

# Choice BMS

for 2S-8S LiPo/Li-ion, LiFe & LiTO

Low power consumption

High accuracy

2.8" TFT LCD display

Programmable



**T**hanks for your purchasing the Choice BMS for your vehicle.

**R**ead the ENTIRE instruction manual to become familiar with the features/functions of the device before operating.

Choice BMS is designed special for LiPo, LiFe and LiTo battery packs applied to an energy storage system or an electric vehicle including E-Motorcycle, E-Scooter, etc. The unit can measure or detect the battery voltage, cell voltage, charge & discharge current, battery temperature, and battery SOC (State of Charge) , displayed with TFT color LCD.

## Safety Notes

Please read the entire manual completely before using, to make sure you can use this device better and more safely.

1. Ensure the BMS program and settings match your battery pack, otherwise the battery will be damaged and a dangerous situation may arise, especially for lithium batteries, which may cause a fire.
2. Energy storage system applications and electric vehicle applications have many differences, please adjust those key parameters carefully, or contact us for more details.
3. Do not allow water, moisture, metal wires or other conductive material into the device.
4. Never charge or discharge any battery having evidence of leaking, expansion/swelling, damaged outer cover or case, color-change or distortion.
5. Do not try to charge "non-rechargeable" dry cells.
6. Do not mix batteries of different types, different capacities or from different manufacturers.
7. Do not exceed the battery manufacturer's suggested maximum charge and discharge rates.
8. Carefully follow the battery pack manufacturer's recommendations and safety advice.



## Warning

1. Don't allow current shunt to contact any metal including BMS metal case.
2. Don't allow the BMS case to contact any metal.
3. Current shunt must be connected to battery pack negative.
4. Prevent the BMS from vibrating violently to make sure the BMS case doesn't contact the battery pack negative.

## Special update

1. Add RS232 port, external device can read out all data from the Choice BMS
2. Improve cell detection accuracy
3. Add over current protection during balancing
4. Optimized SOC accuracy , new approaches are voltage based and coulomb counting , consideration the cell impedance at the same time. Please set up accurate battery capacity on Program setup menu before using the Choice BMS.
5. Add current, AH and WH, SOC interface, it is easy to read charge or discharge current, capacity, power and state of capacity of battery pack on one interface.
6. Relay controller uses 12V 3A large current regulator from 8S battery pack. It can drive larger current mechanical and state solid relay.
7. If using an external adaptor, the Choice BMS can do 2S -8S battery, and the external voltage range is 15-30V.
8. For the same battery positive and negative terminal when charging and discharging, the Choice BMS can control charge and discharge separately. And detect charge and discharge current with one current shunt.



**1.2A balance**

**600A max. charge/discharge**

## Order information

Model	Description	Accessories
Choice BMS - 100	100A charge and discharge	100A shunt, and standard accessories
Choice BMS - 300	300A charge and discharge	300A shunt, and standard accessories
Choice BMS - 600	600A charge and discharge	600A shunt, and standard accessories

All standard accessories are listed on page 22, includes:

1. Battery balance wire, 1pcs
2. Relay controller wire, 1pcs
3. Temperature wire, 1pcs
4. Current sensor wire, 1pcs
5. Current shunt, 1pcs
6. USB data cable, 1pcs
7. Communication wire on COM2, connect main unit to display module, 1pcs
8. Communication wire on COM3, connect BMS to external device, 1pcs
9. Warning LED, 1pcs
10. Warning beeper, 1pcs

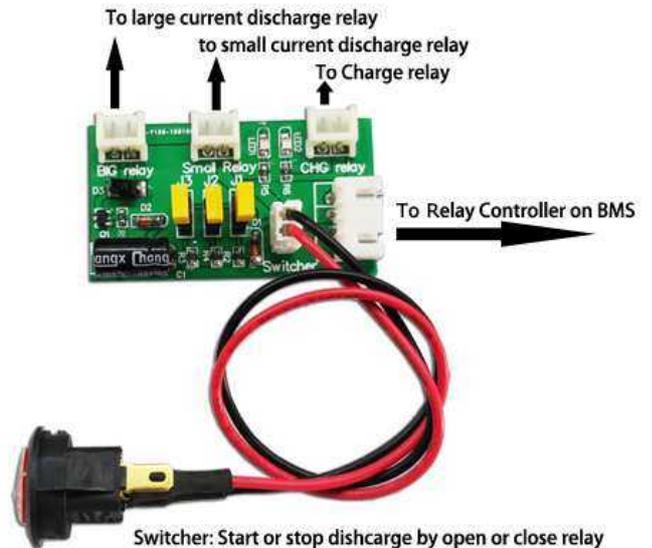
Optional accessories

1. 12V 100A relay
2. 12V 200A relay
3. 12V 400A relay
4. 12V 600A relay
5. 12V 800A relay
6. Relay delay time board

### Notes:

The BMS includes the main unit and display module, after powering on the BMS and finishing all parameters setup on display module, the BMS will work according to these parameters even disconnecting the display module to the main unit, all data won't be displayed and no beeper and LED warning will be displayed, but the BMS still can cut off charge or discharge when any cell is over charged or over discharged. You can connect the external device to the COM3 on the main unit to receive all data, and display this data. if you need to modify the parameters setup, please connect the display module again.

The Choice BMS can fit with any lithium battery charger, when any cell is over charged, the BMS will open the charge relay to cut off charge, if used with our Choice BMS charger there is no need to charge the relay. Only connect the charger to the BMS on COM1, when any cell reaches OVP, the charge current will decrease automatically preventing any cell damage. This feature can save charge relay cost and shorten charge time.



