P700 series iBMS Specification

----Specially designed for household ESS

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Revision record

S/N	Edition	Revision date	Type	Revised content
1	V 1.0	2022-02-14	A	First Edition
2	V 1.1	2022-07-22	M	Updated interface definitions
3	V 1.2	2022-09-10	M	The current limiting module is changed to 5A,antenna added

A-Add，M-Modification，D-Delete

1. Product overview

P700 intelligent battery management system is a new generation of intelligent battery management system developed based on the requirements of home energy storage multi package parallel connection, online-monitoring and easy maintenance. The system supports grid connected and off grid operation, and has the functions of safety protection, power consumption management, precharge management, current limiting charging, heating control, LED display, etc. Bluetooth +WiFi data transmission unit is integrated in the module, which can realize real-time two-way wireless interconnection with the remote data cloud platform. Users can view the system operation status in real time through the mobile app, so that household users can quickly establish an independent, clean and economic energy microgrid.

- Support 14~17 series cells and 6-channel temperature detection;
- Support the detection and alarm of single cell voltage / cell temperature / total voltage / current;
- Support electric short-circuit protection, emergency condition alarm cut-off circuit and signal output;
- Support accurate estimation and abnormal alarm of battery SOC and SOH;
- Support mobile APP, real-time check system running status;
- Support low power consumption mode, and automatically enter low power consumption operation mode under storage and transportation, standby and stop working states;
- Support RS485, RS232, can, WiFi communication and multiple module level communication;
- Support single pack or multiple packs(max 16) connected in parallel, and the parallel strategy is implemented by the main control BMS;
- Support manual/automatic address assignment and intelligent management when multiple modules work in parallel;
- Using cloud full-time balancing, multiple single batteries can be balanced and maintained at the same time, and the single cell balanced energy can be measured;
- Flexible function selection, convenient wiring port configuration and integrated stable current limiting module provide more possibilities for the expansion and application of batteries.

2. Specification parameters

Table 1- Parameter list

Items		Parameters
Working temperature		-20℃~85℃
Storage temperature		-40℃~105℃
Operating humidity		5~95%
SOC estimation accuracy		5%
Voltage detection accuracy		±5mV(0-45℃);±10mV(-20-85℃)
Temperature detection accuracy		±1℃
High voltage detection accuracy		±0.5%
Current detection accuracy		±1%FSR
Data storage		Continuous storage for 30 days
BMS power supply voltage		DC36~80V
Comm.	CAN	2channel (master slave communication, PCS isolated CAN communication)
	RS485	1 channel, isolated
	RS232	1 channel, isolated
	UART	1 channel (connected to matrix display)
	Bluetooth/WiFi two in one	Support
Acquisition	Cell voltage detection	14~17S
	TEMP. detection	8 channels (cell 6 channels, MOS 1 channel, ambient 1 channel)
	Current detection	1 channel (accuracy better than ± 1% FSR)
	Power switch	Support (external switch, for switching on and off of the system)
	Reset switch	Reserved(Wake up only when the device is in hibernation state)
	Other wake-up sources	Bus voltage wake up, RTC wake-up, DI wake-up
Execution	Balancing control	Support (max balancing current 100mA)
	Charge discharge MOS control	Support (same port, control positive)
	Heating MOS control	Support (150W/3A heating power)
	Pre-charge control	Support, Built-in precharge resistance 51Ω
	LED indicator control	Support (SOC, fault, operation status)
Power units	Charge discharge MOS array	Rated 100A, support 100A/75A/50A customization
	Precharge circuit	Precharge time 1ms-5000ms (can set)
	Charging current limiting circuit	Active / passive current limiting (5A)

3. Interface definition

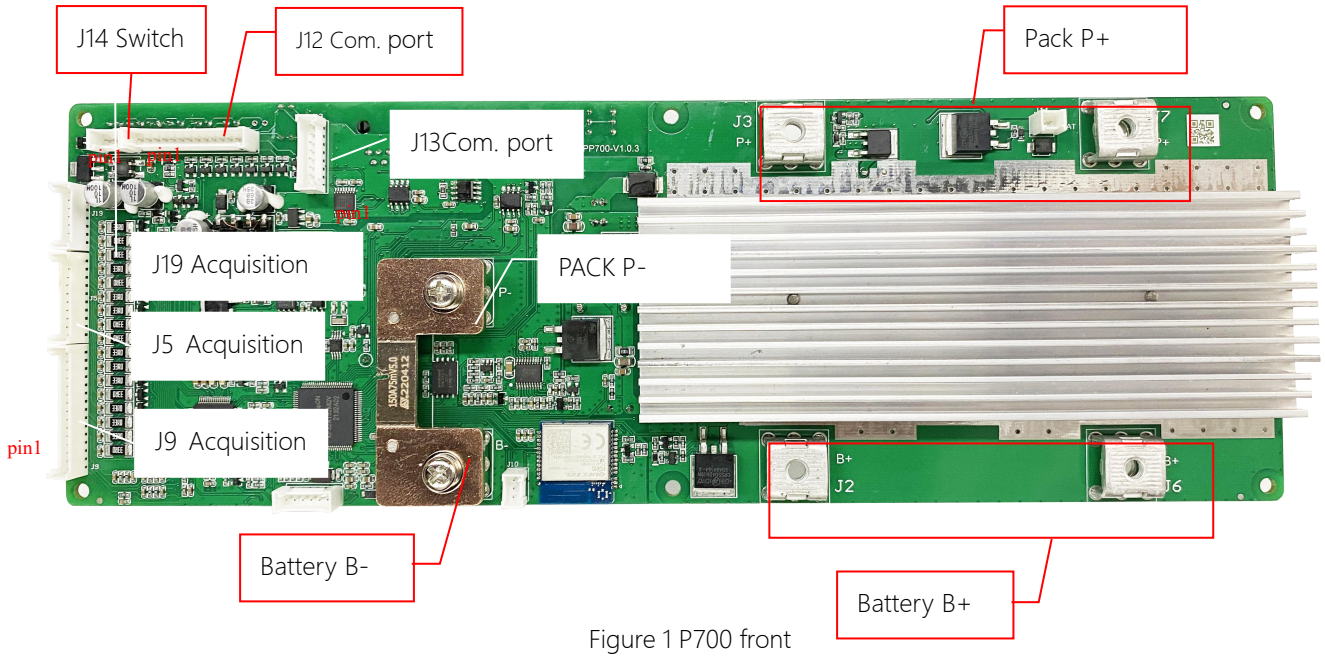

Figure 1 P700 front

Table 2- Interface definitions

Interface	S/N	Name	Description	S/N	Name	Description
J9	1	T-	Temperature sensing co negative	9	T-	Temperature sensing co negative
	2	T1+	1 temperature sensor	10	T5+	5 temperature sensor
	3	T-	Temperature sensing co negative	11	T-	Temperature sensing co negative
	4	T2+	2 temperature sensor	12	T6+	6 temperature sensor
	5	T-	Temperature sensing co negative	13	B-	Board power supply negative
	6	T3+	3 temperature sensor	14	B0	1S cell negative
	7	T-	Temperature sensing co negative	15	B1	1S cell positive
	8	T4+	4 temperature sensor			
Interface	S/N	Name	Description	S/N	Name	Description
J5	1	B2	2S cell positive	6	B7	7S cell positive
	2	B3	3S cell positive	7	B8	8S cell positive
	3	B4	4S cell positive	8	B9	9S cell positive
	4	B5	5S cell positive	9	B10	10S cell positive
	5	B6	6S cell positive	10	B11	11S cell positive
Interface	S/N	Name	Description	S/N	Name	Description
J19	1	B12	12S cell positive	5	B16	16S cell positive
	2	B13	13S cell positive	6	B17	17S cell positive
	3	B14	14S cell positive	7	B+	Board power supply positive
	4	B15	15S cell positive			
Interface	S/N	Name	Description	S/N	Name	Description

