PAC TECHNOLOGY CO.,LTD

User Manual

Home Storage Battery

Model:

PAC-5KWH(48V/51.2V 100Ah)

PAC-7KWH(48V/51.2V 150Ah)

PAC-10KWH(48V/51.2V 200Ah)

PAC-15KWH(48V/51.2V 300Ah)

PAC-20KWH(48V/51.2V 400Ah)

Contents

1.Safety Precautions

- It is very important and necessary to read the user manual carefully before installing or using the battery. Failure to follow any of the instructions or warnings in this document can result in electrical shock, serious injury, death, or may damage the battery and the whole system.
- If the battery is stored for a prolonged time, it is required that they are charged every three to six months, and the SOC should be no less than 80%.
- The battery needs to be recharged within 12 hours, after fully discharging.
- All battery terminals must be disconnected before maintenance.
- Do not expose cable outside.
- Do not use cleaning solvents to clean the battery.
- Do not expose the battery to flammable or harsh chemicals or vapors.
- Do not paint any part of the battery, include any internal or external components.
- Do not connect battery with PV solar wiring directly.
- Any foreign object is prohibited to be inserted into any part of the battery.
- Any warranty claims are excluded for direct or indirect damage due to items above.

1.1.Before Connecting

- After unpacking, please check the battery and packing list first. If the battery is damaged or spare parts are missing, please contact the dealer.
- Before installation, be sure to cut off the grid power and make sure the battery is in the turned-off mode.
- Wiring must be correct, do not mix-connect the positive and negative cables, and ensure no short circuit with the external device.
- It is prohibited to connect the battery with AC power directly.
- The embedded BMS in the battery is designed for 48VDC/51.2VDC, please DO NOT connect battery in series.
- It is prohibited to connect the battery with different type of battery.
- Please ensure the electrical parameters of battery system are compatible to inverter.
- Keep the battery away from fire or water.

1.2.During operation

- If the battery system needs to be moved or repaired, the power must be cut off first and the battery must be completely shut down.
- It is prohibited to connect the battery with different type of battery.
- It is prohibited to put the batteries working with faulty or incompatible inverter.
- In case of fire, only dry powder fire extinguisher can be used, liquid fire extinguishers are prohibited.
- Please do not open, repair or disassemble the battery. We do not undertake any consequences or related responsibility due to violation of safety operation or violating of design, production and equipment safety standards.

2.Battery Specifications

Battery Specifications					
Model No.	PAC-5KWH	PAC-7KWH	PAC-10KWH	PAC-15KWH	PAC-20KWH
Nominal Parameters					
Nominal Voltage	48V/51.2V	48V/51.2V	48V/51.2V	48V/51.2V	48V/51.2V
Nominal Capacity	100Ah	150Ah	200Ah	300Ah	400Ah
Energy	4.8kWh/5.12kWh	7.2kWh/7.68kWh	9.6kWh/10.24kWh	14.4kWh/15.36kWh	19.2kWh/20.48kWh
Dimensions (H x L x W)	680x480x180(220)mm			920x730x235mm	
Weight	58.5kg/60.5kg	75kg/78kg	96.5kg/105.5kg	140kg/150kg	235kg/250kg
Basic Parameters					
Life time(25°C)	15~20 years				
Life cycles(80% DOD, 25°C)	6000 Cycles				
Storage time / temperature	5 months @ 25°C; 3 months @ 35°C; 1 month @ 45°C				
Operation temperature	-20°C to 60°C @60+/-25% Relative Humidity				
Storage temperature	0°C to 45°C @60+/-25% Relative Humidity				
Battery standard	UL1973/UL2580(CELL), IEC62619, UN38.3, CE-EMC				
Enclosure protection rating	IP21				
Electrical Parameters					
Operation voltage	42-54 Vdc/44.8-57.6 Vdc				
Max. charging voltage	54 Vdc/57.6 Vdc	54 Vdc/57.6 Vdc	54 Vdc/57.6 Vdc	54 Vdc/57.6 Vdc	54 Vdc/57.6 Vdc
Max. constant charging/discharging current	100A	100A	100A	200A	200A
Photo					

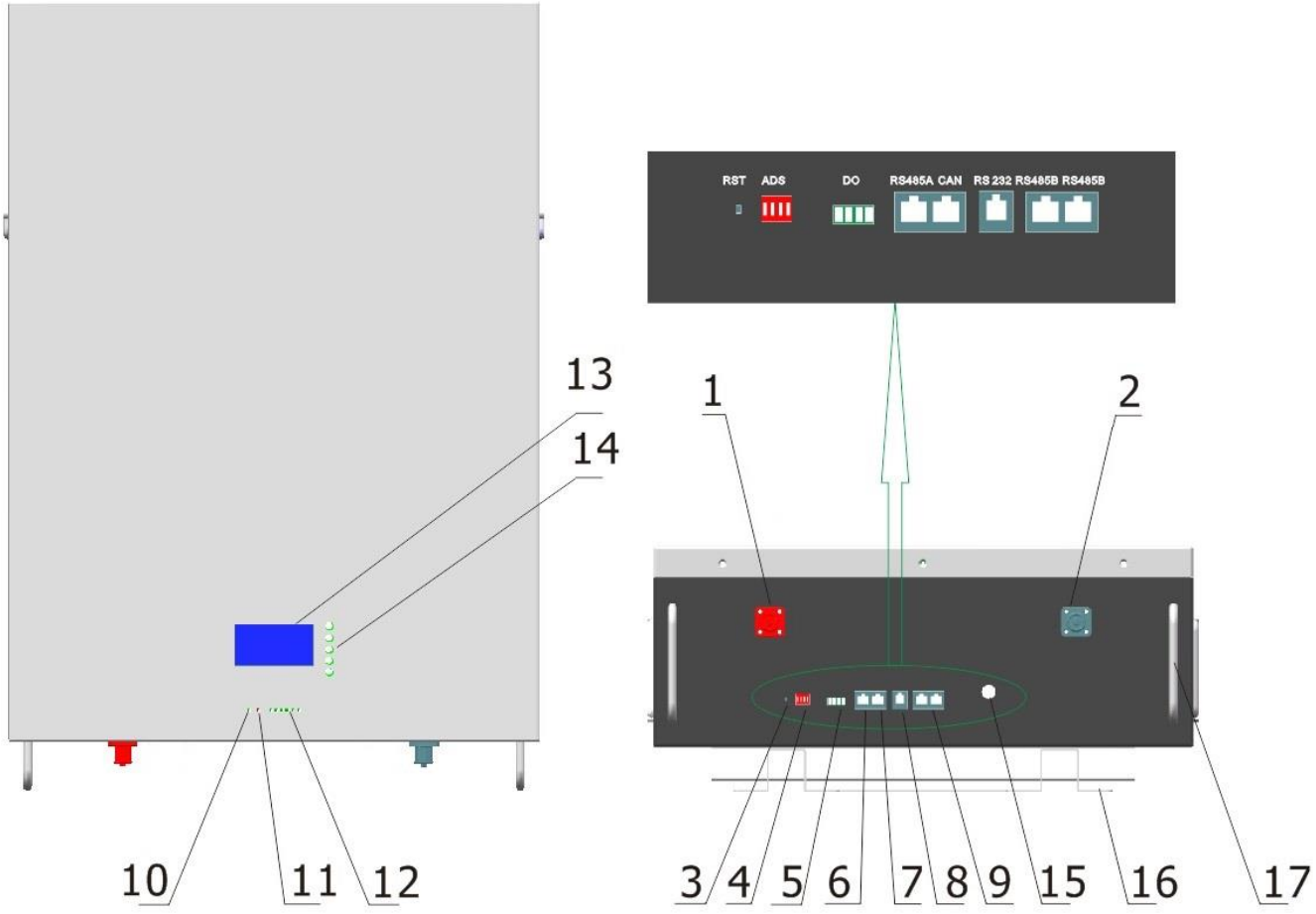
3.Introduction to the battery

3.1.Key Features

- LiFePO4 composition – provides exceptional safety and longevity
- High safety and reliability
- 6,000cycles/more than 15 years' service life
- Consistent performance over wide temperature range
- Wall-mounted/Wheel stand, convenient installation
- Integrated state-of-the-art BMS to manage and monitor battery information including voltage, current and temperature as well as balance cell charging/discharging rates
- 5-10 years warranty

3.2.Interface Introduction

- This section details the interface functions of front and back panel.
- Front interface:



No.	Description	Silk-screen	Remark
1	UES0800	P+	Output terminal

2	UES0800	P-	Output terminal
3	port Reset button	RST	Reset the battery
4	Dial switch	ADS	Set the address
5	Do		
6	RS485A Port	RS485A	**RS485 and inverter connection port**
7	CANbus Port	CAN	**CANbus and inverter connection port**
8	RS232 Port	RS232	RS232 communication port
9	RS485B port	RS485B	RS485 parallel communication interface
10	LED	RUN	Operation indicator
11	LED	ALM	Alarm indicator
12	LED	CAPACITY	Capacity indicator
13	LCD		
14	LCD Key		
15	switch		
16	Bracket		
17	Handle		

