

# **Installation Guide**

## **for Connecting the Super L Battery Module to the TBB Inverters**

### **V1.0**

This document is applicable to RiiO, RiiO Sun and Apollo Maxx

#### Version history

Date	Version	Remark	Author
2021/02/24	V1.0	First version	

## 1.0 Instruction

### 1.1 General description

This installation guide is intended to show you how to install and setup the SUPER L battery module with the Inverter. It should be used in conjunction with the manual of the SUPER L battery module and the inverter.

The SUPER L battery module is a combination of a Battery Management System (BMS) and several battery cells, supporting parallel connection with multiple battery modules.



Figure 1

### 1.2 SUPER L battery module specification

The SUPER L battery module can be managed automatically by the internal BMS, and the specifications are shown as following.

Table 1 SUPER L battery module specification

Model	LS50	LS75
Cell Technology	Li-ion(LFP)	
Battery Module Capacity (kWh)	2.4	3.6
Battery Module Voltage (Vdc)	48	48
Battery Module Capacity (Ah)	50	75
Battery Module Cell Quantity (pcs)	30	45
Battery Cell Capacity (Wh)	80	80
Battery Cell Voltage (Vdc)	3.2	3.2
Battery Cell Capacity (AH)	25	25
Battery Module Cell Quantity in Series (pcs)	15	15
Battery Module Charging Voltage (Vdc)	53.5	53.5
Battery Module Charging Current (Normal)(A)	25	37.5
Battery Module Discharging lower-Voltage (Vdc)	42	42
Battery Module Discharging Current (Normal) (A)	25	37.5
Battery Module Charging Current (Max. in 1s) (A)	55	55
Dimension (W*D*H, mm)	481*360*90mm	481*360*132mm
Communication	CAN	
Pollution Degree (PD)	II	
Protection category	IP20	
Weight(kg)	21	31

### 1.3 Recommended minimum battery capacity

The charging and discharging current of the LS50 battery module are limited by the BMS. The number of battery modules in the system must at least meet the minimum number required to supply the inverter and ensure sufficient inrush current for the inverter to start when it is connected for the first time. In addition, the continuous charging and discharging current of the inverter should not exceed 25A and the peak current should be less than 55A for each LS 50 module.

According to load requirement and the inverter rated power, the required quantity of the battery module  $N = \text{load power} / 1200\text{W}$  and the charging and discharging current =  $N * 25\text{A}$ .

The recommended battery sizes for the inverter are listed in the table 2.

Table 2 Minimum battery capacity recommendation

Inverter Power	Rated Power of the inverter (W)	Recommended minimum quantity of the LS50 battery module (set)	Continuous discharging power from the battery (W)	Recommended numbers of the power cable (set)
2KW	2000	2	2400	1
3KW	3000	3	3600	1
4KW	4000	4	4800	1
5KW	5000	5	6000	2
6KW	6000	5	6000	2

**Note:**

**The maximum current of the power cable is 120A.**

The continuous charging and discharging current of inverter should not exceed 37.5A and the peak current should be less than 100A for each LS75 module.

According to the load requirement and the inverter rated power, the quantity of the battery module  $N = \text{load power} / 1800\text{W}$  and the charging and discharging current =  $N * 37.5\text{A}$ .

The recommended battery sizes for the inverter are listed in the table 3.

Table 3 Minimum battery capacity recommendation

Inverter Power	Rated Power of the inverter (W)	Recommended minimum quantity of the LS75 battery module (set)	Continuous discharging power from the battery (W)	Recommended numbers of the power cable (set)
2KW	2000	2	3600	1
3KW	3000	2	3600	1
4KW	4000	3	5400	1
5KW	5000	3	5400	2
6KW	6000	4	7200	2

## 1.4 Installation notice

Before starting, please make sure the battery modules and the inverter size meet the requirement, and keep both inverter and battery modules completely OFF.

## 1.5 Hardware protection points

In the normal operation, the limits of the charging parameter of the inverter are controlled by the SUPER L battery module through the CANBUS communication. The operating range are shown as following:

- 1) Low voltage protection: When the battery discharging voltage is less than or equal to 44.5V, the battery protection will turn on.
- 2) High Voltage protection: If the charging voltage is over 54V, the battery protection will turn on.
- 3) The discharging temperature range is from -10 to 50°C.
- 4) The charging temperature range is from 0 to 50°C.
- 5) When the discharging voltage reaches 47V, the corresponding current will be 0A and the inverter will be turned off.
- 6) The limits of the over-charging and over-discharging current is 55A for LS50 and LS75 for 1 second.

