



ML314-51.2-W05 USER MANUAL

1 Instructions

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 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.

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 medium level of risk which, if not avoided, could result in death or serious 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
	This sign indicates that waste electrical and electronic equipment (EEE) and batteries (if any) should be collected and disposed of separately and not disposed of as unsorted municipal 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 cause damage.

2.2.2 General Requirements

✓	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.
- Do not stand, lean or sit on the device.
- Do not damage any modules of the device.

2.2.4 Electrical Safety

- Do not perform improper operations. Improper operations may cause fire or electric shock.
- Do not install or remove power cables with power on. When the core of the power cord touches the conductor, it will generate an arc or spark.
- Can cause fire or eye injury.
- If the power input to the device is permanently connected, an easily accessible disconnection device should be installed outside the device.
- Before electrical connection of the device, if live parts may be encountered, disconnect the corresponding breaker at the front of the device.
- You must perform this operation before connecting the AC power supply if the High Leakage Current mark is affixed to the power terminal of the device
- The protective grounding terminal of the device shell must be grounded first to prevent the leakage current of the device from causing electric shocks to the human body.

- Before installing or removing a power cable, turn off the power switch.
- Before connecting a power cable, ensure that the label on the power cable is correct.
- Before powering on the device, ensure that the electrical connection of the device is correct.
- If the device has multiple inputs, disconnect all inputs before performing operations on the device.

3 Product Introduction

3.1 Product Overview

The battery management system is used for charge and discharge management, condition monitoring and safety protection of lithium-ion battery packs.

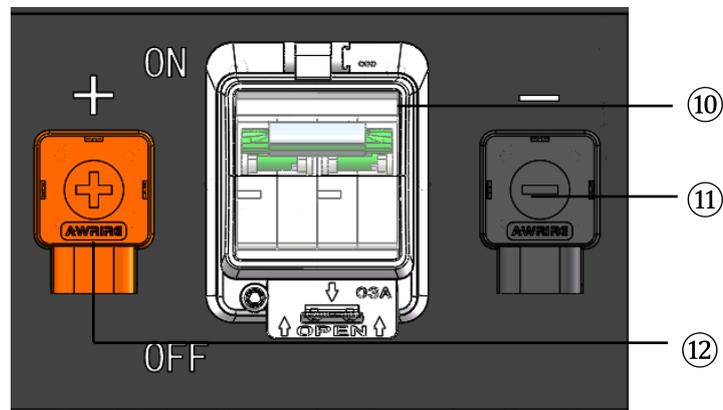
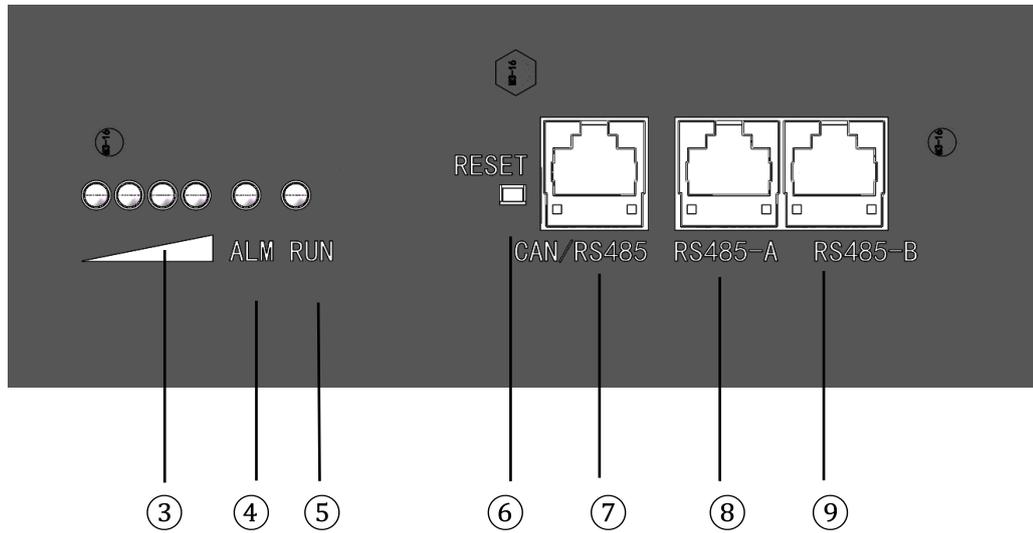
3.2 Battery Specification

