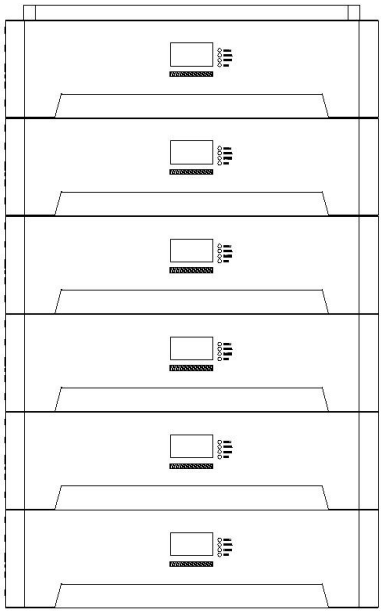
Power Cube P5A Energy Storage System **User Manual**

ECOBATEnergy





Note: Please read and understand all the contents of this Manual carefully before installation and use of the product, and please keep this Manual properly for look-up at any time.

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1 Instructions

Thank you very much for choosing the Power Cube P5A series household energy storage system developed and produced by our company. Please read and understand all contents of the Manual carefully before installing and using the product. If you have any suggestions during the use, please do not hesitate to give us feedback.

1.1 Range of Application

The installation and user manual of PowerCube P5A series is applicable to the installation and use of the following products:

No.	Applicable to the countries with 110V /220V mains voltage		
1	PowerCube P5A-5	5	PowerCube P5A-25
2	PowerCube P5A-10	6	PowerCube P5A-30
3	PowerCube P5A-15	7	PowerCube P5A-35
4	PowerCube P5A-20	8	PowerCube P5A-40

The product should be used in compliance with local standards, laws and regulations, because any non-compliance with the use may lead to personal injuries and property loss.

The drawings provided in this Manual are used to explain the concepts related to the product, including product information, installation guide, electrical connection, system debugging, safety information, common problems and maintenance, etc.

The internal parameters of this product have been adjusted before delivery. No internal parameters can be changed without permission. Any unauthorized changes to the settings will invalidate the warranty, and the Company will not be liable for any loss resulting therefrom.

This Manual and other related documents are an integral part of the product and should be kept properly for onsite installation personnel and related technical personnel to consult.

1.2 Meaning of Abbreviations

AC	Alternating Current
DC	Direct Current
PV	Photovoltaic
BMS	Battery Management System
PCS	Power Conversion System
RJ45	Registered Jack 45
SOC	State Of Charge
C	Charge C-rate
RS485	RS485 Communication Interface
CAN	Controller Area Network

1.3 Symbol Stipulations

There may be following symbols herein, and their meanings are as follows.

Symbols	Description
	Indicate a hazard with a high level of risk which, if not avoided, will result in death or serious injuries.
	Indicate a hazard with a medium level of risk which, if not avoided, could result in death or serious injuries.
	Indicate a hazard with a low level of risk which, if not avoided, could result in minor or moderate injuries.
	Warning information about device or environment safety. If not avoided, equipment damage, data loss, performance degradation or other unanticipated results may be resulted in. The "NOTICE" does not involve any personal injuries.

2 Safety Precautions

2.1 Safety Symbols

This product contains the following symbols, please pay attention to identifying.

Symbols	Description
	Observe enclosed documentation
	Danger. Risk of electric shock!
	Danger of high voltages. Danger to life due to high voltages in the Energy storage system
	Hot surface
	CE certification
	Do not touch the product in 5mins after shutdown
	Comply with RoHS standard
	The Energy storage system should not be disposed together with the household waste.

2.2 General Safety

2.2.1 Important Notice

Before installing, operating and maintaining the device, please read this Manual first and follow the symbols on the device and all the safety precautions in this Manual.

The matters indicated with "DANGER", "CAUTION", "ATTENTION" and "NOTICE" in this Manual do not represent all the safety matters to be observed, but are only the supplements to all the safety precautions. The Company will not be liable for any violation of general safety operating requirements, or any violation of safety standards for the design, production and use of the device. The device must be used in an environment that meets the requirements of the design specifications. Otherwise, the device may fail, and the abnormal device function or component damage, personal safety accident, and property loss arising from this are not covered within the quality assurance scope of the device. When installing, operating, and maintaining the device, the local laws, regulations, and codes shall be followed. The safety precautions in this Manual are only supplements to local laws, regulations, and codes. The Company shall not be liable for any of the following circumstances.

- The device is not run under the conditions of operating described in this Manual.
- The installation and operating environment is beyond the requirements of relevant international or national standards.
- The product is disassembled or changed, or the software code is modified without authorization.
- The operation instructions and safety warnings related with the product and in the documents are not followed.
- Damage of the device is caused by abnormal natural environment (force majeure, such as earthquake, fire, and storm).
- Transportation damage is caused during customer's own transportation.
- The storage condition does not meet the requirements of the product related documents and causes damage.

2.2.2 General Requirements

Symbols	Description
	Operating when the power is on is strictly prohibited during installation.
	It is strictly prohibited to install, use, and operate any outdoor equipment or cables (including but not limited to transporting equipment, operating equipment and cables, plugging and removing signal ports connected to the outdoor, working at altitude, and outdoor installation) in severe weather, such as thunder, rain, snow, and gale level 6.
	In case of any fire, evacuate the building or equipment area and press the fire alarm bell or dial the fire call. Under any circumstances, re-entry into a burning building is strictly prohibited.
	Under no circumstances should the structure and installation sequence of the device be changed without the manufacturer's permission.

	The battery terminal components shall not be affected during transportation. And, the battery terminal bolts shall not be lifted or transported.
	It is strictly prohibited to alter, damage or block the marks and nameplates on the device.
	The composition and working principle of the entire photovoltaic power generation system, as well as the relevant standards of the country/region where the project is located shall be known fully.
	After the device is installed, the empty packing materials, such as cartons, foam, plastics, and cable ties, shall be removed from the device area.

2.2.3 Personnel Safety

- When operating the device, appropriate personal protective equipment shall be worn. If any fault that may lead to personal injury or damage of the device is found, immediately terminate the operation, report to the responsible person, and take effective protective measures.
- Before using any tools, learn the correct method of using the tool to avoid injuries and damage of the device.
- When the device is running, the temperature of the case is high, which may cause burns. Therefore, do not touch the case.
- In order to ensure personal safety and normal use, reliable grounding should be carried out before use.
- Do not open or damage the battery. The electrolyte released is harmful to skin and eyes, so avoid touch it.
- Do not place irrelevant items on the top of the device or insert them into any part of the device.
- Do not place flammable items around the device.
- Never place the battery in the fire to avoid explosion and prevent the personal safety from being endangered.
- Do not place the battery module in water or other liquids.
- Do not short-circuit the battery terminals, because short-circuiting of the battery may cause combustion.
- The battery may pose a risk of causing electric shocks and large short-circuit currents. When using the battery, the following precautions should be paid attention to:

  a) The metal objects, such as watch and rings, shall be removed.

  b) Tools with insulated handles should be used.

  c) Rubber gloves and shoes should be worn.

  d) The charging power supply shall be disconnected before connecting or disconnecting terminals of the battery.

  e) Check whether the battery is accidentally grounded. If the battery is accidentally grounded, remove the power supply from the ground.

  -Do not clean the internal and external electrical components of the cabinet with water or detergent

2.2.4 Personnel Requirements

- The personnel in charge of installation and maintenance must be strictly trained to understand all safety precautions and master proper operation methods.
- Only qualified professionals or trained personnel are allowed to install, operate and maintain the device.
- The personnel who operate the device, including the operators, trained personnel and professionals, must have special operation qualifications required by the local country, such as high voltage operation, working high above the ground, and special equipment operation qualification.
- The replacement of device or components (including software) must be carried out by professionals or authorized personnel.

2.3 Electrical Safety

2.3.1 General Requirements



Before carrying out electrical connections, ensure that the device is not damaged, or an electric shock or fire may occur.



Never install or remove any power cables when the power is on. The electric arcs or sparks may be generated at the moment when the power cable contacts with the conductor, which may cause fire or personal injuries.

- All the electrical connections must meet the electrical standards of the country/region where the project is located.
- The cables prepared by users themselves shall comply with local laws and regulations.
- Special insulating tools should be used in high-voltage operations.
- Before connecting the power cord, ensure that the label identification on the power cord is correct.
- Operations on the device are allowed only five minutes after the device is completely powered off.
- The insulation layer of the cable may be aged or damaged when the cable is used in a high temperature environment. Therefore, the distance between the cable and the heat source must be at least 30mm.
- Cables of the same type should be bundled together. Whereas, the cables of different types should be routed at least 30mm apart, and shall not be wrapped together or crossed.

2.3.2 Grounding Requirements

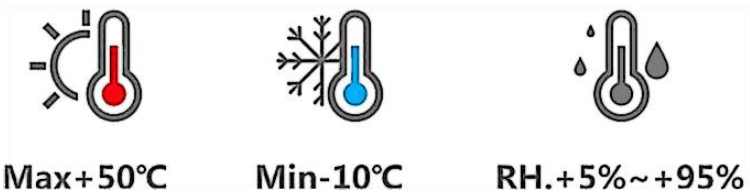
- When installing the device to be grounded, the protective grounding wire must be installed first; when removing the device, the protective grounding wire must be removed at last.
- It is forbidden to destroy the grounding conductor.
- It is forbidden to operate the device without a grounding conductor installed.
- The device shall be permanently connected to the protective grounding wire. Before operating the device, electrical connection of the device shall be checked to ensure that the device is reliably grounded.

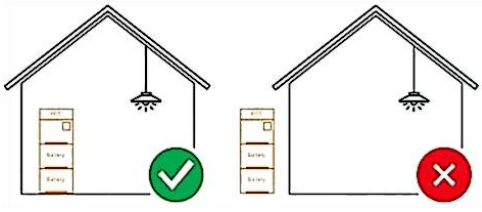
2.4 Installation Environment Requirements

- This product is for indoor use only, and is strictly prohibited to be used in outdoor environment.
- Do not install or use this product in an environment where the temperature is lower than -10 ℃ or higher than 50 ℃.
- It should be installed in a dry and well-ventilated environment to ensure good heat dissipation performance.
- The product can be installed at a maximum altitude of 2,000m.
- The installation position should be away from the fire source.
- The product should be installed and used away from children and animals.
- The installation position should be far away from water sources, such as faucets, sewer pipes, and sprinklers, to avoid entering of water.
- The device should be placed on a firm and flat supporting surface.
- Do not place any inflammable or explosive items around the device.
- When the device is running, do not block the ventilation vent or heat dissipation system to prevent fire caused by high temperature.



The operation and service life of the energy storage is related to the operating temperature. The energy storage should be installed at a temperature equal to or better than the ambient temperature.





