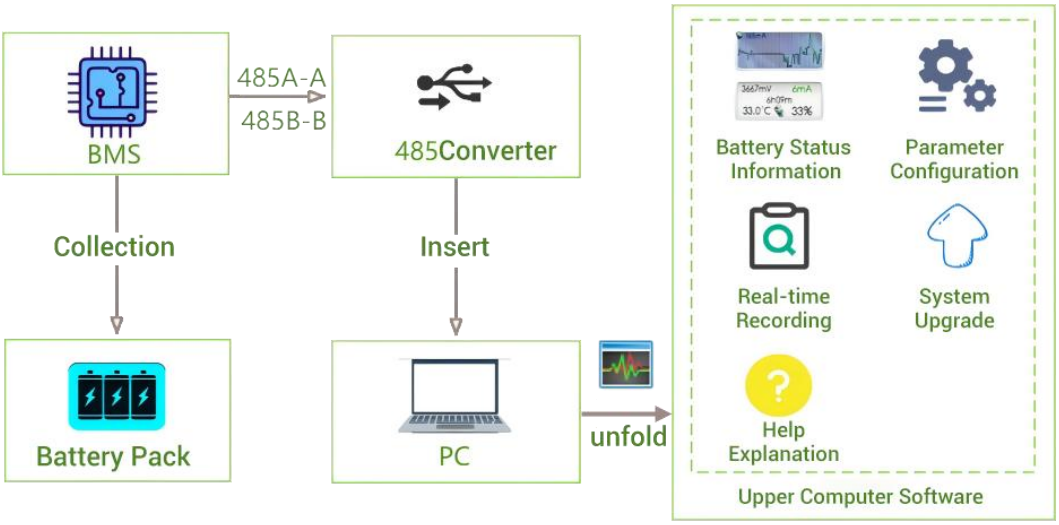
3110 Series BMS
Master-Slave Protection Board
Upper PC Software
User Manual

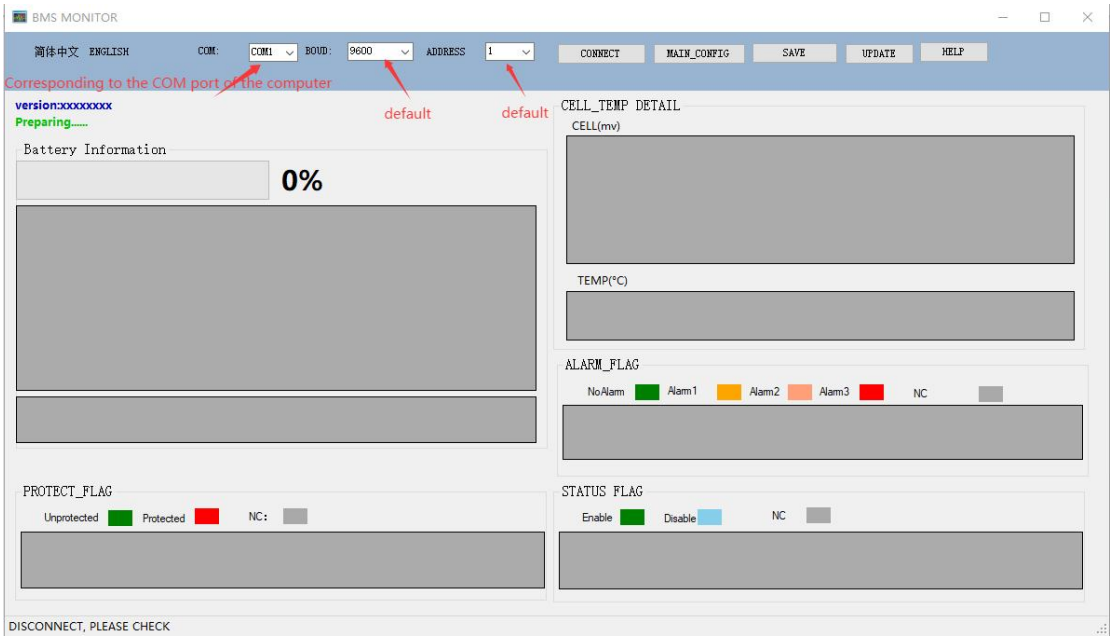
1. Product Introduction

WARNING: Most of the parameters of this PC software are specially customized for customers, please do not change them arbitrarily, otherwise it will not be responsible for battery damage or other serious consequences.

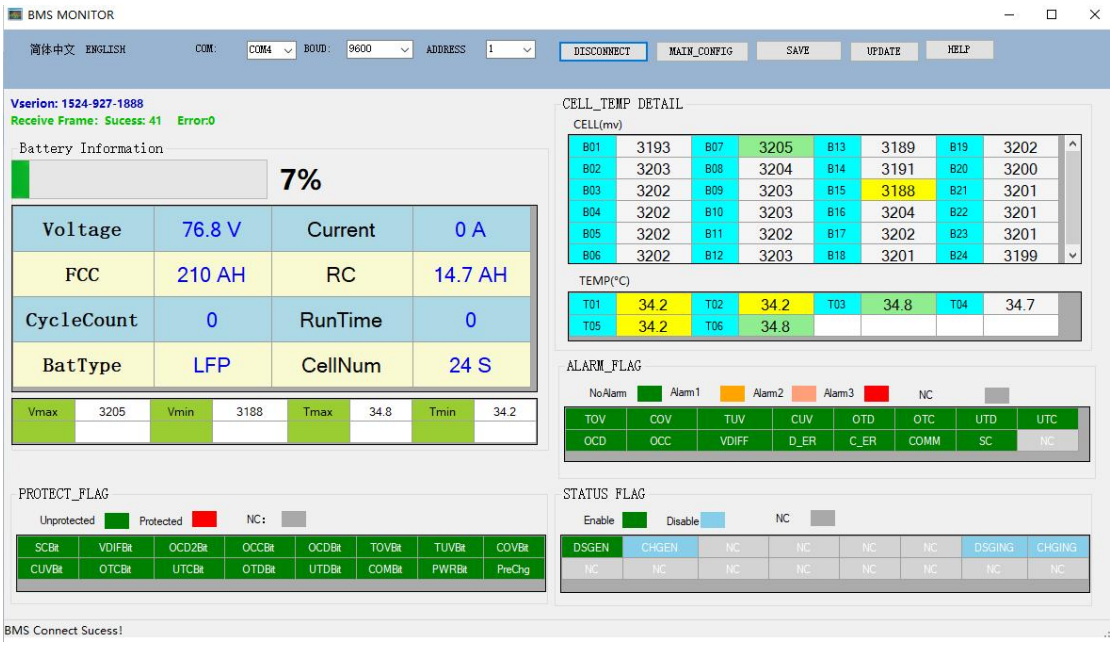
The host computer designed for the BMS battery management system can monitor the battery cell voltage, battery pack total voltage, battery cell temperature, charge and discharge current and other parameters of the lithium battery system in real time with high precision, and display the corresponding lithium battery overcharge, over discharge, over current, over temperature, short circuit and other protection status. The host computer includes the main interface, parameter configuration interface, data recording, firmware upgrade, and help instruction.



After connecting the cables, turn on the host computer, select the correct port number and baud rate at the top of the interface, the station address defaults to 1, and click Connect Device.



