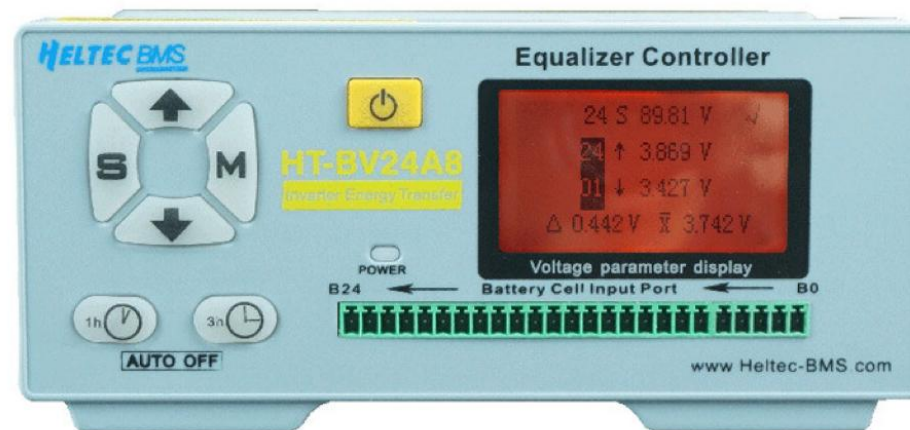




HT-BV24A8

Lithium Battery Pack Voltage Equalization Controller

User Manual



8A Inverter energy transfer equalization .

24-channel battery pack differential pressure analysis analyzer.

Suitable for 2~24S lithium battery packs for 8A inverter energy transfer equalization repair and tester.

Product overview

HT-BV24A8 equalizer controller adopts high-frequency transformer inversion and equipotential isolation coupling energy technology to realize the parallel connection of each series of batteries through equipotential isolation coupling. Based on the parallel connection state, each series of batteries with different high and low voltages realize energy transmission and distribution, and finally realize the high-efficiency and precise balance of the battery pack. The Taiwan main control chip MCU combines with the ultra-low dynamic impedance inverter to obtain the more than 5A balanced current. The precise transformer process and fully symmetrical circuit design can achieve the balanced effect of $\leq 30\text{mV}$.

And the analyzer adopts latest large-scale high-speed MCU chip of American microchip to carry out real-time precision detection of each unit of lithium battery pack. The voltage information collected by the chip is stored and calculated and compared, and the data is processed and displayed on the LCD screen. This detector can detect the voltage of up to 24 series of lithium batteries at the same time, and automatically analyze and compare the voltage. Real-time monitoring equalizing voltage

It is suitable for high-capacity ternary lithium battery pack and lithium iron phosphate battery pack, etc. The maximum equalizing current can reach 8A, and the equalizing voltage difference can reach 30mV; Forced start switch is added to better solve the problem of poor equalization effect.

Product features

1. Automatically analyzing the maximum voltage difference value and the average voltage value of the battery pack. When balancing, it can quickly detect the voltage of each string of the battery pack.
2. Voltage difference analysis and equalizing voltage dual function.
3. Equipped with multi-mode intelligent voltage detection display, it can monitor the working progress of battery pack repair in real time.
4. Nano amorphous isolated fully symmetrical transformer ensures the minimum voltage difference
5. American ultra-low internal resistance MOS devices constitute an ultra-low dynamic impedance inverter circuit. Achieve high power balance.
6. The control and management of intelligent MCU chip realize automatic self balancing;
7. Automatically detect the minimum voltage of the battery, stop working when the battery energy is low, and protect the battery from power loss;
8. Overcurrent fuse resistance at each series input end to ensure safety;
9. 1h/3h/4h time-limited equalization time adjustable;
10. Heat dissipation design of inverter under extreme equilibrium state of high voltage difference.