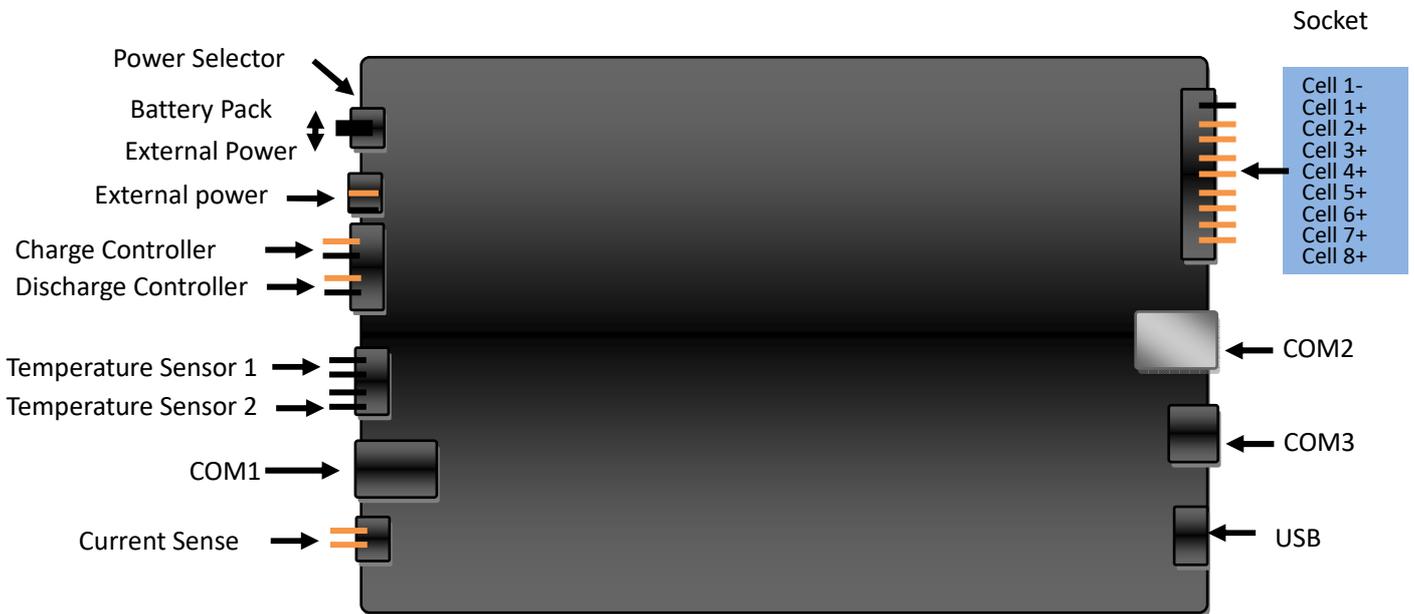
## Special Features

1. The Choice BMS uses advanced ADC measurement technology , high accuracy , high voltage and high current detection circuit. The maximum voltage measurements tolerance is within 5mV at up to 8S LiPo battery (34V).
2. Supports regenerative braking, during braking operation can charge the battery pack and the discharge power (Wh) will decrease to respond to the braking power.
3. Charge/discharge current up to **600A**. Bigger current can be customized.
4. **1.2A** per cell balance current is very useful for large capacity battery pack, the feature can resume all cell voltage balance status at the shortest time. Over temperature protection makes sure the system is safe during balancing.
5. The BMS calculates and displays the charge and discharge power (Wh), generally the battery rated power is rated voltage multiplied by rated battery capacity.
6. TFT LCD screen provides rich information including current, voltage, power, capacity, battery status, SOC and temperature and so on.
7. The Choice BMS features a maximal safety protection , within the range parameters can be set up, the BMS will alarm and cutoff charge or discharge according to users' setup, out of range of parameters, and triggered absolute maximum ratings the BMS will force a cutoff charge or discharge to prevent the battery from catching on fire.
8. Minimize the power consumption by draw current from all cells or external power supply.
9. Dual power design, the unit can be powered by all cells or external power supply.
10. Detect cell count at any time, and compare with the count detected when switch on first time. If it is not uniformity, the device will alarm and cutoff charge or discharge according to users' setup, the feature can prevent any cell connection from loosing.
11. Sound alarm and LED alarm will be triggered when any warning events happened, and then wait several seconds cut off or Don't cut off charge or discharge. The delay time can be programmed.
12. Charge relay and discharge relay are controlled independently.
13. Two temperature sensors monitor battery temperature on different position.
14. Supports upgrading the firmware program by USB port.
15. The BMS provides users the maximal flexibility, key parameters can be programmed.
16. The BMS displays battery SOC or called battery gauge similar with car dashboard. Cell count, battery pack voltage and battery gauge (%) is displayed simultaneously.
17. In case that the battery pack need not be charged and discharged, Press STOP button enter into sleep mode to save energy consumption, at this mode, Charge and Discharge is forbidden, and LCD back light is off. Press any key to resume normal work mode.
18. LCD back light ON time can be programmed to save energy, when it is OFF, press any key to resume "ON".

## Protection functions

1. Cell count error protection
2. Over charge protection
3. Under voltage protection
4. Over current protection when charge or discharge
5. Over temperature protection
6. Over differential cell voltage protection
7. Over differential battery temperature protection
8. Under SOC protection

## Interface



BMS main module



BMS display module

Power Selector	Alternate External power supply or battery pack to power the BMS. If select battery, the battery pack must be 4S to 8S LiFe or LiPo or LiTO. But if power by external power supply, the BMS can do 2S-8S LiPo, LiFe or LiTo battery pack. The external input supply <b>Vin</b> voltage range is 15V to 30V
External power port	External power input, the voltage should be 15V to 30V, 3A minimum, the current depends on the relay, the connector is 5.5*2.1 DC jack.
Charge controller	Charge controller, turn on or turn off charge circuit, generally connect to relay or DC contactor. When any cell voltage is over setup, it will make relay "OPEN" to turn off the charger, otherwise the BMS will output <b>12V</b> power the coil to close the relay. The relay must be form OPEN.
Discharge controller	Discharge controller, turn on or turn off discharge circuit, generally connect to relay or DC contactor. When any cell voltage is under setup, it will make the relay "OPEN" to turn off the motor or other load, otherwise the BMS will output <b>12V</b> power the coil to close the relay. The relay must be form OPEN.
COM1	The COM1 port (black connector) is connected to external device such as Charger. If connect to Choice BMS charger, the BMS can control charge current to shorten charge time
COM2	The COM2 (gray connector) port is connected BMS main unit to display module by gray spring wire
COM3	Output RS232 level with the port, any external device can read out all data from the BMS
Temperature sensor	Two temperature sensors monitor the battery temperature, the sensor must tie to battery surface or gap of cells where the temperature should be the highest during charge or discharge. The temperature range is -20 to 150°C
LED <sup>1)</sup>	Connect to high light LED, the LED will flash when any warning event happened
Beeper <sup>1)</sup>	Connect to beeper or others to alarm. It will output 12V 25mA max.
Current sense	Connect to single current shunt. Charge current and discharge current can be measured simultaneously.
USB	Connect to PC update the firmware by Choice BMS UpdateTool.exe
Socket	Connect to 2S to 8S battery,

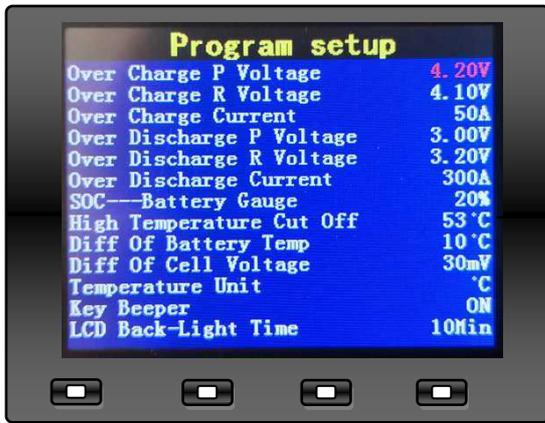
Note:

- 1) On the BMS display module

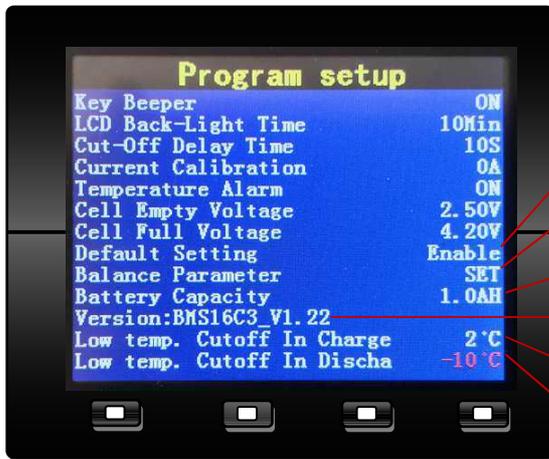
## Absolute maximum or Minimum ratings

Maximal cell voltage	LiPo	4.35V	Larger than the absolute maximum voltage, the BMS will be forced to cut off charge
	LiFe	3.90V	
	LiTO	2.80V	
Minimum cell voltage	LiPo	2.50V	Less than the absolute minimum voltage, the BMS will force to cut off discharge
	LiFe	2.00V	
	LiTO	1.50V	
Battery temperature	LiPo&LiFe&LiTO	80°C	Over the temperature, the BMS will be forced to cutoff the charge and discharge

## Program Setup



Setup the highest battery temperature, when over the temperature, BMS will cut off charge or discharge



Resume default value in factory

Balance setup

Setup battery pack capacity, 1000AH max. it is as a reference when calibrate battery SoC.

Main unit Software version

Under the lowest temperature, forbid to charge

Under the lowest temperature, forbid to discharge

1. Press **SET/START** button for 3 seconds enter into Program Setup interface.
2. Press **UP** or **DOWN** button select the item, press **SET/START** shortly make the value flash, and press **UP** or **DOWN** change the value. Press **SET/START** button shortly confirm the change. After finish all setup, press **SET/START** for 3 seconds quit the setup menu.
3. When quit setup mode, the BMS will record all parameters till next change.

LiPo & LiFe, LiTo Battery Management System

**NOTE: Please keep the default setup unless for a special purpose.**

Parameters		Min.	Type	Max.	Step	unit
<b>Charge Protection</b>						
Over Charge Protection(P) Voltage	LiPo	3.90	4.20	4.35	0.01	V
	LiFe	3.40	3.65	3.90	0.01	V
	LiTO	2.50	2.75	2.80	0.01	V
Over Charge Release(R) Voltage	LiPo	3.80	4.10	4.25	0.01	V
	LiFe	3.30	3.55	3.80	0.01	V
	LiTO	2.40	2.65	2.70	0.01	V
Over Charge current		0	<b>50</b>	600	1	A
<b>Discharge Protection</b>						
Over Discharge Protection(P) Voltage	LiPo	2.75	3.00	4.00	0.01	V
	LiFe	2.00	3.00	3.50	0.01	V
	LiTO	1.50	1.85	2.40	0.01	V
Over discharge Release(R) Voltage	LiPo	2.75	3.20	4.00	0.01	V
	LiFe	2.00	3.10	3.50	0.01	V
	LiTO	1.60	1.95	2.50	0.01	V
Over Discharge current		0	<b>300</b>	600	1	A
SOC--- Battery gauge		5	20	90	1	%
<b>Temperature Protection</b>						
Battery Temperature		30	50	80	1	℃
Difference(Diff) of battery Temperature(Temp)		5	10	30	1	℃
<b>Voltage balance Protection</b>						
Difference(Diff) of cell voltage		5	30	300	1	mV
<b>Others</b>						
Temperature Unit			℃	℉		
Key Beeper			ON	OFF		
LCD Back-Light time <sup>(1)</sup>		1	10	999	1	min
Cut-Off Delay Time <sup>(2)</sup>		0	10	60	1	Second
Current Calibration <sup>(3)</sup>		0	0	255	5	A
Temperature Alarm <sup>(4)</sup>		ON		OFF		
Cell Empty Voltage <sup>(5)</sup>		1.50	2.50	4.34	0.01	V
Cell Full Voltage <sup>(5)</sup>		1.51	4.20	4.35	0.01	V
Default settings	Press <b>SET/START</b> restore all parameters to default value before delivery					
<b>Balance Parameter setup: Press SET/START to setup and press for 3 seconds quit setup</b>						
Balance Start Voltage <sup>(6)</sup>	LiPo	3.3	3.6	4.1	0.01	V
	LiFe	3.0	3.2	3.4	0.01	V
	LiTO	1.75	2.20	2.6	0.01	V
Balance Stop Diff Voltage <sup>(7)</sup>			5	12	200	mV
Balance in Charge	ON means Balance start during charge, OFF disable.					
Balance in Discharge	ON means Balance start during discharge, OFF disable.					
Balance <sup>(8)</sup> in Storage	ON means Balance start during storage, OFF disable.					