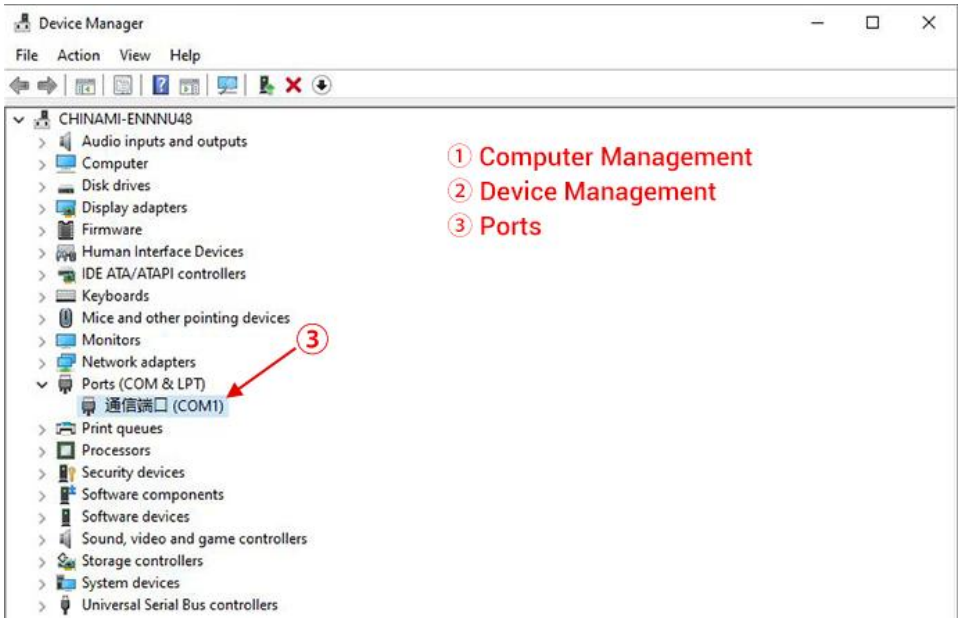
When the version number and battery information appear in the upper left corner, the connection is successful, as shown in the figure below.



To successfully connect to the host computer software to view or modify parameters, you need to check the following points:

- Wiring. After ensuring that the connector is plugged in and out after the switch is closed, and that the wiring harness definition and actual situation are in line with expectations, recheck the product wiring, especially the 485 wiring (485 wiring is 485-A to 485-A, 485-B to 485-B), to eliminate the possibility of wiring errors or poor contact.

- Port number. Make sure the port number is correct. Right-click this computer and select Manage. In the Computer Management interface, click Device Manager and Ports. After inserting the USB port, you can observe the new port number. As shown in the figure below.



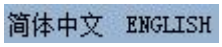
⚠When 485 to USB is connected to the computer, a driver needs to be installed, otherwise an exclamation mark will appear in front of the port and it cannot be used.

2. Key Technical Indicators

Parameters		Indicator
Power supply		18-96V (Note: For battery packs below 96V, power can be supplied using the total battery voltage without the need for an external DC-DC converter.)
System power consumption		Working mode: <10 mA; Sleep mode: <1 mA; Shutdown mode: <50 μA
System startup method		External passive switch signal (default self-locking switch)
Number of collection strings for battery cells		8～240S
Number of temperature acquisition channels		The default is 1/4 of the number of battery cells, which can be expanded to support higher values through the BTU temperature expansion module.
Single cell voltage	Voltage acquisition range	0～5V，Supports all lithium battery monitoring
	Detection error	≤±0.1%
Total battery pack voltage	Measurement range	8～1000V
	Detection error	≤±0.2%
Charging and discharging current	Measurement range selection	Hall detection method, typical ±600A range, optional 100A, 300A, 600A, 1200A
	Detection error	±1 %
Temperature	Measurement range	-40～125℃
	detection error	±1℃
SOC estimation error		≤5 %
Cell balancing (intelligent balancing)		Typical equilibrium current 80mA
Number of relay control circuits		6-channel, 12V/24V high-side drive control

Communication method		Up to 6 isolated CAN 2.0B interfaces: vehicle communication: V_CAN, charging communication: C_CAN, internal communication: I_CAN; debugging communication: D_CAN; reserved CAN: R1_CAN; reserved CAN: R2_CAN. 2 isolated RS485 interfaces supporting Modbus protocol, compatible with VCU or display screen 2 UART interfaces, suitable for connecting Bluetooth modules, GPS remote management, or display screens, etc.
Operating environment	Operating temperature	-40～105℃
	Operating environment	10～90 %RH,No condensation, no corrosive gases
	Altitude	≤4500m

3. Overview information

（1） 

: Language switching button, users can freely switch between Chinese and English for convenience.

（2） 

: Default value, it is the serial port number of the upper computer connecting to the battery management system, generally prohibited from modification.

（3） 

: default 9600, is the rate of the system transmission information, can not be changed arbitrarily.

（4） 

: It is the address of the device used to identify the sending data in ModBus protocol. Generally prohibited to modify, as the source station host address of the battery management system.

（5） 

: the upper computer connects to the battery management system button, after clicking it the upper computer will search for the device and connect it, after clicking it again it will disconnect the system.

（6） 

: Click it to make detailed settings for each parameter of the system.

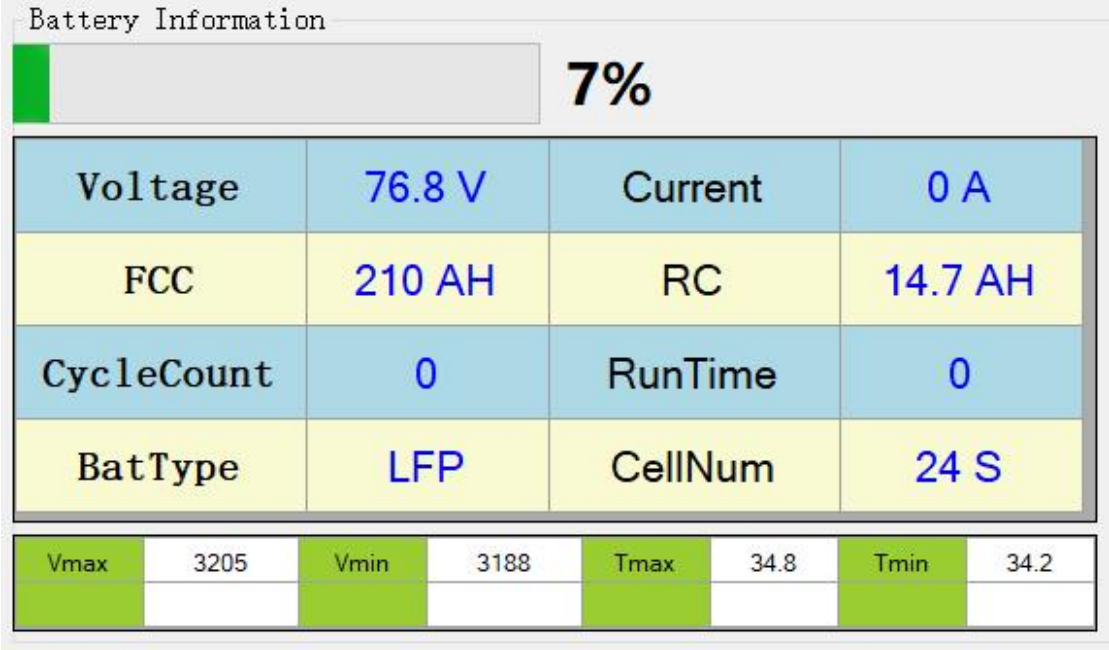
（7） 

: Click to record the parameters of the current system operation, such as voltage, current, temperature, capacity and so on. Click again to stop recording data.

（8） 

: Generally there is no need to upgrade, if the system fails, you can contact the after-sales service to solve the problem or upgrade the system.

（9） HELP: No function, not open for the time being.



（10）Battery Information: Display the current power of the battery pack, green progress for real-time power display, percentage for specific power display.

If the upper computer displays 0% power after connection, it means that the battery has triggered the over-discharge protection, and if it displays 100%, it may have triggered the over-charging protection. It is also possible that the host computer is stuck, you need to restore the factory settings of the motor or restart to work, open the pre-charge relay need to wait a minute or two!

（11）**Voltage:** The total voltage of the battery pack measured by the battery management system through the voltage sensor.

（12）**Current:** The battery management system measures the real-time operating current value of the battery pack by means of a current sensor.（Note the value of the battery current parameter, where negative values represent charging and positive values represent discharging）

（13）**FCC:** the maximum charge capacity of the battery pack measured by the battery management system.