J14	1	KEY+	Board power switch +	3	KEY-	Board power switch -
	2	NC				
Interface	S/N	Name	Description	S/N	Name	Description
J12	1	DI	Digital input signal	8	NC	NC
	2	DO	Digital output signal	9	C-LED6	6th LED drive
	3	CAN0L	CAN0 Low	10	C-LED5	5th LED drive
	4	CAN0H	CAN0 high	11	C-LED4	4th LED drive
	5	CAN0R	CAN0 matching resistor configuration port	12	C-LED3	3rd LED drive
	6	P/B	Reset button signal	13	C-LED2	2nd LED drive
	7	3.3V	Onboard 3.3V power supply	14	C-LED1	1st LED drive
Interface	S/N	Name	Description	S/N	Name	Description
J13	1	485A	485A	5	CAN1H	CAN1 high
	2	485B	485B	6	CAN1R	CAN1 matching resistor configuration port
	3	ISO-G	Com. isolation ground	7	232-TXD	232 send
	4	CAN1L	CAN1 low	8	232-RXD	232 receive

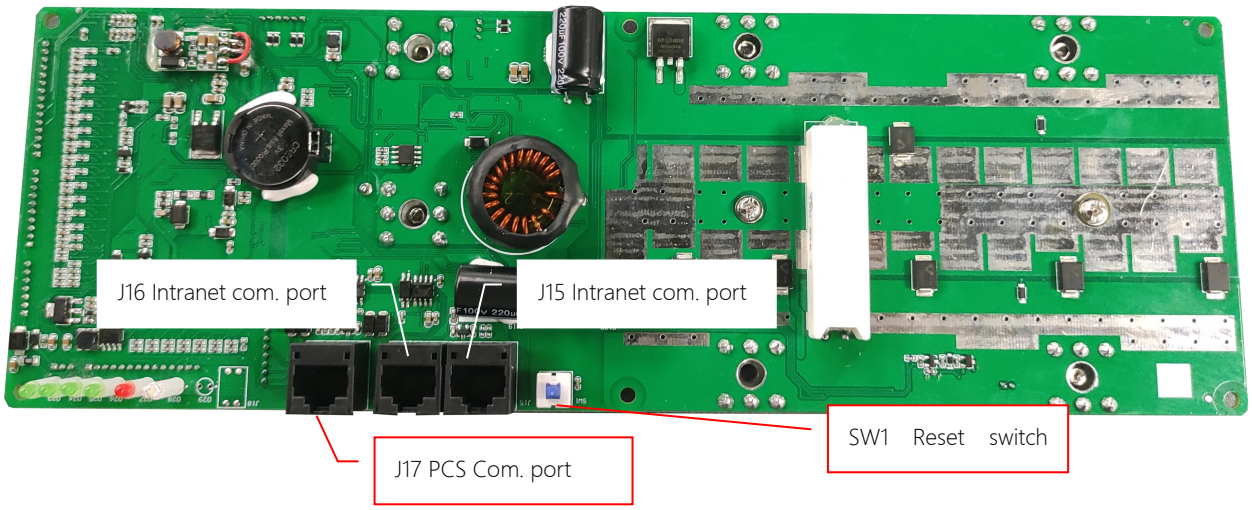

Figure 2 P700 back

Table 3- Interface definitions

Interface	S/N	Name	Description	S/N	Name	Description
J15	1	CAN0H	CAN0 High	5	DI	Digital input
	2	CAN0L	CAN0 Low	6	NC	No connection
	3	NC	No connection	7	CAN0H	CAN0 High
	4	NC	No connection	8	CAN0L	CAN0 Low
Interface	S/N	Name	Description	S/N	Name	Description
J16	1	CAN0H	CAN0 High	5	DO	Digital output
	2	CAN0L	CAN0 Low	6	NC	No connection

	3	NC	No connection	7	CAN0H	CAN0 High
	4	NC	No connection	8	CAN0L	CAN0 Low
Interface	S/N	Name	Description	S/N	Name	Description
J17	1	232-TXD	232 send	5	CAN1L	CAN1 Low
	2	232-RXD	232 receive	6	ISO-G	Com. isolation ground
	3	ISO-G	Com. isolation ground	7	485A	485A
	4	CAN1H	CAN1 high	8	485B	485B

4. Cable harness connection

Table 4- Wiring methods

BMS End		PACK End			
J19	6	B17+	B16+	B15+	B14+
	5	B16+	B15+	B14+	B13+
	4	B15+	B14+	B13+	B12+
	3	B14+			
	2	B13+	B13+		
	1	B12+	B12+	B12+	
J5	10	B11+	B11+	B11+	B11+
	9	B10+	B10+	B10+	B10+
	8	B9+	B9+	B9+	B9+
	7	B8+	B8+	B8+	B8+
	6	B7+	B7+	B7+	B7+
	5	B6+	B6+	B6+	B6+
	4	B5+	B5+	B5+	B5+
	3	B4+	B4+	B4+	B4+
	2	B3+	B3+	B3+	B3+
	1	B2+	B2+	B2+	B2+
J9	15	B1+	B1+	B1+	B1+
	14	B0	B0	B0	B0

Note: the color area indicates that multiple voltage acquisition cables are connected

