



Home Energy Storage LFP Battery










PT-ESS-R5120
PT-ESS-R10240



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Read and follow these instructions!

The following precautions are intended to ensure your safety and prevent property damage. Before installing this product, be sure to read all safety instructions in this document for proper installation.

| | |
|---|---|
|  | ⚠ DANGER Failure to comply with the instructions with this symbol may result in a serious accident, causing death or a severe injury. |
|  | ⚠ WARNING Failure to comply with the instructions with this symbol may result in a serious accident, causing a severe injury. |
|  | ⚠ CAUTION Failure to comply with the instructions with this symbol may result in minor or moderate injury. |
|  | NOTICE Provides information considered important but not hazard-related. The information relates to property damage. |
|  | Read instruction before use |
|  | Risk of electric shock |
|  | Operate as specified by the manual |
|  | Do not reverse connect the positive and negative port |
|  | Do not place at the children or pet touchable area |

This product is designed to an integrated system, which must be performed by a qualified person trained in electrical engineering and familiar with the characteristics and safety requirements of lithium batteries. Do not use this product if you are unsure if you possess the necessary skills to complete this integration.

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1. Precautions

1.1 General Safety Precautions

The product provides a safe source of electrical energy when operated as intended and as designed. Potentially hazardous circumstances such as excessive heat or electrolyte mist may occur under improper operating conditions, damage, misuse and/or abuse. The following safety precautions and the warning messages described in this part must be observed.

If any of the following precautions are not fully understood, or if you have any questions, contact us for guidance.

Risks of explosion

- Do not subject the battery to strong impacts.
- Do not crush or puncture the battery.
- Do not crush or puncture the battery.

Risks of fire

- Do not expose the battery temperatures in excess of 60°C.
- Do not place the battery near a heat source such as a fireplace.
- Do not expose the battery to direct sunlight.
- Do not allow the battery connectors to touch conductive objects such as wires.

Risks of electric shock

- Do not disassemble the battery.
- Do not touch the battery with wet hands.
- Do not expose the battery to moisture or liquids.
- Keep the battery away from children and animals.



Risks of damage to the battery

- Do not allow the battery to encounter liquids.
- Do not subject the battery to high pressures.

1.2 Installation Precautions

Please be aware that a battery presents a risk of electrical shock including high short-circuit current. Follow all safety precautions while operating the batteries.

- Remove watches, rings, and other metallic accessories.
- Use tools with insulated handles in order to avoid inadvertent short circuits.
- Wear rubber gloves and safety boots.
- Do not put tools or any metal parts on the top of the batteries.
- Disconnect charging source and load before connecting or disconnecting terminals.
- When moving batteries and wear all appropriate safety clothing and equipment.
- Do not open or mutilate the batteries.

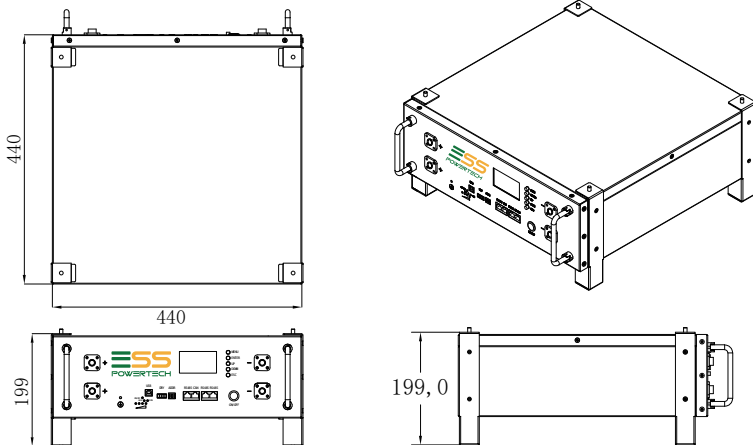
| | |
|---|---|
|  |  |
| | <ul style="list-style-type: none"> - Verify polarity at all connections before energizing the system. Reverse polarity at the battery terminals will void the Warranty and destroy the batteries. Do not short circuit the batteries. - Do not combine Lithium Batteries with other brands or chemistries; Do not mix Lithium Batteries from different installations, clients, or job sites. - Do not disassemble or modify the battery. If the battery housing is damaged, do not touch exposed contents. - The embedded BMS in the battery is designed for 48VDC system, please DO NOT connect battery in series. - If the battery is stored for long time, it is required to charge every six months and the SOC should be no less than 90% |

2. Product Introduction

51.2 V series lithium iron phosphate battery system has been designed to provide power backup for remote or outside telecom plants like Access Terminals, Base Transceiver Stations, and Base Station Controllers. This system has the characteristics of high system integration, well reliability, long service life, and wide operating temperature range.

2.1. Front Panel Function Introduction

In order to operate the product correctly, please carefully view the function of the front panel of the battery.



