V1.0

USER MANUAL

STACK ENERGY PRO

LifePO4
Modular Stackable
Battery System

SUNBEAT
ENERGY FOR BETTER LIVING

Content

1 Overview

1.1 Scope of Application

This document provides comprehensive information on stacked lithium battery products, including their specifications, operational specifications, maintenance procedures and other relevant details. The stacked lithium battery products are widely used in small and medium-size energy storage fields.

1.2 Target Audience

This manual is intended for professionals and technical personnel who install, operate and maintain the batteries, as well as for end-users who may need to view relevant technical parameters.

1.3 User Manual

Please read the user manual carefully before use to ensure a comprehensive understanding of the product. After reading, please store this manual in a secure location for future reference.

1.4 Disclaimers

Failure to operate this product correctly may result in severe injury to oneself or others, as well as damage to the product or surrounding property. By using this product, you are deemed to have fully understood, acknowledged and accepted all the terms and contents in this document. Users assume responsibility for their actions and any resulting consequences. The company shall not be held liable for damages caused by the user's failure to comply with the provisions stated in this document or the user manual.

The content of this manual will be periodically updated and revised without prior notice. It is recommended to obtain the latest product manual.

2 Product Description

Stacked lithium battery products are suitable for applications in low-voltage small and medium-sized energy storage systems. These products adopt the highest safety performance lithium iron phosphate cells, with a high-precision battery management system (BMS). The BMS monitors and collects real-time data on voltage, current and temperature of each cell within the module. The BMS also has a passive balance function and advanced battery control strategy, further enhancing the performance of the battery pack.

The battery module consists of LFP cells, BMS, housing and wiring. Each module is equipped with comprehensive protection functions. The modules can be establishing communication with the external devices through CAN/RS485. The modules interact with each other through RS485.

3 Safety Instructions

3.1 Label Description

To ensure the user's personal safety when using this product, this manual provides relevant identification information and uses appropriate symbols to alert the user. It is recommended that the user carefully reads the following list of symbols used in this manual.

Table 3-1 Label description

	Potentially Low Risk: May result in mild or moderate impairment if not avoided.
	High Risk: May result in serious injury or death if not avoided.
	The battery terminals must be disconnected before commencing work on the battery.
	The battery could explode and/or be severely damaged if dropped or crushed.
	The battery may explode if exposed to open flames or other extreme sources of heat.
	Grounding: The system must be firmly grounded for the operator's safety.
	This side should be facing up.
	Handle with care to avoid damage.
	Keep dry.
	Keep the battery out of reach of children.
	Do not short circuit.
	Do not reverse connection of the positive and negative terminals.
	Please read the instructions in the operation manual.

3.2 Installation Tools

Table 3-2 Installation tool sheet

Tools	Multi-meter 	Protective gloves 	Insulated anti-smashing shoes 
	Protective suit 	Safety glasses 	ESD wrist strap 
Installation Tools	Electric screwdriver 	Cross screwdriver 	Socket spanner 
	Slotted screwdriver 	Wire stripper 	

3.3 Attention Items

3.3.1 Manual Custody

This manual contains important information about the stacked lithium batteries. A careful reading of this manual will help you become familiar with this product. Please keep this manual in a safe place accessible to maintenance personnel whenever needed.

3.3.2 Product Identity Protection

Warning labels, back panels and front doors of cabinet contain important and safety protection information and are strictly forbidden to be torn and damaged.

3.3.3 Operator Requirements

Only trained and qualified professionals should perform various operations on the product. The operator should be fully familiar with the product's system components, operating principles, and the user manual.

3.3.4 Safety Warning

⚠During the installation, daily maintenance, overhaul and other operations of products, the following guidelines should be observed to prevent accidental operations and proximity or occurrence of accidents by unrelated personnel: the front and rear switches of the products should be clearly marked to prevent accidents caused by wrong switches; warning signs or safety warning belts should be placed near the operation area to prevent the proximity of unrelated personnel.

3.3.5 Electric Measurement

⚠Due to the high voltage of the battery that may endanger personal safety, accidental contact may cause serious injury. During measurement operations, please ensure adequate insulation protection (such as using insulating gloves).

3.3.6 Measuring Instrument

⚠To ensure that the electrical installation meets the requirements, please use the relevant electrical measuring equipment, such as multi-meter and power meters.

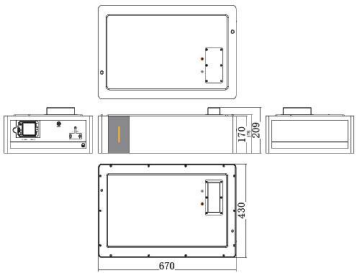
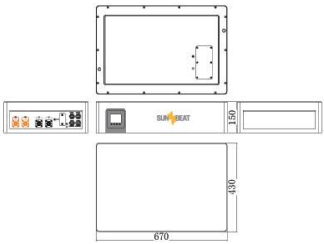
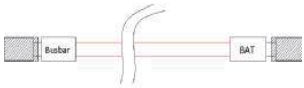
3.3.7 Maintenance

⚠ During maintenance and repair operations, ensure that the energy storage battery cabinet is not accidentally charged. Use a multi-meter to ensure that there is no electricity in the energy storage battery cabinet. Utilize insulating materials to insulate the possible electrical parts of the system. Ensure that the system has necessary grounding connections in place.