5. Structural dimensions

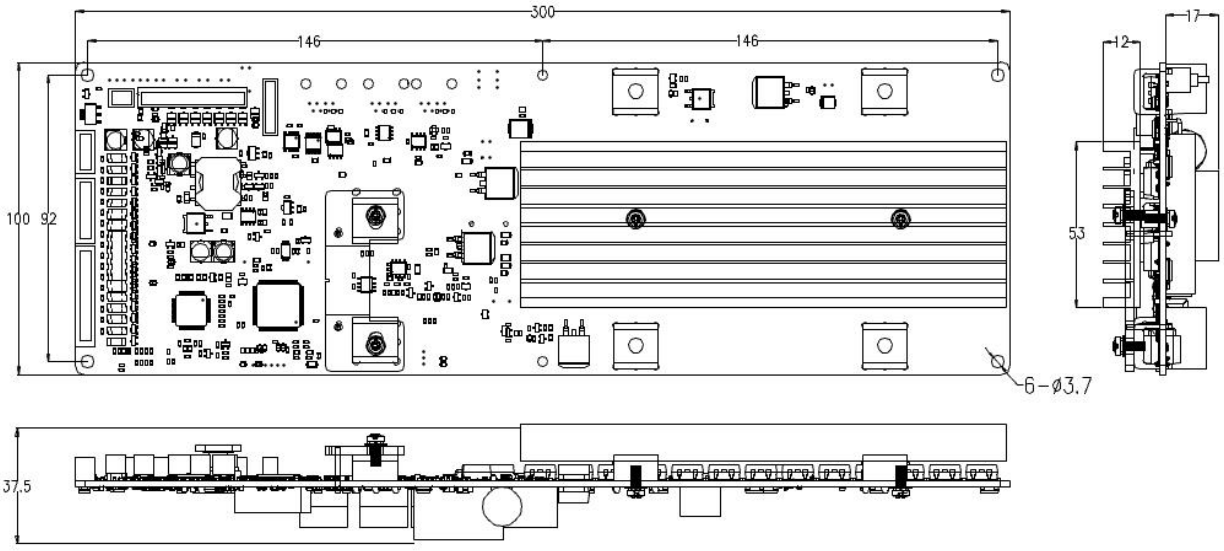

Figure 3 P700 Structure dimensions

6. Working modes

6.1 Single pack mode

Used in scenarios where a single pack is used independently. In this scenario, BMS performs signal acquisition, communication control, security protection, etc. for a single pack according to the preset logic.

1) Communication with PCS: CAN, RS485 or RS232 BUS can be used for communication between energy storage system and PCS;

2) WiFi connection with home network: conveniently configure the energy storage system through the exclusive mobile phone APP to realize powerful functions such as remote monitoring, BMS software OTA, application information tracing, etc.

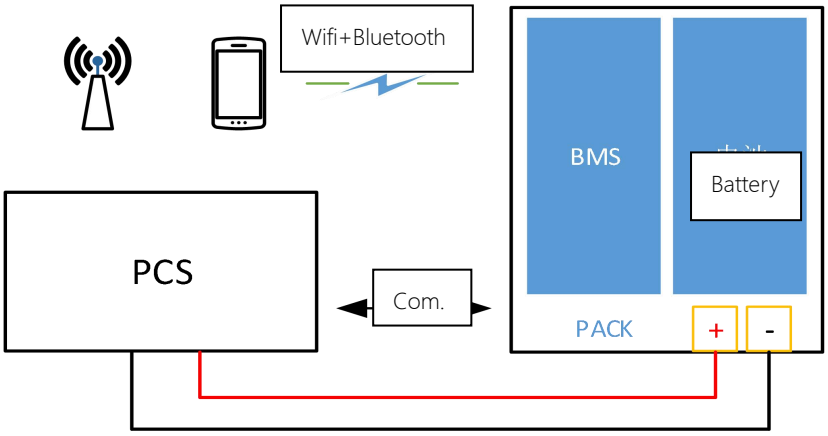

Figure 4- Single pack ESS system

6.2 Multi-pack mode

Used in scenarios where multiple packs are used in parallel. In the online mode, after the system is powered on, it will automatically confirm the identity of the host and the slave according to the intranet connection mode, and automatically assign the address of each BMS in the online system. After online networking, PCS equipment establishes communication connection with the host of BMS in the system.

When multiple modules are connected in parallel, the devices are connected in turn with network cables. After the BMS is powered on, it outputs DO signals and sends networking request instructions. The device checks whether there is DI signal input; If none, it will be set as master, otherwise it will be set as slave; After such internal automatic networking, BMS without DI input in the parallel system are usually defined as hosts.

1) Only the online working mode of parallel power lines is supported (Fig. 5), and the power output of pack can not be used in series;
2) The host communicates with PCS, and can be connected with home network WiFi. At the same time, it communicates with the slave through CAN0 bus.

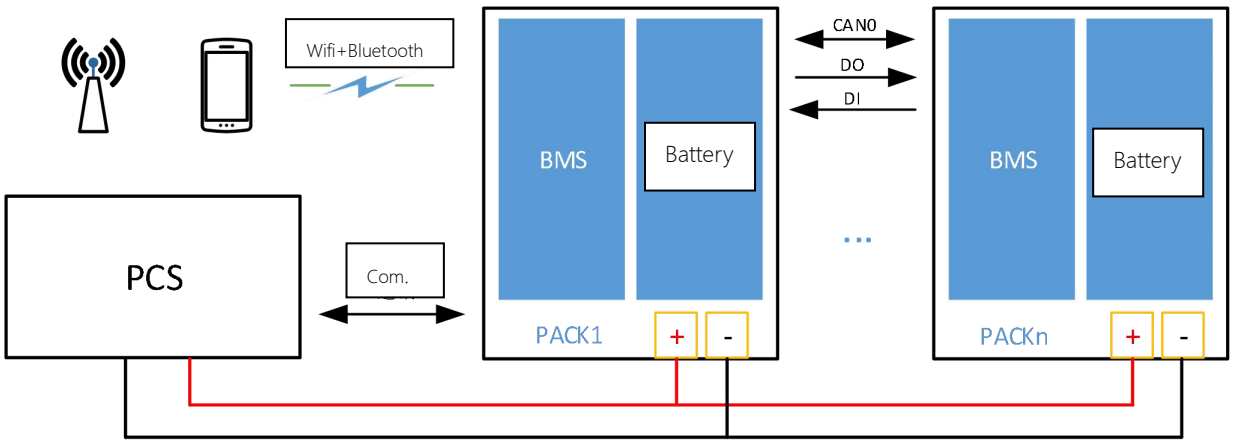

Figure 5- Energy storage system with multiple packs

7. Functional strategy

7.1 Status management

1) State of charge

When BMS detects that the charger is connected and the external charging voltage is greater than the internal battery voltage by more than 0.5V, it first closes the charging MOS. When the charging current reaches the effective value, the system enters the charging state. In the charging state, both the charging and discharging MOS are closed.

2) Discharge state

When BMS detects that the load is connected and the discharge current reaches the effective value, the system enters the discharge state.

3) Idle state

When the charging and discharging states are not satisfied, BMS will enter idle state after 300s.

4) Low power status

If the idle state lasts for 2 hours and there is no charge and discharge demand, it will enter the low power consumption state. In the low power consumption state, the data transmission frequency will be reduced and the charge and discharge MOS will be kept closed. When the external power switch, reset switch, load access and charge access are detected, the system will wake up and switch to the charge, discharge or idle state.

5) Sleep state

When the low power consumption lasts for 48 hours (which can be set by the upper computer), or when the single undervoltage protection or the total voltage over discharge protection, the charging and discharging MOS will be disconnected, and the system will enter the sleep state. The sleep state will wake up regularly every 4 hours (time configurable) and close the charge discharge MOS. At this time, if the charging current is detected, it will exit the sleep state and enter the charging state. If the charging current is not detected for 10 consecutive automatic wakeups, it will not wake up automatically. The wake-up conditions of the sleep state: charging activation, external charging voltage activation, and power switch restart.

7.2 Cell voltage detection

Real time collection and monitoring of the cell voltage is used to realize the cell overvoltage and undervoltage alarm and protection. The cell voltage detection accuracy is ± 5mv under the condition of 0 ~ 45 ℃. The alarm and protection threshold parameters can be set through the upper computer software.

