PYLONTECH

Lithium-Ion Phosphate Energy Storage System
PowerCube-M1 Product Manual

Information Version: 2.3

This manual introduces PowerCube-M1 from Pylontech. PowerCube-M1 is a high voltage Lithium-Ion Phosphate Battery storage system. Please read this manual before you install the battery and follow the instruction carefully during the installation process. Any confusion, please contact Pylontech immediately for advice and clarification.

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1. Safe handling of lithium batteries Guide

Warning: This product is a high voltage DC system, operated by authorized person only.

Before installation or operation you must read <Operation Menu> carefully.

Warning

Before Connecting

1) After unpacking, please check product and packing list first, if product is damaged or lack of parts, please contact with the local retailer;
2) Before installation, be sure to cut off the grid power and make sure the battery is in the turned-off mode;
3) Wiring must be correct, do not mistake the positive and negative cables, and ensure no short circuit with the external device;
4) It is prohibited to connect the battery and AC power directly;
5) Battery system must be well grounded and the resistance must be less than 100mΩ;
6) Please ensured the electrical parameters of battery system are compatible to related equipment;
7) Keep the battery away from water and fire.

In Using

1) If the battery system needs to be moved or repaired, the power must be cut off and the battery is completely shutdown;
2) It is prohibited to connect the battery with different type of battery.
3) It is prohibited to put the batteries working with faulty or incompatible inverter;
4) It is prohibited to disassemble the battery (QC tab removed or damaged);
5) In case of fire, only dry powder fire extinguisher can be used, liquid fire extinguishers are prohibited;
6) Please do not open, repair or disassemble the battery except staffs from Pylontech or authorized by Pylontech. We do not undertake any consequences or related responsibility which because of violation of safety operation or violating of design, production and equipment safety standards.

Reminded

1) Please read the user manual carefully (in the accessories);
2) If the battery is stored for long time , it is required to charge them every six months, and the SOC should be no less than 80%;
3) Battery needs to be recharged within 12 hours, after fully discharged;
4) Do not expose cable outside;
5) All the battery terminals must be disconnected for maintenance;
6) Please contact the supplier within 24 hours if there is something abnormal.
7) The warranty claims are excluded for direct or indirect damage due to items above.

Li-ion

2. Introduction

PowerCube-M1 is a high voltage battery storage system based on lithium iron phosphate battery, is one of new energy storage products developed and produced by Pylontech, it can be used to support reliable power for various types of equipments and systems. PowerCube-M1 is especially suitable for application scene of high power, limited installation space, restricted load-bearing and long cycle life.