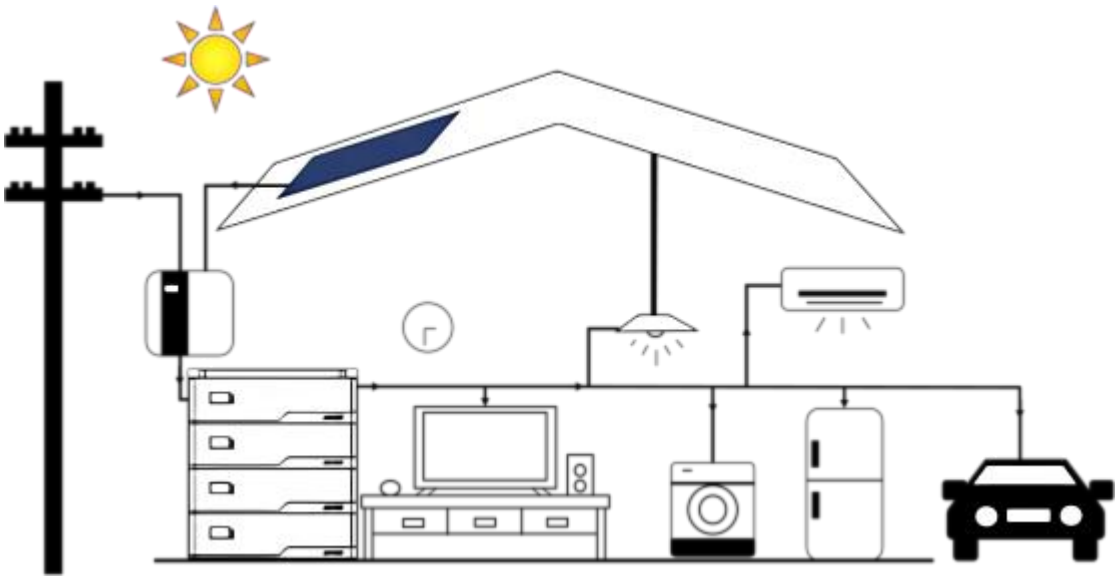
3 Product Introduction

3.1 Brief Introduction to Product

Power Cube P5A is a new generation of household energy storage system with two output specifications of 220V and 110V, which can meet the diversified needs of global users. The PowerCube P5A energy storage system adopts a modular design, including power modules and battery expansion modules, so it can be easily combined into a system of any capacity required by the user.

The lithium iron phosphate batteries with high performance and long service life are used in the energy storage module. Meanwhile, the modular structure design is adopted. Each energy storage module is internally integrated with the intelligent BMS system, which can be easily expanded and can be combined into 80Kwh battery pack at most.

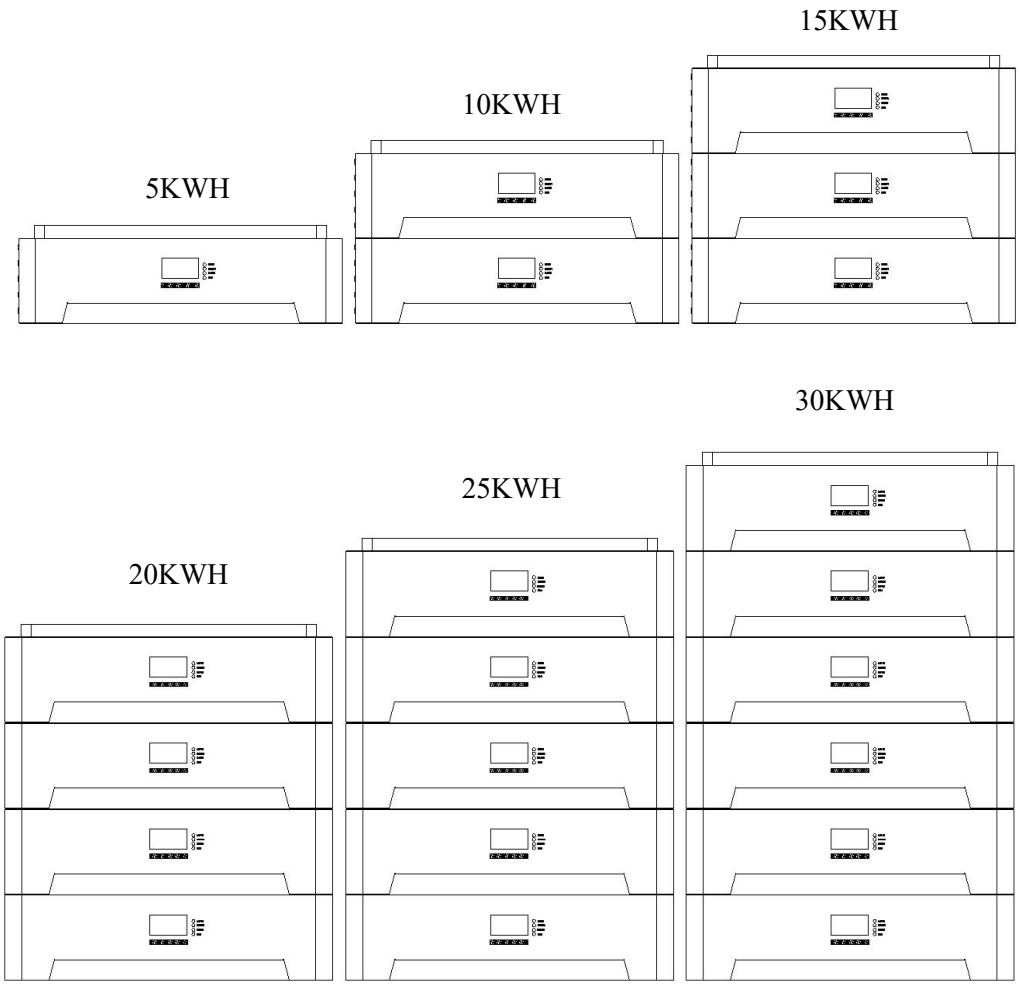
The typical topological diagram for application of the system is as follows:



3.2 Description of Energy Storage Capacity

PowerCube P5A series energy storage system supports the capacity expansion with up to six energy storage modules.

The voltage of a single battery is 48V and the capacity is 100Ah.



3.2.1 Energy Storage Battery Module Communication description

RS232

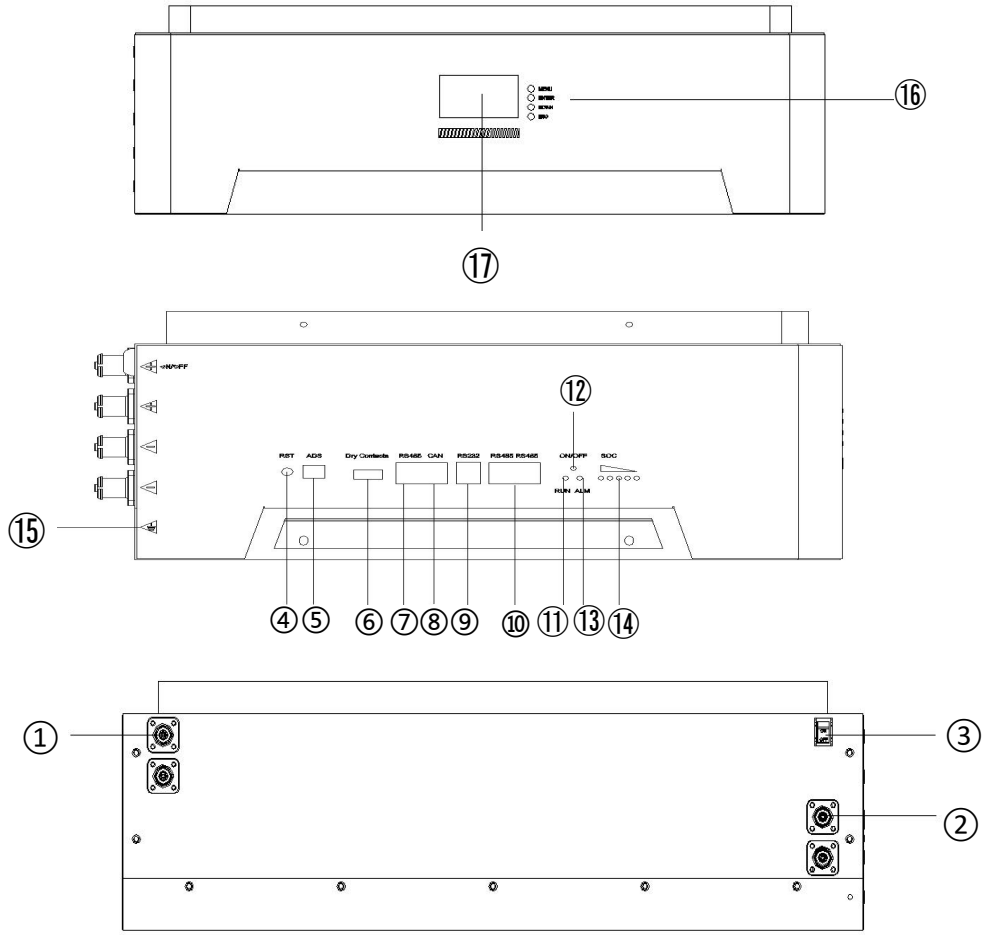
The communication BMS can communicate with the upper computer through RS232 interface, so that various information of the battery can be monitored through the upper computer, including battery voltage, current, temperature, status and battery production information. The default baud rate is 9600bps.

CAN communication

CAN communication, the default communication rate is 250K.

RS485 communication

With dual RS485 interface, you can view the pack information. The default baud rate is 9600bps. If it is necessary to communicate with the monitoring equipment through RS485, the monitoring equipment, as the host, polls the data according to the address。



①	Positive	⑩	RS485/RS485
②	Negative	⑪	(LED)RUN
③	ON/OFF	⑫	(LED)ON/OFF
④	RST	⑬	(LED)ALM
⑤	Address	⑭	(LED)CAPACITY
⑥	Dry Contacts	⑮	Ground wire
⑦	RS485	⑯	MENU
			ESC
⑧	CAN		ENTER
			DOWN
⑨	RS232	⑰	LCD screen

3.2.2 Interface definition

RS232-- adopts 6P6C vertical RJ11 socket.	
RJ11 pin	Definition description
2	NC
3	TX（Veneer）
4	RX（Veneer）
5	GND

RS232 Interface

RS485-- adopts 8P8C vertical RJ45 socket		CAN-- adopts 8P8C vertical RJ45 socket	
RJ45 pin	Definition description	RJ45 pin	Definition description
1、8	RS485-B1	1、2、3、4、5	NC
2、7	RS485-A1	6	CANL
3、6	GND	7	CANH
4、5	NC	8	GND

RS485 and CAN Interface

RS485-- adopts 8P8C vertical RJ45 socket		RS485-- adopts 8P8C vertical RJ45 socket	
RJ45 pin	Definition description	RJ45 pin	Definition description
1、8	RS485-B	1、8	RS485-B
2、7	RS485-A	2、7	RS485-A
3、6	GND	3、6	GND
4、5	NC	4、5	NC

RS485 and RS485 Interface（Battery parallel communication）

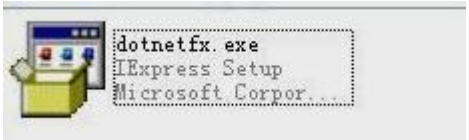
3.3 Monitoring

3.3.1 The software runs on PC and its compatible computer and uses Windows operating system. The system environment requires the support of Microsoft. Net Framework version 2.0 or above. Please confirm that it has been installed before use. The installation is as follows:

