



Record number: EK-B24S8E300A

Latest version: V1.01

Smart Active Balancer BMS (EK-B24S8E300A)

Operation Instruction

Shenzhen Enerkey BMS Power Technology Co., LTD

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Product Name	Smart Active Balancer BMS
Product Model	EK-B24S8E300A
Version	V1.01
Adapt Battery String	16S-24S
Adapt Battery Type	NCM/ LFP/LTO
Function	Active balancing, overcharge protection, over-discharge protection, overcurrent protection, over-temperature protection, short-circuit protection
Effective date	17th.May.2025

Product change history			
Version	Date	Change point description	Approve
V1.01	2025-05-17	Initial version	

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Product warranty terms

Product model: Smart Active Balancer

Warranty period : One year

Firstly, thank you for purchasing the Smart Active Balance from Jingwei Power Technology Co., LTD. Our company provides quality warranty for hardware products and accessories sold by our company, with the warranty period as shown above. If there is a malfunction due to quality reasons during the warranty period, the company has the right to choose to repair or replace the entire product after receiving notification of the product malfunction and conducting inspection and verification. The complete replacement product can be new or nearly new.

1. Shenzhen Jingwei power technology Co.,Ltd. guarantees that the products have been fully tested.
2. Jinwei Power does not guarantee uninterrupted use of the product during the repair process. But the company should ensure that the faulty product is repaired within a reasonable period of time.
3. The product warranty period starts from the date of shipment or the date of installation by Shenzhen Jinwei Power Technology Co., Ltd. If the installation of the company's products is not started within 30 days after the date of shipment due to user schedule or delay, the product warranty period shall be calculated from the 31st day after the date of shipment.
4. Shenzhen Jinwei Power Technology Co., Ltd. does not provide free warranty for product failures and damages caused by any of the following situations:
 - (1) Improper use or improper maintenance;
 - (2) Software, accessories, components, or other items not provided by Shenzhen Jinwei Power Technology Co., Ltd;
 - (3) Unauthorized disassembly, modification and misuse;
 - (4) Use beyond the scope specified in the product technical specifications;
 - (5) Improper transportation, handling and storage;
 - (6) Failure or damage caused by other non-quality reasons (such as earthquake, war, traffic accident, etc.).

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1. Description

The intelligent lithium battery protection equalization board is a protection equalization management system tailored for large-capacity series battery packs.

This series of lithium battery protection parts adopts automotive-grade MOS, 2oz thickened copper foil and copper strip current balancing, making the protection board high-precision, ultra-low internal resistance and ultra-low heat generation.

On the basis of the basic protection board functions such as overcharge protection, over-discharge protection, overcurrent protection, over-temperature protection, and short-circuit protection, equalization function, reset function, electrostatic protection, dust protection and moisture protection are added.

This lithium battery equalization part uses supercapacitors as the medium to achieve active energy transfer equalization.

The APP sets the equalization current to the actual working equalization current value, which has nothing to do with the voltage difference value of the series battery cells in the battery pack.

The voltage acquisition range is 1.5V~4.5V, with an accuracy of 1mV. It is suitable for mainstream ternary lithium, lithium iron phosphate, and lithium titanate batteries on the market.

Supports 16 to 24 strings of batteries and supports disordered power-on.

This lithium battery protection equalizer has Bluetooth communication function and is equipped with mobile phone APP software. The balancer can be connected to Bluetooth to view data such as single cell voltage, single cell maximum voltage, single cell minimum voltage, single cell average voltage, maximum voltage difference, total voltage of battery pack, real-time balancing current, running time, balancing status and device temperature, and the device balancing parameters can be modified online.

It is mostly used in battery PACKs of small sightseeing cars, scooters, shared cars, high-power energy storage, base station backup power supplies, solar power stations and other products.