3.3. SOC Indicator & Status Indicator Guides

● Chart 1: Battery Status

Status	Normal/ Warning/ Protection	RUN	ALM		Capacity LED					Description
										
Shut Down	Shut down	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	All OFF
Standby	Normal	Flash	OFF	OFF	OFF	OFF	OFF	OFF	OFF	Standby
Charge	Normal	ON	OFF	Based on capacity						
	Warning	ON	Flash							
	Protection	ON	ON							
Discharge	Normal	ON	OFF	Based on capacity						
	Warning	ON	Flash							
	Protection	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	UVP,OCP…
Fault	Protection	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	Stop charging or discharging

● Chart 2: Battery Capacity

Status		Charging						Discharging					
Capacity LED Indicator		L6	L5	L4	L3	L2	L1	L6	L5	L4	L3	L2	L1
Capacity	0～16.6%	OFF	OFF	OFF	OFF	OFF	Flash	OFF	OFF	OFF	OFF	OFF	ON
	16.6～32.2%	OFF	OFF	OFF	OFF	Flash	ON	OFF	OFF	OFF	OFF	ON	ON
	32.2～49.8%	OFF	OFF	OFF	Flash	ON	ON	OFF	OFF	OFF	ON	ON	ON
	49.8～66.4%	OFF	OFF	Flash	ON	ON	ON	OFF	OFF	ON	ON	ON	ON
	66.4%～83%	OFF	Flash	ON	ON	ON	ON	OFF	ON	ON	ON	ON	ON
	83%～100%	Flash	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
RUN Status		ON						Flash					

3.4.Connectors

Charge / Discharge connectors: to connect the positive pole (+) and negative pole (-) from the battery to the inverter via DC isolator.

Canbus/RS485: Active communication portal between battery and inverter.

USB To RS232: to get dynamic monitoring data of the battery from upper computer.

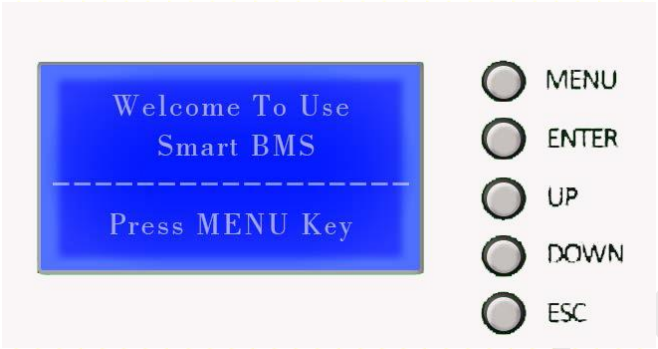
Address: Reserved Address portal for multiple parallel connections.

3.5.Wake Up button

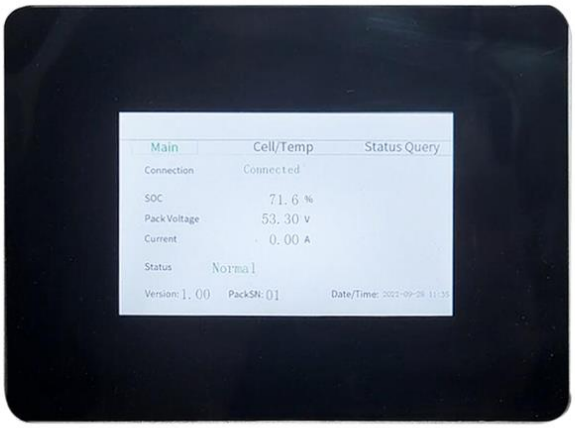
- Switch on: When battery is shut down, press the ON/OFF button for 3 seconds. It is activated when the LED lights flicker from RUN light to the lowest capacity indicator.
- Switch off: When battery is activated, press the ON/OFF button for 3 seconds. It will be shut down when the LED lights flicker from lowest capacity indicator to RUN light.
- RESET Key: Press RST key for 6 seconds, reset BMS, then clear all abnormal states; Press RST key for 3 seconds, with shutdown and boot function.
- Different LCD version can be applied as per request --- Normal press LCD or finger touch LCD.

3.6.Display function instruction(Press Key LCD Type/Finger Touch LCD)

3.6.1. Reference of real figure(Press Key LCD Type)



3.6.2. Reference of real figure(Finger Touch LCD)

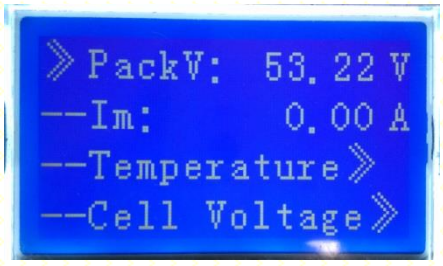


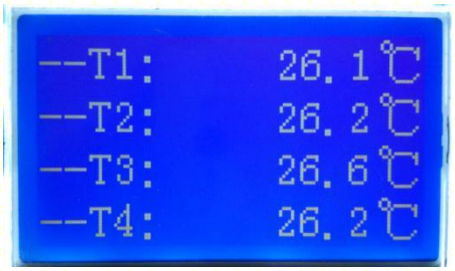
3.6.3. Functional Specifications

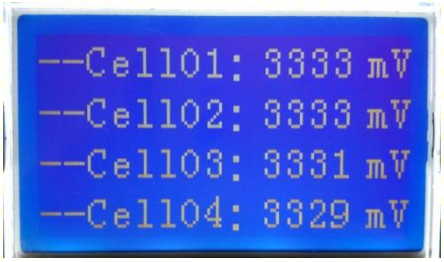
- Interface introduction
- Main menu page
- Electricity/dormancy activated, will show the welcome screen, press the MENU button to enter the main menu page. As shown in the figure below：

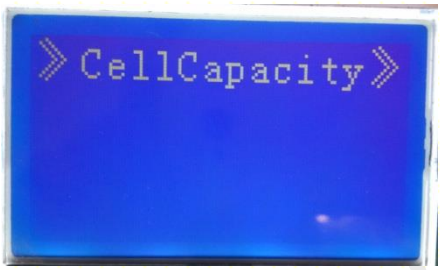
- Battery parameters collection page

When the cursor "》"is point to "Battery Parameters Acquisition"， press ENTER key will enter into the page of "Battery Parameters Acquisition"， As shown in the figure below：



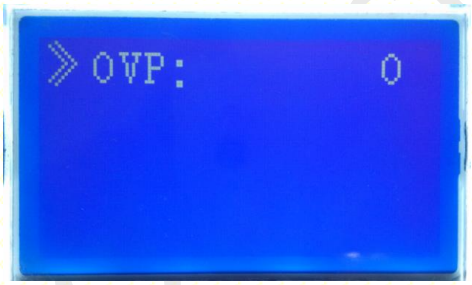




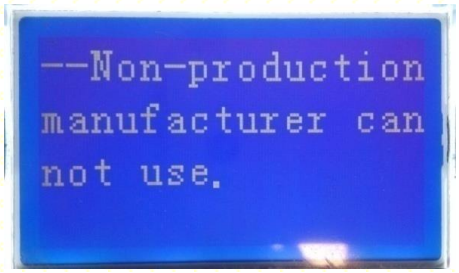


- Battery status page

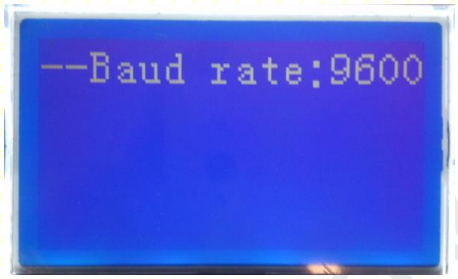
When the cursor "》"is point to "Battery Status", press ENTER key will enter into the page of "Battery Status", As shown in the figure below：



- Parameter Settings
  Screen can not set parameters



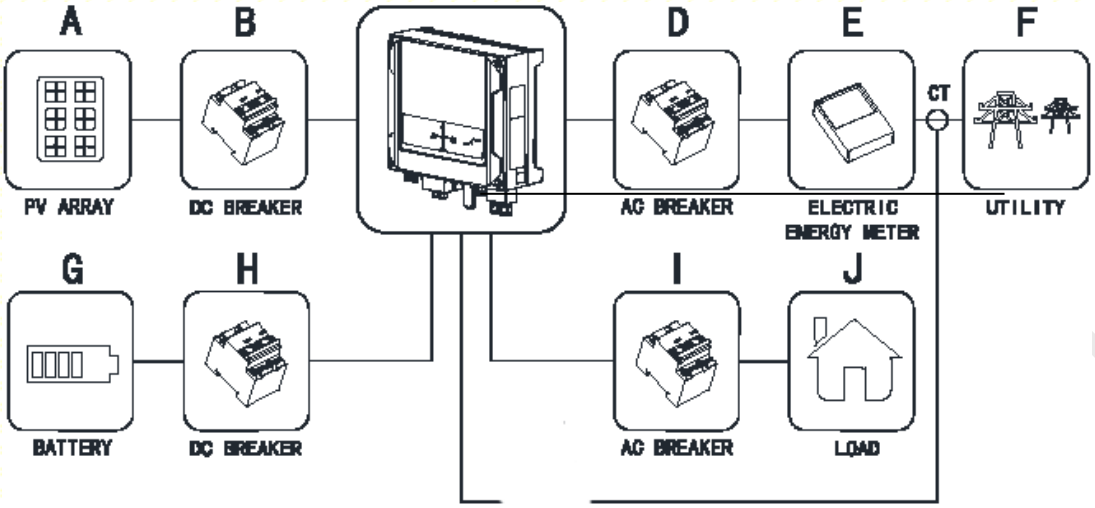
- System Settings Page
  Baud Rate：9600 do not set



- Key description
  1) SW1----NEMU，SW2----ENTER，SW3----UP，SW4----DOWN， SW5----ESC.
  2) Each item is "》" or "--" as a beginning, among them "》" shows the current cursor position, press UP or DOWN key can move the cursor position; with "》" end of the project, the content of the said project is not shown, press ENTER key can enter the corresponding page.
  3) Press ESC key can return to the next higher level directory; In any position, press NEMU key can return to the main menu page.
  4) In a dormant state, press any key, can activate the screen.
- Dormancy/shutdown
  Under normal operation condition, with no keystrokes 1 minutes later, system will enter a state of dormancy/shutdown; At shutdown/dormancy state, press any key, screen can be activated.