Parameters	Min.	Type	Max.	Step	unit
Battery capacity <sup>(9)</sup>	0.1	1	1000	0.1	AH
Version:BMS8C3_v1.22 <sup>(10)</sup>					
Low temp. cutoff in charge	-20	2	20	1	°C
Low temp. cutoff in discharge	-20	-10	20	1	°C

**NOTES:**

- Always on** means the LCD back-light will be ON forever.
- NO** means the BMS will not cut off charge or discharge but alarm by LED flash and Beeper Sound.

**Cut-Off Delay Time** is very important and difference for different battery capacity and application, please carefully test and make a correct decision, for EV, you can select **NO** to control the EV car by manual **NOT** controlled by the BMS, but when cell voltage and temperature trigger the absolute maximum or minimum ratings, the BMS will force to cut off charge or discharge to make sure the battery safety, and prevent battery pack from explode or fire.

- Current Calibration** is not recommended unless use new current shunt. Voltage and current is calibrated before delivery.
- Temperature Alarm OFF means battery temperature and Difference of battery Temperature is unable.
- Cell Empty Voltage and Cell Full Voltage is to set up cell voltage bar graph, the value should be as same as Over Charge Protection(P) Voltage and Over Discharge Protection(P) Voltage
- Setup the battery starting voltage, when minimum cell voltage over the setup, balance will start automatically
- Setup the minimum cell difference, when difference of cell voltage under setup, stop balance automatically
- Balance switcher, default Balance is OFF,
  - If balance in storage setup ON, balance will start in storage status, STORAGE means charge or discharge current under 1A. So the current shunt and current sensor wire must be connected to BMS. **When driving the car, balance in storage OFF is suggested. For storage system, ON is better.**
  - If balance in charge setup ON, balance will start in charge
  - If balance in discharge setup ON, balance will start in discharge
  - Balance current is 1.2A max. per cell,

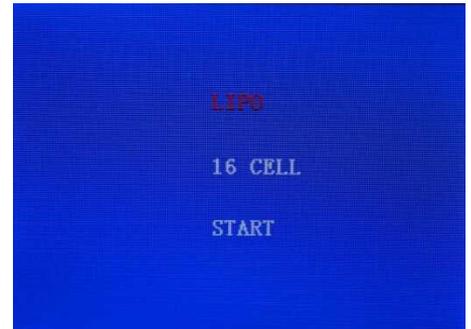


## Balancer

The BMS can resume cell voltage balanced status at the shortest time, it is based on 1.2A balance current per cell, balancing accuracy is 8mV. Balance can be operated in Storage or in charge or in discharge or in all status, the feature can be setup on program setup menu. The balance function is unable before delivery, after the BMS display each cell voltage, please enter into program setup menu to enable balance. Although balance current per cell is larger than other brand BMS, the Choice BMS uses temperature protection to prevent BMS from overheating, and has an over current protection for each cell.

## Operating guideline

1. Connect Beeper, LED, and Current Sensor to the BMS main module, and then connect relay Controller and temperature sensor too.
2. Connect main module to display module by COM2 port
3. Connect the battery to the BMS, keep the cell polarity correct. The detailed connection diagram is as the following typical connection drawings.
4. Move the power selector turn on the device.
5. The BMS will initialize the beeper and LED, beeper sounds one time, then displays the BMS and version, the battery type and cell count interface is displayed. Three battery type LiPo, LiFe and LTO can be selected. Cell count range is 2S to 16S, the cell count will be identified automatically when the battery pack connect to the BMS. Press DOWN or UP button choose the item and press SET/START blink, then press DOWN or UP button modify, finally press SET/START button to run the the BMS or wait for 8 seconds start automatically. After started, battery type and cell count will not be changed unless power off the BMS. Each cell voltage and other data are displayed correctly. If cell voltage is not displayed correctly, please check the battery connection.
6. Press SET/START button for 3 seconds enter into Program Setup interface, modify Over Charge Current (50A default) and Over Discharge Current (300A default) according to your application. If need balance in Charge or in Discharge, please modify the Balance set on Program Menu. the balance function is off before delivery.
7. SOC—battery gauge dashboard will be displayed first, as following. Press UP/DOWN button alter other interface.



Charge or discharge  
current

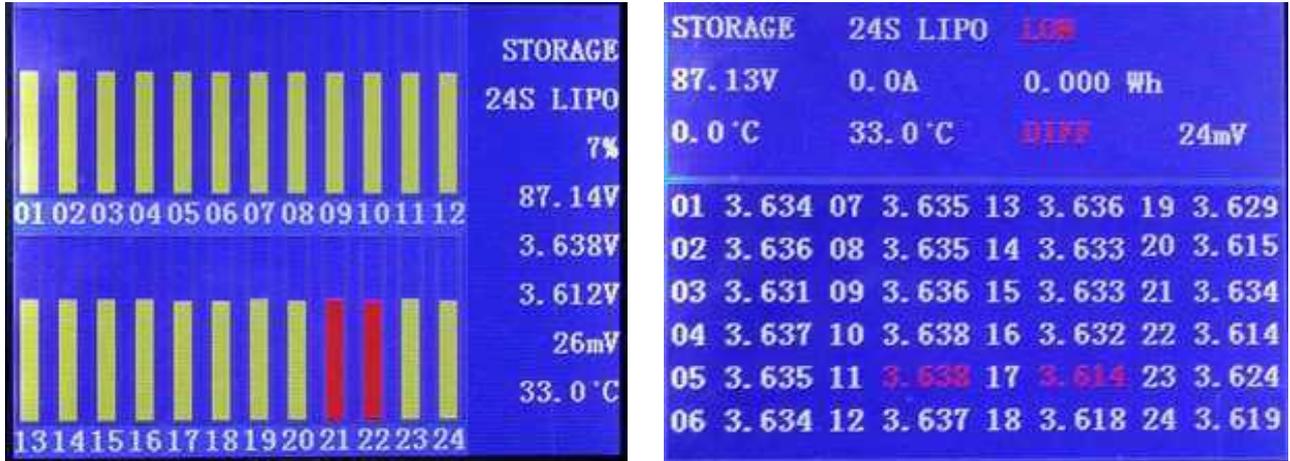
Charge or discharge  
power

STORAGE is battery status, maybe CHARGE or DISCHARGE <sup>(1)</sup>  
 Cell count and battery type  
 SOC—battery gauge, display 0% lose temperature sensor  
 Battery pack voltage  
 Highest cell voltage  
 Lowest cell voltage  
 Difference of cell voltage  
 Battery temperature

### Notes

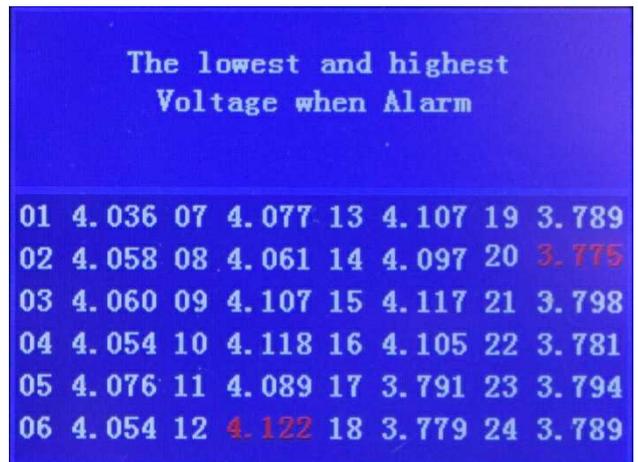
When charge or discharge current less than 1.0A, battery status will be STORAGE.

