



SEPLOS
Trust for Trust

SEPLOS 48V 100A BMS

User Manual

Shenzhen Seplos Technology Co.,Ltd

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1. Application

This Battery Management System(BMS) is designed to monitor 8-16 cells in series battery pack. It has multiple functions, including single cell over voltage and under voltage protection, pack over voltage and under voltage protection, charging and discharging over current protection, high and low temperature protection, short circuit protection and protection recovery. what' s more, it can also calculate the SOC status precisely and keep voltage balancing during charging and discharging, and collect the SOH statistics. All monitoring parameter settings and data can be configurable through the communication between RS485 and the master via CAN BUS and communicating with software on PCs. (Master controller baud rate 9600.)

2. Features

cell and pack voltage monitoring

The BMS measure the voltage difference in real-time. And provide over voltage and under voltage warnings once the the the cell voltages are out of safe operating voltage range. At room temperature of 0-45 °C , the measured voltage difference is about $\pm 10\text{mV}$. However, at the temperature of -20 ~ 0°C and 45 ~ 70°C, the measured voltage difference is up to $\pm 30\text{mV}$.

Individual cell temperature, ambient temperature and components temperature monitoring

The BMS measures the cell temperature, ambient temperature and components temperature in real-time via NTC to provide high temperature or low temperature warnings and protections. The measured temperature difference is within $\pm 2^\circ\text{C}$.

Charging and discharging current monitoring

The BMS calculate the in or out loading current by monitoring the impedance in the charging and discharging circuit. And providing over current or short circuit warnings and protections. If the operating temperature is lower than 40 °C , the measured current count is within 1% difference.

Short-circuit protection function

The BMS monitors the output circuit and provides short circuit protection.

Capacity and cycle life

The BMS estimate the remaining capacity of the battery pack after the primary full charge and discharge. The capacity count is within in 5% difference. And for the cycle life, it can calculate the cycle life according to your setting DOD percentage.

Charging and discharging MOSFET power switch monitoring

The MOSFET power switch, featuring low internal resistance, big current, is an optimization design for the capacitive load starting, switch free, fast charging and high voltage of back up battery bank.

Individual cell equalization

Settings of charging and standby can be configurable to prolong the battery pack cycle life.

LED indicator

6 LED lights indicate the battery remaining capacity, operating mode and warning status.

Power switch

The power switch is used to power on/off the battery manually.

CAN and RS485 communication interface

The data monitoring, battery pack control and parameter settings can be remote controlled through software on PCs or mobile devices.

Paralleled modules communication

Battery modules can be paralleled via RS485 interface. And address can be set with 8 DIP switches at the front panel.

Data storage

According to its status, the BMS stores warnings, protections, and protection release information in real-time. By setting a start and end time, or a storage interval time, the BMS could record the data of a certain period of time. And the maximum stored records is 300 currently. Which can be read and saved as an excel file with master computer.

Battery management parameter settings

All the parameter settings, including individual cell over voltage, battery pack over voltage, over current during charging and discharging, high temperature of battery cell and operating environment, equalizing strategy, battery pack in series, battery capacity etc., can be reset through battery studio software.

Battery management function settings

All voltage, temperature, current(output short-circuit function cannot be turned off) and capacity related functions can be turned on/off manually with master computer.

Pre-charge function

The pre-charge function will be activated at the moment when the pack or the discharge tube start-up. And the pre-charge time can be set from 1ms-1000ms to apply to different capacitive load.

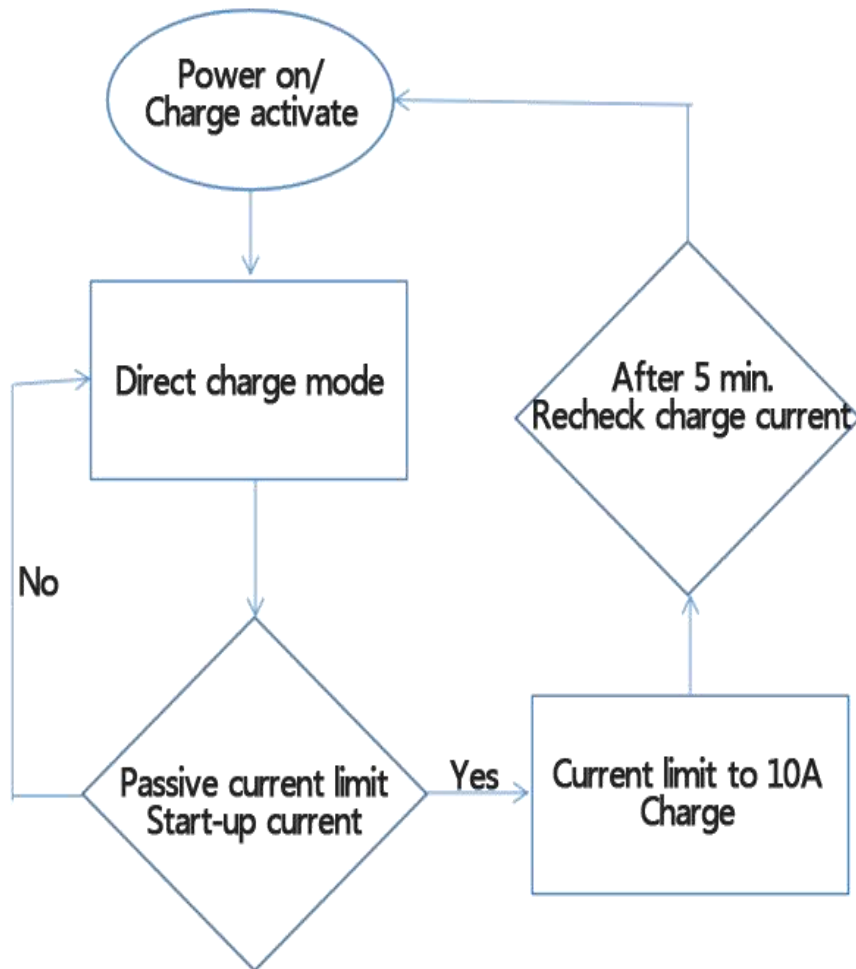
Connection compensation

Connection compensation is functioning when the voltage difference between the battery packs is too large. Check whether the voltage difference between the two cells, which is connected with wires or copper bus bars, is too large with master computer. If there is a voltage difference between the wire and the copper bus bars when connected, impedance compensation is required. During discharge, measure the voltage difference between wire and copper bus bar. And calculate the impedance through dividing voltage difference by current. Then, fill the calculated value on the master computer. The default impedance is wire connection impedance between the anode of 8th cell and the cathode of 9th cell. And 2 compensation impedance are reserved.