4. Safe handling guide

4.1.System Diagram



4.2.Tools

The following tools are required to install the battery pack:

- Wire cutter
- Crimping Modular Plier
- Screw Driver

NOTE

- Use properly insulated tools to prevent accidental electric shock or short circuits.
- If insulated tools are not available, cover the entire exposed metal surfaces of the available tools, except their tips, with electrical tape.

4.3.Safety Gear

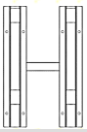
It is recommended to wear the following safety gear when dealing with the battery pack:

- Insulated gloves
- Safety goggles
- Safety shoes

5.Installation

5.1.Inventory of items

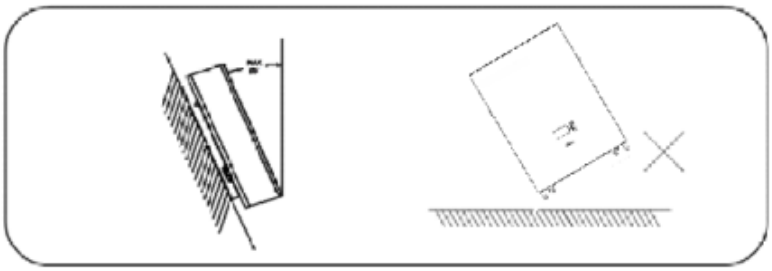
Thoroughly inspect the packaging upon receipt of goods. If there is any item that is missing or if there is any damage to the external packaging or to the unit itself upon unpacking, please contact us immediately.

Photo	Item	Quantity	Specification	Remark
	Battery Pack	1 pc	5kWh/7kWh/10KWh/15kWh/20kWh	As per order
	Mounting frame	1 pc	SPCC	The Wheel stand battery does not contain this item
	Mounting frame screw	12 pcs	M8*60mm	
	Power Cable	2 pcs	2m length, 35m2 cable, 160A connector; waterproof battery connector & M8 connector	
	CANbus/RS485 Communication cable	1 pc	1.6m length	Battery & inverter communication
	Parallel communication cable	1 pc	1m length	Battery parallel connection
	User Manual	1 set	This document	
	Junction box	1 pc	Support 400A current; including power cables and screws	**Optional**

5.2.Installation Location

Make sure that the installation location meets the following conditions:

- The installation site must be suitable for the size and weight of the battery.
- Must be installed on a firm surface to sustain the weight of battery.
- The area is water proof.
- There are no flammable or explosive materials in proximity.
- The ambient temperature is within the range from 0°C to 45°C.
- The temperature and humidity is maintained at a constant level.
- There is minimal dust and dirt in the area.
- Installation must be vertical or tilted backwards by maximum 15° - avoid forward or sideway stilt.



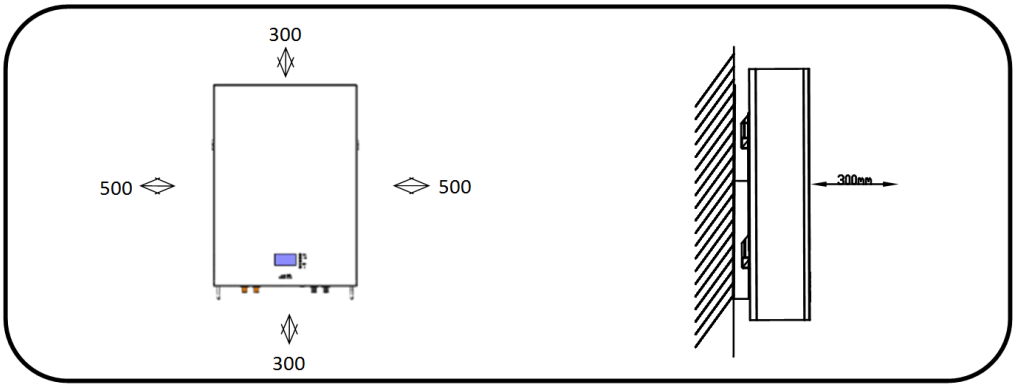
CAUTION

If the ambient temperature is outside the operating range, the battery pack stops operating to protect itself. The optimal temperature range for the battery pack to operate is 0°C to 45°C. Frequent exposure to harsh temperatures may deteriorate the performance and life of the battery pack.

5.2.1.Minimum clearances

Observe the minimum clearances to walls, other batteries or objects as shown in the diagram and picture below in order to guarantee sufficient heat dissipation.

Direction	Minimum clearance (mm)
Above	300
Below	300
Sides	500
Front	300



5.3.Installing the Battery Pack

5.3.1.Mounting to a wall

WARNING

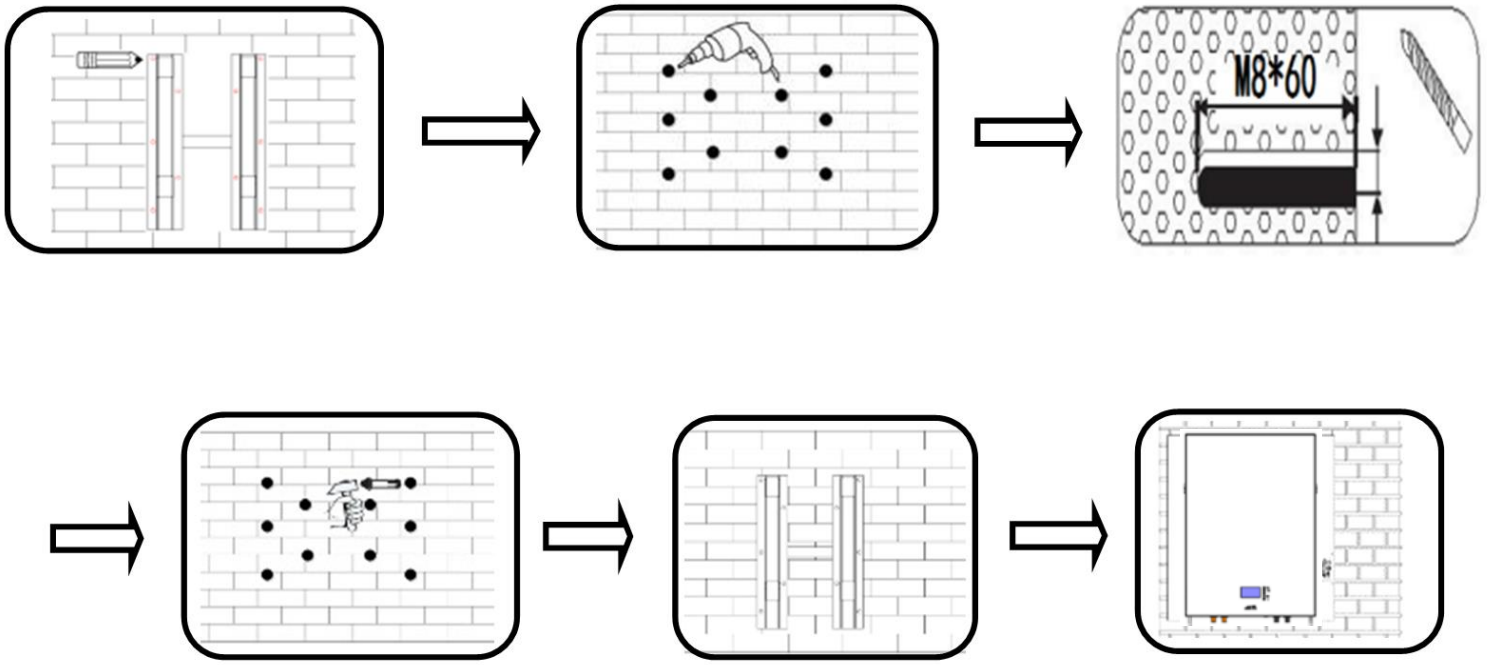
In order to avoid electrical shock or other injury, inspect existing electronic or plumbing installations before drilling holes.

The battery is heavy, please handle with care to avoid damage to the product or injury to the installer.

