



Solis RHI-HV Series Hybrid Inverter Instruction Manual

Ver 1.0

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Please adhere to the actual products in case of any discrepancies in this user manual.

If you encounter any problem on the inverter, please find out the inverter S/N
and contact us, we will try to respond to your question ASAP.



SunSpec
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Comply with CA Rule 21/
Certified to UL 1741 SA

Ningbo Ginlong Technologies Co., Ltd.

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1. Introduction

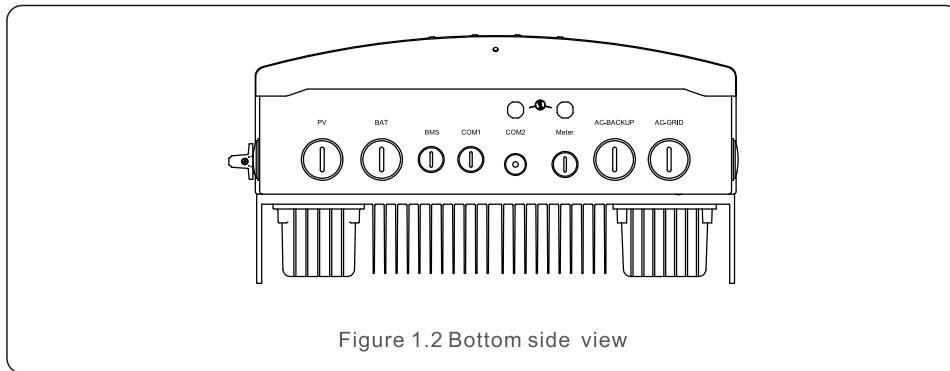
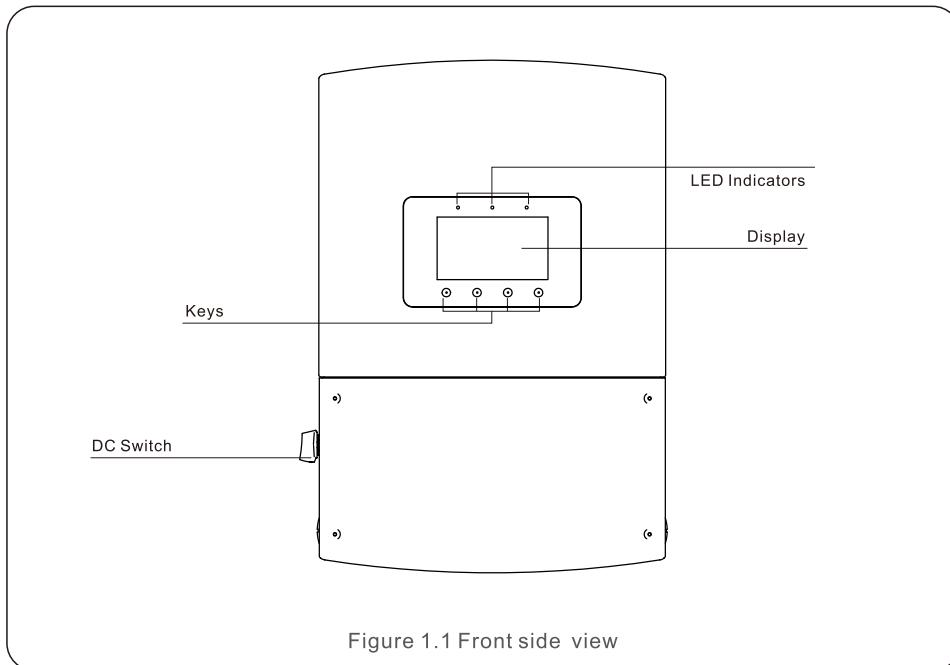
1.1 Product Description

The Solis RHI-HV 5G series is designed for residential hybrid systems, which can work with high voltage lithium ion batteries to maximize self-consumption rate.

This product can operate in both ON-Grid and OFF-Grid modes.

The Solis RHI-HV series hybrid inverters contain 7 different models:

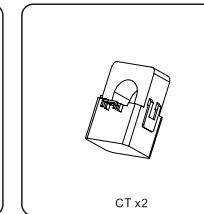
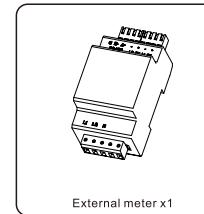
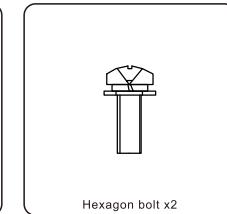
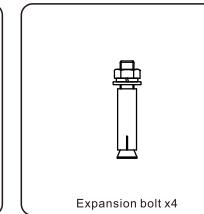
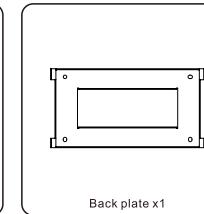
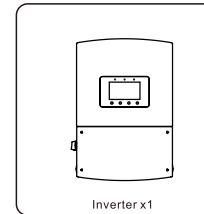
RHI-1P5K-HVES-5G, RHI-1P6K-HVES-5G, RHI-1P7K-HVES-5G, RHI-1P7.6K-HVES-5G, RHI-1P8K-HVES-5G, RHI-1P9K-HVES-5G, RHI-1P10K-HVES-5G



1. Introduction

1.2 Packaging

Please ensure that the following items are included in the packaging with your machine:



If anything is missing, please contact your local Solis distributor.

2. Safety & Warning

2.1 Safety

The following types of safety instructions and general information appear in this document as described below:

**DANGER:**

“Danger” indicates a hazardous situation which if not avoided, will result in death or serious injury.

**WARNING:**

“Warning” indicates a hazardous situation which if not avoided, could result in death or serious injury.

**CAUTION:**

“Caution” indicates a hazardous situation which if not avoided, could result in minor or moderate injury.

**NOTE:**

“Note” provides tips that are valuable for the optimal operation of your product.

2.2 General Safety Instructions

**WARNING:**

Only devices in compliance with SELV (EN 69050) may be connected to the RS485 and USB interfaces.

**WARNING:**

Please don't connect PV array positive (+) or negative (-) to ground, it could cause serious damage to the inverter.

**WARNING:**

Electrical installations must be done in accordance with the local and national electrical safety standards.

**WARNING:**

Do not touch any inner live parts until 5 minutes after disconnection from the utility grid and the PV input.

**WARNING:**

To reduce the risk of fire, over-current protective devices (OCPD) are required for circuits connected to the inverter.

The DC OCPD shall be installed per local requirements. All photovoltaic source and output circuit conductors shall have isolators that comply with the NEC Article 690, Part II. All Solis single phase inverters feature an integrated DC switch.

**CAUTION:**

Risk of electric shock, do not remove cover. There is no user serviceable parts inside, refer servicing to qualified and accredited service technicians.

**CAUTION:**

The PV array supplies a DC voltage when they are exposed to sunlight.

**CAUTION:**

Risk of electric shock from energy stored in capacitors of the Inverter, do not remove cover for 5 minutes after disconnecting all power sources (service technician only). Warranty may be voided if the cover is removed without authorization.

**CAUTION:**

The surface temperature of the inverter can reach up to 75°C (167 F). To avoid risk of burns, do not touch the surface of the inverter while it's operating. Inverter must be installed out of the reach of children.

**NOTE:**

PV module used with inverter must have an IEC 61730 Class A rating.

**WARNING:**

Operations below must be accomplished by licensed technician or Solis authorized person.

**WARNING:**

Operator must put on the technicians' gloves during the whole process in case of any electrical hazards.