Charge current limitation

Two ways charging current limitation: Active current limitation and passive current limitation.

1. Active current limitation: BMS keeps the MOS tube of the current limiting module on in the charging state, and limits the charging current to 10A.
2. Passive current limitation: BMS turns on the MOS tube of the charging module in the charging state. However, when the charging current value reaches the threshold of charging over current warning (current threshold 50A), the current limitation module MOS tube turned on, and limit the charging current to 10A. 5 minutes later, the charging current will be re-checked to confirm whether the charger current reaches the passive current limit condition. (The passive current limitation value is edible.)



Master computer

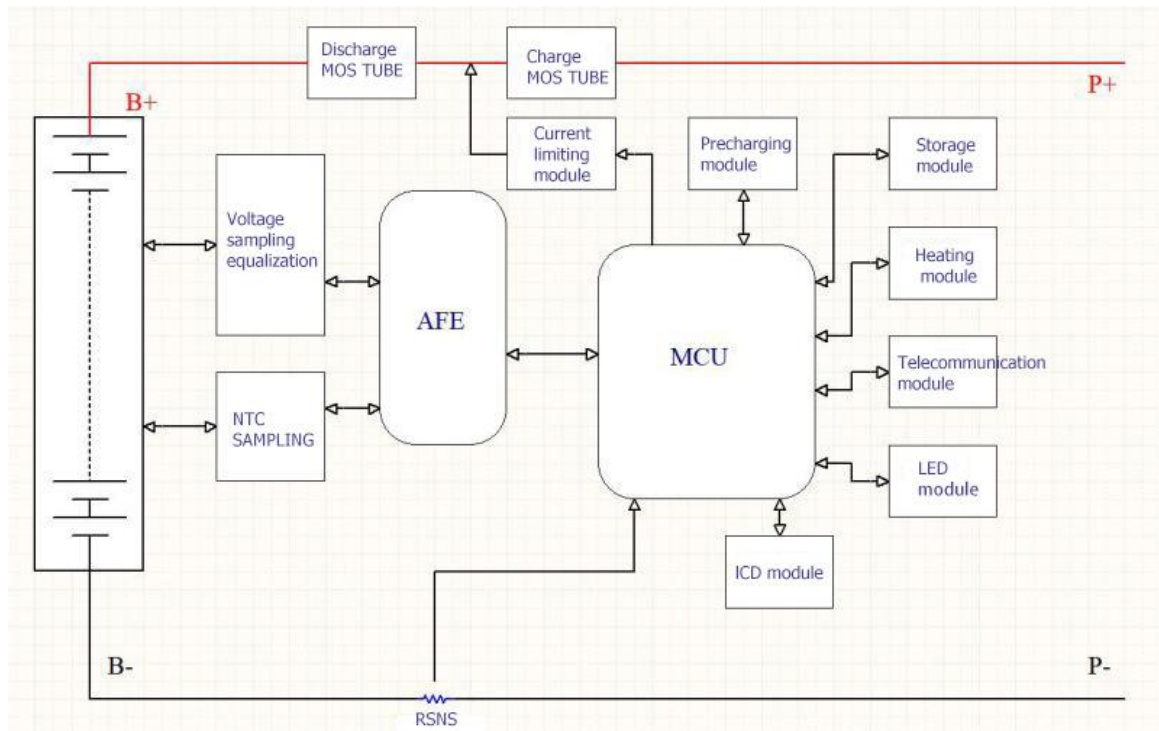
Software: Battery MonitorV2.1.1 version.

Language: Chinese and English (Restart the software after switch language)

Software upgrade

Upgrade with software via RS485 upgrading main application.

3. Diagram



4. Electric Features

Item	Min	Max.	Type
Operating Temperature(°C)	41°C	59°C	48V
Standard Charge Voltage(V)	30V	60V	54V
Operating Temperature Range(°C)	-20°C	70°C	25°C
Continuously Charging Current(A)			100A
Continuously Discharging Current(A)			100A
Discharge Output Impedance(mΩ)	<2mΩ		
Standard Operating Power Consumption(mA)	<40mA		
Static Power Consumption(uA)		50uA	0uA

5. Basic Parameters

Functions	Status	Item	threshold value	Allowed range
Single cell over voltage warning	ON	Over voltage warning threshold	3550mV	Single cell high voltage warning recovery threshold-Single cell over voltage protection threshold
		Over voltage warning recovery threshold	3500mV	3000mV-single cell high voltage threshold
Single cell under voltage warning	ON	Under voltage warning threshold	2800mV	Single cell under voltage protection threshold - single cell under voltage warning recovery threshold
		Under voltage warning recovery threshold	3000mV	single cell under voltage warning threshold - 3300mV
Single cell over voltage protection	ON	Over voltage protection threshold	3650mV	Single high voltage warning threshold - 4500mV

		Over voltage protection recovery threshold	3400mV	Single cell high voltage protection threshold - single cell over voltage warning threshold
		Over voltage protection recovery conditions	1. Voltage count decreases to the recovery threshold. 2. Discharge current should be >1A. 3. Remaining capacity lower than intermittent capacitance compensation.	
Single cell under voltage protection	ON	Under voltage protection threshold	2600mV	1500-2900mV
		Under voltage protection recovery threshold	2900mV	2000-3000mV
		Auto power off at low voltage	Turn off the system and maintain communication for 10s after the reaching under voltage protection limitation.	
		Under voltage protection recovery condition	The charging current is >1A.	
Pack over voltage warning	OFF	Over voltage warning threshold	57.0V	configurable

		Over voltage recovery warning threshold	56.4V	configurable
Pack under voltage warning	ON	Under voltage warning threshold	44.8V	configurable
		Under voltage recovery warning threshold	48V	configurable
Pack over voltage protection	OFF	Over voltage protection threshold	58.4V	configurable
		Over voltage protection recovery threshold	55V	configurable
		Over voltage protection recovery conditions	1. Cell voltage count decreases to the recovery threshold. 2. Discharge current should be >1A. 3. The remaining capacity lower than intermittent capacity compensation.	
Pack under voltage protection	ON	Under voltage protection threshold	41.6V	configurable
		Under voltage protection recovery threshold	46V	configurable

		Auto power off at low temperature	Turn off the system and maintain communication for 10s after the reaching under voltage protection limitation.	
		Under voltage protection recovery condition	Charge current should be >1A.	
Charge Temperature	ON	High temperature warning threshold	50°C	35°C-80°C
		High temperature warning recovery threshold	47°C	35°C-80°C
		Limit high temperature warning threshold	60°C	35°C-80°C
		Limit high temperature warning recovery threshold	50°C	35°C-80°C
		Low temperature warning threshold	2°C	-20°C-10°C
		Low temperature warning recovery threshold	5°C	-20°C-10°C