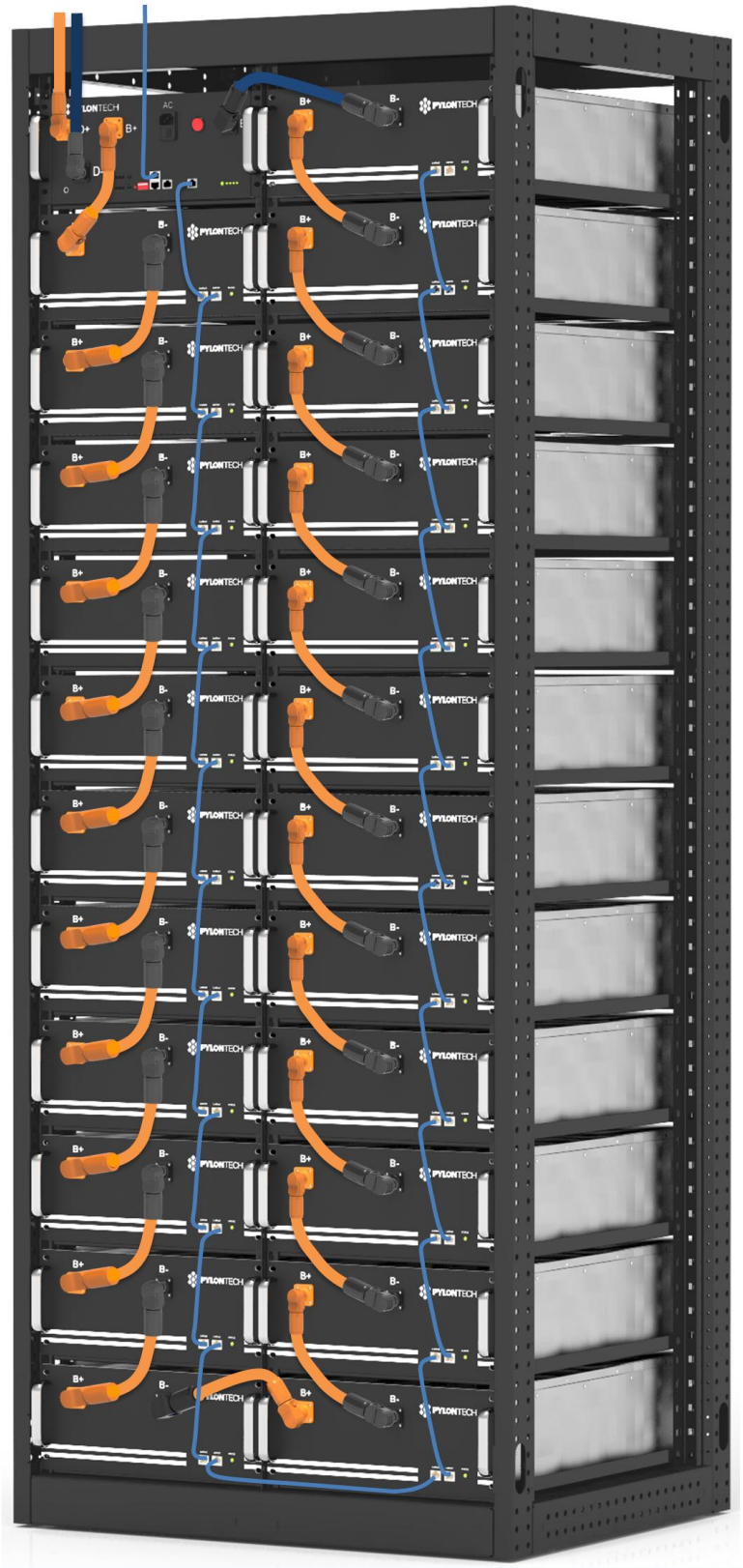
PowerCube-M1 has 3 levels BMS (battery management system) , which can manage and monitor cells information including voltage, current and temperature. What's more, BMS can balance cells charging and discharging to extend cycle life. Multiple batteries can connected in parallel to expand capacity and power in parallel for larger capacity and longer power supporting duration requirements.

2.1 features

- The whole module is non-toxic, non-polluting and environmentally friendly;
- Cathode material is made from $LiFePO_4$ with safety performance and long cycle life;
- Battery management system (BMS) has protection functions including over-discharge, over-charge, over-current and high/low temperature;
- The system can automatically manage charge and discharge state and balance current and voltage of each cell;
- Flexible configuration, multiple battery modules can be in serial for expanding voltage and Capacity.
- Adopted self-cooling mode rapidly reduced system entire noise;
- The module has less self-discharged, up to 6 months without charging ion shelf; no memory effect, excellent performance of shallow charge and discharge;
- Working temperature range is from 10℃ to 40℃, with excellent discharge performance and cycle life;
- Small size and light weight, standard of 19-inchembedded designed module is comfortable for installation and maintenance;

Caution: PowerCube-M1 without soft-start circuit. So must choose the inverter, which has soft-start function, otherwise has the risk of equipment breakdown.