**WARNING:**

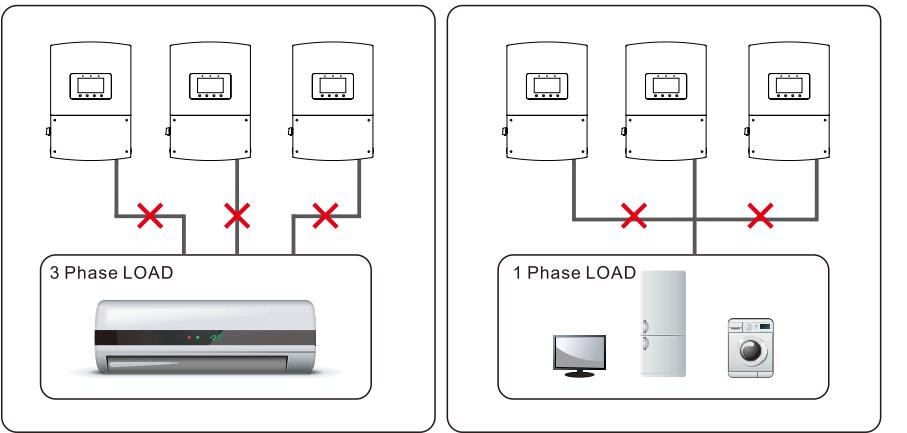
AC-BACKUP of RHI-HV series is forbidden to connect to the grid.

2. Safety & Warning



WARNING:

The RHI series does not support parallel (three- and single-phase) operation on the AC-BACKUP port. Parallel operation of the unit will void the warranty.



2.3 Notice For Use

The inverter has been constructed according to the applicable safety and technical guidelines. Use the inverter in installations that meet the following specifications ONLY:

1. Permanent installation is required.
2. The electrical installation must meet all the applicable regulations and standards.
3. The inverter must be installed according to the instructions stated in this manual.
4. The inverter must be installed according to the correct technical specifications.

3. Overview

3.1 Screen

Solis RHI-HV series adopts a 7 inch color screen, it displays the status, operating information and settings of the inverter.

3.2 Keypad

There are four keys in the front panel of the inverter (from left to right): ESC, UP, DOWN and ENTER keys. The keypad is used for:

- Scrolling through the displayed options (the UP and DOWN keys);
- Access and modification of settings (the ESC and ENTER keys).

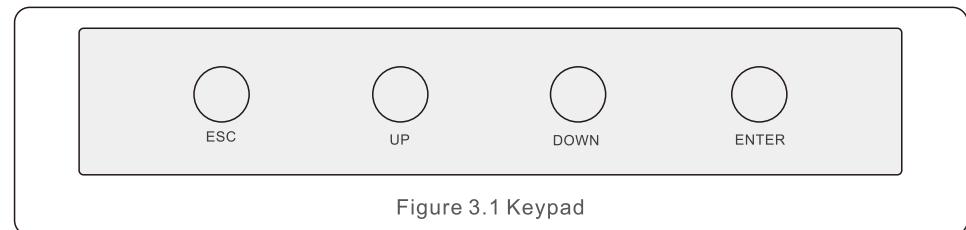


Figure 3.1 Keypad

3.3 Terminal Connection

Solis RHI series inverter is different from normal grid-tied inverter, please refer to the instructions below before initial connection.

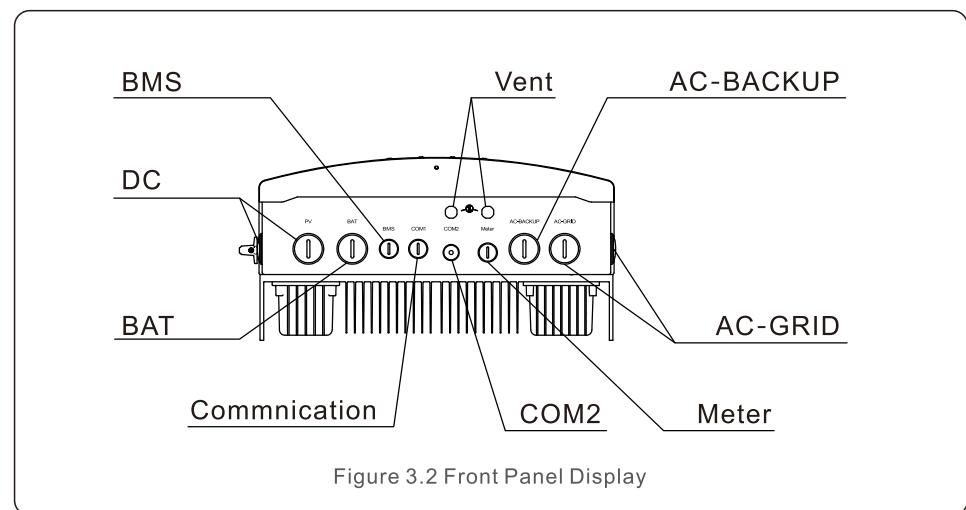


Figure 3.2 Front Panel Display

4. Installation

4.1 Select a Location for the Inverter

To select a location for the inverter, the following criteria should be considered:

WARNING: Risk of fire

Despite careful construction, electrical devices can cause fires.

- Do not install the inverter in areas containing highly flammable materials or gases.
 - Do not install the inverter in potentially explosive atmospheres.
-
- Exposure to direct sunlight may cause output power derating. It is recommended to avoid installing the inverter in direct sunlight.
 - It is recommended that the inverter is installed in a cooler ambient which doesn't exceed 104F/40C.

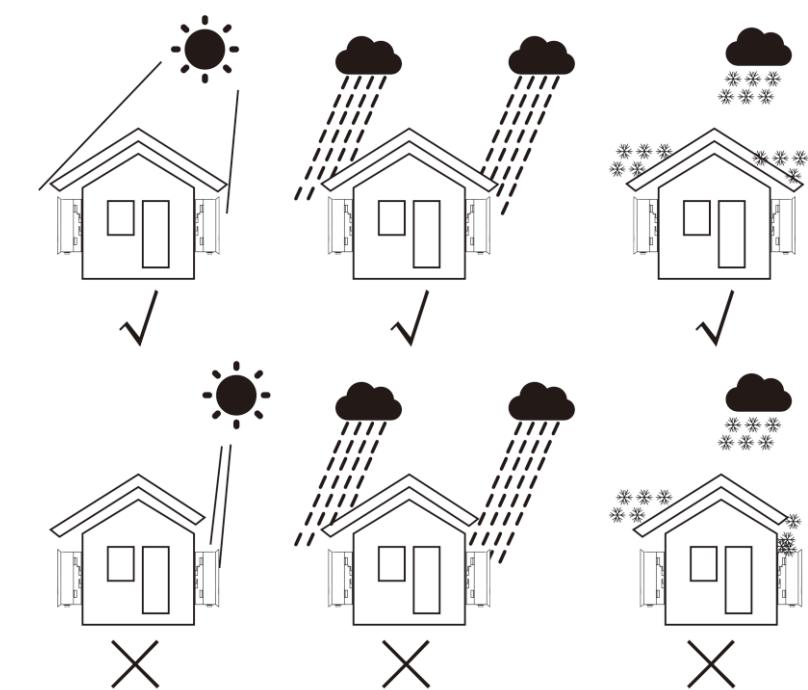


Figure 4.1 Recommended Installation locations

4. Installation

- Install on a wall or strong structure capable of bearing the weight of the machine (30kg).
- Install vertically with a maximum incline of +/- 5 degrees, exceeding this may cause output power derating.
- To avoid overheating, always ensure the flow of air around the inverter is not blocked. A minimum clearance of 300mm(11.8in) should be kept between inverters or objects and 500mm(19.6in) clearance between the bottom of the machine and the ground.

