

Smart Active Balancer (EK-24S15EB)

Instructions for use

NEEY Electronic Co., Ltd

Product Warranty Terms

Product Name: SmartActive Equalizer

Warranty : One year

Firstly, thank you for purchasing the Smart Active Equaliser from NEEY Technologies Ltd.

We provide a quality warranty on hardware and accessories sold by the company for the period shown above. In the event of a failure due to quality reasons during the warranty period, the company shall have the option of repairing or replacing the product as a complete set upon receipt of notification of the failure and after inspection and verification. A complete replacement set is a new or nearly new part.

1. NEEY Technologies Ltd. guarantees that its products have been fully tested.
2. NEEY Technology Ltd. does not guarantee the uninterrupted use of the product during the repair process. However, the company shall guarantee

The product is certified to be repaired within a reasonable period of time if it breaks down.

3. The product warranty period begins on the date of shipment or the date of commencement of installation by NEEY Technologies Ltd. If installation of the company's products has not commenced within 30 days of the date of shipment due to the user's schedule or delays, the warranty period shall commence on the 31st day after the date of shipment.
4. NEEY Technologies Ltd. does not provide a free warranty for any product failure or damage caused by any of the following.
 - (a) Incorrect use or improper maintenance;
 - (b) software, accessories, components or other items not supplied by NEEY Technologies Ltd;
 - (c) Unauthorised dismantling, modification and misuse;
 - (d) Use beyond what is indicated in the technical specifications of the product;
 - (e) inappropriate transport, handling and storage;
 - (f) Other failures or damage not caused by quality (e.g. earthquakes, war, traffic accidents, etc.).

To the extent permitted by law, the above warranty terms are the only express ones, and without any other warranty terms.

Whether written or verbal. Expressly disclaim any implied warranty terms and conditions of business.

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1 Overview

The Smart active equaliser (EK-24S15EB) is a tailor-made equalisation management system for high-capacity series battery packs.

This equaliser uses a supercapacitor as a medium to achieve active energy transfer equalisation.

This equaliser is suitable for 2 to 24 series battery packs and is equipped with voltage acquisition and equalisation functions. The equaliser operates with a continuous equalisation current of 15A for energy transfer and the equalisation current does not depend on the differential voltage of the series cells in the battery pack. The voltage acquisition range is 1.5V~4.5V with an accuracy of 1mV and is suitable for the mainstream Li-ion ternary, LiFePO4 and LiTiO2 batteries.

This equaliser is equipped with Bluetooth communication and a mobile phone APP. You can connect to the equaliser via Bluetooth to check the voltage of the single battery, check the equalisation status and modify the setting parameters.

It can be used in the battery PACK of small sightseeing vehicles, mobility scooters, shared cars, high-power energy storage, base station backup power, solar power stations, etc. It can also be used for battery balancing maintenance and repair.