4 Main Components

The core components of the battery module are shown in Table 4-1 below:

Table 4-1 Main components sheet

No	Item	Picture
1	Battery Module (51.2V100Ah)	
2	Combiner Box	
3	Base	
4	Power Cable	
5	Communication Cable	

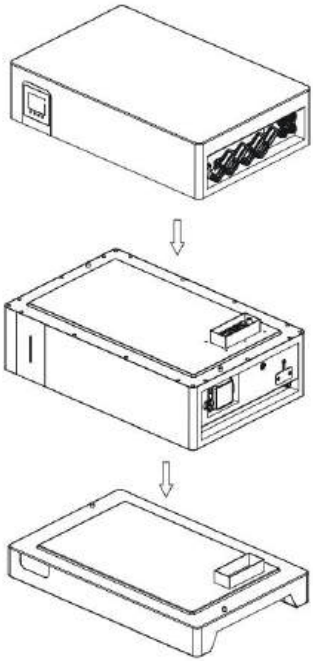
5 Product Description

5.1 Product Introduction

Stacked energy storage products are modular products designed for energy storage applications and are widely used in small and medium-sized energy storage systems. Each module consists of cells, a BMS and a shell. The BMS in each module is equipped with independent voltage, current, temperature detection and protection functions. The optimal configuration of the entire energy storage system can be achieved by adjusting the number of parallel modules.

5.2 System Specification

Figure 5-1 Low-volt Stacked Module



6 Module Description

6.1 Module Specification

Stack Energy Pro are made of lithium iron phosphate battery modules with the highest safety performance.

The battery modules are available in 51.2V 100Ah. The following table describes related parameters.

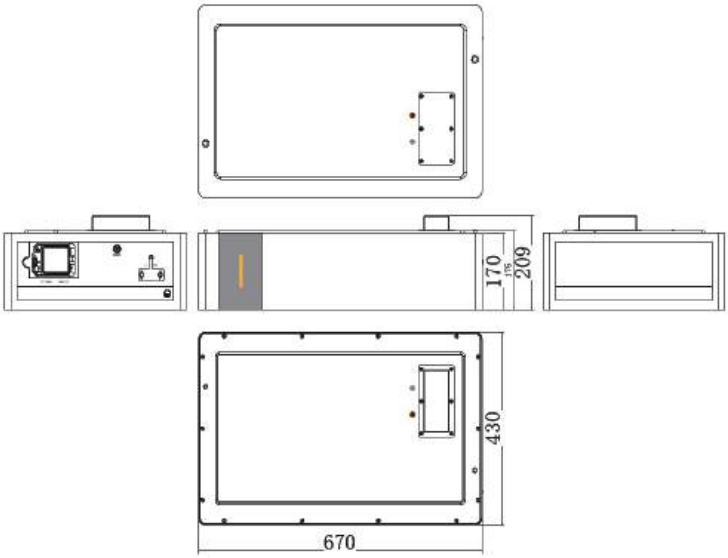
Table 6-1 51.2V100Ah Module Specification

Type	Voltage	Capacity	Energy	Width	Depth	Height	Weight
51.2V100Ah	51.2V	100Ah	5120Wh	670mm	170mm	430mm	53±2kg

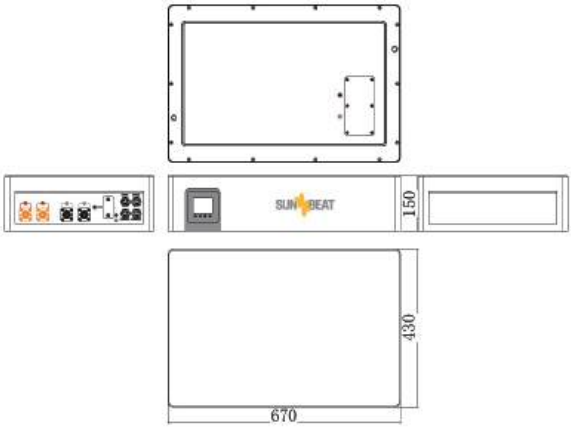
6.2 Module Illustration and Front Panel Description