7.3 Cell, ambient and power temperature detection

NTC sensors are used to collect and monitor the 6-channel cell temperature, 1-channel ambient temperature and 1-channel power temperature in real time to realize high-temperature and low-temperature alarm and protection. The temperature detection accuracy is ± 1 ℃. The NTC103 specification is used by default for the cell temperature sensor. The alarm and protection threshold parameters can be set by the upper computer.

7.4 Current detection

Through the current detection resistance connected to the charging and discharging main circuit, the charging and discharging current of the battery pack is collected and monitored in real time to realize the charging current and

discharging current alarm and protection. The temperature rise of the detection resistance is less than 40 ℃, and the current detection accuracy is better than ± 1% FSR. The alarm and protection threshold parameters can be set through the upper computer software.

7.5 Short circuit protection function

It has the function of detecting and protecting the output short circuit.

7.6 Battery capacity and number of cycles

The real-time calculation of the remaining capacity of the battery can complete the learning of the total capacity through a complete charge and discharge process. The SOC estimation accuracy is better than ± 5%. It has the function of calculating the number of charge and discharge cycles. When the cumulative discharge capacity of the battery pack reaches 80% of the set full capacity, the number of cycles is increased once. The alarm and protection threshold parameters can be set through the upper computer software.

7.7 Charge and discharge MOS switch

Low internal resistance, high current, optimized design for large capacity capacitive load startup, zero switching and double charging withstand voltage applied to backup power supply.

7.8 Smart cell balancing

The battery pack can be fully balanced during charging, discharging or standby, which can effectively improve the service time and cycle life of the battery. The balancing strategy parameters can be set through the upper computer software.

7.9 Sleep function

BMS has automatic and manual sleep functions.

Automatic sleep: when there is no external charge and discharge signal and it lasts for ≥ 48 hours, the BMS automatically enters the sleep state; When the battery pack is under over discharge protection, the BMS will maintain communication for 1 minute and then automatically enter the sleep state.

Manual sleep: manually press and hold the reset switch for 3 seconds to release, and the BMS will enter the sleep state; The upper computer software manually sets the force control BMS to enter the sleep state.

When entering sleep: the LED indicator lights up in turn, turns into the normal working state, and the indicator light returns to the normal working logic.

Wake up after sleep: wake up after charging access; After pressing the reset switch for 1s and releasing it, it wakes up; When quitting sleep, the LED indicator lights up in turn, turns into sleep state, and the LED is all off.

7.10 LED indicator function

1) The power indicator is always on in the non sleep state;

2) Indicators are defined as follows:

Running light	Warning light	SOC indicator			
●	●	●	●	●	●

a) Flashing instructions

Flashing mode	Light on	Light off
Flash 1	0.25S	3.75S

Flash 2	0.5S	0.5S
Flash 3	0.5S	1.5S

b) SOC indicator

State	Charging				Discharging			
SOC indicator	L4●	L3●	L2●	L1●	L4●	L3●	L2●	L1●
0~25%	Light off	Light off	Light off	Flash 2	Light off	Light off	Light off	Always on
25%~50%	Light off	Light off	Flash 2	Always on	Light off	Light off	Always on	Always on
50%~75%	Light off	Flash 2	Always on	Always on	Light off	always on	Always on	Always on
≥75%	Flash 2	Always on	Always on	Always on	Always on	always on	Always on	Always on
Operation indicator ●	Always on				Flash			

c) Status indication

System state	Operating status	Running light	Alarm light	SOC light				Description
		●	●	●	●	●	●	
Power off	Sleep	Light off	Light off	Off	Off	Off	Off	All off
Standby	Normal	Always on	Light off	According to SOC indication				Idle mode
Charging	Normal	Always on	Light off	According to SOC indication				Maximum LED flash 2
	Overcurrent alarm	Always on	Flash 2					Maximum LED flash 2
	Overvoltage protection	Always on	Light off					
	TEMP. and overcurrent protection	Always on	Flash 1					
Discharge	Normal	Flash 3	Light off	According to SOC indication				According to SOC indication
	Alarm	Flash 3	Flash 3					
	TEMP., overcurrent, short circuit protection, etc	Off	Always on	Off	Off	Off	Off	Stop discharging. When the mains supply is offline, BMS will enter sleep mode after no action for 48H
	Undervoltage protection	Off	Off	Off	Off	Off	Off	Stop discharging

7.11 Communication management

CAN/RS485/RS232 BUS is mainly used for the communication between inverters, which is suitable for various inverter

communication protocols. UART serial port communication bus is mainly used for display screen communication to realize human-computer interaction.

1) CAN communication

CAN0 bus, a dual network port design, is the intranet communication BUS when the batteries are connected in parallel, which can upload the battery information from the slave to the host for centralized processing; At the same time, CAN0 BUS enables the master to update the slave programs by OTA in a centralized or decentralized manner; CAN0 intranet is also responsible for the communication function with the upper computer;

The two-way dial switch provides options for the configuration of CAN0 BUS matching resistance: set "1" to represent that the CAN0 end of the equipment is connected to 120 Ω bus matching resistance; Set "0" to indicate that 120 Ω matching resistance is not connected.

CAN1 bus is mainly responsible for the communication with PCS or other external equipment. The isolation design and communication protocol can be customized. After summarizing all battery and working status information of the master and slave, it can be uploaded to PCS equipment.

2) RS485/RS232 communication

RS485/RS232 is reserved to communicate with PCS, ammeter, display screen and other external devices. The communication protocol can be customized.

3) UART serial port communication

Reserved serial port communication is mainly used to communicate with the serial port display screen to form a human-computer interaction interface, which is applicable to the use scenarios of more battery products.

7.12 Battery management parameters setting

Various battery management parameters, such as cell overvoltage and undervoltage, total voltage overvoltage and undervoltage, charge and discharge overcurrent, cell high and low temperature, environmental high and low temperature, balancing strategy parameters, number of battery cells in series, battery capacity, etc., can be reset through the upper computer software.

1) Precharge function

The precharge function is started at the moment of BMS startup or the moment of discharge tube closing. The precharge time can be set (1ms to 5000ms) to deal with various capacitive load scenarios and avoid wiring ignition and BMS output short circuit protection.

2) Charging current limiting

Charging current limiting is divided into two modes: active current limiting and passive current limiting (one can be selected).

Active current limiting: BMS always opens the current limiting module and actively limits the charging current greater than 5A to 5A.

Passive current limiting: when in the charging state, if the charging current reaches the over-current alarm value (the current can be configured by the upper computer software), open the current limiting module, 5A current limiting, disconnect the charging MOS, re-close the charging MOS after 5 minutes of current limiting, and detect whether the charging current returns to normal parameters. If it returns, close the current limiting module, resume closing the normal charging MOS for charging, otherwise continue to open the current limiting module, disconnect the charging MOS, and judge again after 5 minutes, and back and forth.

3) Switch control

External switch: short circuit with BAT+ is effective.

Valid: BMS is powered on, and the normal working logic; Invalid: BMS is shut down and BMS does not work.

Reset switch:

Shutdown/sleep: when the BMS is in standby or working state (except charging), press the 3S reset button, the BMS will sleep, the LED indicator will be on in turn, turn to sleep state, and the LED will be all off;

Power on/wake up: when the BMS is in the sleep state, press the 1s reset button, the BMS is activated, the LED indicator lights up in turn, turns to the normal working state, and the indicator light returns to the normal working logic.