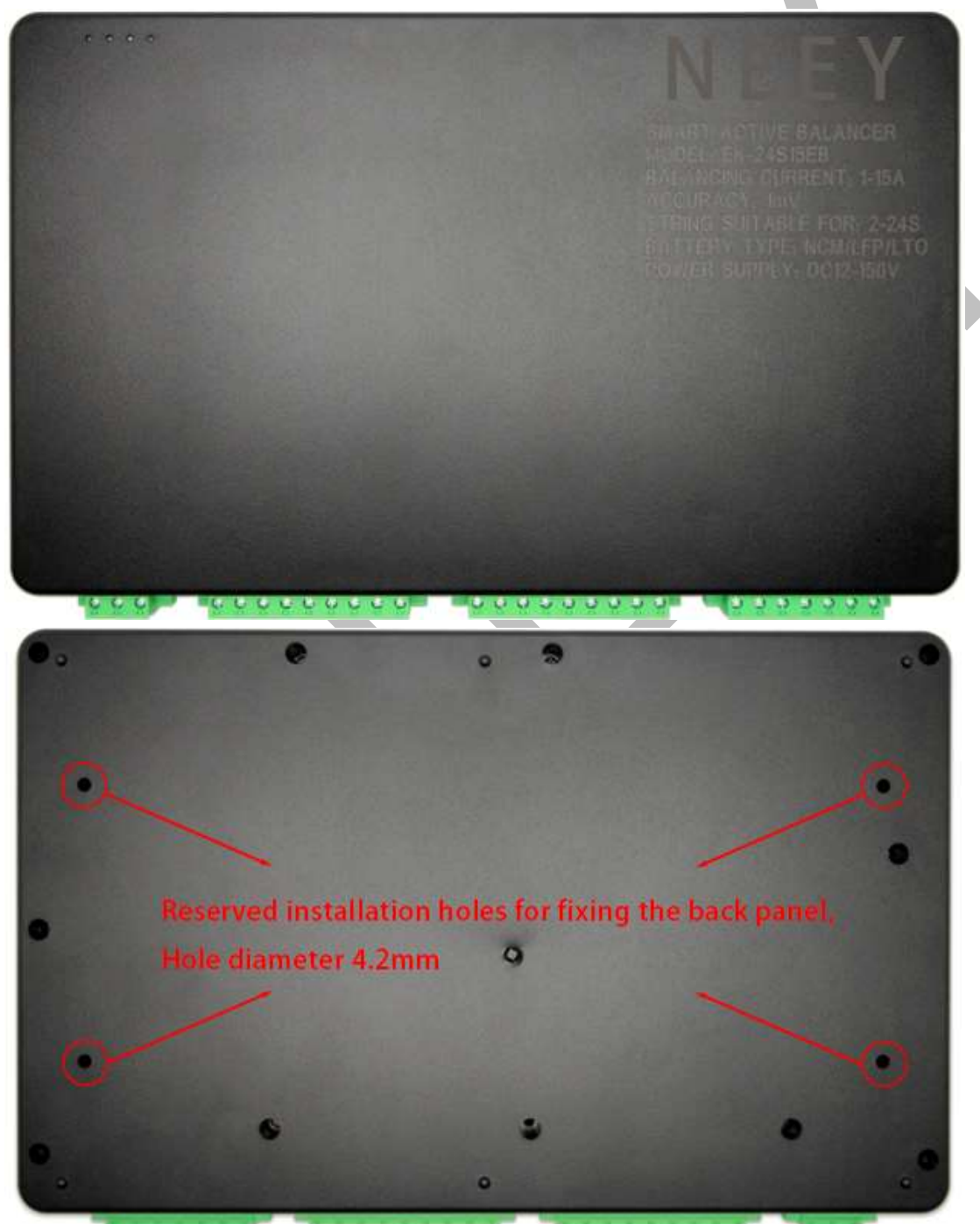
2 Main technical parameters

Model number	EK-24S15EB
Number of applicable strings	2S-24S
Cascade	Cascade support
Dimensions	L313 x W193 x T43 (mm)
Weight (without packaging)	2530g
Reverse connection protection	Supports disorderly power-up detection/protection
External power supply	DC 12-120V
Supported battery types	Lithium Trital Cells (NCM) / Lithium Iron Phosphate (LFP) / Lithium Titanate (LTO)
Monoblock voltage operating range	1.5V~4.5V
Sleeping voltage for undervoltage protection	Customizable APP setting : 1.5-4.2V
Balancing methods	Time-sharing single channel transfer, point-to-point energy transfer.
Balanced current	Customizable APP setting : 1A~15A
Voltage equalisation accuracy	Customizable APP setting : 1mV (typical)
Does it require an external power supply	Can be battery powered (3mV accuracy), externally powered (1mV accuracy)
Power down detection function	Supports power-down detection
Miswiring protection	Support for mis-wiring protection

Fault alarm function	Support for fault alarm connection
Buzzer	App customizable settings
Power consumption	≈ 1W with equalisation system on, ≈ 0.5W with equalisation system off
Operating ambient temperature	-20° to +45°

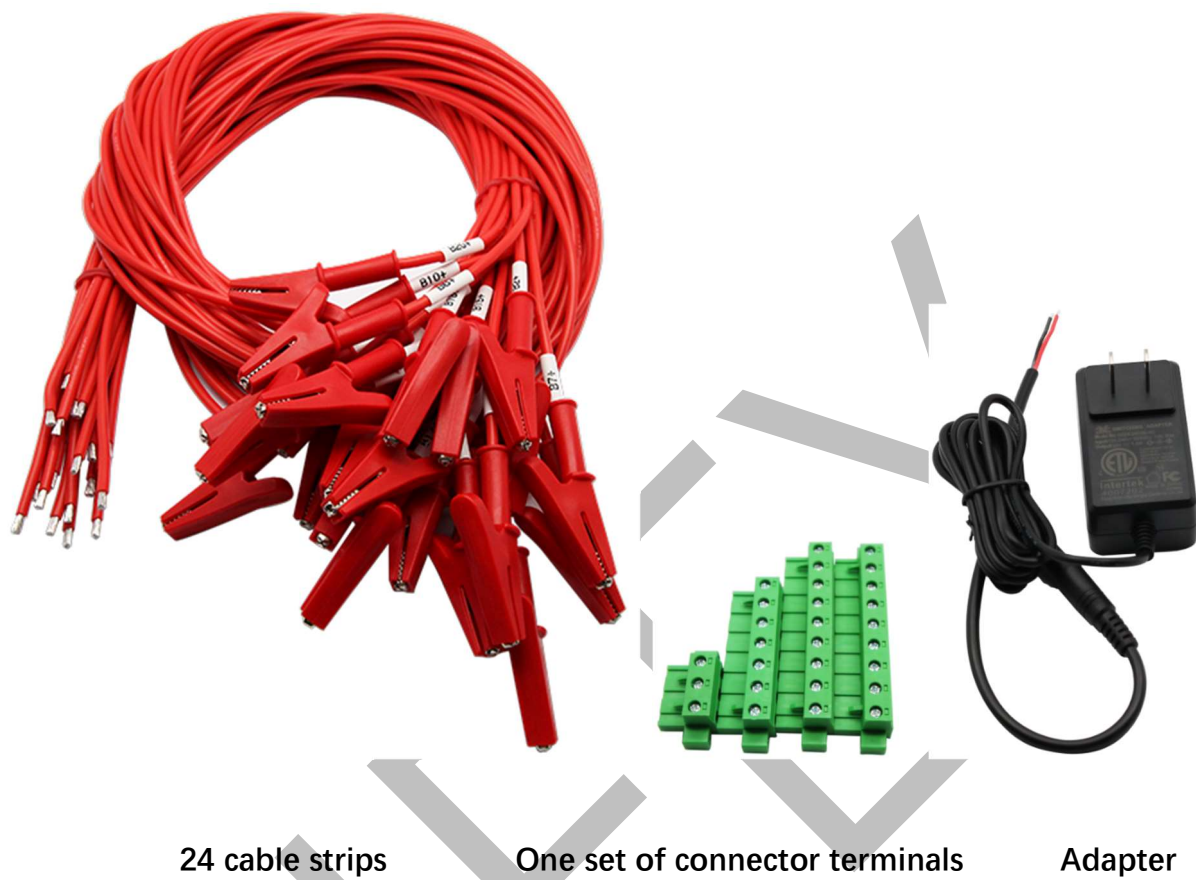
3 Product images

3.1 Product shape



3.2 Accessories

Note: Accessories are shipped in a separate package, please do not leave out.



