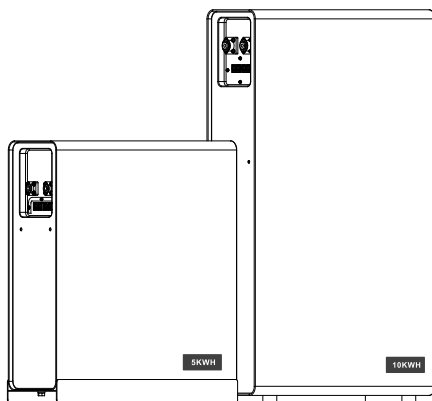




LOW VOLTAGE RESS LI-ION BATTERY USERS GUIDE



End User Documentation

Rev 1.0

Jun-10-2023

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**WARNING:** Explosion, Electrocution, Or Fire Hazard

- ☑ A battery can present a risk of electric shock, burns from high short circuit current, fire, or explosion.
- ☑ Observe proper precautions.
- ☑ Ensure the cables are properly sized.
- ☑ Ensure clearance requirements are strictly enforced around the batteries.
- ☑ Ensure the area around the batteries is well ventilated and clean of debris.
- ☑ Always use insulated tools. Avoid dropping tools onto batteries or other electrical parts.
- ☑ If a battery must be removed, always remove the grounded terminal from the battery first. Make sure all devices are disconnected.
- ☑ All devices must be disconnected when update the BMS software.
- ☑ DO NOT short the battery terminals.
- ☑ DO NOT incinerate, crush, or disassemble.
- ☑ DO NOT reverse connections (polarity) from charger to battery.
- ☑ DO NOT operate battery beyond published voltage and current limits.

**IMPORTANT**

- ☑ When installing batteries, leave adequate clearance between batteries.
- ☑ When replacing batteries, use the same part number of batteries.
- ☑ Avoid any fall or collision during the installation process.
- ☑ Do not remove the battery components. The maintenance of the battery should be carried out by a professional engineer.
- ☑ Do not expose the Li-ion battery to heat in excess of 55°C during operation, 60 °C in storage;
- ☑ The SOC is 50% when shipped from factory, it needs to be recharged in time for long time storage.

LOW VOLTAGE RESS BATTERY

This series li-ion batteries are designed for the residential energy storage market (RESS) which combines safe and reliable LiFePO₄ prismatic cells with RESS dedicated BMS to guarantee high reliability, safety, and scalability when used with different inverter.

This series include 4 models configuration to adapt to the different capacity inverter.

51.2V100Ah (5.12KWH) ,

51.2V200Ah (100A),

51.2V200Ah (150A),

51.2V200Ah (200A),

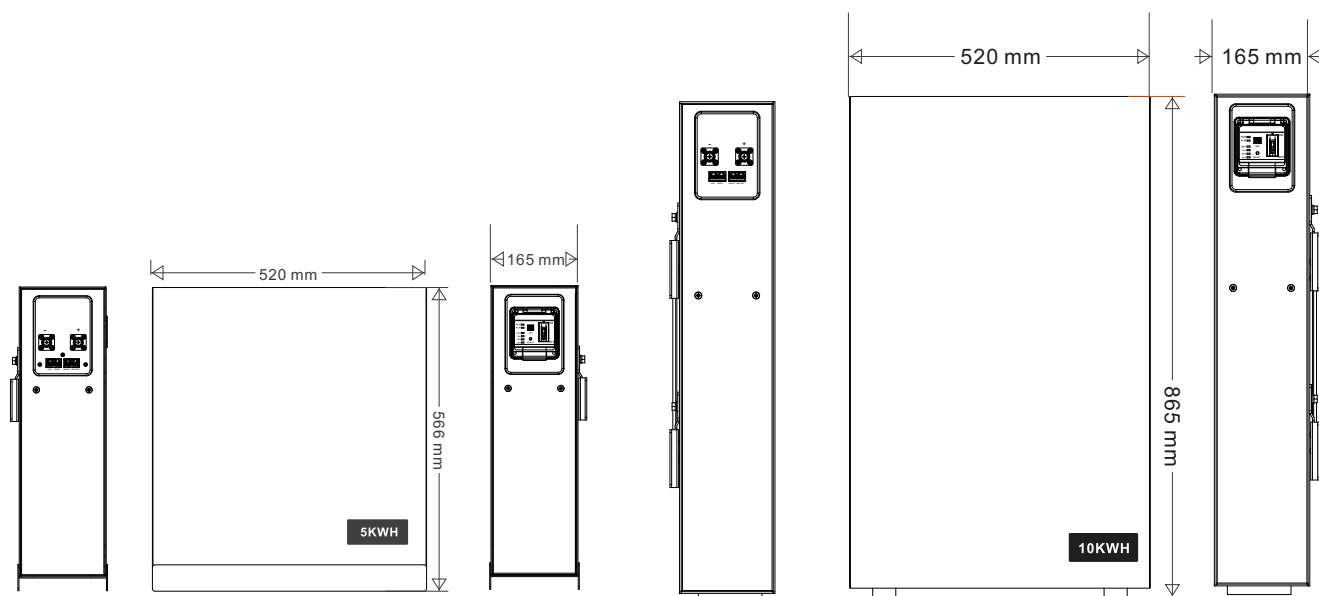
This document is intended for use by anyone required to install and operate Ritar rack type Li-ion batteries. Be sure to review this manual carefully to identify any potential safety risks before proceeding.

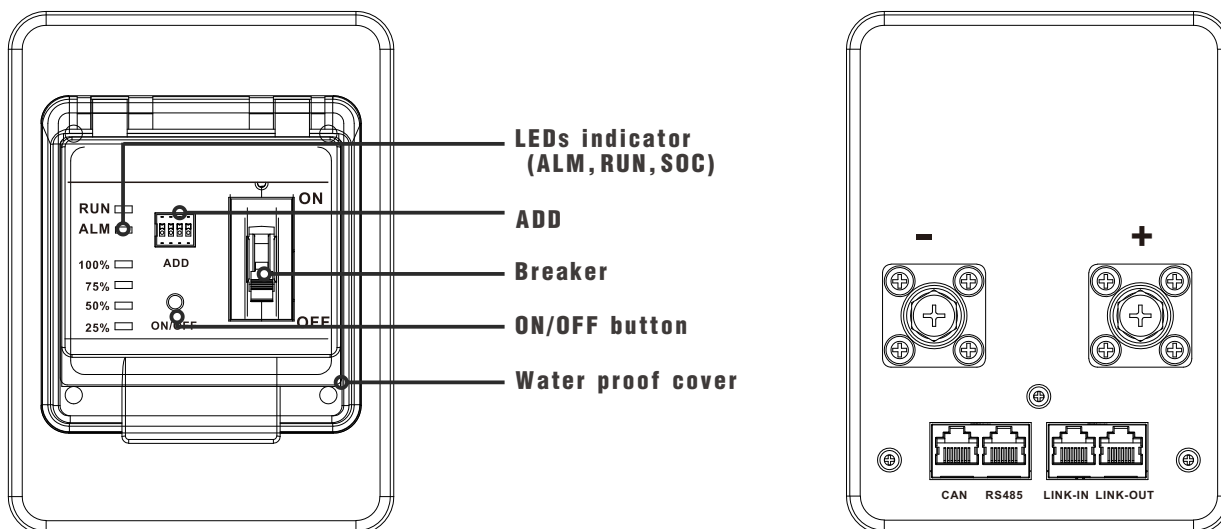
The owner must be familiar with all the features of this product before proceeding.

Failure to install or use this product as instructed can result in damage to the product that may not be covered under the limited warranty.

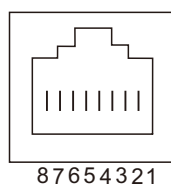
Product Introduction

The RESS batteries are shown in below figures.





Communication port



RS485 PIN MAP

| RJ45 PIN | Description |
|-------------|-------------|
| 1 | RS485_B |
| 2 | RS485_A |
| 3,4,5,6,7,8 | NC |

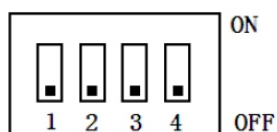
CAN PIN MAP

| RJ45 PIN | Description |
|-------------|-------------|
| 1,2,3,4,5,6 | NC |
| 7 | CAN_H |
| 8 | CAN_L |

LINK-IN/OUT PIN MAP







| RJ45 PIN | Description |
|-------------|-------------|
| 1,2,3,4,5,6 | NC |
| 7 | RS485-2_A |
| 8 | RS485-2_B |

ADD Switch



| ADD | 1# | 1# | 1# | 1# | Remark |
|-----|-----|-----|-----|-----|---|
| 1 | ON | OFF | OFF | OFF | Pack 1, Master Battery, COM to inverter |
| 2 | OFF | ON | OFF | OFF | Pack 2 |
| 3 | ON | ON | OFF | OFF | Pack 3 |
| 4 | OFF | OFF | ON | OFF | Pack 4 |
| 5 | ON | OFF | ON | OFF | Pack 5 |
| 6 | OFF | ON | ON | OFF | Pack 6 |

LED Indicator Description

| Status | Nominal Warning Protection | RUN  | ALM  | SOC     | | | | Description |
|-----------|---|--|--|--|-----|-----|-----|---|
| Shut down | Dormancy | OFF | OFF | OFF | OFF | OFF | OFF | |
| Standby | Nominal | Flash 1 | OFF | Follow module capacity | | | | Standby |
| | Warning | Flash 1 | Flash 3 | | | | | Module at low voltage |
| Charge | Nominal | ON | OFF | Follow module capacity | | | | |
| | Warning | ON | Flash 3 | | | | | |
| | Over-charge Protection | ON | OFF | ON | ON | ON | ON | LED turn to standby if no power supply |
| | Temperature, over-current, Failure protection | OFF | ON | OFF | OFF | OFF | OFF | Stop charging |
| Discharge | Nominal | Flash 3 | OFF | Follow module capacity | | | | |
| | Warning | Flash 3 | Flash 3 | | | | | |
| | Under voltage Protection | OFF | OFF | OFF | OFF | OFF | OFF | Stop discharging |
| | Temperature, over-current, short circuit, failure protection | OFF | ON | OFF | OFF | OFF | OFF | Stop discharging |
| Failure | | OFF | ON | OFF | OFF | OFF | OFF | Stop charging and discharging |

Note:

Flash 1: light 0.25s/off 3.75s

Flash 2: light 0.5s / off 0.5s

Flash 3: light 0.5s / off 1.5s

ON/OFF Button



OFF mode

During in transport, BMS ON/OFF button is at OFF status. it will turn off the BMS power supply.



ON mode

By press ON/OFF button to active BMS to enter into working mode, if the MCB is also ON, the battery voltage will can be measured by terminal.

Even if the button is at ON mode, The BMS will enter into dormancy mode after 24 hours when there are no charge, no discharge and no communication. it can be activated again by charge or communication or repress ON/OFF button.

History Record

The BMS can restore 500 logs about historical alarm / protection data, the logs can be read by PC software.

Parameters

| Model | BAT-5KWH-51.2V | BAT-10KWH-51.2V | BAT-10KWH-51.2V-150A | BAT-10KWH-51.2V-200A |
|---------------------------------|--|----------------------------|----------------------------|----------------------------|
| Nominal Voltage [V] | 51.2 | 51.2 | 51.2 | 51.2 |
| Nominal Capacity [Ah] | 100 | 200 | 200 | 200 |
| Total Energy [Wh] | 5120 | 10240 | 10240 | 10240 |
| Dimension (W*D*H, mm) | 520*165*566 | 520*165*865 | 520*165*865 | 520*165*865 |
| Weight [Kg] | 50 | 96 | 96 | 96 |
| Max. Charging Current [A] | 100 | 100 | 150 | 200 |
| Max. Discharging Current [A] | 100 | 100 | 150 | 200 |
| Pulse Discharge Current | 110A @ 10min 120A @ 10s | 110A @ 10min 120A @ 10s | 165A @ 10min 180A @ 10s | 210A @ 10min 220A @ 10s |
| Charging Voltage [V] | 55.2~57.6 | | | |
| End of Discharge Voltage [V] | 44.8 (Backup Application) / 48 (Cycle Application) | | | |
| Operation Humidity | 0~95% RH (No condensing) | | | |
| Operating Temperature Range | Standard Product: Charge: 0 ~ +55°C; Discharge: -20 ~ +55°C With Optional Heater: Charge / Discharge: -30 ~ +55°C | | | |
| Cycle Life ⁽¹⁾ | >6000 | | | |
| Designed Calendar Life | 10 Years | | | |
| Communication interface | RS485, CAN | | | |
| Protection | Over voltage , Low voltage, Over current, Over Temperature, Low Temperature, Short circuit | | | |
| Parallel Support ⁽²⁾ | Yes, Max. 15 Sets | | | |
| Series Support | Not support | | | |

TRANSPORTATION AND STORAGE

Transportation requirement

The product passes the certifications of the UN38.3 (UN38.3: Section 38.3 of the sixth Revised Edition of the Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria) and SN/T 0370.2-2009 (Part 2: Performance Test of the Rules for the Inspection of Packaging for Exporting Dangerous Goods). This product belongs to class 9 dangerous goods.

The SOC is 50% when shipped from factory.

The product can be delivered to the site directly and transported by land and water. The packing case must be secured for transportation, compliant with related national standards,

and printed with marks such as anti-collision and moisture prevention. Dispose of waste ESMs in strict accordance with local laws and regulations.

Protect the packing case with the product from the following situations:

- Being dampened by rains, snows, or falling into water
- Falling or mechanical impact
- Being upside-down or tilted

Storage

The rack type Li-ion battery can be stored in an environment with temperatures between -40°C and +60°C and between 10% and 90% relative humidity, non-condensing. For long storage periods at 25°C, charge the battery every 6 months. For temperatures above 40°C, charge the battery every quarter.

Do not store the Li-ion battery at temperatures above 60°C.

Keep away from heat sources (such as a heater)

Communication with different inverter

Ritar RESS li-ion battery BMS support to do communication with below inverters.

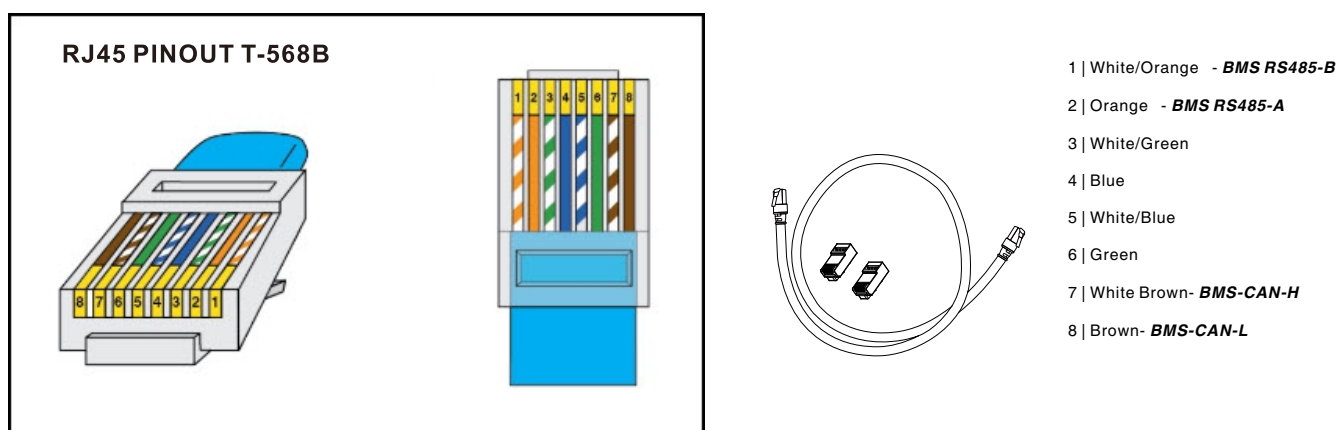
This chapter mainly introduce the communication cable connection and BMS software configuration.

| SN | Inverter Brand | Adaption Series | Communication |
|----|----------------|--------------------------|---------------|
| 1 | Victron | CCGX- VE-CAN | CAN |
| 2 | SMA | SUNNY ISLAND Series | CAN |
| 3 | Megarevo | REVO Series | CAN |
| 8 | MUST | Solar Inverter 2KW-5.5KW | CAN |
| 4 | Voltronic | Axpert Series | RS485 |
| 5 | Growatt | SPF *** TL, ES, Series. | RS485 |
| 6 | OPTI | SP5000 Handy Plus | RS485 |
| 7 | DEYE | SUN-3K/3.6K-SG04LP1 | RS485 |
| 9 | INHENERGY | HI-**-SL Series | RS485 |
| 10 | Afore | HNS3000-6000HS | RS485 |
| 11 | Phocos | Any-Grid PSW-H | RS485 |

Note: The list of inverter will renew by the BMS software update, the newest inverter list will shown on BMS PC software.

Communication cable

The accessories communication cable is standard T-568B CAT5-e cable. it can be used for battery-battery internal communication and inverter CAN (Victron), RS485 (Growatt, DEYE, INHENERGY), for other brand inverter, it needs to modify communication cable according to PINOUT of inverter.



BMS RS485 and CAN Port, Major inverter BMS Port.

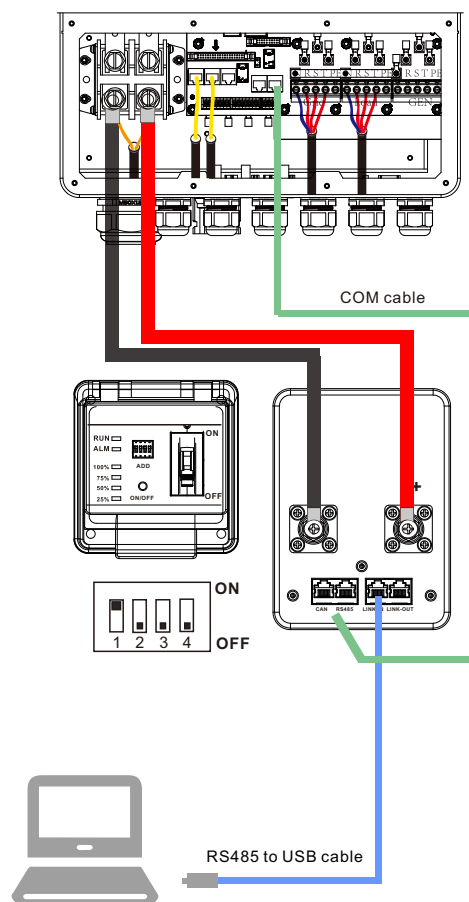
| PIN | BMS | | CAN | | | | RS485 | | | | | |
|-----|-------|-------|----------|----------------|----------|-------|---------|-----------|---------|------------|--------|-----------|
| | RS485 | CAN | Victron | SMA | Megarevo | MUST | Growatt | Voltronic | DEYE | Afore | Phocos | INHENERGY |
| 1 | 485_B | NC | NET-C/V- | Sync1-reserved | / | 485_B | 485_B | / | 485_B | Meter 485A | 232_RX | 485_B |
| 2 | 485_A | NC | NET-S/V+ | CAN_GND | / | 485_A | 485_A | / | 485_A | Meter 485B | 232_TX | 486_A |
| 3 | NC | NC | NET-C/V- | SYNC_H | / | GND | NC | 485_B | / | BAT 485A | 485_B | GND_S |
| 4 | NC | NC | NC | CAN_H | CAN_H | / | NC | / | CAN_H | BAT CANH | +12Vdc | CAN_H |
| 5 | NC | NC | NC | CAN_L | CAN_L | CAN_L | NC | 485_A | CAN_L | BAT CANL | 485_A | CAN_L |
| 6 | NC | NC | NET-S/V+ | SYNC_L | 485_GND | CAN_H | NC | / | 485_GND | BAT 485B | CAN_H | NTC.BAT |
| 7 | NC | CAN-H | CAN-H | Sync7-Reserved | 485_A | / | NC | / | 485_A | CTU | CAN_L | WAKE- |
| 8 | NC | CAN-L | CAN-L | Sync8-Reserved | 485_B | / | NC | / | 485_B | CTN | GND | WAKE+ |

System cable connection

- Step 1. Make sure the battery breaker is in off condition. Connect the power cable to inverter. Make sure the screws are tight.
- Step 2. Connect the communication cable.
- Step 3. Set the battery module ID by ADD. **The master battery which do communication with inverter ADD must be 1.**
- Step 4. Make sure the inverter had be installed correctly.
- Step 5. Press ON/OFF button to active the battery BMS and connect battery to PC by BMS PC software, select inverter protocol on BMS (detail operation refer to user manual)
- Step 6. Turn on battery breaker and the inverter will be activated, set the inverter (battery type and protocol).
- Step 7. If the communication between BMS and inverter is nominal, the SOC, temperature information in PC and inverter display will be totally same.
- Step 8. **Charge the batteries fully in first use.**

Note:

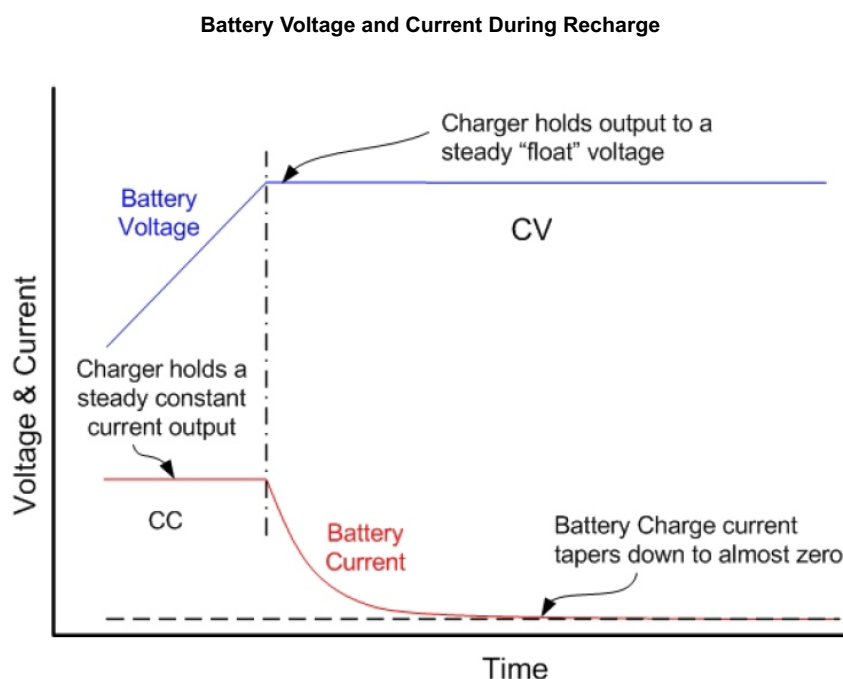
- For 1pcs 5KWH battery and 10KWH-100A, it max support 5KVA inverter or the real load power consumption is less than 5KW.
- For 1pcs 10KWH-150A battery, it max support 8KVA inverter or the real load power consumption is less than 7KW.
- For 1pcs 10KWH-200A battery, it max support 10KVA inverter or the real load power consumption is less than 8KW.



Charging Batteries

The constant current (CC) charger is recommended strongly.

The charge voltage and current setting can refer to below table:



- If there are communication between battery and inverter, the BMS will automatic request charge and discharge parameters from inverter,
- If there are no communication between battery and inverter, setting charge and discharge parameters on inverter.

Recommended setting for 51.2V battery:

Equalized charging voltage: 56.0Vd

Float charging voltage: 53.9Vdc

Charge current: 0.5C

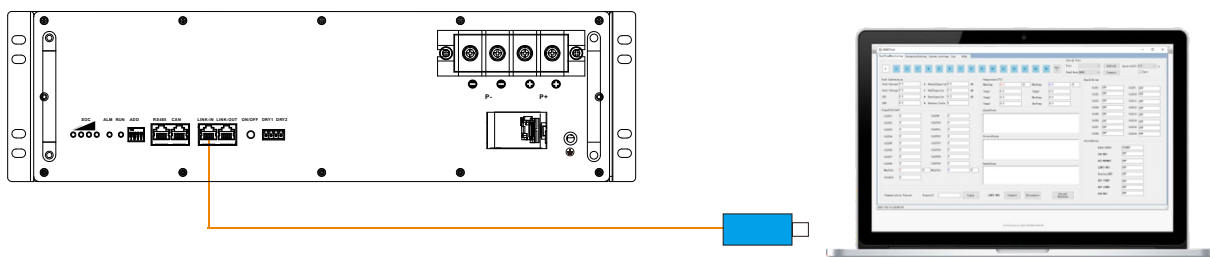
End of discharge voltage: 48Vdc

BMS PC Software Operation

1. Download BMS PC software and Unzip to a local folder.

http://120.27.63.138:8181/docs/bms_software/bms_pcsoftware

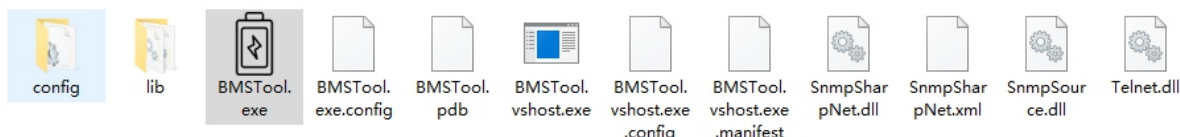
2. Connect battery LINK-IN port to computer by RS485 to USB equipment:



3. Check the battery ADD and make sure the ID=1

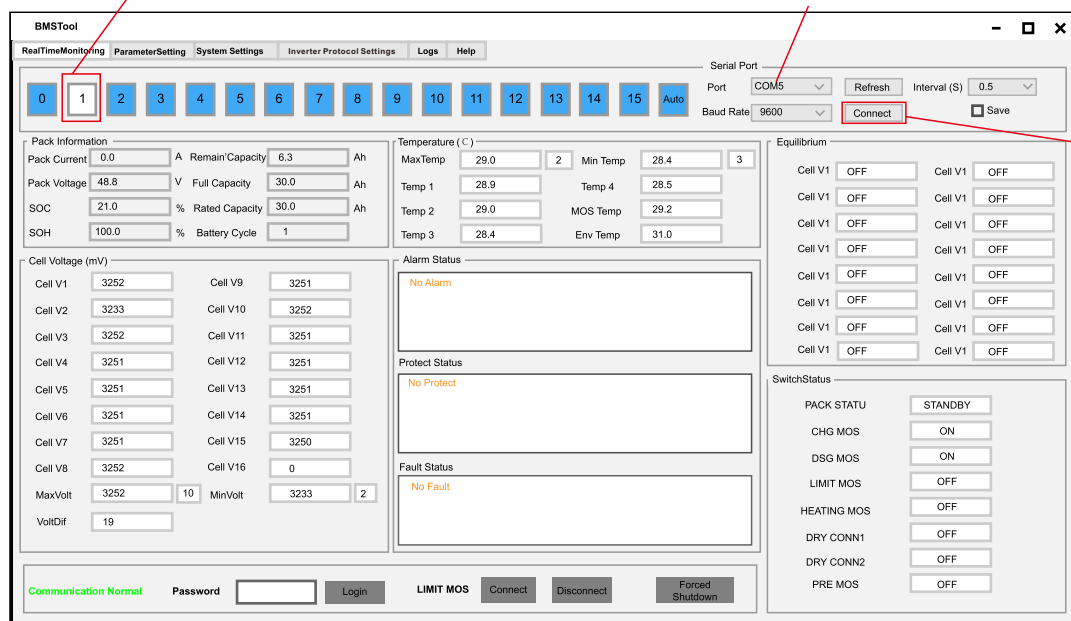


4. Double click “BMSTool.exe” to run BMS PC software.

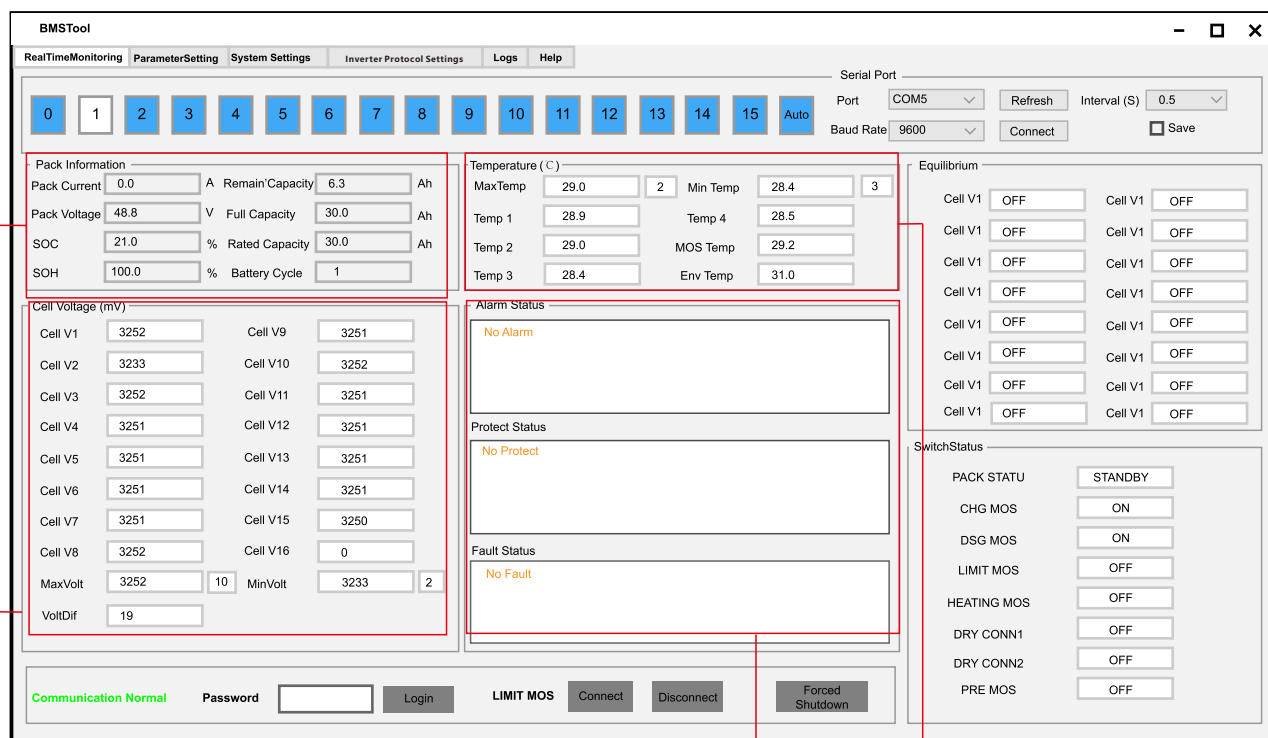


Battery ADD

If RS485 to USB device is connected well, the serial port will be listed, otherwise, it needs to install USB driver.



3. Click “Connect”, the BMS detail information will be listed



BMSTool

RealTimeMonitoring | ParameterSetting | System Settings | Inverter Protocol Settings | Logs | Help

Serial Port: Port COM5, Baud Rate 9600, Interval (S) 0.5, Save

Buttons: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, Auto

Pack Information

| | | | | | |
|--------------|-------|---|-----------------|------|----|
| Pack Current | 0.0 | A | Remain/Capacity | 6.3 | Ah |
| Pack Voltage | 48.8 | V | Full Capacity | 30.0 | Ah |
| SOC | 21.0 | % | Rated Capacity | 30.0 | Ah |
| SOH | 100.0 | % | Battery Cycle | 1 | |

Temperature (°C)

| | | | | | |
|---------|------|---|----------|------|---|
| MaxTemp | 29.0 | 2 | Min Temp | 28.4 | 3 |
| Temp 1 | 28.9 | | Temp 4 | 28.5 | |
| Temp 2 | 29.0 | | MOS Temp | 29.2 | |
| Temp 3 | 28.4 | | Env Temp | 31.0 | |

Cell Voltage (mV)

| | | | | | |
|---------|------|----------|---------|------|---|
| Cell V1 | 3252 | Cell V9 | 3251 | | |
| Cell V2 | 3233 | Cell V10 | 3252 | | |
| Cell V3 | 3252 | Cell V11 | 3251 | | |
| Cell V4 | 3251 | Cell V12 | 3251 | | |
| Cell V5 | 3251 | Cell V13 | 3251 | | |
| Cell V6 | 3251 | Cell V14 | 3251 | | |
| Cell V7 | 3251 | Cell V15 | 3250 | | |
| Cell V8 | 3252 | Cell V16 | 0 | | |
| MaxVolt | 3252 | 10 | MinVolt | 3233 | 2 |
| VoltDif | 19 | | | | |

Alarm Status

No Alarm

Protect Status

No Protect

Fault Status

No Fault

Equilibrium

| | | | |
|---------|-----|---------|-----|
| Cell V1 | OFF | Cell V1 | OFF |
| Cell V1 | OFF | Cell V1 | OFF |
| Cell V1 | OFF | Cell V1 | OFF |
| Cell V1 | OFF | Cell V1 | OFF |
| Cell V1 | OFF | Cell V1 | OFF |
| Cell V1 | OFF | Cell V1 | OFF |
| Cell V1 | OFF | Cell V1 | OFF |
| Cell V1 | OFF | Cell V1 | OFF |

SwitchStatus

| | |
|-------------|---------|
| PACK STATU | STANDBY |
| CHG MOS | ON |
| DSG MOS | ON |
| LIMIT MOS | OFF |
| HEATING MOS | OFF |
| DRY CONN1 | OFF |
| DRY CONN2 | OFF |
| PRE MOS | OFF |

Communication Normal | Password | Login | LIMIT MOS | Connect | Disconnect | Forced Shutdown

Battery information:
Total current, Total voltage,
SOC, SOH, Remain capacity,
Rated capacity, Cycle times.

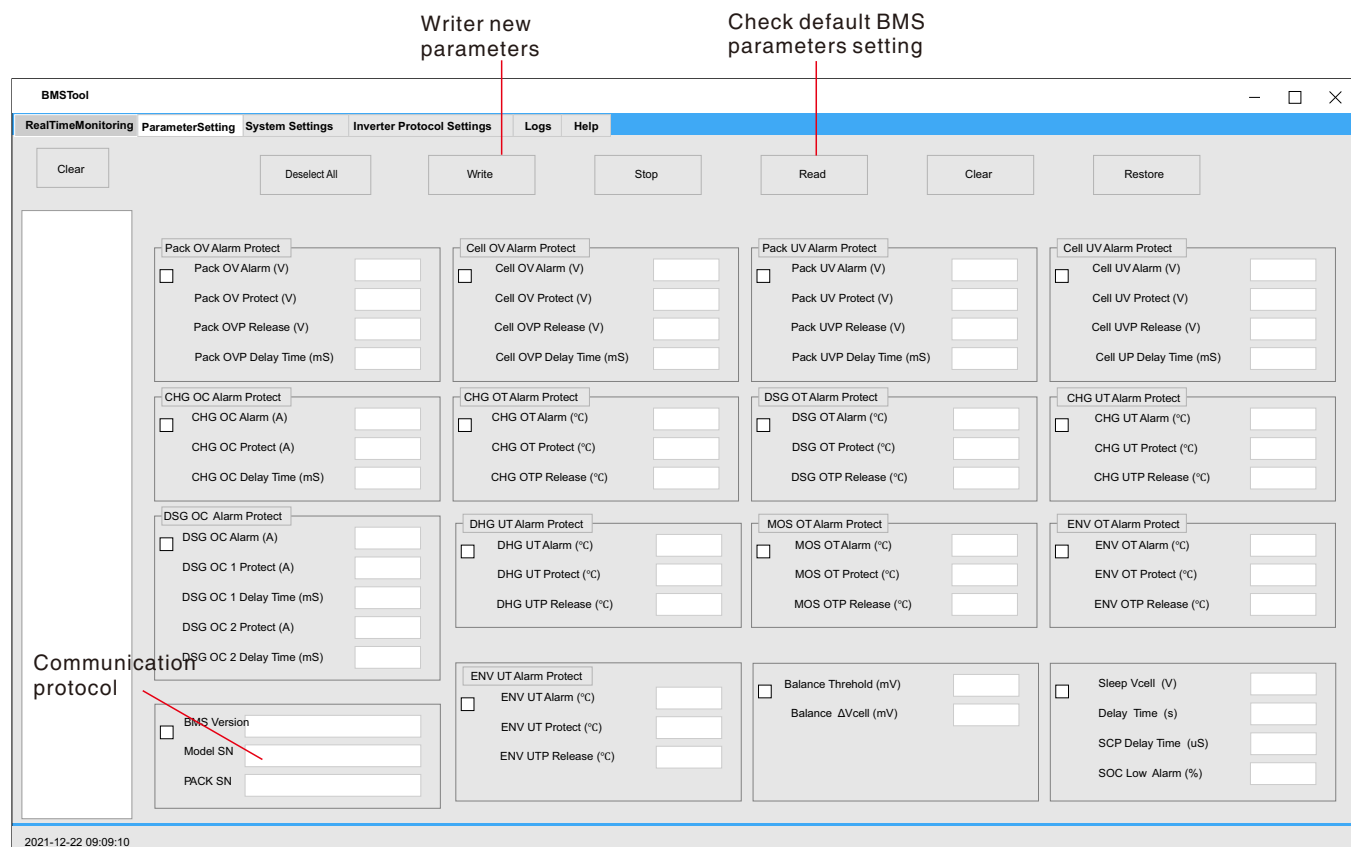
Cells information:
Cell voltage

Alarm, Protection, Fault
information

Temperature information:
Cell temperature
Environment temperature
BMS temperature (MOS)

Note:

The Parameter setting change must be carried out by a professional engineer.



BMSTool

RealTimeMonitoring | ParameterSetting | System Settings | Inverter Protocol Settings | Logs | Help

Buttons: Clear, Deselect All, Write, Stop, Read, Clear, Restore

Writer new parameters

Check default BMS parameters setting

Communication protocol

Pack OV Alarm Protect

| | | |
|--------------------------|--------------------------|--|
| <input type="checkbox"/> | Pack OV Alarm (V) | |
| <input type="checkbox"/> | Pack OV Protect (V) | |
| <input type="checkbox"/> | Pack OVP Release (V) | |
| <input type="checkbox"/> | Pack OVP Delay Time (mS) | |

Cell OV Alarm Protect

| | | |
|--------------------------|--------------------------|--|
| <input type="checkbox"/> | Cell OV Alarm (V) | |
| <input type="checkbox"/> | Cell OV Protect (V) | |
| <input type="checkbox"/> | Cell OVP Release (V) | |
| <input type="checkbox"/> | Cell OVP Delay Time (mS) | |

Pack UV Alarm Protect

| | | |
|--------------------------|--------------------------|--|
| <input type="checkbox"/> | Pack UV Alarm (V) | |
| <input type="checkbox"/> | Pack UV Protect (V) | |
| <input type="checkbox"/> | Pack UVP Release (V) | |
| <input type="checkbox"/> | Pack UVP Delay Time (mS) | |

Cell UV Alarm Protect

| | | |
|--------------------------|-------------------------|--|
| <input type="checkbox"/> | Cell UV Alarm (V) | |
| <input type="checkbox"/> | Cell UV Protect (V) | |
| <input type="checkbox"/> | Cell UVP Release (V) | |
| <input type="checkbox"/> | Cell UP Delay Time (mS) | |

CHG OC Alarm Protect

| | | |
|--------------------------|------------------------|--|
| <input type="checkbox"/> | CHG OC Alarm (A) | |
| <input type="checkbox"/> | CHG OC Protect (A) | |
| <input type="checkbox"/> | CHG OC Delay Time (mS) | |

CHG OT Alarm Protect

| | | |
|--------------------------|----------------------|--|
| <input type="checkbox"/> | CHG OT Alarm (°C) | |
| <input type="checkbox"/> | CHG OT Protect (°C) | |
| <input type="checkbox"/> | CHG OTP Release (°C) | |

DSG OT Alarm Protect

| | | |
|--------------------------|----------------------|--|
| <input type="checkbox"/> | DSG OT Alarm (°C) | |
| <input type="checkbox"/> | DSG OT Protect (°C) | |
| <input type="checkbox"/> | DSG OTP Release (°C) | |

CHG UT Alarm Protect

| | | |
|--------------------------|----------------------|--|
| <input type="checkbox"/> | CHG UT Alarm (°C) | |
| <input type="checkbox"/> | CHG UT Protect (°C) | |
| <input type="checkbox"/> | CHG UTP Release (°C) | |

DSG OC Alarm Protect

| | | |
|--------------------------|--------------------------|--|
| <input type="checkbox"/> | DSG OC Alarm (A) | |
| <input type="checkbox"/> | DSG OC 1 Protect (A) | |
| <input type="checkbox"/> | DSG OC 1 Delay Time (mS) | |
| <input type="checkbox"/> | DSG OC 2 Protect (A) | |
| <input type="checkbox"/> | DSG OC 2 Delay Time (mS) | |

DHG UT Alarm Protect

| | | |
|--------------------------|----------------------|--|
| <input type="checkbox"/> | DHG UT Alarm (°C) | |
| <input type="checkbox"/> | DHG UT Protect (°C) | |
| <input type="checkbox"/> | DHG UTP Release (°C) | |

MOS OT Alarm Protect

| | | |
|--------------------------|----------------------|--|
| <input type="checkbox"/> | MOS OT Alarm (°C) | |
| <input type="checkbox"/> | MOS OT Protect (°C) | |
| <input type="checkbox"/> | MOS OTP Release (°C) | |

ENV OT Alarm Protect

| | | |
|--------------------------|----------------------|--|
| <input type="checkbox"/> | ENV OT Alarm (°C) | |
| <input type="checkbox"/> | ENV OT Protect (°C) | |
| <input type="checkbox"/> | ENV OTP Release (°C) | |

ENV UT Alarm Protect

| | | |
|--------------------------|----------------------|--|
| <input type="checkbox"/> | ENV UT Alarm (°C) | |
| <input type="checkbox"/> | ENV UT Protect (°C) | |
| <input type="checkbox"/> | ENV UTP Release (°C) | |

Balance Threshold (mV)

| | | |
|--------------------------|-----------------------------|--|
| <input type="checkbox"/> | Balance Δ Vcell (mV) | |
|--------------------------|-----------------------------|--|




Sleep Vcell (V)

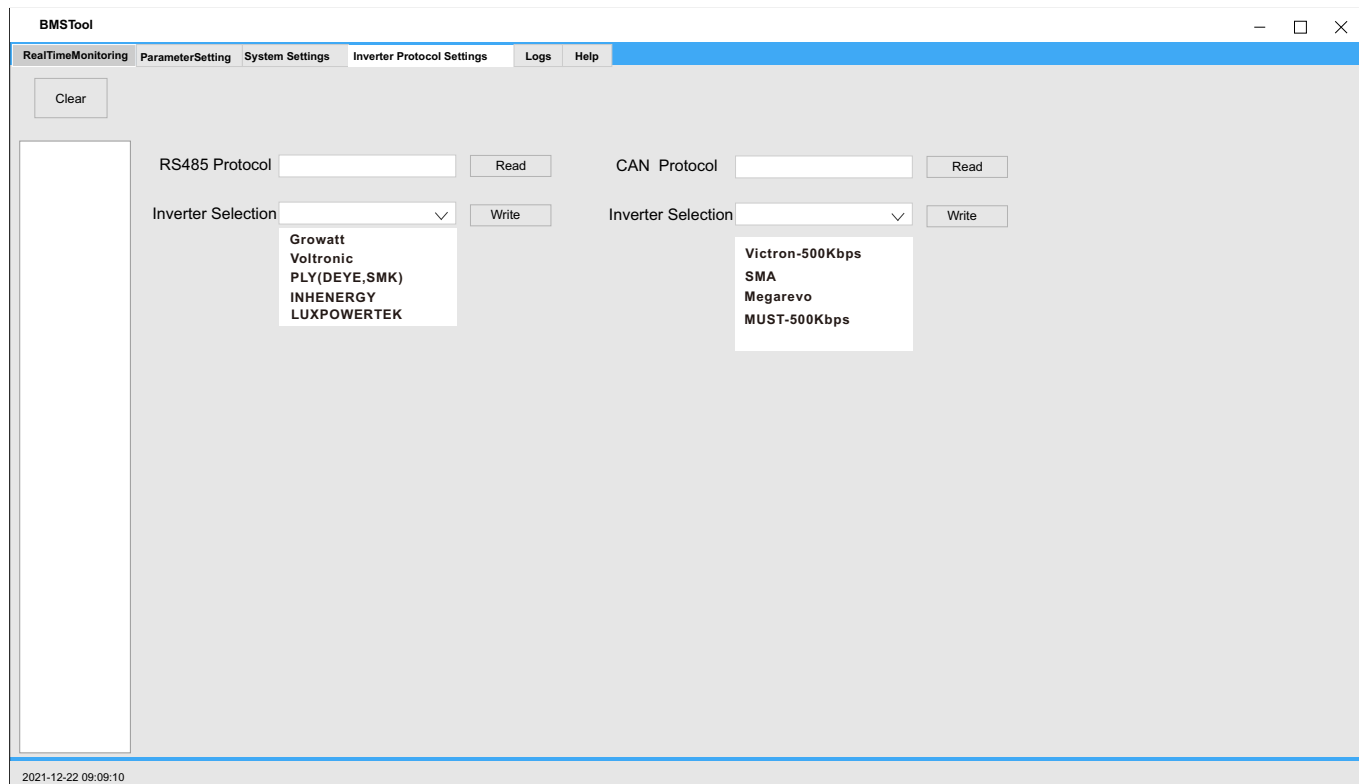
| | | |
|--------------------------|---------------------|--|
| <input type="checkbox"/> | Delay Time (s) | |
| <input type="checkbox"/> | SCP Delay Time (uS) | |
| <input type="checkbox"/> | SOC Low Alarm (%) | |

BMS Version

| | | |
|--------------------------|----------|--|
| <input type="checkbox"/> | Model SN | |
| <input type="checkbox"/> | PACK SN | |

2021-12-22 09:09:10

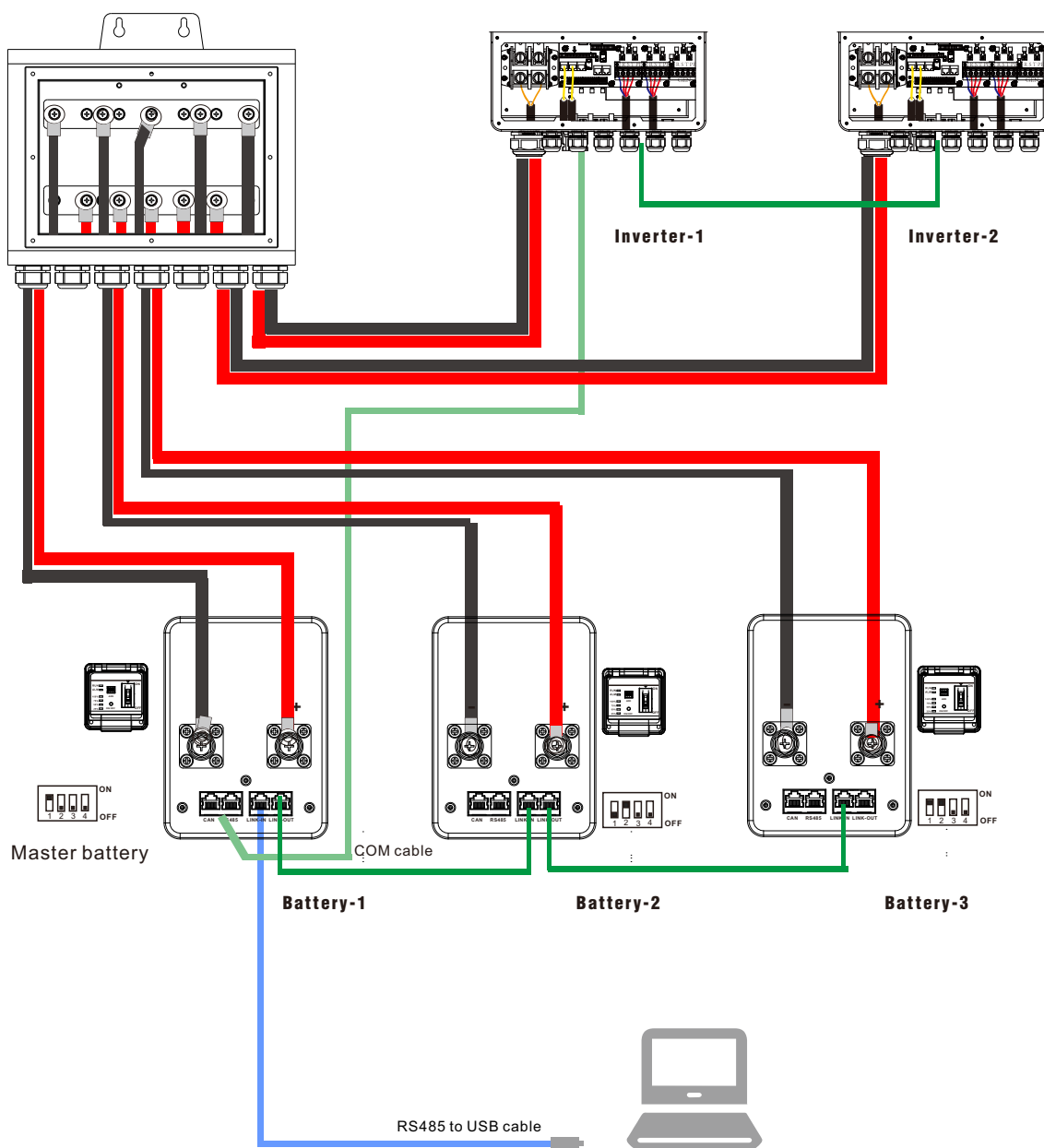
-  Click “Read” to check currently loaded communication protocols.
-  Select protocol by inverter brand and click “Write” to reload protocol.
-  Click “Read” to check



The screenshot shows the BMSTool software interface. The top menu bar includes "RealTimeMonitoring", "ParameterSetting", "System Settings", "Inverter Protocol Settings" (which is the active tab), "Logs", and "Help". Below the menu bar, there is a "Clear" button on the left. The main area is divided into two columns. The left column has a vertical list of inverter brands: Growatt, Voltronic, PLY(DEYE,SMK), INHENERGY, and LUXPOWERTEK. The right column has a vertical list of protocols: Victron-500Kbps, SMA, Megarevo, and MUST-500Kbps. Each list is preceded by a dropdown menu labeled "Inverter Selection". To the right of each list is a "Write" button. Above each list is a text input field for the protocol name, followed by a "Read" button. At the bottom left, a timestamp "2021-12-22 09:09:10" is displayed.

Annex A: Parallel Connection With Distribution BOX

Distribution box is optional for the situation which parallel over 3 batteries or 2~3 inverter in parallel.



Note:

- ☑ Ensure the cables are properly sized.
- ☑ The length fo cable should be same.