1. Download Microsoft version of Microsoft. Net framework



2. Double click the downloaded program to install it (the installation steps of different versions are different. Please refer to the official instructions of Microsoft for installation)



3. The software does not need to be installed independently. As long as the environment meets the requirements, double-click the Bmstools v1.22. icon to run it. After running, the main interface of the software is displayed (see Figure 1-2)

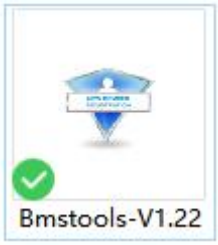


Figure 1-1

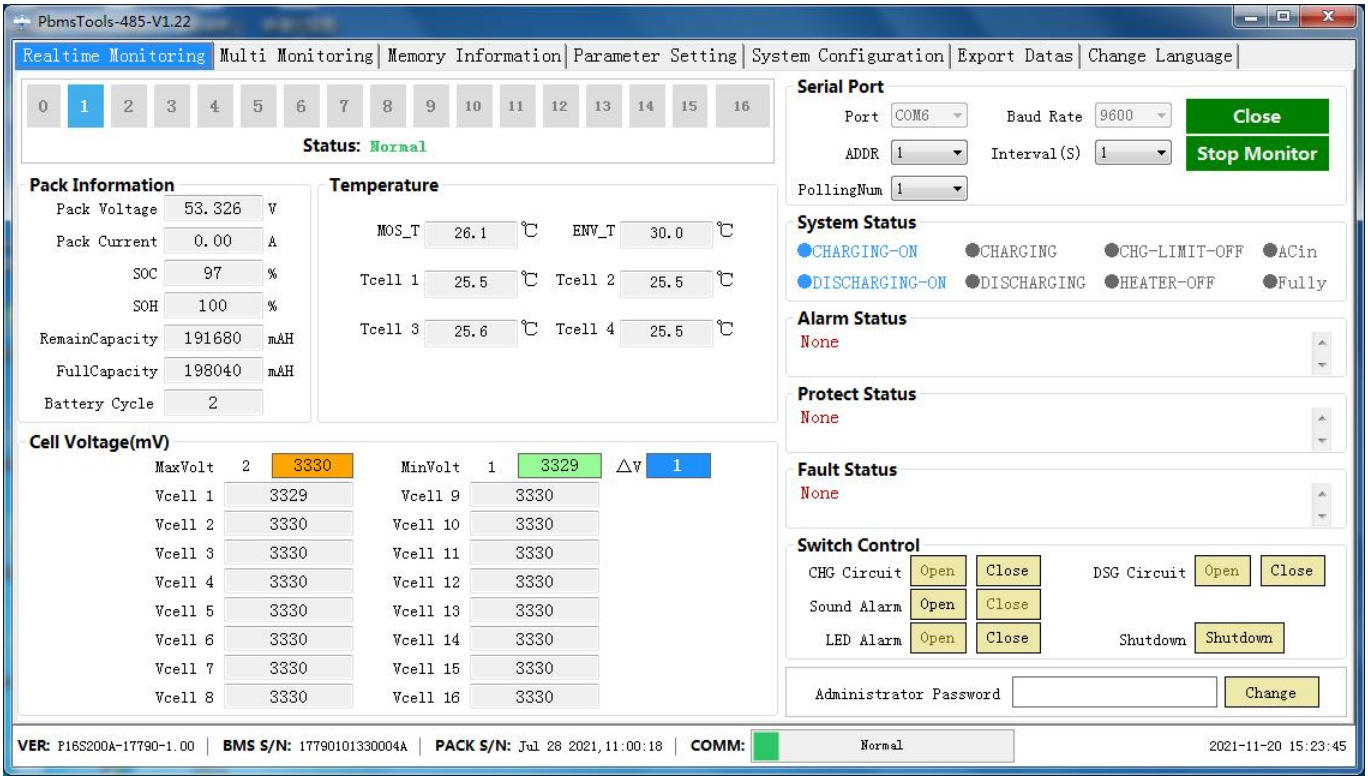


Figure 1-2（Software main interface）

4.After opening the main interface (see Figure 1-2), the software will automatically search all existing serial ports. If an effective serial port is found, it will automatically connect the serial port and communicate, and read battery information, temperature information, unit voltage, system status, alarm status, protection status, fault status and other battery parameters in real time.

3.4 Interface introduction

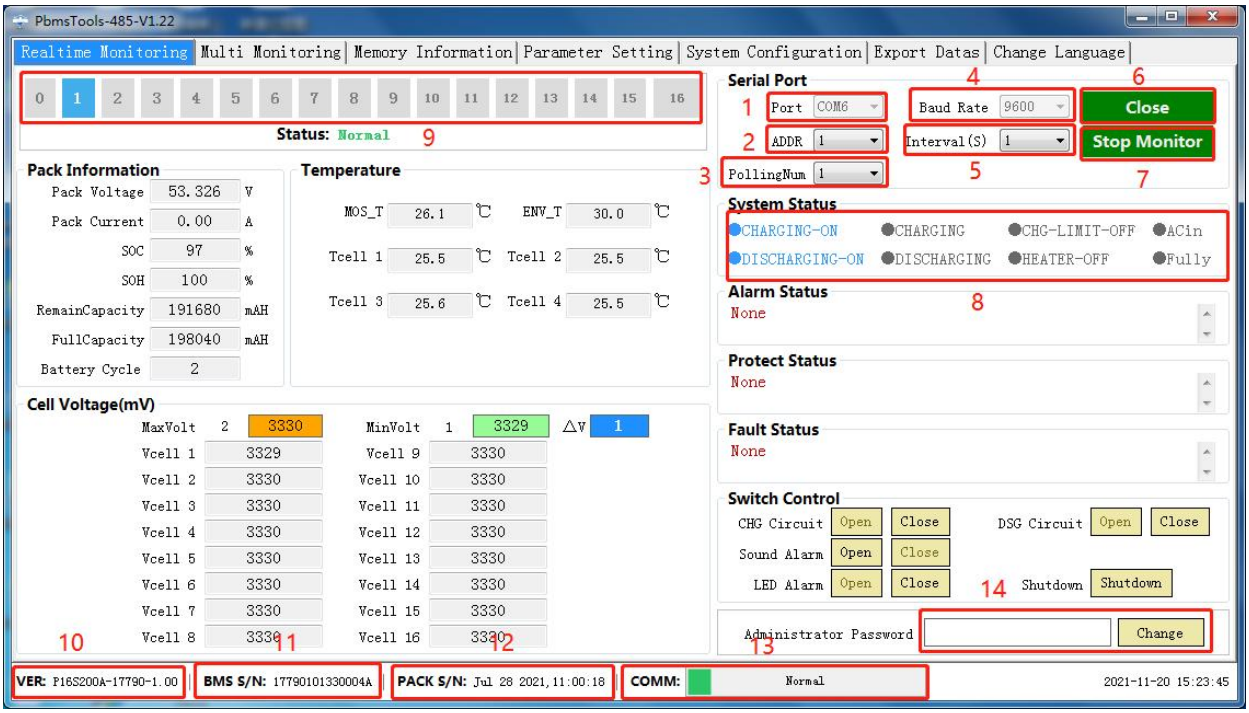


Figure 1-3（Software main interface）

Description of main controls (Figure 1-3)

NO	Explain
1	Serial port: you can select the drop-down item to select the serial port to communicate. (Note: available when the serial port is not opened)
2	Address: read-only value, the currently read BMS address value
3	Read only value, the total number of batteries read by the host computer from the BMS board (when applied to multiple computers in parallel, battery data is obtained from the main battery)
4	Baud rate: you can select the drop-down item to select the baud rate of communication. (Note: available when the serial port is not opened)
5	Interval (seconds): optional. The interval between the upper computer reading data from the BMS board
6	Open serial port: alternate function buttons to open or close the serial port
7	Start monitoring: alternate function buttons to start or stop monitoring. The time frequency of reading data during monitoring is the time interval set in 5
8	System status: when a system status occurs, the text of the item is blue. Gray indicates no occurrence

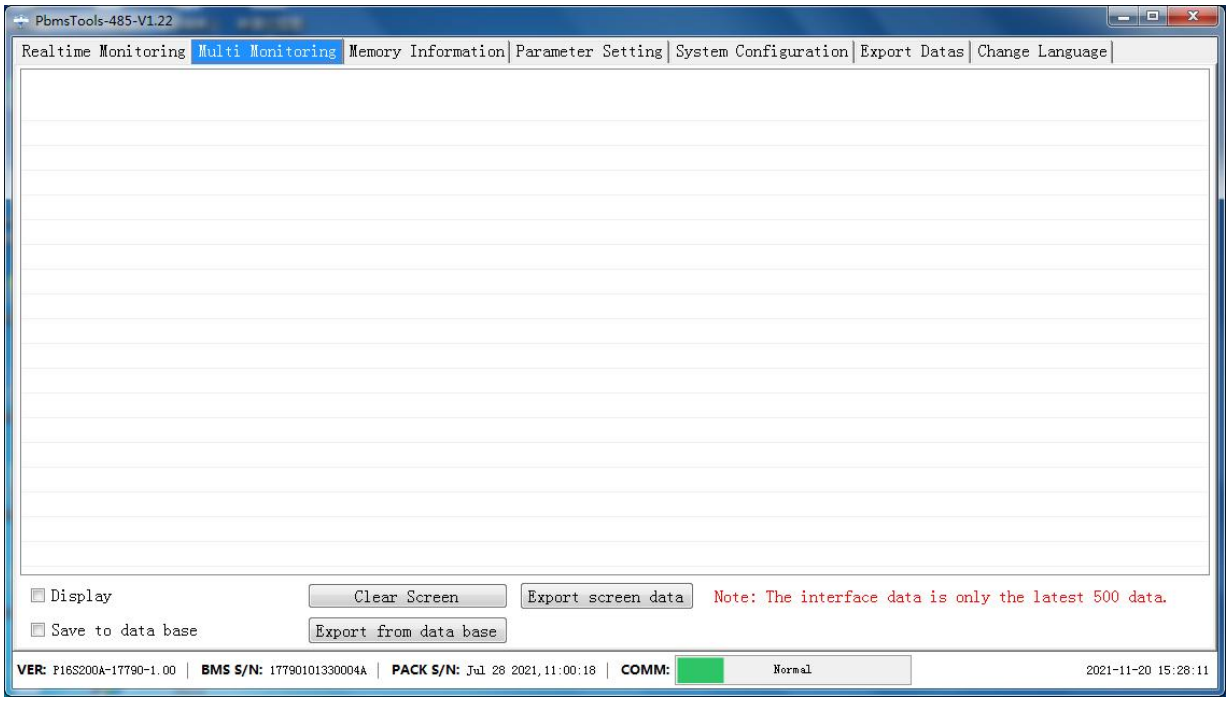
9	Battery pack serial number: data key, which is the serial number of the battery pack. The battery pack being read and presented on the current interface is displayed in white words on a blue background

10	Version: software version number of BMS
11	Bar code of BMS board
12	Bar code of PACK board
13	Communication status: the communication status between the software and BMS board. It is valid when monitoring is started and communication is normal
14	Administrator password column: some setting functions can only be used after entering the administrator password, such as some functions in system settings. (Note: when the password is entered correctly, the input box will turn green, and you have obtained the permission of the administrator)

Open serial port and start monitoring

First set the baud rate and serial port on the upper computer, then connect the BMS board with the RS232 / RS485 communication line, and then insert the USB interface of the communication line into the USB port of the computer. At this time, the upper computer will automatically search the serial port and start monitoring. If the automatic search fails, you need to manually select the newly connected serial port on the upper computer, then click button **Open** to open the serial port, and then click button **Start Monitor** to start monitoring.