8. The following interface is cell voltage bar graph, the highest and the lowest cell voltage is displayed in RED column. The below picture is taken on the BMS as a sample.

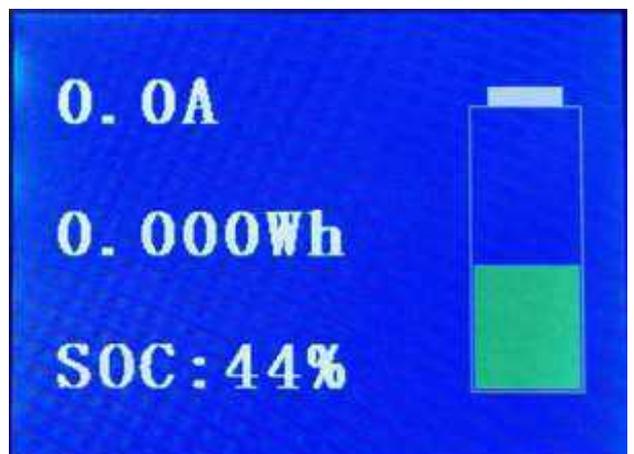


9. The right corner interface display all information including all cell voltage. The highest and the lowest cell voltage is displayed in RED text. Difference of cell voltage and difference of battery temperature is displayed. When any warning events triggered, the BMS will go to the interface and display error information. Such as if the battery connection break down, the cell count and ERROR will be displayed in turn. If the cell voltage over the setup value, the cell voltage and HIGH will be displayed in turn.

10. When any warning events triggered, Press UP or DOWN, you can check which cell triggered the warning events (over charge or over discharge), the voltage will be recorded till next warning. See right picture.



11. The right interface display charge or discharge current, charged or discharged power and SoC. When SoC less than 30%, it is displayed in yellow. When under setup, the BMS will cut off discharge.



## Specifications

1. Battery range: 2S-8S LiPo & LiFe, LTO battery pack
2. Accurate scope of the cell voltage:  $-5\text{mV}/+5\text{mV}$
3. Cell Voltage display range:  $0.10\sim 4.99\text{V}$
4. The voltage of external power:  $15\sim 60\text{V}$
5. Balance current:  $1.2\text{A}$  per cell
6. Temperature display range:  $-20^{\circ}\text{C}\sim 150^{\circ}\text{C}$ ,
7. SOC indicator:
  - RED area @  $0\sim 15\%$  of SOC
  - YELLOW area @  $16\sim 35\%$  of SOC
  - GREEN area @  $36\sim 100\%$  of SOC
8. Main module Size:  $122\times 80\times 28$  (L×W×T, mm) or  $4.8\times 3.2\times 1.1$  (L×W×T, inch)
9. Main module weight: 270g excluding accessories
10. Display module size:  $96\times 80\times 24$  (L×W×T, mm) or  $3.8\times 3.2\times 0.95$  (L×W×T, inch)
11. Warning LED:  $11000\text{mCd}$ , @  $2.0\text{V}$ ,  $20\text{mA}$
12. Warning beeper:  $85\text{dB}$  @  $12\text{V}$ ,  $25\text{mA}$
13. Package: AL alloy case

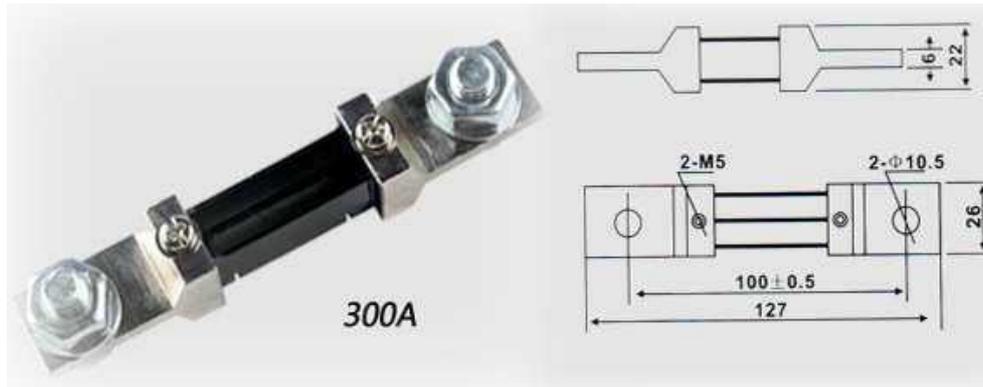


## Current Shunt Specifications

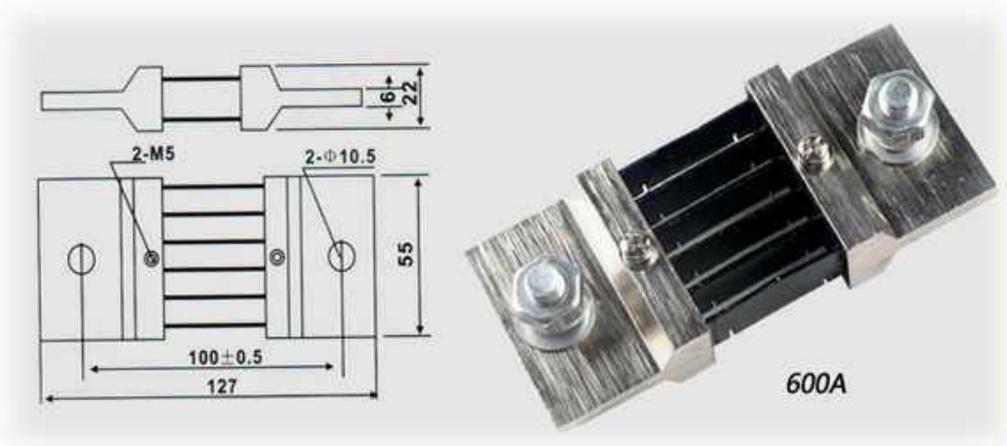
Please use correct current shunt according to actual maximal charge and discharge current, single shunt is enough for the BMS, 75mV or less shunt is suggested. The BMS can detect charge and discharge current by same shunt.

All cell voltage and current are calibrated before delivery.

The 300A and 600A 75mV specification is as below.



300A shunt weight: 230g



600A shunt weight: 530g

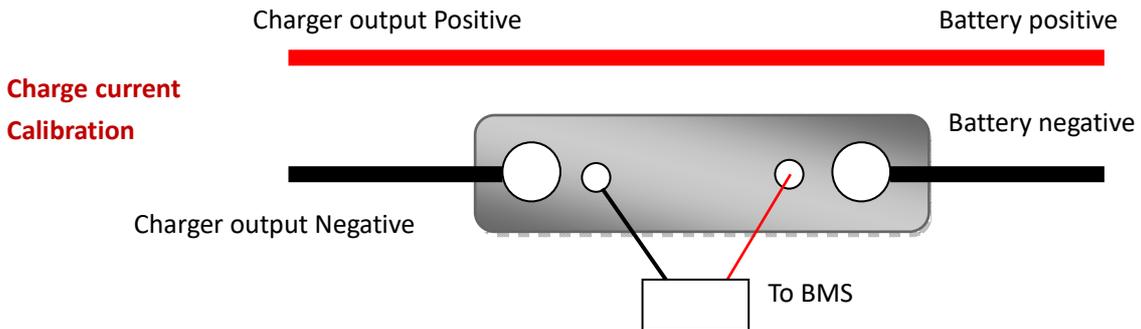
## Current sensor wire



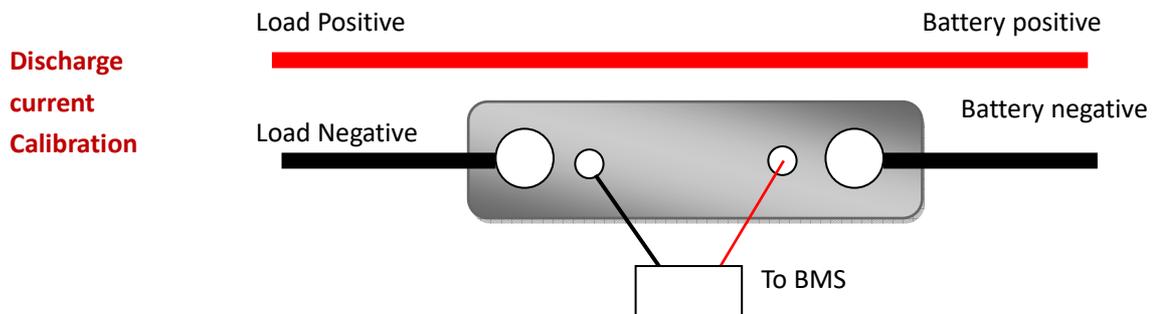
## Current Calibration

Press **SET/START** 3 seconds enter into Program Setup and find the Current Calibration, you can calibrate the current to improve the measure accuracy. If use new current shunt, the current must be calibrated again.