1. Choose suitable firm wall with thickness greater than 80mm.
2. Use the mounting frame as a template, mark the hole position.
3. Drill 8 holes according to the hole position, it is ø10 with depth 60mm.
4. Hammer the M8 screws to the above holes, and screw the nut. Note: Do not position screws flush to the wall - leave 10 to 20 mm exposed.

5. Fix the mounting frame to the 8 screws.

6. Raise the battery a little higher than the mounting frame whilst maintaining the balance of the battery. Hang the battery on the frame through the match hooks.



WARNING

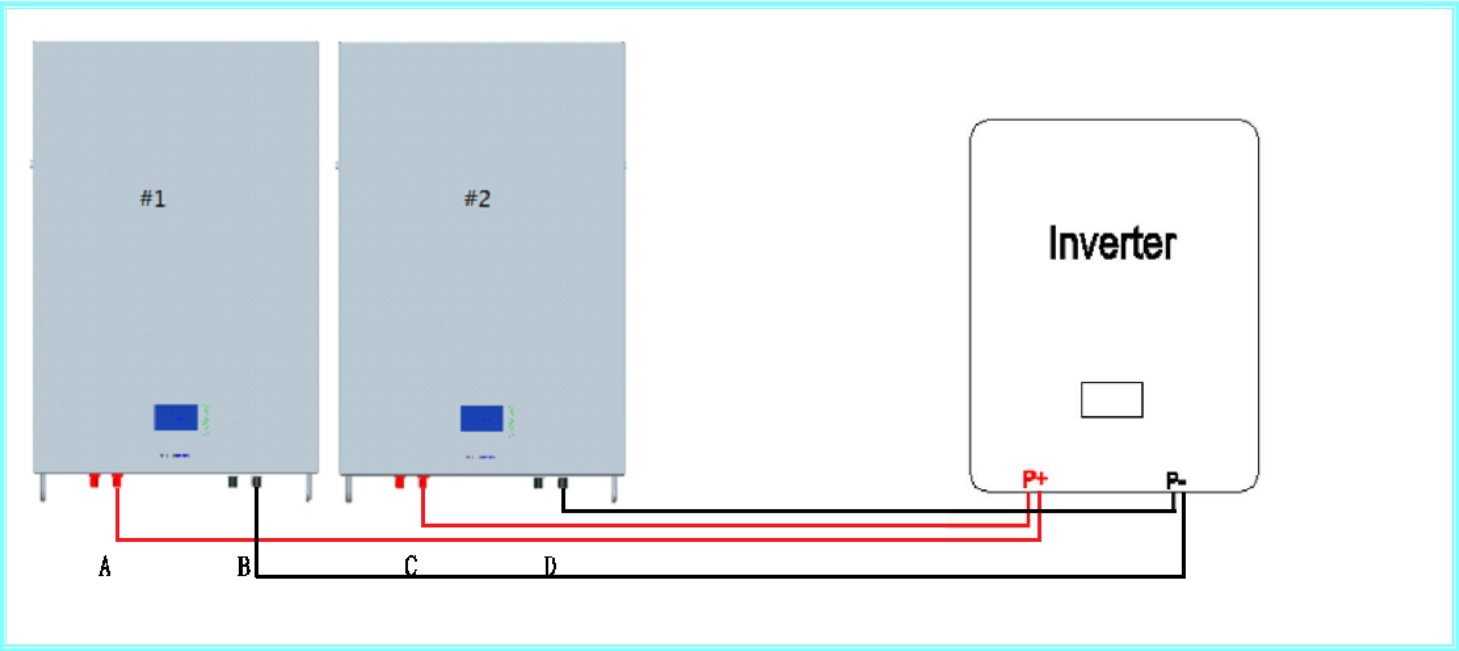
Falling equipment can cause serious or even fatal injury: never mount the battery on the bracket unless you are sure that the mounting frame is firmly mounted on the wall after thorough checking.

5.4. Parallel use of battery

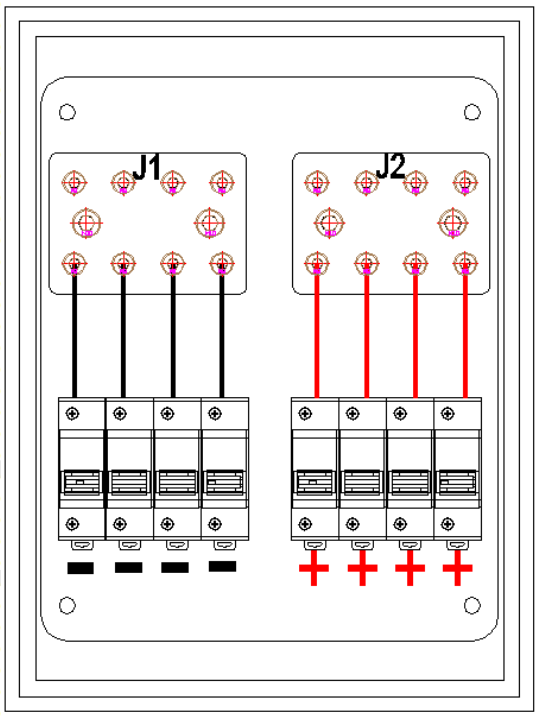
When the battery needs to be used in parallel, the maximum connection is 15 units, but we recommend to use 2-4 units according to application. The application needs power and communication connections as below, choose suitable accessories:

5.4.1.Power connection

Two UNITS Parallel Connection Diagram



For 3 or more batteries, use an additional junction box (not included in the standard pack) to combine the power flow of all batteries. Let's take 4 batteries for example:



Combiner box

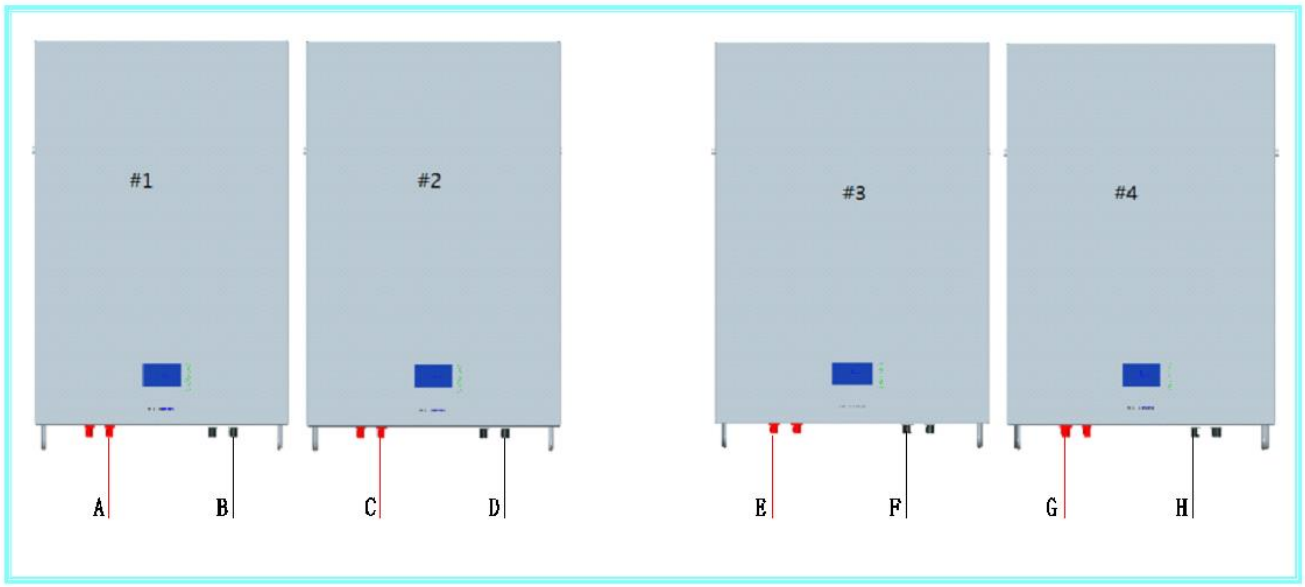
1. Please refer to the figure below to connect the positive output line A.C.E.G. of the battery terminal and the negative output line B.D.F.H of the battery terminal.

