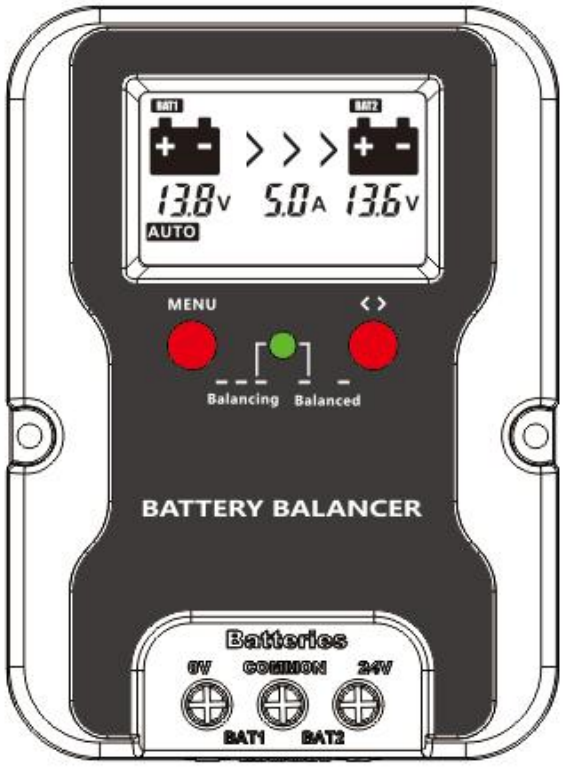
User's Manual



Battery Balancer

Your Battery Guard

Product Introduction

In a 24 or 48V battery pack, the capacity of individual batteries connected in series may change over time under extreme working conditions and frequent charging and discharging cycles, leading to voltage differences. Due to the differences, during the charging and discharging process, the batteries in the battery pack may experience overcharging or overdischarging, while the other battery may experience insufficient charging or discharging. Over time, this type of problem further intensifies, ultimately leading to a failure of one of the batteries in the battery pack. At this point, the entire battery pack is considered invalid and all batteries in the battery pack must be replaced. Replacing only the faulty battery itself does not solve the problem, as the characteristics of the replaced battery will differ significantly from those of other batteries in the battery pack, which will cause the battery pack to malfunction again.

The traditional passive energy consuming battery balancer ensures that all batteries are concentrated in the same voltage state during the charging process by consuming the energy of the higher voltage batteries in the battery pack. This method increases energy consumption and is not effective when the voltage difference is large. And it has no effect on the imbalance during the discharge process of the battery pack.

The GD series intelligent active battery balancer automatically detects the battery voltage during the charging and discharging process, adopts a bidirectional energy transfer balance, and transfers the energy of the high voltage battery to the low voltage battery through energy transfer, thereby achieving equal voltage between the two batteries. High conversion efficiency and fast

speed to achieve balance. The working mode and balance parameters can be set through the menu, which is suitable for various application scenarios of customers. Using a GD balancer in a newly installed battery pack can effectively prevent overcharging and overdischarging of the battery, extending its service life. After using the battery pack for a period of time, it can repair the imbalance of the battery. At the same time, using GD balancer can effectively solve the problem of not mixing old and new batteries, and not mixing batteries of different brands and capacities.