7.13 Overcharge protection and recovery

1) Cell over discharge protection and recovery

When the voltage of any cell is higher than the set value of single overcharge protection, the BMS triggers the overcharge protection and prohibits the battery from charging. After the monomer overvoltage protection, the voltage of all monomers is lower than the monomer overcharge recovery value, and the delay time is reached, and the SOC is lower than 96%, the BMS removes the overcharge protection. After the monomer overvoltage protection is triggered and the discharge state is detected, the BMS discharges the overcharge protection.

2) Total voltage over discharge protection and recovery

When the total battery voltage is higher than the set value of the overcharge protection, the BMS triggers the overcharge protection and prohibits the battery from charging. After the total pressure overcharge protection is detected, the total pressure is lower than the overcharge recovery value, and the delay time is reached, and the SOC is lower than 96%, the BMS removes the overcharge protection. When the total voltage overcharge protection is triggered and the discharge state is detected, the BMS disactivates the overcharge protection.

7.14 Over discharge protection and recovery

1) Individual cell over discharge protection and recovery

When it is detected that the voltage of any battery cell is lower than the set value of unit over discharge protection and the delay time is reached, the BMS triggers over discharge protection, prohibits battery discharge, and keeps the BMS dormant after 1 minute of communication; If the over discharge protection is triggered immediately after power on is activated, the BMS can still maintain the discharge output for 1 minute (reserved for PCs to detect the battery voltage). If a discharge state is detected in this state, the BMS will immediately cut off the output and prohibit the battery discharge; After the over discharge protection is triggered and the charging state is detected, the BMS removes the over discharge protection.

2) Total voltage over discharge protection and recovery

When it is detected that the total voltage of the battery is lower than the set value of the over discharge protection and the delay time is reached, the BMS triggers the over discharge protection, prohibits the battery from discharging, and keeps the BMS dormant after 1 minute of communication; If the over discharge protection is triggered immediately after power on is activated, the BMS can still maintain the discharge output for 1 minute (reserved for PCS to detect the battery voltage). If a discharge state is detected in this state, the BMS will immediately cut off the output and prohibit the battery discharge; After the over discharge protection is triggered and the charging state is detected, the BMS removes the over discharge protection.

7.15 Charging overcurrent protection and recovery

When there is no charging current limiting function, the charging overcurrent protection is triggered according to the following description; If the charging current limiting function is enabled, please refer to the active or passive current limiting function.

If it is detected that the charging current exceeds the set value of the charging overcurrent protection and reaches the delay time, the BMS triggers the charging overcurrent protection and prohibits the charging equipment from charging the battery; After triggering the charging overcurrent protection, the BMS will release the charging overcurrent protection after a fixed time delay; After triggering the charging overcurrent protection, the BMS detects the discharge state and removes the charging overcurrent protection.

7.16 Discharge overcurrent protection and recovery

When it is detected that the discharge current exceeds the set value of the discharge overcurrent protection and reaches the delay time, the BMS triggers the discharge overcurrent protection and prohibits battery discharge; After triggering the discharge overcurrent protection, BMS will release the discharge overcurrent protection after a fixed time delay; After triggering the discharge overcurrent protection, the charging state is detected, and the BMS removes the discharge overcurrent protection.

When it is detected that the discharge current exceeds the set value of the transient overcurrent protection and reaches the delay time, the BMS triggers the transient overcurrent protection and prohibits battery discharge; After triggering the transient overcurrent protection, BMS will release the transient overcurrent protection after a fixed time delay; If BMS removes the transient overcurrent protection, after closing the discharge circuit, it will repeatedly and continuously trigger the transient overcurrent protection for more than 3 times, and then trigger the transient overcurrent locking; After triggering the transient overcurrent lock, the BMS can release the transient overcurrent lock by restarting or charging.

7.17 Temperature protection and recovery

1) High temperature protection and recovery of charge and discharge

In the charge and discharge state, when it is detected that any 6 NTC on cells is higher than the set value of high temperature protection and the delay time is reached, the BMS triggers high temperature protection and prohibits charging or discharging; After triggering the charge discharge high temperature protection, it is detected that when the cell temperature is lower than the high temperature recovery value and the delay time is reached, the BMS will remove the charge discharge high temperature protection and resume charging or discharging.

2) Charge discharge low temperature protection and recovery

In the charge and discharge state, when it is detected that the 6 NTC on cells is lower than the set value of low temperature protection and the delay time is reached, the BMS triggers the low temperature protection and prohibits charging or discharging; After triggering the charge discharge low temperature protection, when it is detected that the

temperature of all cells is higher than the low temperature recovery value and the delay time is reached, the BMS will remove the charge discharge low temperature protection and resume charging or discharging.

3) Ambient temperature protection and recovery

In the charge and discharge state, when it is detected that the ambient high temperature or low temperature exceeds the set value and reaches the delay time, the BMS triggers the ambient temperature protection and prohibits charging or discharging; After triggering the ambient temperature protection, when it is detected that the ambient temperature reaches the recovery value and reaches the delay time, the BMS will remove the ambient temperature protection and resume charging or discharging.

4) Power high temperature protection and recovery

When the power temperature is detected to be higher than the set value of power protection and the delay time is reached, the BMS triggers the power high temperature protection and prohibits charging or discharging; After the power high temperature protection is triggered, when it is detected that the power temperature is lower than the recovery value and the delay time is reached, the BMS removes the power high temperature protection and resumes charging or discharging.

7.18 Balancing function

Charging balancing: BMS system adopts energy consumption balancing circuit, and the balancing starting voltage is adjustable by software. Any section of the balancing starting condition is higher than the balancing starting voltage and the voltage difference meets the conditions together. When the charging is stopped or the voltage difference of the battery cell is less than the set value, the balancing stops.

The network version of the product has the cloud full-time balancing function. The server and terminal equipment jointly manage the battery balancing. The issuing cycle of the balancing instruction is 1 minute / time, and the execution cycle of the balancing instruction is 1 minute/time.

7.19 Data storage function

BMS is equipped with information storage module. The storage contents include: protection and alarm , recovery time of protection and alarm, single cell voltage, total battery voltage, charge / discharge capacity, charge / discharge current, temperature, etc., which are recorded in year / month / day / hour / minute / second. The information storage capacity is not less than 30 days, and the storage cycle is not more than 60s/ time. Historical data can be read through the upper computer and saved in Excel file.