6.2.1 Appearance & Dimension Schematic Diagram

Figure 6-1 51.2V100Ah Appearance & Dimension drawing



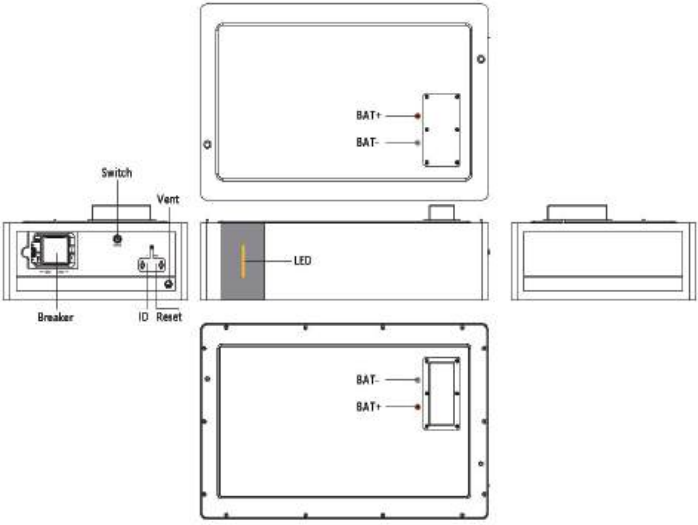
Battery Mode



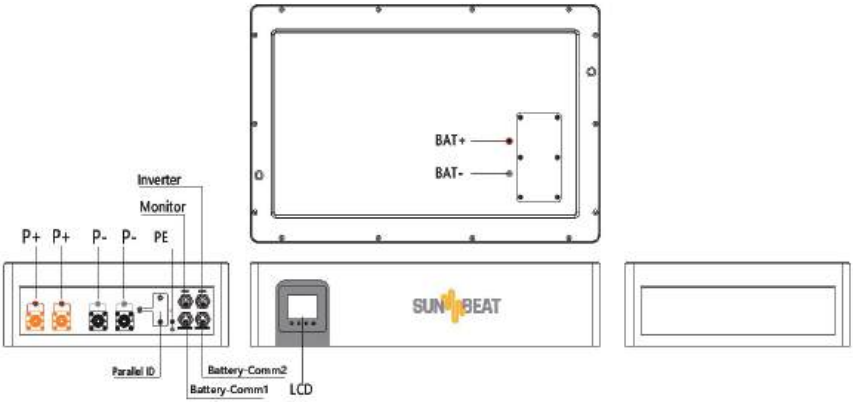
Combiner Box

6.2.2 51.2V100Ah Side View

Figure 6-2 51.2V100Ah side panel diagram



Battery Mode



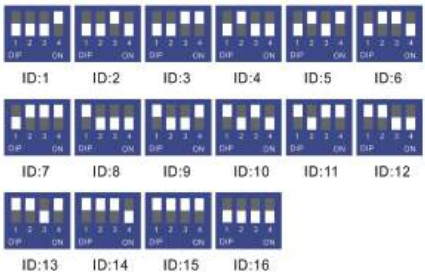
Combiner Box

Table 6-2 Battery Mode Side interface description

Battery Mode			
No.	Item	Function Description	Remarks
1	BAT+	Battery positive	
2	BAT-	Battery negative	
3	Switch	Power output/LED switch	
4	LED	Power Led display	
5	Breaker	Battery DC switch	
6	ID	Battery address	
7	Reset	Reset button	
Combiner Box			
1	BAT+	Connect to the positive battery terminal	
2	BAT-	Connect to the negative battery terminal	
3	P+	Output+	
4	P-	Output-	
5	Battery-Comm	Inter battery communication when paralleled	Pin1&Pin8--RS485B; Pin2&Pin7--RS485A;
6	Monitor	Check battery status in case of malfunction	Pin1&Pin8--RS485B; Pin2&Pin7--RS485A;
7	Inverter-Comm	Inter Inverter communication when paralleled	Pin1&Pin8--RS485B; Pin2&Pin7--RS485A; Pin4--CAN_H; Pin5--CAN_L.
8	Paralleled ID	Selection of Combiner box ID when paralleled	
9	LCD	LCD Screen	

6.3.1 Battery ID Setting Description

Figure 6-3 ID dialing code address assignment instructions

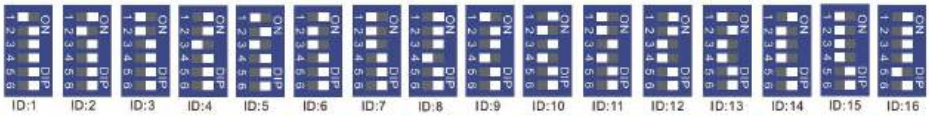


Notes:

1. The ID code bits correspond to binary digits, with down for "ON" and up for "OFF". The right side of the code bit is the low bit, while the left side is the high bit. The code ranges from 1 to 16, and in communication mode.
2. Reset the battery while configuring the dial code for standalone battery operation or parallel operation.

6.3.2 Combiner Box ID Setting Description

Figure 6-3-1 ID dialing code address assignment instructions



Notes:

1. The ID code bits correspond to binary digits, with down for "ON" and up for "OFF". The right side of the code bit is the low bit, while the left side is the high bit. The code ranges from 1 to 16, and in communication mode.
2. Reset the battery while configuring the dial code for standalone battery operation or parallel operation.