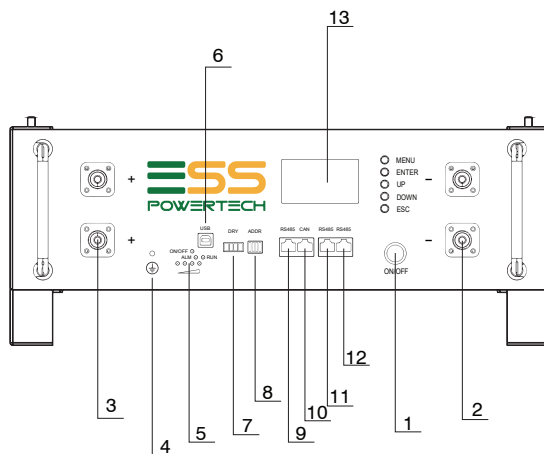
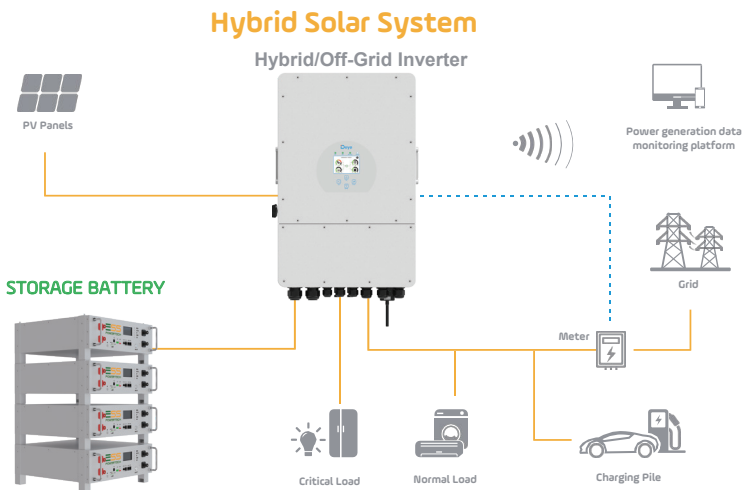


Figure 2-1: Front Panel Function Introduction

| Item | Name | Definition |
|------|-------------------|---|
| 1 | Power Switch | ON/OFF.must be in the"ON"state when battery in use |
| 2 | Negative Terminal | Battery output negative or parallel negative line |
| 3 | Positive Terminal | Battery output positive or parallel positive line |
| 4 | Ground terminal | Connect the ground cable |
| 5 | LED Indicator | Working Status of battery |
| 6 | USB | Communication port,battery connection to host computer |
| 7 | Dry Contact | To connect optional external alarm |
| 8 | ADDR | DIP switch for battery address setting |
| 9 | RS485 | Inverter communication port, supports RS485 communication |
| 10 | CAN | Inverter communication port, supports CAN communication |
| 11 | RS485-Parallel1 | Battery to battery RS485 parallel communication ports |
| 12 | RS485-Parallel2 | Battery to battery RS485 parallel communication ports |
| 13 | LCD screen | Display screen,check the working status of battery module |

| | PT-ESS-R5120 | PT-ESS-R10240 |
|--|---|---------------|
| BATTERY MODULE SPECIFICATION | | |
| Battery/Cell Type | LFP | LFP |
| Nominal Voltage (Vdc) | 51.2V | 51.2V |
| Nominal Capacity (Ah) | 100Ah | 200Ah |
| Total Energy (Wh) | 5120 | 10240 |
| Max. Charge and Discharge Current (A) | 100 | 150 |
| Recommend Charge and Discharge Current(A) | 50 | 80 |
| Operating Voltage Range (Vdc) | 43.2-57.6 | |
| Recommend Depth of Discharge | 90% | |
| Discharge Cut-off Voltage (V) | 40 | |
| Parallel | Up to 16 connected in parallel | |
| Cycle Life | ≥6000 cycles at 70% EOL, 0.2C, 25°C | |
| Warranty | 5 years (designed life 15 years) | |
| COMMUNICATION | | |
| Display | LCD Screen | |
| Communication | RS485 between modules in Parallel, CAN bus/RS485 to inverter,USB to PC Monitoring | |
| STANDARD COMPLIANCE | | |
| Safety (Cell level) | UL1642 / IEC62619 / CE / ROHS / MSDS /UN38.3 | |
| Safety (Module level) | IEC61000 / CE / ROHS / MSDS /UN38.3 | |
| MECHANICAL SPECIFICATIONS | | |
| Dimensions (W x H x D) (mm) | 440*440*145 | 440*780*145 |
| Weight (kgs) | 48 | 96 |
| Installation | Wall mounted/Stackable | |
| Operating Temperature ^(a) Charge/Discharge (°C) | -10 to +50 | |
| Storage Temperature (6 months between recharge) (°C) | -10 to +45 | |
| Cooling Method | Natural convection | |
| Noise (at 1m distance) (dBA) | <25 | |

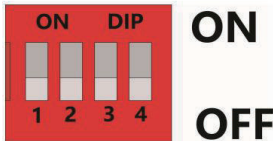


2.3 DIP switch definition and description

| DIP switch position (host communication protocol and baud rate selection) | | | |
|---|----|----|----|
| #1 | #2 | #3 | #4 |
| Baud rate selection | | | |
| CAN: 500K RS485: 9600 | | | |