【Multi Monitoring】



Check【☑Display】 at the bottom left to display the monitored real-time data in the data area. Note: there is data only when the monitoring is started normally. If there is no data, please check whether the monitoring is normal.

Click **Clear Screen** button to clear the real-time data on the interface.

Click Export screen data to save the existing data on the interface to the local.

Check【☑Save to data base】 to automatically save each real-time data. The saved path is in the folder named "data" under the program root directory by default, and is stored according to the battery pack serial number by date.

【Memory Information】
1. The interface
Click the main interface TAB [Memory Information] to enter the interface, as shown in Figure 3-1

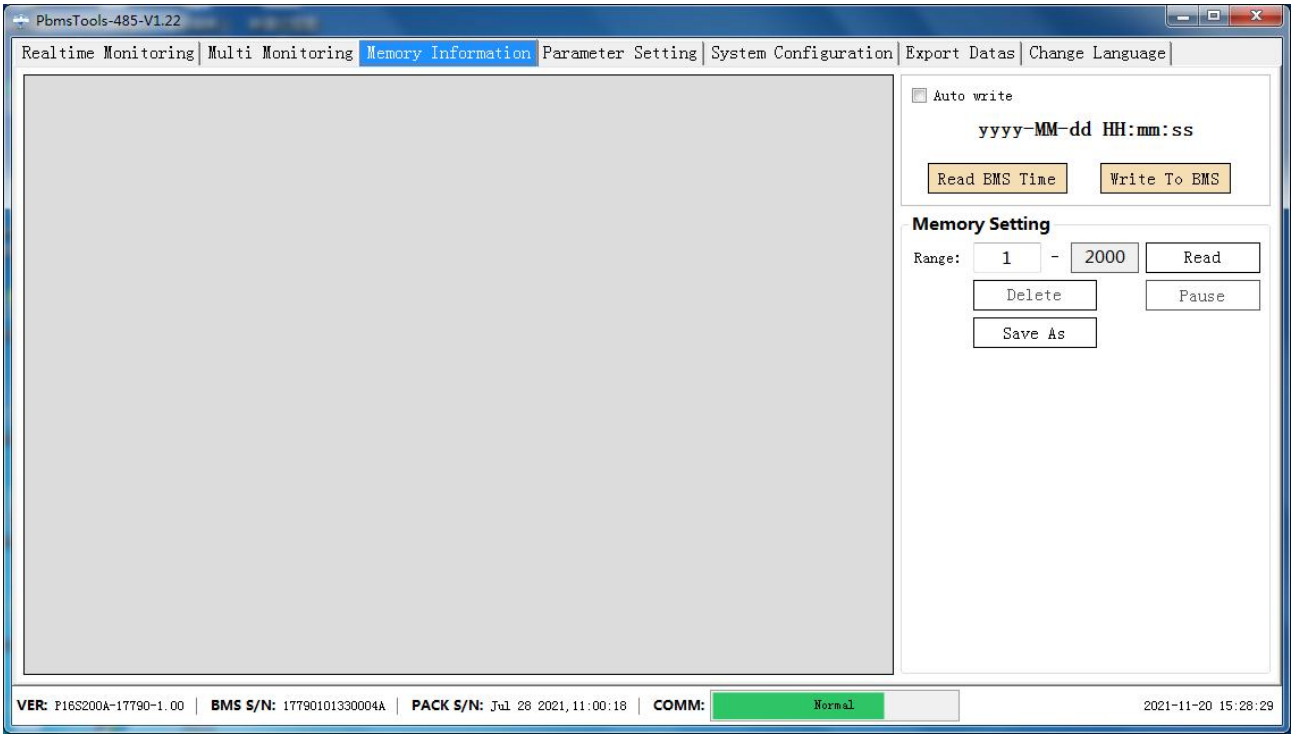


Figure 3-1

2. Read/write the BMS time

Click the upper right button to Read BMS Time

Click the upper right button to Write To BMS

3. Storage Settings
Read Record: Click Read the BMS. On the right.

Pause/Continue: Click Pause reading while reading records, and click again to continue reading.

Save records: Click Save as to save the records that have been read to the interface locally.

Delete Record: Click Delete to delete the stored record in the BMS.

【Parameter Setting】

3.4.1The interface

Click the main interface TAB [Parameter Information] to enter the interface. When entering the interface, the default value of the interface is empty. As shown in figure 4-1

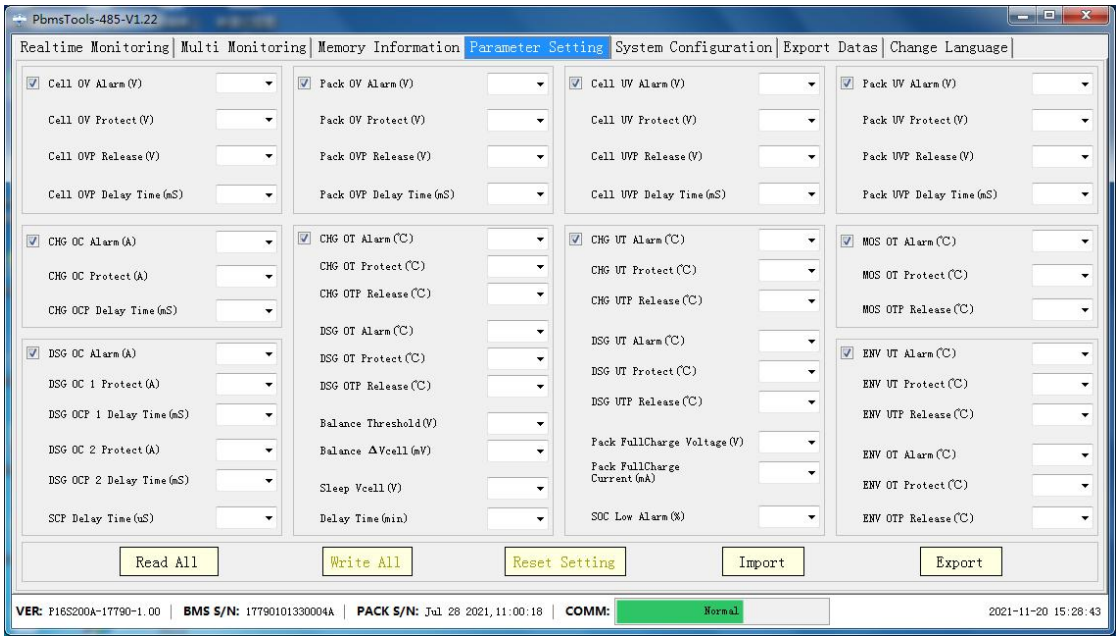


figure 4-1

Function of 2.

Read parameters: Click Real All button to read all parameters of the interface.

Write parameters: Click the Write all button to write parameters. This operation requires administrator privileges.

Restore default parameters: Click the Resent Setting button to restore all interface parameters to default parameters. The default parameters come from the default parameters in the BMS. This operation requires administrator privileges.

Import parameters: click the Import button to read the data from the local file into this interface. Note: Data is only read to the interface, not written to the BMS, if you need to write, please perform write operation.

Export parameters: Click the Export button to save the data on the interface as an XML file.

【System configuration】

3.4.2 Interface

Click the main interface TAB [System Configuration] to enter the interface, as shown in Figure 5-1

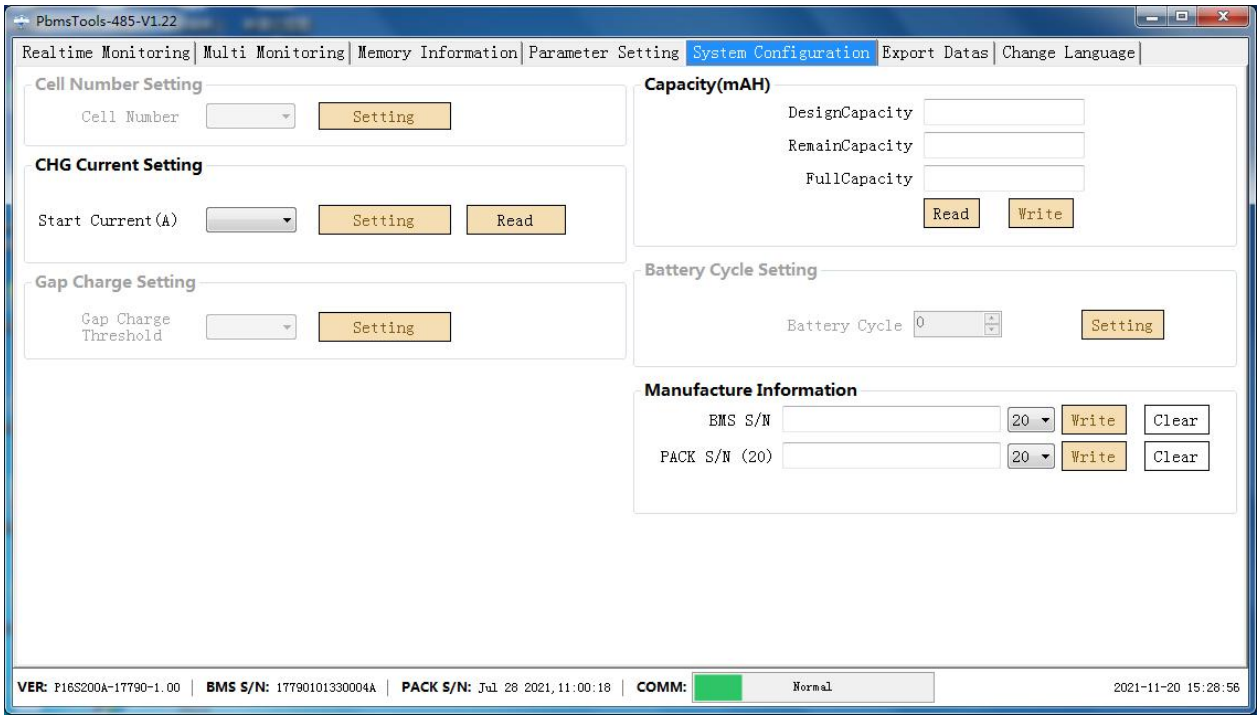
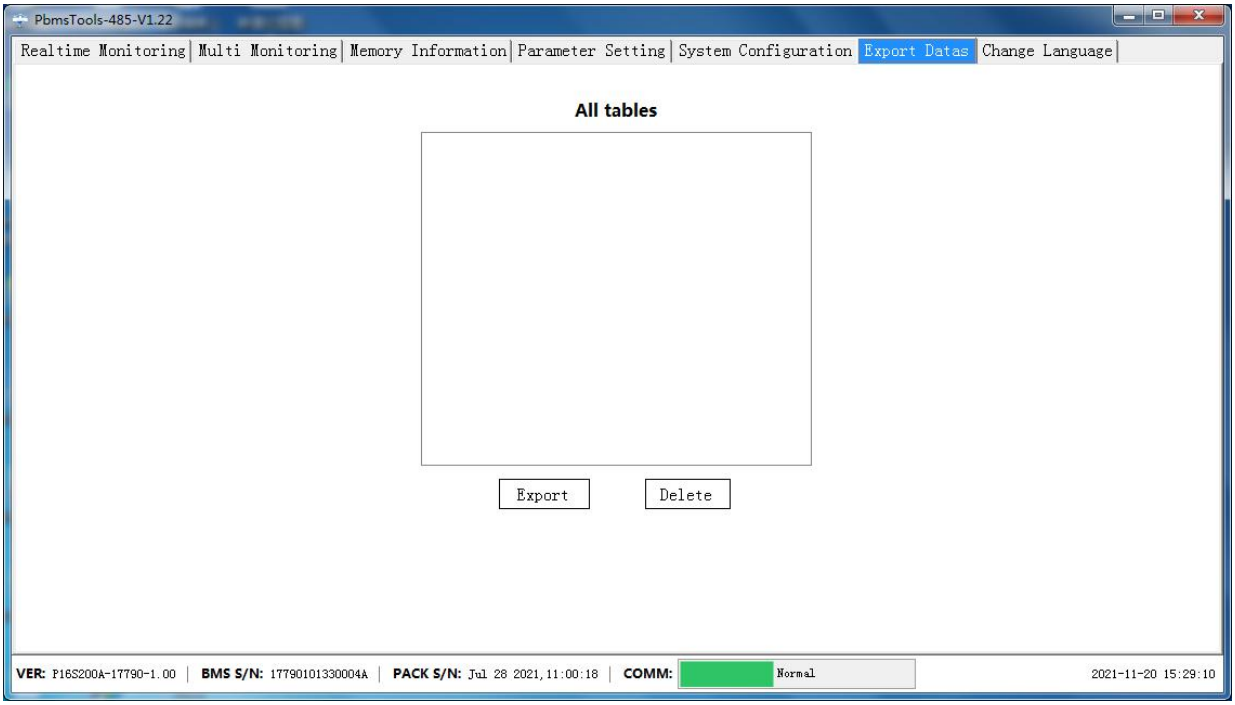