3.3 Connectors

3.3.1 Connector pictures



3.3.2 Connector pinout

Connectors	Pin No.	Name	Definition
P1	1	IN-	Input negative (DC12-120V)
	2	NC	Empty
	3	IN+	Input positive (DC12-120V)
P2	1	B0	Series 1 negative battery terminal
	2	B1	Series 1 positive battery terminal
	3	B2	2nd string positive battery terminal
	4	B3	3rd string of positive battery terminals
	5	B4	4th string positive battery terminal
	6	B5	5th string positive battery terminal
	7	B6	String 6 positive battery terminal
	8	B7	Series 7 positive battery terminal
	9	B8	Series 8 positive battery terminal
P3	1	B9	Series 9 positive battery terminal
	2	B10	Positive battery terminal of the 10th series
	3	B11	Series 11 positive battery terminal
	4	B12	Positive battery terminal of the 12th string
	5	B13	String 13 positive battery terminal
	6	B14	Series 14 positive battery terminal
	7	B15	Series 15 positive battery terminal
	8	B16	16th string of positive battery terminals
	9	B17	Series 17 positive battery terminal
P4	1	B18	Positive battery terminal of the 18th string
	2	B19	String 19 positive battery terminal
	3	B20	Positive battery terminal of the 20th series
	4	B21	Series 21 positive battery terminal
	5	B22	22nd string of positive battery terminals
	6	B23	23rd string of positive battery terminals
	7	B24	Positive battery terminal of the 24th series

3.3.3 External TTL communication interface



External TTL Interface type: JTC8; (PITCH): 2.54mm

3.3.4 Password reset switch



4 Indicator light description



green – power status indicator;

always on: power supply normal;

Blue – Bluetooth status indicator;

always on: successful connection; **Flashing:** Connection disconnected.

yellow – working status indicator;

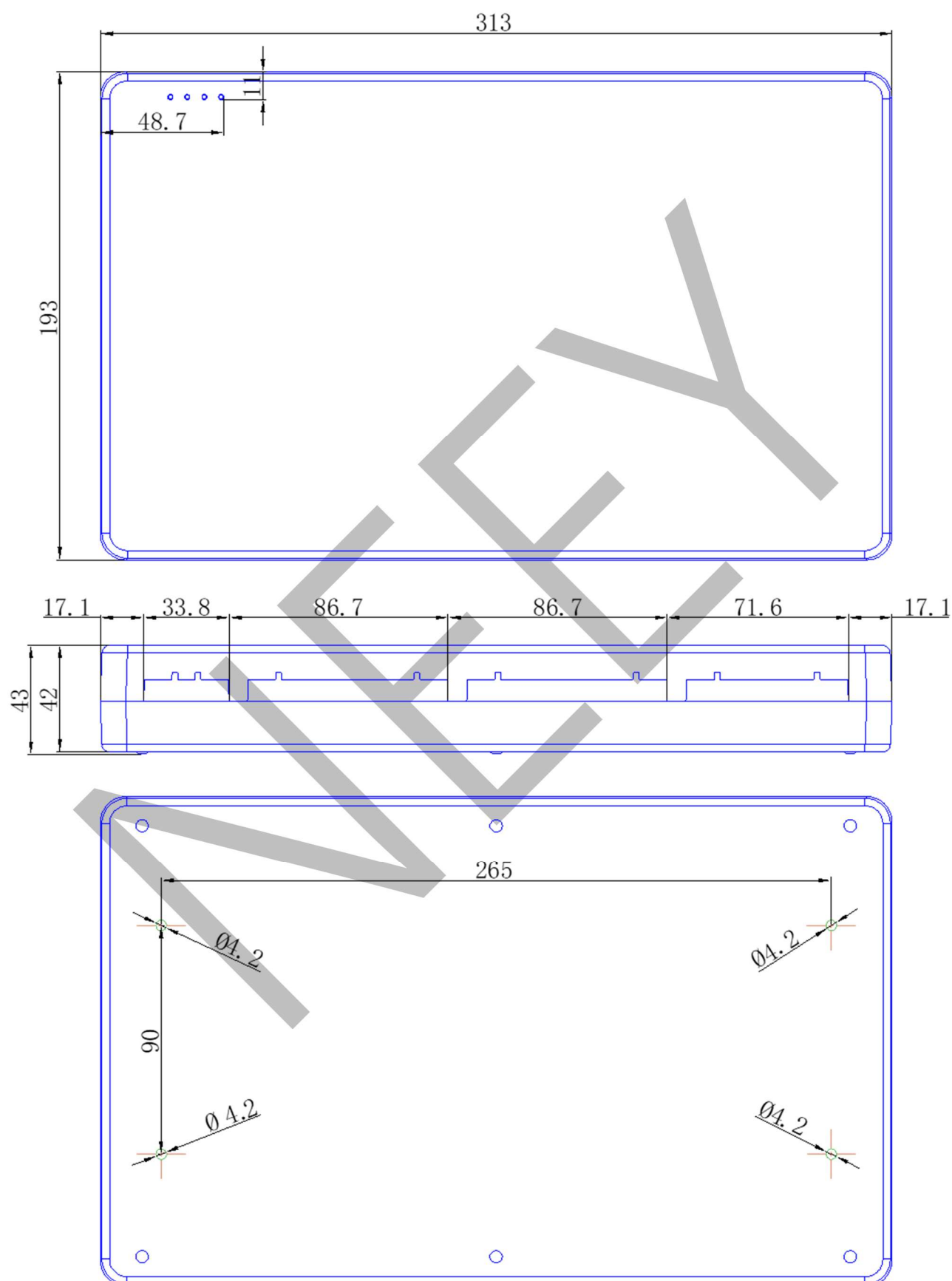
always on: equalisation complete; **Flashing:** balanced work in progress.

red – fault status indicator;

always on: internal fault; **Flashing:** Battery test does not pass.

5 Product size

Unit: mm



6 Introduction to homeostasis

6.1 Principle of equilibrium

The equalisation process of this active equaliser consists of three steps, which are cycled sequentially until the maximum differential pressure is within the set range as follows:

1. detection of the largest and smallest monomers;
2. the maximum single unit charges the supercapacitor in the equaliser with a set current of 15A maximum;
3. supercapacitor in the equalizer discharges the smallest single unit with a set current of up to 15A;
4. Cycle steps 1 to 3 in sequence until the differential pressure is within the set range.

6.2 Single removal capacity

Equation for calculating the capacity of a single move of the equaliser: $\text{equalisation current} / 60$.

For example, if the equalisation current is 15A, the single move capacity is 0.25AH.

If the capacity of the battery being equalised is small or the difference in capacity is small, there will be too much capacity shift, for example, if the difference in capacity between the largest unit and the smallest unit is 0.1AH, and the equalisation current is set to 15A, there will be too much capacity shift and the smallest unit will become the largest unit and the largest unit will become the smallest unit after the current equalisation cycle. The simplest solution to this is to turn the equalisation current down.