6.4 Communication Interface Diagram and Description

Figure 6-4 Inverter port Communication interface diagram

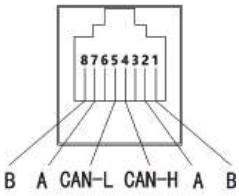


Table 6-3 Inverter port Communication interface definition

RS485/CAN port			
Pin No.	Definition	Pin No.	Definition
Pin-1,Pin-8	RS485 B-(T/R-)	Pin-2,Pin-7	RS485 A-(T/R-)
Pin-4	CAN_H	Pin-5	CAN_L
Others	NC	/	/

Monitor port			
Pin No.	Definition	Pin No.	Definition
Pin-1,Pin-8	RS485 B-(T/R-)	Pin-2,Pin-7	RS485 A-(T/R-)
Others	NC	/	/

7 Module Auxiliary Accessories

7.1 Power Cable

The power cable is used to connect the battery modules of the cabinet to carry the operating current. This facilitates the integration of multiple battery modules into a complete power system.

Table 7-1 Power cable specification

Picture	Item	Specification
	Cross-sectional area	2/0 AWG
	Safety Current	250A
	Cross-sectional area	2/0 AWG
	Safety Current	250A

7.2 Communication Cable

The communication line is suitable for the information interaction between modules when the modules are used in parallel.

Table 7-2 Communication cable specification

Picture	Item	Specification
	Communication cable for inverter. Follow the cable mark "Battery" and "Inverter" to connect.	
	UL Rating	UL1007
	Parameter	CAT6

8 System Installation

8.1 Handling, Transportation, Storage

8.1.1 Handling

⚠ Improper handling practices may cause short circuits or damage to the battery pack, resulting in battery leakage or fire. Use forklifts or carts for handling. Ensure that the dimensions of materials do not exceed the width and height of aisles and doors, and maintain a moderate speed. Avoid situations where battery packs are inverted or stacked on top of each other during unloading.

8.1.2 Transportation

To ensure safety, it is recommended to use a forklift or have multiple individuals handle the battery module due to its heavy weight. Avoid dropping, throwing, and exposing the equipment to collisions or strong vibrations during transportation.

Figure 8-1 Handling tool diagram

8.1.3 Storage

Short-term storage (within 3 months): If the battery is not used for a short period of time, the battery can be fully charged and stored in a dry, cool environment with non-corrosive gas. The recommended temperature range is 10~45°C, with a relative humidity of 60±30%. Store the battery away from strong electromagnetic fields and direct sunlight.

Long-term storage (over 3 months): If the battery is not used for more than 3 months, keep the battery SOC at 50%~70%. Store it in a dry, cool environment with non-corrosive gas. The recommended temperature range is 20~35°C, with a relative humidity of 50±15%. Store the battery away from strong electromagnetic fields and direct sunlight. Charge the battery once every 6 months to avoid irreversible capacity loss caused by long-term storage.

8.2 Open-box Inspection

Table 8-1 Unpacking tools sheet

Item	Tools		
Tools	Slotted screwdriver 	Protective gloves 	Stripper 
	Hammer 		

⚠ The products undergo thorough testing and inspection prior to leaving the factory. Upon receipt, please carefully inspect the products and sign for them after confirming their condition. If any damage is observed, please promptly contact the local distributor. When opening the box, please check the following:

(1) Outer Packaging: Ensure that the outer packaging is intact and not damaged.

(2) Quantity and Type: Verify that the quantity and type of goods received match the description provided in the bill of materials.

(3) Internal Equipment: Inspect the internal components to ensure they are undamaged.

8.2.1 Packing List

Table 8-2-1 Packing list

Battery Parts List		
Item	Item name	Qty
1	Battery Module	1
2	User manual	1

Table 8-2-2 Packing list

Combiner box Parts List		
Item	Item name	Qty
1	Combiner Box	1
2	Power cable between battery and Inverter（Red）	1
3	Power cable between battery and Inverter（Black）	1
4	Communication cable	1