		Limit low temperature protection threshold	-10°C	-20°C-10°C
		Limit low temperature protection recovery threshold	0°C	-20°C-10°C
Discharge Temperature	ON	High temperature warning threshold	52°C	35°C-80°C
		High Temperature warning recovery threshold	47°C	35°C-80°C
		Limit high temperature warning threshold	60°C	35°C-80°C
		Limit high temperature warning recovery threshold	50°C	35°C-80°C
		Low temperature warning threshold	-10°C	-20°C-10°C
		Low temperature warning recovery threshold	3°C	-20°C-10°C
Discharge Temperature				

		Limit low temperature protection threshold	-10°C	-20°C-10°C
		Limit low temperature protection recovery threshold	-10°C	-20°C-10°C
Environment Temperature Warnings	ON	High air temperature warning threshold	50°C	-20°C-60°C
		High air temperature warning recovery threshold	47°C	-20°C-80°C
		Low air temperature warning threshold	-10°C	-20°C-60°C
		Low air temperature warning recovery threshold	3°C	-20°C-60°C
Power Temperature Warnings	ON	High power temperature warning threshold	80°C	60°C-120°C
		High power temperature warning recovery threshold	75°C	60°C-120°C

		Limit high power temperature warning recovery threshold	100°C	60°C-120°C
		Limit high power temperature warning recovery threshold	85°C	60°C-120°C
Charging Over Current Warning	ON	Over current warning threshold	50A	0A-charging protecting current threshold
		Over current warning recovery threshold	45A	0A-charging warning current threshold
Charging Over Current Protection	ON	Over current protection threshold	160A	0A-150A
		Charge over current time delay threshold	10S	
		Over current protection recovery conditions	1. automatically recover 60s later. 2. once the battery begins to discharge.	
Charge Current Limitation	ON	Limit charge current threshold	10A (0A indicates the termination of current limitation function)	0A-10A
Effective Charge	Current in during charge		600mA	

Current	Current out during charge		500mA	
Discharging Over Current Warning	ON	Discharge over current warning threshold	-105A	0A-discharging protecting current threshold
		Discharge over current warning recovery threshold	-103A	0A-discharging warning current threshold
Discharging Over Current Protection	ON	Discharge over current protecting threshold	-110A	0A- 2nd discharge protecting current
		Discharge over current time delay threshold	10S	1S-600S
2nd Over Current Protection	ON	2nd over current protection threshold	-200A	Discharge protecting current threshold-300A
		2nd Discharge over current time delay threshold	100mS	1mS-500mS
		2nd over current protection recovery threshold	1. automatically recover 60s later. 2. once the battery begins to charge.	
	OFF	2nd over current lock	over current for 2 times, or the lock times over the threshold	

		Over current protection lock times	5 times	
		unlock 2nd over current protection lock	Connected to a charger	
Short Circuit Protection (output)	ON	Short circuit protection lock	Continuously short, or the short circuit protection lock times over threshold	
		Short circuit protection lock times	5 times	
		Unlock Short circuit protection lock	connected to a charger	
Effective Discharge Current	Current in during discharge		-1000mA	
	Current out during discharge		-900mA	
Equalizing Function	ON	Charge equalizing	At charging or float charging status	
		equalizing voltage threshold	3350mV	
		Equalizing voltage difference	30mV	
	ON	Equalizing temperature limitation	Automatically start according to the environment temperature	
		High temperature threshold	50°C	

		Low temperature threshold	0°C	
Cell Failure Warning	ON	Voltage difference of cell failure warning threshold	500mV	
		Voltage difference of cell failure warning recovery threshold	300mV	
Capacity	Rated Capacity		100Ah	5-200Ah
	Remaining Capacity		Calculate accordingly to the cell voltage	
	ON	Remaining Capacity warning threshold	15%	
Button	POWER ON/ACTIVATE		When the BMS at the dormant state, activate the BMS by pressing this button. Then, the LED lights are on. The system enters into working mode.	
	POWER OFF/STANDBY		When the BMS at standby or operating status, hold the button for 3s. Then, the LED lights were on. The system enters dormant state.	
BMS power consumption management	Longest standby time		48h (no effective discharge current and no charge connected)	

Precharging Function	3000ms	1000-5000ms options	Pre-charge function starts at the moment of BMS is on.	
Heating Function (At Low Temperature)	OFF	Cell low temperature heating threshold	0°C	Configurable
		Cell low temperature heating recovery threshold	10°C	
Internal Switch	ON	BMS can be turned on and off by operating external switch in standby mode.		
LCD Screen	ON	Simplified monitoring software, you can view data such as cell, temperature, current, etc.		
Impedance Compensation	Impedance compensation of connection fault	10mΩ	Default value between 8-9mΩ	Compensation impedance
	compensation impedance	0mΩ	9	Battery connection impedance compensation
	compensation impedance	0mΩ	13	Configurable

6. Working Mode

Charge Mode

When connected with a charger, and the charging voltage is 0.5V larger than the battery voltage, MOSFET begins to charge. Then entering into charging mode after the charging current reaches the effective charging current threshold. The charging and discharging MOSFET are both turned on at Float Charge Mode

Discharge Mode

When connected with loads, and the discharging current reaches the effective discharging current. The system enters discharge mode.

Standby Mode







Other than charge mode, float charge mode and discharge mode, the system is in standby mode.

Power Off Mode









After standby for 4 hours, battery detects under voltage protection, BMS enters standby mode through button or command from PC software.

7. Indicator

6 LED indicator lights

					
SOC				ALARM	RUN







Capacity indicator

Status	Charge				Discharge			
Capacity indicator	 L4	 L3	 L2	 L1	 L4	 L3	 L2	 L1
0-25%	OFF	OFF	OFF	Blink	OFF	OFF	OFF	Solid Green
25%-50%	OFF	OFF	Blink	Solid Green	OFF	OFF	Solid Green	Solid Green
50%-75%	OFF	Blink	Solid Green	Solid Green	OFF	Solid Green	Solid Green	Solid Green
>75%	Blink	Solid Green	Solid Green	Solid Green	Solid Green	Solid Green	Solid Green	Solid Green
Operating indicator	Solid Green				Blink			

LED Light Blink Type

Blink Mode	ON	OFF
Blink Type 1	0.25s	3.75s
Blink Type 2	0.5s	0.5s
Blink Type 3	0.5s	1.5s