About the voltage difference between battery strings after equalization:

1. The min voltage difference of 824A series design is $\leq 30\text{mV}$ (actually 15~20mv);
2. The min voltage difference after equalization is related to the equalization time.
The longer the equalization time is, the smaller the pressure difference is;
3. The minimum voltage difference after equalization is related to the battery internal resistance, connecting line resistance and connector resistance. The smaller the resistance is, the smaller the pressure difference is.

About the voltage difference between battery strings after equalization:

The 824A equalizer adopts the high-frequency transformer inversion and equipotential isolation coupling energy mode to realize the parallel connection each series of batteries through the equipotential isolation coupling mode. Based on the parallel connection state, each series of batteries with different voltages can realize energy transmission and distribution, and finally realize the high-power precision balance of the battery pack. The actual equalization work is carried out by the main control chip MCU, and the inverter with ultra-low dynamic impedance obtains more than 8A equalization current. Precise transformer technology and fully symmetrical circuit design can achieve the equalization effect of $\leq 30\text{mV}$.

Product parameters

Product name	Lithium battery pack voltage equalization controller		
Power supply	AC 110V~220V	Applicable battery strings	2~24S
Type of battery	Ternary lithium Lithium iron phosphate	Equalizing current	0~8A
Equalization effect	$\leq 30\text{mV}$	Interface	3.81 Interface
Equalization duration	1h/3h/4h	Equalization mode	Parallel energy transfer mode
Low voltage automatic shutdown	2.7V(2.5V)/S	Voltage high precision test range	0.5~5V
Range of battery pack's total voltage	16S: 67.2V 24S: 100.8V	Setting alarm for low voltage of battery	0.5~5V
Setting alarm for high voltage of battery	0.5~5V	Setting alarm for voltage's maximum difference	0.5~5V
Minimum voltage detection resolution	0.001V	Precision of testing voltage	$\pm (0.1\%RD+0.1\%FS)$
Voltage sampling rate	1000 times/S	Screen refresh rate	10 Times/S

Application range

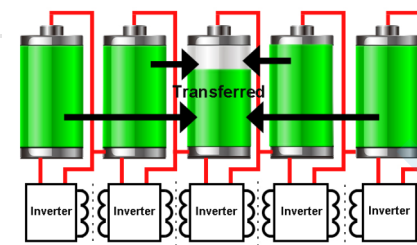
It is especially suitable for all scientific research institutions, lithium battery dealers, battery production units and battery protection system production units to carry out outdoor detection and on-site analysis of multi string battery voltage, maintenance of electric vehicles, electric tools, battery pack manufacturers, power battery pack maintenance, etc

Working principle

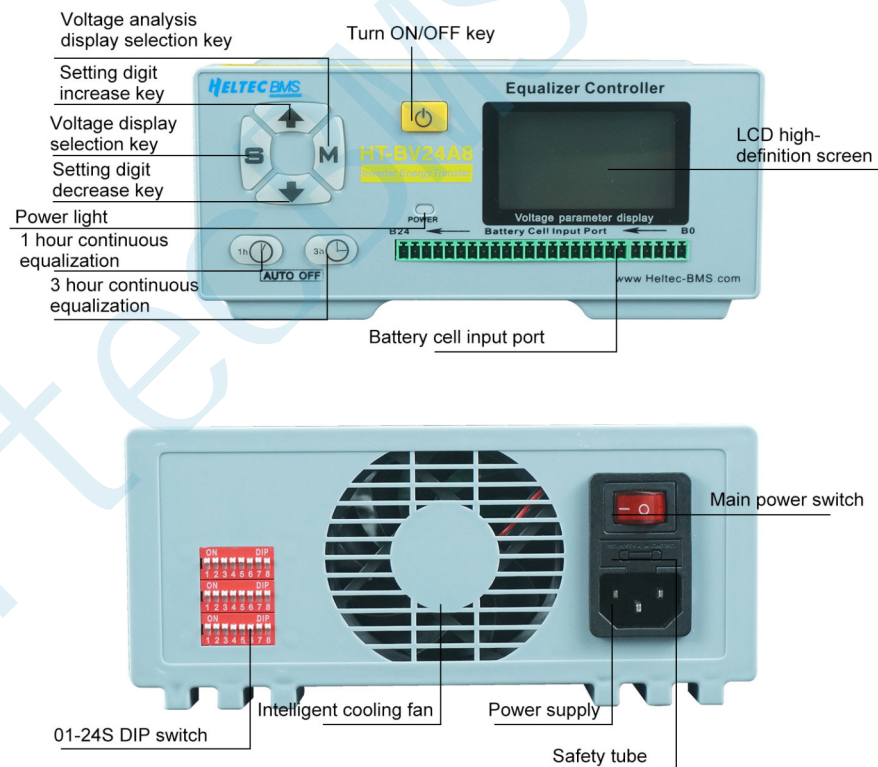
Equalization principle:

High voltage energy is transferred to low voltage parallel transmission at the same time to realize battery voltage balance.

Sketch:



Product diagram



Explanation of equalizing current, equalizing time, equalizing connection and equalizing minimum differential pressure

1. The equalization current marked on the equalization module and equalizer is the maximum current that can be output or absorbed by the product, and it is also the maximum current allowed to flow through the chip on the product.

2. When the equalizer is actually used to equalize the battery pack, the equalized current is affected by the following factors:

- ① Internal resistance of battery pack;
- ② Resistance of connecting cable;
- ③ Contact resistance of connector;
- ④ Voltage difference between battery cells (unbalanced condition)

A: The smaller the internal resistance of battery pack, the greater the equilibrium current

B: The smaller the resistance of connecting wires and connectors, the greater the equilibrium current

C: The greater the voltage difference of the battery, the greater the equilibrium current

8A current test conditions:

Voltage difference between batteries $\geq 0.5V$, connecting line battery $< 8m \Omega$ (single wire)

Internal resistance of battery $\leq 15m \Omega$, connector resistance $< 4m \Omega$

3.Measurement method of equalizing current:

Since the equalizing current is affected by the loop resistance, the loop resistance will be increased and the equalizing current will be reduced when the ammeter is connected, so the access ammeter is not recommended. In addition, disconnecting the equalizing line during normal equalizing operation will lead to the risk of battery short circuit and damage to the equalizer. Therefore, the test current can only be measured by DC Clamp ammeter.

4.Equilibrium time correlation

A: Under the condition of the same internal resistance of battery, if it can work in equilibrium with the maximum current, the time will be shorter, and the smaller the resistance of connecting line and connector, the shorter the time will be.

B: The equalization time of high-capacity battery pack will be longer.

C: The smaller the equalizing voltage difference, the longer the time.

D: In the final stage of equalization, the voltage difference is very small, so the current is also very small, this period takes a long time.

E: When active continuous online equalization is adopted, the equalization state is ideal, and the battery voltage difference can also be controlled between 30mv-80mv. You don't need to pay attention to time by this way.

About the connection of equalizer and battery pack:

1. The connection mode of the connector on the equalizer product is based on the convenience of users' installation and use. However, because the connector has a contact resistance of 3~10m Ω , each string of batteries will increase 2x3~10=6~20m Ω , which will greatly reduce the equalization current. Therefore, it is recommended to cancel the connector and connect it directly with wires;
2. Larger cross-sectional area and shorter connection shall be adopted as far as possible for the connecting wire between the battery pack and the battery pack;
3. When direct wire connection is adopted, one end of the equalizer must be welded first, and the battery pack end shall be connected (welded) when it is firmly welded. Pay attention to prevent short circuit between wires during operation!
4. In order to obtain a larger balanced current value, it is recommended to use 0.5mm²/A when selecting the connecting wire. If the equalizer is far away from the battery pack and needs to be extended, the conductor section needs to be increased proportionally.