6.3 Small volume balancing strategy

The 15A equaliser has designed an equalisation strategy to deal with the excessive energy shift that occurs when the capacity difference is small. When the equalisation cycle is completed and the smallest unit becomes the largest unit and the largest unit becomes the smallest unit, the equaliser waits for 3 minutes to allow the battery voltage to recover, if after 3 minutes the maximum becomes the minimum and the minimum becomes the maximum, then the equalisation is indeed over-balanced and the equaliser automatically reduces the equalisation current by half, for example the original 15A equalisation current is now reduced to 7.5A. The current is equalised. If the equalisation is still too high, continue to reduce the equalisation current until the differential pressure is within the set range.

7 Installation method and precautions

7.1 Unpacking inspection and precautions

1. The boxes, equalisers, etc. should be handled gently and not inverted as far as possible;
2. Pay attention to whether the packaging is intact before opening the box, e.g. whether there are signs of impact, damage, etc;

7.2 Description of the installation of the individual equaliser

1. A single equaliser is suitable for battery packs with 2-24 series of cells in series.

IN- is connected to the total negative terminal of the battery pack (B-/B0) and IN+ is connected to the highest level of the

battery pack. As shown in 7.2.1.

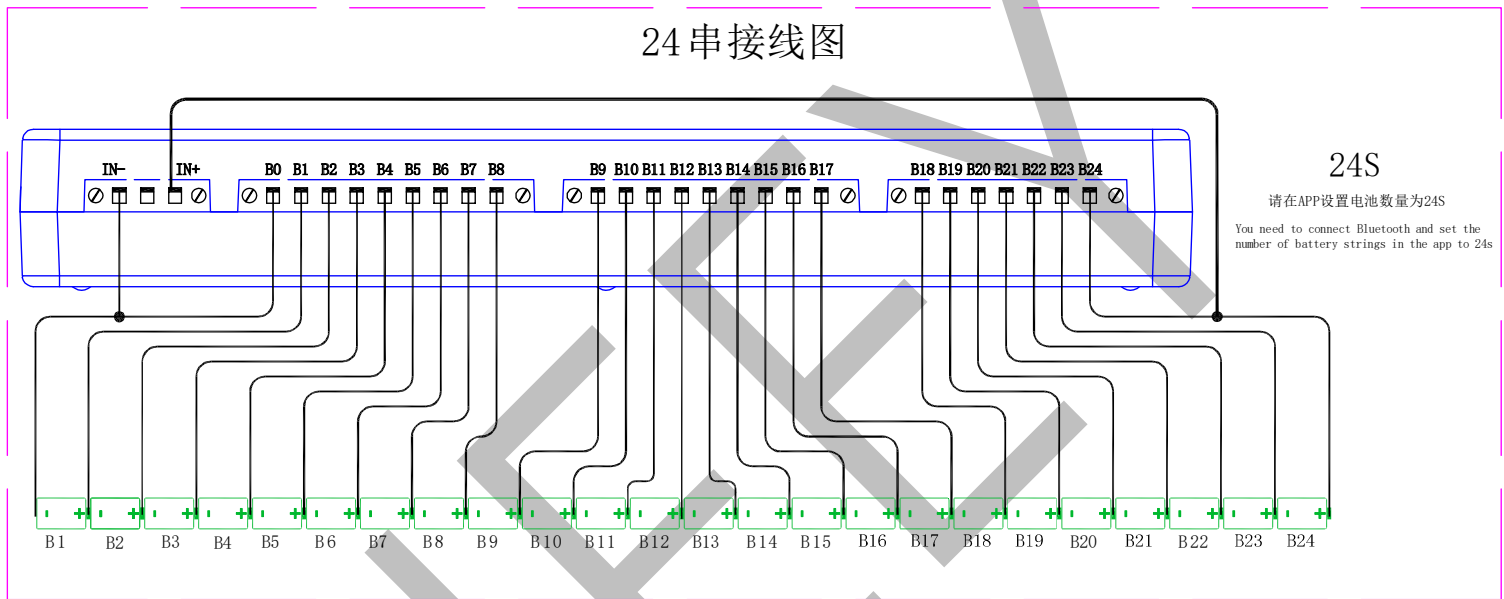
2、When the battery pack voltage is below 12V, the equaliser needs to provide an external DC 12V~120V power supply.

IN- is connected to the negative side of the power supply and IN+ is connected to the positive side of the power supply. As shown in 7.2.3.

3. When used in a battery pack with less than 24 strings of cells in series, the free pins are left hanging. As shown in 7.2.2.