Table 8-2-3 Packing list

base Parts List		
Item	Item name	Qty
1	System base	1

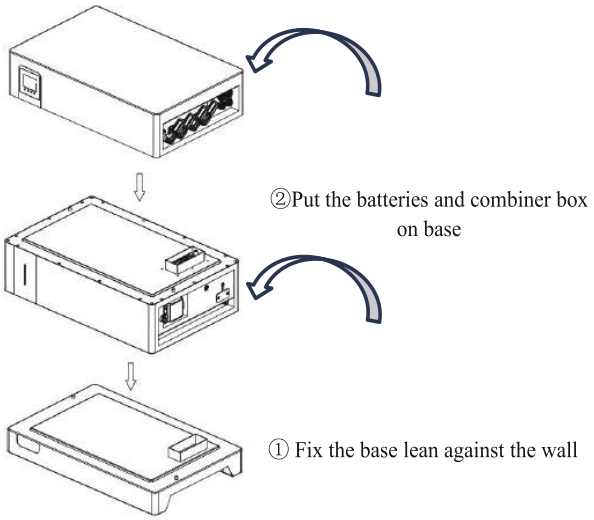
8.3 Mechanical Installation

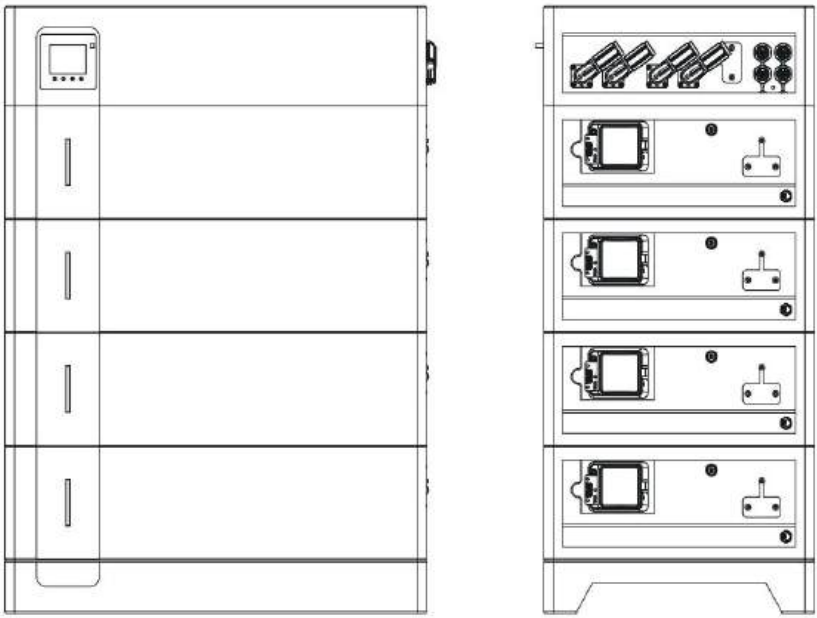
8.3.1 Installation Requirements

The position of the battery cabinet during installation has a direct impact on its safety, service life and performance. Ensure that the wiring of the system is convenient and easy to maintain and operate. Avoid placing the battery cabinet in a high temperature and high humidity environment. To ensure the flatness of installation floor. The installation should involve at least two or more individuals on site.

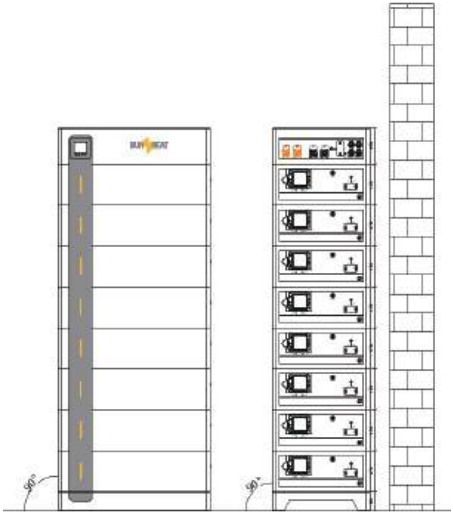
8.3.2 Module Installation

Figure 8-2 Module Installation





③ Immobilize the battery batteries and combiner box



④ Complete the installation

8.4 Installation Notes

8.4.1 Tools Introduction

The following tools are required for electrical connection, as shown in Table 8-3:

Table 8-3 Electrical installation tools diagram

Item			
Tools	Multi-meter 	Protective gloves 	Screwdriver 
	Electric batch 	Cross screwdriver 	Socket wrench 

8.4.2 Cable Connection Notes

(1) Grounding. One end of the grounding cable(PVC 25mm2) is screwed to the grounding hole at the end of the chassis（M5）, and the other end is connected to the grounding copper strip to ensure a solid connection.

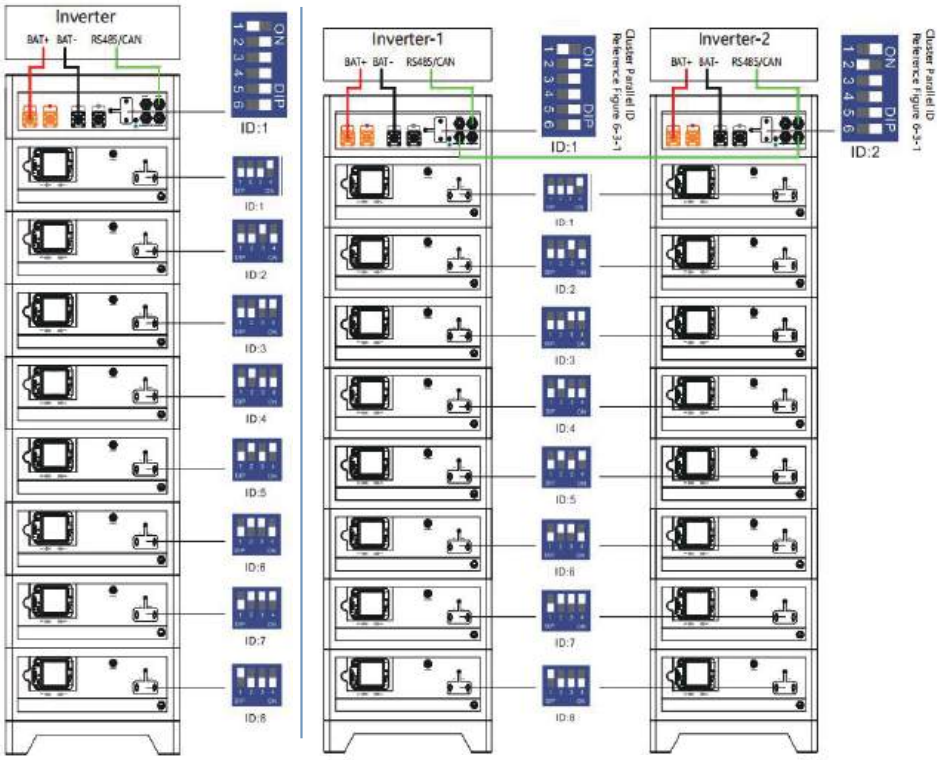
(2) Communication cable installation. Finally, connect the RS485/CAN interface of the Combiner Box to the inverter via communication cable.