Voltage analysis interface

The BV24A8 instrument have three display modes.Press the “M” key to switch mode.

(1) Analyzing display mode

Number of battery strings: 20 S 75.28V X Result: Work normally
 Total voltage: 75.28V
 The 2nd string: 02 ↑ 3.441V The highest string voltage value
 The 12th string: 12 ↓ 2.553V The lowest string voltage value
 The maximum difference voltage: Δ 0.888V | X̄ 3.137V Average voltage value

Analyzing display mode is the POWER-ON default mode

(2) Separate page mode

2~24 strings can be measured: 24 S 100.8V 0.5~100.8V can be measured
 The 2nd string: 02 3.441 V 05 3.225 V The 5th string
 03 3.042 V 06 3.308 V

Press the “M” key to switch.

(3) 1-page mode

The 3rd string: 03 3.140 V 11 3.631 V 15 3.60
 The 14th string: 14 3.59
 The max display battery voltage of single page: 04 3.030 V 08 3.541 V 12 3.631 V 16 3.63

Press the “M” key again to switch.

How to set alarm for safety parameter?



Switch to analyzing display mode,

Continuously press the “S” key, set the high / low voltage and differential voltage by the “↑ ↓”. If the set value is exceeded, it will alarm.

Noted in operation

- 1 Please connect battery pack with equalization controller correctly. Please follow the manual instruction to test voltage within the range. Otherwise, the instrument will be damaged.
- 2 Please make sure to follow the instruction about voltage within the range when tester is supplied by external power.
- 3 Do not connect more than one battery pack to test.
- 4 Please turn off power when use inner power supply after testing.
- 5 Please disconnect instruction with battery pack when not testing to avoid energy loss.
- 6 Please make sure the connection correctly to avoid loose contact. and the testing voltage within the range.
- 7 Please do not use in flammable area or steam area.
- 8 Please keep dry to reduce fire and electric shock.

Equalizing current measurement

The voltage difference is 1V, the equilibrium current is 7.81A.



The voltage difference is 0.1V, the equilibrium current is about 1.5A.



Do not use the protection board line directly!

Because the line of part of the protection board is only 0.1 square and is a signal line, the current can not exceed 2A. If it's directly connected to the equalization board, it will be easy to overheat because of the large current, which has potential safety hazards. Equalizer boards using 5A and 8A must be rewired and the wire must not be less than 0.5 square.

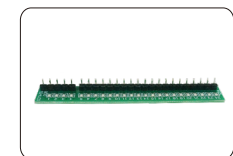
Packing list



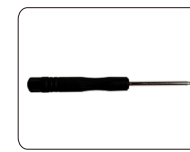
Equalization controller x1



Power cord x1



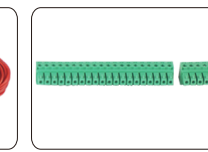
Line sequence detection board x1



Slotted screwdriver x1



Electronic wire x1

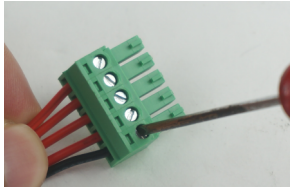


3.81 cable interface x1

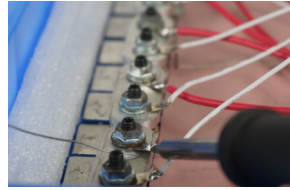


User manual x1

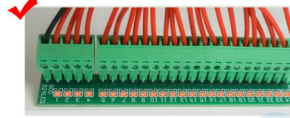
Operation instance



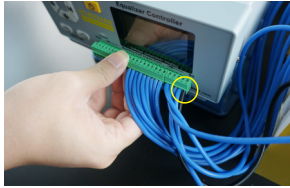
Connect the wire to the socket of 3.81 and pay attention to the locking screw.



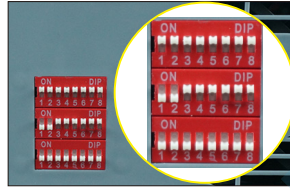
Connect the positive pole of the battery pack in line sequence.