1. Turn off charge and discharge, make the current blink, press **UP/DOWN** modify the value to zero, shortly press **SET/START** button finish 0A calibration.
2. Connect the current shunt as following calibrate charge current



3. Shortly press SET/START make the current blink and increase the current to new value (up to 125A, it must be less than current shunt, it is better to make it equal to your charge current, the key is the current must be accurate), turn on charger and charge battery at the current, 3 seconds later, press **SET/START** save the charge current calibration.
4. Connect the current shunt as following calibrate discharge current



5. Press SET/START again and decrease the calibration current to new value (up to -125A, it must be less than current shunt, it is better to make it equal to your motor current, the key is the current must be accurate) turn on motor and discharge battery at the current, 3 seconds later, press **SET/START/** save the discharge calibration.
6. Turn off motor, Press **SET/START** for 3 seconds quit Program Setup, current calibration is finished.

## Firmware Upgrades via USB Port

1. Please download the update tool, the USB driver need not installed.
2. Connect the BMS main unit or display module, and power on BMS, the USB driver will be installed on your computer automatically
3. Connect PC to BMS by USB data cable and power on BMS, if update main unit, the LCD display module need not connect to main unit.

**NOTE:** BMS main unit and LCD display module must be updated separately

4. Execute Choice BMS update tool software, When the port number (such as com5) appears, this shows the update tool identified the BMS. Click OPEN button lock the port please.
5. Click Open File button load the firmware file. The file should be .hex file.

**NOTE:** BMS main unit and LCD display module have different firmware file.

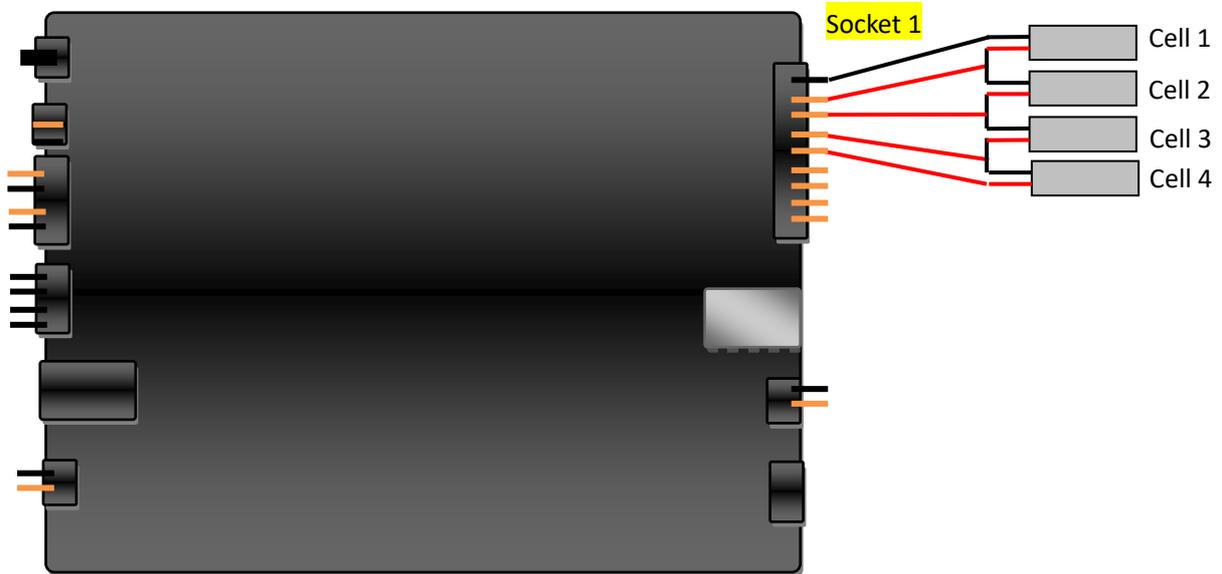
6. Click Update button start to update, the update progress bar will appear, update complete information will be displayed on PC. BMS will also display the progress bar simultaneously.

7. Finish update, the BMS will start automatically.

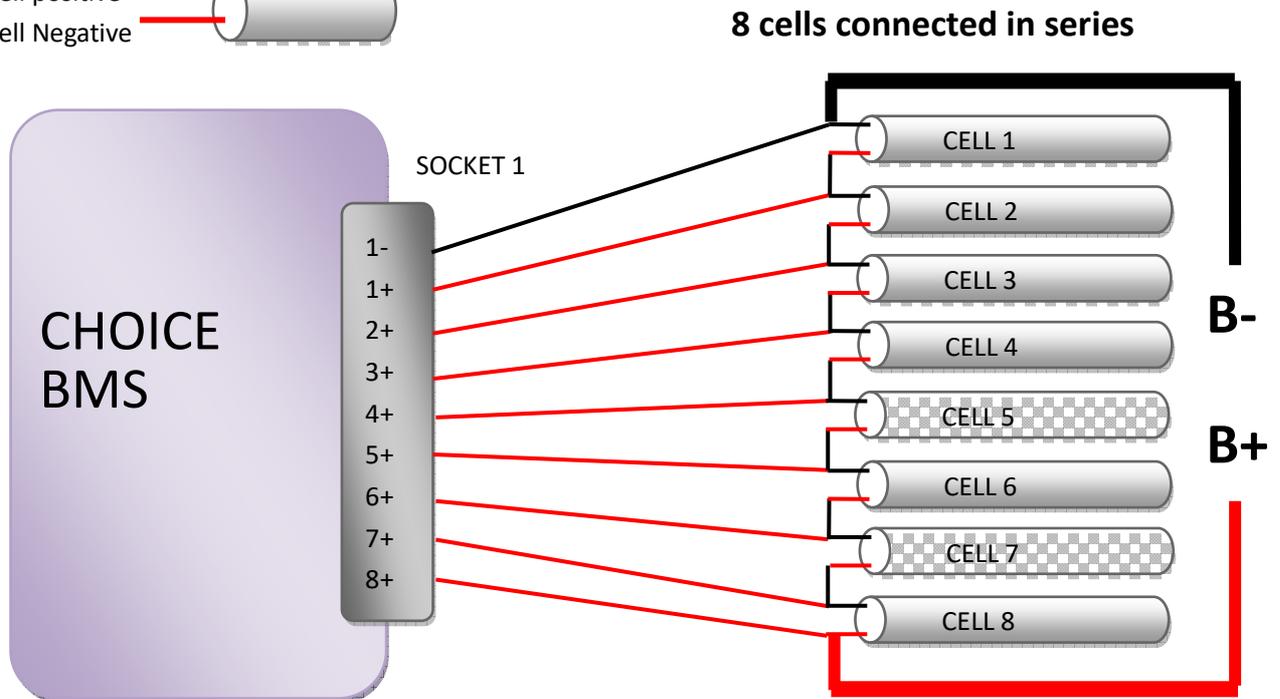
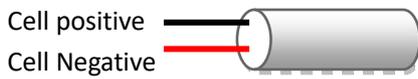
## Typical Connection