（14）**RC:** the current actual charging capacity of the battery pack measured by the battery management system.

（15）**CycleCount**: After a complete charging and discharging of the battery pack, it is counted as one cycle.

（16）**Run time:** the working running time of the battery management system, unit: min/min

（17）**BatType:** shows the battery type of the battery pack.

（18）**CellNum:** shows the specific string number of the battery pack.

（19）**Vmax:** display the battery management system to measure the highest single string voltage value of the battery pack.

（20）**Vmin:** display the battery management system to measure the lowest single string voltage value of the battery pack.

（21）**Tmax:** Displays the highest single string temperature value measured by the battery management system for the battery pack.

（22）**Tmin:** Displays the lowest single string temperature value of the battery pack measured by the battery management system.



4. Protection flag：（green for safe value, red for protection status）

（1）**SCBit:** When the current in the battery pack exceeds 4 times the maximum current, it will start the protection state.

（2）**VDIFBit:** When the voltage difference between single cells in the battery pack exceeds the set protection value, the protection will be triggered.

（3）**OCD2Bit:** The protection will be triggered when the current in the battery pack exceeds the set protection value of level 2 during discharge.

（4）**OCCBit:** the protection will be triggered when the current of the battery pack exceeds the set protection value during charging.

（5）**OCDBit:** the protection will be triggered when the current of the battery pack exceeds the set protection value during the discharge process.

（6）**TOVBit:** The battery management system will trigger the protection when it detects that the overall voltage of the battery pack exceeds the set protection value during the charging process.

（7）**TUVBit:** The battery management system will trigger the protection when it detects that the overall voltage of the battery pack is lower than the set protection value during the discharging process.

（8）**COVBit:** The battery management system will trigger the protection when it monitors that the voltage of a single cell exceeds the set protection value during the charging process.

（9）**CUVBit:** The battery management system will trigger the protection when it monitors the voltage of single cell is lower than the set protection value during the discharging process.

（10）**OTCBit:** The battery management system will trigger the protection when the temperature of single cell exceeds the set protection value during the charging process.

（11）**UTCBit:** the battery management system will trigger the protection when it monitors the temperature of single cell battery is lower than the set protection value during the charging process.

（12）**OTDBit:** the battery management system will trigger the protection when the temperature of the single cell is over the set protection value during the discharge process.

（13）UTDBit: The battery management system will trigger the protection when it monitors the temperature of the single cell is lower than the set protection value during the discharge process.

（14）**COMBit:** If the battery management system detects that it cannot receive/send data during the working process, it will trigger the communication protection.

（15）**PWRBit:** The battery management system will trigger the protection if it detects that the power supply is unable to supply power and other conditions during the working process.

（16）**PreChg:** The battery management system will trigger the protection if it fails to detect the temperature of a single string of cells of the battery pack during the working process.

CELL_TEMP DETAIL

CELL(mv)

B01	3193	B07	3205	B13	3189	B19	3202
B02	3203	B08	3204	B14	3191	B20	3200
B03	3202	B09	3203	B15	3188	B21	3201
B04	3202	B10	3203	B16	3204	B22	3201
B05	3202	B11	3202	B17	3202	B23	3201
B06	3202	B12	3203	B18	3201	B24	3199

TEMP(°C)

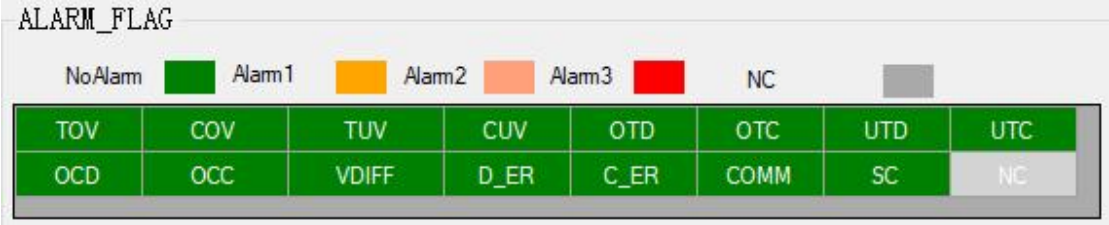
T01	34.2	T02	34.2	T03	34.8	T04	34.7
T05	34.2	T06	34.8				

5. Cell_temp detail :

Voltage and temperature information can be viewed for each string of cells in the battery pack.

The text starting with B in the voltage and temperature details indicates the cell number. The first string of numbers from the negative pole is B01, the second string is B02, and so on. The text starting with T indicates the temperature number. In the voltage area, green indicates the highest voltage and yellow indicates the lowest voltage.

If the battery pack voltage shows 0 then the battery may be over discharged or there may be a problem with the BMS settings. If the battery pack voltage shows 6553 or other maximum voltage, the battery may be overcharged or there is a problem with the BMS settings.



6. Alarm flag

（Green means no alarm, yellow is first level warning, vermilion is second level warning and red is third level warning. The third level warning will trigger the protection, when there is an alarm you need to check the alarm information and solve it in time.）

TOV: The battery management system will trigger an alarm when it monitors that the overall voltage of the battery pack exceeds the set alarm value during the charging process.

COV: The battery management system will trigger an alarm when it monitors that the voltage of a single cell exceeds the set alarm value during the charging process.

TUV: The battery management system will trigger an alarm when it detects that the total voltage of the battery pack is lower than the set alarm value during the discharging process.

CUV: The battery management system will trigger an alarm when the voltage of a single cell is lower than the set alarm value during the discharge process.

OTD: The battery management system will trigger an alarm when the temperature of the single cell exceeds the set alarm value during the discharge process.

OTC: The battery management system will trigger an alarm when the temperature of a single battery exceeds the set alarm value during the charging process.

UTD: the battery management system will trigger an alarm when it monitors the temperature of a single cell to be lower than the set alarm value during the discharging process.

UTC: The battery management system will trigger an alarm when it monitors the temperature of a single cell to be lower than the set alarm value during the charging process.

OCD: The battery management system will trigger an alarm when the current exceeds the set alarm value during the discharge process.

OCC: when the battery pack current exceeds the set alarm current value during the charging process, it will trigger an alarm.

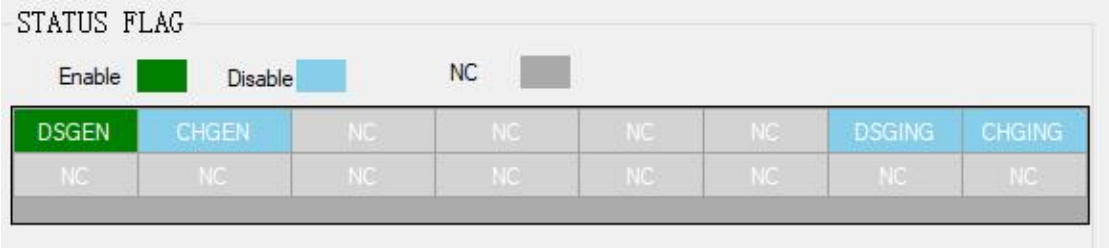
VDIFF: When the voltage difference between single cells in the battery pack exceeds the set alarm value, an alarm will be triggered.

D_ER: The alarm will be triggered when the discharge relay fails to close (no internal path is formed) or when the battery pack cannot be discharged due to other reasons.

C_ER: When the charging relay fails to close (no internal path is formed) or other reasons lead to the battery pack can not be charged, an alarm will be triggered.

COMM: An alarm will be triggered if the battery management system detects that it is unable to receive/send data during the working process.

SC: short-circuit alarm will be triggered when the current detected during charging/discharging of the battery pack is greater than the set value.