Battery Status indicator

Battery status	Operating Mode	RUN	ALM	LED Light				Remark
								
Power off	Standby	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Standby	Normal	Solid Green	OFF	According to battery SOC status				Standby mode
Charge Mode	Normal	Solid Green	OFF	According to battery SOC status				
	Over current warnings	Solid Green	Blink type 2					
	Over voltage protection	Blink type1	OFF	OFF	OFF	OFF	OFF	
	Temperature, over current protection	Blink type1	OFF	OFF	OFF	OFF	OFF	

Discharge Mode	Normal	Blink type 3	OFF	According to battery SOC status				
	Warning	Blink type 3	Blink type 3					
	Over current, temperature, short-circuit protection	OFF	Solid Red	OFF	OFF	OFF	OFF	Termination of discharge
	Under voltage protection	OFF	OFF	OFF	OFF	OFF	OFF	Termination of discharge

8. Functions

Standby status

After the BMS is correctly connected, press the reset button to powered on. If battery pack is not in over voltage, under voltage, over current, short circuit, high temperature and low temperature states. The BMS enters standby mode. At standby mode, the running LED light blinks, and the battery can be charged and discharged.

Overcharge protection and recovery

- Overcharge protection and recovery of individual cell

When a cell voltage is detected to exceed individual cell overcharge protection threshold, BMS enters overcharge protection state. And the charger device cannot charge the battery.

After enters overcharge protection state, if the cell voltage drops below the cell over voltage recovery threshold, and cell SOC is lower than 96%, the overcharge protection state will be released. Discharge the battery can also releases the overcharge protection.

- Overcharge protection and recovery of battery pack

When the battery pack voltage is detected to exceed the pack overcharge protection threshold, the BMS enters the overcharge protection state, and the charging device cannot charge the battery.

When the pack voltage drops below the pack voltage overcharge recovery threshold, and the SOC is lower than 96%, the overcharge protection state will be released. Discharge the battery can also releases the overcharge protection.

Over discharge protection and recovery

- Over discharge protection and recovery of individual cell

When a cell voltage is detected to lower than the over discharge protection threshold, the BMS enters over-discharge protection state, and the battery cannot be discharged. After 1 minute of communication, the BMS shuts down.

After shutting down, charging the battery or pressing power button can activate the BMS. Keep output voltage for 1 minute for inverter to detect. Therefore, discharge is not allowed during this period.

Over discharge protection state can be released by charging the battery pack. Or press reset button, and the BMS will detect the pack voltage, if the voltage value reaches over discharge protection recovery threshold, over discharge protection state can also be released.

- Over discharge protection and recovery of battery pack

When the battery voltage is lower than the total voltage over-discharge protection set value, the BMS enters the over-discharge protection state, and the load cannot discharge the battery. After maintaining communication for 1 minute, the BMS is turned off. After over discharge protection occurs, charging the battery pack can release the over discharge protection status. Or press the reset button once, and the BMS will turn on again to check whether the battery pack voltage has reached the recovery value.

Charging over current protection and recovery

Without charging current limiting function, charging over current protection can be triggered. When the charging current exceeds the set value of the charging over current protection, and the delay time is reached. The BMS enters the charging over current protection, and the charging device cannot charge the battery. After the charging over-current protection occurs, the BMS automatically recovers after a delay and re-detects the external charger current. Discharging can also release the charge over current protection.

Discharge over current protection and recovery

When the discharge current exceeds the set value of the discharge over current protection, and

the delay time is reached. The BMS enters discharge over current protection, and the load cannot charge the battery. After the discharge over current protection occurs, the BMS will automatically recover after a delay and re-examine the external load current. Charging can also release the discharge over current protection. The discharge over current protection has secondary protection, and the transient over current protection is restored as the discharge over current protection. The transient over current protection will be locked when the number of occurrences reaches the condition. The recovery must be turned off before the power is turned on or the charge is released.

Temperature protection and recovery

The BMS has 6 temperature detection ports. It monitors temperature changes to achieve protection measures.

- **Charge and discharge high temperature protection and recovery**

When the charge and discharge state, any one of the 4 cells NTC is higher than the high temperature protection set value, the BMS enters the high temperature protection. BMS stops charging or discharging. When the battery temperature is lower than the high temperature recovery value, the BMS resumes charging or discharging.

- **Charge and discharge low temperature protection and recovery**

When any one of the 4 cells NTC is lower than the low temperature protection set value in the state of charge and discharge, the BMS enters low temperature protection. BMS stops charging or discharging. When the battery temperature is higher than the low temperature recovery value, the BMS resumes charging or discharging.

- Ambient temperature alarm, power temperature protection

When NTC detects that the ambient temperature is higher than the ambient high temperature set value, the BMS generates an alarm. BMS does not stop charging and discharging. When NTC detects that the power temperature is higher than the power protection set value, the BMS enters the power high temperature protection. BMS stops charging and discharging.

Equalization function

The BMS comes with standby and charge equalization functions. The BMS system uses an energy-consuming equalization circuit. The equalization start-up voltage can be adjustable through software. The equalization function will start up when the cell voltage and the voltage difference is higher than equalized voltage.

When charging is stopped or the cell voltage value is less than the setting threshold, the equalization function terminates.

Power on/off

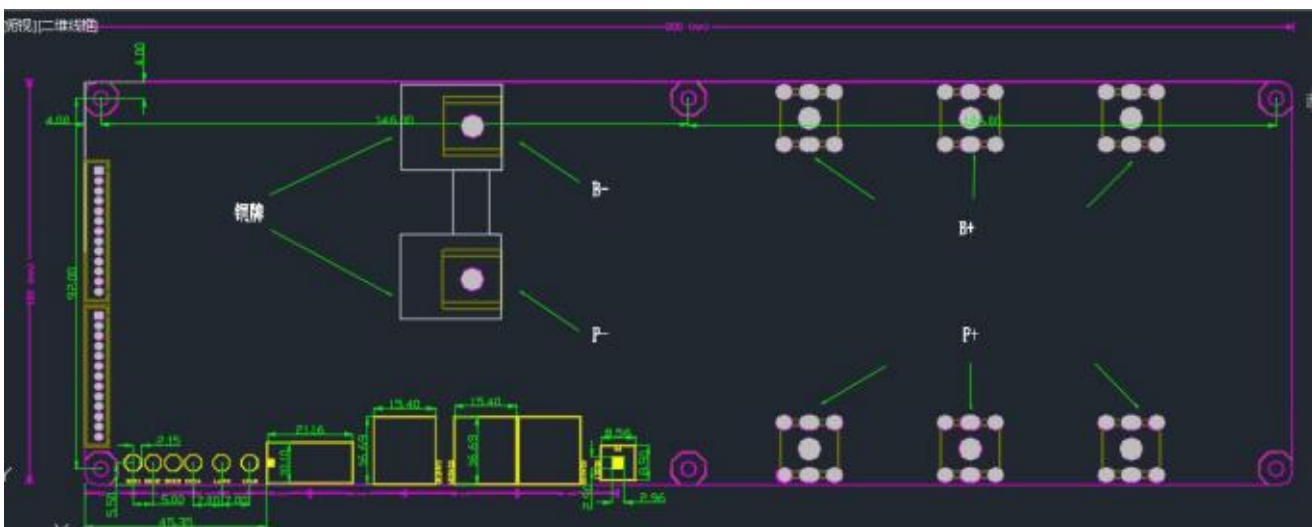
No.	Function	Definition
1	Power on	When the BMS is in sleep state, press the reset button, the BMS is started, and the LED indicators flash in sequence, and then enter the normal working state.