Figure 5-1

3.4.3 Function

Perform operations as prompted. Some functions require administrator rights.

【Export Data】



【Change Language】

3.4.4 Interface

Click the main interface TAB [Switch Language] to enter the interface, as shown in Figure 6-1

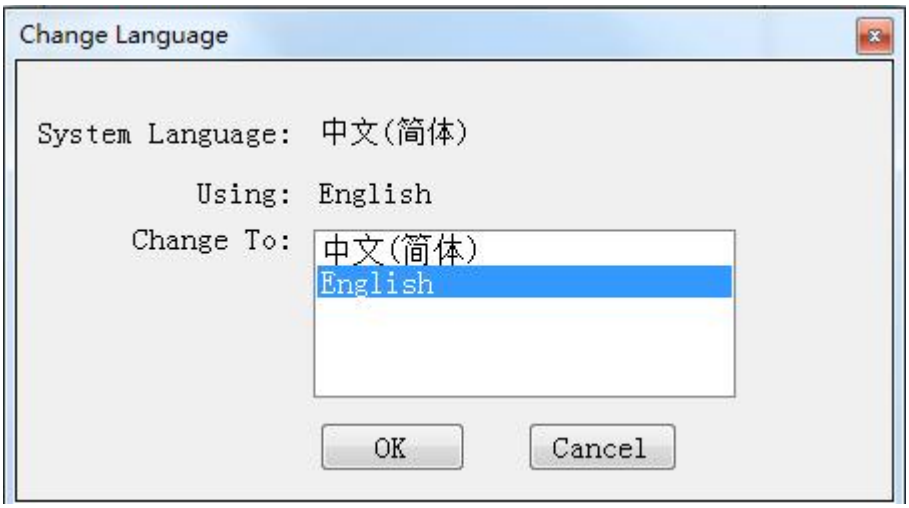


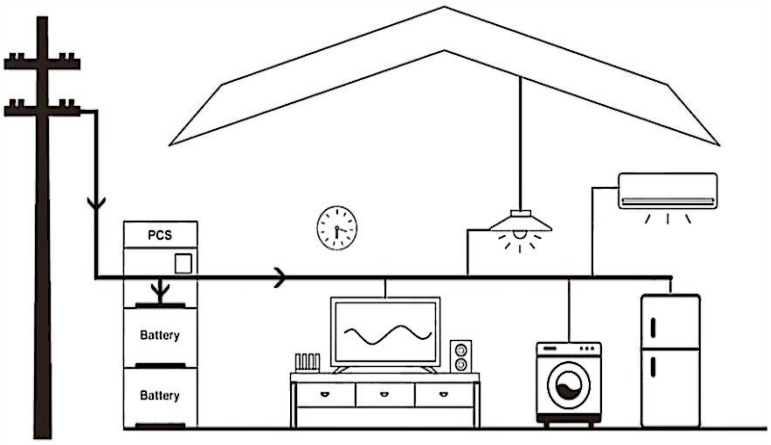
Figure 6-1

4 Application Scenarios and Settings

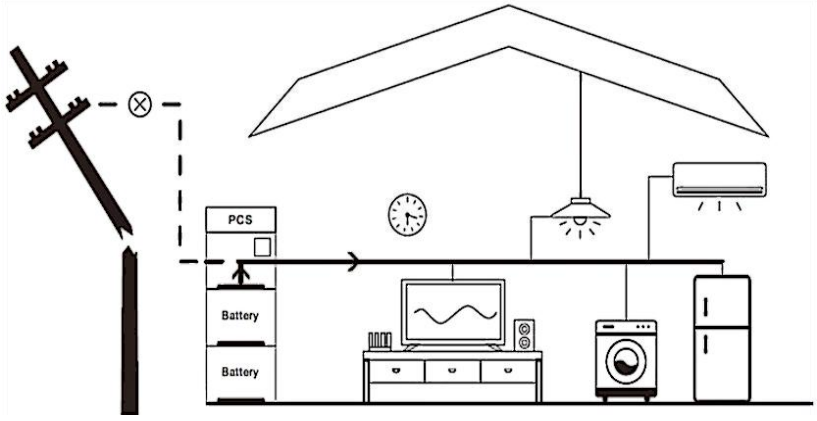
4.1 Application Scenarios

4.1.1 Application Scenarios with Only Mains Power but No Photovoltaic

When the mains is normal, it charges the battery and supplies power to the loads.

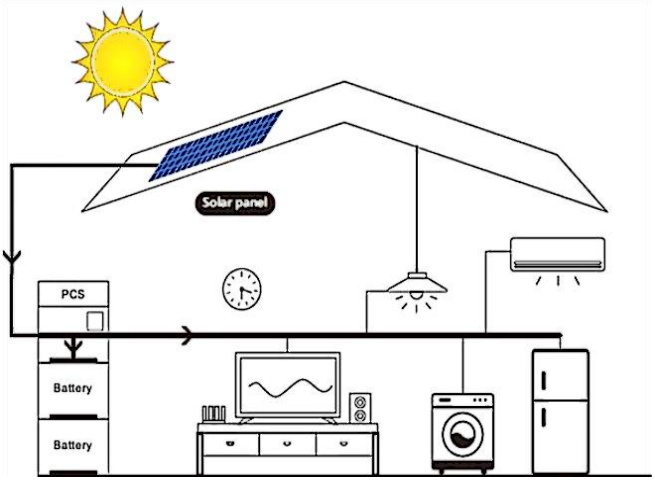


When the mains is disconnected or stops working, the battery supplies power to the load through the power module.

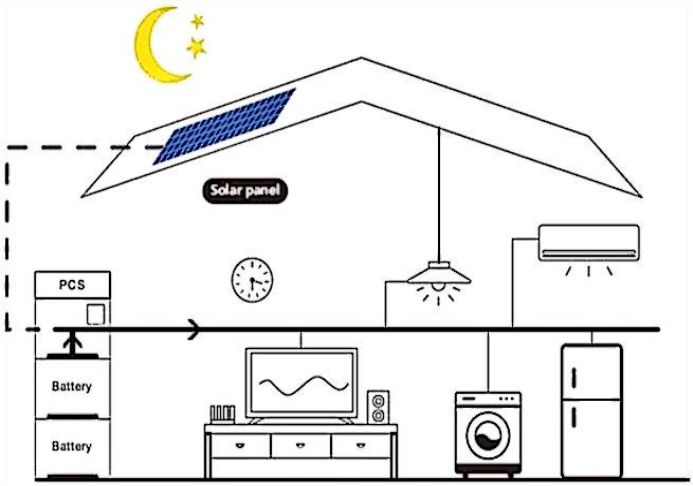


4.1.2 Application Scenarios with Only Photovoltaic but No Mains Power

During the day, the photovoltaic directly supplies power to the loads while charging the battery.

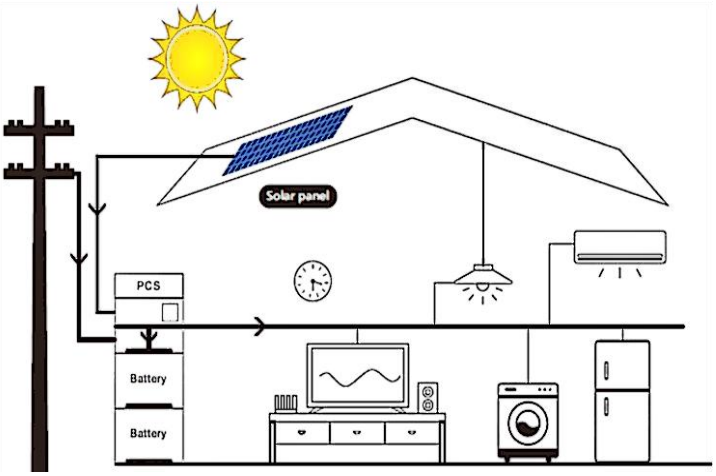


At night, the battery supplies power to the loads through the power module.