7. Status flag:

（green color means the flag bit is in enable (closed/working) state, blue color means the flag bit is in disable (disconnect/deactivate) state. Users can set the flag bit's opening and closing by themselves）

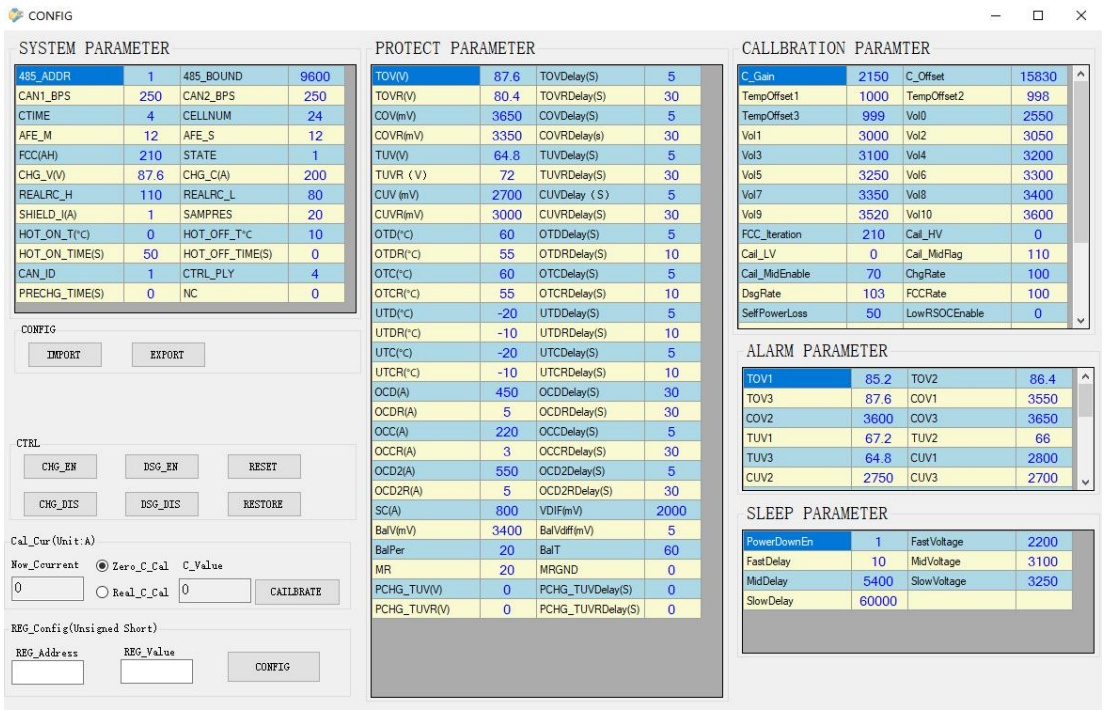
DSGEN: the flag bit shows green when clicked closed, at this time, the discharge relay is on, and the discharge operation can be carried out. After clicking again, the discharge relay is disconnected, and no discharge operation can be performed at this time.

CHGEN: After clicking closed, the symbol shows green, at this time, the charging relay is on, and charging operation can be carried out. After clicking again, the charging relay is disconnected, and charging operation cannot be carried out at this time.

DSGING: when the symbol shows green, it means the battery pack is discharging, when the symbol shows blue, it means the battery pack is not discharging.

CHGING: When the symbol shows green, it means the battery pack is charging, when the symbol shows blue, it means the battery pack is not charging.

⚠ The action must also meet the battery's own conditions. For example, if the battery reaches under-voltage protection, it will not pull in even if the pull-in is pressed.
If the system turns off the discharge relay and it still shows discharge in progress, the relay may be short-circuited or the current may not be zeroed.



Special note: The modification of the parameter configuration page must be performed by relevant professionals. The filled value must meet the value range and value function definition instructions. Without confirming whether the definition and value of the parameter configuration item are accurate, please do not configure it randomly, which will cause BMS function disorder!After modifying the system parameters, you need to reboot the system to save the modified parameters！

SYSTEM PARAMETER

485_ADDR	1	485_BOUND	9600
CAN1_BPS	250	CAN2_BPS	250
CTIME	4	CELLNUM	24
AFE_M	12	AFE_S	12
FCC(AH)	210	STATE	1
CHG_V(V)	87.6	CHG_C(A)	200
REALRC_H	110	REALRC_L	80
SHIELD_I(A)	1	SAMPRES	20
HOT_ON_T(°C)	0	HOT_OFF_T°C	10
HOT_ON_TIME(S)	50	HOT_OFF_TIME(S)	0
CAN_ID	1	CTRL_PLY	4
PRECHG_TIME(S)	0	NC	0

8. System parameter:

485_Address: default value, it is the access address of RS485 communication interface, usually cannot be modified.

485_BOUND: default value, it is the transmission speed of RS485 communication interface, usually cannot be modified.

Can1_BPS: default value, it is the transmission speed of can communication in the system, usually cannot be modified.

Can2_BPS: default value, it is the transmission speed of can communication in the system, usually cannot be modified.

CTIME: Default value, meaning the time and speed of acquiring system test data, usually cannot be modified.

CELLNUM: the total number of battery strings in the system, users can set it by themselves, it should be the same as the actual number of battery strings.

AFE_M: default value, it is the battery string number of the battery management system from the collection module, and it is forbidden to modify it.

AFE_S: default value, it is the number of battery series of the battery management system from the acquisition module, and it is forbidden to modify it.

FCC(AH): the overall capacity value of the battery pack, usually cannot be modified.

STATE: default value is 0, modification is prohibited.

CHG_V(V): the total voltage of the battery pack, it needs to be consistent with the total over-voltage value of the battery pack in the protection parameters, and can be modified manually.

CHG_C(A): the maximum charge/discharge current of the battery pack, can be modified.

REALRC_H: related to charging and discharging control strategy and thermal runaway prevention, default value, system automatically adjusts, prohibit modification.

REALRC_L: related to charge/discharge control strategy and thermal runaway prevention, default value, automatically adjusted by the system, modification is prohibited.

SHIELD_I(A): set for the battery management system to detect whether the current is abnormal or not, default value, prohibit modification.

SAMPRES: important parameter for monitoring current monitoring and protection in battery management system, prohibit modification.

HOT_ON_T(℃): when the temperature of the battery pack is too low, the system will start the heating function when it detects the value, to prevent the battery pack performance and efficiency from decreasing, can be modified.

HOT_OFF_T(℃): when the battery pack is heated to the set value, the heating will stop, can be modified.

HOT_ON_TIME(S): When the heating temperature reaches the turn on temperature, the heating will not start immediately, but after a delay to ensure that the temperature is still at the turn on heating temperature before starting heating.

HOT_OFF_TIME(S): the heating of the system will not stop immediately after reaching the specified temperature, but after a delay to ensure that the temperature is stabilized at the specified temperature before stopping the heating.

Can_ID : it is an important parameter to decide the communication priority, data classification and network conflict management mechanism between BMS and other controllers, and modification is prohibited.

CTRL_PLY: as the core control strategy policy of the battery management system, it needs to be modified to 3 when the system has docking agreement with the battery pack, and it needs to be modified to 2 when the system has no docking agreement with the battery pack and blind charging. If there is a total negative relay, you need to change it to 4.

PRECHG_TIME(S): it is the time delay needed to wait for the bus voltage to rise to the safety threshold smoothly after the BMS control pre-charging relay is closed during the process of the high-voltage system powering up. This is a key protection mechanism to prevent the load equipment from being damaged by the high-voltage electric shock, and the default value cannot be modified arbitrarily.