No.	Item	Parameter	Remark
1	Rating Voltage	51.2 V	
2	Capacity	314 Ah	0.2C discharge after full charge
3	Minimum Capacity	≥ 314 Ah	0.2C discharge after full charge
4	Communication Mode	CAN、RS485	
5	Recommend Charge Voltage	56 ± 0.2 V	
6	Discharge cut-off Voltage	46.4V	
7	Impedance	≤ 30 m Ω (Max)	
8	Charging Mode	CC/CV	Constant Current/Constant Voltage
9	Operating Temperature	-20°C to 60°C	
10	Maximum Charge Current	200A	
11	Maximum Discharge current	200A	
12	Recommend Charge Current	150A	
13	Recommend Discharge Current	150A	
14	Cycle Life	8000 cycle	$\leq 80\%$ DOD

3.3 Functional characteristics

- Highly integrated analog front end
- Adjustable overcurrent protection
- isolated power supply circuit
- has a variety of sleep and wake up modes
- Integrated serial IC
- Low power consumption
- High voltage accuracy ($\leq 10\text{mV}$)
- Dual RS485 communication
- High current accuracy ($\leq 2\%@\text{FS}$)
- The parameter is adjustable
- 4-way battery temperature detection ($\leq 2^\circ\text{C}$)
- Buzzer alarm function
- SOC estimation
- SOH estimation
- LED status indicator
- with charge balancing function
- Short circuit protection

3.4 Panel Operation Instructions



NO.	Description	Silk-screen	Remark
1	Output ON/OFF	ON/OFF	Switch
2	LCD		Display screen
3	Capacity light		
4	ALM alarm indicator light blinking	ALM	Red-trouble-light on
5	Run indicator light	RUN	Display state information
6	ON/OFF button	RESET	Reset key
7	CAN/RS485 port	CAN485	CAN and 485 communication port
8	RS485A port	RS485	RS485connection port-A RS485
9	RS485B port	RS485	RS485connection port-B RS485
10	DC breaker		Breaker
11	Battery -	-/-	Negative terminal
12	Battery +	+/+	Positive terminal

3.5 Communication Interface Defination

3.5.1 Communication Interface Description

② CAN and RS485 Communication

The BMS is equipped with the CAN communication function for battery pack upload, with a baud rate of 500K. The CAN communication interface adopts an 8P8C network cable interface. Through the CAN interface, it can communicate with the inverter or CAN TEST. When battery packs are connected in series, they are connected in series through RS485 communication, and finally the battery pack data, status, and information are uploaded to the PCS through CAN communication.

The BMS also has the RS485 communication function for battery pack upload, with a baud rate of 9600bps. The RS485 communication interface adopts an 8P8C network cable interface. Can only be read, but not edited. When battery packs are connected in series, they are connected in series through RS485 communication, and finally the battery pack data, status, and information are uploaded to the PCS or inverter through RS485 communication.

③ RS485 Communication

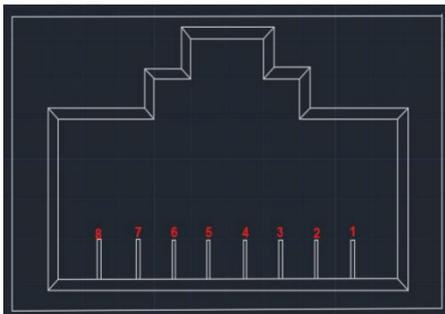
The BMS is equipped with RS485 communication for the battery pack connection, with a baud rate of 9600bps. The RS485 communication interface uses an 8P8C network cable

interface.

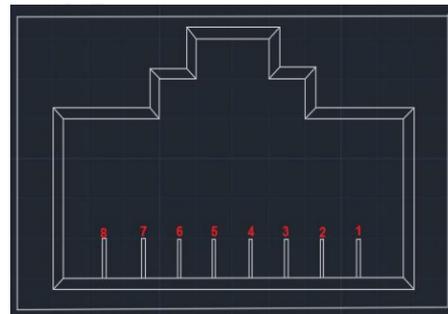
CAN/RS485 -- RJ45 socket		RS485 -- RJ45 socket	
RJ45 pin	Definition specification	RJ45 pin	Definition specification
1、 8	RS485-B	1、 8	RS485-B
2、 7	RS485-A	2、 7	RS485-A
4	CAN-H	3、 6	GND
5	CAN-L	4、 5	NC
3、 6	GND		

CAN-RS485 port

RS485 port



CAN and RS485 port

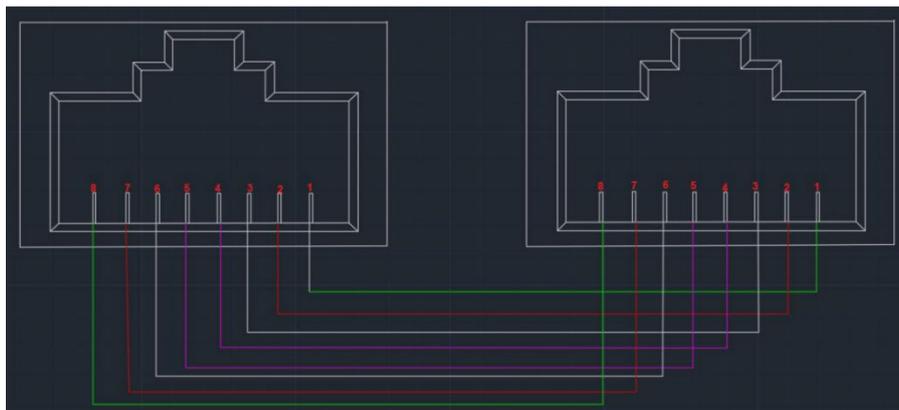


RS485 port

3.5.2 Parallel communication

When multiple machines are connected in parallel, the RS485 interface serves as the communication interface for the parallel machines, while the CAN interface acts as the communication interface for the upper level. The terminal equipment can read the total battery data of all the parallel PACKs through the CAN interface.

When multiple machines are connected in parallel, the connection of the RS485 interface is as shown in the following figure:



4 System Installation

4.1 Preparations Before Installation

4.1.1 Inspections

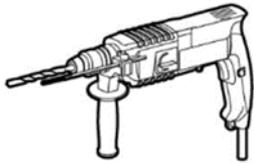
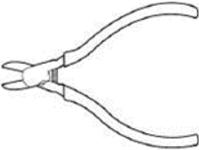
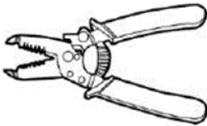
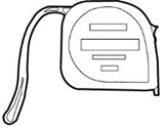
Inspection of outer package

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.

Inspection of deliverables

After opening outer package of the energy storage, check if the deliverable is complete and whether there is any visible external damage. If any items are missing or damaged, please contact us.

4.1.2 Tools

Type	Tools		
Installation tool			
			  
			

4.1.3 Personal Protective Equipment

Do not wear conductive objects such as watches, bracelets, bracelets, rings, and necklaces during installation, operation, and maintenance.

Use special insulation tools during installation, operation, and maintenance. For example, wear insulation gloves, safety marks, safety goggles, safety hats, and safety shoes. As shown in the following picture:

Type		Tools	
Personal Protective Equipment			
			

4.2 Selection of Installation Location

4.2.1 Installation Environment Requirements

Prohibited Installation Areas (Including but not limited to the following):

- Humid environments: such as bathrooms, showers, near swimming pools
- High temperature area: close to heat source, boiler or direct sunlight
- Flammable and explosive places: gas stations, chemical storage areas
- Confined space: unventilated basement, small storage room



It is prohibited to install in closed, unventilated, lack of fire protection facilities or difficult for fire personnel to reach the place.

NOTE: Do not install them in a place that is easy to touch.

Do not install in areas where flammable and explosive materials are stored.

Do not install it outdoors in areas with salt damage..

Do not install in the place where children can touch.

Recommended installation conditions:

Argument	Demand
Operating temperature	-20°C ~ 60°C
Storage temperature	-20°C ~ 60°C
Working humidity	15%~85%
Storage humidity	15%~85% (non-condensing)
Altitude	≤2000 m (if the altitude exceeds the threshold for derating)

4.2.2 Installation Space Requirements

Floor Mount: The battery should be placed in the right position first, and the installation site should be smooth, and the product does not require installation.

5 System Debugging

5.1 Inspections Before Power-on

- Prior to installation, unpacking to check the quantity of the parts and battery appearance.
- Measure the battery voltage with a multimeter. The general factory voltage of the battery is 50V-53V.
- Prior to wiring, check the anode and cathode of the battery and the anode and cathode terminals shall not be connected reversely.
- Before the battery is connected with the externally connected equipment, make the equipment in a disconnected state, check whether the connecting polarity of the battery and total voltage are correct, connect the battery anode with the equipment anode and battery cathode with the equipment cathode and fix the connecting line.
- Do not put any article made of the metal conductive material together with the battery or assemble it into the battery box.

5.2 Power-On of Battery Module

5.2.1 Power-on Sequence

After the battery is connected to the inverter, please power on in the following order.

First, Turn on the breaker switch, if there are multiple battery modules, turn on all the breaker switches.

Secondly, turn on the battery switch button and the battery starts to work. If there are multiple modules, please turn on the power switch one by one according to the address sequence.

5.2.2 System Status Indication



System state	Running state	RUN	ALM	SOC				Note
Shut down	Sleep	OFF	OFF	OFF	OFF	OFF	OFF	Standby status
Steady	Normal	Flash1	OFF	OFF	OFF	OFF	OFF	Standby status
Charge	Normal	Solid Green	OFF	According to battery indicator				Highest LED flash 2
	Alarm	Solid Green	Flash2	According to battery indicator				Highest LED flash 2
	Oversvoltage protection	Flash1	OFF	OFF	OFF	OFF	OFF	
	Temperature, Overcurrent protection	Flash1	Flash1	OFF	OFF	OFF	OFF	
Discharge	Normal	Flash3	OFF	According to battery indicator				According to battery indicator
	Alarm	Flash3	Flash3	According to battery indicator				
	Temperature, overcurrent, short current protection	OFF	Solid Green	OFF	OFF	OFF	OFF	Stop discharging, forced dormancy without action after 48h when the mains is offline
	Under-voltage Protection	OFF	ON	OFF	OFF	OFF	OFF	Stopping Discharge

LED blinking description:

Flash	LED ON	LED OFF
Flash1	0.25s	3.75s
Flash2	0.5s	0.5s
Flash3	0.5s	1.5s

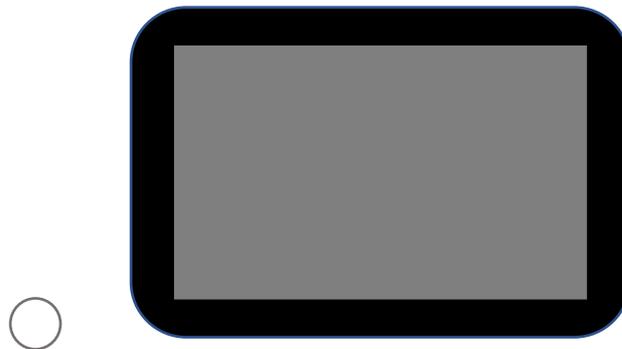
5.2.3 Capacity Indicator

Capacity indicator LED	SOC
	0% ~ 25%
	25% ~ 50%
	50% ~ 75%
	$\geq 75\%$

5.2.4 LCD Screen

5.2.4.1 Page Introduction

The main screen interface of this BMS is composed of a touch panel and switches.



5.2.4.2 Detailed Information

1.Functional Specifications:

Main page

After power-on activation, the battery management interface will be displayed, as shown in the following figure:



Icon Description

- 1) Tap  to switch to Chinese, tap  to switch to English and so on;
- 2) Tap  to enter the PACK parameter page.

PACK Parameter Page

On the current page, you can see the main parameters of each PACK under this system, as shown in the following figure:



Icon Description

- 1) Tap  to return to the main page;
- 2) Tap  to view other PACK parameters, as shown in the figure below:
- 3) Tap  to view the detailed parameters of PACK 1 (the same applies to other PACKs), as shown in the following picture:



- 4) Tap  to return to the previous page;
- 5) Tap  or  can view "Alarm" and "Protection" information, as shown in the following figure:



Switching of the agreement page

1) Click on the main page  to enter the protocol switching page, as shown in the following picture:



2) Touch  /  Selectable Protocol, as shown in the following figure:



3) Once you tap  to confirm, the page will return to the main page.

5.2.4.3 Term Description

BMS: Battery Management System
 SOC: State of Charge
 SOH: State of Health
 SCP: Short Circuit Protection
 OTP: Over-Temperature Protection
 UTP: Under-Temperature Protection
 OC: Over-Current

OCP: Over-Current Protection
 UV: Under-Voltage
 UVP: Under-Voltage Protection
 OV: Over-Voltage
 OVP: Over-Voltage Protection
 OT: Over-Temperature
 OTP: Over-Temperature Protection

5.2.4.4 Battery Communication Protocol

The supported inverter communication protocols are as follows, and will be continuously updated.

Inverter brand	CAN protocol	Inverter brand	485 protocol
Goodwe	√	SRNE	√
JINLANG	√	Deye	√
Sungrow	√	Growatt	√
Chint	√	SMK	√
Senegy	√	Voltronic	√
Sofar	√	Chisage	√
Aiswe	√	MPP Solar	√
Growatt	√	Easun	√
SMA	√	Epever	√
Victron	√	Bentterson	√
Hoymile	√	Xindun	√
Luxpower	√	Techfine	√
Aotai	√	CVTE	√
Sol-Ark	√	Given	√
Studer	√	NEXT	√
TBB	√		
Deye	√		
Sunsynk	√		
LYVOLTEK	√		
Soroups	√		
MEGAREVO	√		
Afor	√		
MUST	√		
INVT	√		
RENAC	√		
Each	√		
Oulu	√		
Hanon	√		
Hypon	√		

5.3 Bluetooth Function

Users can connect to the Bluetooth via the SN code to view the device information in a close-range manner.

5.3.1 Download Method

Andriod download :

download marvel tech application



5.4 Sleep Mode

Automatic sleep:

In the absence of external charging and discharging, the battery automatically enters a sleep state for 48 hours. When the battery pack is over-discharged and requires protection, it maintains communication for 1 minute, and the BMS enters the sleep state.

Manual Sleep:

- 1) By manually pressing the 6S reset button, the 6 LED lights will light up one by one, and the BMS will enter sleep mode.
- 2) The power on/off can be controlled by an external switch. When the switch is closed, the device will power on; when the switch is open, the device will power off.
- 3) The standby sleep mode can be set through the upper computer.

6 Electrical Connection



Before electrical connection, please ensure that the switches of the energy storage are in the "OFF" state. Otherwise, the high voltage of the device may cause electric shock.



The operations related to electrical connections must be carried out by professional electrical technicians. When carrying out electrical connections, the operator must wear personal

6.1 Preparation of Cables

NO.	Cables	Description	Recommended specifications	Source
1	Power Cables	Used for the charging and discharging connection of the equipment		Provide with the product together
2	Signal Line	Signal cable between battery modules or between battery and inverter		Provide with the product together

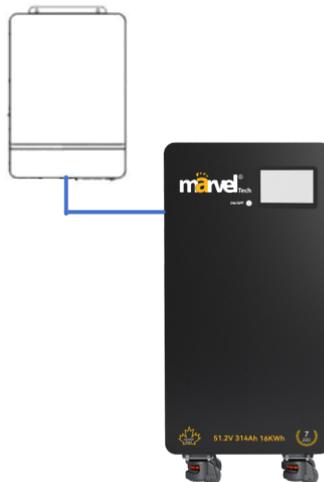
6.1.1 Connecting Power Cord

When connecting the battery wiring, please make sure that the battery switch is off and the indicator light is off.