(3) Power cable installation. Use the power cable to connect battery and inverter as the above picture shows. Avoid short circuit and reverse connection of positive and negative terminal.

(4) Connect the equipment. Make sure the battery and device are powered off before connecting. Clearly identify the location of the positive and negative terminals of the system, red to the positive terminal, black to the negative terminal, to ensure no connection errors.

8.5 Multiple Batteries in Parallel

Figure 8-3 Multiple batteries in parallel schematic diagram



8.6 System Starting Up

8.6.1 Start Up Checking

⚠After installation or maintenance, the lithium battery system needs to be started up. Before starting up, please check the following precautions carefully to make sure there are no errors.

All electrical connections must be made in accordance with the electrical diagrams in the manual; the DC combiner box must be open; the cables are properly distributed, without mechanical damage, and connected and fastened correctly; the internal protection devices in the combiner box must be firmly installed; No excess parts or conductive material remains.

8.6.2 System Turn On

⚠ After completing the above steps, press the ON/OFF switch on the control panel to turn on the machine, then turn on the miniature circuit breaker and turn on the power of the whole system to complete the installation.

System turns on step:

(1) Double check all cables are connected correctly, and make sure the grounding is proper.

(2) Turn on the switch at inverter's battery side or between inverter and battery.

(3) Turn on the battery system.

(4) Turn on the inverter.

8.6.3 System Turn off

When failure or before service, must turn off the battery system, the procedure to switch off is:

(1) Switch off the inverter;

(2) Switch off the battery;

(3) Switch off the air switch between the battery and the inverter if there is any.

8.6.4 System Charge

⚠ When the battery system is transported or stored for a long time, the battery SOH may be low due to self-discharge of the cells and system consumption, and the lithium battery needs to be charged after normal start-up and before use.

9 LCD Screen and PC Software

Each module has a built-in LCD display. The PC software is only suitable for installation and maintenance.

9.1 LCD Display Introduction

LCD display is embedded in each battery module. It is used to display some important information about the cells, such as voltage, current, temperature, SOC, capacity, and running status.

9.1.1 Button Description

There are 4 function buttons below the display, with detailed descriptions as shown in the table below.

Figure 9-1 Button description

The corresponding function description for each button is shown in the table below.

Table 9-1 Button description Table

No.	Item	Description
1	Up	Page up
2	Down	Page down
3	Back	Return
4	Enter	Confirm

9.1.2 Screen Wake Up

Press any key to wake up the screen when power is on, and more information will be shown on the display.

Figure 9-2 Main Page information

Table 9-2 Main page information introduction (For example)

Battery ID	1	CAPACITY	100Ah
Battery status	Discharging	Battery module voltage	52.57V
Battery SOC	SOC: 76%	PROTOCOL	CAN: 10
System time	2021-12-021 11:42		RS485: 01

9.1.3 Working Communication Protocol Selection

To change the protocol to another, follow the steps:

1. Turn on the battery, and press "Back" button for 5 seconds to enter the protocol selection screen;
2. Select the corresponding RS485 program or CAN program;
3. Press "Enter" to choose the protocol from the list;
4. Press the "Back" button to return to the main interface, restart the battery, and the battery will correspond to the program.