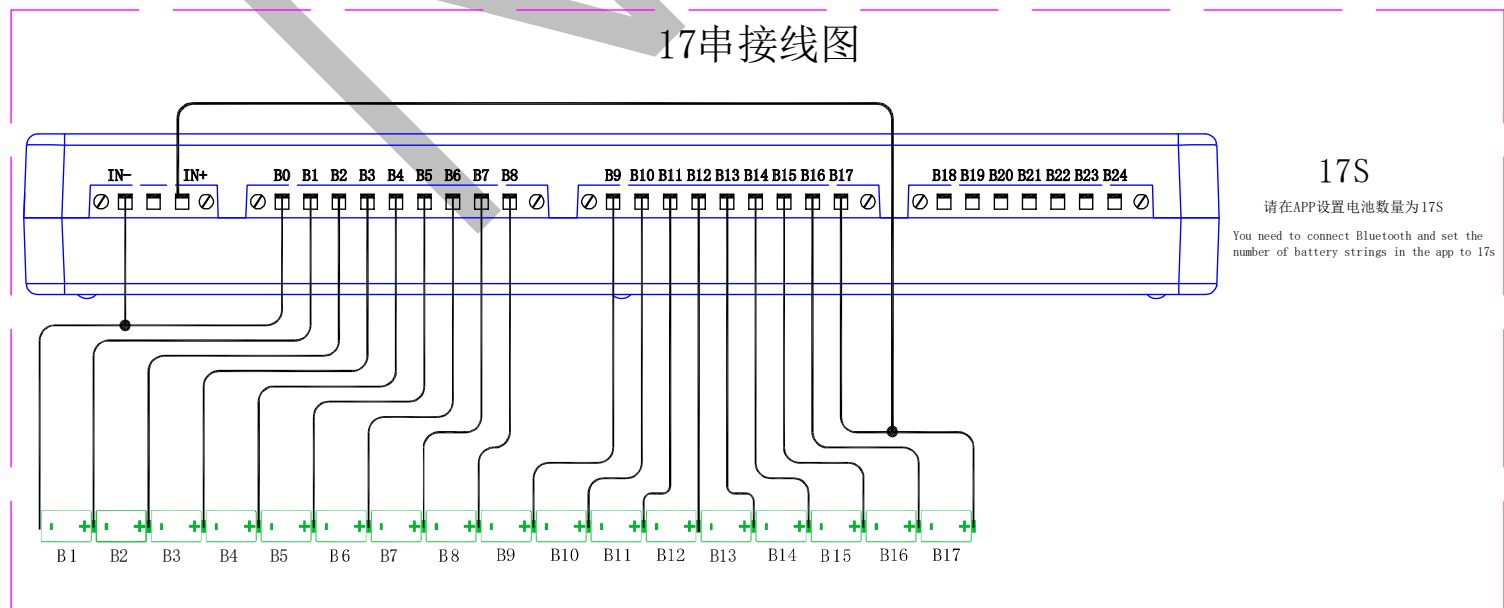
7.2.1 24-string wiring method

For a battery pack with 24 batteries in series, the installation wiring is as shown in the following diagram:



7.2.2 Wiring methods for less than 24 strings

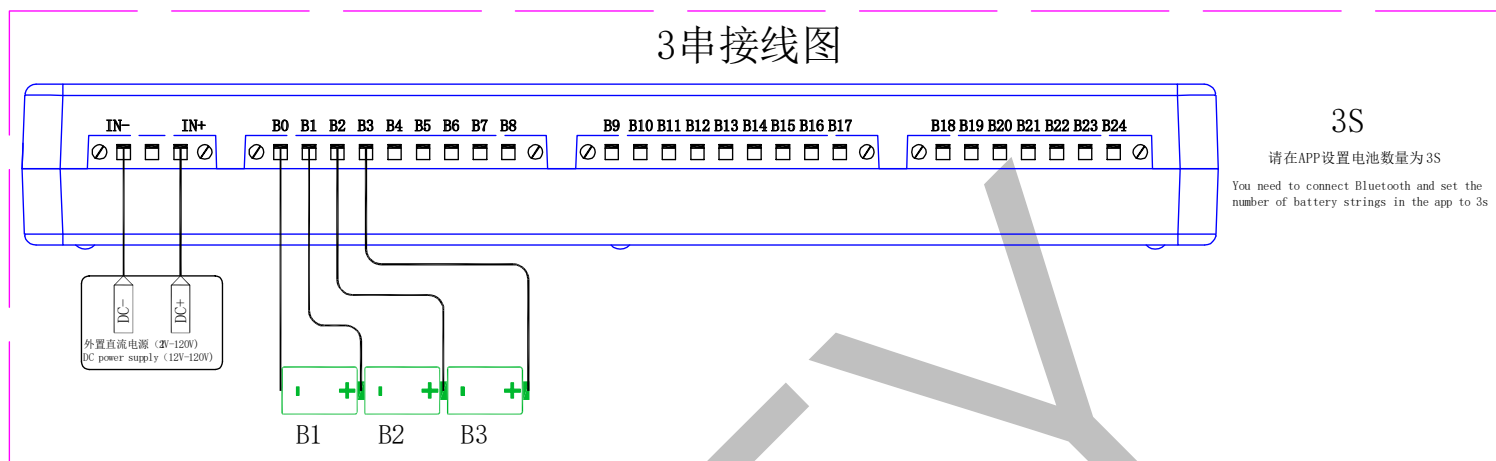
For battery packs with less than 24 strings of cells in series, the installation wiring is as shown in the following diagram (17 strings as an example):



7.2.3 Wiring when the battery pack voltage is below 12 V

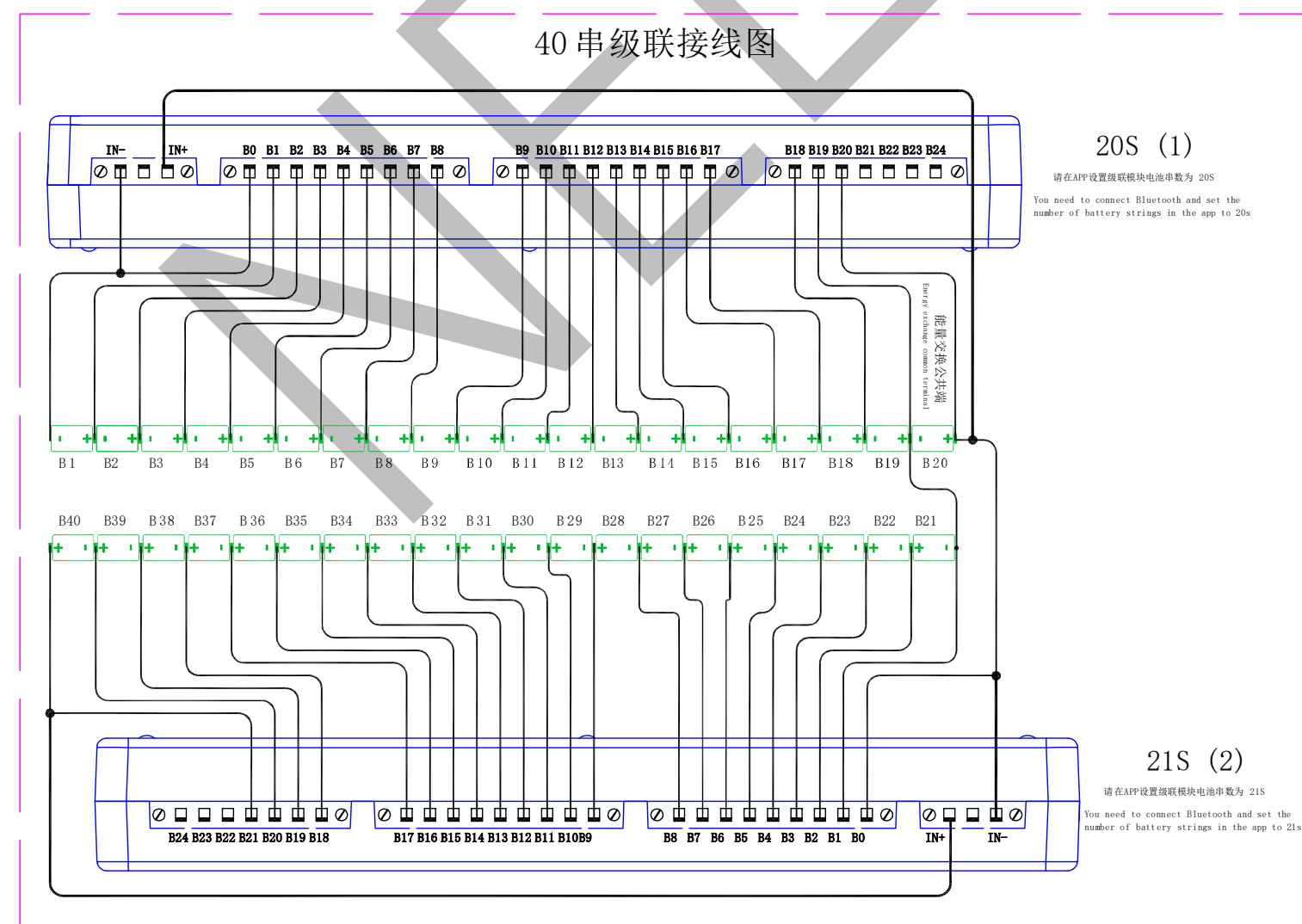
For battery pack voltage below 12V, external DC 12V-120V power supply is required, please use our matching power adapter.