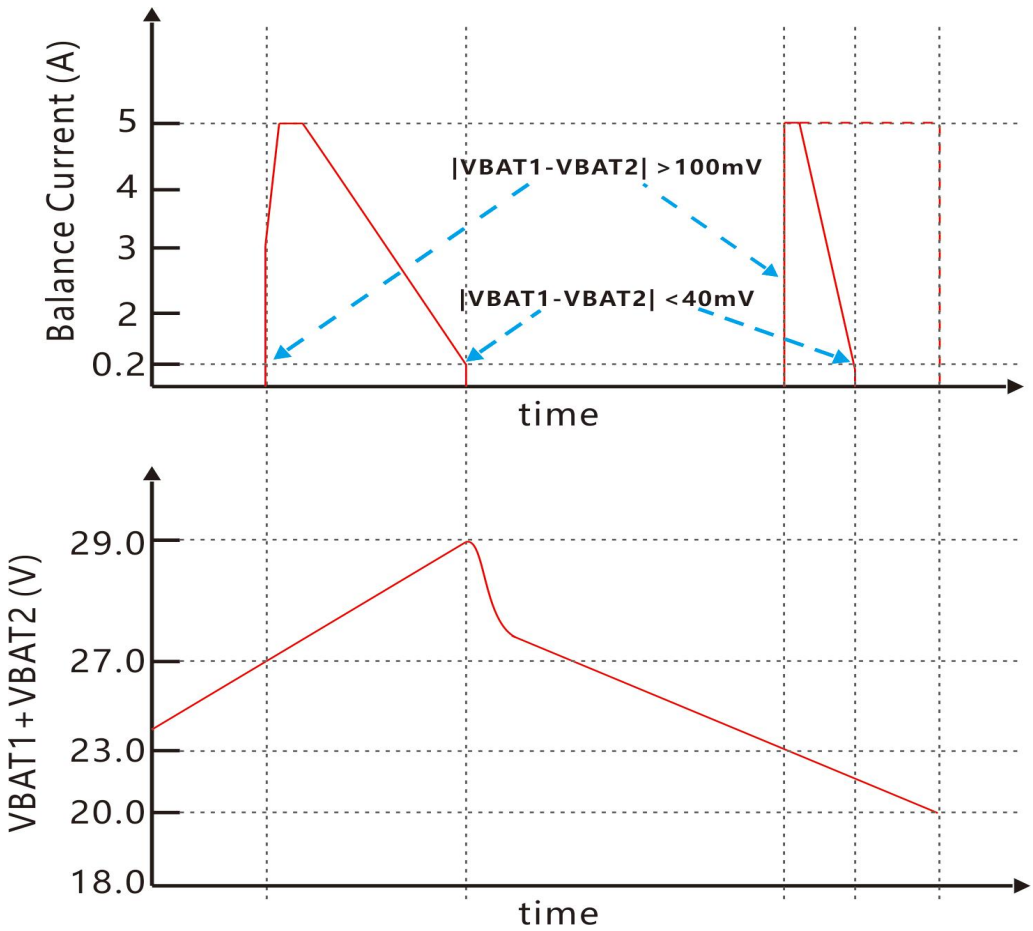
Main Function

- Adopt energy transfer for active equalizing
- The maximum conversion efficiency is up to 92%, the maximum equalizing current is 5A, and the equalizing accuracy is 40mV.
- Both equalizing current and equalizing voltage can be set.
- Different equalizing modes can be selected according to different application scenarios.
- Full protection functions: battery reverse protection, over temperature protection, and over current protection.

Introduction to Work Mode

1. **Automatic equalizing mode:** mainly used for battery packs that are not severely equalized or newly installed. Only eliminate the imbalance phenomenon when the battery pack reach to fully charged or low voltage, maximize the protection of the battery without causing additional losses caused by energy transfer. (Slight imbalance in other voltage ranges will not cause damage to the battery)

Start equalizing process: If | VBAT1-VBAT2 |>100mV is detected and the voltage of the battery pack is>27.0V or<23.0V after power on, the maximum current will be activated for equalizing. When | VBAT1-VBAT2 |<40mV and the equalizing current<0.2A, the equalizing stops.



2. **Forced equalizing mode:** Used for severe imbalance or mismatched battery capacity, supporting mixed use of different capacities, brands, and old and new batteries.
   Start process: After selecting the forced equalizing mode, as long as | VBAT1-VBAT2 |>100mV, the battery pack will be equalizing in any voltage range, with a maximum equalizing current of 5A. When | VBAT1-VBAT2 |<40mV and the equalizing current<0.2A, the equalizing stops. **Attention: If there is a significant**

difference in capacity between two batteries, there may still be a risk of imbalance between the two batteries when the battery pack reaches its maximum equalizing current during 10A charging and discharging

3. **Stop equalizing mode**：stop equalizing and run at the lowest power consumption.
4. **Manual equalizing mode**：Used for testing balancer or temporarily equalizing batteries.