Figure 9-3 Working mode selection—RS485

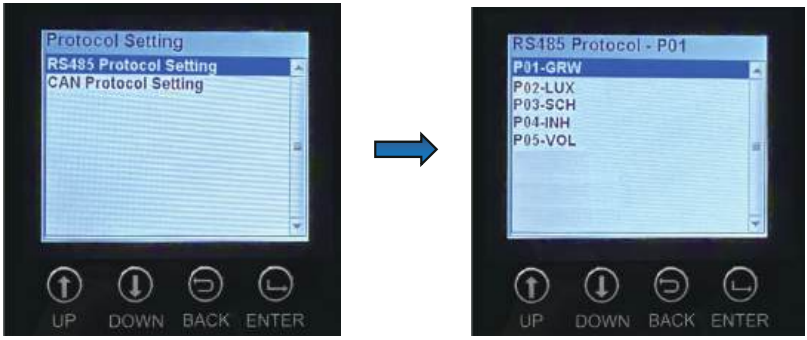
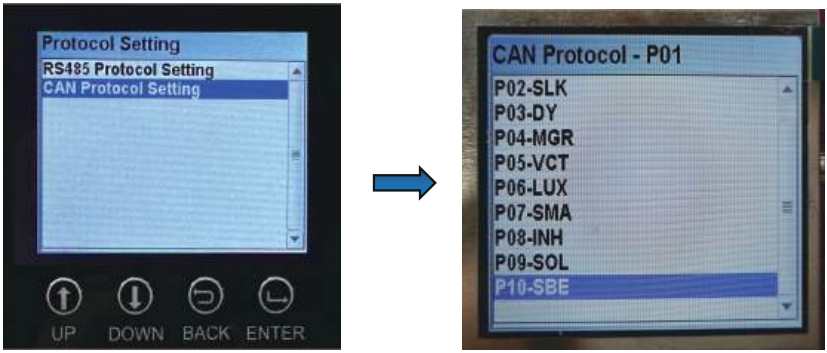


Figure 9-4 Working mode selection—CAN



Notes:

The protocol can only be changed at address No.16. After the change is completed, restart the battery to take effect. Refer to the protocol list below for available options.

Table 9-3 The communication protocol list

RS485			CAN		
Protocol name	Inverter's brand name	Inverter protocol setting	Protocol name	Inverter's brand name	Inverter protocol setting
P01-GRW	Growatt	PECL L01 0363	P01-GRW	Growatt	PECL L51 0363
P02-LUX	Luxpower	LI 06	P02-SLK	Sol-Ark	/
P03-SCH	Schneider	Setup-Modbus settings-Baud rate 9600	P03-DY	Deye	Lithium Mode 00
P04-INH	Inhenergy	/	P04-MGR	Megarevo	Settings-battery parameter-Lithium battery
P05-VOL	Voltronic	PYL 05	P05-VCT	Victron	/
			P06-LUX	Luxpower	LI 06
			P07-SMA	SMA	"Start the installation assistant"
			P08-INH	Inhenergy	/
			P09-SOL	Solis	Advanced Settings - Energy Storage Settings - Battery Model selection -Zeta
			P10-SBE	SBE	/

Notes:

"/" means that there is no need to set it on the inverter. Instead, connect the communication cable (network cable) directly.

9.2 PC Software Installation

Contact the supplier to get the latest version of the software for free. Run the BMS_tools.exe program directly after unpacking, as shown Figure 9-5:

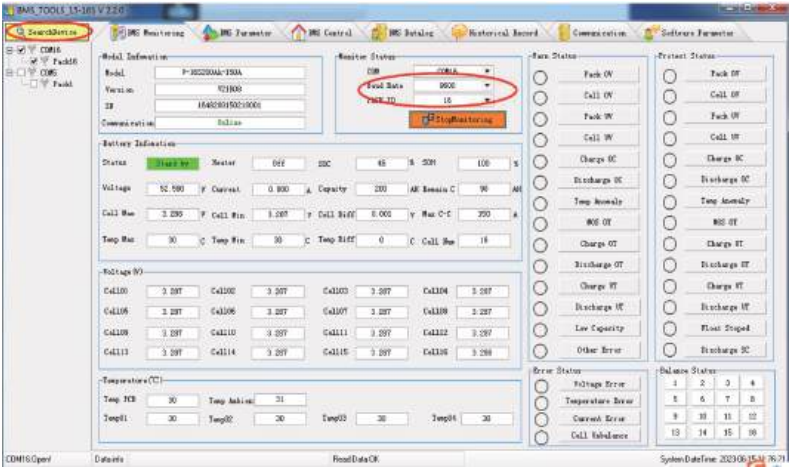
Figure 9-5 PC software installation steps

9.3 Communication Connection

Connect the 485 to USB cable and set the baud rate to 9600. Click on "Find Device" in the upper left corner.

The software will automatically identify the connected battery pack. See Figure 9-6 for reference.

Figure 9-6 Communication connection setting



9.4 Software Interface

The software interface is shown as figure 9-7:

Figure 9-7 Software interface

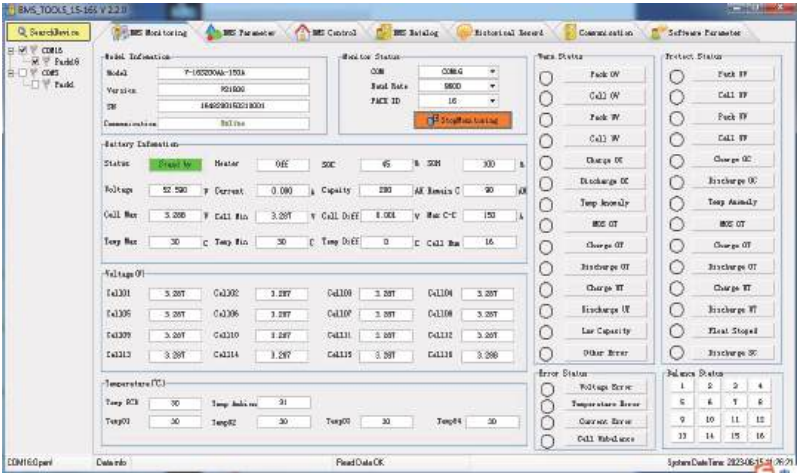


Table 9-4 Interface menu definition

Item	Definition
BMS Real-time monitoring	Real-time data and status monitoring of the BMS
BMS Parameter Setting	BMS parameter Setting management
BMS Control Management	Control state management of BMS (not open)
BMS Data Record（Optional）	BMS operation data logging
Monitoring History	Battery operation data record in this machine (exportable)
Real-time data reception	Record of sending and receiving of battery pack data (mainly for debugging)
Software system parameters	Software configuration, settings and language selection, etc.