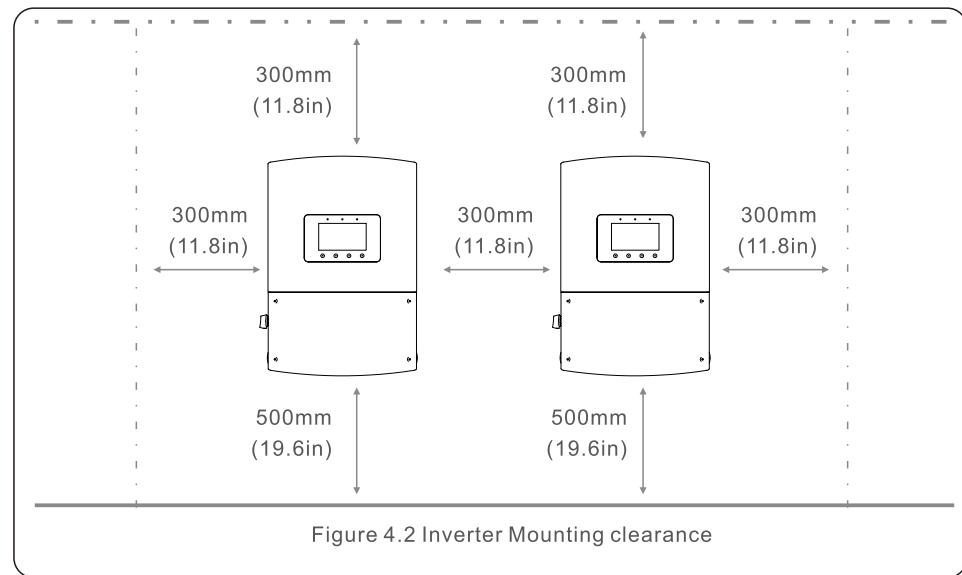


Figure 4.2 Inverter Mounting clearance

- Visibility of the LEDs and LCD should be considered.
- Adequate ventilation must be provided.



NOTE:

Nothing should be stored on or placed against the inverter.

4. Installation

4.2 Mounting the Inverter

Dimensions of mounting bracket:

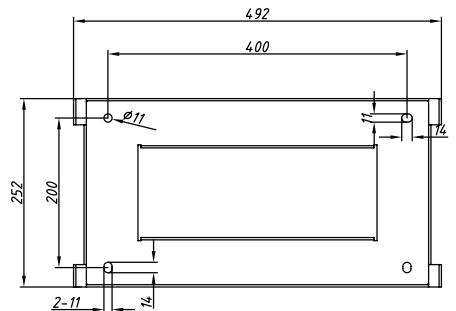


Figure 4.3 Inverter wall mounting

Once a suitable location has been found according to 4.1 using figure 4.3 and figure 4.4 mount the wall bracket to the wall.

The inverter shall be mounted vertically.

The steps to mount the inverter are listed below:

1. Select the mounting height of the bracket and mark the mounting holes.

For brick walls, the position of the holes should be suitable for the expansion bolts.

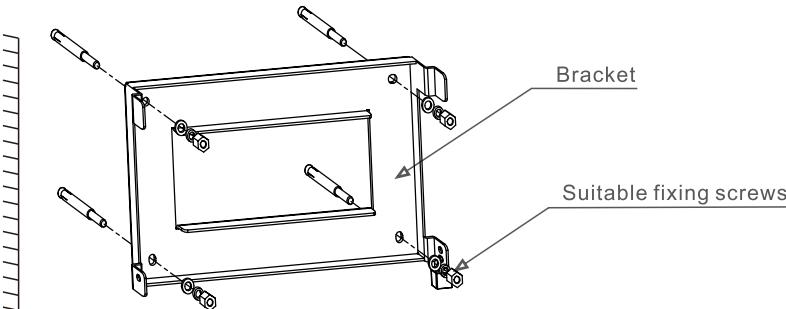


Figure 4.4 Fix bracket on the wall



WARNING:

The inverter must be mounted vertically.

4. Installation

2. Lift up the inverter (be careful to avoid body strain), and align the back bracket on the inverter with the convex section of the mounting bracket. Hang the inverter on the mounting bracket and ensure the inverter is secure (see Figure 4.5)

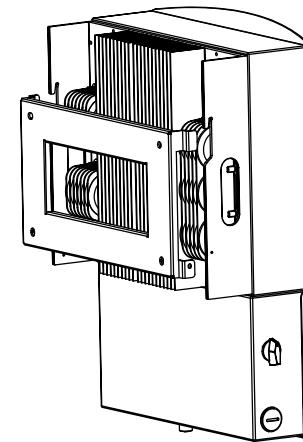


Figure 4.5 Wall Mount Bracket

4. Installation

	Cross-sectional Dimension	Functionality	Where to connect
PV Cables	12-10AWG, 90°C Copper	PV DC source	From PV strings to terminal "DC+" and "DC-"
Battery Cables	10-8AWG, 90°C Copper	Battery DC source	From Battery modules to terminal "BAT+" and "BAT-"
AC Grid Cables	8-4AWG for 5-9K system, 6-4AWG for 10K system, 90°C Copper	AC Grid connection	From incoming AC distribution box to terminal AC-GRID "L1" and "L2"
AC Backup Cables	10-4AWG, 90°C Copper	AC Backup connection	From backup loads to terminal AC-BACKUP "L1", "L2" and "N"
PE Cables	8-4AWG, 90°C Copper	Grounding connection (Dimension depends on AC backup cables and AC grid cables)	From AC groundings to copper bar inside the wiring box
Meter COM cable	22-16AWG, 90°C Copper	Communication between inverter to Meter	From meter to terminal MT "A" and "B". Details refer to 4.2.2 Install the energy meter
CAN Cable	22-16AWG, 90°C Copper	Communication between inverter to Battery	From battery to terminal CAN "L" and "H". Details refer to 4.2.3 Install the battery
BMS Cable	22-16AWG, 90°C Copper	Not Applicable in these systems	Not Applicable in these systems
Cover External Grounding Cable	Same as PE cable	Ground the inverter cover	From grounding screw on the inverter external cover to the ground
Datalogger (Optional)	Pre-assembled Plug	Modbus/Sunspec Communication between the system and the Solis monitoring portal	4-pin COM port at the bottom of the inverter. (Detailed info please refer to Solis datalogger user manual)

Table 4.1 Wire Specification

4. Installation

4.3 PV Terminals

Please ensure the following before connecting the inverter:

- Ensure the voltage of the PV string will not exceed the max DC input voltage (500Vdc). Violating this condition will void the warranty.
- Ensure the polarity of the PV terminals are correct.
- Ensure the DC-switch, battery, AC-BACKUP, and AC-Grid are all in their off-states.
- Ensure the PV resistance to ground is higher than 20K ohms.