The installation wiring is shown in the following diagram (example of 3 strings):



7.3 Description of the installation of multiple equalisers

The EK-24S15EB supports cascade use, with cascade installation wiring as shown in the following diagram (40 strings as an example):



8 APP installation and use

8.1 APP Installation

APP has Android Chinese/English version, foreign users can search in Google Apps Market: NEEY

8.2 APP use

1、Check before use

After downloading the app, be sure to turn on location and location information and allow the app to use location information, not turning on location will result in the equaliser not being searched.

Before switching on the power supply, please make sure that the equaliser cables are connected properly, that the power supply to the equaliser is within the required range, that the equaliser has been placed securely and that there are no short circuits on the circuit board, etc. Make sure this is correct before switching on the equaliser.

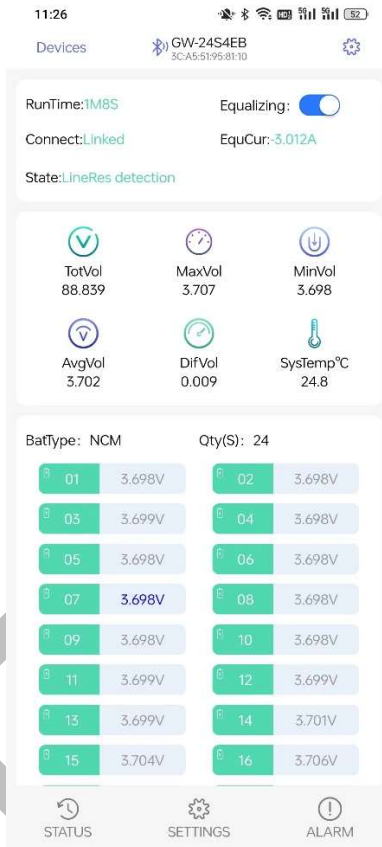
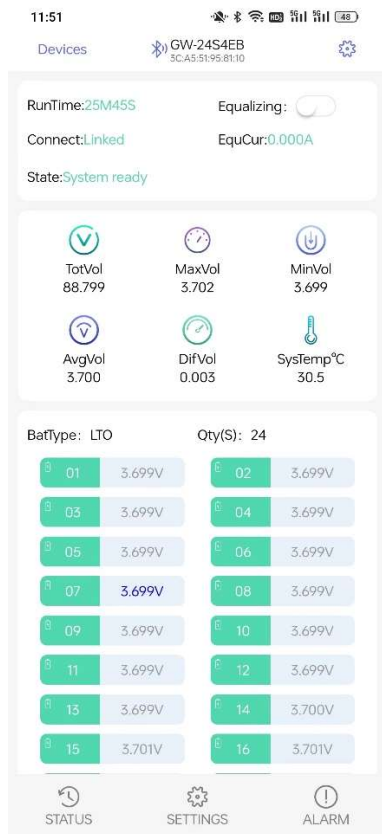
2. Equipment operation

Step 1, connect the device (be sure to turn on location and location information and allow the app to use location information), as shown below;

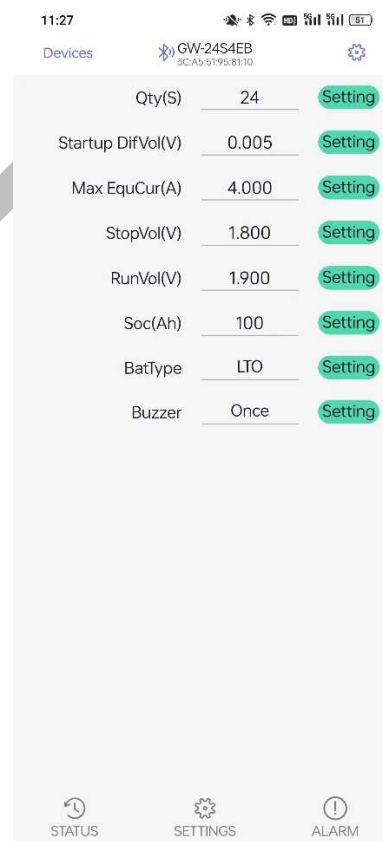
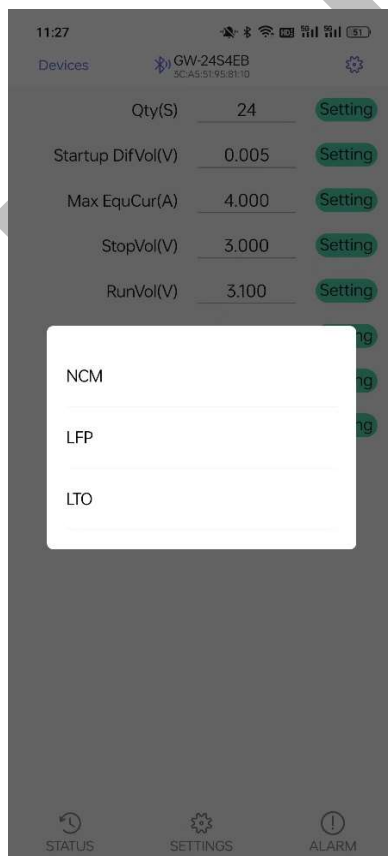
the system will automatically start scanning the device once the unconnected device enters the app;