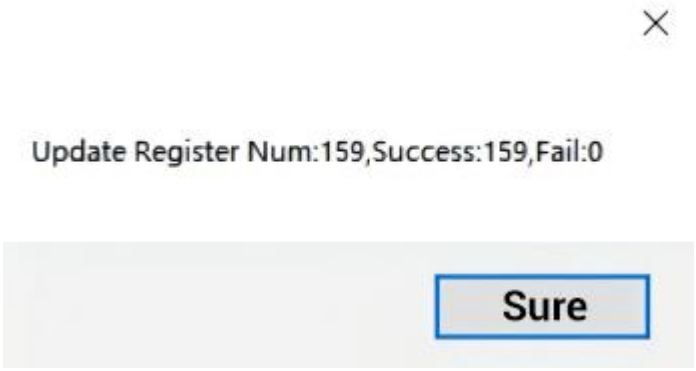
NC: It refers to the margin or redundant space reserved in advance in hardware resource allocation, software algorithm design and safety strategy. The core purpose is to provide a buffer for the

system to cope with uncertainties (e.g. sensor error, aging drift, etc.) to ensure safety and reliability, and cannot be changed arbitrarily.



9. Config import:

Click to import the previously saved parameter settings.（After the import is completed, the system will automatically restart and a pop-up box as shown below will appear. Click OK and the configuration will be successfully imported.）



Export: You can save the currently set parameters and import them for use next time.



10. CTRL

CHG_EN: Clicking on it will close the un-closed charging relay.

DSG_EN: Click to close the un-closed discharge relay.

RESET: If the system is stuck or there is a system error, you can restart the system to start working again.

CHG_DIS: Click to disconnect the closed charge relay and stop working.

DSG_DIS: Click to disconnect the closed discharge relay and stop working.

RESTORE: When the customer modifies the parameter arbitrarily and does not know the initial parameter or wants to go back to the original state, clicking can make the upper computer restore the original parameter setting.

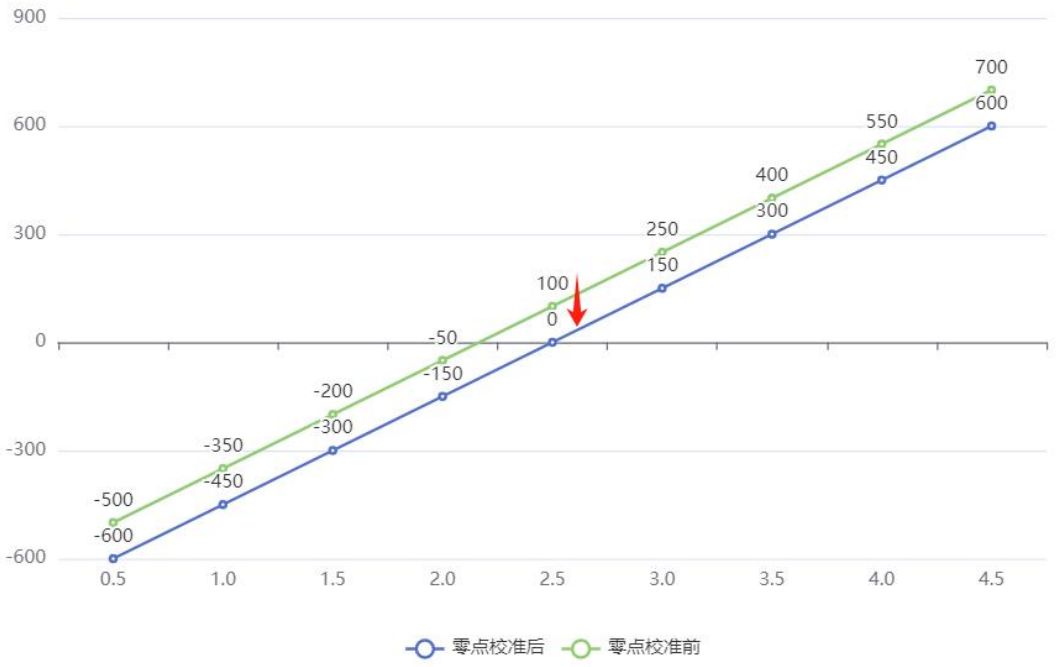
11. Car_cur(Unit:A)

Now_current:Displays the real-time operating current value of the current system.

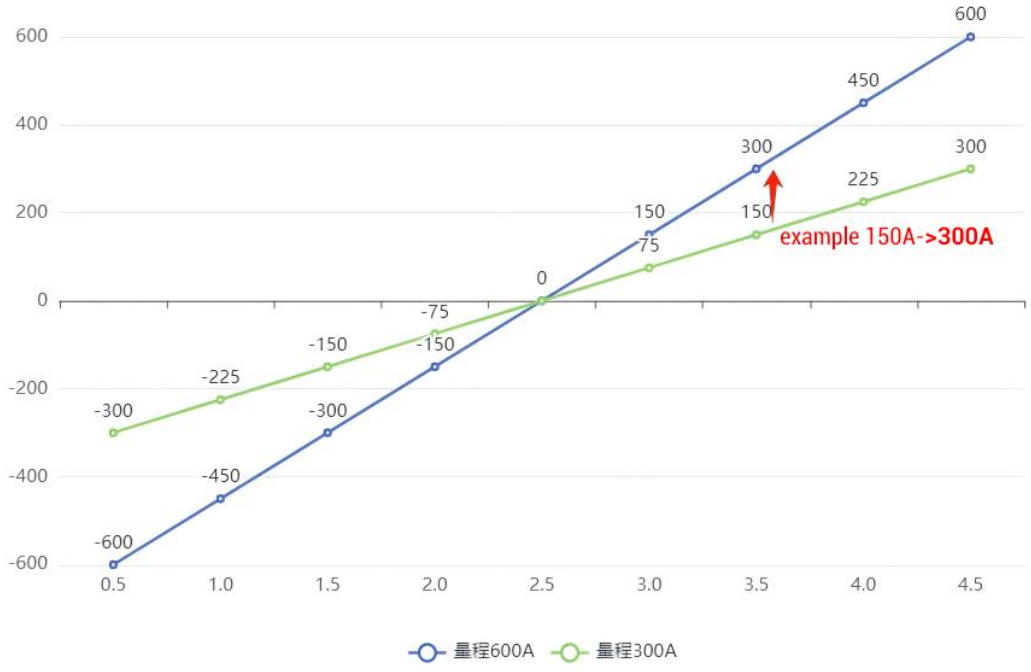
Zero_c_cal: When the system is in non-operating state with 0 current, input 0 value at this time and click calibration to calibrate the non-0 current to 0 current.

Real_c_cal: After measuring the current current value by yourself, input the measured value and click calibration, it can make the incorrect current calibrated to the correct current value.

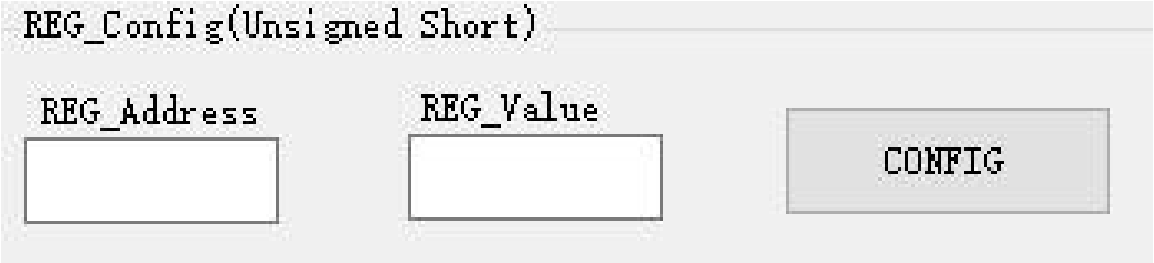
The principles of zero-point current calibration and real-time current calibration are shown in the following figure.



Zero Current Calibration Principle



Real-time Current Calibration Principle



12. REG_Configuration(Unsigned Short)

REG_Address: constitute the underlying instruction set in the BMS and are prohibited from being changed.

REG_Value： constitute the underlying instruction set in the BMS and are prohibited from being changed.