6.1.2 Connecting Signal Line

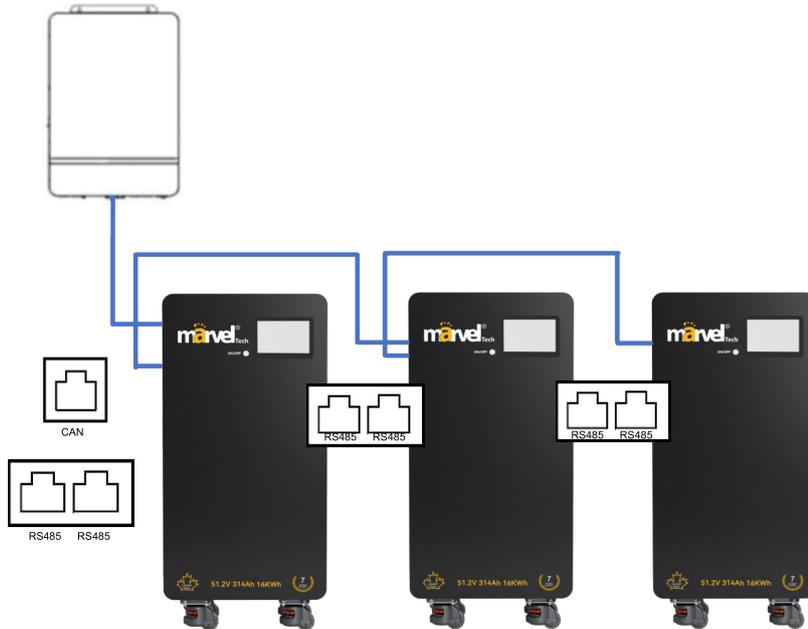
The signal line shall be used to connect RS485-Inverter interface for battery module and inverter. The communication port of the some brand inverter needs to be connected to the RS485 interface.



6.2 Electrical Connection Of Multiple Battery Modules

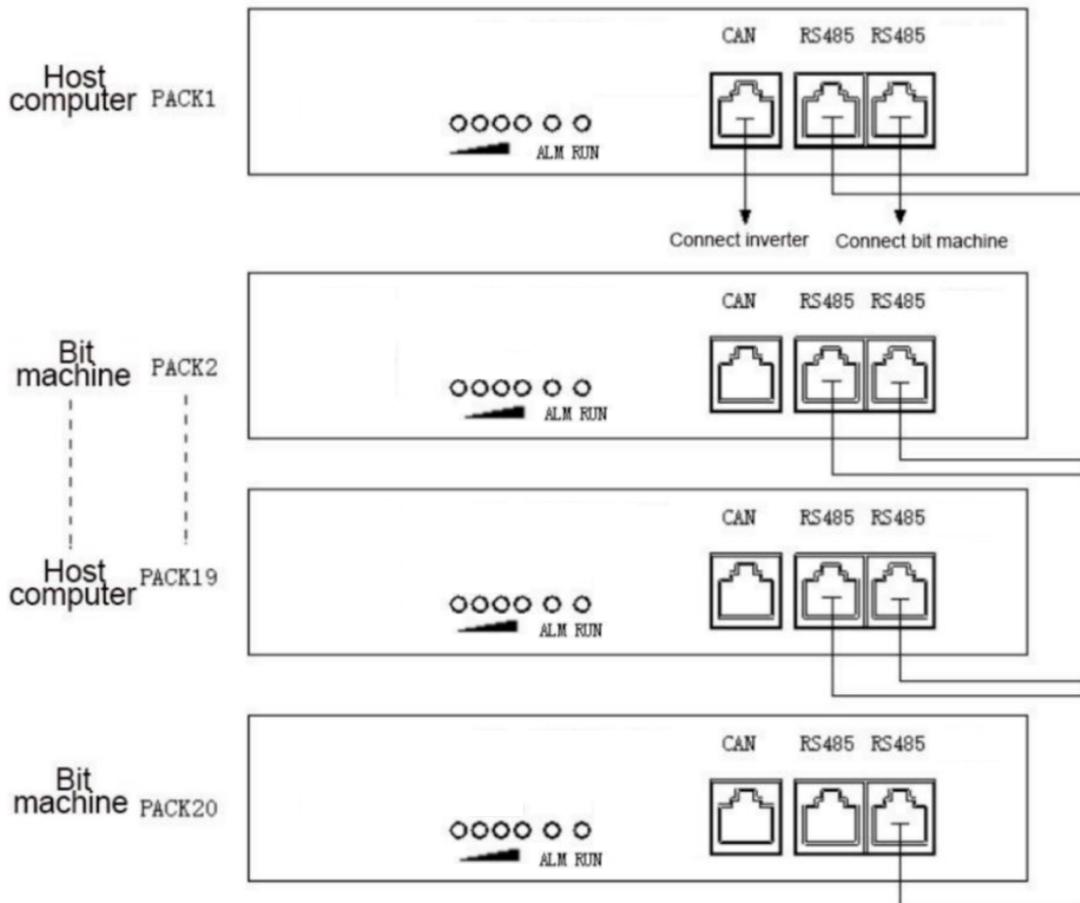
6.2.1 Connecting Signal Line

If there are multiple batteries, you need to connect the communication line of each battery. Battery and battery connection use RS485-RS485 interface, battery and inverter connection need RS485-Inverter interface.