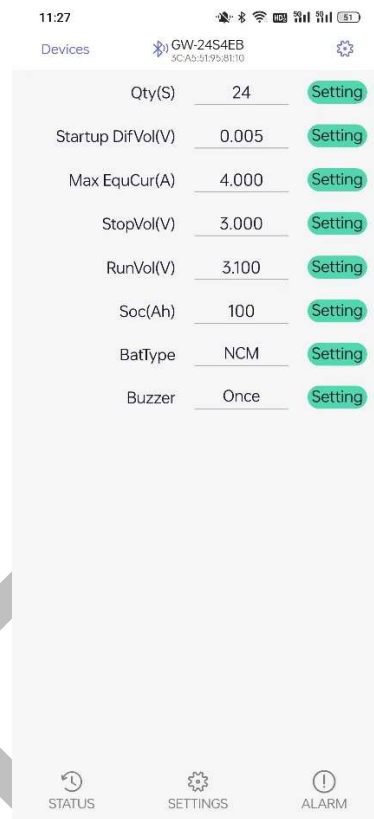
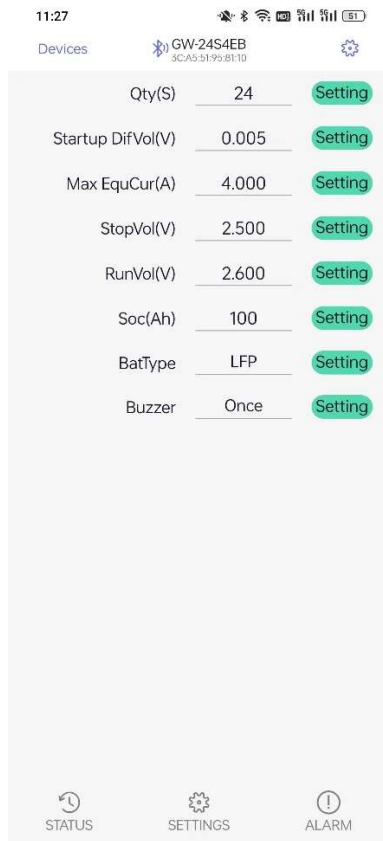


Step 2. After successful connection, activate the equalization switch as shown below;

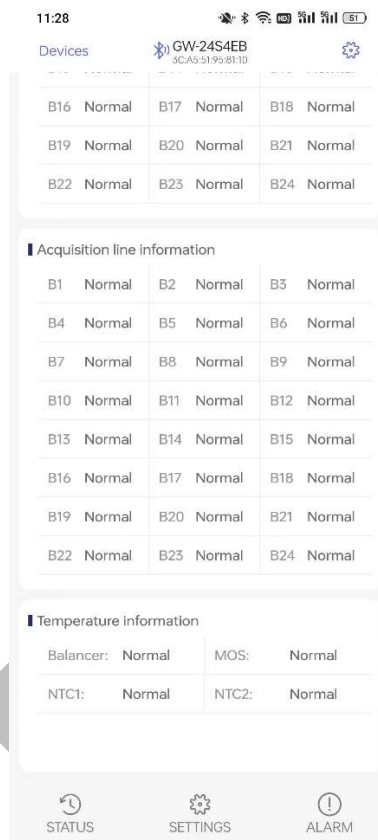
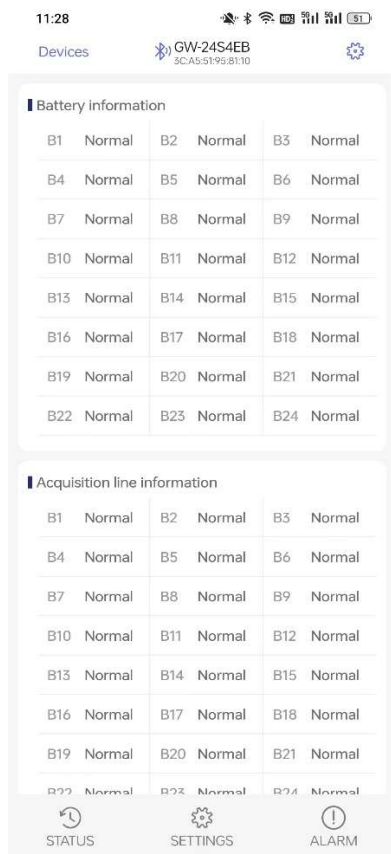


step 3, change the parameters according to the battery type and the number of battery strings (a password is required to enter the settings for the first time), as shown in the figure below;