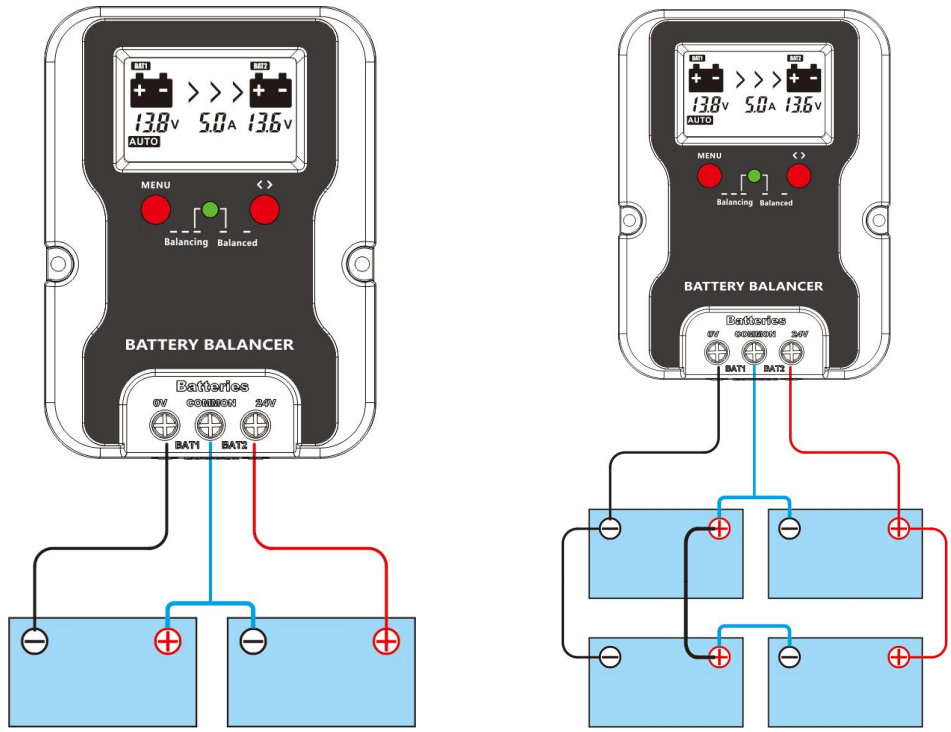
Start process: If the current state is in a stop balance state and | VBAT1-VBAT2 |>100mV, short press the operation button on the main interface to activate manual mode. Regardless of the voltage range in which the battery pack is equalizing, it will be turned on to balance at a maximum equalizing current of 5A. When | VBAT1-VBAT2 |<40mV and equalizing current<0.2A, the balance stops and exits manual mode, returning to the previously set mode for operation.

If the state is in equalizing, short press the operation button on the main interface will force the equalizing to stop. Press again will turn on equalizing.