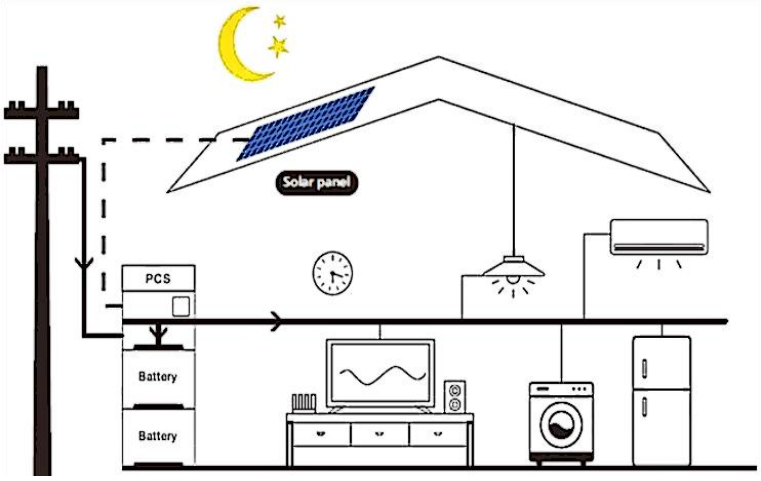


4.1.3 Complete Application Scenarios

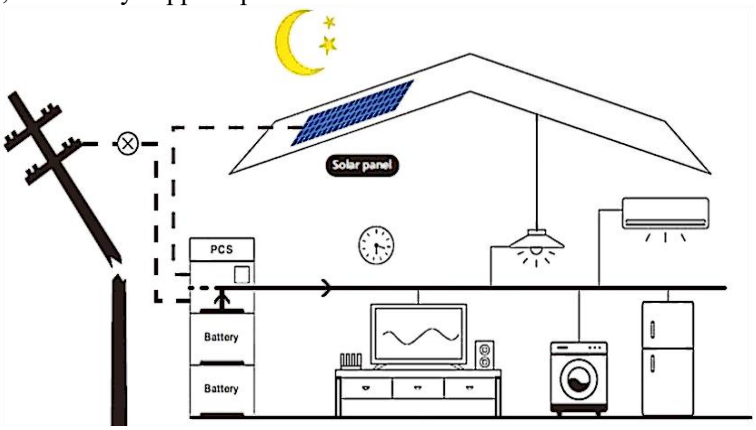
During the day, the mains and photovoltaic simultaneously charge the battery and supply power to the loads.



At night, the mains supplies power to the loads, and continues to charge the battery, if the battery is not fully charged.



If the mains is disconnected, the battery supplies power to the loads.



4.2 Load Working Mode

Load working mode	PCS setting	Description
PV priority mode	SOL	switching to the Mains when the PV fails or the battery is lower than the set value of parameter
Mains priority mode	UTI	Mains priority mode, switching to inverter only when the mains fails.
Inverter priority mode	SBU	switching to the mains only when the battery is under voltage orlower than the set value of parameter

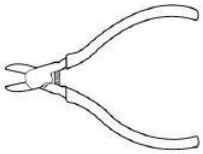
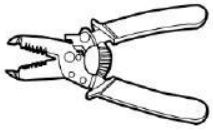
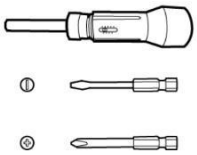
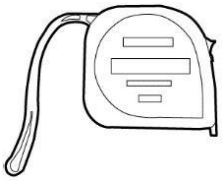
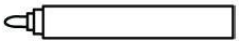
5 System Installation

5.1 Inspections before Installation

Inspection of outer package

Before opening outer package of the energy storage, check if there is any visible damage on the outer package, such as holes, cracks or other signs of possible internal damage, and check the type of energy storage. If there is any abnormality on the package or model of the energy storage is inconsistent, do not open it and contact us as soon as possible.

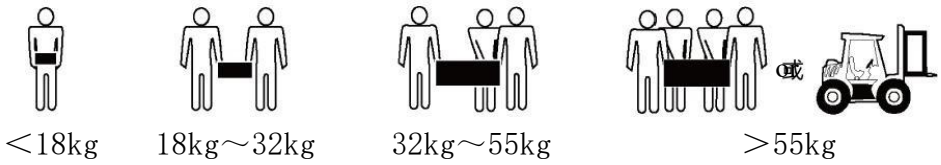
5.2 Preparation of Tools and Meters

Types	Tools and meters		
Installation tool			
			
Personal protective equipment			
			

5.3 Selection of Installation Location

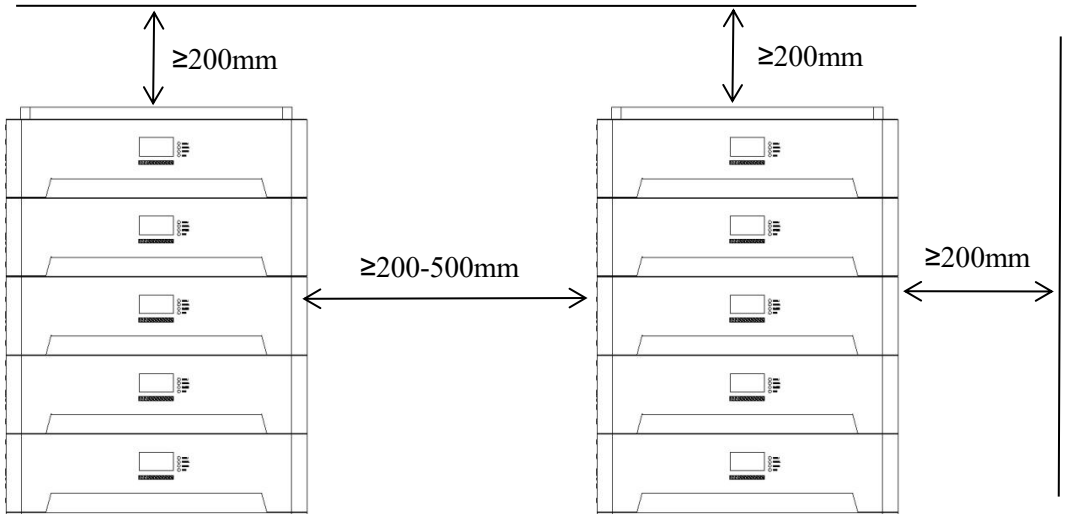
5.3.1 Basic Requirements

- When the energy storage is running, the temperature of the case and the radiator will be high. Therefore, do not install them in a place that is easy to touch.
- Do not install in areas where flammable and explosive materials are stored.
- If the energy storage is installed in areas with salt damage, it will be corroded and may cause fire. Therefore, do not install it outdoors in areas with salt damage. The areas with salt damage are defined as the areas which are not 500m away from shore or will be affected by sea breezes. The areas affected by the sea breezes vary depending on meteorological conditions (e.g. typhoons, monsoons) or topographical conditions (dams, hills).
- Do not install in the place where children can touch.
- The energy storage cannot be installed forwardly, horizontally, inversely, backwardly or sideways.
- When drilling holes on walls or ground, the goggles and protective gloves shall be worn.
- During drilling, the device should be shielded to prevent debris from falling into the device. After drilling, the debris shall be cleaned up in time.
- When handling any heavy objects, you should be prepared to bear loads to avoid being crushed or sprained.
- When handling the device by hand, wear protective gloves to avoid injury.



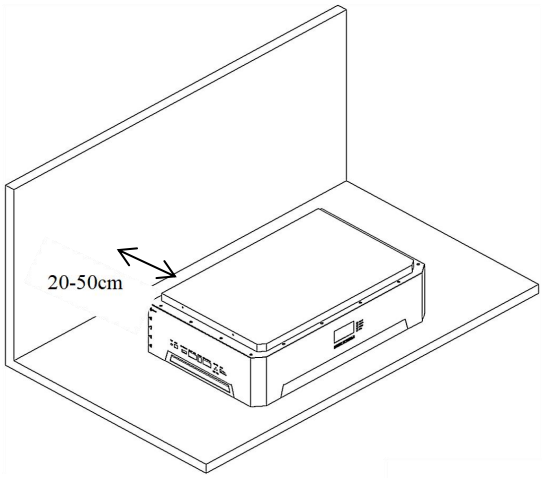
5.3.2 Installation Space Requirements

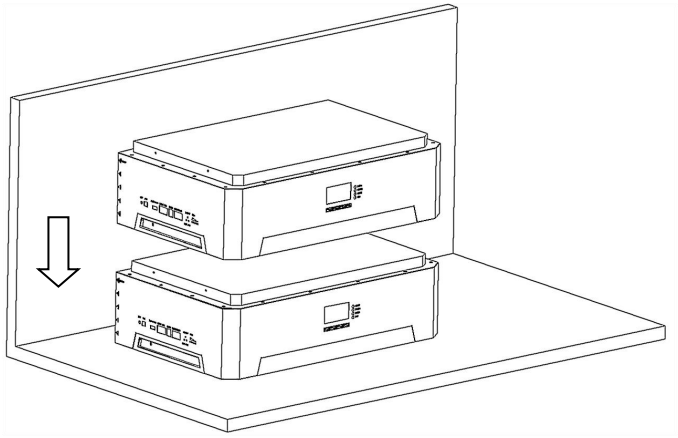
When installing the energy storage, certain space shall be left around it to ensure sufficient space for installation and heat dissipation.

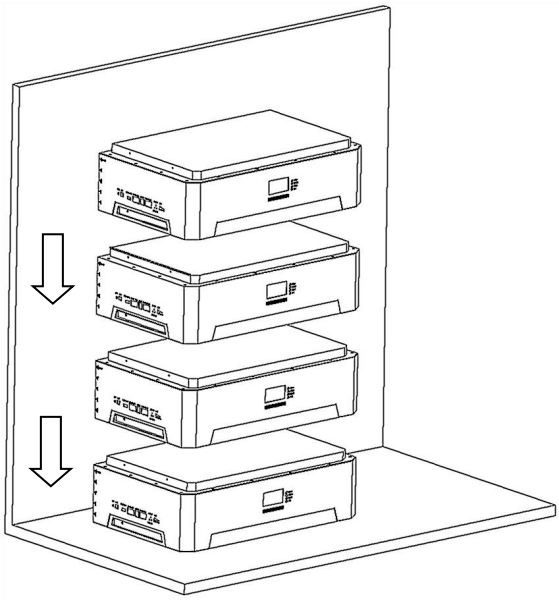


5.4 Device Installation

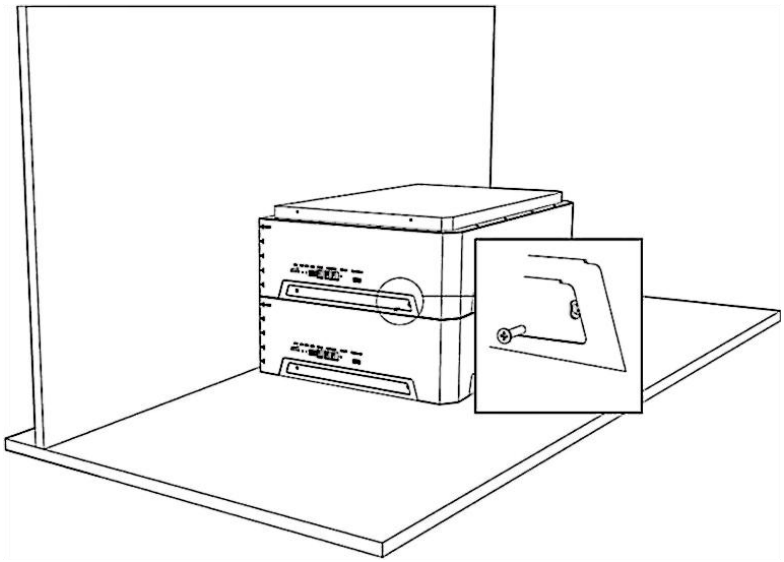
The battery should be placed in the right position first, and the installation site should be smooth and the floor should be solid, and the device is 20-50cm away from the wall.If there is more than one battery, the first battery should be placed properly before placing other batteries.