DIP switch description:

When the battery pack is connected in parallel, the host can communicate with the slave through the RS485-1 & RS485-2 interface. The host summarizes the information of the entire battery system and communicates with the inverter through CAN or 485. The connection mode is divided into the following two cases:



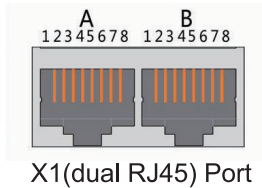
| Pack | Codes the switch position | | | |
|---------------|---------------------------|-----|-----|-----|
| | #1 | #2 | #3 | #4 |
| 1 (master) | OFF | OFF | OFF | OFF |
| 2 (slave 1) | ON | OFF | OFF | OFF |
| 3 (slave 2) | OFF | ON | OFF | OFF |
| 4 (slave 3) | ON | ON | OFF | OFF |
| 5 (slave 4) | OFF | OFF | ON | OFF |
| 6 (slave 5) | ON | OFF | ON | OFF |
| 7 (slave 6) | OFF | ON | ON | OFF |
| 8 (slave 7) | ON | ON | ON | OFF |
| 9 (slave 8) | OFF | OFF | OFF | ON |
| 10 (slave 9) | ON | OFF | OFF | ON |
| 11 (slave 10) | OFF | ON | OFF | ON |
| 12 (slave 11) | ON | ON | OFF | ON |
| 13 (slave 12) | OFF | OFF | ON | ON |
| 14 (slave 13) | ON | OFF | ON | ON |
| 15 (slave 14) | OFF | ON | ON | ON |
| 16 (slave 15) | ON | ON | ON | ON |

Pin Definition

2.4 CAN / RS485-1 Communication Interface Definition:

CAN port definition

| PIN Out Config | |
|----------------|-----------|
| PIN 1 | NC(empty) |
| PIN 2 | CGND |
| PIN 3 | NC(empty) |
| PIN 4 | CAN-H |
| PIN 5 | CAN-L |
| PIN 6 | NC(empty) |
| PIN 7 | CGND |
| PIN 8 | NC(empty) |



RS485 port definition

| PIN Out Config | |
|----------------|-----------|
| PIN 1 | RS485-B1 |
| PIN 2 | RS485-A1 |
| PIN 3 | RS485-GND |
| PIN 4 | RS485-B1 |
| PIN 5 | RS485-B1 |
| PIN 6 | RS485-GND |
| PIN 7 | NC(empty) |
| PIN 8 | NC(empty) |

A

B

2.5 LED Status Indicators



| State | Normal / alarm / protection | RUN | ALM | The power level indicates the LED | | | | Explain |
|---------------------------|--|----------|----------|---|----------|----------|----------|--|
| | | ● | ● | ● | ● | ● | ● | |
| Shut down | Dormancy | off | off | off | off | off | off | Alloff |
| Await the oportune moment | normal | Flash, 1 | off | According to the electricity instruction | | | | stand by |
| | report an emergency | Flash, 1 | Flash, 3 | | | | | |
| Charge | normal | Lighting | off | According to the electricity instruction(Power level indicates maximum LED flash 2) | | | | Alarm when overvoltage/light off |
| | report an emergency | Lighting | Flash, 3 | | | | | |
| | Overcharge protection | Lighting | off | Lighting | Lighting | Lighting | Lighting | If there is nocharging, the indicator is in standbystate |
| | Temperature, overcurrent, and failure protectionprotect | off | Lighting | off | off | off | off | |
| Discharge | normal | Flash, 3 | off | According to the electricity instruction | | | | |
| | report an emergency | Flash, 3 | Flash, 3 | | | | | |
| | Undervoltage protection | off | off | off | off | off | off | Stop discharge |
| | Temperature, over-current, short-circuit,Reverse connection and failure protection | off | Lighting | off | off | off | off | Stop discharge |
| Lose efficacy | | off | Lighting | off | off | off | off | Stop charging and discharging |

2.6 LED working status indication

| The state | | Charge | | | | Discharge | | | |
|--------------------------|---------|----------|----------|----------|----------|-----------|----------|----------|----------|
| Capacity indicator light | | L4 | L3 | L2 | L1 | L4 | L3 | L2 | L1 |
| SOC(%) | 0~25% | off | off | off | Flash, 2 | off | off | off | Lighting |
| | 25~50% | off | off | Flash, 2 | Lighting | off | off | Lighting | Lighting |
| | 50~75% | off | Flash, 2 | Lighting | Lighting | off | Lighting | Lighting | Lighting |
| | 75~100% | Flash, 2 | Lighting | Lighting | Lighting | Lighting | Lighting | Lighting | Lighting |

3. Unpack the Battery







The battery and the related accessories are packed in the carton box. Use tools to open the packing box. After open the packing box, confirm the product components according to the parts list.

| | |
|---|--|
|  |  |
| | <p>Violent unpacking is strictly prohibited. If the battery system is found to be broken, deformed or other abnormal conditions, the user shall immediately stop using the battery and contact us.</p> |

3.1 Parts List

Check the parts during unpacking.