PROTECT PARAMETER

TOV(V)	87.6	TOVDelay(S)	5
TOVR(V)	80.4	TOVRDelay(S)	30
COV(mV)	3650	COVDelay(S)	5
COVR(mV)	3350	COVRDelay(s)	30
TUV(V)	64.8	TUVDelay(S)	5
TUVR（V）	72	TUVRDelay(S)	30
CUV (mV)	2700	CUVDelay（S）	5
CUVR(mV)	3000	CUVRDelay(S)	30
OTD(°C)	60	OTDDelay(S)	5
OTDR(°C)	55	OTDRDelay(S)	10
OTC(°C)	60	OTCDelay(S)	5
OTCR(°C)	55	OTCRDelay(S)	10
UTD(°C)	-20	UTDDelay(S)	5
UTDR(°C)	-10	UTDRDelay(S)	10
UTC(°C)	-20	UTCDelay(S)	5
UTCR(°C)	-10	UTCRDelay(S)	10
OCD(A)	450	OCDDelay(S)	30
OCDR(A)	5	OCDRDelay(S)	30
OCC(A)	220	OCCDelay(S)	5
OCCR(A)	3	OCCRDelay(S)	30
OCD2(A)	550	OCD2Delay(S)	5
OCD2R(A)	5	OCD2RDelay(S)	30
SC(A)	800	VDIF(mV)	2000
BalV(mV)	3400	BalVdiff(mV)	5
BalPer	20	BalT	60
MR	20	MRGND	0
PCHG_TUV(V)	0	PCHG_TUVDelay(S)	0
PCHG_TUVR(V)	0	PCHG_TUVRDelay(S)	0

13. Protect parameter

TOV(V): the total voltage of the battery pack overvoltage protection value, need to be consistent with the requested voltage value, more than this value the system will start the protection.

TOV Delay(S): When the total voltage of the battery pack exceeds the set value, the system will first delay and then determine whether the voltage really exceeds the total voltage set value, if it does, the system will start the protection measures.

TOVR(V): When the battery pack voltage returns to the set voltage value, the system will stop protection and return to normal working condition.

TOVR Delay(S): when the battery pack voltage drops to the total overvoltage release value, it will first delay, and then determine whether the total voltage is lower than the overvoltage release value, if it is lower than the system will stop the protection and return to normal operation.

COV(mV): When the voltage of single cell of the battery pack reaches the set value, the protection will be activated.

COV Delay(s): when the battery pack single cell voltage reaches the single-unit over-voltage value will not start protection immediately, but first delay and then detect whether it reaches the single-unit over-voltage value, such as reaching and then protection.

COVR(mV): when the battery pack single cell voltage is lower than the set value, the system will start the protection.

COVR Delay(s): when the battery pack single cell voltage is lower than the single under-voltage release value, it will first delay and then detect whether it is lower than the single under-voltage release value, and if it is lower than that, the system will start the protection.

TUV(V): When the overall voltage of the battery pack is lower than the set value, it is considered that the battery pack is under-voltage and protection will be activated.

TUV Delay(S): when the total voltage of the battery pack is lower than the total under-voltage value, it will first delay and then detect whether the voltage is still lower than the total under-voltage value, and if it is lower than that, it will start the protection.

TUVR(V): when the total voltage of the battery pack is restored to the value, the system will release the protection state and return to normal operation.

TUVR Delay(S): when the total voltage of the battery pack is restored to the total under-voltage release value, the system will first delay and then detect whether it is lower than the total under-voltage release value, and lower than that, the system will release the protection and return to normal operation.

CUV(mV): When the voltage of single cell of the battery pack is less than or equal to the value, the system will start the protection.

CUV Delay(S): when the battery pack single cell voltage is less than or equal to the single under-voltage value, the system will first extend the time and then detect whether it is still less than or equal to the single under-voltage value, if less than or equal to it, it will start the protection.

CUVR(mV): When the voltage of single string battery of the battery pack is restored to the set value, the battery management system will turn off the protection and return to normal operation.

CUVR Delay(S): when the battery pack single string battery voltage is less than or equal to the single under-voltage release value, it will first delay for a period of time and then detect whether the voltage is less than or equal to the single under-voltage release value, if it is, then it will turn off the protection and return to normal operation.

OTD(℃): When the temperature of the battery pack reaches the set value during the discharge process, the battery management system will start the protection and stop the discharge work.

OTD Delay(S): When the temperature of the battery pack reaches the discharge high temperature value during discharge, the battery management system will first delay for a set period of time, and then determine whether the discharge high temperature value has been reached, and if it has been reached, it will start the protection and stop the discharge.

OTDR(℃): when the battery pack temperature returns to the set value, the system will close the protection and resume normal discharge work.

OTDR Delay(S): when the battery pack temperature returns to the discharge high temperature release value, it will not immediately return to normal operation, but will first delay and then determine whether the temperature is really less than or equal to the discharge high temperature release value, if so, the system will turn off the protection and return to normal discharging state.

OTC(℃): When the temperature of the battery pack reaches the set value during the charging process, the battery management system will start the protection and stop the charging work.

OTC Delay(S): When the temperature of the battery pack reaches the charging high temperature value during charging, the battery management system will first delay for a set period of time, and then determine whether the charging high temperature value has been reached, and then start the protection and stop charging if it has been reached.

OTCR(℃): when the battery pack temperature returns to the set value, the system will turn off the protection and resume normal charging work.

OTCR Delay(S): when the battery pack temperature returns to the charging high-temperature release value, it will not immediately return to normal operation, but will be delayed before judging whether the temperature is really less than or equal to the charging high-temperature release value, if it is, the system will turn off the protection and return to normal charging status.

UTD(℃): When the temperature of the battery pack reaches the set value during the discharge process, the battery management system will start the protection and stop the discharge work.

UTD Delay(S): when the temperature of the battery pack reaches the discharge low temperature value during discharge, the battery management system will first delay for a set period of time, and then determine whether the discharge low temperature value has really been reached, and if so, the system will activate the protection and stop the discharge.

UTDR(℃): When the battery pack temperature returns to the set value, the system will turn off the protection and resume normal discharge work.

UTDR Delay(S): when the battery pack temperature returns to the discharge low-temperature release value, it will not immediately return to normal operation, but will first delay and then determine whether the temperature is really greater than or equal to the discharge low-temperature release value, and if it is, the system will turn off the protection and return to normal discharge state.

UTC(℃): When the temperature of the battery pack reaches the set value during the charging process, the battery management system will start the protection and stop the charging work.

UTC Delay(S): when the temperature of the battery pack reaches the charging low temperature value during charging, the system will first delay for a set period of time, and then determine whether the charging low temperature value has been reached, and then the system will activate the protection and stop charging if it has been reached.

UTCR(℃): when the battery pack temperature returns to the set value, the system will turn off the protection and resume normal charging work.

UTCR Delay(S): when the battery pack temperature returns to the charging low-temperature release value, it will not immediately return to normal operation, but will first delay and then determine whether the temperature is really greater than or equal to the charging low-temperature release value, and if it is, the system will turn off the protection and return to normal charging status.

OCD(A): when the battery pack is discharging, the current exceeds the set value, it will start the protection function and stop discharging.

OCD Delay(S): when the battery pack in the discharge process, the current exceeds the set value of discharge over-current will first delay, and then determine whether it is greater than or equal to the discharge over-current value, if so, the system will start the protection and stop the discharge work.

OCDR(A): when the current returns to the set value after the battery pack is protected from discharge over-current, the system will stop the protection and return to the normal discharge state.

OCDR Delay(S): when the battery pack current is less than or equal to the discharge over-current release value, it will not resume normal work immediately, but will first delay, and then determine whether the total current is less than or equal to the discharge over-current release value, if so, the system will resume the normal discharge work state.

OCC(A): When the battery pack is charging and the current exceeds the set value, the protection function will be activated to stop the charging work.

OCC Delay(S): when the battery pack in the charging process, the current exceeds the charging over-current set value will first delay, and then determine whether it is greater than or equal to the charging over-current value, if so, the system will start the protection and stop charging work.

OCCR(A): when the battery pack is protected from charging over-current and the current returns to the set value, the system will stop the protection and return to the normal charging state.