Install retaining screws.



6 Electrical Connection

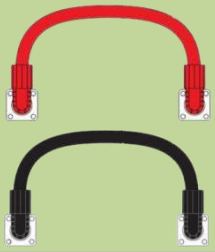
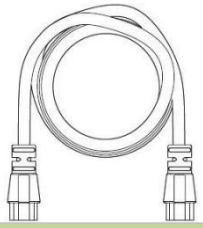


Before electrical connection, please ensure that the switches of the energy storage and power module and all switches connected to the energy storage are in the "OFF" state, and the power module is in the OFF state. Otherwise, the high voltage of the device may cause electric shock.



- The device damage caused by incorrect wiring is not covered in warranty scope of the device.
- When carrying out electrical connections, the operator must wear personal protective articles.
- The operations related to electrical connections must be carried out by professional electrical technicians.

6.1 List of product accessories

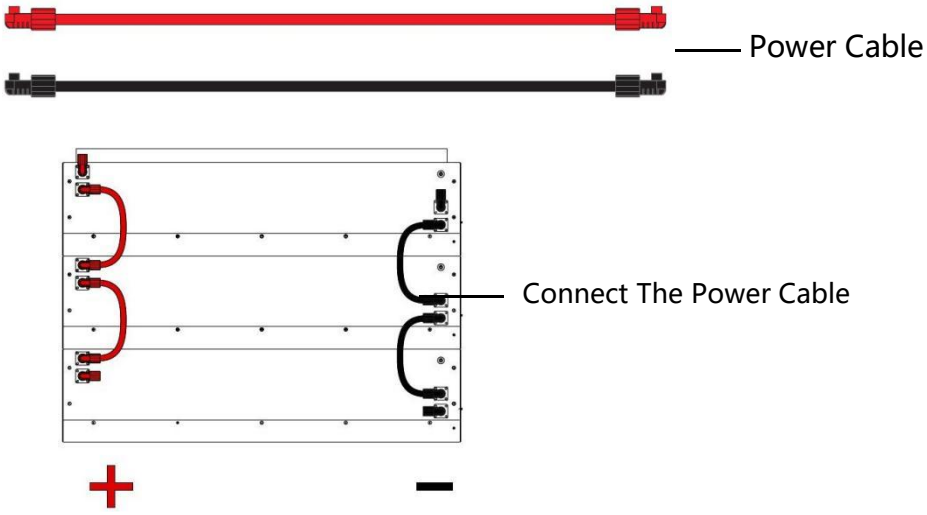
No.	Cables	Description	Recommended specifications	Source
1	Certificate of approval	The Product Quality Act clearly stipulates that all products must be inspected and labeled as qualified before leaving the factory		Provide with the product together
2	User Manual	Instructions and precautions for use		Provide with the product together
3	Positive and negative outgoing lines	Connecting line between battery and inverter		Provide with the product together
4	Parallel connection cable of energy storage	Power cable between the storage battery modules		Optional
5	Signal line of energy storage	Signal cable between the storage battery modules		Provide with the product together
6	Ground wire	Ground cable between the storage battery modules		Provide with the product together

7	Desiccant	Keep product dry		Provide with the product together
8	Warning posted	Safety instructions and precautions		On the product

6.2 Internal Electrical Connection of Energy Storage

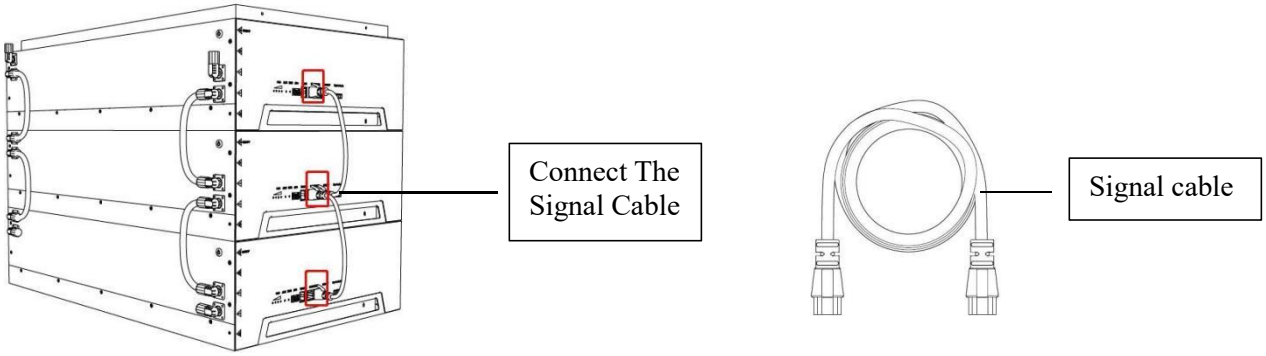
6.2.1 Connecting Power Cord

Before connecting the energy storage battery module, ensure that the energy storage battery is not working and the indicator lights on the battery are OFF. The power cord delivered with the product together should be used to connect the positive and negative terminals of other batteries or power modules. It shall be noticed that the red cable should be connected to the red terminal (positive battery terminal) and the black cable to the black terminal (negative battery terminal).



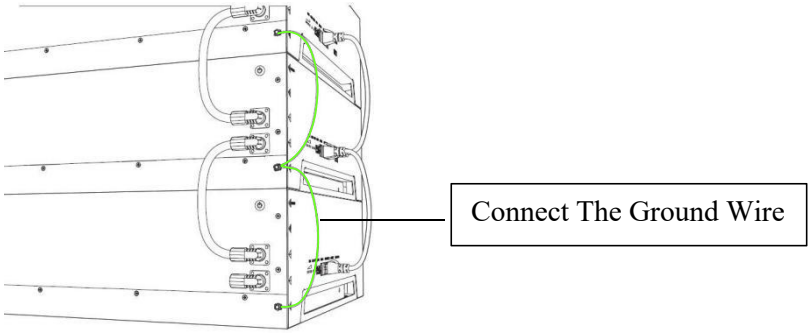
6.2.2 Connecting Signal Line

The signal line delivered with the product together shall be used to connect each energy storage battery module.



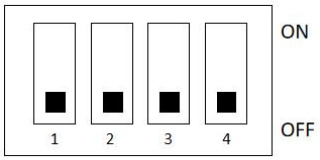
6.2.3 Connecting Grounding Wire

Each energy storage battery module shall be connected with the grounding wire provided with the product together.



6.2.4 Energy Storage Battery Module Address Setting

If multiple energy storage battery modules are used in parallel, the address of the energy storage battery module needs to be set. The address is set to 1~4, and the address of each module cannot be repeated.



Address	Dial switch position				Explanation
	#1	#2	#3	#4	
0	OFF	OFF	OFF	OFF	Set to Pack0
1	ON	OFF	OFF	OFF	Set to Pack1 (host)
2	OFF	ON	OFF	OFF	Set to Pack2
3	ON	ON	OFF	OFF	Set to Pack3
4	OFF	OFF	ON	OFF	Set to Pack4
5	ON	OFF	ON	OFF	Set to Pack5
6	OFF	ON	ON	OFF	Set to Pack6
7	ON	ON	ON	OFF	Set to Pack7
8	OFF	OFF	OFF	ON	Set to Pack8
9	ON	OFF	OFF	ON	Set to Pack9
10	OFF	ON	OFF	ON	Set to Pack10
11	ON	ON	OFF	ON	Set to Pack11
12	OFF	OFF	ON	ON	Set to Pack12
13	ON	OFF	ON	ON	Set to Pack13
14	OFF	ON	ON	ON	Set to Pack14
15	ON	ON	ON	ON	Set to Pack15

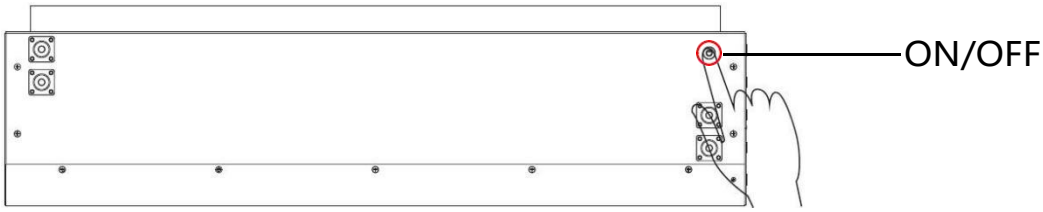
7 System Debugging

7.1 Inspections before Power-On

No.	Inspection items	Acceptance criteria	Validation
1	The energy storage is installed in place	The installation is correct, secure and reliable.	☐Yes ☐No
2	The installation environment meets requirements	The installation space is reasonable and the environment is clean and tidy without any construction remains.	☐Yes ☐No
3	The energy storage power cord is correctly connected	The positive and negative terminals are connected correctly without any missing.	☐Yes ☐No
4	The energy storage signal line is correctly connected	The signal line is connected reliably	☐Yes ☐No
5	The grounding is reliable	The grounding wire is correctly and reliably connected.	☐Yes ☐No
6	The switch of the energy storage battery module is off	All switches connected to the energy storage are in the "OFF" state.	☐Yes ☐No
7	All air switches of the power module are off	All air switches of the power module are in the "OFF" state.	☐Yes ☐No

7.2 Power-On of Energy Storage Battery Module

After power-on check and confirmation, first turn on the switch of the energy storage battery module. If there are multiple modules, please turn on the power switch one by one according to the address sequence.



8 System Maintenance

8.1 System Power-Off



● After the system is powered off, the case still has residual power and heat, which may cause electric shocks or burns. Therefore, protective gloves should be worn before operating the energy storage 5 minutes after the system is powered off. Maintenance operations on energy storage should be performed only after ensuring that all indicator lights of the energy storage are off.
● When the energy storage system is running, the system cannot be powered off completely when only turning off the switch of the power unit. At this time, no maintenance operation can be performed on the energy storage. The switch of energy storage must be turned off before

Power-off operation steps of the system:

Step 1 Turn off the switch between the power unit and AC output.

Step 2 Turn off the switch between the power unit and AC input.

Step 3 Turn off the switch between the power unit and the PV string.

Step 4 Turn off the switch between the power unit and the energy storage battery unit.

Step 5 Turn off switches on all energy storage units and hold down the key on energy storage for three seconds until all indicator lights turn off and the energy storage is powered off successfully.