Parts Lists:

| No. | Items | Appearance | Usage | Qty. | Remarks |
|-----|-----------------------------------|---|--|------|---------|
| 1 | Battery |  | Provide power | 1 | |
| 2 | RJ45 communication line 220mm |  | Communication cable for battery parallel | 1 | |
| 3 | 4AWG Red & Black Power line 170mm |  | Power cable for battery parallel | 2 | |
| 4 | RJ45 communication line 1500mm |  | Communication cable connect with hybrid inverter | 1 | |
| 5 | M6*4 bolts |  | Fix the battery on the rack or cabinet | 4 | |
| 6 | Battery Stacking Rack bracket |  | Used for battery stacking | 4 | |
| 7 | User manual | / | / | 1 | |



Power cable terminals: there are two pair of terminals with same function, one connect to equipment, the other one paralleling to other battery module for capacity expanding. For each single module, each terminal can achieve charging and discharging function.

For power cables uses water-proofed connectors. It must keep pressing this Lock Button while pulling out the power plug.

Recommended Tools, Instruments and Safety gears



Torque Screwdriver



Phillips Screwdriver



Hexagon Wrench



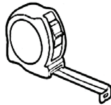
Phillips Screwdriver



Slotted Screwdriver



Torque Wrench



Tape Measure



Driller



Pencil or Marker

NOTE:

Use properly insulated tools to prevent accident tale 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.

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



Safety gloves



Safety goggles



Safety shoes


3.2 Visual Inspection of the Modules


After transporting the modules to the installation location, check for:


- Physical damage to the exterior
- Damaged or protruding screws


4. Battery Installation


This system must be installed by qualified, trained workers familiar with the required instruments.

| | |
|---|--|
|  | ⚠ WARNING |
| | <ul style="list-style-type: none">▪ Be sure to use insulated tools (torque wrench, extension, socket, etc.).▪ All the instruments must be insulated and no metal articles (e.g., watch, ring) should be present in the installation area.▪ All power switches must be turned off in advance.▪ Prepare a CO₂ fire extinguisher, a first aid kit, and an AED (automated external defibrillator) before installation. |

| | |
|---|--|
|  | ⚠ WARNING |
| | Arc Flash and Shock Hazard Insulated tools are required for any work on this energized equipment. |

| | |
|---|---|
|  | ⚠ WARNING |
| | Sharp Edges Wear gloves and other protective gear to prevent injury. |

| | |
|--|---|
|  | ⚠ WARNING |
| | Pinch Point Use caution when working in the enclosure to prevent injury. |

| | |
|---|---|
|  | ⚠ CAUTION |
| | Heavy Object Can cause muscle strain or back injury. Use lifting aids and proper lifting techniques when moving trays, batteries and other heavy objects. |

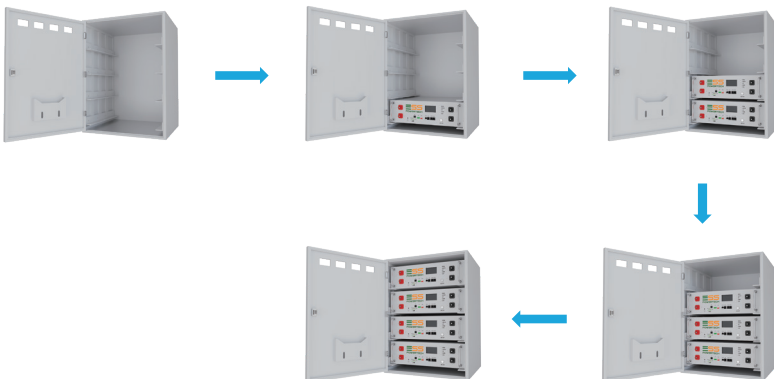
4.1 Battery Module Installation


1. Transport battery modules to the installation location.
2. Place the battery modules on the bracket or rack or cabinet.
3. Fix the battery on the bracket or rack. Using the bracket or cabinet bolt to fix the battery into the bracket or rack.
4. After installation, tighten all bolts.

Installation method 1: With simple bracket installation




Installation method 2: With standard cabinet or rack installation






| | |
|---|---|
|  | IMPORTANT |
| | <ul style="list-style-type: none">▪ The battery can be mounted on a standard cabinet or rack.▪ Battery modules can be inserted into a rack frame according to the customer battery configuration scheme. |