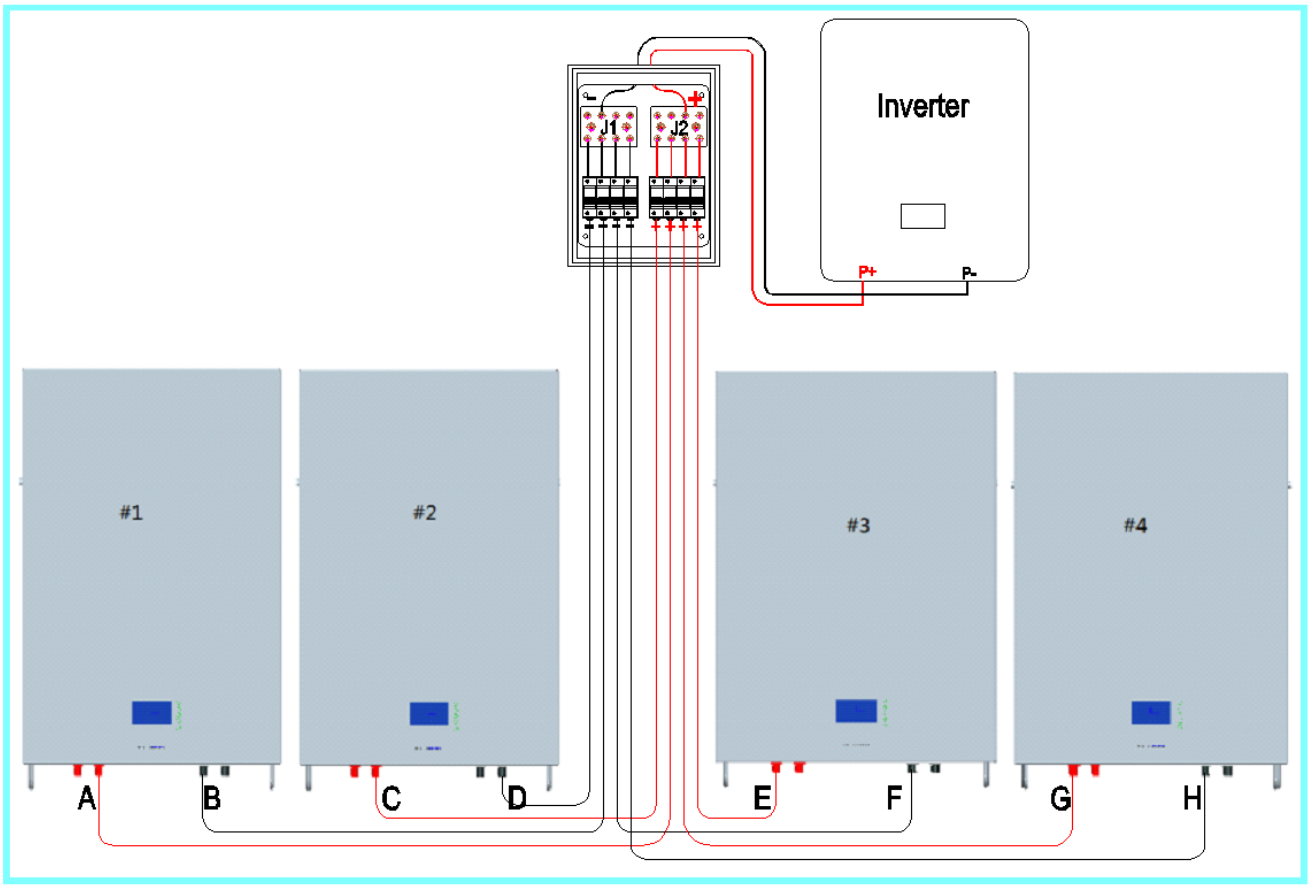
2. The other end of the battery, positive A.C.E.G., is connected to the leakage switch of the combiner box. The negative B.D.F.H is connected to the leakage switch of the combiner box.

3. Connect J1 with inverter's negative pole.

4. Connect J2 with inverter's positive pole.

5. Add suitable isolators when necessary.

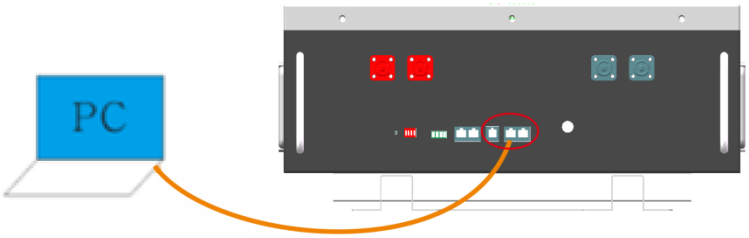




5.4.2.Communication connection diagram and ADS guide Line

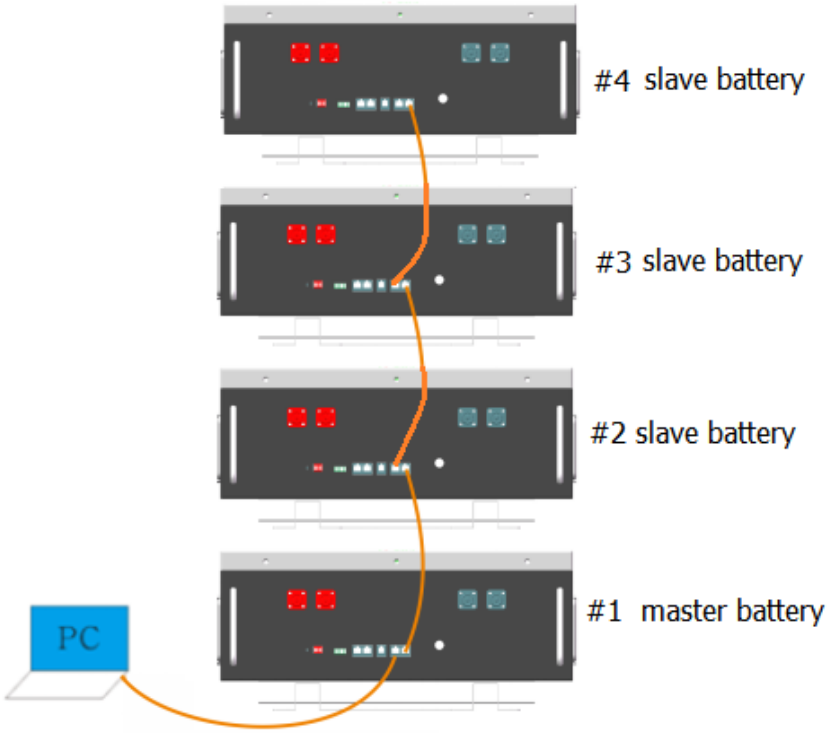
5.4.2.1 Battery and PC communication(note: insert the RS485B port)

1) Stand-alone communication



Rs232 and Rs485 two communication modes

2) Parallel communication



RS485/USB Communication cable

5.4.2.2 Inverter and PC communication (note: insert the RS485A or CANBUS port)

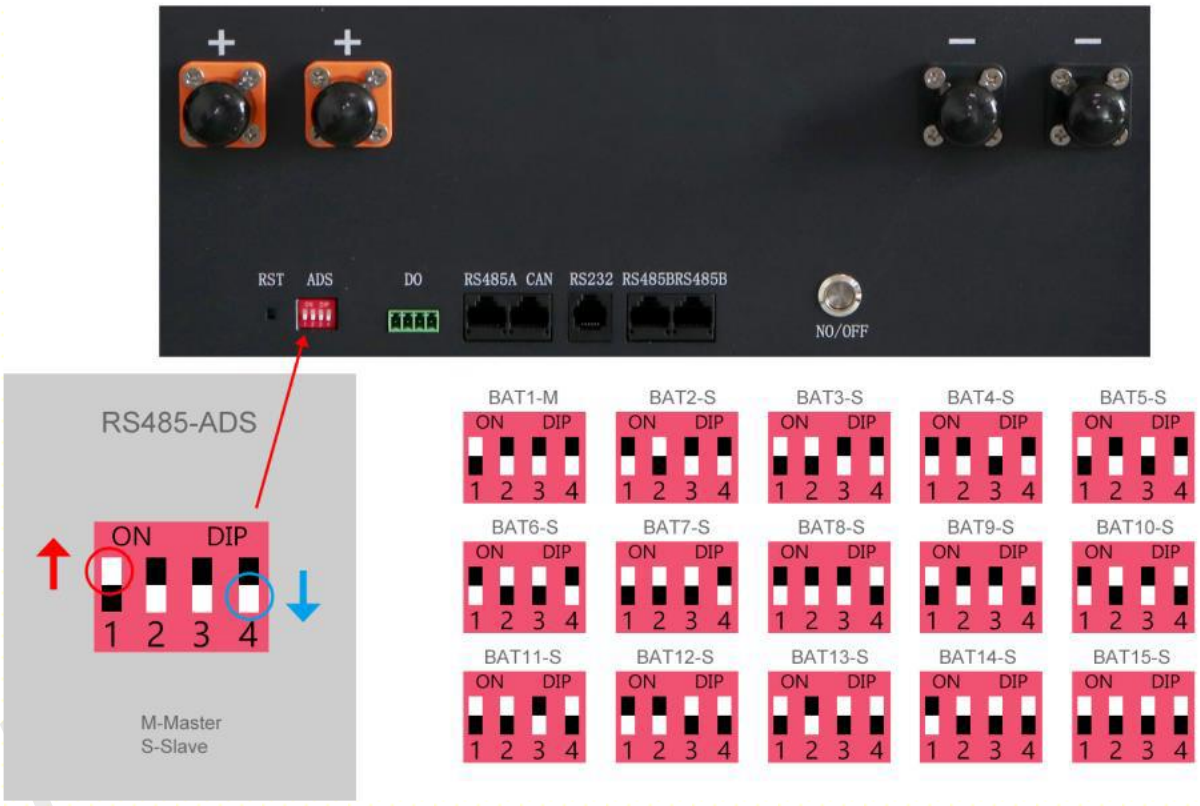
1) Stand-alone communication

2)Parallel communication

Note: When the single unit is used, the inverter communicates with the battery as the host;
When multiple batteries are used in parallel, the battery is internally connected in parallel via RS485B hardware interface, and RS485A/CANBUS communicates with the inverter;