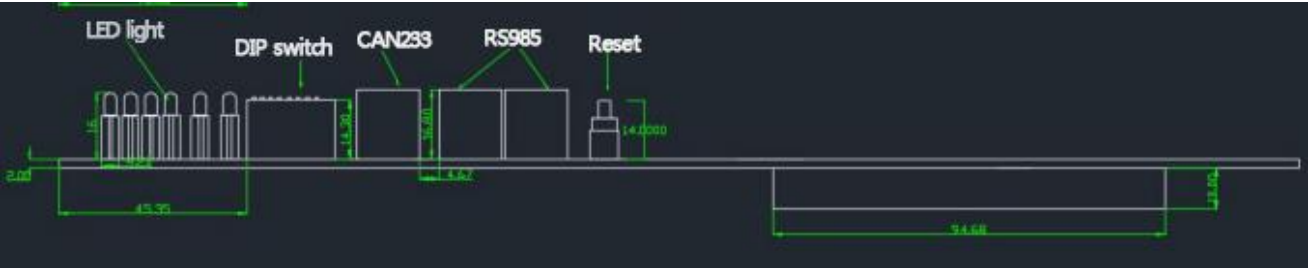
2	Power off/ Standby	When the BMS is in sleep or discharge state, hold the button for 3s, the BMS is working. And the LED indicators flash in sequence, and then enter the sleep mode. Sleep mode do not need power consumption.
3	External Switch	External switch can power on/off the BMS.

Storage Function

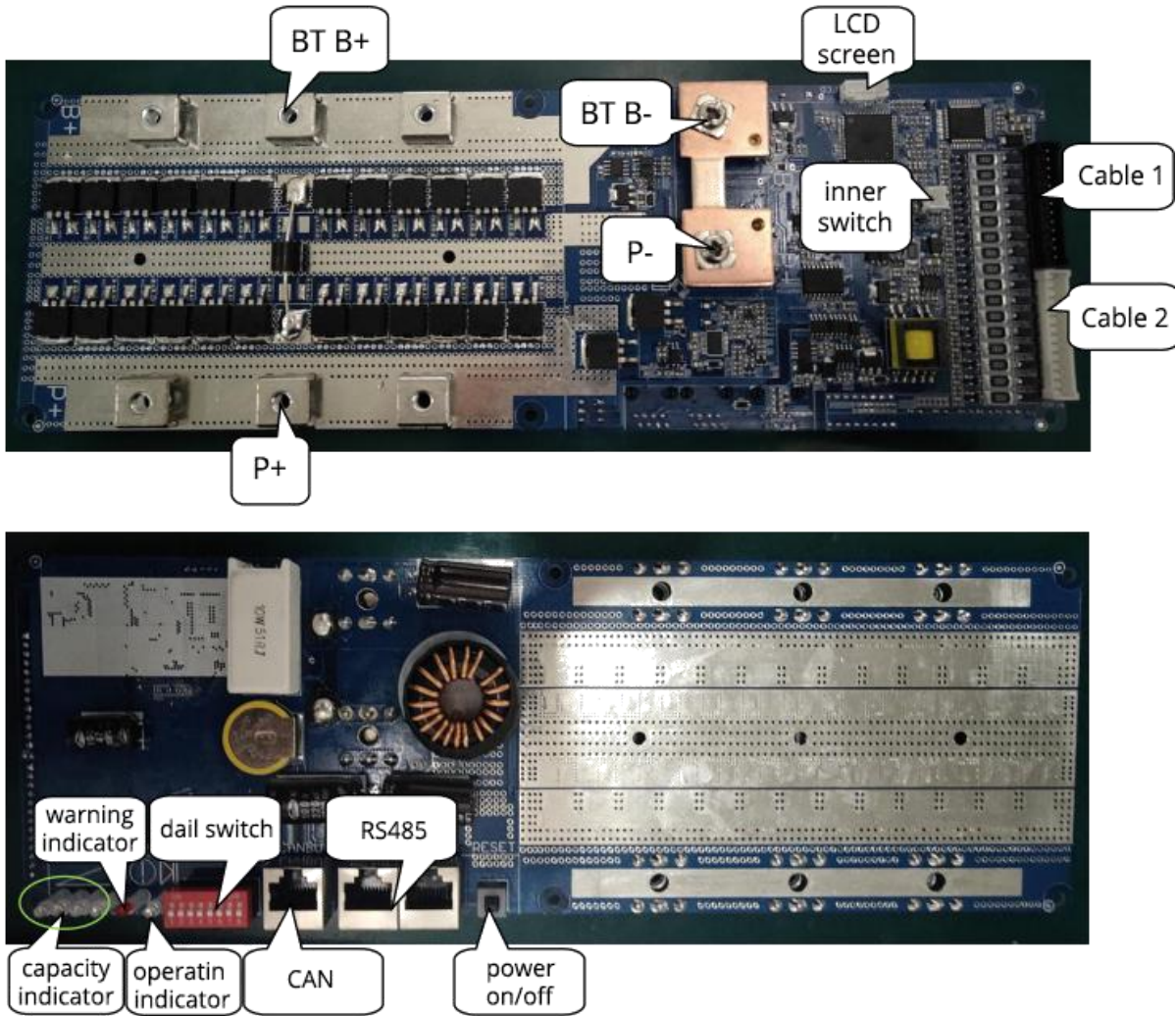
BMS has data storage module. The storage contents include protections and warnings, protection and warning recovery time, battery voltage. Pack voltage, capacity, charge/discharge current, temperature etc. It is recorded in year/ month/day/hour/minute/second. It can also be set to record the information content in a certain period of time. The amount of information stored is not less than 300. Can read the historical data through the host computer and save it as an excel file to the computer.