PV wire requirements: 12-10AWG 90°C Copper

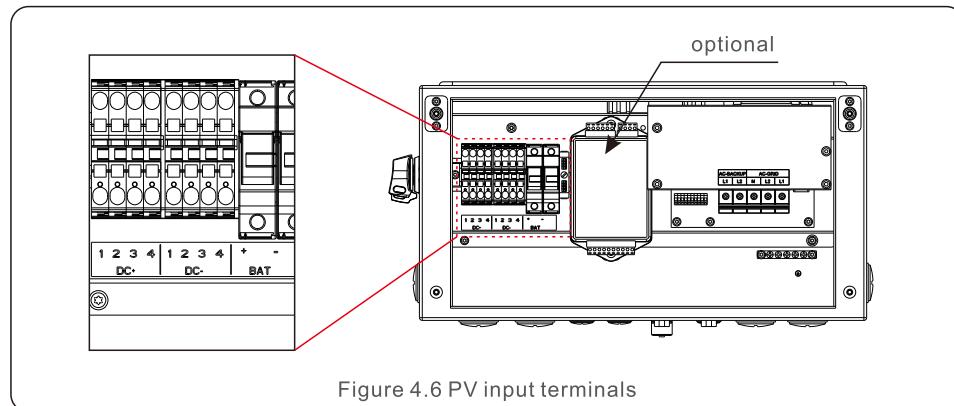


Figure 4.6 PV input terminals

4.4 Assembling the AC Terminals

There are two AC terminals and the assembly steps for both are the same.

Remove the AC connector parts from the packaging.

1. Ensure you use a cable within the correct specifications as shown in the image below.

Describe	AC-BACKUP	AC-GRID (For 5~9KW)	AC-GRID (For 10KW)
Traverse cross sectional area	10~4 AWG	8~4 AWG	6~4 AWG
Recommend	10 AWG	8 AWG	6 AWG
Exposure Length		18mm	

Table 4.2 AC wire specification

4. Installation

2. Lead the AC cable through the cable gland and the housing.
3. Remove a length of 40mm of the cable jacket and strip the wire insulation to a length of 18 – 19mm.
4. Each of the terminals are labeled. Ensure that the correct conductor is fastened (2 N.m. torque) to the correct terminal.
5. Ensure the rib of the terminal block and the groove on the housing engage correctly and a “click” is heard or feltt.

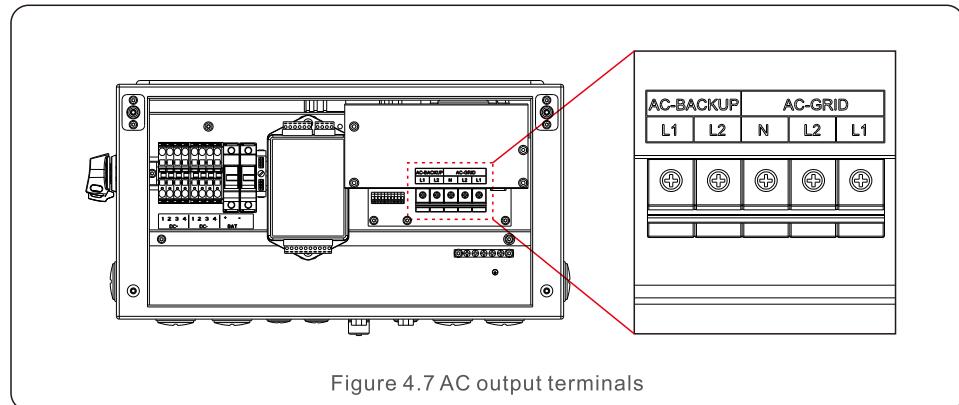
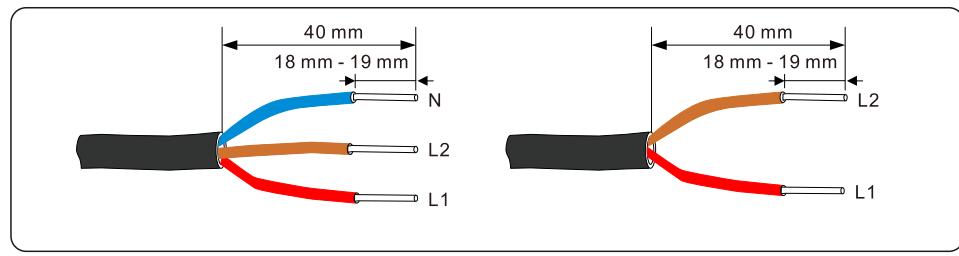


Figure 4.7 AC output terminals



WARNING:



Observe the terminal layout of terminal block.

Do not connect the phase lines to “PE” terminal, otherwise the inverter will not function properly.

Note:



AC Grid and AC Backup output 240V L1-L2.

For 120V load, auto-transformer is required in the system.

Detailed information about the auto-transformer please refer to Solis auto-transformer quick installation guide.

4. Installation

4.5 Battery Fuse Terminals

Battery power cables should be connected to the battery fuse terminals in the wiring box through the BAT conduit.

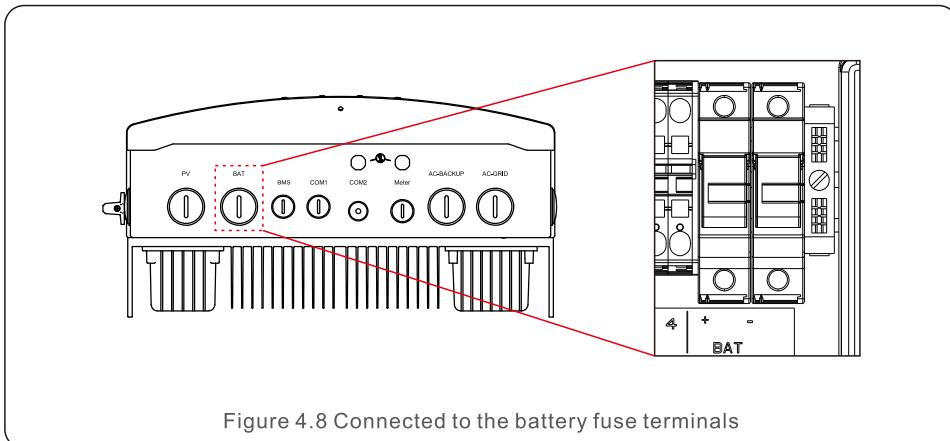


Figure 4.8 Connected to the battery fuse terminals

Cross sectional area	10~8 AWG
Exposure length	12 mm
Torque	2~4N.m

Table 4.3 Battery power cable requirement

Note:

The battery fuses in the wiring box are replaceable.

The replacement must be done by Solis authorized technicians only.

Fuse specification: 600V, 30A.

4. Installation

4.6 Communication Terminals

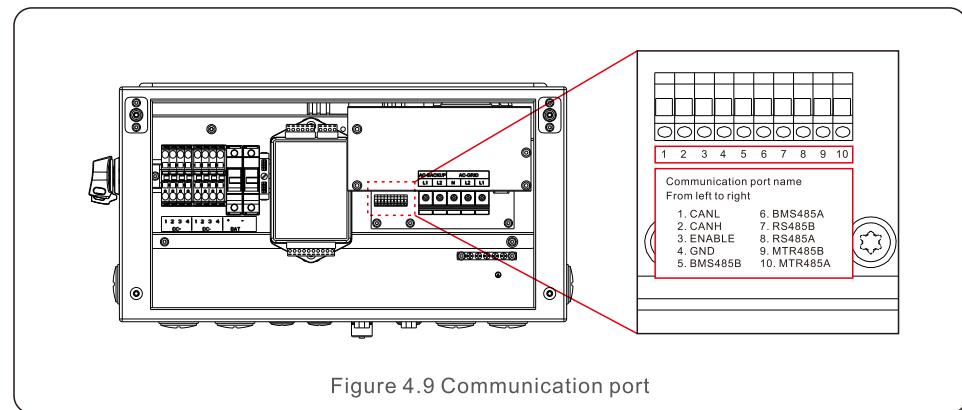


Figure 4.9 Communication port

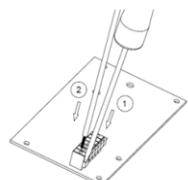
From left to right, the communication terminals consist of ten ports.