10 Maintenance

10.1 Common Faults（Phenomenon）and Solutions

Common faults and solutions are shown in table 10-1.

Table 10-1 Common faults(phenomenon) and solutions

NO.	Fault phenomenon	Analysis	Solution
1	Communication failure with inverter	Communication port connect error or battery ID setting error	Check communication connection or ID settings
2	No DC output	Not close breaker or low voltage	Close breaker or charge the battery
3	Power supply time is too short	Battery capacity lack or not fully charged	Maintenance or replacement
4	Battery can't be fully charged	Power system DC output voltage falls below the minimum charge voltage	Regulating DC output voltage of power supply to battery suitable charging voltage
5	The battery output voltage is unstable	Battery management system does not operate normally	Press the reset button to reset the system, then reboot the system
6	Different SOC value of batteries in parallel	Normal phenomenon	No operation

10.2 Daily Maintenance

Routine maintenance items are shown in Table 10-2 below.

Table 10-2 Routine maintenance items

Item	Maintenance Method	Maintenance intervals
Power Cables 	1. Inspect the power cable for any signs of mechanical damage and ensure that the terminal insulation sleeves are intact without falling off. If any damage is found, please turn off the machine and perform maintenance or replace the cable. 2. Check for any looseness in the power cable. If there are any signs of looseness, please use a standard torque wrench to tighten it. 3. Examine the system for loose screws or discoloration of the copper bus bar. If the screws are found loose, please tighten them with a standard torque wrench. If the copper bus bar is discolored, please contact the manufacturer for after-sales replacement.	Once every 6 months
Communication Cables 	1. Verify that the terminals of the parallel communication cable are securely tightened. If any terminal is loose, re-tighten it. 2. Check the communication cable for any obvious discoloration. If discoloration is present, please shut down the machine to replace the communication cable.	Once a year
Cleanliness	Check the cleanliness of the front door, back door and battery module inside the cabinet. If it is dusty, please clean up in time.	Once 6-12 months
System Running Status 	1. Check if all parameters (system voltage, current, temperature, etc.) are normal when the system is running. 2. Check if the main core components of the system, including system switches and contactors, are functioning properly. 3. Inspect the system air inlet, outlet, and air ducts for any blockages or congestion. Clean them if any issues are detected.	Once every 6 months
Charge and Discharge Maintenance	Perform a light load and shallow charge/discharge test to assess the normality of the SOC and SOH status of the battery (using the upper computer software to read the parameters). It is recommended that the depth of discharge and charge/discharge power should not exceed 20% of the rated value.	Once every 6 months

11 Cautions and Warranty

11.1 Cautions

 Please read and comply with the following installation and usage conditions of the battery. Incorrect installation or use of the battery may cause personal injury or damage to the product.

(1) DO NOT throw the battery into water. Store the battery in cool and dry environment.

(2) DO NOT put the battery into fire or heat the battery, as it may cause explosion or other hazardous incidents.

(3) During battery charging, please choose specialized charging equipment and follow correct procedures. Do not use unqualified chargers.

(4) DO NOT reverse positive and negative terminals. Do not connect the battery directly to AC power. Avoid battery short circuits.

(5) DO NOT using batteries from different manufacturers or different types together, and do not mix old and new batteries.

(6) DO NOT use the battery when it is hot, bulging, deformed or leaking.

(7) DO NOT puncture the battery with nails or other sharp objects. Do not throw, stamp on, impact or hit the battery.

(8) DO NOT open or try to repair the battery when it is defective. Warranty becomes invalid if the battery is repaired or disassembled.

(9) Batteries are half charged before shipment. Do not use the battery if it feels hot, bulges, emits an abnormal smell, or exhibits any other abnormalities. Report it to the after-sale department immediately.

(10) If a long-time storage is needed, please charge and discharge the battery every three months to ensure the optimal performance. The recommended state of charge for storage is between 50% and 60%.

(11) Please use the battery within the temperature range specified in the manual.

(12) The state of charge of batteries is 50% before shipment. Please charge the battery before using.

11.2 Description of Warranty

We assure you that within the specified warranty period, our company will provide free repair and replacement services for any product damage or functional failure resulting from non-human or intentional causes. To avail of these services, customers are required to provide a valid purchase invoice or relevant product warranty information. In the absence of valid proof, our company reserves the right to decline providing related services.

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