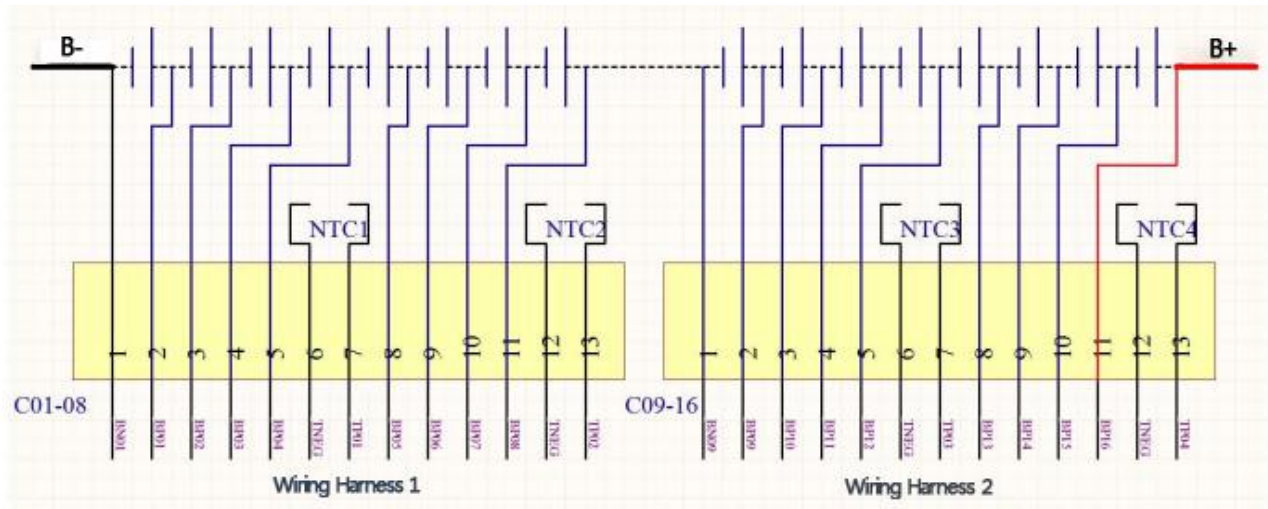
9. Dimension





10. Interface





Wiring

Wiring harness 1		Wiring harness 2	
CELL1-	Cathode of the 1 st cell	CELL9-	Cathode of the 9 th cell
CELL1+	Anode of the 1 st cell	CELL9+	Anode of the 9 th cell
CELL2+	Anode of the 2 nd cell	CELL10+	Anode of the 10 th cell
CELL3+	Anode of the 3 rd cell	CELL11+	Anode of the 11 th cell
CELL4+	Anode of the 4 th cell	CELL12+	Anode of the 12 th cell
NTC1+	Temperature sensor NTC1	NTC3+	Temperature sensor NTC3
NTC1-	Temperature sensor NTC1	NTC3-	Temperature sensor NTC3
CELL5+	Anode of the 5 th cell	CELL13+	Anode of the 13 th cell
CELL6+	Anode of the 6 th cell	CELL14+	Anode of the 14 th cell
CELL7+	Anode of the 7 th cell	CELL15+	Anode of the 15 th cell
CELL8+	Anode of the 8 th cell	CELL16+	Anode of the 16 th cell
NTC2+	Temperature sensor NTC2	NTC4+	Temperature sensor NTC4
NTC2-	Temperature sensor NTC2	NTC4-	Temperature sensor NTC4

Power on/off order

Power on wiring connection steps:

1. Connect B-
2. Connect wiring harness 1 and wiring harness 2
3. Connect B+
4. Connect P+ and P-

After wire connection, the BMS is in shutdown status. Charging the battery, or pressing the RESET button or power switch could activate the system.

Power off wiring connection steps:

1. Disconnect charger and loads (Hold the reset button for 3 seconds, or press the power switch to power off.)
2. Disconnect B+
3. Disconnect wiring harness 2 and wiring harness 1
4. Disconnect B-

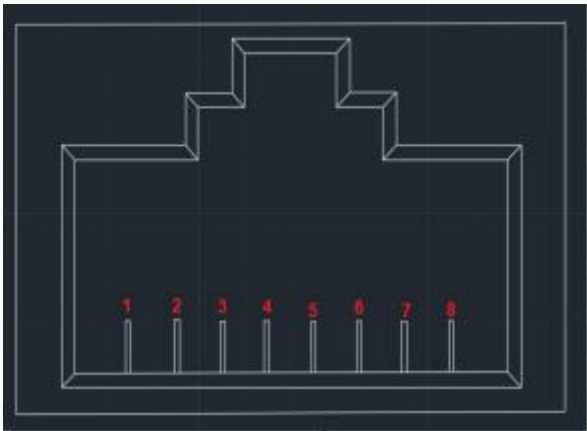
11. Communication**CAN communication**

BMS equipped with CAN communication. Baud rate is 500K. CAN communication interface equipped with 8P8C network interface, which could communicate with inverters and CAN test.

Paralleled packs communicate each other via RS485 interface. And the battery pack data, status,

and information could read and record through CAN communication.

CAN communication interface definition:



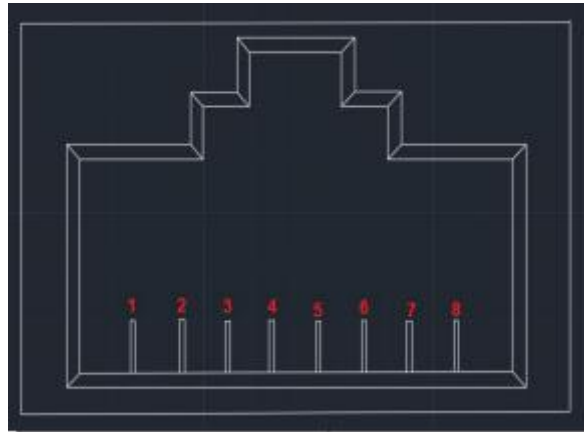
Pin	Definition
PIN 1, 2, 7, 8	NC (Bridge weld)
PIN 4	CAN-L
PIN 5	CAN-H
PIN 3, 6	Ground

RS485 communication

BMS equipped with RS485 communication for paralleled packs. The baud rate is 19200bps.

RS485 communication adopted 8P8C internet interface.