NO.	Symbol	Wire Requirement	Comments
1	CANL		
2	CANH		
3	ENABLE		
4	GND		
5	BMS485B	22-16AWG Recommend:18AWG Exposure length: 11mm	Battery communication depends on different battery types. Refer to Section 4.6.2 for details.
6	BMS485A		
7	RS485B		RS485 Communication
8	RS485A		
9	MTR485B		Meter Communication
10	MTR485A		

Table 4.4 communication terminals

Cable connection steps:

1. Use slot type screwdriver to press the block on the top.
2. Insert the exposed copper part of the cable into the terminal.



4.6.1 Meter Communication

Communication Terminals: MTR485B and MTR485A.

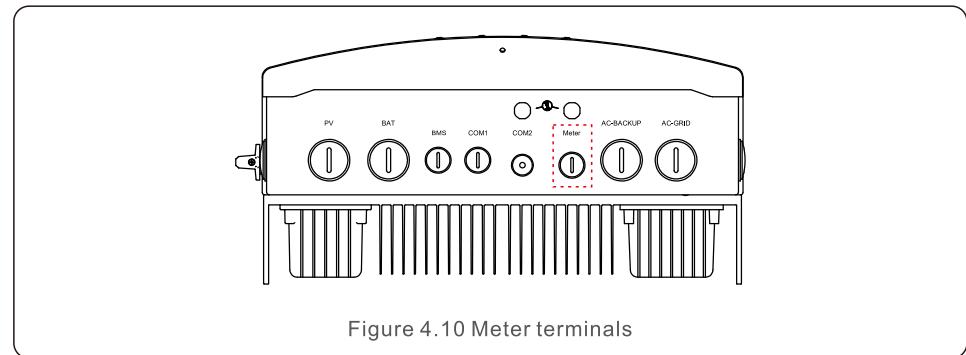


Figure 4.10 Meter terminals

The Solis RHI-HV 5G series inverter integrates export power control function which requires an external meter to detect the power flow.

The following figure shows the corresponding connection of the meter.

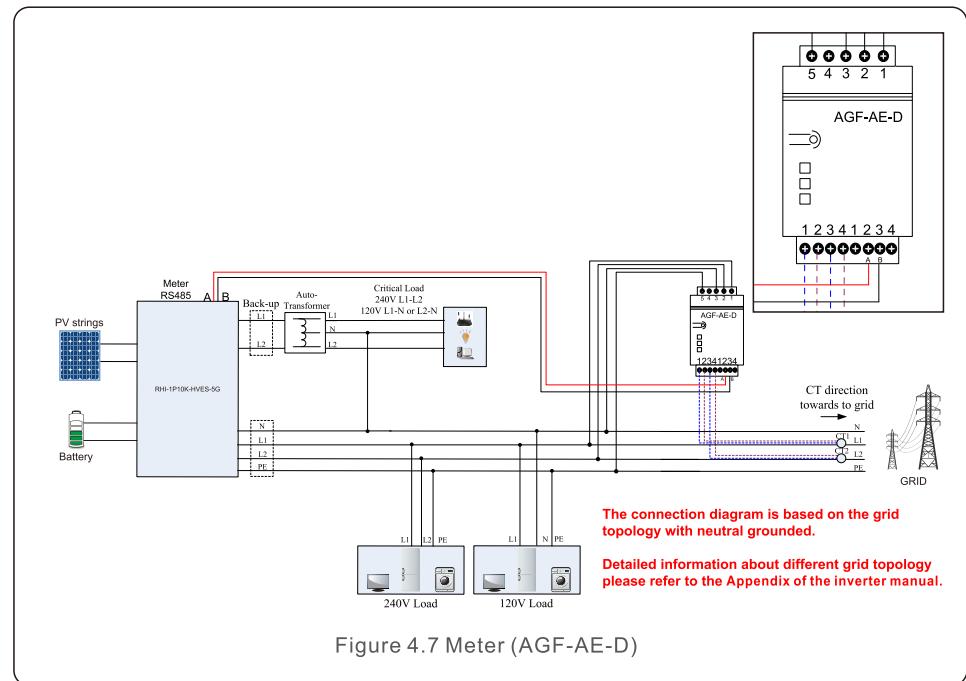


Figure 4.7 Meter (AGF-AE-D)

4. Installation

4.6.2 Battery Communication

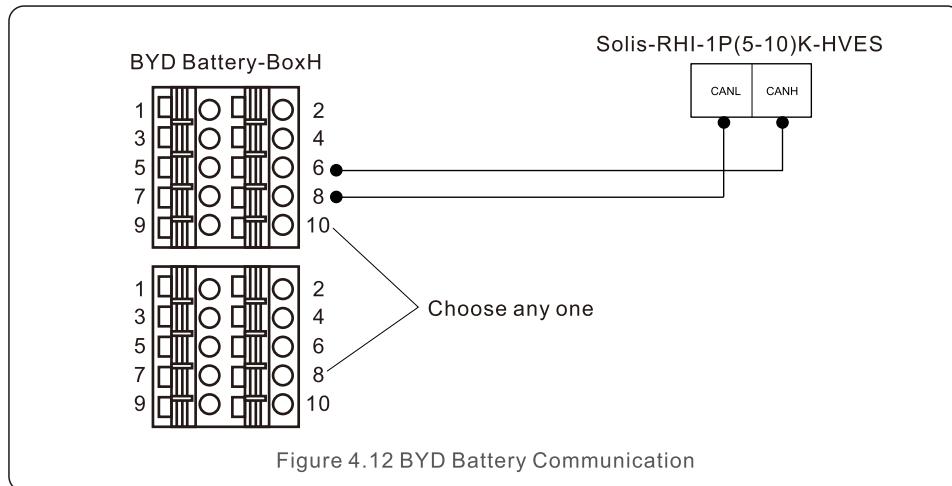
Communication Terminals: **CANL, CANH, ENABLE, GND, BMS485B, BMS485A**

Different battery types have different communication requirements.

• BYD Battery

For BYD Battery-BoxH, CANL and CANH are used.

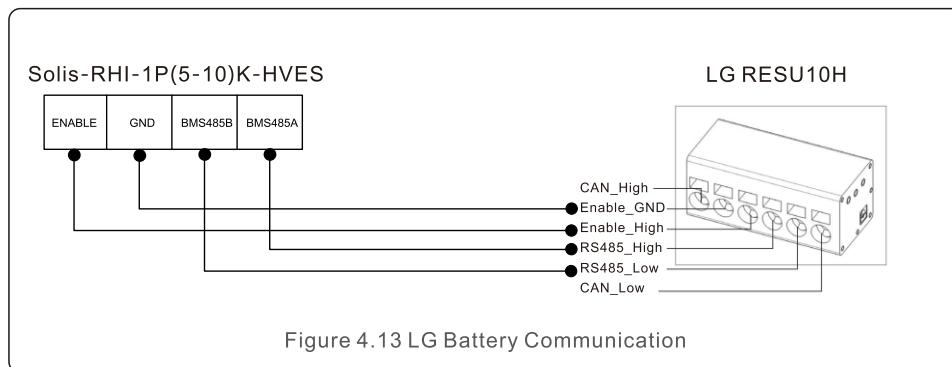
The detailed connection is shown in the following figure.



• LG Battery

For LG RESU10H, ENABLE, GND, BMS485B and BMS485A are used.