8.2 Routine Maintenance

To ensure the long-term and good operation of the energy storage system, it is recommended to perform the routine maintenance as described in this section

Items	Methods	Maintenance interval
System cleanliness	Check if the radiator is covered or dirt on a regular basis.	Once every six months to one year.
Running status of system	● Observe whether the energy storage appearance is damaged or deformed. ● Listen to whether the energy storage has any abnormal sound during running. ● When the energy storage is running, check whether the energy storage parameters are set correctly.	Once every six months.
Electrical connection	● Check if any cable connection is off or loose. ● Check if any cable is damaged, and especially if there are cuts on the sheath where the cable contacts with the metal surface. ● Check if the unused DC input terminals, energy storage terminals, COM ports, and waterproof covers are locked.	Half a year after first debugging and testing, and once every six months to one year thereafter.
Grounding reliability	Check if the grounding cable is grounded reliably.	Half a year after first debugging and testing, and once every six months to one year thereafter.

8.3 Troubleshooting

8.3.1 Fault Code and Handling Methods

Fault code	Fault name	Whether it affects the output or not	Description
【01】	BatVoltLow	No	Battery under-voltage alarm
【02】	BatOverCurrSw	Yes	Battery discharge average current over-current software protection
【03】	BatOpen	Yes	Battery not-connected alarm
【04】	BatLowEod	Yes	Battery under-voltage stop discharge alarm
【05】	BatOverCurrHw	Yes	Battery over-current hardware protection
【06】	BatOverVolt	Yes	Charging over-voltage protection
【07】	BusOverVoltHw	Yes	Bus over-voltage hardware protection
【08】	BusOverVoltSw	Yes	Bus over-voltage software protection
【09】	PvVoltHigh	No	PV over-voltage protection
【10】	PvBuckOCSw	No	Buck over-current software protection
【11】	PvBuckOCHw	No	Buck over-current hardware protection
【12】	bLineLoss	No	Mains power down
【13】	OverloadBypass	Yes	Bypass overload protection
【14】	OverloadInverter	Yes	Inverter overload protection
【15】	AcOverCurrHw	Yes	Inverter over-current hardware protection
【17】	InvShort	Yes	Inverter short circuit protection
【19】	OverTemperMppt	No	Buck heat sink over temperature protection
【20】	OverTemperInv	Yes	Inverter heat sink over temperature protection
【21】	FanFail	Yes	Fan failure
【22】	EEPROM	Yes	Memory failure
【23】	ModelNumErr	Yes	Model setting error
【26】	RlyShort	Yes	Inverted AC Output Back-fills to Bypass AC Input
【29】	BusVoltLow	Yes	Internal battery boost circuit failure

8.3.2 Common Faults and Handling Methods

Faults	Handling measures
No display on the screen	Check if the battery air switch or the PV air switch has been closed; if the switch is in the "ON" state; press any button on the screen to exit the screen sleep mode.
Battery over-voltage protection	Measure if the battery voltage exceeds rated, and turn off the PV array air switch and Mains air switch.
Battery under-voltage protection	Charge the battery until it returns to the low voltage disconnection recovery voltage.

Fan failure	Check if the fan is not turning or blocked by foreign object.
Heat sink over temperature protection	When the temperature of the device is lower than the recovery temperature, normal charge and discharge control is resumed.
Bypass overload protection, inverter overload protection	① Reduce the use of power equipment; ② Restart the unit to resume load output.
Inverter short circuit protection	① Check the load connection carefully and clear the short-circuit fault points; ② Re-power up to resume load output.
PV over-voltage	Use a multi-meter to check if the PV input voltage exceeds the maximum allowable input voltage rated.
Battery missed alarm	Check if the battery is not connected or if the battery circuit breaker is not closed.

8.4 Battery Storage and Maintenance

8.4.1 Battery Storage Requirements



Do not put the battery into fire. The battery may explode.
Do not open or damage the battery. The electrolyte flowing out from the battery is harmful to the skin and eyes. The electrolyte may also be toxic;

1. When being stored, the batteries shall be placed correctly in accordance with the marks on the packing case. Do not put them upside down or on the side.
2. When stacking up the battery packing cases, the stacking requirements on the outer package shall be met.
3. The batteries should be handled with care, and damage to batteries should be strictly prohibited.
4. Requirements for the storage environment:

– Ambient temperature: -10℃ to 55 ℃, recommended storage temperature: 20℃ to 30℃.

– Relative humidity: 5%RH-80%RH.

– Dry, well ventilated, and clean.

– The corrosive organic solvents, gases and other substances shall be kept away.

– Exposing to direct sunlight shall be avoided.

– The distance from the heat source should not be less than two meters.

5. When being stored, the battery shall be disconnected from the external connection. If there is an indicator light on the battery panel, the indicator light shall be off.
7. The warehouse keeper shall make monthly statistics on the battery storage, and regularly inform the planning link of the battery inventory. If any battery has been stored for nearly 15 months (-10 ℃ to 25 ℃), 9 months (25 ℃ to 35 ℃), or 6 months (35 ℃ to 55 ℃), recharging shall be arranged in time.

8. When the stored batteries are going to be delivered, the first-in first-out principle should be followed.
9. After the battery is produced and tested, it shall be recharged to at least 50% SOC before being stored. If the device will not be used for a long period of time, discharge the battery to 45% to 60% of the battery capacity and disconnect the battery output to avoid the battery runs out;
10. Do not touch the battery pack with wet hands.
11. Do not squeeze, drop, or pierce the battery.
12. The battery should always be disposed in accordance with local safety regulations.
13. The battery should be stored and recharged in accordance with this User's Manual.
14. Do not reverse polarity of the battery when storing or transporting the batteries, the batteries shall not be stacked up without protective packaging, and the number of stacked packed batteries should not exceed the number specified on the packaging.
15. All operators of the energy storage system shall comply with the user manual, installation and service manual, and quality assurance requirements. Any damage to the device resulting from neglecting or misreading of the user's manual, installation and service manual, and the quality assurance requirements will invalidate the product warranty.

8.4.2 Requirements for Charging of Battery

The batteries to be stored for a long period of time (unused, for more than 3 months) must be kept in a dry and cool place. The storage voltage is 51V-53V. The batteries should be stored in a clean environment of 23±2℃ and humidity of 45%-75%. If the battery will be shelved and not used for a long period of time, it should be recharged every 3 months to ensure that the battery voltage is within the above range.

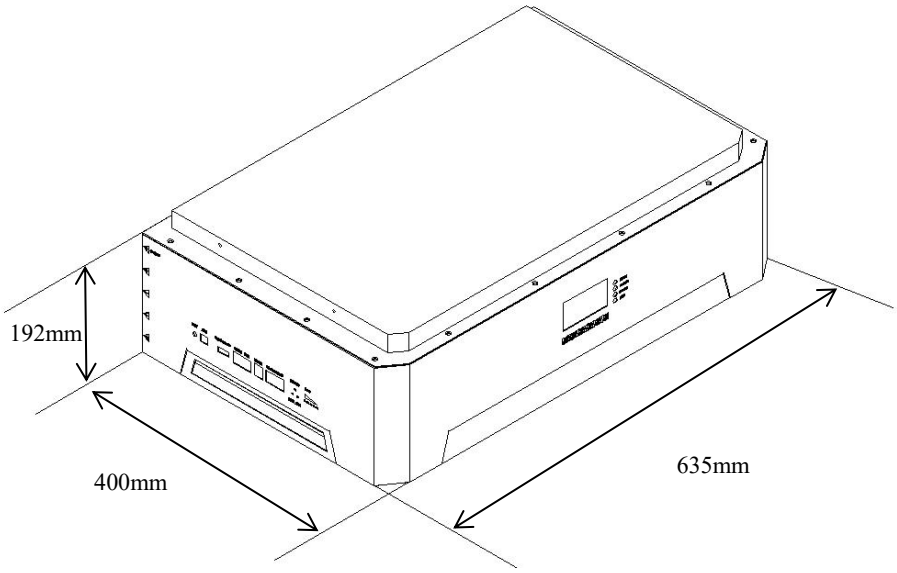
As for batteries and long-term storage, routine maintenance is required. Please charge the battery to 40% SOC at a current of 0.2C according to the requirements in the table below.

Ambient temperature for storage	Relative humidity for storage environment	Storage Time	SOC
<-10℃	/	Prohibited	/
-10~25℃	5%~70%	≤12 months	30%≤SOC≤60%
25~35℃		≤6 months	
35~45℃		≤3 months	
>45℃	/	Prohibited	/

8.5 Device Cleaning

It is recommended to clean and maintain the product from time to time. When cleaning, the dust and stains on the product shall be removed with a piece of soft dry cloth or vacuum cleaner, especially when cleaning the heat dissipation and air vents on both sides of the product. The product shall not be cleaned with organic solvents, corrosive liquids and other cleaning products

8.6 Battery Module Data



Technical Parameters	
Model	PowerCube P5A
Battery Type	LiFePO4
Energy	5.12kWh
Capacity	100AH
Rated Voltage	51.2V
Working Voltage Range	49.5-57.6V
Max Charge/Discharge Current	100A
Standard Charge/Discharge Current	50A
Round-Trip Efficiency	≥95%
Max Parallel Quantity	15
Cycle Life	⩾6000 cycles
Storage Temperature	Within 1month:-20~55℃,1-3months:0~35℃, 3-12months:20~25℃
Operation Humidity	5～95%
Nominal Operation Altitude	＜3000m
IP Rating	IP65
Installation Method	Stacking
Net Weight	46.3kg
Dimension (L*W*H)	635*400*192 mm
Communication Protocol	RS232,RS485, CAN
Calendar Life	⩾10 years
Certificates	IEC62619/UN38.3/CE
Operating Temperature	Charge：0～60℃ Discharge：-10~60℃

9 Transportation

Always check all applicable local, national, and international regulations before transporting an LFP battery.

During the transportation, protect the battery from severe vibration, shock or squeeze, and from exposure to the sunlight and rain.

During the loading and unloading process, the battery should be handled lightly and should be protected against falling, rolling and from being pressed with heavy pressure.

10 Emergency Situations

10.1 Leaking Batteries

If the battery pack leaks electrolyte, avoid contact with the leaking liquid or gas. If one is exposed to the leaked substance, immediately perform the actions described below.

a) Inhalation: Evacuate the contaminated area and seek medical attention.

b) Contact with eyes: Rinse eyes with flowing water for 15 minutes and seek medical attention.

c) Contact with skin: Wash the affected area thoroughly with soap and water and seek medical attention.

d) Ingestion: Induce vomiting and seek medical attention.

10.2 Fire

NO WATER! Only dry powder fire or carbon dioxide extinguisher can be used; if possible, move the battery pack to a safe area before it catches fire.

10.3 Wet Batteries

If the battery pack is wet or submerged in water, do not let people access it, and then contact SC Ecobat Energy SRL, or an authorized dealer for technical support.

Cut off all power switch on inverter side.

10.4 Damaged Batteries

Damaged batteries are dangerous and must be handled with the utmost care. They are not fit for use and may pose a danger to people or property.

If the battery pack seems to be damaged, pack it in its original container, and then return it to SC Ecobat Energy SRL, or an authorized dealer.

10.5 Caution

Damaged batteries may leak electrolyte or produce flammable gas.

11 Remarks

Recycle and disposal

In case a battery (normal condition or damaged) needs disposal or needs recycling, it shall follow the local recycling regulation (i.e. Regulation (EC) Nº 1013/2006 among European Union) to process, and using the best available techniques to achieve a relevant recycling efficiency.

12 Legal Statement

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