2. Specifications

Item	Smart Active Balancer BMS		
Product Model	EK-B24S8E200A	EK-B24S8E250A	EK-B24S8E300A
Product size	L237 x W107 x T24.5（mm）		
Product weight	1500g		
Single cell voltage collection range	1.5V～4.5V		
Communication ports	CAN/485		
Outlet mode	Same ports		
Product material	Aluminum alloy, PC plastic, FR-4/lead-free tin-spraying		
Battery protection parameters			
Continuous discharge current	120A Default 15A～200A adjustable	120A Default 15A～250A adjustable	120A Default 15A～300A adjustable
Continuous charge current	200A Default 15A～200A adjustable	250A Default 15A～250A adjustable	300A Default 15A～300A adjustable
Battery type	NCM	LFP	LTO

Battery string number	16S~24S	16S~24S	20S~24S
Single cell overcharge protection	4.200V	3.650V	2.700V
Single cell overcharge recovery	4.000V	3.450V	2.400V
Single cell undervoltage	2.900V	2.600V	1.600V
Single cell undervoltage	3.100V	2.900V	1.800V
Equalization parameters			
Active balancing current	1A~8A (adjustable)		
Balanced voltage accuracy	1mV (adjustable)		
Start balancing voltage difference	0.001V~5.000V (adjustable)		
Stop balancing voltage difference	0.001V~5.000V (adjustable)		
Balanced start voltage value	1.500V~4.500V (adjustable)		
Balanced stop voltage value	1.500V~4.500V (adjustable)		
Temperature protection parameters			
Charge over-temperature	Default 60℃/30℃~80℃ (adjustable)		
Charge over-temperature recovery	Default 50℃/30℃~80℃ (adjustable)		
Charge low-temperature	Default -2℃/-40℃~20℃ (adjustable)		
Charge low-temperature recovery	Default 2℃/-40℃~20℃ (adjustable)		
Discharge over-temperature	Default 60℃/30℃~80℃ (adjustable)		
Discharge over-temperature recovery	Default 50℃/30℃~80℃ (adjustable)		
Discharge low-temperature	Default -10℃/-40℃~20℃ (adjustable)		
Discharge low-temperature recovery	Default -5℃/-40℃~20℃ (adjustable)		

3.Product photos

3.1.Product Appearance



Top view



Side View



Front View



Back View

3.2.Product Accessories

NTC terminal wire



Switch wire



14pin & 18pin terminal wire



NTC Terminal cable

Thermistor terminal cable specifications					
Terminal Specification	Resistance	B value	length	Remark	Q'ty
MX3.0-8Pin(4*2)	10K1%	B3950	42cm	Customizable	1

Switch cable

Switch cable specifications					
Terminal Specification	Resistance	Number	length	Remark	Q'ty
MX3.0-4Pin(2*2)	Cu	24AWG	52cm	3cm	1

Terminal cable

Terminal cable specifications					
Terminal Specification	Resistance	Number	length	Remark	Q'ty
MX3.0-18Pin(9*2)	Cu	20AWG	70cm	3cm	2
MX3.0-14Pin(7*2)	Cu	20AWG	70cm	3cm	1

Terminal Lugs



M6 Screws

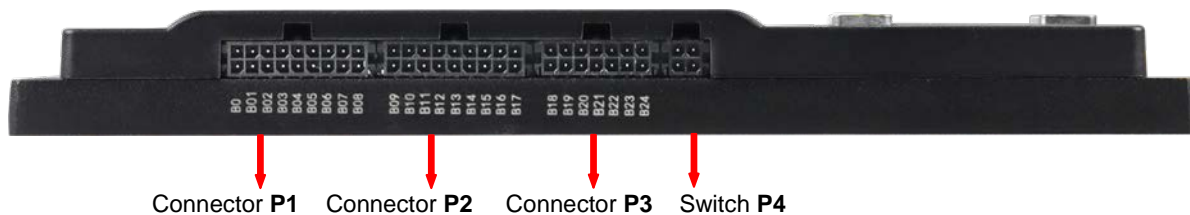


Terminal Lugs and Screws

Accessories Specifications					
Material Model	Material	Hole diameter	Screw holes	Terminal length	Q'ty
OTZ25-6 Terminal Lugs	Cu	8.2MM	6.3MM	31MM	4
M6 Screws	Nickel-plated	-	-		4