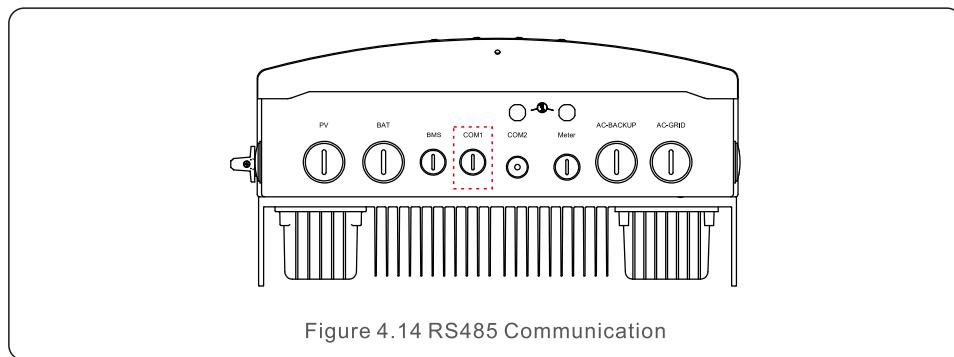
The detailed connection is shown in the following figure.



4. Installation

4.6.3 RS485 Communication

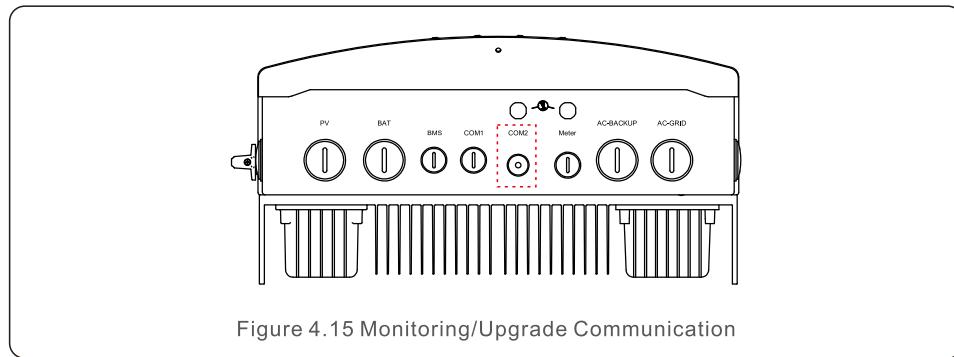
Communication Terminals: RS485B and RS485A.



This pair of RS485 terminals is reserved for external communication.

4.6.4 Monitoring/Upgrade Communication.

Communication Port: COM2.



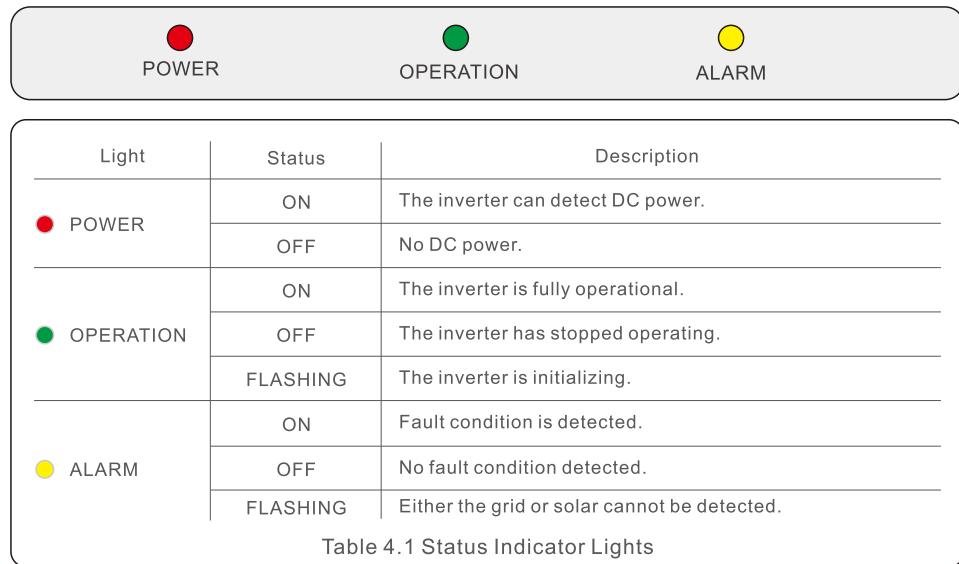
COM2 is a 4-pin RS485 communication port which is used to connect Solis datalogging stick.

If necessary, firmware upgrades can be done through an upgrade tool connecting to this port.

4. Installation

4.7 LED Indicators

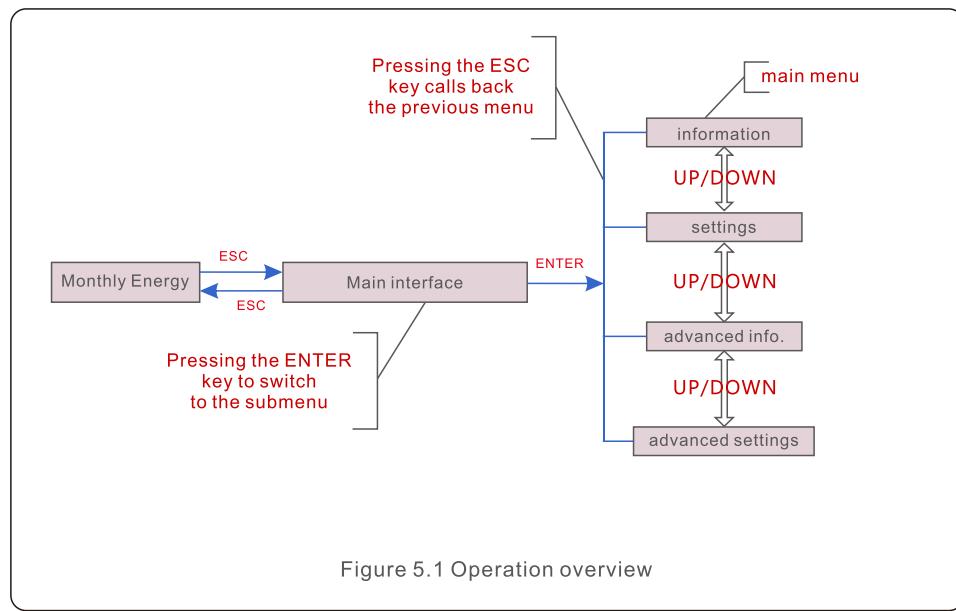
There are three LED indicators on the RHI inverter (Red, Green, and Orange) which indicate the working status of the inverter.



Light	Status	Description
● POWER	ON	The inverter can detect DC power.
	OFF	No DC power.
● OPERATION	ON	The inverter is fully operational.
	OFF	The inverter has stopped operating.
	FLASHING	The inverter is initializing.
● ALARM	ON	Fault condition is detected.
	OFF	No fault condition detected.
	FLASHING	Either the grid or solar cannot be detected.

Table 4.1 Status Indicator Lights

5. Operation



5.1 Initial Display

When powering up the inverter for the first time, it is required to set the language. Press "ENT" to select.