8. Threshold setting

Table 5- Parameter configuration

Function name	Setting	Item list	Set value		Set range
Cell overvoltage alarm	On	Cell overvoltage alarm	≥ 3500mV	2S	Cell high voltage recovery ~ cell overvoltage protection
		Cell overvoltage alarm recovery	< 3400mV	2S	3000mV~cell high voltage alarm
Cell overvoltage protection	On	Cell overvoltage protection	≥ 3650mV	2S	Cell high voltage alarm~4500mV
		Cell overvoltage protection recovery	< 3400mV	2S	Cell high voltage recovery ~ cell overvoltage

		Overvoltage recovery conditions	Cell voltage drops to overvoltage recovery point The remaining capacity is 96% lower than the intermittent power supply capacity		Two conditions must be met to recover
			Battery discharge current detected >0.5A		
Cell undervoltage alarm	On	Cell low-voltage alarm	≤ 2900mV	2S	Cell undervoltage protection ~ cell low voltage recovery
		Cell low-voltage alarm recovery	> 3100mV	2S	Cell low voltage alarm~3300mV
Cell undervoltage protection	On	Cell undervoltage protection	≤ 2700mV	2S	1500mV~Cell undervoltage recovery
		Cell undervoltage protection recovery	> 3100mV	2S	Cell undervoltage protection ~ cell low voltage recovery
		Cell undervoltage shutdown	Undervoltage protection shutdown after 1 minute communication		
		Undervoltage shutdown recovery conditions	Charging current (>0.5a) detected or Reset switch wakes up to judge again		
Battery overvoltage alarm	On	Total voltage high voltage alarm	≥ 52.5V	2S	Total voltage high voltage recovery ~ total voltage overvoltage protection
		Total voltage high voltage alarm recovery	< 50.5V	2S	53.0v~ total voltage high voltage
Total voltage overvoltage protection	On	Total voltage overvoltage protection	≥ 54.0V	2S	Total voltage high voltage alarm ~60.0v
		Total voltage overvoltage protection recovery	< 50.5V	2S	Total voltage high voltage recovery ~ total voltage overvoltage protection
		Overvoltage recovery conditions	When the voltage of cell unit drops to the overvoltage recovery point, the residual capacity is 96% lower than the intermittent power supplement capacity		Two conditions must be met to recover
			Battery discharge current >0.5A detected		
Total voltage undervoltage alarm	On	Total voltage low voltage alarm	≥ 43.5V	2S	Total voltage undervoltage protection ~ total voltage low voltage recovery
		Total voltage low voltage recovery	< 45.0V	2S	Total voltage low voltage alarm ~55.0v
Total voltage undervoltage	On	Total voltage undervoltage	≥ 40.5V	2S	36.0V~ total voltage undervoltage recovery

protection		protection			
		Total voltage undervoltage recovery	< 45.0V	2S	Total voltage undervoltage protection ~ total voltage low voltage alarm
		Total voltage undervoltage shutdown	Undervoltage protection shutdown after 1 minute communication		
		Undervoltage recovery conditions	Charging current detected (>0.5a)		
Cell TEMP. forbidden charging	On	Charging high TEMP. alarm	≥ 50℃	2S	Charging high TEMP. recovery ~ charging over TEMP. protection
		Charging high TEMP. alarm recovery	< 47℃	2S	35 ℃ ~ charging high TEMP. alarm
		Charging over TEMP. protection	≥ 55℃	2S	Charging over TEMP. recovery ~80 ℃
		Charging over TEMP. protection recovery	< 50℃	2S	Charging high TEMP. recovery ~ charging over TEMP. protection
		Charging low TEMP. alarm	≤ 2℃	2S	Charging under TEMP. protection ~ charging low TEMP. recovery
		Charging low TEMP. alarm recovery	> 5℃	2S	Charging low TEMP. alarm ~10 ℃
		Charging under TEMP. protection	≤ -10℃	2S	-20 ℃ ~ charging under TEMP. recovery
		Charging under TEMP. protection recovery	> 0℃	2S	Charging under TEMP. protection ~ charging low TEMP. recovery
Cell TEMP. forbidden discharge	On	Discharge high TEMP. alarm	≥ 52℃	2S	Discharge high TEMP. recovery ~ discharge over TEMP. protection
		Discharge high TEMP. alarm recovery	< 47℃	2S	35 ℃ ~ discharge high TEMP. alarm
		Discharge over TEMP. protection	≥ 55℃	2S	Discharge over TEMP. recovery ~80 ℃
		Discharge over TEMP. protection recovery	< 50℃	2S	Discharge high TEMP. recovery ~ discharge over TEMP. protection
		Discharge low TEMP. alarm	≤ -10℃	2S	Discharge under TEMP. protection ~ discharge low TEMP. recovery
		Discharge low TEMP. alarm recovery	> 3℃	2S	Discharge low TEMP. alarm ~10 ℃
		Discharge under TEMP. protection	≤ -15℃	2S	-30 ℃ ~ discharge under TEMP. recovery
		Discharge under TEMP. protection recovery	> 0℃	2S	Discharge under TEMP. protection ~ discharge low TEMP. recovery
Ambient TEMP. protection	On	Ambient high TEMP. alarm	≥ 50℃	2S	Ambient high TEMP. recovery ~ ambient over TEMP. protection
		High TEMP. alarm	< 47℃	2S	-20 ℃ ~ ambient high TEMP.

		recovery			alarm
		Over temperature protection	≥ 60℃	2S	Ambient over TEMP. recovery ~80 ℃
		Over TEMP. protection recovery	< 55℃	2S	Ambient high TEMP. recovery ~ ambient over TEMP. protection
		Low ambient TEMP. alarm	≤ 0℃	2S	Ambient under TEMP. protection ~ ambient low TEMP. recovery
		Ambient low TEMP. alarm recovery	> 3℃	2S	Ambient low TEMP. alarm ~60 ℃
		Ambient under TEMP. protection	≤ -10℃	2S	-30 ℃ ~ ambient under TEMP. recovery
		Recovery of ambient under TEMP. protection	> 0℃	2S	Ambient under TEMP. protection ~ ambient low TEMP. recovery
MOS TEMP. protection	On	High TEMP. alarm	≥ 90℃	2S	Power high TEMP. recovery ~ power over TEMP. protection
		High TEMP. alarm recovery	< 85℃	2S	60 ℃ ~ power high TEMP. alarm
		Over TEMP. protection	≥ 100℃	2S	Power high TEMP. alarm ~120 ℃
		Over TEMP. protection recovery	< 85℃	2S	Power high TEMP. recovery ~ power over TEMP. protection
Charging overcurrent	On	Charging overcurrent alarm	≥ 100A	2S	Charging overcurrent recovery ~ charging overcurrent protection
		Charging overcurrent alarm recovery	< 95A	2S	0A~ charging overcurrent alarm
		Charging overcurrent protection	≥ 110A	2S	Charging overcurrent alarm ~200A
		Charging overcurrent protection recovery	Delay 60s recovery	60S	Can set
Discharge overcurrent	On	Discharge overcurrent alarm	≥ |-105|A	2S	Discharge overcurrent protection ~ put it into overcurrent recovery
		Discharge overcurrent alarm recovery	≤ |-103|A	2S	Discharge overcurrent alarm ~0a
		Discharge overcurrent protection	≥ |-110|A	2S	Transient overcurrent protection ~ discharge overcurrent alarm
		Discharge overcurrent protection recovery	Delay 60s recovery	60S	Can set
Transient overcurrent protection	On	Transient overcurrent protection	≥ |-250|A	30mS	Discharge overcurrent protection value to 300A
		Transient overcurrent protection recovery	Recovery upon charging	60S	
	Off	Transient overcurrent lockout	Continuous two-stage overcurrent, exceeding overcurrent locking times		
		Overcurrent locking	5 times		