There are 1 socket connecting to 2S-8S battery pack,

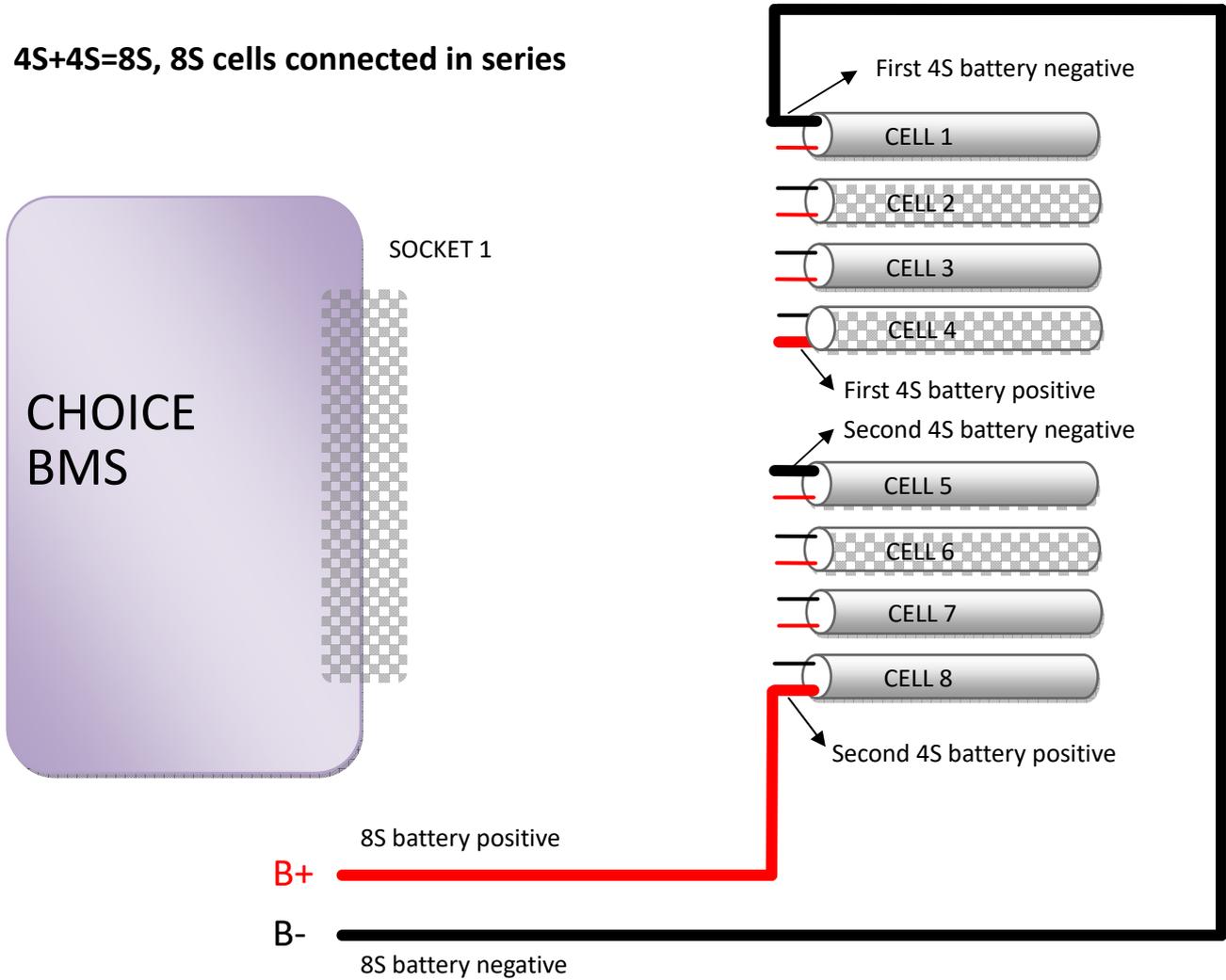
1. 2S-4S battery connect to the socket 1 directly, but external power supply is essential, it is as following.