5. Cable Connection

5.1 Single Battery Connection

| | |
|---|---|
|  | NOTICE |
| | <ul style="list-style-type: none">▪ Before connect the cable with the inverter, the worker must confirm the output switch of the inverter has been turn off, to prevent the risk of fire or electric shock. |

| | |
|--|--|
|  | <p>⚠ CAUTION</p> <ul style="list-style-type: none"> ▪ Before connection, make sure to close the battery. ▪ Please follow the instructions to protect the module BMS against damage. ▪ DO NOT deviate from the sequence of steps below. ▪ Exercise extreme caution prevent the terminals from contacting anything except their intended mounting points. ▪ Terminals and their connected wires have either positive or negative polarity (Positive: +; Negative-). The polarity of a terminal or a wire connected to the terminal is on the front of each module. Exercise extreme caution to prevent the terminals and/or wires with opposite polarity from contacting with each other. ▪ The maximum voltage of the battery is no more than 60V, which is higher than the safe voltage of 36V. Therefore, we still recommend that the battery terminals or other exposed parts should not be directly touched during the |
|  | <p>NOTICE</p> <ul style="list-style-type: none"> ▪ When tightening the screws, make sure they are at a straight angle from the battery module terminals to avoid damage to the nuts inside. ▪ Assemble the screws using a Phillips-head within the fastening torque of less than 8.0 Nm (81.5 kgf-cm). |
|  | <p>IMPORTANT</p> <ul style="list-style-type: none"> ▪ The power terminals, such as "+," "-", of the module are covered with the protecting cover to guard against a short circuit (Shown in Figure 5-1). ▪ You must remove the insulation cover prior to connecting and reattach the insulation cover immediately after connecting. |

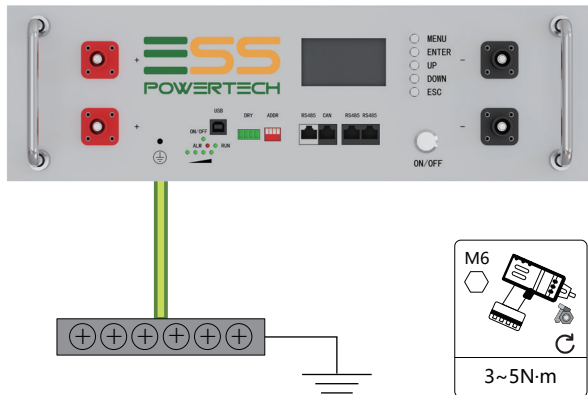


Figure 5-1: Install the Grounding Wire

Step 1 Wear the protective gloves

Step 2 Install the battery ground cable

Step 3 Install negative and positive power cables for the battery.

1)Remove the protective cover from the battery power wiring terminal.

2)Connect the negative power cable to the battery.

3)Connect the positive power cable to the battery.

4)Install the other end of the battery power cables at a battery route and the corresponding busbar in the power system.

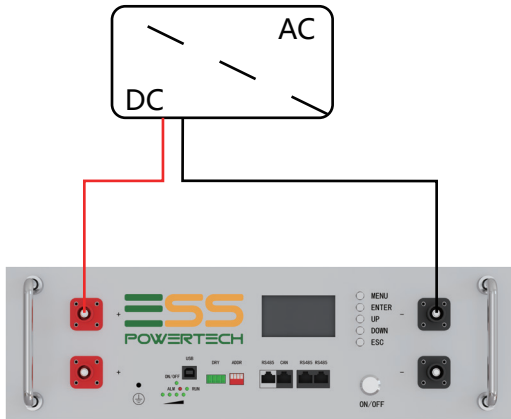


Figure 5-2: Single Battery Connection

Step 1 Wear the protective gloves.

Step 2 Install the battery ground cable.

Step 3 Install negative and positive power cables for the battery.

- 1) Remove the protective cover from the battery power wiring terminal.
- 2) Connect the negative power cable to the battery.
- 3) Connect the positive power cable to the battery.
- 4) Install the other end of the battery power cables at a battery route and the corresponding busbar in the power system.

Connect the inverter:

- 1) Remove the protecting cover.
- 2) Take-down positive fixing bolt by the Phillips Screwdriver and connect the positive output cable between the battery positive terminal of the battery and the inverter. After connecting the battery, fastening bolt immediately to avoid dropping.
- 3) Take-down negative fixing bolt by the Phillips Screwdriver and connect the negative output cable between the battery negative terminal of the battery and the inverter. After connecting the battery, fastening bolt immediately to avoid dropping.
- 4) Install the protecting cover.
- 5) Sort the cables and fasten the battery cables to the perforated bracket with cable ties.
- 6) Communication Line Connection

As shown in Figure 5-3, when monitoring the battery by the computer, connect the 'USB box' communication line between battery and computer.

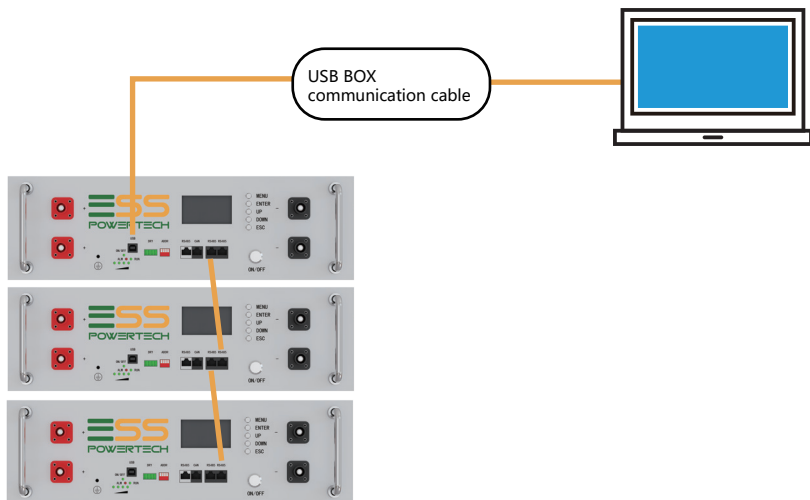


Figure 5-3: Communication Cable Connections between Battery and Computer

5.2 Connect Cables of the Multiple Batteries in Parallel

When multiple batteries in parallel, the cable connecting procedures are follows.

1.As shown in Figure 5-4, following the cable connection method of the single battery, connect the positive and negative cables between the Battery 1 and the busbar, Battery 2 and the busbar, and Battery N and the busbar respectively.

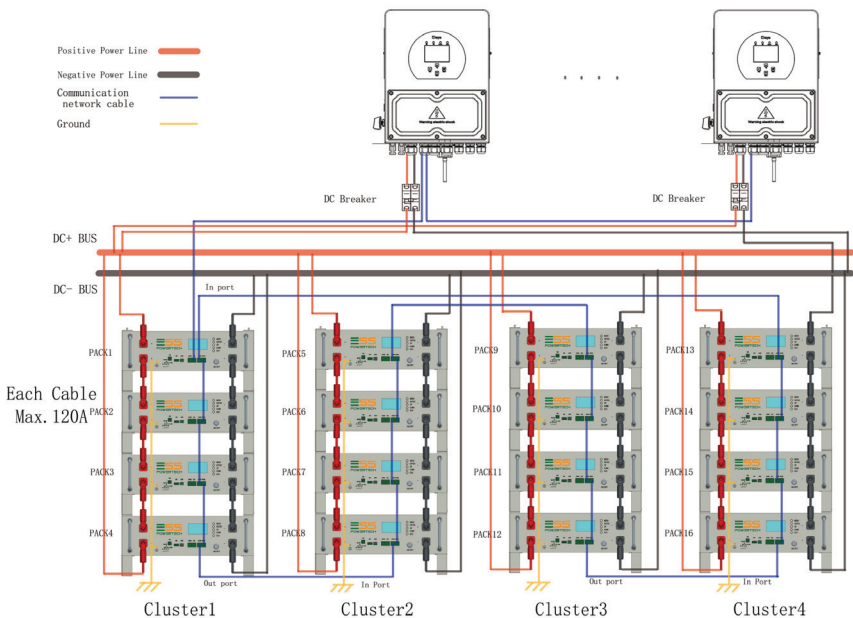


Figure 5-4: Multiple Batteries Connections

As shown in Figure 5-4, connect the communication line (a standard RJ45 network cable) between the adjacent batteries.

Note:

1. To ensure the current balance, please use power cables with the same diameter and length for each battery when connect with the busbar.
2. For safety and longer life of battery pls always set Max. charge and discharge current of battery on inverter is 50A.
3. For single cluster can do Max. 4pcs in parallel
4. The CAN Port of the first battery must be connected to the inverter's battery communication interface, otherwise the inverter cannot communicate with the batteries.
4. The CAN Port of the first battery must be connected to the inverter's battery communication interface, otherwise the inverter cannot communicate with the batteries.

5.3 Visual Inspection of the Connection

After connecting the battery, check for:

- Usage of positive and negative cables.
- Connection of the positive and negative terminals.
- All the bolts are tightened.
- Cables fixation and the appearance.
- The communication cable is connected correctly.
- The installation of the protecting cover.

6. Activate the Product

6.1 Start the Battery

After installation, wiring, and configuration are completed, you must check all the connection.

When the connections are correctly, and then press power button to activate the battery. The green working light on the front panel of the battery flashes, indicating that the battery system is normal.

7. Inspection, Cleaning and Maintenance

7.1 General Information

- The battery product is not fully charged. It is recommended that the installation be completed within 3 months after arrival;
- During the maintenance process, do not re-install the battery in the battery product. Otherwise, the performance of the battery will be reduced;
- It is forbidden to dismantle any battery in the battery product, and it is forbidden to dissect the battery;
- After the battery product is over-discharged, it is recommended to charge the battery within 48 hours. The battery product can also be charged in parallel. After the battery product is connected in parallel, the charger only needs to connect the output port of any product battery.
- Never attempt to open or dismantle the battery! The inside of the battery does not contain serviceable parts.
- Disconnect the Li-Ion battery from all loads and charging devices before performing cleaning and maintenance activities
- Place the enclosed protective caps over the terminals before cleaning and maintenance activities to avoid the risk of contacting the terminals.

7.2 Inspection

- Inspect for loose and/or damaged wiring and contacts, cracks, deformations, leakage, or damage of any other kind. If damage to the battery is found, it must be replaced. Do not attempt to charge or use a damaged battery. Do not touch the liquid from a ruptured battery.
- Regularly check the battery's state of charge. Lithium Iron Phosphate batteries will slowly self-discharge when not in use or whilst in storage.
- Consider replacing the battery with a new one if you note either of the following conditions:
 - The battery run time drops below 70% of the original run time.
 - The battery charge time increases significantly.

7.3 Cleaning

If necessary, clean the Li-Ion battery with a soft, dry cloth. Never use liquids, solvents, or abrasives to clean the Li-Ion battery.

7.4 Maintenance

The Li-Ion battery is maintenance free. Charge the battery to approximately > 80% of its capacity at least once every year to preserve the battery's capacity.

7.5 Storage

- The battery product should be stored in a dry, cool, and cool environment;
- Generally, the maximum storage period at room temperature is 6 months. When the battery is stored over 6 months, it is recommended to check the battery voltage. If the voltage is higher than 51.2V, it can continue to store the battery. In addition, it is needed to check the voltage at least once a month until the voltage is lower than 51.2V. When the voltage of the battery is lower than 51.2V, it must be charged according to the charging strategy.
- The charging strategy is as follows: discharge the battery to the cutoff voltage with 0.2C₁₀A current, and then charge with 0.2C₁₀A current for about 3 hours. Keep the SOC of the battery at 40-70% when stored;
- When the battery product is stored, the source of ignition or high temperature should be avoided and it should be kept away from explosive and flammable areas.

8. Troubleshooting

To determine the status of the battery system, users must use additional battery status monitoring software to examine the protection mode. Refer to the installation manual about using the monitoring software. Once the user knows the protection mode, refer to the following sections for solutions.

Table 8-1: Troubleshooting

| Fault Type | Fault Generation condition | Possible Causes | Troubleshooting |
|---|---|--|--|
| BMS fault | The cell voltage sampling circuit is faulty. The cell temperature sampling circuit is faulty | The welding point for cell voltage sampling is loose or disconnected. The voltage sampling terminal is disconnected. The fuse in the voltage sampling circuit is blown. The cell temperature sensor has failed. | Replace the BMS. |
| Electrochemical cell fault | The voltage of the cell is low or unbalanced. | Due to large self- discharge, the cell over discharges to below 2.0V after long term storage. The cell is damaged by external factors, and short circuits, pinpricks, or crushing occur. | Replace the battery. |
| Overvoltage protection | The cell voltage is greater than 3.65 V in charging state. The battery voltage is greater than 58.4 V. | The busbar input voltage exceeds the normal value. Cells are not consistent. The capacity of some cells deteriorates too fast or the internal resistance of some cells is too high. | If the battery cannot be recovered due to protection against abnormality contact local engineers to rectify the fault. |
| Under voltage protection | The battery voltage is less than 40V. The minimum cell voltage is less than 2.5V | The mains power failure has lasted for a long time. Cells are not consistent. The capacity of some cells deteriorates too fast or the internal resistance of some cells is too high. | Same as above. |
| Charge or discharge high temperature protection | The maximum cell temperature is greater than 60 °C | The battery ambient temperature is too high. There are abnormal heat sources around | Same as above. |
| Charge low temperature protection | The minimum cell temperature is less than 0 °C | The battery ambient temperature is too low. | Same as above. |
| Discharge low temperature protection | The minimum cell temperature is less than -20 °C | The battery ambient temperature is too low. | Same as above. |

By checking the above data and sending the data to the service personnel of our company, the service personnel of our company will reply the corresponding solution after receiving the data.

9. Inverter Communication

NOTE: The ESS Powertech battery's BMS comes factory preloaded with multiple inverter brand protocols. The default brands are listed below and only require connection with communication cable to the applicable interface port. (i.e. RS485 or CAN). Communication is established automatically. The 2 methods listed below are for default inverters (Method 1) or formanually selecting inverter (Method 2) using the BMS tool with a hostcomputer through the RS232 port.

9.1 Inverter Protocol Codes

16S100A BMS Protocol

| RS485 Protocol | |
|----------------|-------------------------------|
| Protocol name | Compatible protocol |
| Local | BMS Protocol |
| Voltronic | MOTOMA/Opti_Solar/SAKO/Phocos |
| Growatt | Growatt / SMK |
| SOLAX | Solax |
| LTW | LT-POWER |
| PACE | PACE |
| MUST | MUST |
| SRNE | SRNE/PACE/EPEVER |
| Baykee | Baykee |
| SMK | SMK |
| AFORE | AFORE |

| CAN Protocol | |
|---------------|--|
| Protocol name | Compatible protocol |
| Local | BMS Protocol |
| GOODWE | SOLARFAM |
| Growatt | Growatt |
| SOLAX | SOLAX |
| Sofar | Sofar |
| Luxpower | Luxpower |
| MUST | MUST |
| LTW | LTW |
| Victron | Victron |
| PYLON | PYLON/DEYE/Sunsynk/Solis/TBB/LUXPower/SOFAR/Megarevo/Invnt/Afore |
| Sorotec | Sorotec |
| SOLARFAM | SOLARFAM |
| IMEON | IMEON |
| Schneider | Schneider |
| INHENERGY | INHENERGY |
| SMA | SMA/Sofar/Studer |

Note: Compatible tests with different brands of inverter are continuously, updates of this list will be periodically.

9.2 Method 1: Communication with Factory Default Inverters

Step 1: Select the appropriate communication cable according to the brand of inverter. Some inverter brand cables come supplied with the battery. If your inverter brand cable is not supplied, please contact us to get the detailed information how to make the correct RJ45 cable. Insert the RJ45 connector of the battery end (CAN/RS485) and the inverter end (CAN/RS485) into the interfaces on both sides.

Step 2: Turn on the battery first and once it is running then turn on the inverter. The battery is configured by factory default to communicate with DEYE, SOLIS, Luxpower, Sofar, Afore, TBB inverters (CAN Port) and default with Local (RS485 Port). The battery will automatically select and communicate with one of these inverters.

Step 3: After successful communication between battery and inverter, battery status will be displayed on inverter: voltage, current, SOC, temperature, etc.

9.3 Method 2: Communication via Manual Selection of Inverters

NOTE: In order to manually switch BMS protocols you will need the BMS Tool and RS232 serial cable. Please contact ESS Powertech or visit our website for further details. The BMS protocol only needs to be changed on the master battery. When communicating with other brands of inverters such as: Growatt, Solax, Goodwe, Sorotech, LTW, MUST, SMA, etc

Step 1: Turn on the battery and ensure the BMS is powered up and not in sleep state. Take the RJ45 end of the RS232 cable (not provided) and plug it into the battery RS232 port. Then plug the USB side of cable into your host computer/laptop

Step 2: Place the BMS monitoring software file on your desktop and unzip the file (Windows Microsoft .NET Framework 2.0 or above). The software does not need to be installed. Only double click the main program icon BMS Tool (.exe file) to run and use. Enter the password (pls contact ESS Powertech).

Step 3: Click "Parameter information" at the top system page, then click "Read All" to read the battery parameter. Select the inverter protocol at the "Protocol type" (RS485 or CAN). Click the "Write All" button to set the protocol. Once the protocol system displays, the selection is complete.

Step 4: Select the appropriate communication cable according to your inverter brand. Insert the RJ45 connector of the battery end (CAN/RS485) and the inverter end (CAN/RS485) into the interfaces on both sides. Restart the battery first and ensure it is running. Then switch on the inverter. The battery will automatically communicate with the inverter corresponding to the selected protocol.

10. Battery recovery

Aluminum, copper, lithium, iron and other metal materials are recovered from discarded LiFePO₄ batteries by advanced hydrometallurgical process, and the comprehensive recovery efficiency can reach 80%. The specific process steps are as follows:

10.1 Recovery process and steps of cathode materials

Aluminum foil as collector is amphoteric metal. Firstly, it is dissolved in NaOH alkali solution to make aluminum enter the solution in the form of NaAlO₂. After filtration, the filtrate is neutralized with sulfuric acid solution and precipitated to obtain Al(OH)₃. When the pH value is above 9.0, most of the aluminum precipitates, and the obtained Al(OH)₃ can reach the level of chemical purity after analysis.

The filter residue is dissolved with sulfuric acid and hydrogen peroxide, so that lithium iron phosphate enters the solution in the form of Fe₂(SO₄)₃ and Li₂SO₄, and is separated from carbon black and carbon coated on the surface of lithium iron phosphate. After filtration and separation, the pH value of the filtrate is adjusted with NaOH and ammonia water. First, iron is precipitated with Fe(OH)₃, and the remaining solution is precipitated with saturated Na₂CO₃ solution at 90°C. Since FePO₄ is slightly dissolved in nitric acid, the filter residue is dissolved with nitric acid and hydrogen peroxide, which directly precipitates FePO₄, separates impurities such as carbon black from acid solution, leaches Fe(OH)₃ from filter residue respectively, and precipitates Li₂CO₃ with saturated Na₂CO₃ solution at 90°C.

10.2 Recovery of anode materials

The recovery process of anode materials is relatively simple. After the separation of anode plates, the purity of copper can be more than 99%, which can be used for further refining electrolytic copper.

10.3 Recovery of diaphragm

The diaphragm material is mainly harmless, and has no recycling value.

10.4 List of recycling equipment:

Automatic dismantling machine, pulverizers, wet gold pool, etc.

11. Transportation Requirements

The battery products should be transported after packaging and during the transportation process, severe vibration, impact, or extrusion should be prevented to prevent sun and rain. It can be transported using vehicles such as cars, trains, and ships.

Always check all applicable local, national, and international regulations before transporting a Lithium Iron Phosphate battery.

Transporting an end-of-life, damaged, or recalled battery may, in certain cases, be specially limited or prohibited.

The transport of the Li-Ion battery falls under hazard class UN3480, class 9. For transport over water, air and land, the battery falls within packaging group P1965 Section I.

Use Class 9 Miscellaneous Dangerous Goods and UN Identification labels for transportation of lithium-ion batteries which are assigned Class 9. Refer to relevant transportation documents.

Lithium batteries and lithium-ion cells are regulated in the U.S. in accordance with Part 49 of the Code of Federal Regulations, (49 CFR Sections 105-180) of the U.S. Hazardous Materials Regulations.



Figure 10-1: Class 9 Miscellaneous Dangerous Goods and UN Identification Label