If the operation exceeds the operating range, the battery will be disconnected for self-protection.

## 2.0 Example Wiring Diagram

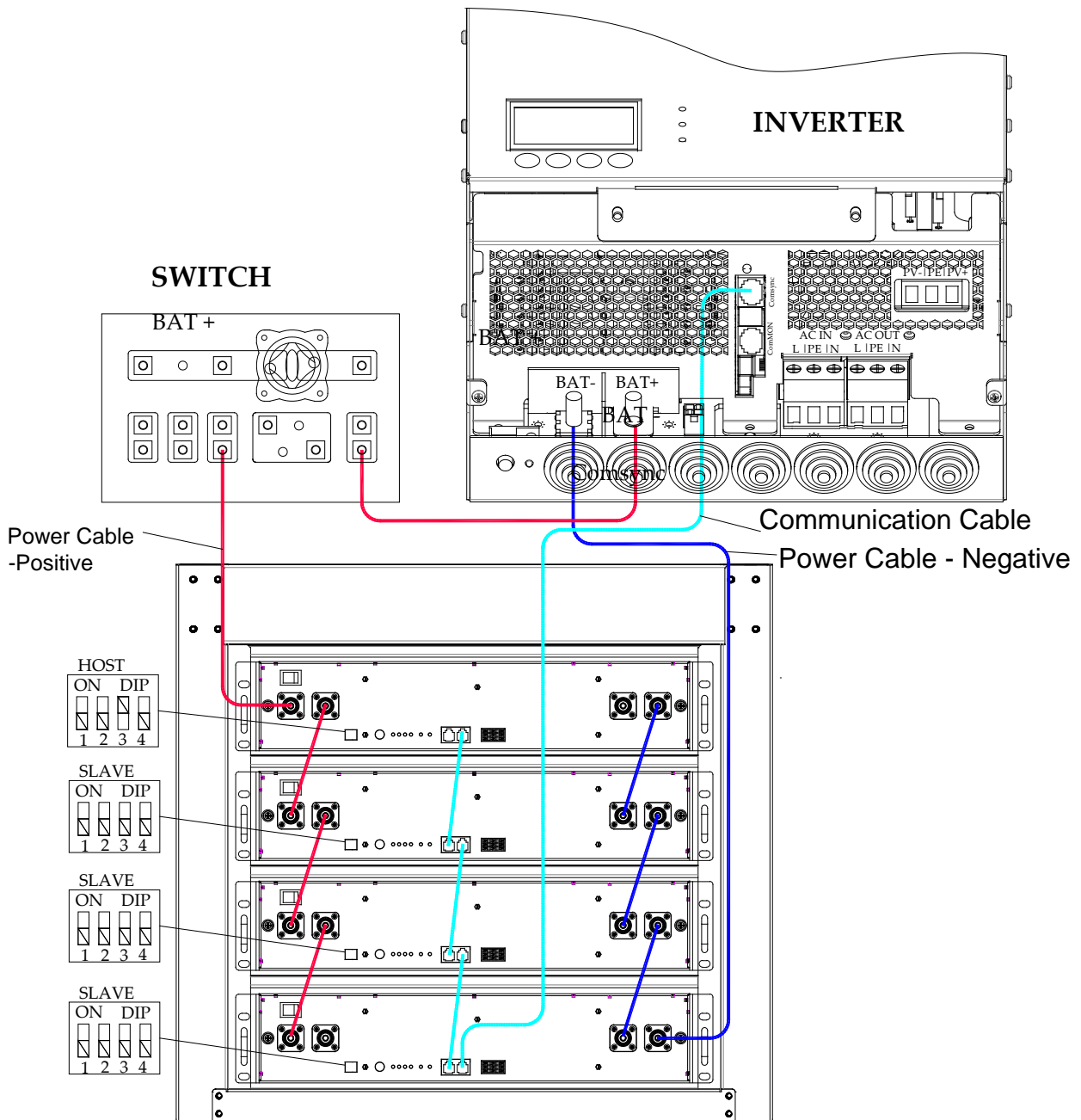


Figure 2 Example for the wiring diagram

**Note: We take four batteries as an example for connection.**

### 3.0 Installation material list

Table4 Installation material list

No.	Item	Spec	QTY	Picture
1	RiiO Sun All in One Solar Inverter	RiiO Sun 3.0S	1	
2	LS50 Battery module	48V/50Ah 481x360x90mm	4	
3	Power Cable-Positive	Red 120A /25mm <sup>2</sup> /L2050mm	1	
4	Power Cable-Negative	Black 120A /25mm <sup>2</sup> /L2050mm	1	
5	Parallel Cable-Positive	Red 120A /25mm <sup>2</sup> /L215mm	3	
6	Parallel cables-Negative	Black 120A /25mm <sup>2</sup> /L215mm	3	
7	Positive Cable	Red /35mm <sup>2</sup> /L1100mm	1	
8	Negative Cable	Black /35mm <sup>2</sup> /L1100mm	1	
9	Communication cable - Battery to Inverter	Black /L2000mm	1	
10	Communication Parallel Cable	Yellow /L250mm/Double RJ45plug	3	
12	DC circuit breaker	NDM3Z-125/2300	1	

**Note: We take four batteries as an example for connection.**

## 4.0 Installation procedure

### 4.1 Parallel connection between SUPER L battery modules

- 1) Connect the CAN/485 OUT port of the first module to the CAN/485 IN port of the second module with the communication parallel cable (L250mm).
- 2) Using the same type cable to connect the communication ports from the second to the third and from the third to the fourth module, as shown in Figure. 3 (yellow wiring).
- 3) Using the positive battery parallel cables (L215mm) to connect the positive pole of the first module to the positive pole of the second module.
- 4) Using the same type cable to connect the second to the third module and the third to the fourth module, and so on. The positive power cable parallel connection is shown in Figure 3 (red connection).