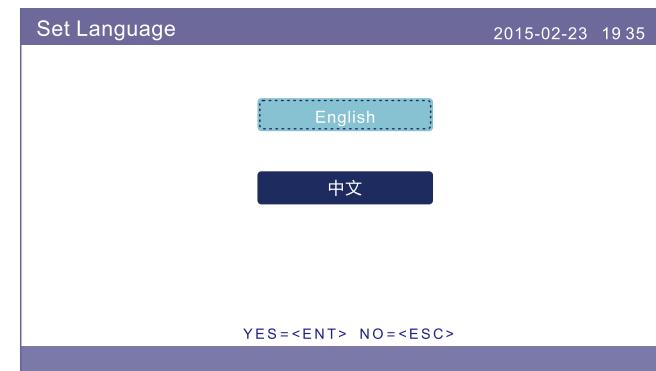


Figure 5.2 Set Language

5. Operation

After setting the language, press "ESC" to access the main page.

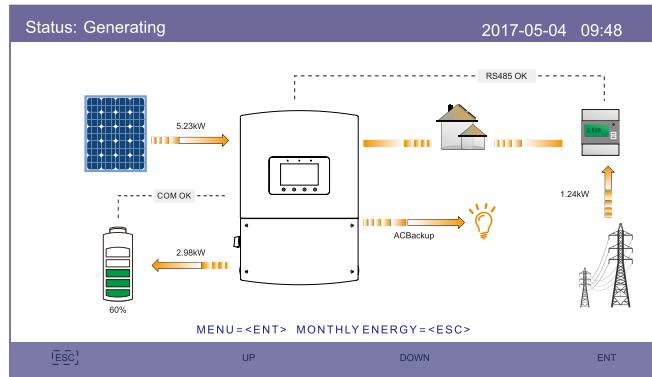


Figure 5.3 Main Page

On the main page,

Press "ESC" : View the yield data on a monthly bar charts. Then use "UP" and "DOWN" to change the date and "ENT" to move the cursor.

Press "UP" or "DOWN": View different status on the top left of the main page.

Press "ENT": Enter the main menu.

	Solar Power: When solar power is generated , an arrow indicates the direction of the power flow and the value is shown above the arrow.
	Battery: When the battery is connected successfully, it will display "COM OK" and the battery SOC arrow and flow will be shown. If the battery is not connected it will show "COM FAIL".
	Loads: Loads connected to the AC Grid port that will shutdown in the event of a grid outage.
	Smart Meter: When the smart meter is connected successfully, it will display "RS485 OK", otherwise "RS485 Fail".
	Critical Loads: Loads connected to the AC backup port which will be supported by battery and solar during a grid outage.
	Grid: The arrow and value indicate the export/import power of the hybrid system.

5. Operation

5.2 Main Menu

There are four submenu in the Main Menu:

1. Information 2. Settings 3. Advanced Information 4. Advanced Settings

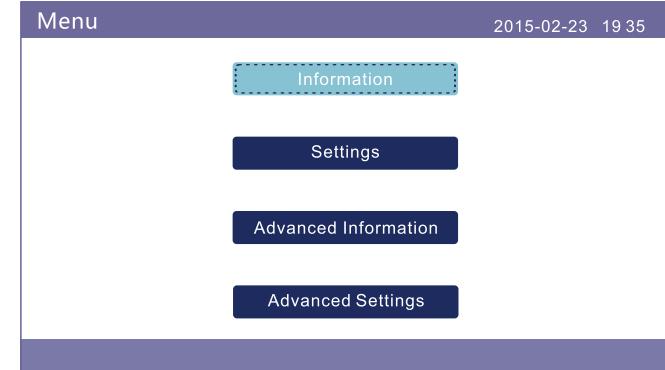


Figure 5.4 Main Menu

5.3 Information

In the information section, operating data and information data can be viewed.

Sub-sections include:

1.General Info 2.System Info 3.Energy Records 4.BMS Info 5.Meter Info

The example displays are shown in the following figures.

Values are for reference only.



Figure 5.5 Information

5. Operation

General Info		2015-02-23 19:35
Inverter SN :	000F80017A20515	DRM NO. : 08
Device Status :	Waiting	Model NO. : 00
Battery Status :	Waiting	Software Ver. : 040000
Backup Status :	Waiting	
Grid Status :	Off Grid Mode	
Wakeup Status :	Undone	

Figure 5.6 General Info

Energy Records		2015-02-23 19:35
Total Energy :	0000008kWh	This Month : 0000kWh
Today :	0000.0kWh	Last Month : 0000kWh
Yesterday :	0000.0kWh	This Year : 0000000kWh
		Last Year : 0000008kWh

Figure 5.8 Energy information

System Info		2015-02-23 19:35
Solar Power :	00000W	Grid Power : +00.0kW
Solar Voltage1 :	000.0V	Grid Voltage : 000.0V
Solar Voltage2 :	000.0V	Grid Frequency : 00.00Hz
Solar Current1 :	00.0A	Battery Voltage : 000.0V
Solar Current2 :	00.0A	Backup Voltage : 000.0V
		Charge Power : +00.0kW

Figure 5.7 System information

BMS Info		2015-02-23 19:35
Battery Voltage :	000.0V	BMS Status : CAN Fail
Battery Current :	+00.0A	
Charge Limit :	000.0A	
Discharge Limit :	000.0A	
SOC Value :	000%	
SOH Value :	000%	

Figure 5.9 BMS information

5. Operation

5. Operation

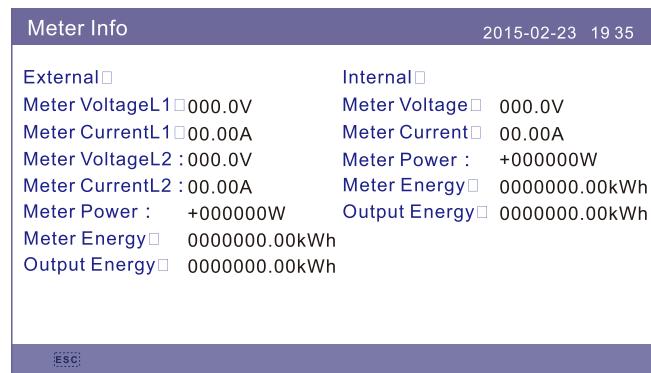


Figure 5.10 Meter Info



NOTE:

Meter Power/Grid Power: Positive value indicates exporting power to the grid, negative value indicates importing power from the grid
Charge Power: Positive value indicates charging, negative value indicates discharging.

5.4 Settings

In the "Settings" section, Time/Date, Slave address and language can be modified.

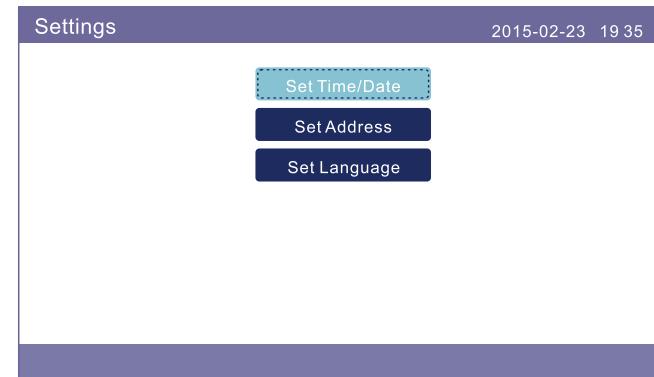


Figure 5.11 Setting

5.4.1 Set Time/Date

Set the time and date on the inverter. Must set this according to local time as it affects the daily yield calculation. (If Solis monitoring system is used, must set the correct time zone of the system, otherwise datalogger will update the inverter time based on the time zone of the system.)

Press "UP" and "DOWN" to change the value.

Press "ENT" to move the cursor.

Press "ESC" to save the change.