OCCR Delay(S): when the battery pack current is less than or equal to the charging over-current release value, it will not resume normal work immediately, but will first delay, and then judge whether the total current is less than or equal to the charging over-current release value, if so the system will resume normal charging work state.

OCD 2(A): The second layer of protection to prevent the failure of the first layer of protection. When the battery pack is discharging and the current exceeds the set value, the protection function will be activated and the discharging work will be stopped.

OCD 2 Delay(S): when the battery pack in the discharge process, the current exceeds the discharge over-current set value will first delay, and then determine whether it is greater than or equal to the discharge over-current layer 2 value, if it is, then the system will start the protection and stop the discharge work.

OCD2R(A): when the battery pack is protected by the 2nd layer of discharge over-current and the current returns to the set value, the system will stop the protection and resume the normal discharge working state.

OCD2R Delay(S): when the battery pack current is less than or equal to the discharge over-current 2 release value, it will not resume normal work immediately, but will first delay, and then determine whether the total current is less than or equal to the discharge over-current 2 release value, if so, the system will resume normal discharge working state.

SC(A): when the battery pack current reaches the set value during the working process, it will be considered as a short-circuit of the battery pack line and the circuit will be cut off immediately.

VDIF(mV): when the voltage difference between the battery strings reaches the set protection value, the system will turn on the protection and stop the ongoing work.

BalV(mV): When the voltage of each battery string reaches the set value, the system will be ready to start the equalization work on the battery.

BalVdiff(mV): When the voltage of each string of cells in the battery pack reaches the equalization starting voltage, the system will detect the pressure difference between them, and start to equalize the batteries when the pressure difference between the batteries reaches the set value.

Balper: It is the core parameter describing the ratio of the working time of the equalization circuit, which directly affects the equalization efficiency and safety. Its essence is to adjust the average value of the actual equalization current by controlling the ratio of on/off time of the switching device, so as to avoid damage to the battery cell by continuous high current.

BalT: When the battery pack temperature is less than or equal to the set value, the system will force the equalization to shut down, preventing the impact of increased internal resistance of the battery caused by the temperature drop.

MR: Positive Insulation Value is a core safety parameter for assessing the insulation status of the HV system to the vehicle/equipment chassis (ground), and is essentially an indicator to quantify the risk of leakage in the HV circuit. It is directly related to personnel electric shock protection and system safety.

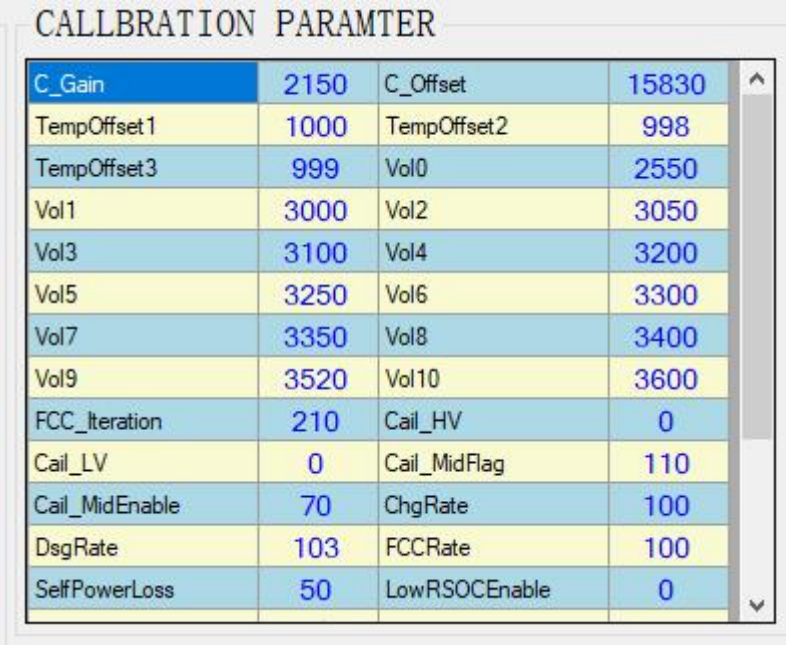
MRGND: Negative insulation value is the core safety parameter to assess the insulation status of high voltage system to vehicle/equipment chassis (ground), and its essence is to quantify the risk of leakage of high voltage circuit index. It is directly related to personnel electric shock protection and system safety.

PCHG_TUV(V): the battery voltage threshold for triggering the pre-charging process, which is the high-voltage battery state condition for judging whether to allow pre-charging to start in the BMS control strategy.

PCHG_TUV Delay(S): when the system voltage meets the pre-charging opening voltage, it will not close the pre-charging relay immediately, but will first delay and then detect whether the voltage is always greater than or equal to the pre-charging opening voltage, if so, the system will close the pre-charging relay.

PCHG_TUVR(V): Precharge recovery voltage refers to the minimum battery voltage threshold required for the system to retry to start the precharge process after the precharge relay closure fails.

PCHG_TUV Delay(S): This is the time interval that the BMS is forced to wait before it tries to start the precharge process again after the precharge has failed. Its core role is to protect the high voltage hardware (relays, resistors) and wait for the system state to be restored, and is a key safety redundancy design in the precharge strategy.



14. Calibration parameter

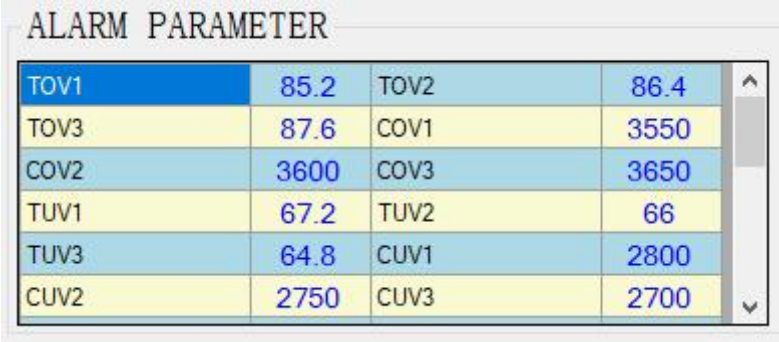
C_Gain: Current gain refers to the amplification of the weak electrical signal generated by the battery charge/discharge current in the current measurement circuit. It is one of the core parameters for BMS to realize accurate current detection, which directly affects the accuracy, range and reliability of current measurement.

C_Offset: It is the non-zero signal value output by the current measurement circuit when there is "no current input in theory", i.e. the fixed deviation between the measurement result and the real value. It is one of the key error sources affecting the accuracy of current measurement, and needs to be eliminated through calibration to ensure the BMS's accurate judgment of the battery's charging and discharging status.

TempOffset1/2/3: Temperature compensation is a correction mechanism for the deviation of battery performance with temperature change, the core function is to offset the interference of temperature on the judgment of battery status by dynamically adjusting the measurement, calculation or control parameters to ensure that the BMS works accurately in different temperature environments.

Vol0-10: Voltage calibration parameter is a set of preset data or algorithm parameter used to correct the deviation of voltage measurement, the core function is to ensure that the battery voltage measured by BMS (such as single cell voltage, total voltage) is the same as the real value by compensating the error brought by the hardware, environment or the battery itself, so as to provide a reliable basis for the subsequent SOC calculation, charging and discharging protection and other functions.

FCC_Iteration:is the capacity size of the battery pack under the real full-charged state, the set value must be consistent with the rated capacity and cannot be changed arbitrarily.



15. Alarm parameter

TOV 1: the overall voltage of the battery pack is too high 1 alarm, when the total voltage of the battery pack exceeds the set value, the system will prompt the user to warn, but will not start the protection.

TOV 2: the overall voltage of the battery pack is too high level 2 alarm, when the total voltage of the battery pack exceeds the set value, the system will prompt the user to warn, but will not start the protection.