4.Connector terminal

4.1.Connector picture



4.2.Connector pin description

Connector	Pin	Pin name	Description
P1	1	B0	1st battery string negative pole/battery pack total negative pole
	2	B01	1st battery string positive pole
	3	B02	2nd battery string positive pole
	4	B03	3rd battery string positive pole
	5	B04	4th battery string positive pole
	6	B05	5th battery string positive pole
	7	B06	6th battery string positive pole
	8	B07	7th battery string positive pole
	9	B08	8th battery string positive pole
P2	1	B09	9th battery string positive pole
	2	B10	10th battery string positive pole
	3	B11	11th battery string positive pole
	4	B12	12th battery string positive pole
	5	B13	13th battery string positive pole
	6	B14	14th battery string positive pole
	7	B15	15th battery string positive pole
	8	B16	16th battery string positive pole
	9	B17	17th battery string positive pole
P3	1	B18	18th battery string positive pole
	2	B19	19th battery string positive pole
	3	B20	20th battery string positive pole
	4	B21	21st battery string positive pole
	5	B22	22nd battery string positive pole
	6	B23	23rd battery string positive pole
	7	B24	24th battery string positive pole/battery pack total positive pole



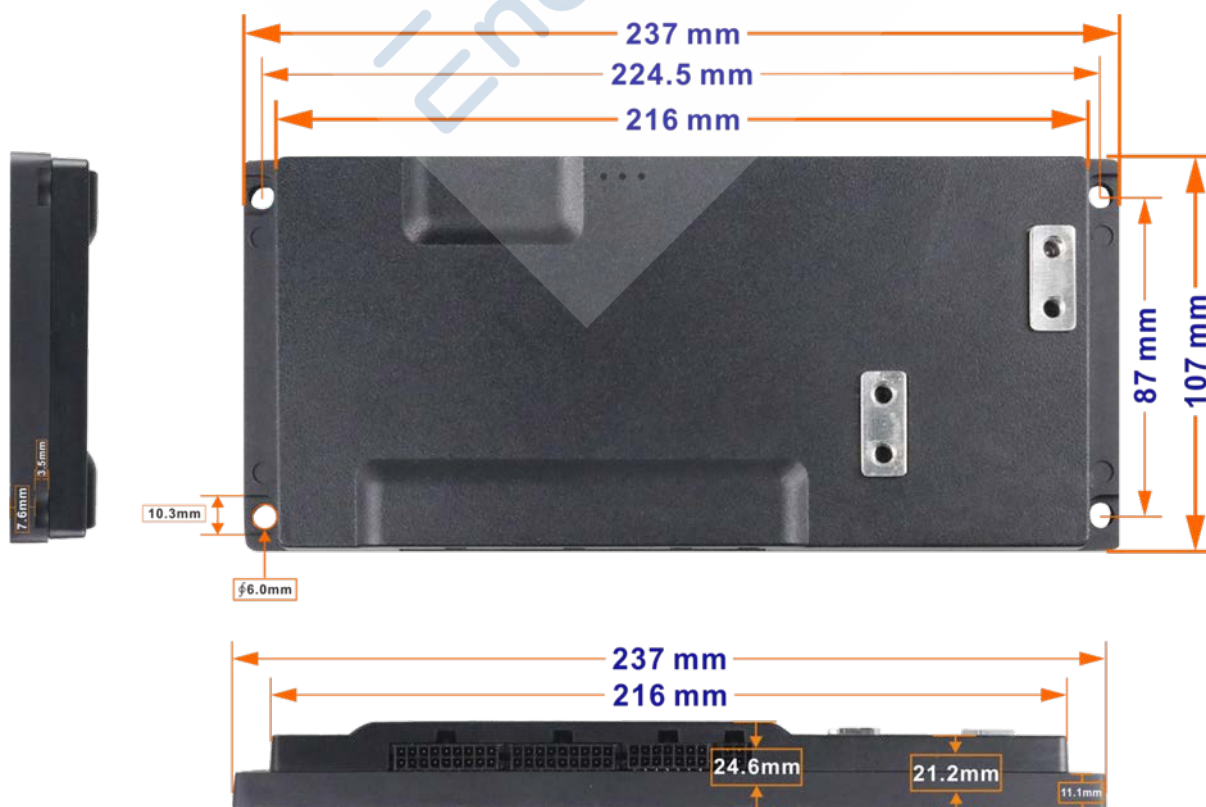
5.Indicator description



Indicator light	Indicator light color	When the LED is always on	When LED flashes
Bluetooth status indicator light	Blue	the device is connected successfully	Device not connected
Fault status indicator light	Red	internal fault	Battery detection failed
Working status indicator light	Yellow	balancing completed	Balance in progress

6.Product Size

Notes : Unit is mm, the error is $\pm 0.5\text{mm}$



7.Introduction to Balance

7.1.Protection function and principle

1. Overcharge protection

Principle: Real-time monitoring of battery voltage. When the voltage exceeds the set threshold (such as $4.25V \pm 0.05V$), the protection board cuts off the charging circuit.

Implementation: The control IC detects the battery voltage through the voltage divider resistor, triggers the internal comparator, turns off the charging MOSFET, and stops charging.

2. Over-discharge protection

Principle: When the battery voltage is lower than the set threshold (such as $2.5V \pm 0.1V$), the protection board disconnects the discharge circuit to prevent deep discharge.

Implementation: After the control IC detects low voltage, it turns off the discharge MOSFET, and the battery enters a dormant state. It needs to be charged to the recovery voltage (such as $3.0V$) before it can be reactivated.

3. Overcurrent/short circuit protection

Principle: By detecting the loop current, when the current exceeds the set value (such as 3~5 times the rated current) or a short circuit occurs, the circuit is quickly cut off.

Implementation:

Current detection: Use a precision sampling resistor (such as milliohm level) to measure the current, and the control IC calculates the voltage difference and compares it with the threshold.

Response time: Short circuit protection requires extremely fast response (usually $<50\mu s$), and overcurrent protection is triggered in stages according to the current size.

4. Temperature protection

Principle: The battery temperature is monitored through a thermistor (NTC), and protection is triggered when it exceeds the range (such as $-20^{\circ}C \sim 80^{\circ}C$).

7.2.Equalization function and principle

The balancing process of the active balancing part consists of the following three steps, which are cycled in sequence until the maximum voltage difference is within the set range:

1. Detect the largest and smallest cells;
2. The largest cell charges the supercapacitor in the balancer, and the charging current is the set current, with a maximum of 8A;
3. The supercapacitor in the balancer discharges the smallest cell, and the discharge current is the set current, with a maximum of 8A;
4. Cycle steps 1 to 3 in sequence until the voltage difference is within the set range.

1. Single transfer capacity

The calculation formula for the single transfer capacity of the balancer is: balancing current/3600*duration time (2-5S)

For example, if the balancing current is 4A, the single transfer capacity value is between 0.0022Ah-0.0056Ah.

If the capacity of the battery being balanced is relatively small or the capacity difference is relatively small, there will be too much capacity transfer. For example, the capacity difference between the largest cell and the smallest cell is 0.1AH, and the balancing current is set to 4A at this time, there will be too much capacity transfer. After the current balancing cycle is completed, the original smallest cell becomes the largest cell, and the largest cell becomes the smallest cell. The simplest solution to this is to reduce the balancing current.

2. Small capacity balancing strategy

For the situation where there is too much energy transfer due to small capacity differences, the balancing part has designed a balancing strategy to deal with this situation. When the balancing cycle is completed, the original smallest cell becomes the largest cell, and the largest cell becomes the smallest cell. The balancer waits for 3 minutes to allow the battery voltage to recover. If the largest cell still becomes the smallest cell and the smallest cell becomes the largest cell after 3 minutes, it means that the balancing is indeed over-balanced. At this time, the balancer automatically reduces the balancing current by half, for example, the original 4A balancing current is now reduced to 2A current balancing. If there is still over-balancing, continue to reduce the balancing current until the voltage difference is within the set range.