Be sure the wiring sequence is right use by the line sequence test board.



Connect the instrument, pay attention the interface B0 connect the negative pole (black).



Turn on the DIP switch corresponding to the string number on the back of the balance controller.



Press the main switch back of the balance controller.



Press the "P" turn on the balance controller.



Press the "M" key to analysis the differential voltage.



Press the "1h" "3h" button at the same time. Start 4 hours balance duration. The red light flashing.



After 4 hours of equalization, detect the voltage, if the voltage difference is not satisfied. That can press "1h" "3h" again to continue equalizing. If the battery pack capacity above 50AH, that need to repeat equalization 2-3 times.

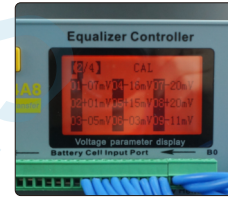
The minimum voltage difference after equalization is related to the equalization time. **The longer the equalization time is, the smaller the pressure difference is;**
The minimum voltage difference after equalization is related to the battery internal resistance, connecting line resistance and connector resistance. **The smaller the resistance is, the smaller the pressure difference is.**



Attention

This product can charge and equalize at the same time when the charging current is less than 8A. If the charging current is greater than 8A, it is not recommended to charge while equalizing. Otherwise, the instrument will be damaged.

How to calibration voltage



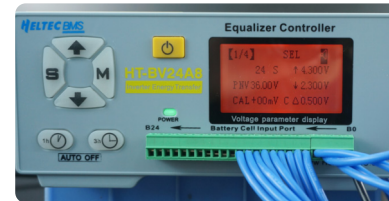
Switch to calibration voltage interface

Continuously press the "S" key switch to cal-voltage interface, according to the test data of multimeter, adjust the voltage by the "↑↓" key.

Before delivery the instrument have been calibrated, that's not 0mV.

Example: If the BV24A8 controller test the 2nd string voltage is 3.58V, but the multimeter test result is 3.65V, that need to press the "↓" key to reduce 70mV, don't care about the "±" signs.

How to set the alarm and silent?

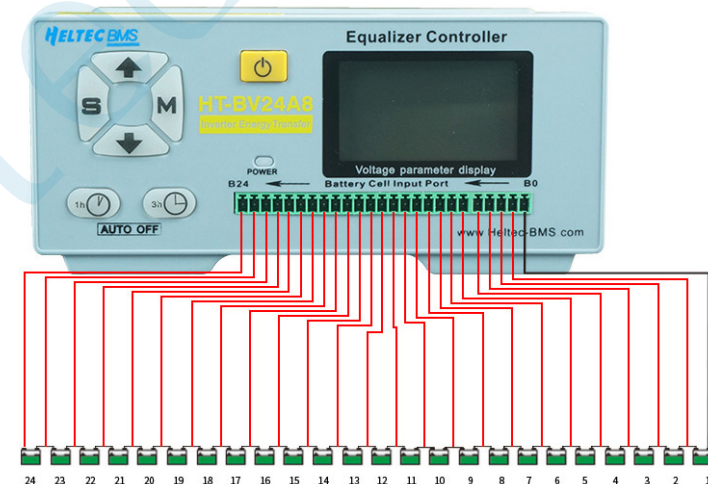


Continuously press the "S" key switch to alarm, press the "↑↓" key to set.