2.2 Specifications



2.2.1 The parameter of system

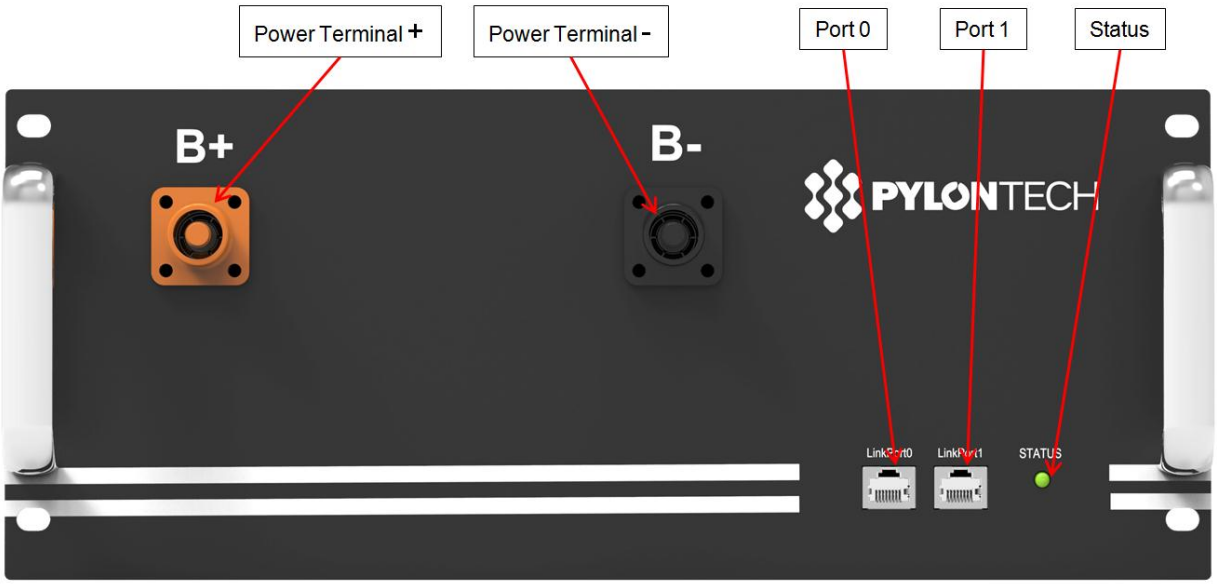
No.	Item	POWERCUBE-M1 (736V148AH)
1	Cell Technology	Li-ion (LFP)
2	Battery System Capacity (kWh)	108.9
3	Battery System Voltage (Vdc)	736
4	Battery System Capacity (Ah)	148
5	Battery Controller Name	SC1000-200
6	Battery Module Name	H32148
7	Battery Module Quantity (pcs)	23
8	Battery Module Capacity (kWh)	4.74
9	Battery Module Voltage (Vdc)	32
10	Battery Module Capacity (Ah)	148
11	Battery Module Cell Quantity (pcs)	10
12	Battery System Charge Voltage (Vdc)	828.0
13	Battery System Charge Current (Standard)	29.6
14	Battery System Charge Current (Normal)	74
15	Battery System Charge Current (Max.)	148
16	Battery System Discharge lower-Voltage (Vdc)	621.0
17	Battery System Discharge Current (Standard)	29.6
18	Battery System Discharge Current (Normal)	74
19	Battery System Discharge Current (Max.)	148
20	Efficiency	95%
21	Depth of Discharge	90%
22	Dimension (W*D*H, mm)	815*659*2130
23	Communication	RS485\CAN
24	Protection Class	IP20
25	Weight (kg)	1250
26	Operation Life (Years)	10
27	Operation Cycle Life	3500
28	Operation Temperature (℃)	10~40
29	Storage Temperature (℃)	-20~60
30	Humidity	5%~95%
31	Altitude (m)	<2000
32	Product Certificate	TÜV, CE
33	Transfer Certificate	UN38.3
34	Pollution Degree (PD)	II
35	Other: 1）Battery Controller Dimensions (W*D*H) 2）Battery Module Dimensions (W*D*H)	 330*628*150.5 330*628*150.5

Remark: The parameter will be changed when the battery modules in different series (1~23 pcs battery modules).

2.2.2 Battery Module (H32148)

No.	Product Type	H32148
1	Cell Technology	Li-ion(LFP)
2	Battery Module Capacity (kWh)	4.736
3	Battery Module Voltage (Vdc)	32
4	Battery Module Capacity (AH)	148
5	Battery Module Quantity (pcs)	40
6	Battery Cell Capacity (Wh)	118.4
7	Battery Cell Voltage (Vdc)	3.2
8	Battery Cell Capacity (AH)	37
9	Battery Module Cell Quantity in Series (pcs)	10
10	Battery Module Charge Voltage (Vdc)	36
12	Battery System Charge Current (Standard)	29.6
13	Battery Module Charge Current (Normal)	74
14	Battery Module Charge Current (Max.)	148
15	Battery Module Discharge lower-Voltage (Vdc)	27
16	Battery System Discharge Current (Standard)	29.6
17	Battery Module Charge Current (Normal)	74
18	Battery Module Charge Current (Max.)	148
19	Efficiency	96%
20	Depth of Discharge	90%
21	Dimension(W*D*H, mm)	330*628*150.5
22	Communication	RS485\CAN
23	Protection Class	IP20
24	Weight	48
25	Operation Life	10+Years
26	Operation Cycle Life	4000
27	Operation Temperature	0~50℃
28	Storage Temperature	-20~60℃
29	Product Certificate	TÜV, CE
30	Transfer Certificate	UN38.3

Battery Module (H32148) Front Interface



Power Terminal +/-

To connect battery series power cables.