8. Installation method and precautions

Unpacking inspection and precautions

1. The packaging box, protection equalization board, etc. need to be handled with care and try not to turn them upside down;
2. Before unpacking, pay attention to whether the packaging is intact, such as whether there are any impact marks or damage;

Instructions for installation of protection equalization board

1. A single equalizer can connect a battery pack with up to 24 batteries in series. As shown in 8.2.1.
2. When used for a battery pack with less than 24 batteries in series, the remaining pins are left floating. As shown in 8.2.2.
3. Lithium battery protection equalization board, supports ternary and iron phosphate 16S-24S. Supports lithium titanate 20S-24S.

The following figure shows the installation and wiring method for a 24S battery pack:

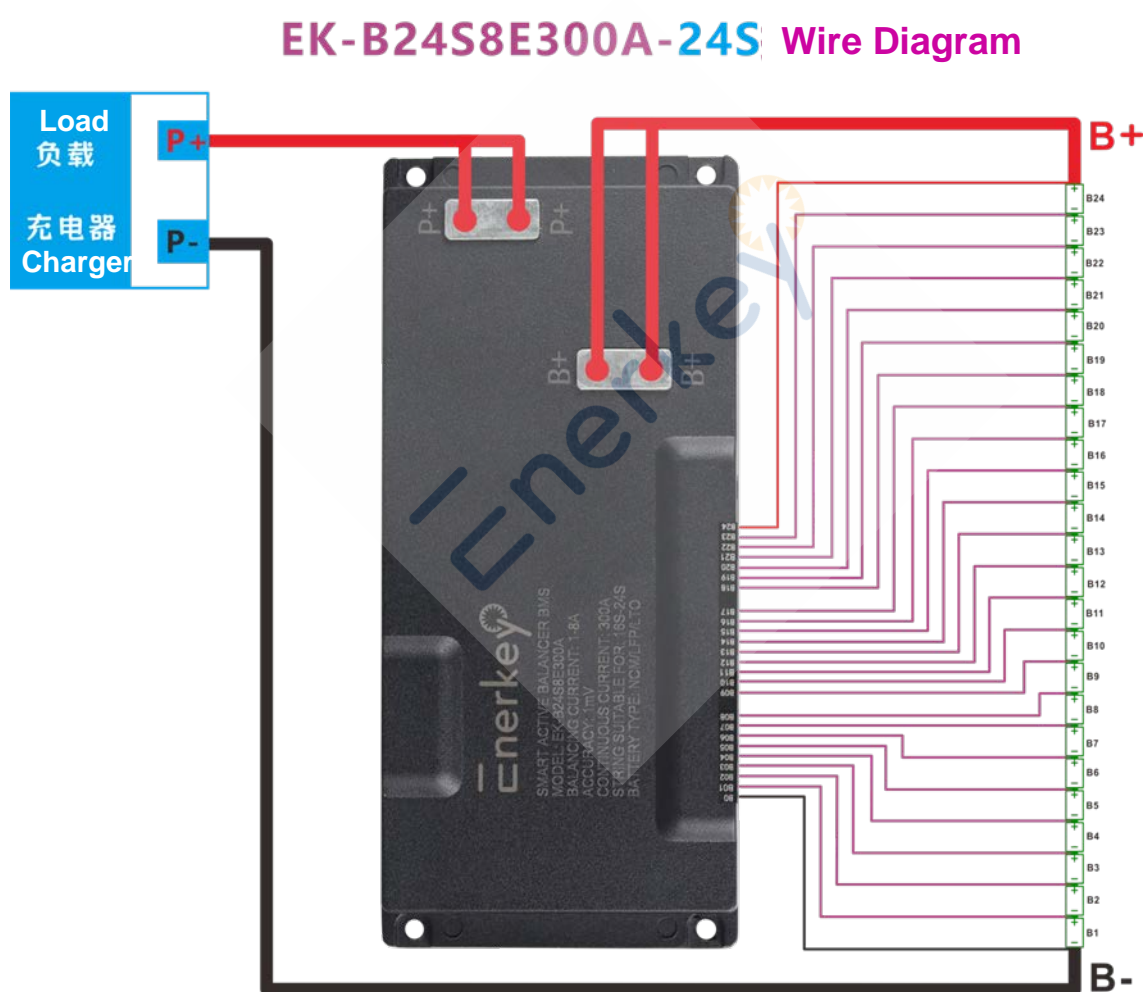


Figure 8.2.1

When used in a battery pack with less than 24 batteries in series, the remaining pins are left floating.