- 5) Using the negative battery parallel cables (L215mm) to connect the negative pole of the first module to the negative pole of the second module.
- 6) Using the same type cable to connect the second to the third module and the third to the fourth module, and so on. The negative power cable parallel connection is shown in the Figure 3 (black connection).



Figure 3

### 4.2 Dip switch setting in the SUPER L battery modules

#### 1) HOST battery module setting

Set the DIP switch SW3 of the first SUPER L battery module to the ON position, and keep the other dip switch in the OFF position. Then the first lithium battery module is set as the HOST as shown in Figure 4 (the first DIP switch).

**\*\*NOTICE:**

The DIP switch setting is valid only when the battery module is powered off.

2) For the other battery modules, keep their SW1 ~ SW4 of DIP switch in the OFF position, indicating that they are set as SLAVES, as shown in the Figure 4 (the second, third and fourth DIP switches).

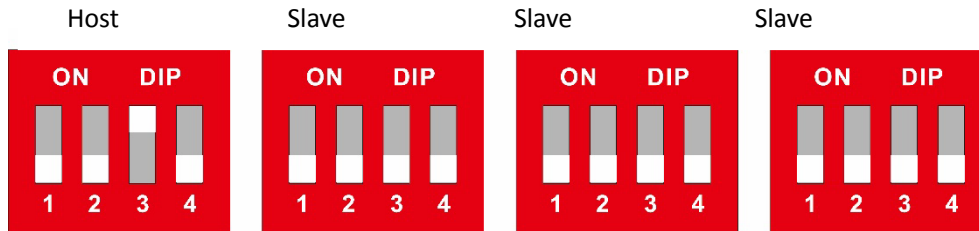


Figure 4

**4.3 Cable connection between the SUPER L battery pack and the inverter**

**4.3.1 Battery power cable wiring**

1) Using the L=2050mm “Power cable - Positive” to connect the positive pole of the fourth module of the SUPER L battery pack to the DC circuit breaker, and then use the L=1100mm Positive cable to connect the battery positive input terminal of the inverter from DC circuit breaker as shown in Figure 5 (red wire).

2) Using the L=2050mm “Power cable –Negative” to connect the negative pole of the first module of the SUPER L battery pack to the DC circuit breaker, and then use the L=1100mm Negative cable to connect the battery negative input terminal of the inverter to the DC breaker, as shown in Figure 5 (black wire).

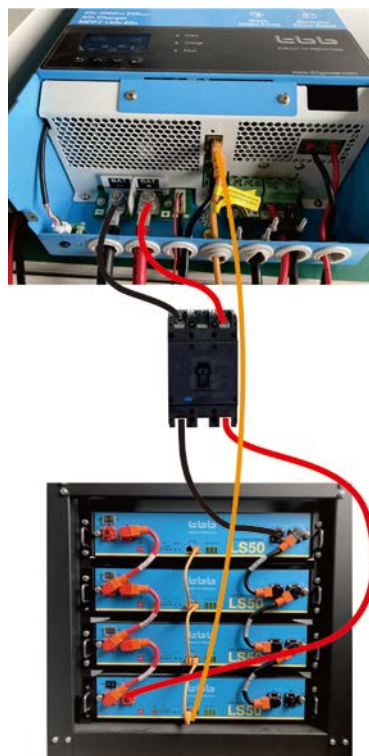


Figure 5

### 4.3.2 CAN BUS Wiring

1) You can use the communication cable(RJ45 Cable) –Battery to Inverter ( L2000mm) supplied by TBB to wire the CAN BUS between the battery and the inverter. Plug one side of the RJ-45 cable into the CAN port of the Slave SUPER L battery module, and plug the other side of the RJ-45 cable into the CAN port of the inverter which is labeled **ComSync**.

2) IF the inverter is Apollo Maxx ,then check the CAN terminator in the other CAN socket which is labeled as Com Sync out on the inverter.



Figure 6

## 5.0 Configuration

### 5.1 Switch on the battery modules

- 1) Double check and make sure all the positive and negative electrodes, communication and other wirings are correct.
- 2) Press the ON/OFF button to the ON position, and then press and hold the SW button for 3 seconds. Switch on all battery modules in turn until the SOC lights of all SUPER L modules are normally displayed (if the SOC light is not on, keep pressing the SW key of the first lithium SUPER L module for 3S), as shown in the Figure 7 (label ①,②,③,④).



Figure 7

### 5.2 Switch on the inverter

- 1) Switch ON the DC circuit breaker.
- 2) Press **ON/OFF** button (shown as figure 8) more than 2s to power on the inverter.



Figure 8

### 5.3 Battery type setting




- 1) After the power on self-test is completed, the inverter is in the standby state.
- 2) Press  to enter the setting mode, then press  or  to select **30** for setting the Battery type, as shown in the figure 9.



Figure 9





- 3) Press  to set the **Battery\_type**, press  or  to select **battery type** as **6-TBB SUPER-L**, as shown in the figure 10, Press  to confirm.



Figure 10

### 5.4 Other parameters setting

After the battery type is successfully set, in the normal operation, the limits of the charging and the discharging parameter of the inverter will be controlled by the SUPER L battery through CANBUS communication.

If the settings and connections are correct, values will be set automatically as below.

#### 5.4.1 Battery AH setting for the inverter

When the communication is set successfully, the battery AH setting of the inverter would be controlled by the SUPER-L battery module through the CAN BUS.

### 5.4.2 Advanced setting

After the battery type was set successfully, you can find the following setting items for SUPER L battery module in the Advanced Set:

- 43 SOC low warning:** setting range 15%~90%, default setting 15%;
- 44 SOC Low Protect:** setting range 3%~50%, default setting 5%;
- 54 SOC CHG Enough:** setting range 30%~99%, default setting 80%;

### 5.5 Battery modules status

In normal condition, the real-time information of battery SoC status is shown as a percentage, as shown in the figure 11.



Figure 11

### 5.6 Turn on the inverter

Wait in the standby mode for 30 seconds, then press the On/Off button again for 1 second to turn on the inverter into the inverting mode and observe the LCD and invert LED to make sure the inverter is running normally.

#### Notice

To avoid the over voltage malfunction of the battery module, you should wait in the standby mode for 30 seconds before turning on the inverter into the inverting mode.

## 6.0 Trouble shooting

Table 6 list of common faults

<b>Problem</b>	<b>Possible cause</b>	<b>Solution</b>
Communication error	The inverter shows communication error when the battery module doesn't response its data requests more than 30 seconds.	Check the communication cable
Overcurrent occurs in the battery module	When the inverter is connected to the battery module for the first time, the inrush current of internal capacitor may cause overcurrent warning or protection.	Increase the quantity of the battery modules to match the capacity of the inverter.
	When the inverter operates on the inverter mode, inrush current of the AC loads may result in overcurrent warning or protection.	Increase the quantity of battery modules to match the capacity of the inverter or load.
AC output voltage of the inverter is flickering	<ol style="list-style-type: none"> <li>1) Battery module is under the overcurrent protection mode.</li> <li>2) Bad connection between the battery module and the inverter</li> </ol>	<ol style="list-style-type: none"> <li>1) Increase the quantity of the battery modules to match the capacity of the inverter.</li> <li>2) Replace the battery cables</li> </ol>
The inverter shows 40 for the warning code while it is powered on.	The inverter is not powered on under the correct procedure.	Follow the correct procedure to turn on the inverter.