		times		
		Transient lockout release	Connect charger	
Output short circuit protection	Off	Short circuit protection threshold	Current and delay, write program (can not set)	
		Short circuit protection recovery	The charging is recovered immediately or automatically after 60s	
	On	Short circuit protection lockout	Continuous output short circuit, exceeding overcurrent locking times	/
		Short circuit locking times	5 times	/
		Short circuit locking release	Connect charger	/
Cell failure protection	On	Cell failure voltage difference	≥ 1000mV	can set
		Cell recovery voltage difference	＜ 800mV	can set
Cell balancing function	On	Opening voltage (V)	3450mV	Setting is not supported at present
		Min voltage difference(V)	10mV	Setting is not supported at present
		Max voltage difference(V)	800mV	Setting is not supported at present
		Minimum voltage (V)	2700mV	Setting is not supported at present
		Cloud balancing	Enable	
Battery capacity setting	/	Rated capacity of battery	100Ah	5Ah to 500Ah
	/	Remaining battery capacity	Estimated based on cell voltage	Can set
	/	Cycle cumulative capacity	80%	Cycle times, can set
	On	Residual capacity alarm	15%	Can set
		Residual capacity protection	5%	Forbidden, can set
Charging current limiting	Off	Active current limiting	5A, charger current is greater than 5A, open current limiting	
	On	Passive current limiting	5A, charger current is greater than charging overcurrent alarm (value can be set), start current limiting	
		Charging current limiting delay	5 minutes after the current limit is turned on, re check whether the current limit is turned on after 5 minutes	
Effective charging current	On	Charging input current	500mA	3S	Setting is not supported at present
		Charging exit current	300mA	3S	Setting is not supported at present
Effective	On	Discharge entry	-500mA	3S	Setting is not supported at present

discharge current		current			
		Discharge exit current	-300mA	3S	Setting is not supported at present
Precharge function	On	2000ms	0~5000ms (can set)		BMS starts the precharge function at the moment of startup
Power management	On	Maximum standby time	48h(can set)		Charger is absent and there is no effective discharge current
Low temperature heating for cells	On	Cell low TEMP. heating	0℃		
		Cell heating recovery	10℃		
		Heating on logic	When the charger is on and the cell temperature reaches the on condition, it will turn on the heating standby state and the discharge state will not be heated		
Compensation impedance	/	Compensation point 1	0mΩ		None, the software can be configured separately
	/	Compensation point 2	0mΩ		None, the software can be configured separately
Reset button	/	Power on/activation	When the BMS is in the sleep state, press the 1s reset button, the BMS is activated, the LED indicator lights up in turn, turns to the normal working state, and the indicator light returns to the normal working logic		
	/	Shutdown/sleep	When the BMS is in the sleep state, press and hold the reset key for 1 second, the BMS is activated, the LED indicator lights up in turn, turns to the normal working state, and the indicator light returns to the normal working logic		
External switch	/	Normal operation when closed; When disconnected, no power supply and no operation			