Take 16S as an example below, the 17S-23S pins should be left floating. The installation and wiring method is as follows:

EK-B24S8E300A-16S Wire Diagram – Support NCM/LFP

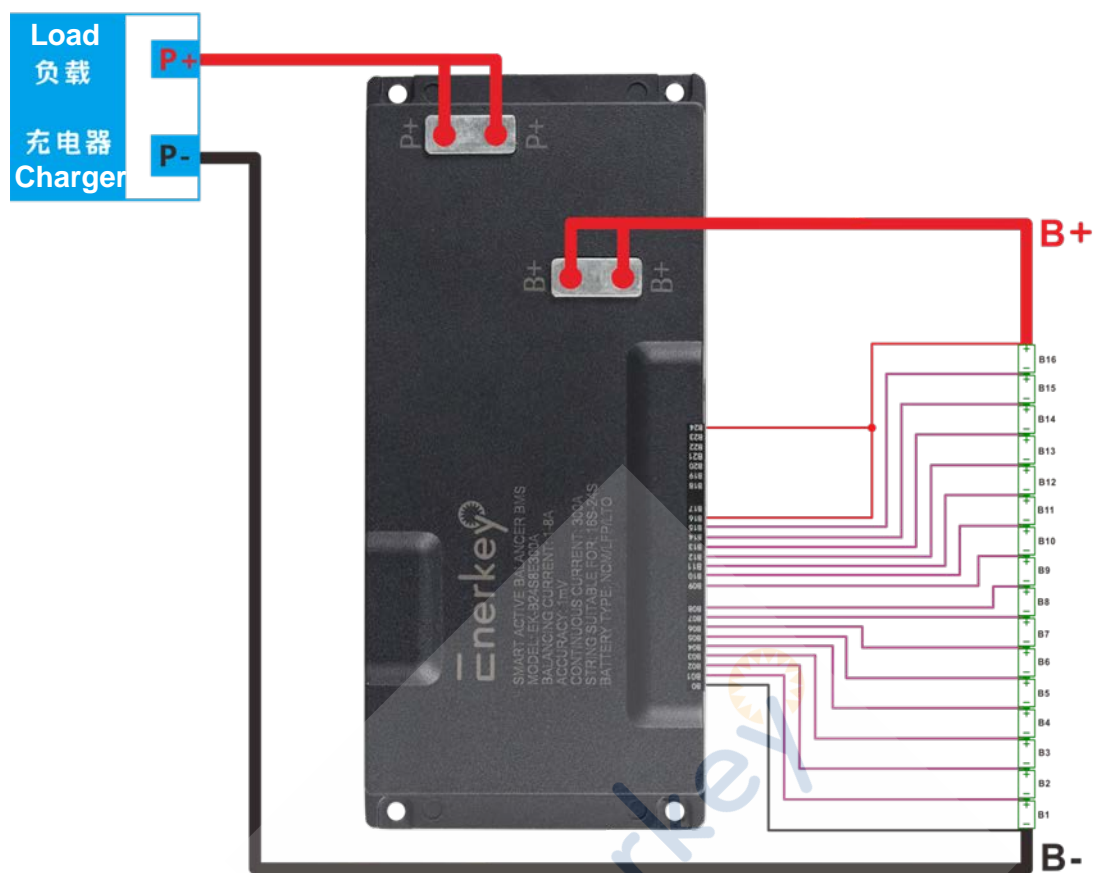


Figure 8.2.2

▲ Precautions:

- ①. Installing the protection equalization board requires a certain amount of electronic knowledge.
- ②. Welding the cable: The first cable (black line) is connected to the total negative pole of the battery, the second cable (red line) is connected to the positive pole of the first battery string, and the third cable (red line) is connected to the positive pole of the second battery string... and so on, connect all the cables;
- ③. Detect the cable: After connecting the cable, measure the voltage between two adjacent cables from the head of the cable to confirm that there is no problem of wrong connection or missing connection in the welding sequence of the cable.
- ④. Connect the B+ line of the protection board to the total positive pole of the battery, and then connect the sampling cable plug to the protection board. After activating the protection board, confirm that the voltage before the board (battery voltage B+.B-) and the voltage after the board (P+.P-) are consistent.

9.APP Installation and Use

9.1.APP Installation

The APP has two versions of Android system and IOS system, both support Chinese and English

For IOSphone, You can directly search "Enerkey" in appstore



For Android phone, Please directly search "Enerkey" in google play store

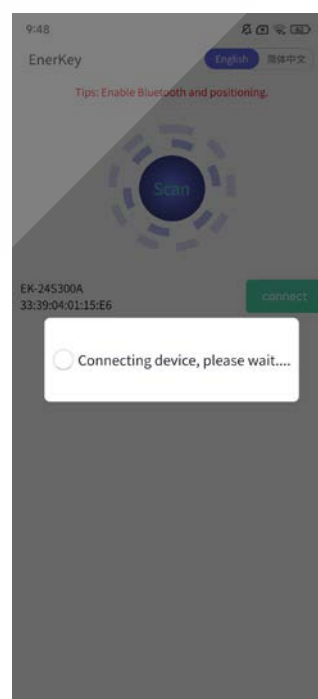
9.2.APP Use

9.2.1. Pre-use inspection

- ①. After downloading the APP, you must enable the location and location information and allow the APP to use the location information. If the location is not enabled, the equalizer cannot be searched and the device cannot be connected.
- ②. Before powering on the power supply, check whether the equalizer is properly connected, whether the power supply for the equalizer is within the required range, whether the equalizer is properly placed, and whether there is short circuit on the circuit board.

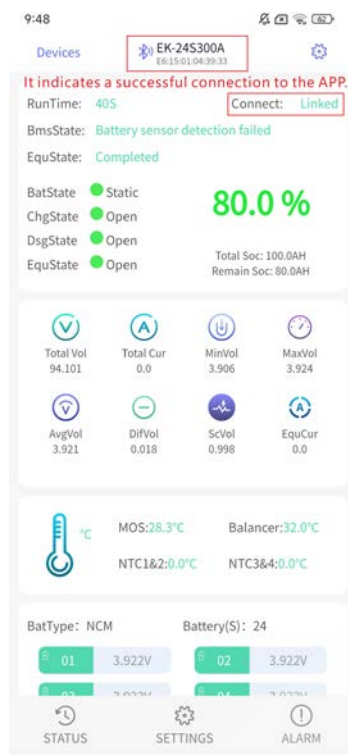
9.2.2. APP Connect device procedure

Step 1: Connect the device, as shown below; After the unconnected device enters the APP, the system will automatically start scanning the device.



Step 2:

After the connection is successful,
the APP interface is as shown below,
You can see the battery status.



Step 3:

Enter the settings interface,
set the required parameters.



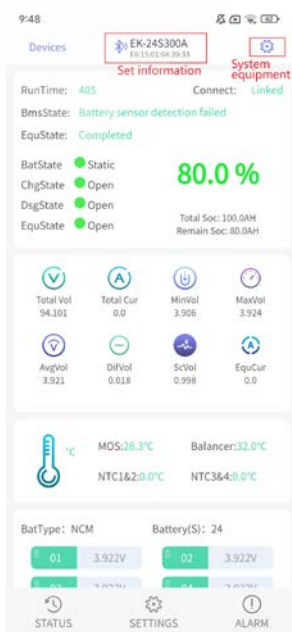
Step 4:

After setting the required parameters,
you can monitor the parameters of
each monomer, from the "Status"
or "Alarm" page;



Step 5

Attached are the steps to view device
information, and change device password,
as shown below:



Notes

- ①. The default setting for the equalizer is 24S for the first use. So when you use it for the first time, if the connected battery pack is not 24S, the fault indicator light will light up. This is normal. Because the number of strings set in the APP is inconsistent with the number of battery strings actually connected, you should modify the battery parameters before turning on the balance after the connection is successful.
- ②. When a fault occurs, the balance cannot be turned on.