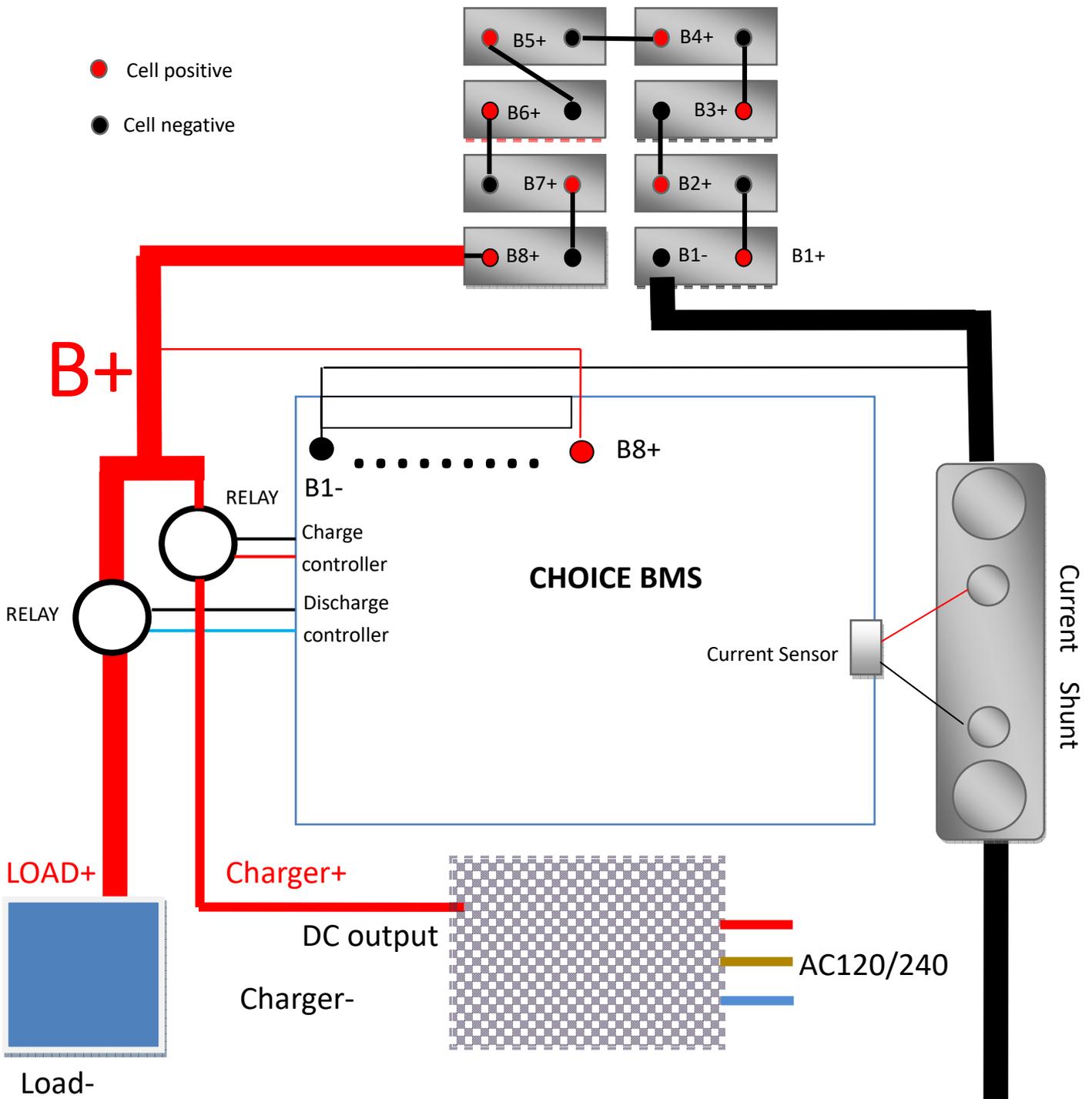


2. 8S battery connected to the Choice BMS



4S+4S=8S, 8S cells connected in series



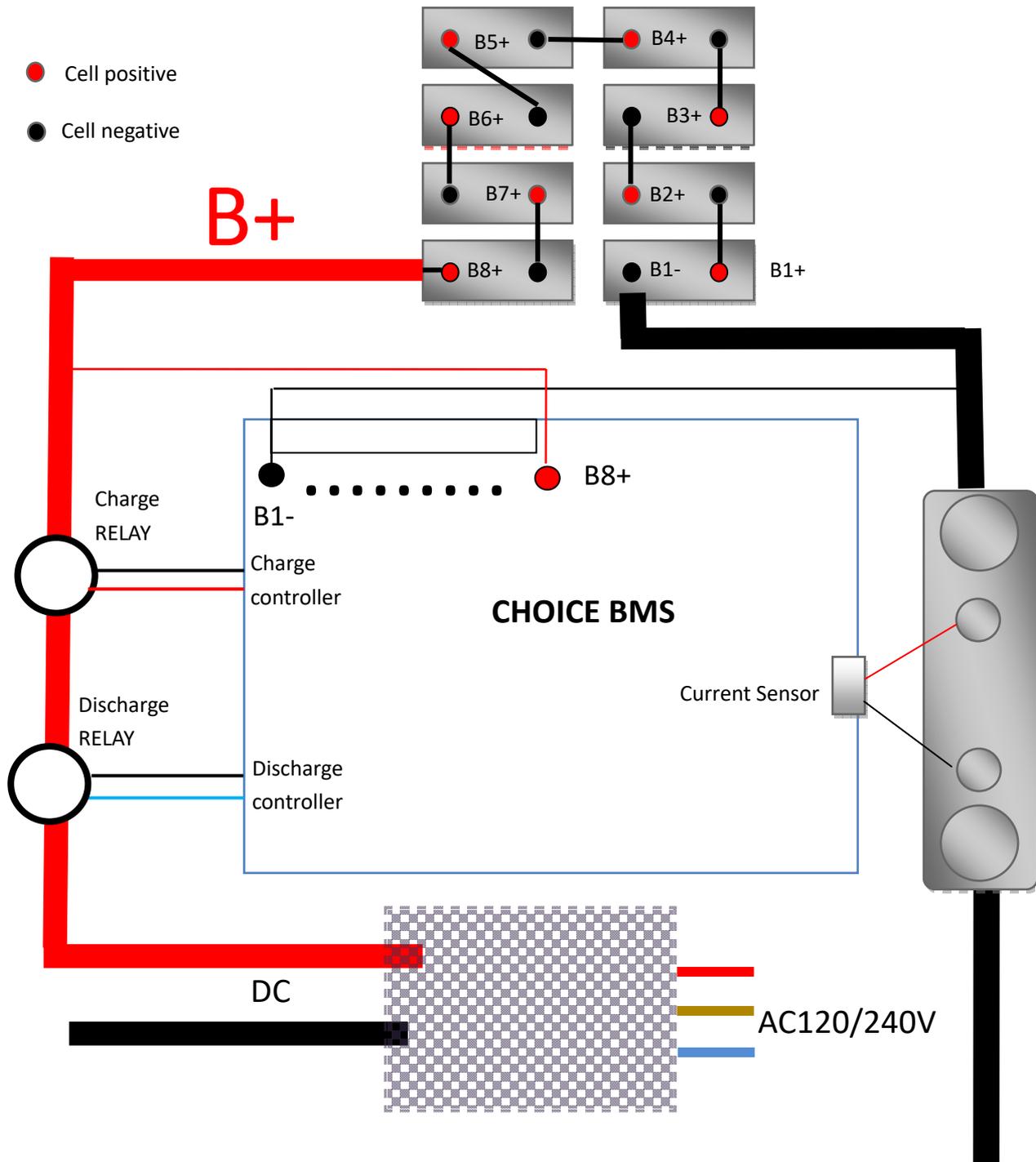


Heavy RED wires are positive of battery pack (B+/B8+), charger and load such as motor, and heavy black wire is negative of battery pack(B-/B1-), charger and load.

## Warning

Before connect the relay to charge or discharge controller, please confirm the coil of relay voltage. The BMS controller will output 12V to power the coil, and total current for charge and discharge relay don't be larger than 2.5A.

When charge and discharge use one port, the charge relay and discharge relay can be connected in series, but the charge relay must be with enough rated current that is larger than maximal discharge current.



Heavy RED wires are positive of battery pack (B+/B8+), charger and load such as motor, and heavy black wire is negative of battery pack(B-/B1-), charger and load.

## Warning

Before connect the relay to charge or discharge controller, please confirm the coil of relay voltage. The BMS controller will output 12V to power the coil, and total current for charge and discharge relay don't be larger than 2.5A.

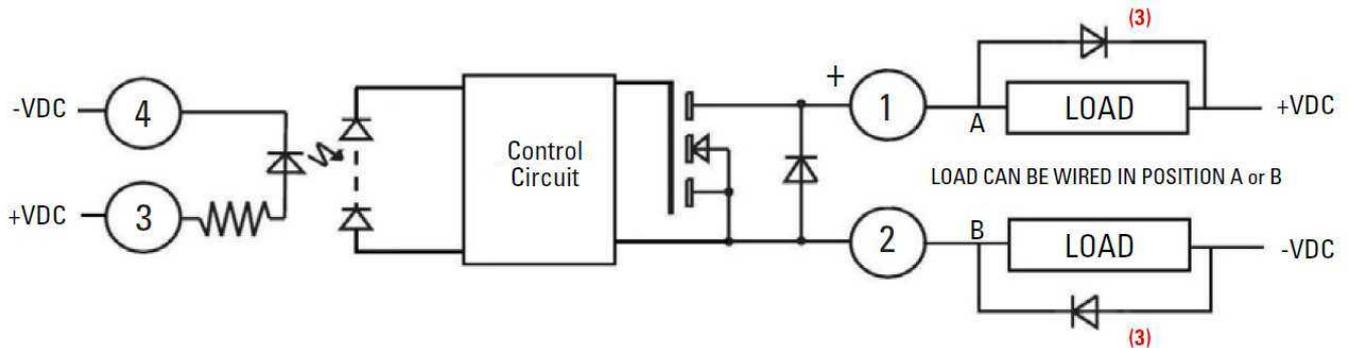
## Charge relay and discharge relay lectotype for the BMS

The Choice BMS can output 12V 3A to power the charge and discharge relay. So the relay coil driven voltage must be 12V and total current for charge and discharge relay won't be larger than 2.5A.

1. Relay DC rated current should be over 1.2 times of real charge or discharge current. If discharge current is 100A, 120A relay for discharge is suitable.
2. If the BMS is powered by external power supply, the external voltage should be 15-60V and can output 3A at least to drive the relay and power the BMS.



3. For solid state relay, the driven voltage (+VDC, -VDC), adequate Heats Sink and rated load current is very important, please pay attention to its wire connection.



## Standard Accessory

<b>USB data cable</b>	<b>Battery connection XHR-9PIN, 600mm</b>	
		
<b>Temperature sensor, 600mm</b>	<b>Relay controller wire 600mm</b>	
		
<b>Warning LED, 300mm</b>	<b>Warning Beeper, 300mm</b>	
		
<b>Current sensor wire, 600mm</b>	<b>Communication wire (4.5 meters)</b>	<b>COM3 Data line</b>
		

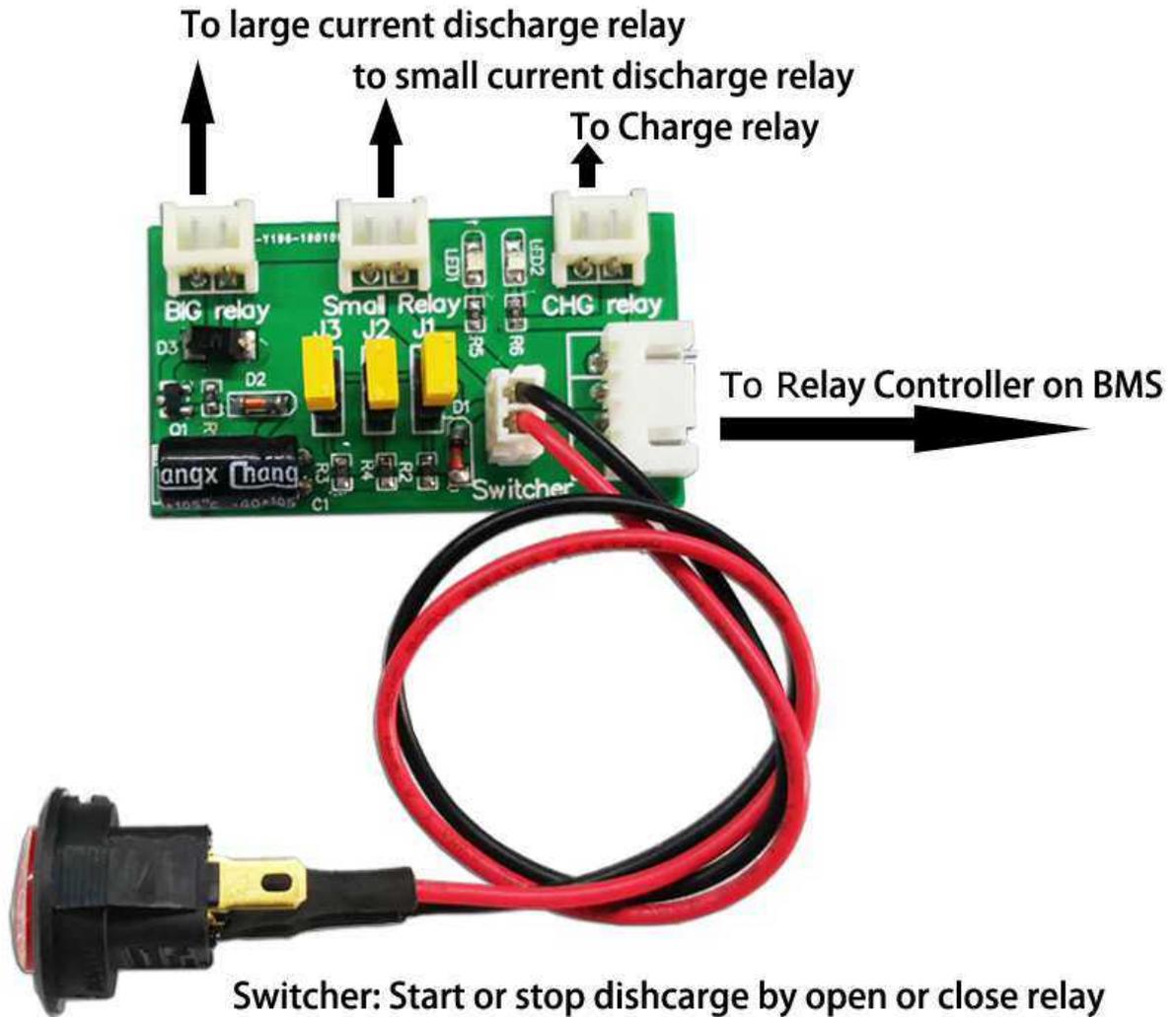
## Optional accessories

- 12V 100A, 200A 400A, 600A and 800A relay, all is normal open

Rated Operating voltage	12V – 500V DC				
Continuous (Carry) Current, Typical	100A	200A	400A	600A	800A
Voltage drop at 100A load	≧80mV	≧80mV	≧80mV	≧80mV	≧80mV
Coil operating voltage range	12V±20%	12V±20%	12V±20%	12V±20%	12V±20%
Close (includes bounce), Typ.	10 ms				
Release (includes arcing), Max	40 ms				
Bounce (after close only), Max.	3 ms				
Insulation Resistance @ 500VDC	20MΩ	20MΩ	20MΩ	20MΩ	20MΩ
Coil power	4-10 w				
Load Life	20000 Cycles				
Mechanical Life	1 million				
Operating Ambient Temperature	-40 to +85 °C				
Weight, Nominal	0.3 Kg	0.5 Kg	1.0 Kg	1.6 Kg	3 Kg