5.4.2.3 Please refer to below chart to set up the master level and slave level battery.

RS485 Version –Max 15 pcs

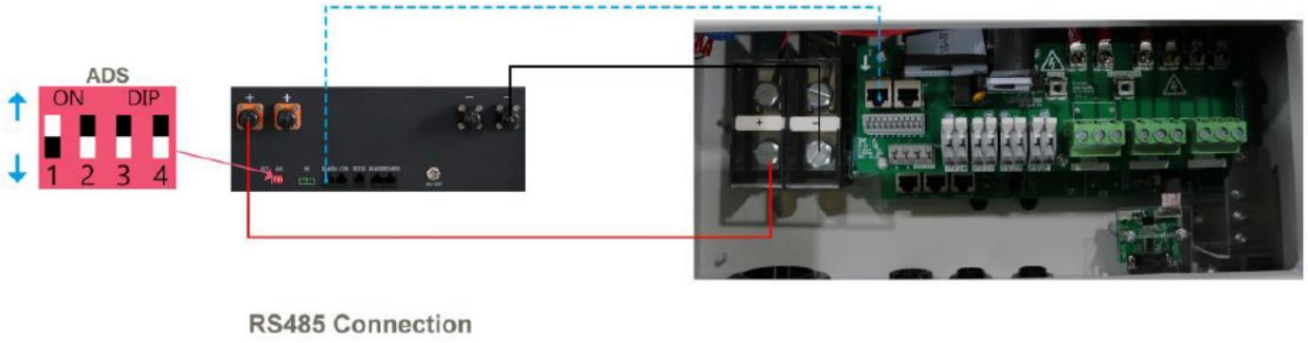


Address setting list Duplicate address bits cannot be used for communication.

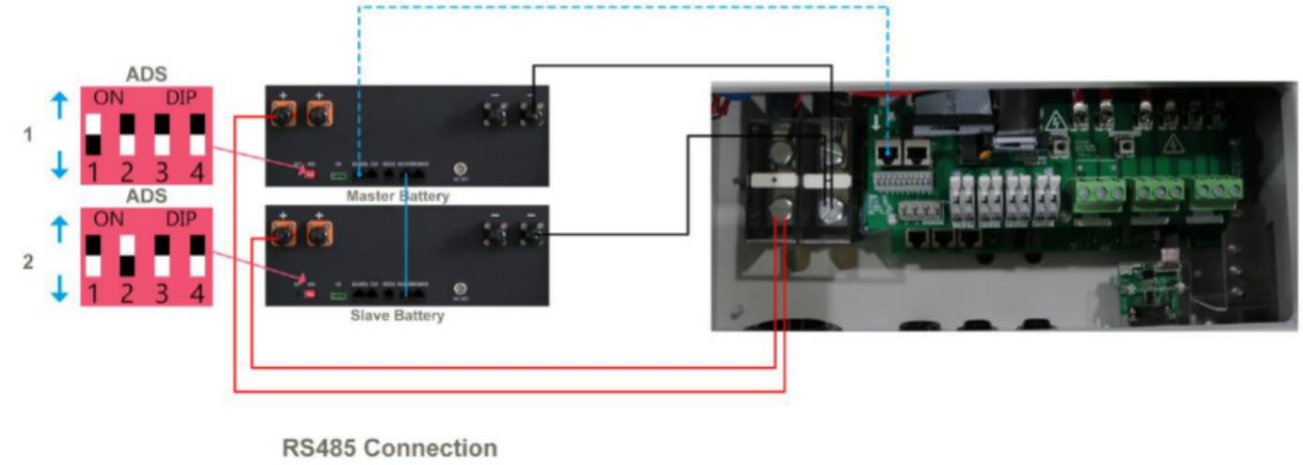
Please ensure that the battery is turned on during communication.