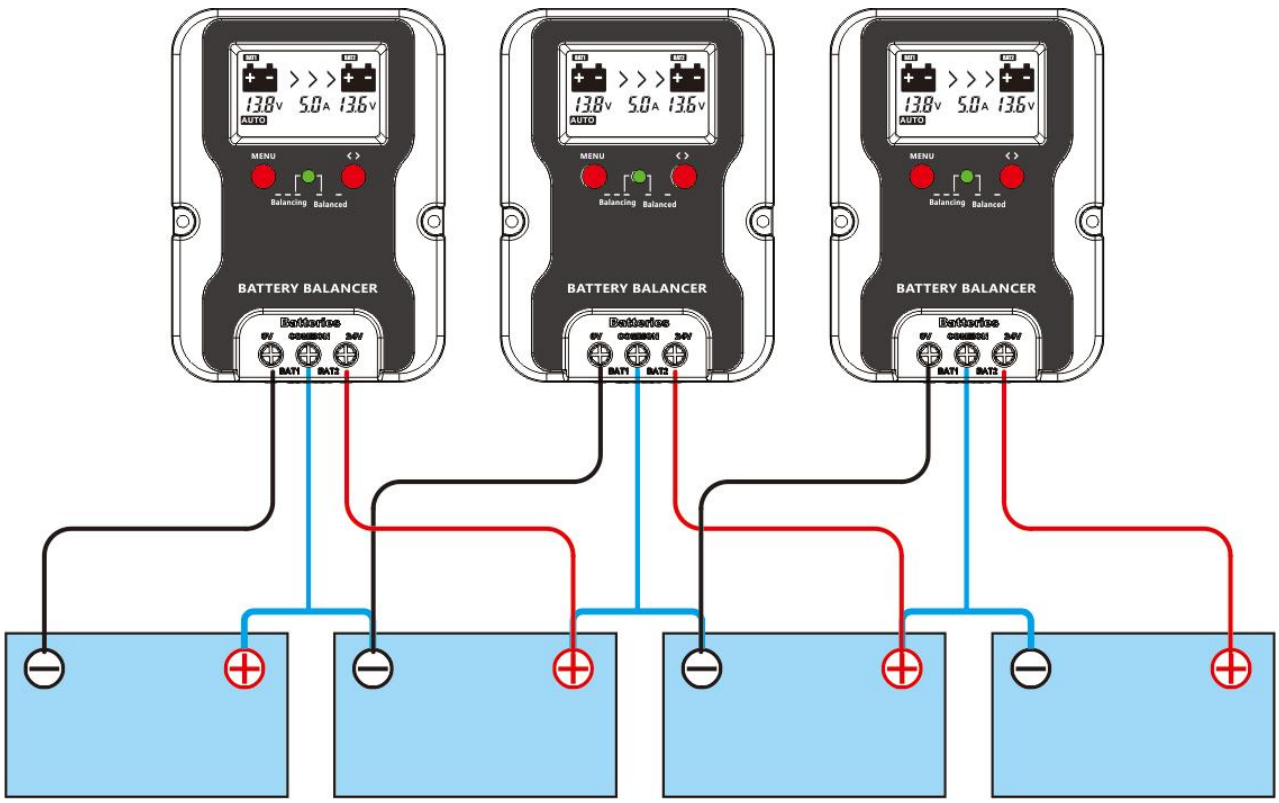
Connection and Installation

1. Please connect the balancer to the battery pack in the following order：

(1) “24V” Port connected to the positive pole of the battery pack
(2) “0V” Port connected to the negative pole of the battery pack
(3) “COMMON” Port connected to the middle node of two series connected batteries

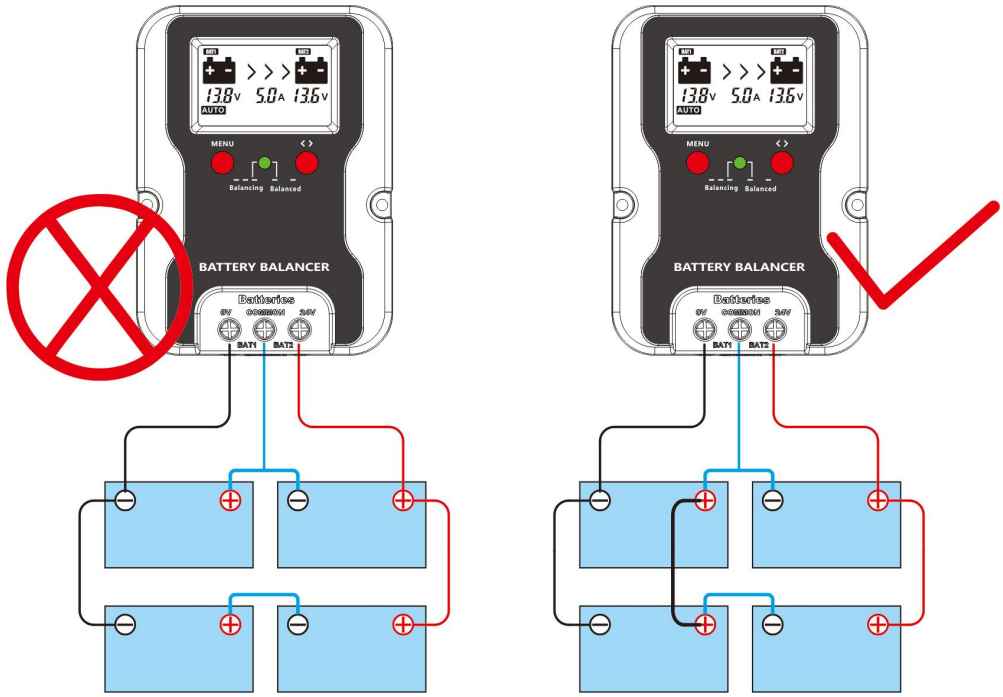


24V Battery pack connection



48VBattery pack connection

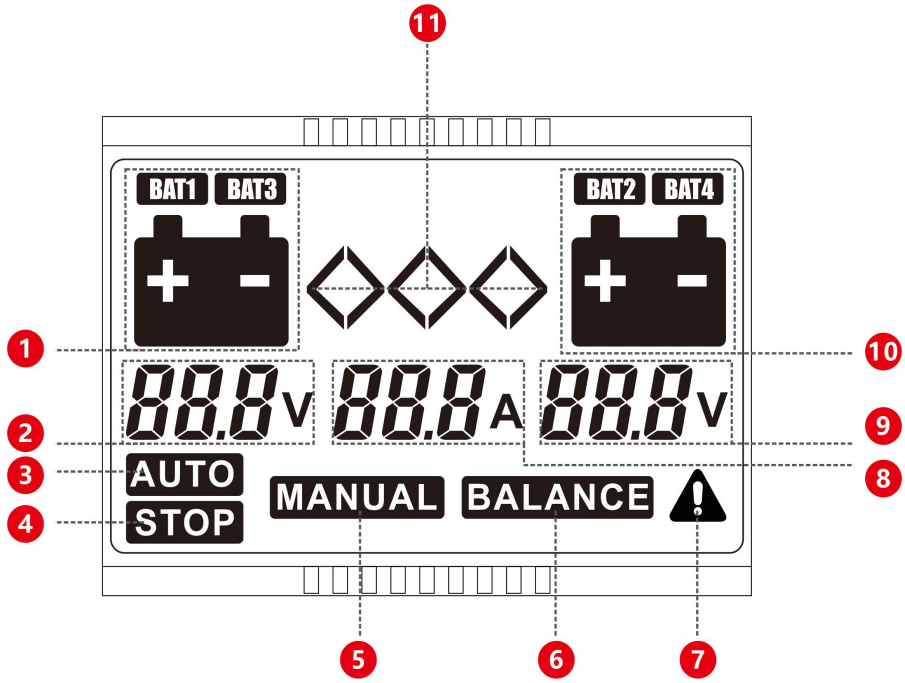
For multiple series and parallel connected battery packs, it is necessary to connect the intermediate nodes of each string in order for the balancer to work on each string



2. The area of the wire connecting the balancer to the battery shall not be less than 1mm^2。
3. Before connecting the battery balancer, please confirm the positive and negative poles of the battery pack and the voltage of the battery pack. Avoid short circuits and reverse connections during wiring.

Interface display and Operation

1. Interface display



Number	Explanation
①	Battery1, Battery3
②	BAT1、BAT3 voltage display
③	Automatic equalizing mode
④	Stop equalizing mode
⑤	Manual equalizing mode
⑥	equalize indication
⑦	Fault indication
⑧	equalize current display
⑨	BAT2、BAT4 voltage display
⑩	Battery 2, Battery4
⑪	equalize direction

2. Button

Mode	Illustrate
Manual on/off balancer	Short press the operation button **(<>)** to turn on and off the balancer
Browse mode	Short press the menu button **(MENU)** to enter the menu page
Setup mode	Brows to the submenu page, press the menu button **(MENU)** for more than 5 seconds to enter the settings mode. Short press the operation button **(<>)** to set parameters Long press the menu button **(MENU)** to confirm, or automatically exit the setting interface mode after 10 seconds of inactivity.