RS485 communication interface definition:

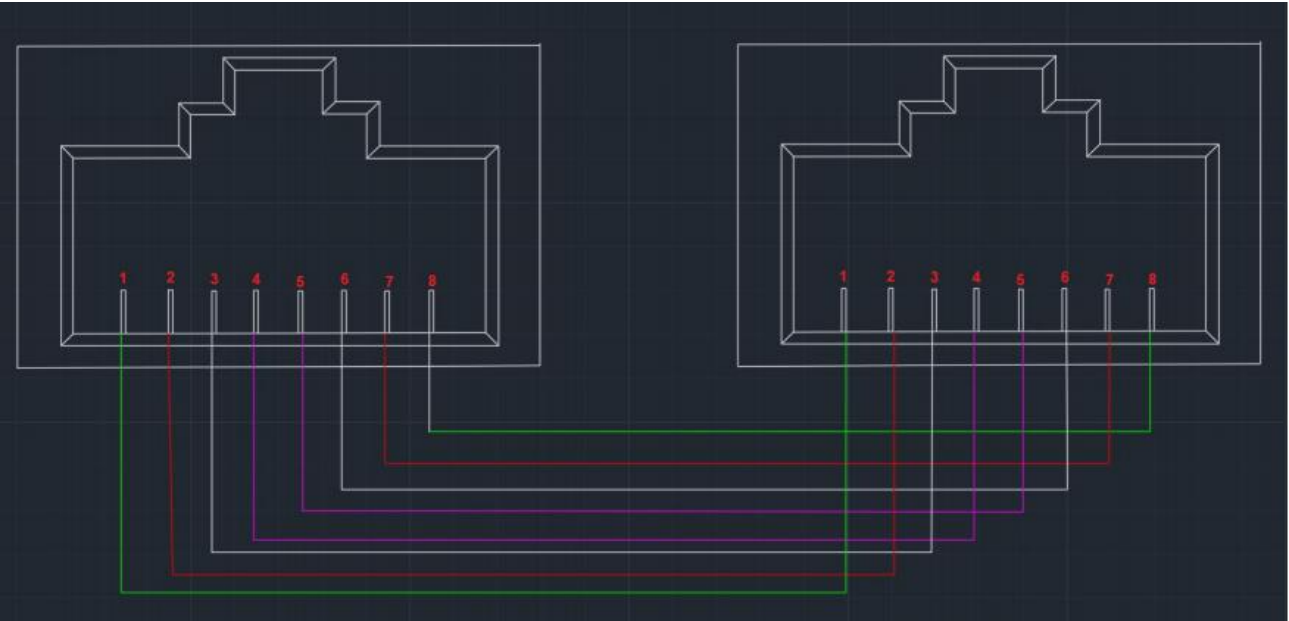


Pin	Definition
PIN 1, 8	RS485-B
PIN 2, 7	RS485-A
PIN 3, 6	Ground
PIN 4,5	NC (Bridge weld)

Paralleled packs communication

Packs in parallel could communicate with each other through RS485 interface. As RS485 interface As master communication interface, end user device could read and record all the battery data and information through CAN interface.

When packs connected in parallel, RS485 interface wiring connection:



DIP address

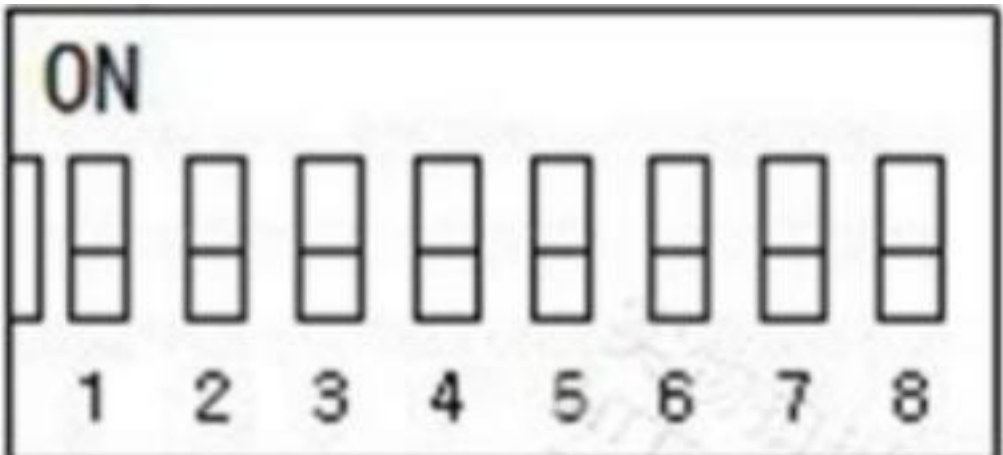
DIP switch definition:

To distinguish different pack addresses

When packs are in parallel, the hardware address can be set with DIP switches.

One pack address setting: 0000 0000

For packs in parallel address settings, please refer to the following table:



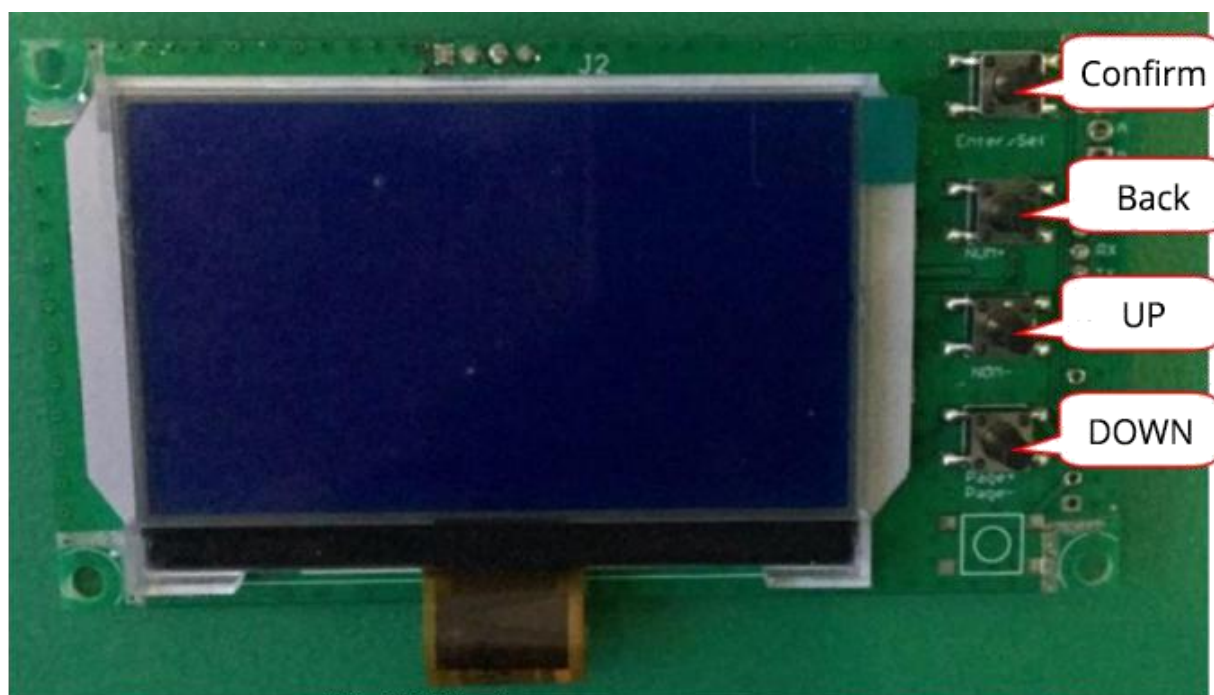
Slave pack address setting

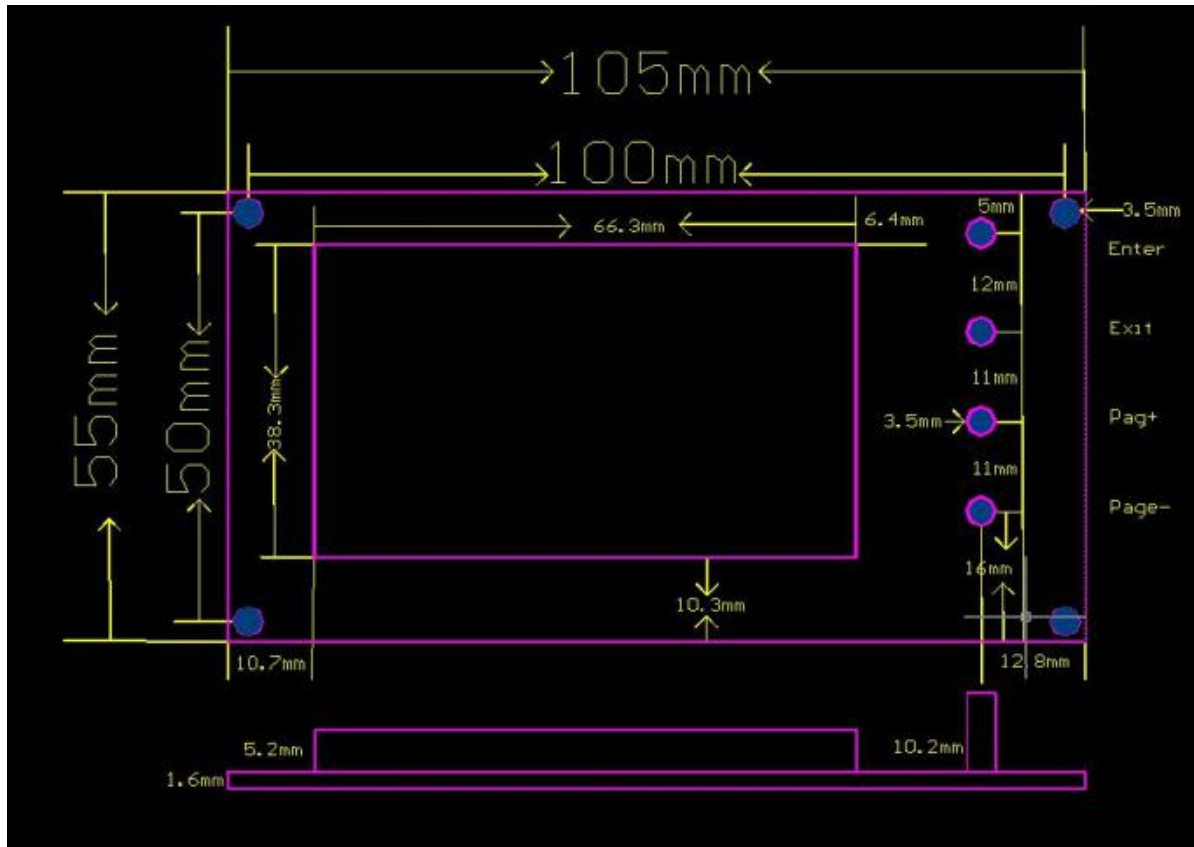
Add.	DIP Switch				Remark
	#1	#2	#3	#4	
1	ON	OFF	OFF	OFF	Pack 1
2	OFF	ON	OFF	OFF	Pack 2
3	ON	ON	OFF	OFF	Pack 3
4	OFF	OFF	ON	OFF	Pack 4
5	ON	OFF	ON	OFF	Pack 5
6	OFF	ON	ON	OFF	Pack 6
7	ON	ON	ON	OFF	Pack 7
8	OFF	OFF	OFF	ON	Pack 8
9	ON	OFF	OFF	ON	Pack 9
10	OFF	ON	OFF	ON	Pack 10
11	ON	ON	OFF	ON	Pack 11
12	OFF	OFF	ON	ON	Pack 12
13	ON	OFF	ON	ON	Pack 13
14	OFF	ON	ON	ON	Pack 14
15	ON	ON	ON	ON	Pack 15

Host pack address setting

Add.	DIP Switch				Remark
	#1	#2	#3	#4	
2	ON	OFF	OFF	OFF	2 modules in parallel
3	OFF	ON	OFF	OFF	3 modules in parallel
4	ON	ON	OFF	OFF	4 modules in parallel
5	OFF	OFF	ON	OFF	5 modules in parallel
6	ON	OFF	ON	OFF	6 modules in parallel
7	OFF	ON	ON	OFF	7 modules in parallel
8	ON	ON	ON	OFF	8 modules in parallel
9	OFF	OFF	OFF	ON	9 modules in parallel
10	ON	OFF	OFF	ON	10 modules in parallel
11	OFF	ON	OFF	ON	11 modules in parallel
12	ON	ON	OFF	ON	12 modules in parallel
13	OFF	OFF	ON	ON	13 modules in parallel
14	ON	OFF	ON	ON	14 modules in parallel
15	OFF	ON	ON	ON	15 modules in parallel

12. LCD Screen





13. Precautions

- The battery management system cannot be used in series
- Do not do charge and discharge cycles with over 100V voltage charging and discharging cabinet.
- Do not make direct contact to the surface of the cell during assembly to avoid damage to the cell. The assembly must be firm and reliable.
- During use, pay attention to the lead head, soldering iron, solder, etc. Do not touch the components on the circuit board, otherwise it may damage the circuit board.
- Pay attention to anti-static, moisture-proof and waterproof during use.
- During use, please follow the designed parameters and conditions of use, and must not

exceed the values in this specification, otherwise the protection board may be damaged.

- After combining the battery pack and the protection board, if you find that there is no voltage output or no charge, please check whether the wiring is correct.
- This document is subject to change without any notice.