5.4.2.4 Battery Connection Diagram with ONE inverter

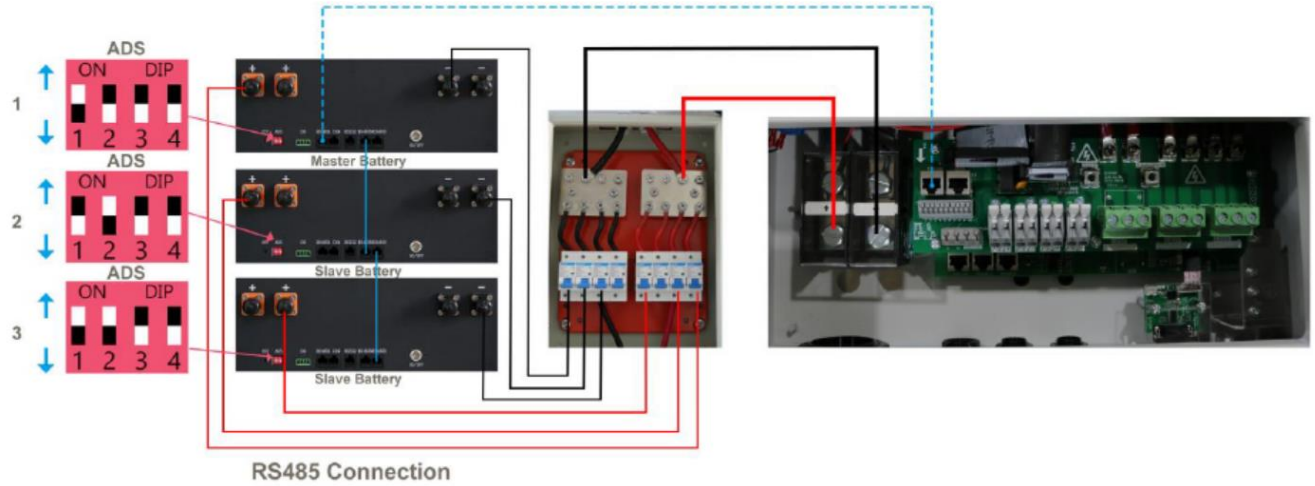
One battery connection



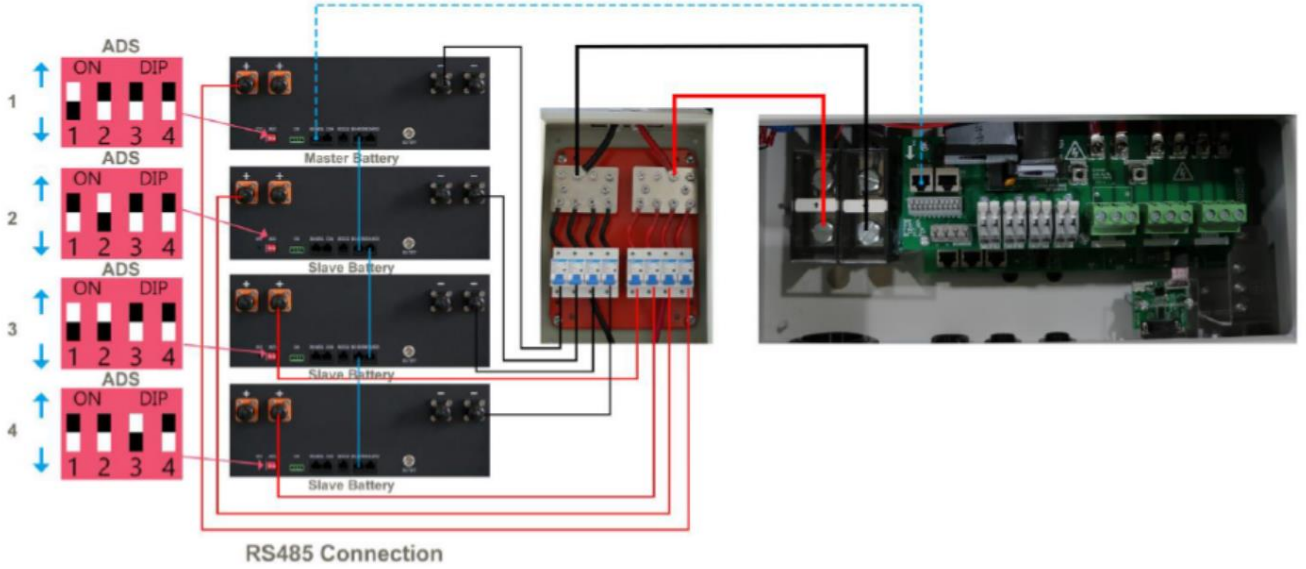
Two batteries parallel connection



Three batteries parallel connection

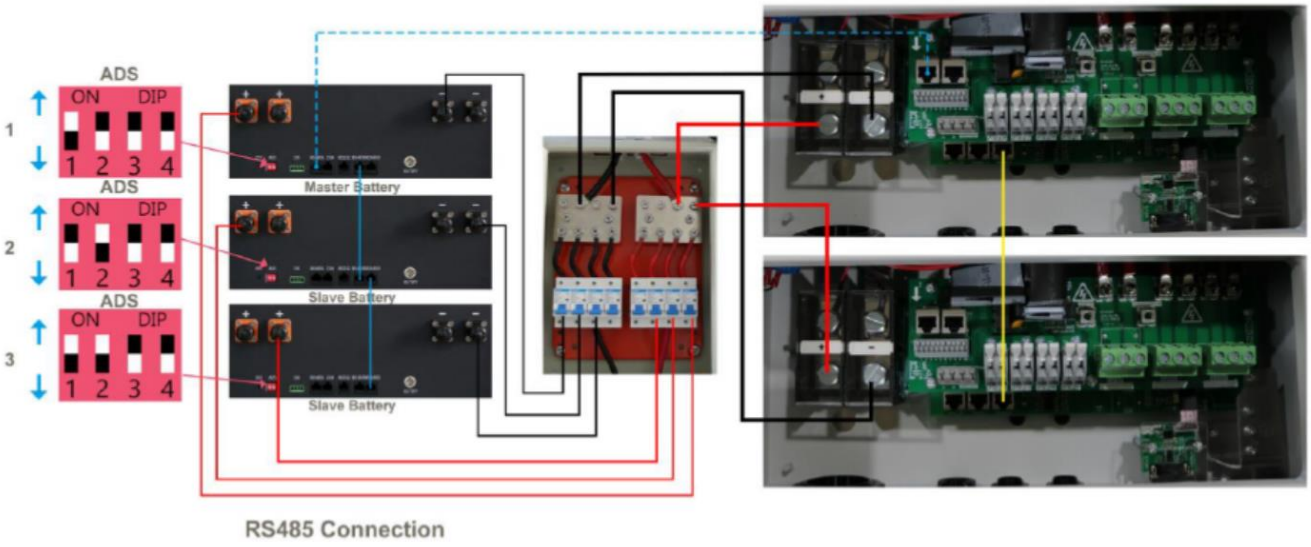


Four batteries parallel connection

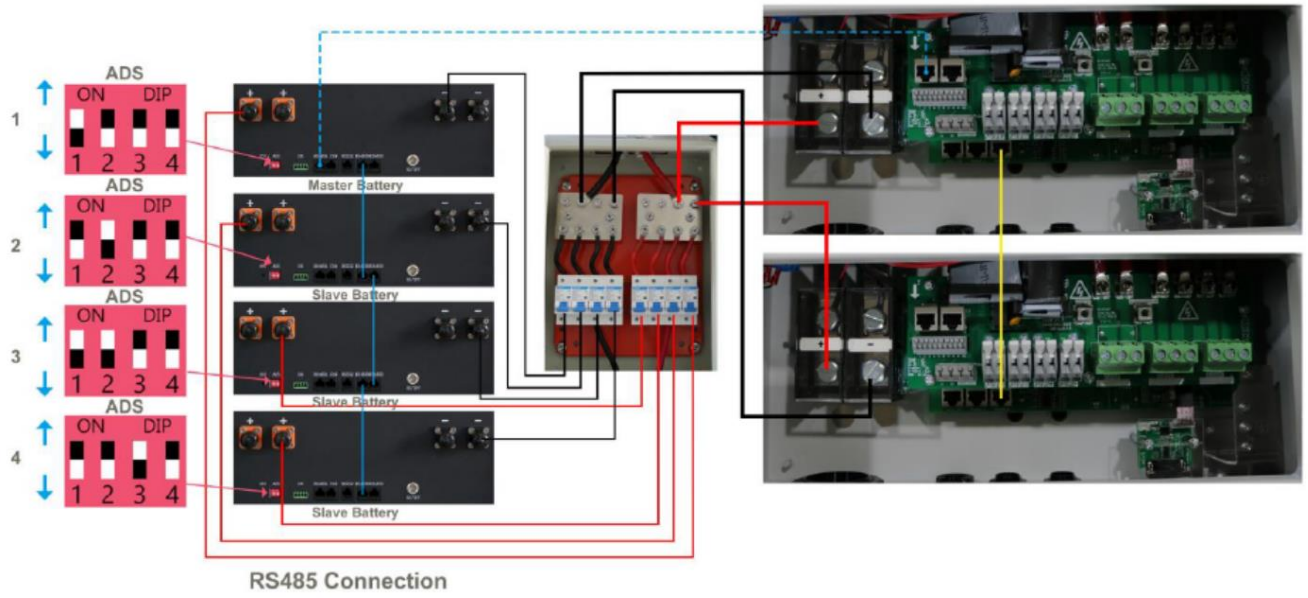


5.4.2.5 Battery Connection Diagram with TWO inverters

Three batteries parallel connection



Four batteries parallel connection



5.4.3. ADS guide Line for 15-20KWH battery

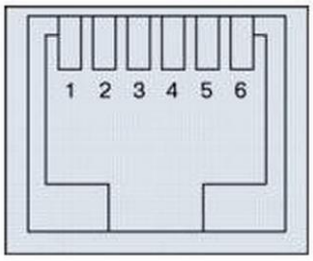
If you start to connect PAC 15-20kwh solar storage battery with hybrid inverter, make sure you should consult with PAC sales manager before connection. If the hybrid inverter is not from PAC factory brand, please specify related hybrid on-off grid inverter brand with PAC sales managers.

How to dial for master and slave battery units for 15-20KWH PAC home storage Battery:

5.4.4.Communication Port Definition

RS232 Communication Port Definition

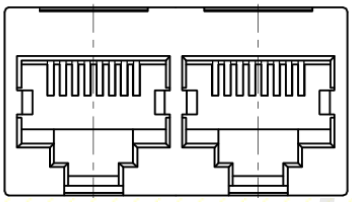
RS232 Terminal Port	Definition
Pin3	TX
Pin4	R
Pin2,5	GND
Pin1,6	NC



RS485A and CANbus Communication Port Definition

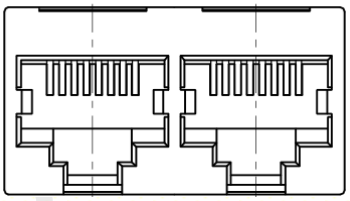
RS485 Terminal Port	Definition	RS485 Terminal Port	Definition
Pin1,8	RS485_B	Pin 9、10、	NC

		11、14、16	
Pin2,7	RS485_A	Pin 12	CANL
Pin3,6	GND	Pin 13	CANH
Pin4,5	NC	Pin 15	GND

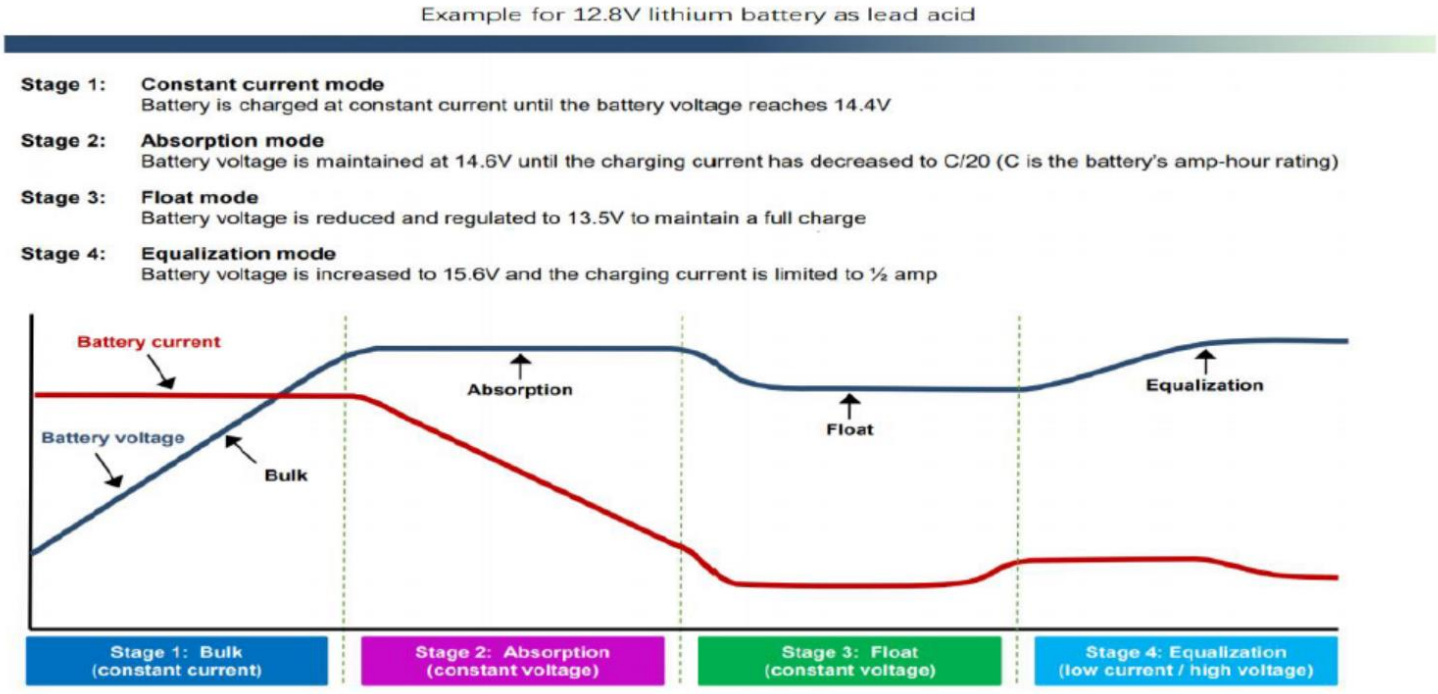


RS485B Communication Port Definition

RS485 Terminal Port	Definition	RS485 Terminal Port	Definition
Pin 1、8	RS485-B	Pin 9、16	RS485-B
Pin 2、7	RS485-A	Pin 10、15	RS485-A
Pin 3、6	GND	Pin 11、14	GND
Pin 4、5	NC	Pin 12、13	NC