Status

Status light: to show the battery module's status (Normal●, Abnormal●).

RS232 Terminal

Console Communication Terminal: (RJ45 port) follow RS232 protocol, for manufacturer or professional engineer to debug or service.

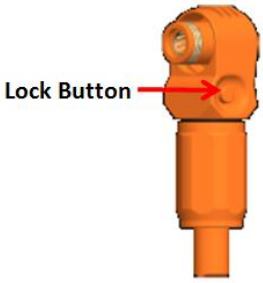
Link Port 0, 1

Link Port 0, 1 Communication Terminal: (RJ45 port) follow RS485 protocol, for communication between multiple serial battery modules and control module.

Power Terminals

Power cable terminals: there are two pair of terminals with same function, one connect to equipment, the other one paralleling to other battery module for capacity expanding. For each single module, each terminal can achieve charging and discharging function.

For power cables uses water-proofed AMPHENOL connectors. It must keep pressing this Lock Button during pulling out the power plug.

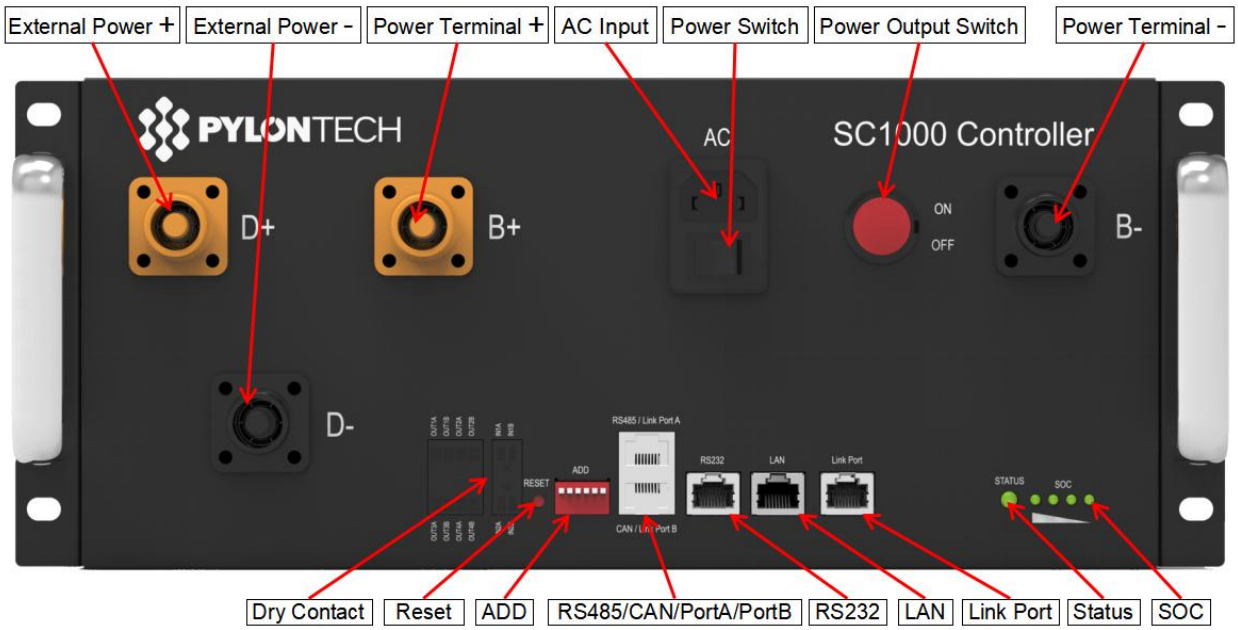


2.2.3 Control Module (External Power Supply)

PowerCube-M1's Control Module has only **external** power supply.