TOV 3: the overall voltage of the battery pack is too high 3 alarms, when the total voltage of the battery pack exceeds the set value, the system will prompt the alarm user, and will start the protection, cut off the battery pack work.

COV1: single cell voltage is too high 1 level alarm, when the battery pack single cell voltage exceeds the set value the system will prompt the user to warn, but will not start protection.

COV 2: single cell voltage is too high level 2 alarm, when the battery pack single cell voltage exceeds the set value of the system will prompt to warn the user, but will not start the protection.

COV3: single cell voltage is too high 3 alarm, when the battery pack single cell voltage exceeds the set value of the system will alert the alarm user, and will start the protection, cut off the battery pack work.

TUV1: the total voltage of the battery pack is too low 1 level alarm, when the total voltage of the battery pack is lower than the set value, the system will prompt the user to warn, but will not start the protection.

TUV2: the total voltage of the battery pack is too low 2 alarms, when the total voltage of the battery pack is lower than the set value, the system will prompt to warn the user, but will not start the protection.

TUV 3: the total voltage of the battery pack is too low 3 alarms, when the total voltage of the battery pack is lower than the set value of the system will prompt the alarm user, and will start the protection, cut off the battery pack work.

CUV1: single cell voltage is too low 1 level alarm, when the battery pack single cell voltage is lower than the set value of the system will prompt to warn the user, but will not start the protection.

CUV2: single cell voltage is too low level 2 alarm, when the battery pack single cell voltage is lower than the set value of the system will prompt the user to warn, but will not start the protection.

CUV 3: single cell voltage is too low 3 alarm, when the battery pack single cell voltage is lower than the set value of the system will prompt the warning user, and will start protection, cut off the battery pack work.

OTD 1: discharge temperature is too high level 1 alarm, when the battery pack in the discharge process, the temperature reaches the set value when the system will prompt the alarm user, but will not start the protection.

OTD 2: discharge temperature is too high level 2 alarm, when the battery pack in the discharge process, the temperature reaches the set value when the system will prompt the alarm user, but will not start the protection.

OTD3: discharge temperature is too high level 3 alarm, when the battery pack in the discharge process, the temperature reaches the set value when the system will alert the alarm user, and will start protection, cut off the battery pack work.

OTC1: charging temperature is too high 1 level alarm, when the battery pack in the charging process, the temperature reaches the set value when the system will prompt the alarm user, but will not start the protection.

OTC 2: charging temperature over-temperature level 2 alarm, when the battery pack in the charging process, the temperature reaches the set value when the system will prompt the alarm user, but will not start the protection.

OTC3: charging temperature is too high level 3 alarm, when the battery pack in the charging process, the temperature reaches the set value when the system will prompt the alarm user, and will start the protection, cut off the battery pack work.

UTD1: discharge temperature is too low 1 level alarm, when the battery pack in the discharge process, the temperature drops to the set value when the system will prompt the alarm user, but will not start the protection.

UTD2: discharge temperature is too low 2 alarm, when the battery pack in the discharge process, the temperature drops to the set value when the system will prompt the alarm user, but will not start the protection.

UTD3: discharge temperature is too low level 3 alarm, when the battery pack in the discharge process, the temperature drops to the set value when the system will prompt the alarm user, and will start the protection, cut off the battery pack work.

UTC1: charging temperature is too low level 1 alarm, when the battery pack in the charging process, the temperature drops to the set value when the system will prompt the alarm user, but will not start the protection.

UTC2: charging temperature is too low level 2 alarm, when the battery pack in the charging process, the temperature drops to the set value when the system will prompt the alarm user, but will not start the protection.

UTC3: charging temperature is too low level 3 alarm, when the battery pack in the charging process, the temperature drops to the set value when the system will prompt the alarm user, and will start the protection, cut off the battery pack work.

OCD1: discharge current is too large 1 level alarm, when the battery pack in the discharge process, the current is greater than the set value of the system will alert the alarm user, but will not start the protection.

OCD2: Discharge current is too large level 2 alarm, when the battery pack in the discharge process, the current is greater than the set value of the system will prompt the alarm user, but will not start the protection.

OCD3: Discharge current is too large 3 alarms, when the battery pack in the discharge process, the current is greater than the set value of the system will alert the alarm user, and will start the protection, cut off the battery pack work.

OCC1: charging current is too large 1 level alarm, when the battery pack in the charging process, the current is greater than the set value of the system will alert the alarm user, but will not start the protection.

OCC 2: charging current is too large level 2 alarm, when the battery pack in the charging process, the current is greater than the set value when the system will prompt the alarm user, but will not start the protection.

OCC 3: charging current is too large 3-level alarm, when the battery pack in the charging process, the current is greater than the set value of the system will alert the alarm user, and will start the protection, cut off the battery pack work.

VDIFF1: the voltage difference between the battery strings is too large 1 level alarm, when the battery pack in the working process, the voltage difference between any two strings is greater than or equal to the set value, the system will prompt the alarm user, but will not start the protection.

VDIFF2: the voltage difference between the battery strings is too large level 2 alarm, when the battery pack in the working process, the voltage difference between any two battery strings is greater than or equal to the set value, the system will prompt the alarm user, but will not start the protection.

VDIFF3: the voltage difference between the battery strings is too large 3 alarm, when the battery pack in the working process, the voltage difference between any two strings is greater than or equal to the set value, the system will prompt the alarm user, and will start the protection, cut off the battery pack work.

SLEEP PARAMETER

PowerDownEn	1	FastVoltage	2200
FastDelay	10	MidVoltage	3100
MidDelay	5400	SlowVoltage	3250
SlowDelay	60000		

16. Sleep parameter

PowerDownEn: 0 means disable, 1 means enable hibernation function, by setting this parameter you can control whether it enters hibernation state. When enabled, the system will enter hibernation after charging to reduce battery consumption.

Fast Voltage: Fast Voltage refers to high-frequency, real-time voltage sampling, which is used to quickly capture sudden changes in battery voltage (e.g., voltage fluctuations caused by charging and discharging moments, and dynamic response caused by sudden changes in load).

Mid Voltage: Medium Voltage, refers to medium frequency voltage sampling, which is used to balance monitoring accuracy and system resource consumption.

Slow Voltage: slow voltage, refers to low frequency voltage sampling, used for long-term monitoring of the static characteristics of the battery (battery aging, etc.).

Fast Delay: Fast Delay, refers to a short delay time setting, when the battery management system detects an emergency situation such as over-voltage, over-current, etc., a fast delay will be set in order to trigger the protection mechanism quickly after a very short period of time.

Mid Delay: medium delay, representing a medium length delay time, when the battery management system monitors the battery voltage or temperature and other parameters close to the

critical value, it will set a medium delay, and continue to observe the parameter changes during the delay time to determine whether it is really necessary to take further measures to avoid triggering the protection mechanism by mistake due to the short fluctuation.

Slow Delay: Slow delay, representing a longer delay time setting, is commonly used in some time-insensitive scenarios, such as self-discharge monitoring when the battery is standing still for a long time, or waiting time setting before the battery management system enters into hibernation state. By setting the slow delay, it can reduce the unnecessary frequent operation of the system and lower the power consumption.

Appendix I. Additional Matters

- The content of this document may be modified without prior notice as the product is improved. Our company has the priority to modify it. If you are not sure, please contact the relevant personnel of our company to request the latest specification.

- Although our company has always been committed to improving product quality and reliability, integrated circuit products may fail or erroneously operate with a certain probability. In order to prevent personal accidents, fire accidents, social damage, etc. caused by failures or erroneous operations, please fully reserve redundant options, perform functional tests when using, take multiple safety protection measures, use in response to the spread of fire, and use safely and correctly. Our company shall not bear any legal responsibility for any consequences caused by abuse or improper use.

- The content of this document shall not be reproduced or copied for other purposes without the permission of our company.

The company's after-sales guarantee is valid for 1 year, if you encounter any technical problems can contact after-sales customer service to get help!