10.

Click the icon in the upper left corner to scan the device. The first time you connect to the app, you will be prompted to enter the password. The default password of the device is "1234". After the device is connected, the app will automatically record the password. The next time you connect, you do not need to enter the password. After you open the app, you will automatically connect. The password input interface is shown in Figure 11.

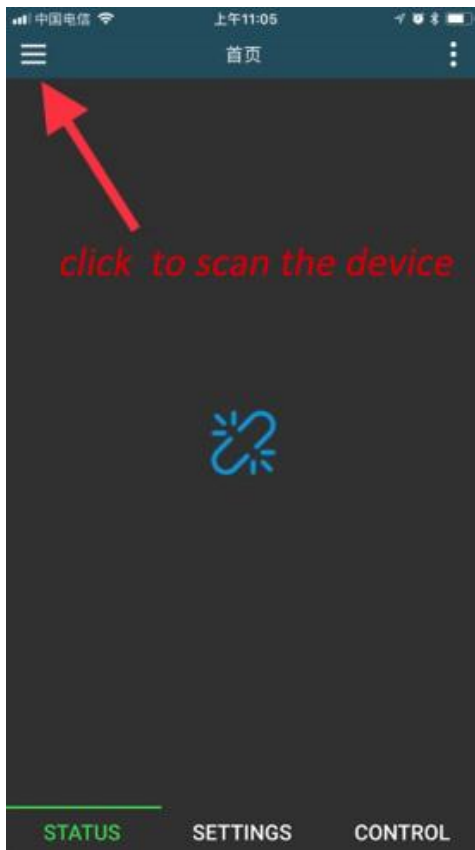


Figure 10. Device Scan

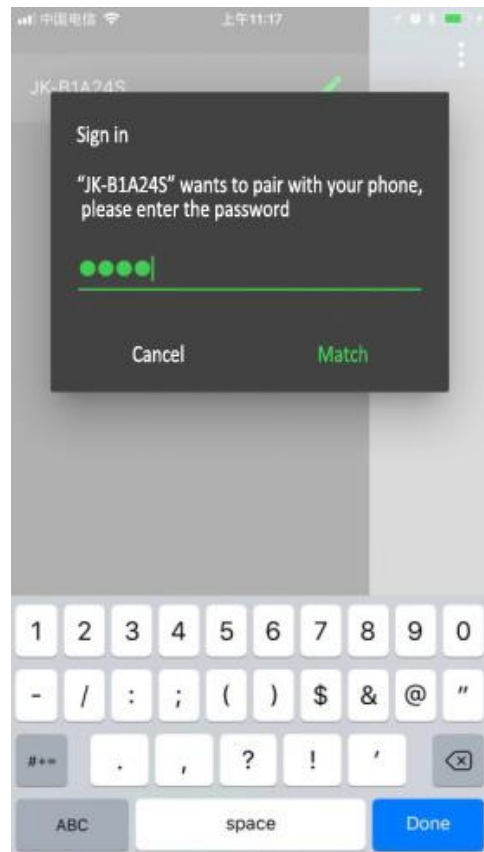


Figure 11. Password Input Interface

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.

The interface for modifying the device name is shown in Figure 12. Note that the device name only supports English or numbers, not Chinese names and Chinese characters.

The password modification interface is shown in Figure 13. To change the device password, you must first enter the old password of the device. Only when the current password is correct can you enter the new password entry option. After entering the new password twice, select confirm to complete the device password modification.



Figure 12. Changing name



Figure 13. Changing password

### 5.3.2 Status View

The real-time status interface is shown as figure 14.



Figure 14. Real-time Status

On the real-time status page, you can view information such as cell voltage, total battery voltage, maximum differential voltage, average cell voltage, equalization state, equalization current, and equalization line resistance.

### 5.3.3 Parameter Settings

The parameter setting page is shown as figure 15.

In the parameter setting page, parameters such as the number of cells, the single cell identification voltage, the trigger equalization voltage difference, the maximum equalization current, the automatic shutdown voltage, and the voltage acquisition reference can be set.



Figure 15. Real-time Status

### 5.3.4 BMS Control

The BMS control page is for an equalizer with battery output protection. The 0821/ 0824 equalizer does not have this function and the page is empty.

## 6. General Fault Analysis and Elimination

The cause and treatment of the fault are shown in below table.

No.	Symptom Cause	Analysis	Remedy	Remarks
1	The power indicator is off	The equalizer does not supply power properly.	Check that the power pins on the P2 connector are plugged into the power supply.	

2	The number of APP prompts is not the same as the set value.	The number of single settings is incorrect or the equalization line connection is abnormal.	Check that the number of unit settings is the same as the number of batteries connected.	
3	APP prompts that the equalization line resistance is too large	Battery to connector line resistance is too large	Check the battery unit to connector connector for poor contact, otherwise replace the wire.	
4	Inaccurate voltage acquisition	Wiring error or incorrect parameter setting	Check the connection exclusion connection errors one by one. Fine-tune through the voltage acquisition reference until the acquisition is accurate.	
5	Equalizer does not boot	The equalizer does not meet the working conditions	Check if the voltage of the first string of batteries is higher than 2.4V. If the conditions are not met, please charge the battery to 2.4V or higher, then the equalizer will automatically turn on.	

Listed above are common faults, possible causes and solutions. If the fault has not been corrected, please contact us.

## 7. Safety Protection Measures and Precautions

The equalizer itself does not have high voltage, and it will not cause electric shock damage to the body.

The equalizer has static-sensitive components that require anti-static protection. If it is not operated properly, it will cause damage to the equalizer. If you need to operate the equalizer, please pay attention to the following instructions:

- a) Before touching the PCB, the person performing the operation must discharge static

electricity and take anti-static measures;

b) the equalizer is not allowed to come into contact with clothing made of electrically insulating material – plastic film, insulated table top or rayon;

c) When performing welding work on the equalizer, make sure that the soldering iron tip is grounded;

d) If non-conductive containers are inevitably used, they must be packaged with a conductive material, such as conductive foam rubber or plain aluminum foil, before placing the PCB.

## **8. Transportation and Storage**

### **8.1 Transportation**

The packaged product can be transported by ordinary means of transport without being directly affected by rain or snow and violently colliding with bumps. It is not allowed to put together with corrosive substances such as acid and alkali during transportation.

### **8.2 Storage**

Packaged products should be stored in a permanent warehouse. The temperature of the warehouse is 0 °C ~ 35 °C, the relative humidity is not more than 80%. There should be no acid and alkali and corrosive gas in the warehouse, no strong mechanical vibration and impact, no strong magnetic field.

Android mobile uses browser to scan code to install app, and apple mobile users can directly search "extremely empty BMS" in app store of Apple store to download and install.