No.	Product Type	SC1000-200E
1	Related Product	M1
2	Controller Working Voltage	220Vac
3	System Operation Voltage(Vdc)	0~1000
4	Charge Current(Max.)(A)	200
5	Discharge Voltage(Vdc)	0~1000
6	Discharge Current(Max.)(A)	200
7	Self-consumption Power(W)	8
8	Dimension(W*D*H,mm)	330*628*150.5
9	Communication	RS485\CAN
10	Protection Class	IP20
11	Weight(kg)	17.5
12	Operation Life(Years)	15
13	Operation Temperature(℃)	-20~65
14	Storage Temperature(℃)	-40~80
15	Product Certificate	TÜV, CE

Control Module (SC1000-200E) Front Interface



External Power Terminal +/-

Connect battery system with Inverter.

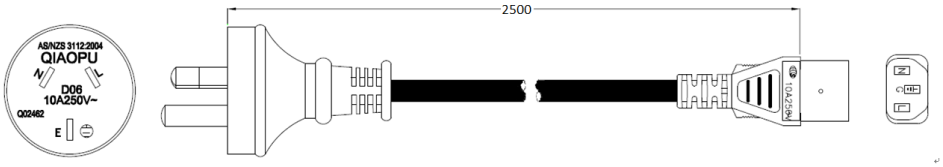
Power Terminal +/-

To connect battery power cables in series.

AC Input

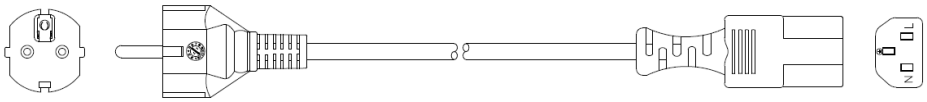
AC Socket and Control Module Power Switch: External power supply Control Module has an Australia or Europe standard AC Power input socket and power switch. It is applied with UPS system.

Australia Standard



Or

Europe Standard



Dry Contact Terminal

Dry Contact Terminal: provided 2 input and 4 output dry contact signal.

Reset

Reset Button: Long press this button to restart the battery system.

ADD

ADD: 6 bit dial switches to manually distribute the communication address of the battery system. Nether position is OFF, means "0". Upper position is ON, means "1". 1st bit to 5th bit is for address, and the 6th bit dial switch support a 120Ω resistance.

Power Output Switch

To control the high voltage DC power output ON/OFF during the Control Module Power Switch ON.

Caution: When the breaker is tripped off because of over current or short circuit, must wait after 30min to turn on it again, otherwise may cause the breaker damage.

CAN / RS485

CAN Communication Terminal: (RJ45 port) follow CAN protocol, for communication between battery system and inverter.

RS485 Communication Terminal: (RJ45 port) follow RS485 protocol, for communication between battery system and inverter.

RS232 Terminal

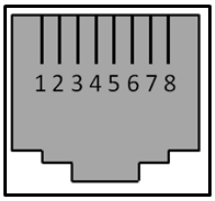
Console Communication Terminal: (RJ45 port) follow RS232 protocol, for manufacturer or professional engineer to debug or service.

Link Port 0, 1

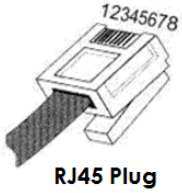
Link Port 0, 1 Communication Terminal: (RJ45 port) follow RS485 protocol, for communication between multiple serial battery modules and control module.

Definition of RJ45 Port Pin

No.	CAN	RS485	RS232 Pin
1	---	---	---
2	GND	---	---
3	---	---	TX
4	CANH	---	---
5	CANL	---	---
6	---	GND	RX
7	---	RS485A	---
8	---	RS485B	GND



RJ45 Port



RJ45 Plug

Status

Status light: to show the battery module's status (RUN●, Alarm and Protection●).

LED Status Indicators

✧ Battery capacity indicator: 4 green lamps, each light represent 25% capacity.