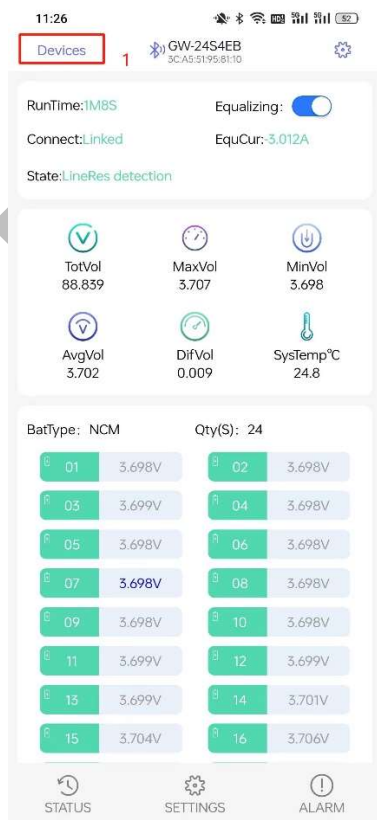




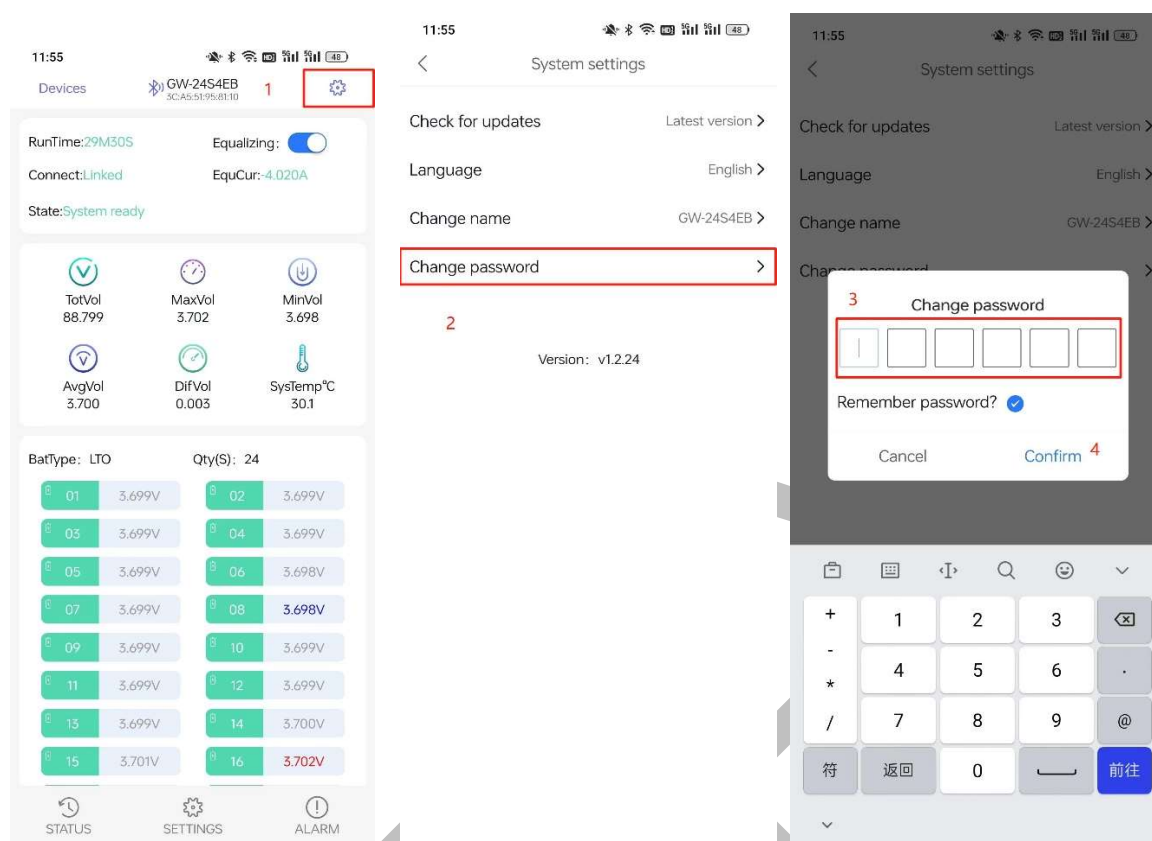
Step 4: Once the required parameters have been set, the parameters of each individual unit can be monitored from the "Status" or "Alarms" page;



To change the connecting device, proceed as shown below:



Finally, the steps to change the device password are attached, as shown below;



9 General fault analysis and troubleshooting

Serial number	Failure phenomena	Cause Analysis	Solutions
1	Power indicator does not light up	Improper power supply to the equaliser	① Check that the equaliser power supply pins are correctly connected; ② Determine if the battery pack voltage is less than 12V. If it is less than 12V use the matching power adapter to power the equaliser.
2	No equipment searched	APP does not have the relevant authorisation	Check that Bluetooth is on; turn on location and location information and allow the app to use location information.
3	Equalizer does not turn on	Equaliser does not meet operating conditions	Check if the voltage of the first string of batteries is above 2.4V, if the condition is not met, please charge the batteries to above 2.4V, then the equaliser will automatically switch on.
4	APP prompts for single unit settings	Wrong number of monoblock settings or	Check that the number of individual settings is the same as the number of batteries connected.

	Quantity does not match the set value	abnormal equalisation line connection	
5	APP prompts for equalisation Line resistance is too high	Excessive resistance of the wire from the battery to the connector	Check the connection wire from the battery unit to the connector for poor contact, if there is no poor contact, replace the wire.
6	Inaccurate voltage collection	Wrong wiring or wrong parameter setting	Check the connections one by one to eliminate connection errors. Fine tune with the voltage acquisition reference until the acquisition is accurate.

The above are the possible causes and solutions for common faults, if you still do not troubleshoot, please contact Powerwell Power Supply after-sales.

10 Safety and protection measures and transport and storage

10.1 Safety and protection measures

1. The equaliser itself does not have high voltage and will not cause electric shock damage to the body.
2. There are no user serviceable parts inside the equaliser. All repairs should be carried out by qualified service personnel. If the factory-set operating voltage is changed, the safety certificate of conformity no longer applies.
3. Before touching the sampling line of the equaliser, the person performing the operation must discharge the static electricity himself and take anti-static measures.

10.2 Transport

After packing, the product is not directly affected by rain or snow and can be transported by the usual means of transport under violent collisions and bumps. It is not allowed to be placed together with corrosive substances such as acids and alkalis during transport.

10.3 Storage

The packaged products should be stored in a permanent warehouse with a temperature of 0C to 35C and arelative humidity of not more than 80%.The warehouse should be free of acid alkali and corrosive gases, stronginstitutional vibrations and shocks, and strong magnetic fields.