Connection method

When batteries are connected in parallel, the connection method of the RS485 interface is as follows:



NOTE: Due to the need to maintain the consistency of interface definitions, the connection lines between the inverter and the battery CAN only be connected to the RS485 and CAN interface when connecting the battery.

Communication interface definition

Communication	Interface Type	Instruction	
RS485	RJ45	1,8-RS485B 2,7-RS485A 3,6-GND 4,5-internal communication	
RS485/CAN	RJ45	1-RS485B 2-RS485A 3-GND 4-CANH	5-CANL 6-GND 7-RS485A 8-RS485B

6.2.2 Energy Storage Battery Module Address Setting

This machine uses an automatic code-pushing method. For detailed operation instructions, please refer to Section 6.2.1 - "Connection Method".

7 System Maintenance

Scheduled maintenance:

- Monthly: Check vents for blockage
- Quarterly: Clean the dust on the surface of the device
- Each year: A professional conducts a system health check

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 indicator of the energy storage battery is correct.

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 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.

NOTE: 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.

8 Faults Handling

Symptom	Possible causes	Solution
The indicator light and LCD does not work	Battery is sleeping mode	Press the power button to wake up
The indicator is blinking red	The battery is too warm	Suspend the service and contact after-sales service
The battery cannot be charged	The charger is improperly connected	Check that the cable connector is secure
Battery overcurrent protection fault	The current is too high.	Pause the machine for five minutes and then adjust the current.
APP communication was interrupted	Due to the obstruction at the scene, the signal became unstable.	Re-search the device, refresh the device list.

9 Safety Information

- The equipment should be stored in a dry, well-ventilated and clean environment.
- The installation and usage environment must comply with international, national and local standards related to lithium-ion batteries, and local laws and regulations must be followed.
- To prevent battery short circuits, do not directly connect the positive and negative terminals of the battery. Maintenance of the battery while it is powered on is prohibited.
- To avoid battery damage or fire, prevent the battery from mechanical vibration, dropping, collision, puncture or strong impact. To prevent overheating or electrolyte leakage, ensure that the battery terminals do not come into contact with other metal objects.
- Disassembling, modifying or damaging the battery is prohibited, such as inserting foreign objects into the battery, squeezing the battery or immersing it in water or other liquids.
- Do not use damaged batteries (such as those damaged by dropping, collision, swelling or shell denting), as such damage may cause electrolyte leakage or release of flammable gas. If electrolyte leakage or battery deformation occurs, immediately contact the installer or professional maintenance personnel to remove or replace the battery. Damaged batteries should not be stored near other equipment or flammable materials and kept away from non-professionals.
- The equipment operates at a relatively high temperature. Do not install it in easily

accessible locations. To prevent fires caused by high temperatures, do not block the ventilation holes or the cooling system.

- In backup power scenarios, do not use the power supply for medical equipment, control equipment, computer systems of public importance, near medical equipment or other similar devices.

10 Emergency Guide

If the battery smokes or catches fire, evacuate immediately and call the fire department. Professional personnel should handle the situation on site. Firefighters need to wear heat-resistant equipment. After extinguishing the fire, continue to spray water to cool down and monitor for 24 hours. Before disassembling, ensure there are no signs of temperature rise. Disassembled batteries should be placed in a fire sand box or salt water.

In case of electric shock, immediately cut off the power supply, wear professional insulating equipment and use insulating tools to separate the victim from the power source. If the injury is severe, call for medical rescue immediately. Contact the distributor or installer to dispatch professional maintenance personnel to troubleshoot.

If the battery leaks, stop the operation of the energy storage system immediately, evacuate to a safe area and contact professional personnel for handling. Avoid contact with the electrolyte and released gas.

After the battery fire is extinguished, the battery should be handled by professional personnel. Fire water may cause pollution. Please notify the environmental protection department for disposal.

11 Product Dimensions and Packaging

11.1 Product Dimensions

The external dimensions of the energy storage battery module and power module are 929.73*443*245mm.