9. P700 system wiring

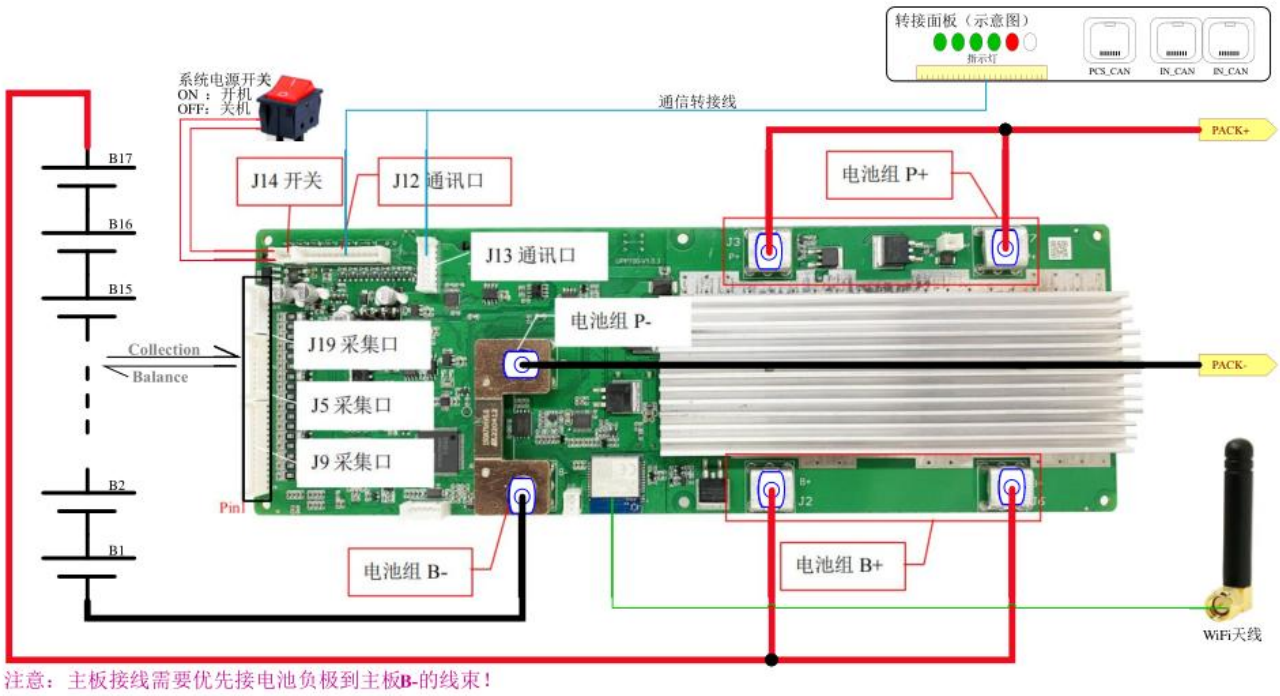

Figure 6-P700 Single Pack Battery Wiring

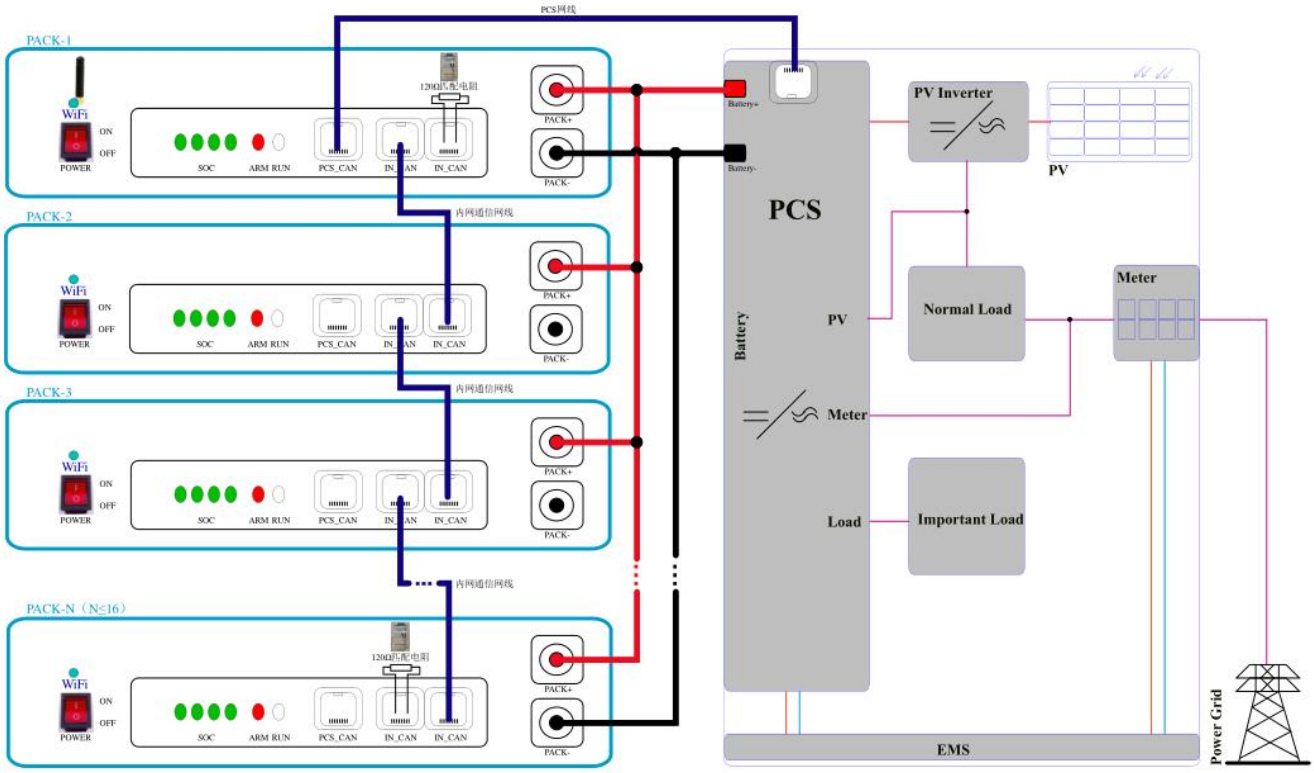

Figure 7-P700 Multiple Battery Packs in Parallel

10. Antenna

P700 standard antenna is switched through the battery pack, as shown in the figure below

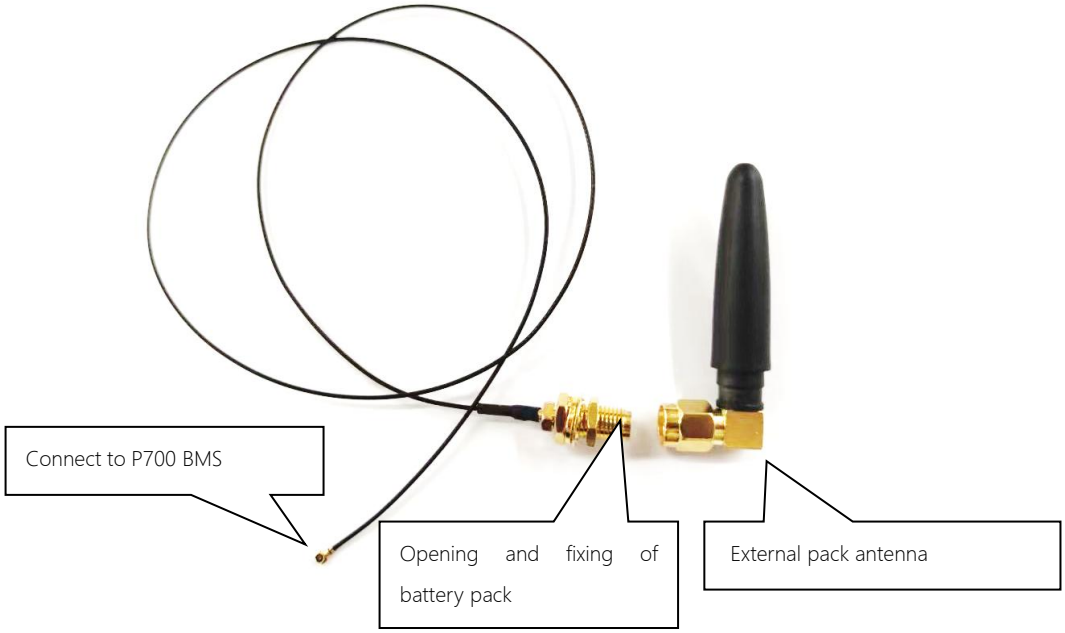

Figure 8 - Picture of antenna

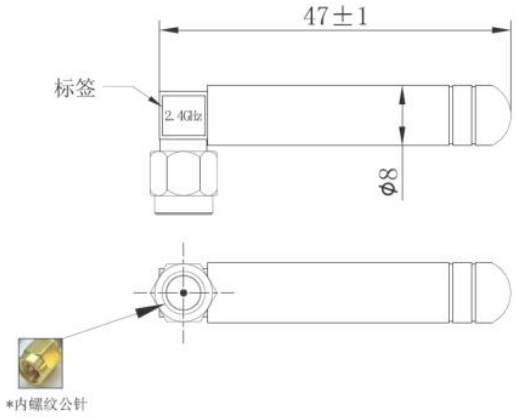

Figure 9 - Antenna dimensions outside the pack

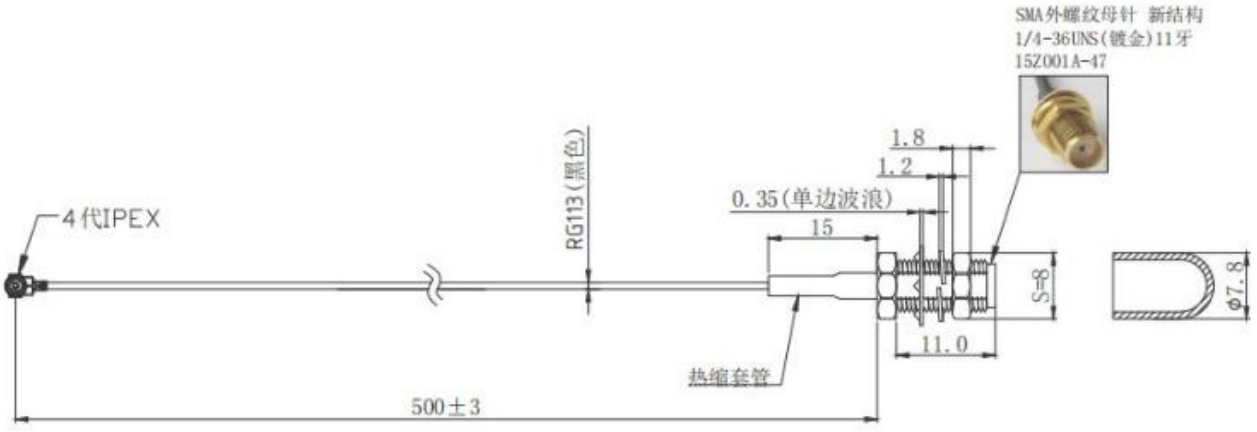

Figure 10 - Antenna dimension inside pack

11. Other precautions

- Hot plugging is prohibited during product operation;
- The supplier has the right to modify the specification without notifying anyone;
- Matters not covered shall be discussed and decided by the supplier and buyers;
- The supplier shall not be liable for any loss caused by operation not in accordance with the specifications.

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