10. Phenomenon description

10.1. General fault analysis and elimination

N o.	Fault Phenomenon	Analysis Of Causes	Final Solution
1	The power indicator is off	The power supply to the equalizer is abnormal	①Check whether the electric source pin of the equalizer is connected correctly; ②If the battery string is less than 25V, an external 30V to 100V DC power supply is required
2	Device not found	The APP has no relevant authorization	①Check whether the Bluetooth is turned on; ②Turn on location and location information and allow the APP to use location information.
3	The equalizer does not start	The equalizer does not meet working conditions	Check whether the first battery voltage is higher than 2.4V, if not meet the conditions, please charge the battery to more than 2.4V, and then the equalizer will automatically start.
4	The APP prompts that the number of monomer Settings does not match the set value	The number of units set or the balance line is improperly connected	Check whether the number of units configured is the same as the number of connected batteries. If it is different, change the number of battery strings actually connected in the APP.
5	The APP indicates that the resistance of the balance line is too large	The cable resistance from the battery to the connector is too large	Check whether the cable between the battery unit and the connector is in poor contact. If no, replace the cable.

6	Inaccurate voltage acquisition	Cables are incorrectly connected or parameters are incorrectly set	Check the connection one by one to eliminate connection errors. Fine-tune through the voltage acquisition reference until the acquisition is accurate.
7	Cannot be cascaded	There is no energy exchange common end	Contact customer service or after-sales personnel to consult the wiring diagram for your desired cascade.

Special note: The above are the possible causes of common faults and solutions,
if the fault is still not removed, please contact Jingwei power after-sales.

10.2. Buzzer alarm description

No.	Fault Phenomenon	Analysis Of Causes	Final Solution
1	The buzzer goes off twice every one second (Red fault indicator lights up when ringing).	The hardware data store is faulty	contact the manufacturer
2	The buzzer sounds three times every 0.5 seconds (Red fault indicator light up when ringing).	Bluetooth communication error	contact the manufacturer
3	The buzzer sounds four times every 0.5 seconds (Red fault indicator light is only on at intervals)	The device hardware is faulty. The supercapacitor voltage overvoltage	contact the manufacturer

Special note: Hardware problems rarely occur, mostly caused by hardware damage caused by operation errors.
You can try to reconnect the device several times.

10.3. Buzzer description

No.	Phenomenon	Notes
1	After the device is powered on, the buzzer rings four times. (The green light is on at this time)	
2	After the balance is enabled, the buzzer sounds. (The yellow light is blinking at this time)	
3	After the equalization is complete, delay 3 minutes and beep. (The yellow light is on at this time)	Need in the Settings, Turn on the buzzer function.

11.Safety protection measures and transportation and storage

11.1. Safety precautions

- ①. The equalizer itself does not have high pressure and will not cause electric shock damage to the body.
- ②. There are no user repairable parts inside the equalizer. All repairs should be performed by qualified maintenance personnel. If the operating voltage set by the factory is changed, the safety certificate is no longer applicable.
- ③. Before touching the sampling line of the equalizer, discharge the static electricity and take ESD preventive measures.

11.2. Transportation

The packaged products can be transported by the usual means of transport without being directly affected by rain and snow and violent collisions.

It is not allowed to be put together with corrosive substances such as acid and alkali during transportation.

11.3. Storage

Packaged products should be placed in a permanent warehouse storage, warehouse temperature is 0℃~35℃, relative humidity is not more than 80%,

There should be no acid, alkali and corrosive gases in the warehouse, no strong mechanism vibration and impact, and no strong magnetic field.