Battery pack descending string cable diagram

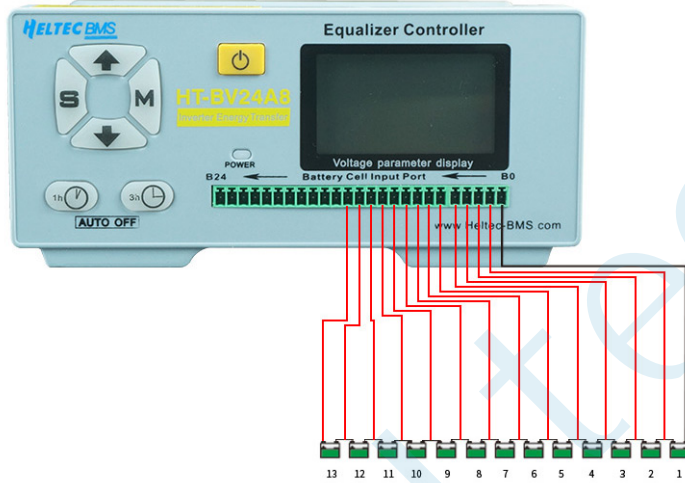
Wiring from the total negative electrode B0 in sequence. According to the following line sequence diagram.

24S wiring diagram:



13S wiring diagram:

Wiring from the total negative electrode B0 in sequence. According to the following line sequence diagram. The rest of the vacant ones are not connected.



Three equalization durations are available

① 1 hour balance duration



Press the "1h" button
The red light flashing

② 3 hour balance duration



Press the "3h" button
The red light flashing

③ 4 hour balance duration



Press the "1h" "3h" button. The red light flashing.

Note: If the ternary lithium battery is lower than 2.7V / lithium iron phosphate battery is lower than 2.5V, the active equalization board does not start the equalization work.

Suggestion: Since the high voltage battery is balanced by energy transfer to the low voltage battery, the voltage of each string of the balanced battery pack needs to be greater than 3.2V for better effect.

Test line sequence

Line sequence detection board

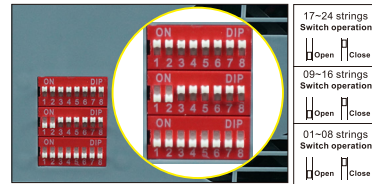
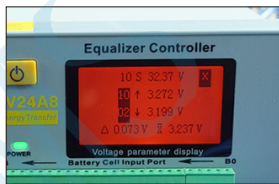


Attention
Before connecting the equalizing board, be sure the wiring sequence is right use by the line sequence test board. The wrong line sequence will lead to the damage of the equalizing board. In that case, the board cannot be returned and replaced. Please pay attention.

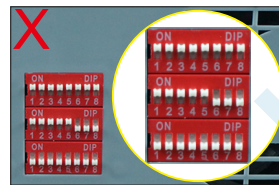
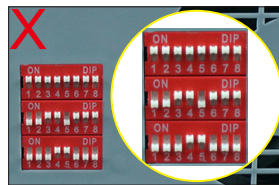
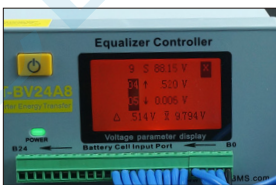
How to set the DIP switch

Before use, be sure to connect the terminals after the correct wiring, and then according to the battery pack string number, turn on the DIP switch corresponding to the string number on the back of the balance controller. Otherwise the string number will be displayed abnormal or the screen display is garbled. Wrong or reverse connection of the line sequence will directly damage the balance controller.

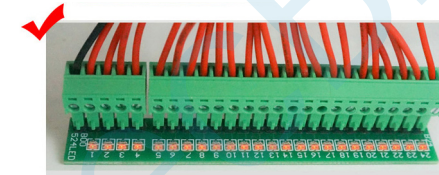
Correct operation Correctly display the voltage of each string.



Wrong operation Wrong operation the string number will be displayed abnormal or the screen display is garbled.



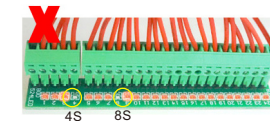
Line sequence correct connection display



When the positive and negative wire sequence of the battery pack is correctly connected, the corresponding LED light is red



Reverse polarity display



When the sequence connection of two strings of wires is reversed, it shows the balanced arrangement of wires.