2. Relay delay time board



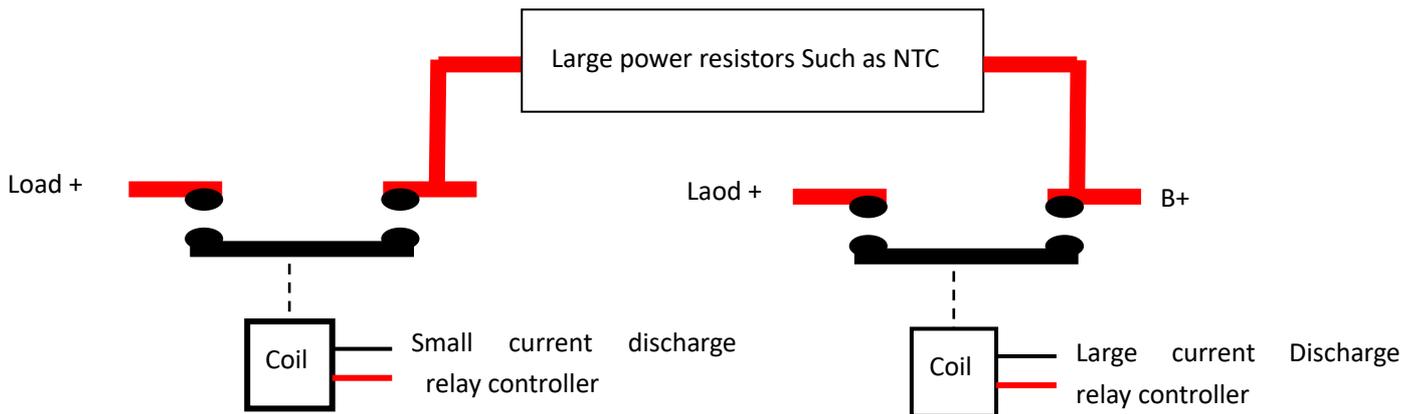
When battery start to discharge and power the motor, the surge current is very large, in order to restrain the current, we designed the special board, it can fit with Choice BMS-8, BMS-16, and BMS-24 and so on.

The board gets the relay driven signal from the BMS, charge relay coil and small current discharge relay will be closed without any delay. But the large current discharge relay will be closed after a delay time. When large current relay closed, the small relay will be open automatically according to the below connection diagram.

The delay time can be adjusted by J1, J2 and J3.

- Short circuit all jumpers: J1, J2 and J3, the delay time is 2 seconds,
- Short circuit two of 3 jumpers: J1 and J2, or J2 and J3, or J1 and J3, the delay time is 3 seconds.
- Short circuit one of 3 jumpers: J1, or J2 or J3, the time is 6 seconds.

The small current relay and large current connection is as below,



The large power resistors must be chose by delay time and load current.

Before finish all connections, please power off the switcher (LED 1 is off). On the board, there are two BLUE led indicators, when charge relay closed, the LED 2 is on, otherwise it is off, when discharge relay closed, the LED 1 is on.

Finish all connection and setup, when ready to go, please close all other switchers on other device first, finally power on the switcher on the board, LED 1 is ON, small current relay closed immediately, after setup delay time, the large current relay closed. The battery will discharge normally.

When the battery is not in use, please power off the switcher to save battery energy. The switcher should be installed on convenient place to be operated.

## Related parts

The following device is related with the Choice BMS-8

MODEL	DESCRIPTION	COMMENTS
BMS-16	For 2S-16S, without cell balancer	300A charge/discharge
BMS-16T	For 2S-16S, 1.2A balance current per cell	600A max. charge/discharge
BMS-24T	For 2S-24S, 1.2A balance current per cell	600A max. charge/discharge
C10325	AC charger for 4S-24S battery pack	1-25A charge, 1500W max.



1.2A balance

600A max. charge/discharge

## Total solution on E-Vehicle application

If you use the Choice BMS charger , the charge relay can be ignored , the BMS can communicate with th charger, when any cell over charged, BMS will send signal to charger, the charger will decrease charge current till the cell voltage under safe value. If use other brand charger, the BMS only make the relay OPEN, if charge current is big such as over 10A, the relay will open and close repeatedly. The relay life will be shortened and charge time will be longer.

Choice BMS charger and the BMS save a relay cost and shorten the charge time.



The BMS on above picture is BMS-24, it is as a sample, the connection is as same as BMS-8 and BMS-16

### NOTE

The Choice BMS charger decreases charge current according to "Over Charge Protection(P) Voltage" on BMS setup , so please setup the charge terminal voltage setup in accordance with Over Charge Protection (P) Voltage on BMS.

## Frequent questions

### 1. Charge or discharge relay/DC contactor don't be open or closed

- a) Confirm relay coil driven voltage, it must be 12V.
- b) Confirm relay coil consume power or current, don't be over 1A for each relay
- c) Without alarm the charge and discharge relay controller voltage is 12V,
- d) When any alarm events happen, the charge and discharge relay controller voltage is 0V,
- e) Without any warnings, the relay always closed

### 2. Cell voltage display is not accordance with actual cell voltage

- a) Check 9pin balance wire connection is good.
- b) Measure actual cell voltage on BMS balance port.
- c) Disconnect battery, measure resistance on balance port. Such as, if cell 5 voltage is not correct, measure resistance between cell 5- and 5+ on balance port. Generally it is very large.
- d) Or send back to us and calibrate the cell voltage again.

### 3. SOC is wrong

- a) Setup accurate battery capacity on program setup interface
- b) Charge or discharge the battery. Charged capacity or discharged capacity is 25% of battery rated capacity at least.
- c) BMS will calibrate the SOC automatically after charge or discharge.

### 4. Charge or discharge current display is not stable or wrong

- a) The wire length from current shunt to battery negative should be as short as possible.
- b) Check charge current or discharge current ripple, especially on inverter.
- c) Add low-pass filter on current sensor
- d) Calibrate current again

### 5. Cell voltage difference drop slow during balance

- a) Setup balance in storage is ON
- b) Setup balance in charge is ON
- c) Setup lower balance start voltage
- d) Confirm the BMS main unit blue case is warm, if yes, means the balance is in working.
- e) If a cell voltage is always lower than others, such as cell 5, please disconnect all battery and measure resistance between cell 5- and 5+ on balance port. Generally it is very large. If only 10 ohm or less, please return back to us for repair.
- f) For over 50Ah battery, the balance time is longer
- g) After discharge, check the cell voltage difference on LCD, if over 100mV even 200mV, means the cell impedance difference or capacity difference is very large. Change lower voltage cell in discharge or higher voltage cell in charge is suggested.

### 6. STOP button freeze

- a) When current displayed is zero, that is to say, the battery don't be charged or discharged, press STOP button make the BMS enter into sleep mode to save battery energy. At other situations, the STOP button is disable.
- b) If stop charge or discharge, please operate on charger or motor.

## Warranty and Service

Choice BMS as manufacture of power system warrants its BMS and current Sensor to be free of defects in material and workmanship . This warranty is effective for 12 months from date of purchase . If within the warranty period the customer is not satisfied with the products performance resulting from a manufacturing defect, the accessory will be replaced or repaired.

Your selling dealer is your first point of contact for warranty issues. Return postage costs are the responsibility of the user in all cases. Please submit copy of original receipt with the return.

Damage due to physical shock (dropping on the floor, etc.), inappropriate power supply (unstable output voltage and insufficient power, etc.), water, moisture, and humidity are specifically NOT covered by warranty.