LED Indicators Instructions

Battery Status	Protection / Alarm / Normal	RUN	PRC	Capacity SOC				Descriptions
		●	●	●	●	●	●	
Shut Down		Off	Off	Off	Off	Off	Off	All off
Sleep	Normal	Flash 2	Off	Off	Off	Off	Off	Indicates Sleep Mode, to save the power.
Standby	Normal	Light	Off	Off	Off	Off	Off	Indicates save power mode.
	Alarm	Off	Flash 3	Off	Off	Off	Off	Indicates the battery is low.
Charge	Normal	Light	Off	The highest capacity indicator LED flashes (flash 2), others lighting				The highest capacity indicator LED flashes (flash 2), others lighting,
	Alarm	Off	Flash					

			3					horse race lamp when SOC＞90%
	Protection	Off	Light	Off	Off	Off	Off	Stop charging, PRC lighting
Discharge	Normal	Flash 2	Off	Indicate based on capacity				Indicate based on capacity
	Alarm	Off	Flash 3					
	Protection	Off	Light					Stop discharging, PRC lighting
Abnormal	Protection	Off	Light	Off	Off	Off	Off	Stop charging/discharging, PRC lighting

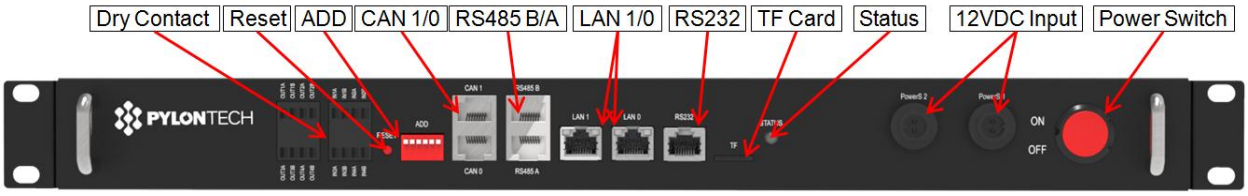
Note: The flashing instructions, flash 1 - light 0.25s / off 3.75 seconds; flash 2 - 0.5s light / 0.5s off; flash 3 - 0.5s light / 1.5s off.

2.2.4 3rd Level Control Module (MBMS)

MBMS is the controller for multiple battery piles in parallel connection.

If the power supply is 220Vac, an adaptor (220Vac to 12Vdc) will be provided.

Serial Number	Product Model	MBMS1000
1	Operating voltage range	12 Vdc
2	Communication interface	CAN*2/RS485*2/Ethernet*2
3	Output dry contact interface	4 groups
4	Input dry contact interface	2 groups
5	System Consumption	2W
6	Size	442*190*44mm
7	Protection degree	IP20
8	Weight (kg)	5
9	Working temperature	-20~60℃
10	Storage temperature	-40~80℃



12VDC Input

Take 12VDC power from outside (from control module or AC/DC adaptor).

Dry Contact

Dry Contact Terminal: provided 2 way input and 4 ways output dry contact signal.

Reset

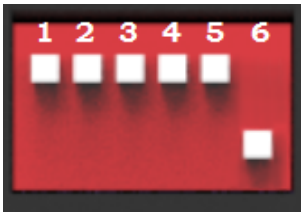
Reset Button: Long press this button to restart the battery system.

ADD

Under CAN Communication Mode between MBMS and BMS (battery string qty. ≤6 set)

The MBMS's ADD Switch set with "1000X_1X_0". The last 2 bits are terminal resistances. X_0=1; When the CAN port communicate with only one another equipment, if this equipment uses terminal resistance then X_1 should be "1", if this equipment uses without terminal resistance X_1 should be "0"; If When the CAN port communicate with multi equipments, if this equipments uses terminal resistance then X_1 should be set follow the CAN bus condition.

Note: X_1 address should correspond with CAN1 port, X_0 address should correspond with CAN0 port.



The BMS's first five bits must set in below <**BMS's Address Configure Table**>. The last BMS's terminal resistance must set in "1" (X=1), and other BMS's terminal resistance must set in "0".

The address is configured follow ASCII code: ("X" is terminal resistance).

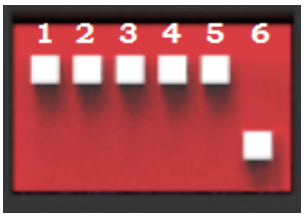
BMS's Address Configure Table:

Battery String	Address Bit
1	10000X
2	01000X
3	11000X
4	00100X
5	10100X
6	01100X

Under Ethernet communication between MBMS and BMS (battery string qty. 1~32 set)

The MBMS's ADD Switch set with "0000X_1X_0". The last 2 bits are terminal resistances. When the CAN port communicate with only one another equipment, if this equipment uses terminal resistance then X_1 should be "1", if this equipment uses without terminal resistance X_1 should be "0"; If When the CAN port communicate with multi equipments, if this equipments uses terminal resistance then X_1 should be set follow the CAN bus condition.

Note: X_1 address should correspond with CAN1 port, X_0 address should correspond with CAN0 port.



The BMS's first five bits must set in above <**BMS's Address Configure Table**>. The other BMS' terminal resistance must set in "0".

The address is configured follow ASCII code: ("X" is terminal resistance).

BMS's Address Configure Table:

Battery String	Address Bit	Battery String	Address Bit	Battery String	Address Bit	Battery String	Address Bit
1	10000X	9	10010X	17	10001X	25	10011X
2	01000X	10	01010X	18	01001X	26	01011X
3	11000X	11	11010X	19	11001X	27	11011X
4	00100X	12	00110X	20	00101X	28	00111X
5	10100X	13	10110X	21	10101X	29	10111X
6	01100X	14	01110X	22	01101X	30	01111X
7	11100X	15	11110X	23	11101X	31	11111X
8	00010X	16	00001X	24	00011X	32	00000X

Multi MBMS Communication Mode

In some project it configures multi Energy Storage Systems. In this case will have multi MBMS. The address of MBMS must follow <MBMS's Address Configure Table> .

The MBMS's ADD Switch set with "0000X_1X_0". The last 2 bits are terminal resistances.

X_0=1; When the CAN port communicate with only one another equipment, if this equipment uses terminal resistance then X_1 should be "1", if this equipment uses without terminal resistance X_1 should be "0"; If When the CAN port communicate with multi equipments, if this equipments uses terminal resistance then X_1 should be set follow the CAN bus condition.

Note: X_1 address should correspond with CAN1 port, X_0 address should correspond with CAN0 port.

MBMS	Address Bit	MBMS	Address Bit
1	1000XX	9	1001XX
2	0100XX	10	0101XX
3	1100XX	11	1101XX
4	0010XX	12	0011XX
5	1010XX	13	1011XX
6	0110XX	14	0111XX
7	1110XX	15	1111XX
8	0001XX	16	0000XX

CAN 1/0

CAN Communication Terminal: (RJ45 port) follow CAN protocol, for communication between battery system and PCS.

RS485 B/A

RS485 Communication Terminal: (RJ45 port) follow RS485 protocol, for communication between battery system and PCS.

LAN 1/0

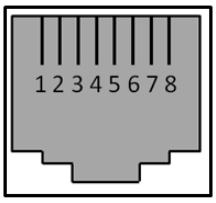
Ethernet Communication Terminal: (RJ45 port) follow CAN protocol for communication between BMS and MBMS.

RS232

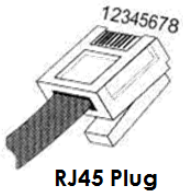
Console Communication Terminal: (RJ45 port) follow RS232 protocol, for manufacturer or professional engineer to debug or service.

Definition of RJ45 Port Pin

No.	CAN	RS485	RS232 Pin	Link Port Pin
1	---	---	---	---
2	GND	---	---	GND
3	---	---	TX	---
4	CANH	---	---	CANH
5	CANL	---	---	CANL
6	---	GND	RX	---
7	---	RS485A	---	---
8	---	RS485B	GND	---



RJ45 Port



RJ45 Plug

Status

Status light: to show the battery module's status (RUN●, Alarm and Protection●).

Note: The flashing instructions, flash 1 - light 0.25s / off 3.75 seconds; flash 2 - 0.5s light / 0.5s off; flash 3 - 0.5s light / 1.5s off.

Power Switch

Turn ON/OFF the MBMS power, and ON/OFF the power output of external power of control modules.

BMS function:

Protection and Alarm	Management and Monitor
Charge/Discharge End	Cells Balance
Charge Over Voltage	Intelligent Charge Model
Charge/Discharge Over Current	Capacity Retention Calculate
High/Low Temperature	Administrator Monitor
Short Circuit	Operation Record

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