3. Indicator

Color	Condition	Explanation
Green	Off for 2 seconds and on for 0.2 seconds	Stop equalizing
	On for 2 seconds, off for 0.2 seconds	Manual turn off equalizing
	Fast flashing	equalizing
Red	Fast flashing	Fault

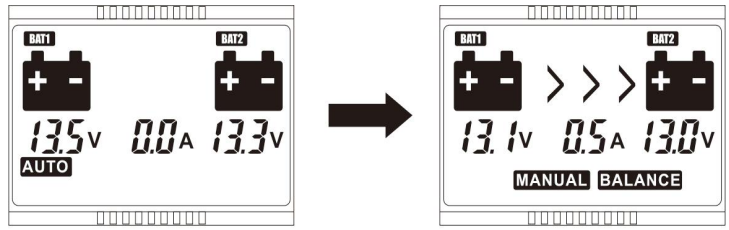
4. Fault Code

Fault code	Explanation
E01	Battery pack low voltage
E02	BAT1 low voltage
E03	BAT1 over voltage
E04	BAT2 low voltage
E05	BAT2 over voltage
E06	Over current protection
E07	Over temperature protection

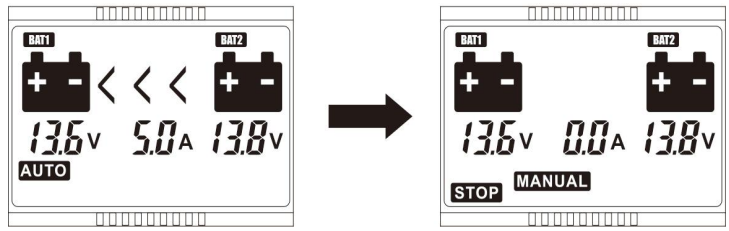
5. Browsing Interface

(1) The main interface displays battery voltage, balance status, and balance current. Pressing the operation button on the main interface can activate manual mode once. When the voltage difference between the two batteries is more than 0.1V, the balance mode can be forcibly turned on; It is also possible to manually turn off the normal balance mode in progress. (If the battery is in a equalizing state, manual mode cannot be activated)

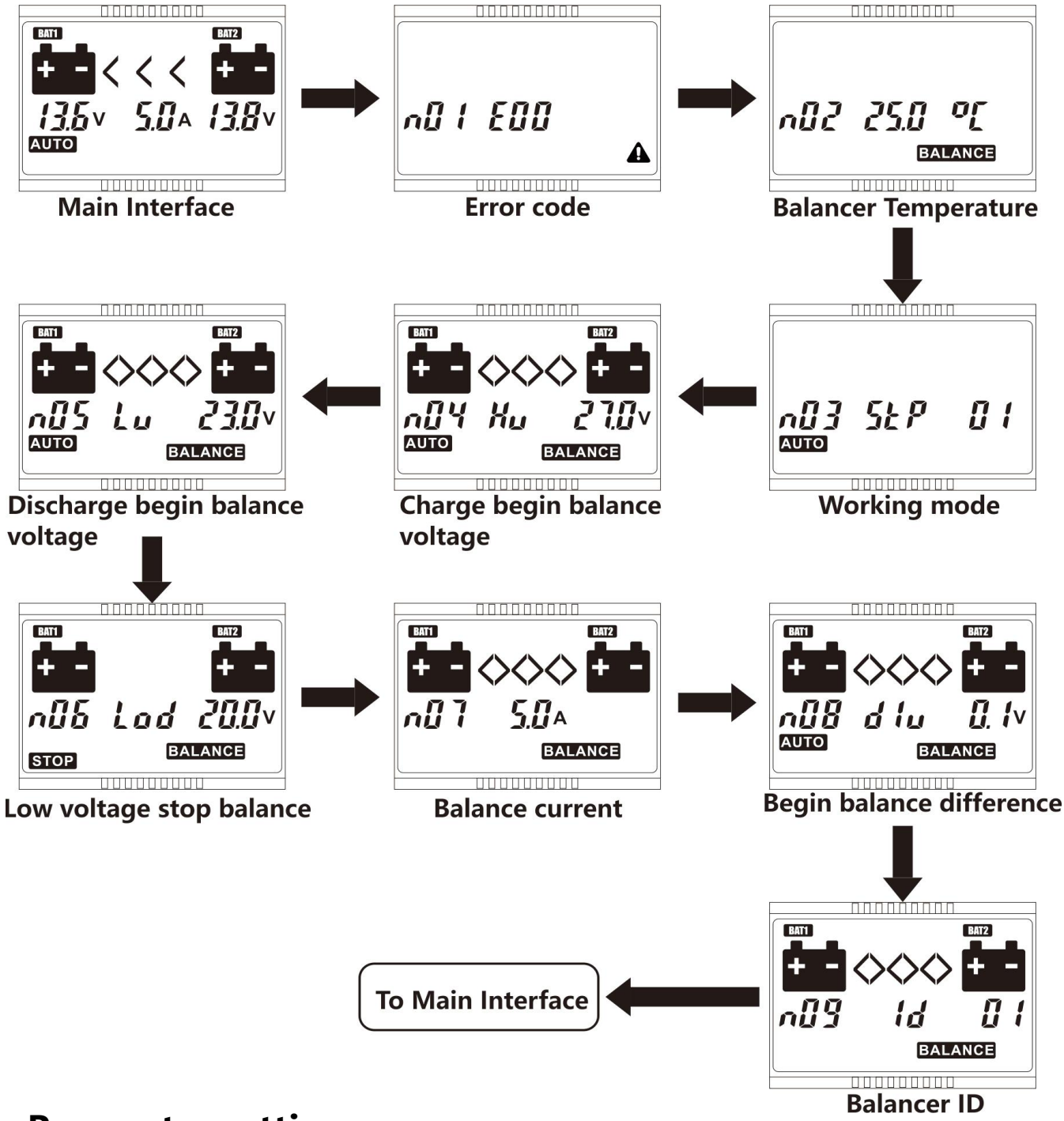
Manual Start equalizing
(Press operation button)



Manual Stop equalizing
(Press operation button)



(2) Press the menu button on the main interface to enter the menu page



6. Parameter settings

(1) Work Mode Settings

The balancer can be set to the following three work modes

Mode	Function
STP 00	Stop equalizing Mode：The balancer will start equalizing under any condition
STP 01 (Default)	Automatic equalizing Mode：When the voltage drop between BAT1 and BAT2 reaches the set value, detect the total voltage of the battery pack, and automatically start and stop the balancer based on the set value
STP 02	Forced equalizing Mode：When the voltage drop between BAT1 and BAT2 reaches the set value, equalizing will be activated regardless of the voltage of the battery pack

Working mode

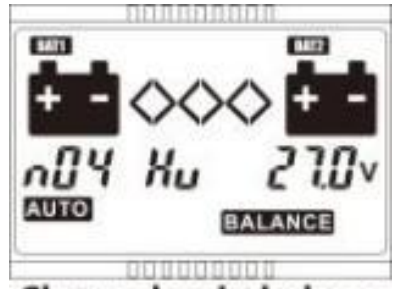
Operation:

Step 1 In the main interface display state, short press the menu button to enter the mode setting interface (as shown in the right figure)

Step 2 Long press the menu button until the value flashes to enter the setting state

Step 3 Short press the menu button or operation button to adjust the value

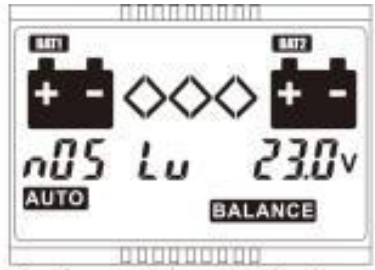
Step 4 After setting up, long press the menu button to save the settings. If there is no operation within 20 seconds, the balancer will automatically return to the main interface.



Charge begin balance voltage

(2) Charging start equalizing voltage

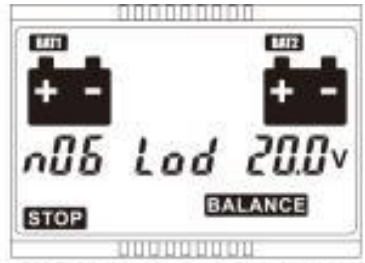
When the mode is set to STP 001, when the voltage of the battery pack is higher than the charging start equalizing voltage, and there is a voltage drop between BAT1 and BAT2, the balancer starts equalizing. The operation method is the same as "1"



Discharge begin balance voltage

(3) Discharging start equalizing voltage

When the mode is set to STP 001, when the voltage of the battery pack is less than the discharge start equalizing voltage, and there is a voltage drop between BAT1 and BAT2, the balancer starts equalizing. The operation method is the same as "1"



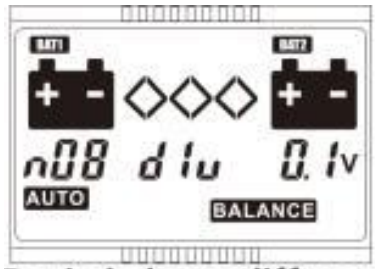
Low voltage stop balance

(4) Low voltage stop equalizing voltage

When the voltage of the battery pack is less than the low voltage stop equalizing voltage, the balancer stops equalizing. The operation method is the same as "1"

(5) equalizing current settings

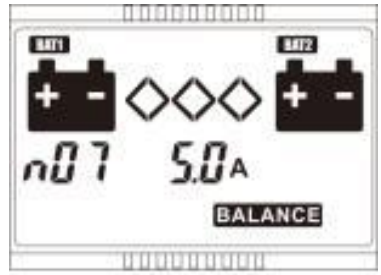
When the battery capacity is relatively small or the imbalance is small, an appropriate equalizing current can be set. When the voltage difference between the two batteries is large, the set current constant 5A default. The operation method is the same as "1"



Begin balance difference

(6) Starting equalizing voltage drop

When the voltage drop between BAT1 and BAT2 exceeds the set value, activate the balancer. When other conditions are met, start the balancer for equalizing. When the voltage drop is less than the starting equalizing voltage drop, the balancer stops. The operation method is the same as "1"



Balance current

Protection Function and Fault Handling

1. Protection Function

Battery Reverse Connection Protection	When the battery is reversed, the equipment will not be damaged and can resume normal operation after correction
Battery Overvoltage Protection	When the battery experiences overvoltage and stops equalizing, it can resume operation after returning to normal voltage
Battery Low Voltage Protection	When the battery low voltage, it stops equalizing and can resume operation after returning to normal voltage
Overheat Protection	When the internal temperature of the controller exceeds 75 ℃, the device begins to reduce the equalizing current. When the temperature exceeds 85 ℃, equalizing stops. After the temperature dropped to 65 ℃, normal operation resumed.
Overcurrent Protection	equalizing constant current output according to the set current value. If a short circuit occurs, the balancer will be turned off and automatically released after 5 seconds.

2. Fault Handling

Fault Phenomenon	Possible Reason	Solution
No display on LCD after power on	1.reverse connection of battery 2.The wires between the battery and the equipment are not connected. 3.Battery low	Ensure that the voltage of the battery pack is above 16V Connect the battery correctly and ensure good wire contact
No equalizing	1.Balance mode setting error 2.The battery pack is not imequalizing 3.Not meeting the conditions for starting equalizing 4.Other protections have occurred	Confirm that the set mode is correct and there are no other faults occurring. Manual mode can be enabled to force equalizing
equalizing current is small	1.The voltage drop between two batteries is too small 2.The area of the wire connecting the battery is not enough	Replace the appropriate wires and ensure that there is a sufficient voltage drop between the two batteries

Technical Data

Mode	24V/5A	48V/5A
Input Voltage range	8---36V	8---72V
Starting equalizing Voltage	27.0V or 23.0V(Mode STP 01)	
Stop equalizing Voltage	20.0V	
Starting equalizing voltage drop	100mV	
Balance accuracy	40mV	
Maximum equalizing current	5A	
Self-consumption	≤6mA	
Working temperature range	-20℃---+50℃	
Protection grade	IP32	
Size	99mm×75mm×32 mm	99mm×150mm×32 mm
Net weight	120g	310g