5.4.5 How to set PAC LiFePO4 Battery Using as Lead Acid Type Inverters



Inverter Setting for Standard 15S 48V Lithium Battery

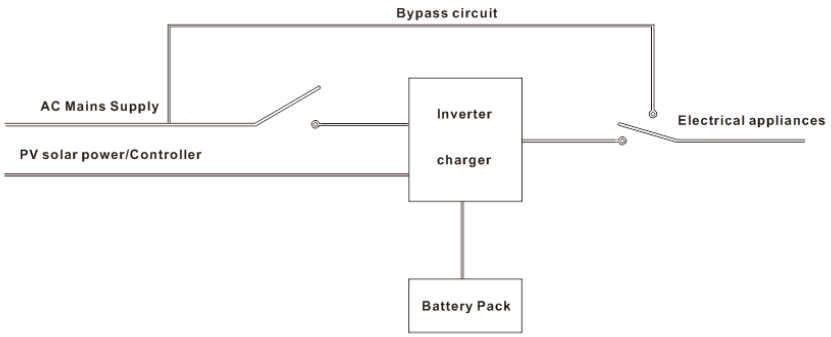
Inverter	80% DOD, 6000 cycles	90-100% DOD, 4000 cycles
Constant current mode charge voltage	51.8	52.5
Absorb Voltage	51.8	52.5
Float Voltage	51.8	52.5
Equalization Voltage	53.2	53.2
Fully charge Voltage	53.2	53.2
AC Input Mode	Grid Tired / Offgrid / Hybrid Type	
Cut Off Voltage	45.0	45.0
BMS Protection Voltage	42.0	42.0

Inverter Setting for Standard 16S 51.2V Lithium Battery

Inverter	80% DOD, 6000 cycles	90-100% DOD, 4000 cycles
Constant current mode charge voltage	55.2	56.0
Absorb Voltage	55.2	56.0
Float Voltage	55.2	56.0
Equalization Voltage	56.8	56.8
Fully charge Voltage	56.8	56.8
AC Input Mode	Grid Tired / Offgrid / Hybrid Type	
Cut Off Voltage	48.0	48.0
BMS Protection Voltage	45.0	45.0

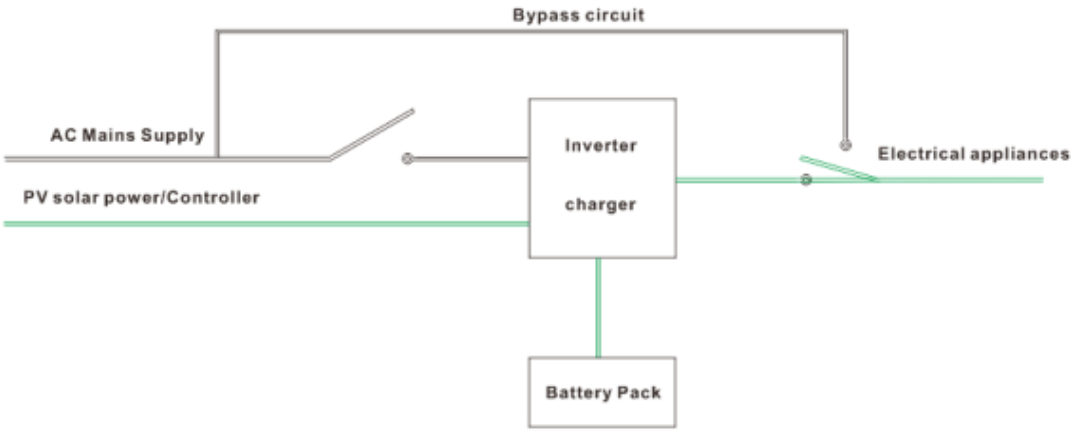
6.Working Principle

6.1.Product system block diagram



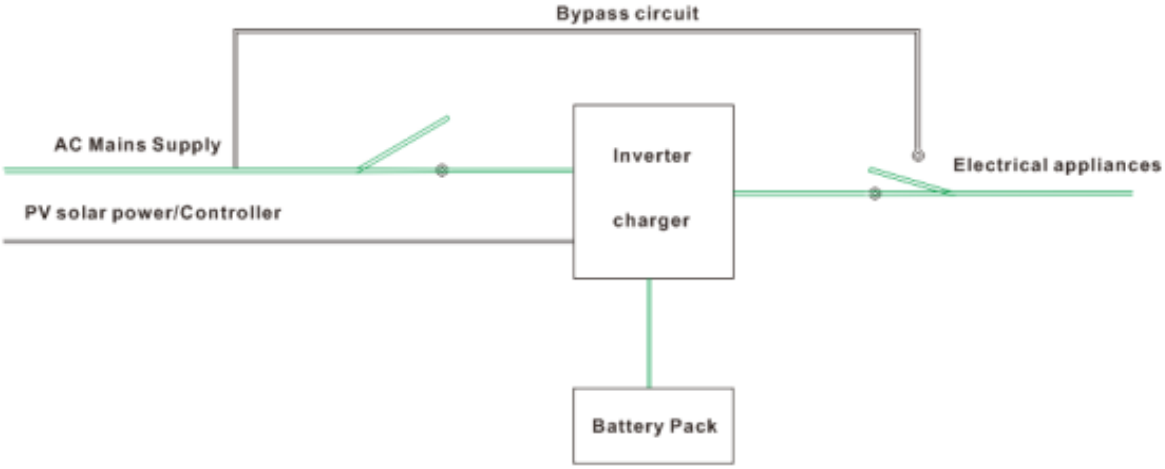
6.2.Working mode description

6.2.1.PV solar priority mode



In the PV solar priority mode, the power supply to the load is fed by the solar panel input, as shown in the green path above:
The amount of electricity generated by the solar cell is stored in the battery in addition to the user load.
When the amount of electricity generated by solar energy does not meet the user load, the amount of electricity stored in the battery is replenished to the load.

6.2.2.AC priority mode



In AC mains priority mode, the power supply of the load is provided by the mains input to ensure the stability

of the output power. At this time, solar power only charges the battery;
When the battery power is seriously insufficient, in addition to supplying power to the load, the AC mains will start to replenish the battery, and the battery will not be fully charged at this time;
When the AC mains is powered off or abnormal, the system will switch to the battery to supply power to the load.

7. Abnormal situation handling

Fault phenomenon	Cause of issue	Approach
Inverter cannot be turned on	AC input failure	Check if the AC input switch is closed Check if the line is open
Abnormal communication	PC cannot read device information	Whether the device is turned on Is the PC software used correctly? Whether the PC software correctly reads the serial port Signal line wiring and address are correct
Equipment overload	Excessive power or short circuit	Check if the load is less than the rated power of the device Confirm if there is a short circuit condition
Battery failure	Fault light (red light) is always on	Press the SET button 6S, all the indicators light up at the same time, release the SET button, if it can not be solved, please contact the manufacturer
Inverter failure	System operation error	Disconnect the load and reboot

Warranty Term & Card

1. Product Warranty

1.1. If you have purchased this product from factory, you should be aware that this warranty is provided in addition to other rights and remedies held by a consumer at law.

1.2. You are entitled to a replacement or refund for a major failure and for compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure.

1.3. For the above-mentioned products, you receive the factory warranty valid for 5-10 years from the date of delivery from factory. The factory warranty covers any costs for repair or spare parts during the agreed period beginning on the date of delivery of the device, subject to the following conditions.

2. Factory Warranty Scope

The factory warranty does not cover damages caused by following reasons:

--Breaking the product seal (opening the casing)
--Transport damage
--Incorrect installation or commissioning
--Failure to observe the user manual, quick installation instructions
--Incorrect usage or inappropriate operation
--Insufficient ventilation of the device
--Failure to observe the applicable safety regulations
--Force majeure

Neither does it cover cosmetic defects which do not influence the energy production.

3. Warranty conditions

If the battery becomes defective during the agreed factory warranty period and, unless this should be impossible or disproportionate, one of the following options will be selected at the discretion of factory:

--Battery repair or
--Battery repair at on-site, or
--Exchange for a replacement device of equivalent value with regard to model and age.

In the latter case, the remainder of the warranty entitlement will be transferred to the replacement device and your entitlement will be documented at factory.

Excessiveness in the meaning above exists in particular if the cost the measures for factor will be unreasonable.

--In view of the value that the device would have without the defect
--Taking in account of the significance of the defect, and
--After consideration of alternative work around possibilities at factory customers could revert to without significant inconvenience.

Thank you very much to choose PAC Storage Batteries. Please fill the required information in and send this page to factory when you need to apply warranty service support.

Warranty Card

User Information

Company / User Name:
Address:
Telephone:
Email:
Project installation location:

Product Information

Battery Model:
Serial No.:
(**Attach to the battery BMS**) – **Important for service**
Invoice Number:
Purchase Date:
Dealer:
Commission date:
Fault/Error Description: