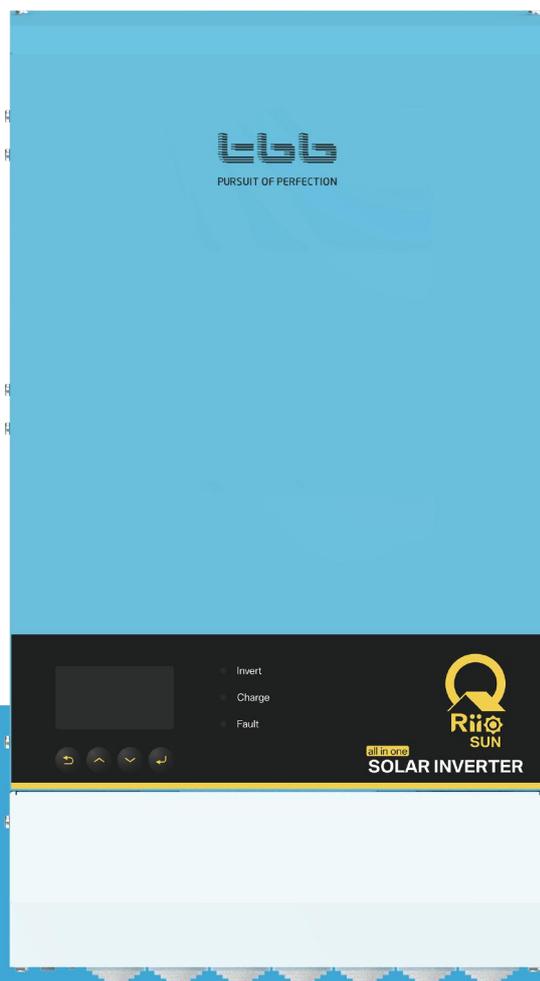




PURSUIT OF PERFECTION



RiiO Sun Series

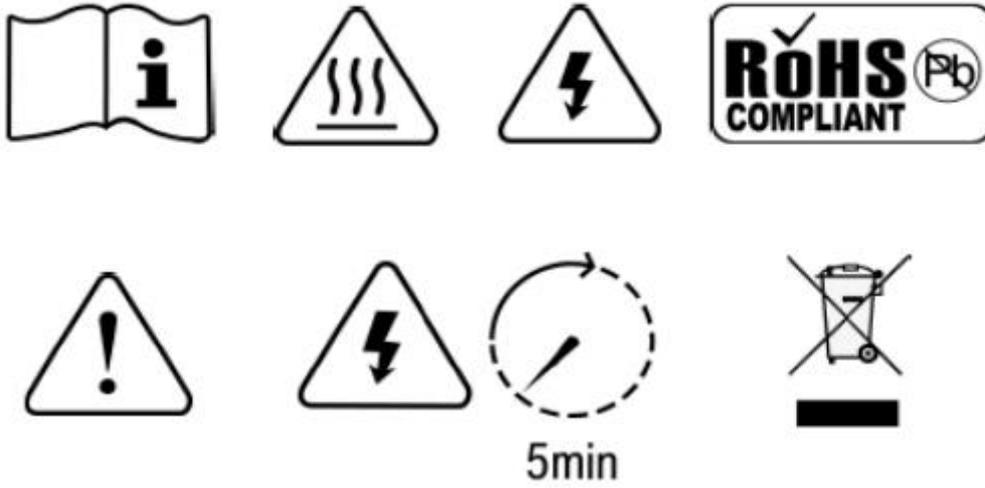
All in One Solar Inverter

A1.2

TBB POWER Co.,Ltd.
www.tbbpower.com



PURSUIT OF PERFECTION



WARNING: HIGH VOLTAGE INSIDE

CAUTION: THE DC FUSE MUST HAVE BEEN TURNED OFF BEFORE SERVICING

MADE IN CHINA

Disclaimer

Unless specially agreed in writing, TBB Power Co.,Ltd

- Take no warranty as to the accuracy, sufficiency and suitability of any technical or other information provided in this manual or other documentation.
- Assumes no responsibility or liability for loss or damage, whether direct, indirect, consequential or incidental, which might arise out of the use of such information.
- TBB offer standard warranty with its products, taking no responsibility for direct or indirect loss due to equipment failure.

About this Manual

This manual describes our product features and provides procedure of installations. This manual is for anyone intending to install our equipment.

General Instruction

Thanks for choosing our products and this manual are suitable for RiiO Sun All in One Solar Inverter. This chapter contains important safety and operation instructions. Read and keep this User Guide well for later reference.

The RiiO Sun All in One Solar Inverter needs to be installed by professionals and please pay attention to the following points prior to installation:

Please check the input voltage or voltage of battery is the same to the nominal input voltage of this inverter.

- Please connect the positive terminal “+” of the battery to “+” the input of the inverter.
- Please connect the negative terminal “-” of the battery to “-” the input of the inverter.
- Please use the shortest cable for connection and ensure the secure connection.
- While connecting, please secure the connection and avoid the short circuit between the positive terminal and the negative terminal of the battery, to protect the battery from damage.
- The inverter will have high voltage inside. Only authorized electrician can open the case.
- The inverter WAS NOT designed to use in any life retaining equipment.

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1. General Safety Instruction

1.1 Safety Instruction

As the dangerous voltage and the high temperature exist within the RiiO Sun All in One Solar Inverter, only the qualified and authorized maintenance personnel is permitted to open and repair it. Please make sure RiiO Sun All in One Solar Inverter is turned off before opening and repairing it.

This manual contains information concerning the installation and operation of the RiiO Sun All in One Solar Inverter. All relevant parts of the manual should be read prior to commencing the installation. Please follow the local stipulation in the meantime.

Any operation against safety requirement or against the design, manufacture, safety standard are out of the manufacturer warranty.

1.2 General precaution

- DO NOT expose the inverter to the dust, rain, snow or liquids of any type, it is designed for the indoor use. DO NOT block off ventilation, otherwise the RiiO Sun All in One Solar Inverter would be overheating.
- To avoid the fire and the electric shock, make sure all cables selected with right gauge and connected well. Smaller diameter and broken cable are not allowed to use.
- Please do not put any inflammable goods near to the inverter.
- NEVER place the unit directly above batteries, the gases from the battery will corrode and damage the RiiO Sun All in One Solar Inverter.
- DO NOT place battery over RiiO Sun All in One Solar Inverter.

1.3 Precaution regarding battery operation

- Use plenty of fresh water to clean in case the battery acid touches the skin, the clothing, or eyes and consult with doctor as soon as possible.
- The battery may generate flammable gas during charging. NEVER smoke or allow a spark or a flame in the vicinity of the battery.
- DO NOT put the metal tool on the battery, a spark and a short circuit might lead to a explosion.
- REMOVE all personal metal items such as rings, bracelets, necklaces, and watches while working with batteries. Batteries can cause short-circuit current high enough to make metal melt, and could cause severe burns.

2. Instruction

2.1 Brief Instruction

2.1.1 General Description

RiiO Sun is a new generation of all in one solar inverter designed for various type of off grid system including DC Couple system and generator hybrid system. It can provide UPS class switching speed.

RiiO Sun delivers high reliability, performance and industry leading efficiency for mission critical application. Its distinguishing surge capability makes it capable to power most demanding appliances, such as air conditioner, water pump, washing machine, freezer, etc.

With the function of power assist & power control, it can be used to work with a limited AC source such as generator or limited grid. RiiO Sun can automatically adjust its charging current avoiding grid or generator to be overloaded. In case of the temporary peak power appears, it can work as the supplement source to the generator or the grid.

2.1.2 Naming Rules

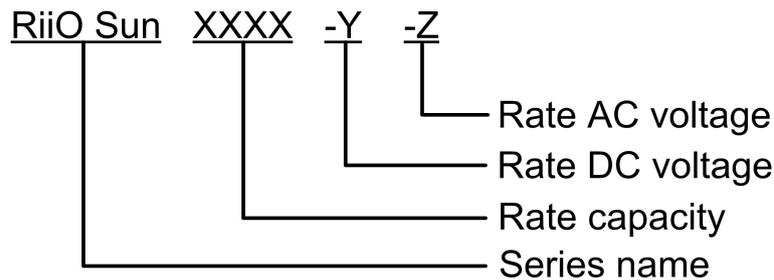


figure	explanation	
RiiO Sun	series name	
2KVA	Represent rate capacity	2000W
3KVA		3000W
4KVA		4000W
5KVA		5000W
6KVA		6000W
-M	Represent rate DC voltage	24VDC
-S		48VDC
--	Represent rate DC voltage	230VAC
-LV		120VAC

Naming example : RiiO Sun 3KVA-S

RiiO Sun All in One Solar Inverter

Rate capacity : 3000W

Rate DC voltage : 48V

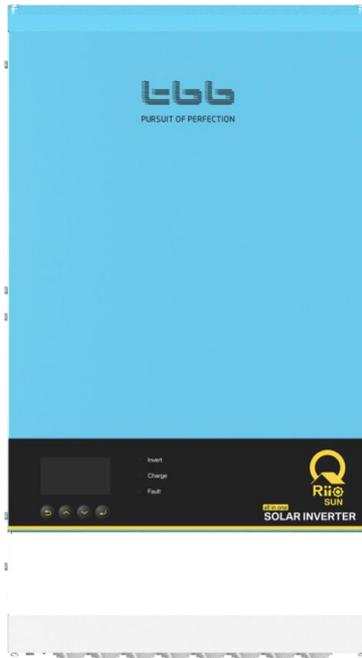
2.2 Structure

2.2.1 Front



RiiO Sun 2KVA-M, RiiO Sun 2KVA-S, RiiO Sun 3KVA-M, RiiO Sun 3KVA-S, RiiO Sun 4KVA-S

RiiO Sun 3KVA-M-LV, RiiO Sun 3KVA-S-LV



RiiO Sun 5KVA-S, RiiO Sun 6KVA-S

Figure 2-1 Front View of the All in One Solar Inverter Structure

2.2.2 Control panel

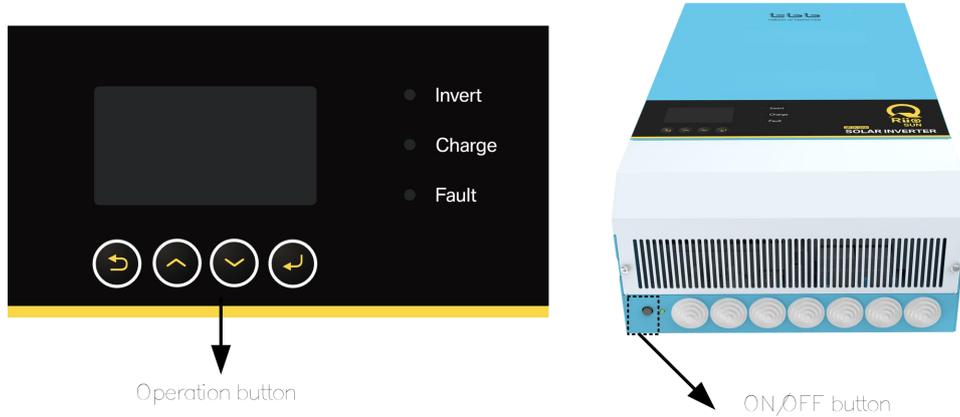
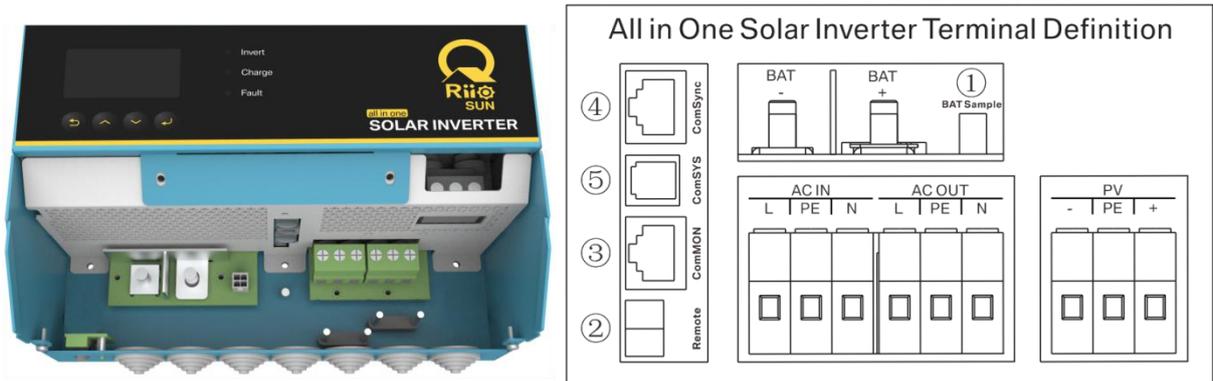


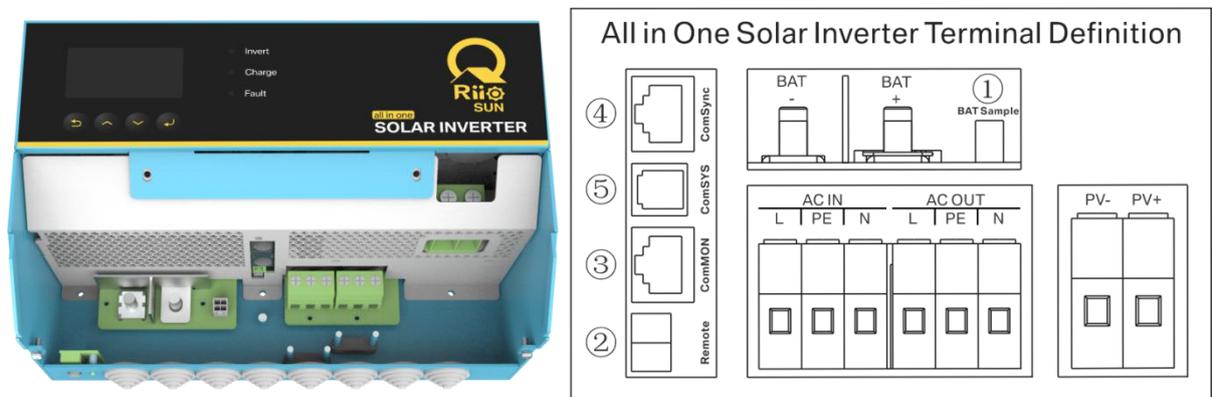
Figure 2-2 All in One Solar Inverter Control Buttons

2.2.3 Connection compartment



RiiO Sun 2KVA-M, RiiO Sun 2KVA-S, RiiO Sun 3KVA-M, RiiO Sun 3KVA-S, RiiO Sun 4KVA-S

RiiO Sun 3KVA-M-LV, RiiO Sun 3KVA-S-LV

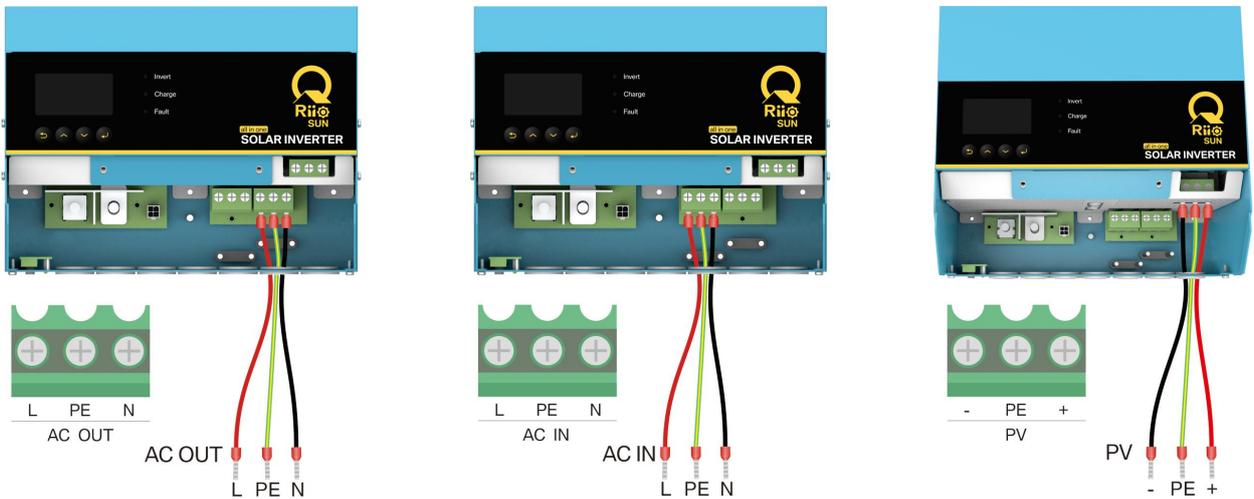


RiiO Sun 5KVA-S, RiiO Sun 6KVA-S

Figure 2-3 Signal Terminals

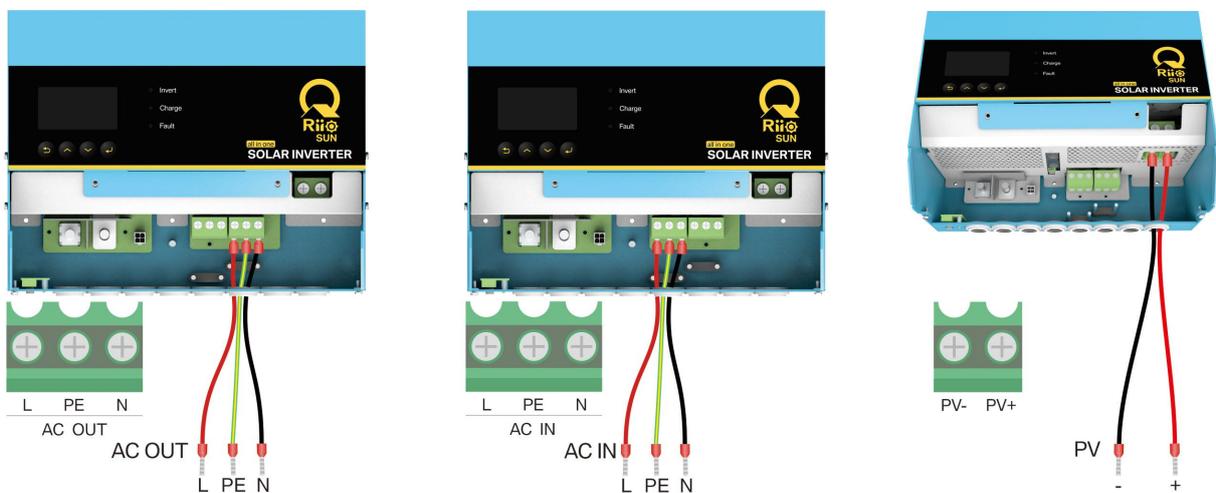
Table 2-1 Signal Terminals Introduction

No.	Silk-screen	Definition
①	BAT Sample	Battery temperature and voltage sample.
②	Remote	Dry contact input control, remote ON/OFF control.
③	ComMON	RS485 port for external monitor such as MCK, SNMP, Kinergy, etc.
④	ComSync	BMS communication (CAN) .
⑤	ComSYS	System communication(RS485), connected to SP or BGK.



RiiO Sun 2KVA-M, RiiO Sun 2KVA-S, RiiO Sun 3KVA-M, RiiO Sun 3KVA-S, RiiO Sun 4KVA-S

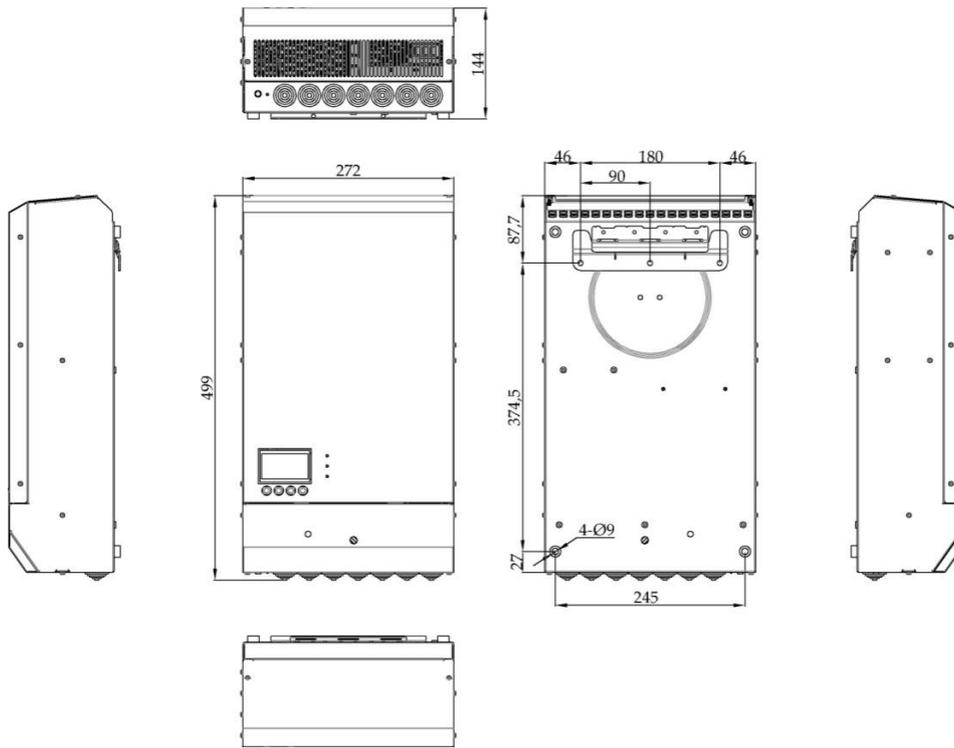
RiiO Sun 3KVA-M-LV, RiiO Sun 3KVA-S-LV



RiiO Sun 5KVA-S, RiiO Sun 6KVA-S

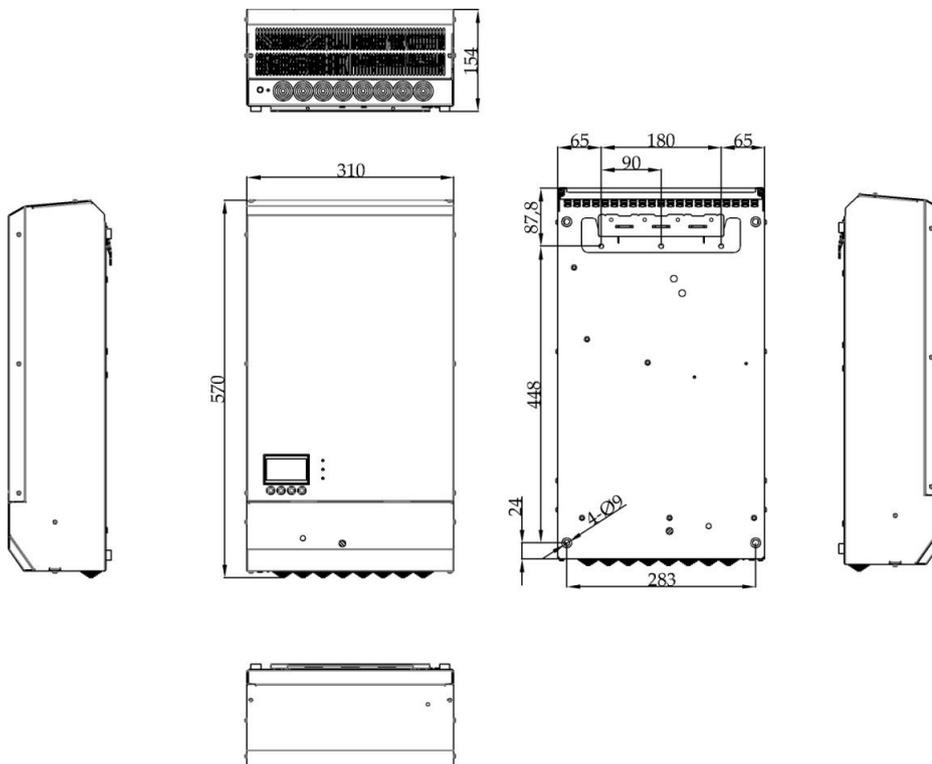
Figure 2-4 Power terminal

2.2.4 Dimension



RiiO Sun 2KVA-M, RiiO Sun 2KVA-S, RiiO Sun 3KVA-M, RiiO Sun 3KVA-S, RiiO Sun 4KVA-S

RiiO Sun 3KVA-M-LV, RiiO Sun 3KVA-S-LV



RiiO Sun 5KVA-S, RiiO Sun 6KVA-S

Figure 2-5 Dimension of the All in One Solar Inverter

2.3 Function

2.3.1 Power Control and Power Assist

RiiO Sun offers a unique feature of power control & power assist, which is very useful when you have a limited grid supply or working with the generator. RiiO Sun will take control of energy flow automatically, using extra power to charge the battery or inverting as the supplement to the grid or generator. With this feature, you can avoid the air switch trip and do not have to use oversize generators.

2.3.2 Powerful and Reliable Inverter

High Performance Pure Sine Wave

RiiO Sun is a pure sine wave inverter generating a near perfect sinusoidal AC wave power output that is very similar or even better to what you can get from your utility grid. Pure sine wave can guarantee the correct function of the sensitive equipments (computer, laser printer, TV, etc.). Also, your home appliances such as fridge, microwave and power tools will work more efficiently.

High Surge Power Capability

Provided with outstanding surge power capability and low frequency transformer, RiiO Sun is suitable for heavy inductive load like fridge, coffee maker, microwave, power tools, air conditioner, etc.

Battery Low Voltage/SOC Protection

RiiO Sun provides configurable battery low voltage/SOC protection.

2.3.3 Professional Battery Charger

Multi Stage Sophisticated Charging Algorithm for Lead Acid Battery

Fitted with multistage charging algorithm (bulk-absorption-float-recycle), the built-in charger of the RiiO Sun is designed to charge battery quickly and fully. Microprocessor controlled charging algorithm with variable absorption charging timer could guarantee the optimal charging for the batteries of different discharged states.

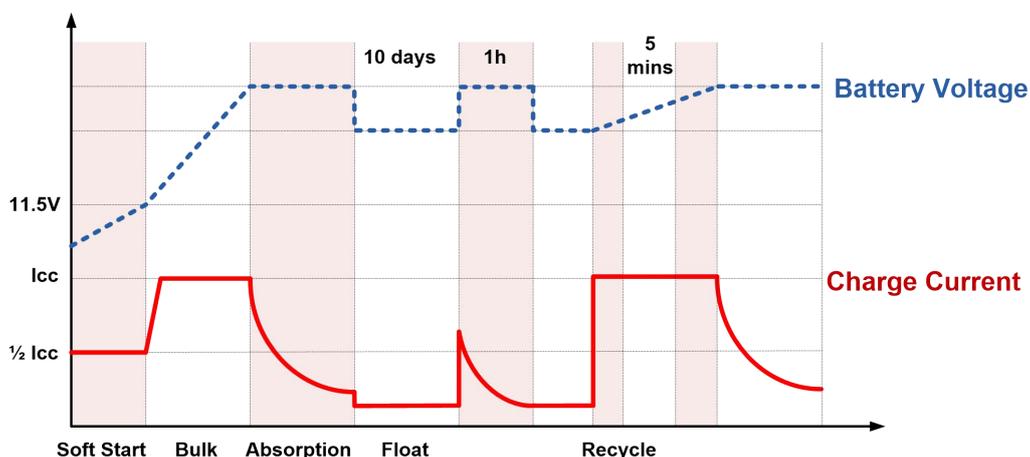


Figure 2-6 Multi Stage Sophisticated Charging Algorithm for Lead Acid Battery

Float charging and recycle charging program guarantee your battery getting proper maintenance in case of long time connected and less aging in case of long time connected with no use.

Multi Chemical Batteries Available

RiiO Sun offers premium charging algorithm for the common chemical acid batteries including AGM, GEL, Flooded, lead-carbon and Lithium battery. You can set the battery parameters through the LCD interface and the TBB Link software.

Lithium Battery Compatible

RiiO Sun has built in communication protocol compatible with for Super L lithium battery from TBB.

Manual Equalization



It is strongly recommended to read this section carefully before you start the EQ charging and Don't leave the battery unattended while performing desulfuration.



Always check if you're the battery supplier recommend the EQ charging. Only start when it is suitable.



If the battery type was set at AGM, GEL or Lead-Carbon , this charging profile can't be triggered on.

Over a period of time, the cells in a flooded battery can develop uneven chemical states. This will result in a weak cell which in turn can reduce the overall capacity of the battery. To improve the life and performance of the flooded battery, RiiO Sun provides a manual equalization program that can be used. If it is recommended by the battery manufacturer, you can initiate the desulfuration program manually. Once you trigger on the equalization program, the RiiO Sun will perform equalization charging.

After 30 minutes, it will quit EQ and enter into float charging.

- Check the electrolyte level and refill the battery with the distilled water if necessary.
- If you want to come to normal charging, you need to stop equalization charging and switch off the unit.
- Switch on the unit again, then you will have your equipment back to normal charging.



During equalization, the battery generates potentially flammable gases. Follow all the battery safety precautions listed in this guide. Ventilate the area around the battery thoroughly and ensure that there are no sources of flame or sparks in the vicinity.



Turn off or disconnect all loads on the battery during equalization. The voltage applied to the battery during equalization may be above the safe levels for some loads.

Frequency:

Maximum once a month, for heavily used battery, you may wish to equalize your battery. For battery with light service only need to be equalized every 2-3 months.

Important:

- Equalization may damage your batteries if it is not performed properly. Always check battery fluid before and after equalization. Fill the batteries only with the distilled water.
- Always check the equalization switch is set back to OFF after each time's equalization.
- Follow the battery manufactures' recommendations on equalization vary. Always follow the battery manufacturer's instructions to properly equalize the batteries. According to the guide, a heavily used battery may require equalization once a month while a battery in light duty service only needs equalizing once every 2 to 4 months.
- Battery type: as a kind of protection, equalization charging can be performed if and only if you set the battery to be a traction, Flooded /OPzV batteries. If you choose the AGM, GEL or Lead-Carbon, EQ charging can't be performed.

2.3.4 Transfer

Uninterrupted AC Power

In case of voltage/frequency/waveform of AC input match the minimum quality, the voltage will be switched directly to the AC output. The RiiO Sun All in One Solar Inverter will work as a battery charger and the loads will be powered by AC input. The voltage of the AC output and the AC input will be the same.

In case of the AC input failure or excessive AC input current set by the user, the RiiO Sun All in One Solar Inverter will initiate a quick switching to the inverter, which will guarantee an undisturbed power. Once the AC input resumes or matches the quality, it will switch back again. Due to its ultra quick transfer design, as quick as 4ms, RiiO Sun All in One Solar Inverter could be used as an UPS.

2.3.5 Protect Function

The RiiO Sun All in One Solar Inverter is equipped with a series of complete hardware and software protection functions to ensure its stable and reliable operation.

Overload Protection

When overload protection is triggered on, it will restart automatically after 60s. And after three consecutive overload shutdown protections, the equipment will not restart automatically. At this time, the user needs to manually restart.

Over Temperature Protection

When the internal temperature is too high, RiiO Sun will enter into the over-temperature protection. After the internal temperature returns to normal, it can automatically resume normal operation.

Short Circuit Protection

The equipment will automatically shut down when the AC output is shorted and needs to be manually activated.

Battery Low Voltage/SOC Protection

To prevent the permanent damage caused by the over discharge of battery, the equipment will automatically cut off the output according to the low voltage/SOC protection point set by the user.

2.3.6 Communication

Dry Contact Input

RiiO Sun is equipped with a dry contact input for remote on/off control.

Note: When the setting item 64 **Main switch selection** is set as **Mobile Only mode**, the touch switch needs to be changed to a rocker switch.

RS485

Equipped with two RS485 interfaces.

ComSYS: System communication(RS485), connected to SP or BGK.

ComMON: RS485 port for external monitor such as MCK, SNMP, Kinergy, etc.

2.3.7 ECO Mode

ECO Mode is to reduce the output power of the inverter while maintaining the normal use. When the battery capacity is insufficient or the SoC is in a low value, by setting the ECO Mode in the inverter, the power consumption of some specific loads can be reduced by 45% at max (30% on average), thereby prolonging the battery life.

3. Installation and Wiring

Please refer to "Installation & operation guide for RiiO Sun 2KVA-4KVA " and "Installation & operation guide for RiiO Sun 5KVA-6KVA".



Keep away from the fire, avoid direct sunlight and rain; do not store flammable, explosive or corrosive gases or liquids in the working environment. Don't install in a working environment with the metal conductive dust.

- Please install the equipment in a dry, clean and cool location with good ventilation.
- Operating temperature: -20~65℃
- Storage temperature: -40~70℃
- Cooling: Force fan
- Relative humidity in operation: 95% without condensation.
- Altitude: 2000m

3.1 Recommended DC cables

Please find the following minimum wire size. If the DC cable is longer than 5m, please increase the cross section of the cable to reduce the loss.



Use a torque wrench with insulated box spanner in order to avoid shorting the battery. Avoid shorting the battery cables.

Maximum torque: 12 Nm.

Model	Recommended cross section φ 8 aperture copper terminal (Length<5m)
RiiO Sun 2KVA-M	35mm ² ~50mm ²
RiiO Sun 2KVA-S	25mm ² ~50mm ²
RiiO Sun 3KVA-M	50mm ²
RiiO Sun 3KVA-S	25mm ² ~50mm ²
RiiO Sun 4KVA-S	35mm ² ~50mm ²
RiiO Sun 5KVA-S	50mm ²
RiiO Sun 6KVA-S	50mm ²
RiiO Sun 3KVA-M-LV	50mm ²
RiiO Sun 3KVA-S-LV	25mm ² ~50mm ²

4. Configuration

4.1 Check before Operation

Please check before Operation according to the following.

- The inverter is installed correctly and steady.
- Reasonable cable layout to meet customer requirements.
- Make sure the grounding is reliable.
- Make sure the ground wire is properly connected and firm and reliable.
- Double check the battery breaker is OFF.
- Make sure the cables are properly connected and firm and reliable.
- Reasonable installation space, clean and tidy environment, no construction residue.

4.2 Power ON Test



Make sure the battery voltage is within the permissible range before turning ON the breaker.

Please follow the following instructions step by step.

- Step 1: Turn on the circuit breaker between the battery and the inverter.
- Step 2: Press the On/Off button for 2 seconds to turn on the inverter into the standby mode, the power LED will light up and the LCD will enter into the self diagnostic mode.
- Step 3: 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.

4.3 Power OFF



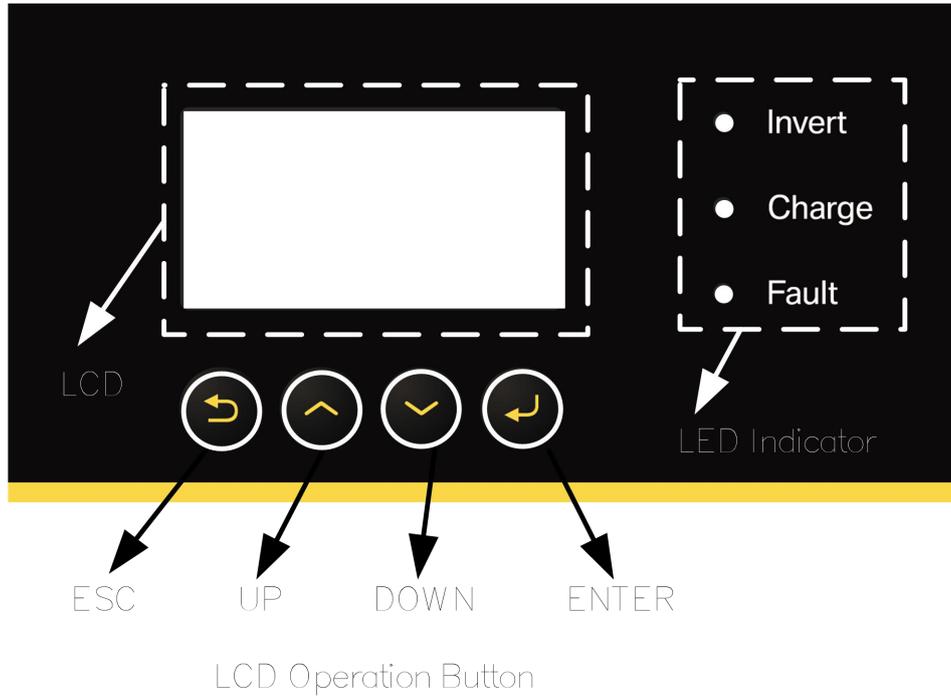
After the inverter is power OFF, there is still residual power and heat in the chassis, which may lead to electric shock or burning. Therefore, after the MPPT charger is powered off for 5 minutes, you should wear protective gloves before removing the MPPT charger.

- Step 1: When the inverter is in the inverting mode or charging mode, press the On/Off button for 2 seconds to turn off the inverter into the standby mode.
- Step 2: When the inverter is in the standby mode, press the On/Off button for 5 seconds to turn off the inverter into the complete off mode.
- Step 3: Turn off the circuit breaker between the battery and the inverter.

5. Operation

5.1 Operation and Display Panel

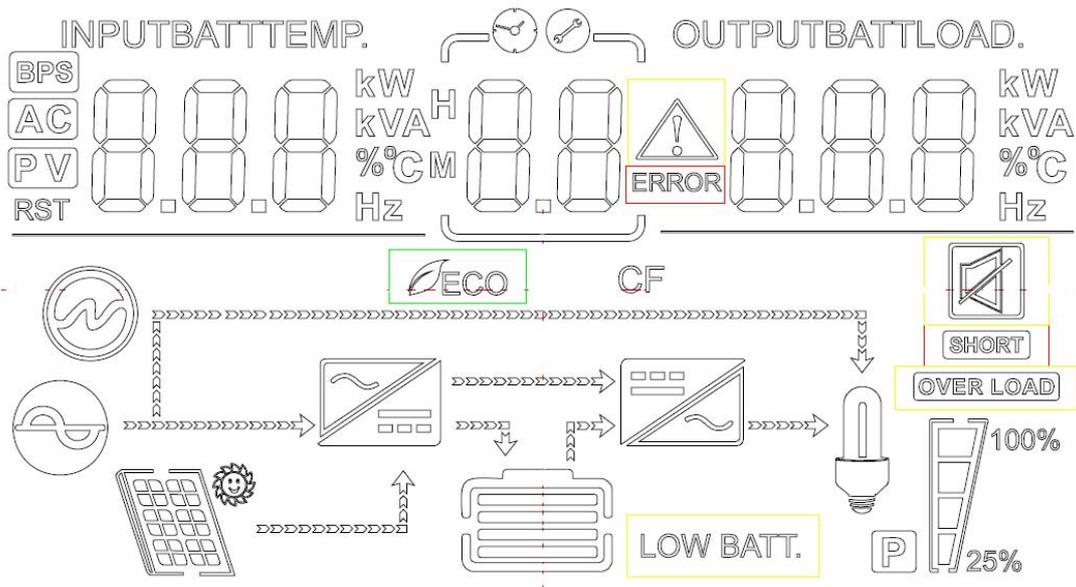
The operation and display includes four buttons and a LCD display, indicating the operating status and input/output power information.



Button	Function
	➤ To exit the setting mode or confirm the fault code.
	➤ To go to the previous selection.
	➤ To go to the next selection.
	➤ To enter the setting mode or confirm the selection.

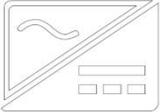
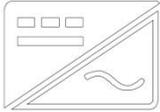
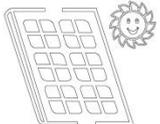
LED Indicator			Function
Invert	Green	Solid on	Inverting mode
		Flashing	Power Assist mode
Charge	Green	Solid on	The battery is Charging.
		Flashing	The battery is fully Charged.
Fault	Red	Solid on	Fault occurs
		Flashing	Warning occurs

5.2 LCD Display Icons



Icon	Function description
Input Source Information	
	Indicates the AC input
	Indicates the PV input

	<p>Indicates input voltage, input frequency, PV voltage, charge current, charge power, battery voltage.</p>
<p>Configuration Program and Fault Information</p>	
	<p>Indicates the setting programs</p>
	<p>Warning: flashing every 2 seconds. Press <ESC> button to view the warning code. Fault: flashing every 1 second. Press <ESC> button to view the warning code.</p>
<p>Output Information</p>	
	<p>Indicates output voltage, output frequency, load percent, load in Watt, load in VA, and discharging current.</p>
<p>Battery Information</p>	
	<p>Indicates the battery level by 0~24%, 25~49%, 50~74%, 75~100% in battery mode and charging status in line mode.</p>
<p>Load Information</p>	
	<p>Indicates the load level by 0~24%, 25~49%, 50~74%, 75~100%.</p>
<p>Mode Operation Information</p>	

	<p>Indicates the inverter working in a charging mode</p>
	<p>Indicates the inverter working in a inverting mode</p>
	<p>Indicates the inverter connecting to the mains or generators.</p>
	<p>Indicates the inverter connecting to the PV panel.</p>

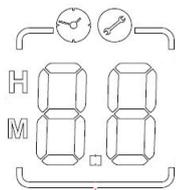
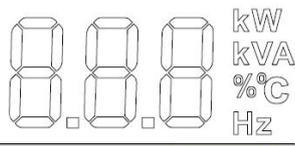
5.3 LCD Setting

After press and holding the <ENTER> button for 3 seconds, the inverter will enter the setting mode. Press <UP> or <DOWN> button to select setting programs. Then press the <ENTER> button to confirm the selection of the setting programs, or press the <ESC> button to exit the setting mode.

After confirm the selection of the setting programs, press the <UP> and <DOWN> button to modify the parameters. Press the <ENTER> button to confirm the modification, or press the <ESC> button to cancel.

The digital tube on the left side of LCD displays [PA] standing for PASS when the parameters are set successfully, otherwise it will display [FA] standing for FAIL.

Setting item

Item	Description	Setting Range
	OUTPUTBATTLOAD. 	/
Inverter Parameter		
00	Output voltage	220~240V(@230V) 110~120V(@120V) Step:10V Default: 230V(@230V) 120V(@120V)
01	Output frequency	50~60Hz Step:10Hz Default: 50Hz(@230V) 60Hz(@120V) (only in standby mode)
05	Fault unlock	1 (Press <ENTER> to trigger the effect once) Default:0
06	Fan dedusting	1 (Press <ENTER> to trigger the effect once) Default:0
ACin Parameter		
11	Power assist current	0~Max(Rate AC input Current) Step:1A Default: Max

<p>12</p>	<p>AC in source priority</p> <p>Note:</p> <p>ACin First: The system will work in AC input first mode (default)</p> <p>When there is an AC input, the load will firstly be powered by the AC input. When the solar panel is sufficient to charge the battery independently and there are still some surplus solar power, it will also supply power to the AC load together with the AC input.</p> <p>BATT First: The system will work in battery first mode.</p> <p>When the PV power is more than the power of the AC load in operation, the solar energy will charge the battery and supply power to the AC load first.</p> <p>When the PV power is less than the power of the AC load in operation and the solar panel is insufficient to take the AC load, the battery will discharge to supply power to the AC load together with the solar panel</p> <p>When the battery is running low (lead-acid battery under low-voltage protection or lithium battery under SoC protection) and both solar and battery are insufficient to power the load, the AC load will be powered by the grid only, and the battery will be charged by the grid as well as the solar panel until the battery is charged at constant voltage and the overload is removed, the system will disconnect the grid power supply and restore to the battery first mode.</p> <p>Time Ctrl: Set the time period for the BATT First mode, once it exceeds this time period, it will automatically switch to the AC input to supply power</p> <p>In the ACin Logic Time Ctrl setting in the TBBLink User Control interface, up to three valid periods can be set</p> <p>In the ACin Logic Time Ctrl setting in the TBBLink User Control interface, you can turn ON/OFF Auto Charge when U_BAT_LV Warning to choose whether to automatically switch to AC input charging when the battery voltage is low</p> <p>Ubat/SOC Ctrl: Battery Status Mode</p> <p>When the battery type is non-TBB SUPER-L, the Ubat Ctrl will be displayed, and the ACin First power supply can be turned on/off according to the battery voltage.</p>	<p>0-AC First 1-BATT First 2-Time Ctrl 3-Ubat Ctrl/ SOC Ctrl 4-AC IN backup Default:0</p>
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	<p>When the battery type is TBB SUPER-L, the SOC Ctrl will be displayed, and the ACin First power supply can be turned on/off according to the battery SOC.</p> <p>The SOC value should be set in the TBB LINK user control interface.</p> <p>ACin Backup mode: In the Battery First mode, the AC load will be powered by the solar power or both solar power and the battery. When the battery under-voltage alarm or an overload alarm occurs, the system will switch its power supply to the grid to charge the battery and power the AC load until the battery voltage reaches the set value and the overload is released. Then disconnect the grid power supply and restore to the Battery First Mode.</p>	
13	Maximum AC in charging current	<p>0~Max(Rate AC charge current)</p> <p>Step:1A</p> <p>Default: Max</p>
14	Maximum AC in voltage	<p>240~280V(@230V)</p> <p>120~140V(@120V)</p> <p>Step:1V</p> <p>Default: 265V(@230V)</p> <p>140V(@120V)</p>
15	Minimum AC in voltage	<p>160~220V(@230V)</p> <p>80~110V(@120V)</p> <p>Step:1V</p> <p>Default: 175V(@230V)</p> <p>85V(@120V)</p>
16	Maximum AC in frequency	<p>51~55Hz (@50Hz)</p> <p>61~65Hz (@60Hz)</p> <p>Step:1Hz</p> <p>Default: 55Hz (@50Hz)</p> <p>65Hz (@60Hz)</p>
17	Minimum AC in frequency	<p>42~49Hz (@50Hz)</p> <p>52~59Hz (@60Hz)</p> <p>Step:1Hz</p> <p>Default: 45Hz (@50Hz)</p> <p>55Hz (@60Hz)</p>

18	AC wave harmonic adaption	0-Normal 1-Weak AC Input Default:0
21	AC in connect delay	20~990s Step:10s Default:20s
23	Low AC in alarm control	0-Display 1-Shield Default:1
24	Maximum ACin charging current in the ACin backup mode under the low battery voltage condition	0~Max(Rate AC charge current) Step:1A Default: Max
25	Searchload enable	0-Disable 1-Enable Default:0
26	Searchload gate	25~500W Step:1W Default: 80W
Battery parameter		
30	Battery type	0-GEL/OPzV 1-AGM 2-Lead-Carbon 3-Flooded 4-Traction 5-Customerize 6-TBB SUPER-L (Only applicable to the compatible lithium battery, such as Super-L, Pylontech lithium battery and other lithium batteries compatible with CAN communication protocol.) Default:0
31	Maximum system charging current	5~Max (Max DC Couple system charge current) Step:5A Default:30A
32	Bulk charging voltage (C.V voltage)	24V: default 28.2V 48V: default 56.4V Step:0.1V Default:14.1V/(12V/cell) (≥Floating charging voltage)

33	Floating charging voltage (C.F voltage)	24V: default 27.2V 48V: default 54.4V Step:0.1V Default:13.6V/(12V/cell) (\leq Bulk charging voltage)
34	Low battery alarm voltage	24V:20.0~26.0V, default 22.0V 48V:40.0~52.0V, default 44.0V Step:0.1V Default:11.0V/(12V/cell) (\geq Low battery protect voltage)
35	Low battery protection voltage	24V:19.0~24.0V, default 21.0V 48V:38.0~48.0V, default 42.0V Step:0.1V Default:10.5V/(12V/cell) (\geq Low DC cut-off voltage) (\leq Low battery alarm voltage)
36	Low DC cut-off voltage Note: Below this voltage, the inverter is completely powered down.	24V:18.0~22.0V, default 19.8V 48V:36.0~44.0V, default 39.6V Step:0.1V (\leq Low battery protect voltage)
37	Minimum bulk charging time	10~600min Step:5min Default:30min
38	Maximum absorption charging time	1~120h Step:1h Default:8h
39	Charging cycle time	8~960h Step:8h Default:240h
40	Charging temperature compensation coefficient	0~60mV/°C(for 24V) 0~120mV/°C(for 48V) Step:1 mV/°C Default:18 mV/°C/(12V/cell)
41	Charging temperature compensation control	0-Disable 1-Enable Default:1
42	Low battery alarm recover voltage	24V:22.0~28.0V, default 26.0V 48V:44.0~56.0V, default 52.0V Step:0.1V

43	<p>Low SOC alarm threshold</p> <p>Note: Only applicable to the compatible lithium battery, such as Super-L, Pylontech lithium battery and other lithium batteries compatible with CAN communication protocol.</p>	<p>15~90%</p> <p>Step:1%</p> <p>Default:15%</p> <p>(≥Low SOC protect threshold)</p>
44	<p>Low SOC protect threshold</p> <p>Note: Only applicable to the compatible lithium battery, such as Super-L, Pylontech lithium battery and other lithium batteries compatible with CAN communication protocol.</p>	<p>3~50%</p> <p>Step:1%</p> <p>Default:5%</p> <p>(≤Low SOC alarm threshold)</p>
45	<p>Battery over temperature threshold</p>	<p>25~65°C</p> <p>Step:1°C</p> <p>Default:55°C</p>
46	<p>Battery equalization control</p>	<p>0-OFF</p> <p>1-ON</p> <p>Default:0</p> <p>(Only in charge mode)</p>
47	<p>Battery equalization voltage</p>	<p>24V:31.0~32.6V, default 31.0V</p> <p>48V:62.0~65.2V, default 62.0V</p> <p>Step:0.1V</p> <p>Default:15.5V/(12V/cell)</p>
48	<p>Battery equalized time</p>	<p>30~90min</p> <p>Step:5min</p> <p>Default:30min</p>
49	<p>Battery Ah</p>	<p>50~5000Ah</p> <p>Step:50Ah</p> <p>Default:200Ah</p>
50	<p>BMS over voltage alarm</p> <p>Control BMS</p>	<p>0-Display</p> <p>1-Shield</p> <p>Default:0</p>
51	<p>ACin stop charging voltage in the ACin backup mode</p>	<p>24V:23.0~29.0V, default 26.0V</p> <p>48V:46.0~58.0V, default 52.0V</p> <p>Step:0.1V</p> <p>Default:13.0V/(12V/cell)</p> <p>(≤Float charging voltage - 0.1)</p> <p>(≥Low battery alarm voltage + 0.1)</p>
52	<p>BMS lower charge voltage</p> <p>The negative compensation for the lithium battery charging voltage is to reduce the probability of uneven voltage in the internal cells of the lithium battery by appropriately reducing the charging voltage of the lithium battery</p>	<p>0~2.0V</p> <p>Step:0.1V</p> <p>Default:0V</p>

53	ACin stop charging SOC in the ACin backup mode Select ACin First mode in the setting item 12 AC in source priority, then when the lithium battery reaches the set SOC threshold, the AC input will stop charging the battery.	30~99% Step:1% Default:80% (≥Low SOC alarm threshold + 1%)
54	SOC enough threshold When the lithium battery reaches the set SOC threshold, it will stop charging.	30~99% Step:1% Default:80% (≥Low SOC alarm threshold + 1)
Mode Setting		
62	Bypass supply control When the inverter fails, you can set whether to enable the AC input to supply power to the load	0-Disable 1-Enable Default:1
63	N2G voltage detect (The voltage between the Neutral and the GND) You can set whether to enable the alarm function when Neutral and the GND voltage exceed the limit.	0-Disable 1-Enable Default:1
64	Main switch selection In Default state, the inverter is controlled through the touch button. In Mobile Only mode, it is controlled through the rocker switch. Press the rocker switch to the ON position, the inverter will be switched on. Press the rocker switch to the OFF position, the inverter can only charge the battery because the AC input source can automatically wake up the inverter for charging. When there is no AC input source, it will automatically shut down after 3 minutes. REGO System: It is not applicable for the RiiO Sun Series. Do not choose it.	0- Default 1- Mobile 2- REGO System Default:0
66	Charging current optimization You can set whether to enable the DC battery charging current optimization mode to reduce the charging current ripple	0-Disable 1-Enable Default:0 (only in standby mode)
67	MPPT charger number Set the number of SP series MPPT chargers connected to the inverter	1~6 Step:1 Default:1

68	BGK_Module Select the type of the BGK module	For48V: 0-N/A 1-BGK-12 For24V: 0-N/A 1-BGK-Balancer Step:1 Default:0 (Not lithium-ion batteries for 24V and 48V system)
69	BGK_RESTART One-key reset of the BGK module	1 (Press <ENTER> to trigger the effect once) Default:0
73	Remote control enable Set whether to enable the remote control function. When you select the disabling option, the external communication cannot perform any setting, control, firmware update, etc.	0-Disable 1-Enable Default:1
74	Remote update enable Set whether to enable the remote firmware update function (the 73 option must be set as Enable at the same time). This option is set as Disable by default after the single inverter is powered on again.	0-Disable 1-Enable Default:0
75	MPPT Offline alarm control Set whether to display the alarm of disconnection between the MPPT charger and inverter	0-Display 1-Shield Default:0
76	Error restart enable When set as Disable, the inverter cannot restart automatically after the fault is removed. You need to manually power off the inverter before restarting. When set as Enable, the inverter will automatically restart after the fault is removed.	0-Disable 1-Enable Default:0
77	LCD backlight keep-on enable Set whether to enable the screen backlight to be always on	0-Disable 1-Enable Default:1
Version		
80	Software version	(Ready only)
81	Firmware version	(Ready only)
82	MPPT Software version	(Ready only)
83	Year	20~99 Default: N/A
84	Month	1~12 Default: N/A



85	Day	0~ The last day of this month Default: N/A
86	Hour	0~23 Default: N/A
87	Minute	0~59 Default: N/A

6. FAQ

6.1 Fault code

When inverter fault occurs, press the ESC button to view the fault code. The digital tube in the middle of LCD displays the fault code, and the digital tube on the left side of LCD displays the "Err".

6.1.1 Inverter Fault

Fault Code	Description	Solution
01	The DC bus is over voltage	Check the battery voltage.
02	The DC bus is under voltage	Check the battery connection and the voltage.
03	Hardware protection against DC bus over voltage	Check the battery voltage and the charger output voltage
04	Abnormal auxiliary power supply	Restart the inverter. Contact the installer in case it still exists
05	The heat sink's temperature is too high	Check and assure the inverter has good ventilation
06	The transformer's temperature is too high	Too high ambient temperature.
07	Abnormal sampling	Restart the inverter. Contact the installer in case it still exists.
08	Abnormal ROM	
09	Output short circuit	Check if there is a short circuit at the loads.
10	Output over load	Reduce the loads.
11	Abnormal cooling system	Checking if fan is working properly.
12	Battery is severely under voltage	Connect to a valid grid or generator. Restart the inverter and charge the battery.
14	Instantaneous over current	Check if there is a short circuit at the loads.
16	Abnormal Relay	Restart the inverter. Contact the installer in case it still exists.

6.1.2 MPPT Fault

Fault Code	Description	Solution
17	The DC bus is over voltage	Check the PV input voltage.
18	The battery is under voltage	Check the battery voltage.
19	Hardware protection against DC bus over voltage	Check the battery voltage and the charger output voltage
20	Buck short circuit	Check if there is a short circuit at the MPPT output.
21	The Buck 1 is over current	Check the MPPT output connection. Restart the equipment, contact the installer in case the error still exists.
22	The Buck 2 is over current	
23	The control board's temperature is too high	Check fan ventilation.
24	The heat sink's temperature is too high	Too high ambient temperature.
25	Abnormal auxiliary power supply	Restart the MPPT. Contact the installer in case the error still exists.
26	Abnormal auxiliary power supply (hardware)	
27	Abnormal sampling	
28	Abnormal ROM	

6.2 Warning code

When inverter fault occurs, press the ESC button to view the warning code. The digital tube in the middle of the LCD will display the warning code.

6.2.1 Inverter Warning

Warning Code	Description	Solution
1	The battery is over voltage	Check the battery voltage.
2	The battery is under voltage	Check the battery voltage.
3	The battery is under voltage protection	Check the battery voltage.
4	Overload warning	Reduce the loads.
5	Heat sink NTC fail	Power off the inverter and check the

6	Transformer NTC fail	internal NTC connection. Contact the installer if the fault still exists.
7	The battery temperature is too high	Check battery sensor connection; Check battery temperature; Check battery connection
8	Abnormal Fan	1.Check whether the fan is blocked.
		2.Open the case, check the fan connection. Contact the installer if the fault still exists.
14	The system mode and the parameter setting do not match	Check the parameter setting (Lithium battery)
16	Abnormal internal communication of the LCD	Open the case, check the LCD wire connection. Contact the installer if the fault still exists.
20	AC input is over voltage	Check the AC input voltage and the connection
21	AC input is under voltage	
22	AC input is over frequency	
23	AC input is under frequency	
24	Abnormal AC input phase sequence	
30	Abnormal Communication between the inverter and the DSP	Open the case, check all the inner connections. Contact the installer if fault still exists.
31	Software and hardware matching error	Restart the inverter. Contact installer if the fault still exists.

6.2.2 MPPT Warning

Warning Code	Description	Solution
62	MPPT current limitation alarm	Check if there is a short circuit at the output
64	Heat sink NTC fail	Power off the inverter and check the internal NTC connection. Contact the installer if the fault still exists.
66	Abnormal Fan	1.Check whether the fan is blocked.
		2.Open the case, check the fan connection. Contact the installer if the fault still exists.
79	Communication off line	Check the comm connection with the inverter at the DC Couple system

6.2.3 BMS Warning

Warning Code	Description
40	The lithium module is over voltage protection.
41	The lithium module is under voltage protection.
42	The lithium module's temperature is too high.
43	The lithium module's temperature is too low.
44	The lithium module's discharging current is over normal value.
45	The lithium module's charging current is over normal value.
46	Fault occurs on the lithium Battery Module.
50	The lithium module is over voltage.
51	The lithium module is under voltage.
52	The lithium module's temperature is too high.
53	The lithium module's temperature is too low.
54	The lithium module's discharging current is over normal value.
55	The lithium module's charging current is over normal value.
56	Abnormal Communication among the Lithium modules.
57	Abnormal Communication with the inverter.
58	Lithium module low SOC warning.

6.2.4 BGK Warning

Warning Code	Description
80	Battery over voltage alarm.
81	Battery under voltage alarm.
82	The single battery voltage is lower than the average voltage.
83	The single battery voltage is higher than the average voltage.
84	The battery temperature is too high.
85	NTC fail
86	The Battery Cell voltage does not match.
87	Communication address error.
88	Communication error with the inverter.
89	Communication error among the BGK modules.
90	System initialization error.

7. Specification

Series	RiiO Sun						
Model	2KVA-M	3KVA-M	2KVA-S	3KVA-S	4KVA-S	5KVA-S	6KVA-S
Product Topology	Transformer based						
Power Assist	Yes						
AC inputs	Input voltage range:175~265 VAC, Input frequency:45~65Hz						
AC input Current (transfer switch)	32A				50A		
Inverter							
Nominal battery voltage	24VDC			48VDC			
Input voltage range	21~34VDC			42~68VDC			
Output	Voltage: 220/230/240 VAC \pm 2%, Frequency: 50/60 Hz \pm 1%						
Harmonic distortion	<2%						
Power factor	1.0						
Cont. output power at 25°C	2000VA	3000VA	2000VA	3000VA	4000VA	5000VA	6000VA
Max. Output power at 25°C	2000W	3000W	2000W	3000W	4000W	5000W	6000W
Peak power (3 sec)	4000W	6000W	4000W	6000W	8000W	10000W	12000W
Maximum efficiency	91%		93%			94%	
Zero load power	13W	17W	13W	17W	19W	22W	25W
Charger							
Absorption charging voltage	28.8VDC			57.6VDC			
Float charging voltage	27.6VDC			55.2VDC			
Battery types	AGM / GEL / OPzV / Lead-Carbon / Li-ion / Flooded / Traction TBB SUPER-L(48V series)						
Battery Charging current	40A	70A	20A	35A	50A	60A	70A
Temperature compensation	Yes						
Solar Charger Controller							
Max output current	60A		40A	60A		90A	
Maximum PV power	2000W		3000W	4000W		6000W	
PV open circuit voltage	150V						
MPPT voltage range	65V~145V						
MPPT charger maximum efficiency	98%						
MPPT efficiency	99.5%						
Protection	a) output short circuit, b) overload, c) battery voltage too high d) battery voltage too low, e) temperature too high, f) input voltage out of range						
General data							
AC Out Current	32A				50A		
Transfer time	<4ms(<15ms when WeakGrid Mode)						
Remote on-off	Yes						
Protection	a) output short circuit, b) overload, c) battery voltage over voltage d) battery voltage under voltage, e)over temperature, f) Fan block g) input voltage out of range, h) input voltage ripple too high						
General purpose com. Port	RS485 (GPRS,WLAN optional)						
Operating temperature range	-20 to +65°C						
Storage temperature range	-40 to +70°C						
Relative humidity in operation	95% without condensation						
Altitude	2000m						
Mechanical Data							
Dimension	499*272*144mm					570*310*154mm	
Net Weight	15kg	18kg	15kg	18kg	20kg	29kg	31kg
Cooling	Forced fan						
Protection index	IP21						
Standards							
Safety	EN-IEC 62477-1, EN-IEC 62109-1, EN-IEC 62109-2						
EMC	EN61000-6-1, EN61000-6-2, EN61000-6-3, EN61000-3-11, EN61000-3-12						

Series	RiiO Sun	
Model	3KVA-M-LV	3KVA-S-LV
Product Topology	Transformer based	
Power Assist	Yes	
AC inputs	Input voltage range:85~140 VAC, Input frequency:45~65Hz	
AC input Current (transfer switch)	32A	
Inverter		
Nominal battery voltage	24VDC	48VDC
Input voltage range	21~34VDC	42~68VDC
Output	Voltage: 110/115/120 VAC \pm 2%, Frequency: 50/60 Hz \pm 1%	
Harmonic distortion	<2%	
Power factor	1.0	
Cont. output power at 25°C	3000VA	3000VA
Max. Output power at 25°C	3000W	3000W
Peak power (3 sec)	6000W	6000W
Maximum efficiency	91%	93%
Zero load power	17W	17W
Charger		
Absorption charging voltage	28.8VDC	57.6VDC
Float charging voltage	27.6VDC	55.2VDC
Battery types	AGM / GEL / OPzV / Lead-Carbon / Li-ion / Flooded / Traction TBB SUPER-L(48V series)	
Battery Charging current	70A	35A
Temperature compensation	Yes	
Solar Charger Controller		
Max output current	60A	60A
Maximum PV power	2000W	4000W
PV open circuit voltage	150V	
MPPT voltage range	65V~145V	
MPPT charger maximum efficiency	98%	
MPPT efficiency	99.5%	
Protection	a) output short circuit, b) overload, c) battery voltage too high d) battery voltage too low, e) temperature too high, f) input voltage out of range	
General data		
AC Out Current	32A	
Transfer time	<4ms(<15ms when WeakGrid Mode)	
Remote on-off	Yes	
Protection	a) output short circuit, b) overload, c) battery voltage over voltage d) battery voltage under voltage, e)over temperature, f) Fan block g) input voltage out of range, h) input voltage ripple too high	
General purpose com. Port	RS485 (GPRS,WLAN optional)	
Operating temperature range	-20 to +65°C	
Storage temperature range	-40 to +70°C	
Relative humidity in operation	95% without condensation	
Altitude	2000m	
Mechanical Data		
Dimension	499*272*144mm	
Net Weight	18kg	18kg
Cooling	Forced fan	
Protection index	IP21	
Standards		
Safety	EN-IEC 62477-1, EN-IEC 62109-1, EN-IEC 62109-2	
EMC	EN61000-6-1, EN61000-6-2, EN61000-6-3, EN61000-3-11, EN61000-3-12	



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