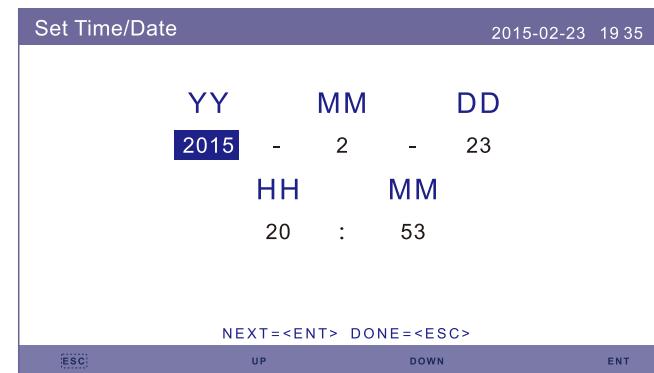


Figure 5.12 Set Time

5. Operation

5.4.2 Set Address

Set the slave address of the inverter. The default address is 01.



Figure 5.13 Set Address

5.4.3 Set Language

Set system language. Chinese and English are available.

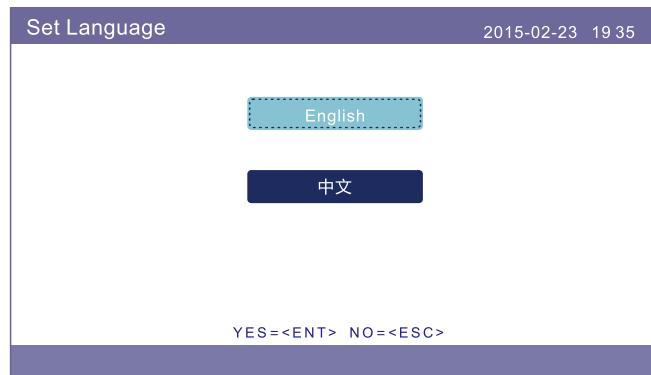


Figure 5.14 Set Language

5.5 Advanced Information

Detailed information can be viewed in this section:

1. Alarm Message
2. Warning Message
3. Running Status
4. Communication Data
5. Yield Profile

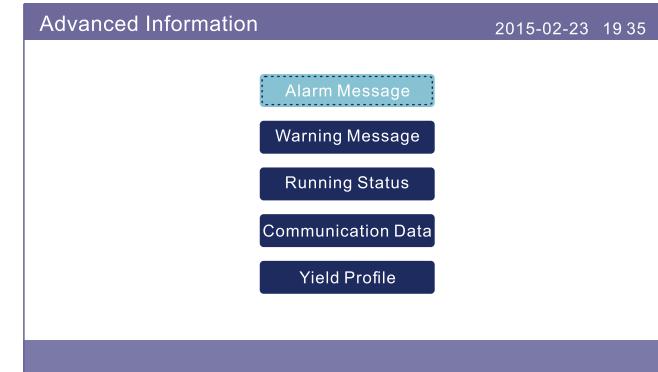


Figure 5.15 Advanced information

5.5.1 Alarm Message

40 pages of latest alarm messages (5 per page). Alarm message shows the alarm that will lead to inverter shutdown.

Alarm Message		
Message	Date/Time	Date
NO-Grid	02-23 19:35	0000
NO-Grid	02-23 19:34	0000
NO-Grid	02-23 19:34	0000
NO-Grid	02-23 19:24	0000
NO-Grid	02-23 18:22	0000
	01/40	

Figure 5.16 Alarm Message

5. Operation

5.5.2 Warning Message

10 pages of latest warning messages (5 per page).

Warning message shows the warning that is abnormal but will not lead to inverter shutdown.



Figure 5.17 Warning Message

5.5.3 Running Status

This function is for maintenance person to get running message such as internal temperature, Standard NO. etc.(Values are for reference only).



Figure 5.18 Running Status

General Status		2015-02-23 19 35
DC Bus Voltage :	000.0V	
Power Factor :	-0.00	
Power Limit :	000%	
Inverter Temperature :	+000.0degC	
Grid Standard :		

Figure 5.19 General Status

Advanced Status		2015-02-23 19 35
Grid Filter NO. :	00	Relay-Fault Func. : RUN
Ground Voltage :	000.0V	ILeak-Fault Func. : RUN
		AFCI-Fault Func. : RUN
		PV-G-Fault Func. : RUN
		OV-F-Fault Func. : RUN
		GRID-INTF.02 Func. : RUN

Figure 5.20 Advanced Status

5. Operation

5.5.4 Communication Data

Internal communication data can be viewed in this section. For maintenance person only.
Values are for reference only.

Communication Data		2015-02-23 19 35
01-10 :	86 61 A1 00 01 50 8A 06 1E 00	
11-20 :	D5 05 1E 00 00 00 00 00 00 00	
21-30 :	00 00 00 00 00 00 00 00 00 00	
31-40 :	09 02 00 00 00 00 B8 10 C0 00	
41-50 :	20 5C 80 01 00 00 43 00 07 02	
51-60 :	01 00 04 00 6D 04 E6 05 01 00	
61-70 :	DC 05 1E 00 59 06 1E 00 D4 03	
71-80 :	10 27 00 00 00 00 00 00 00 00	
81-90 :	00 00 00 00 00 00 60 00 00 00	

Figure 5.21 Communication Data

5.5.5 Yield Profile

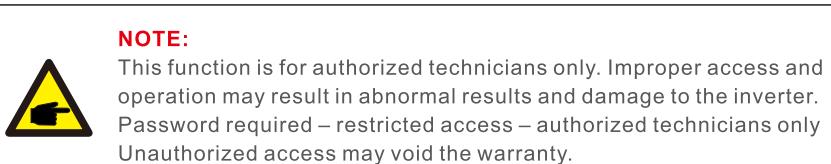
The yield profile includes Monthly Energy, Yearly Energy and Total Energy.
All the historical energy generation records can be easily viewed in this section.

Yield Profile		2015-02-23 19 35
Monthly Energy		
Yearly Energy		
Total Energy		

Figure 5.22 Yield Profile

5. Operation

5.6 Advanced Settings - Technicians Only



Select Advanced Settings from main menu, the LCD screen show the password is needed:

Password		2015-02-23 19 35
Please Input The Current Password		
X	X	X
X	X	X
YES=<ENT>	NO=<ESC>	ENT
ESC	UP	DOWN

Figure 5.23 Enter Password

Press "DOWN" to move the cursor.
Press "UP" to change the number.
Press "ENT" to enter the restricted section.
Select Advanced Settings from the Main Menu to access the following options:

Advanced Settings		2015-02-23 19 35
Select Standard	Software Update	
Switches	Export Power Set	
Battery Control	Calibrate	
Backup Control	Reset Password	
Storage Energy Set	Restart HMI	
STD.Mode Settings		

Figure 5.24 Advanced Settings

5. Operation

5.6.1 Select Standard

This function is used to select corresponding grid standards.

Please refer to the actual LCD setting for the grid standard options.

Press the UP/DOWN keys to select the standard (UL-240V, UL-208V, R21P3-240,

R21P3-208, ISONE240, ISONE208, MEX-CFE , User-Def, etc.).

Press the ENTER key to confirm the setting.

Press the ESC key to cancel changes and returns to previous menu.

There are 6 settings for USA and CSA market, UL-240V, UL-208V, R21P3-240, R21P3-208, ISONE240 and ISONE208. The default grid setting is UL-240V.



Figure 5.25 Select Standard

Press "UP" and "DOWN" to go through the list.

Press "ENT" to check the parameters, press "ENT" again to select the standard.

5.6.2 Switches

This function is used to start or stop the generation of the inverter (see Figure 5.26).

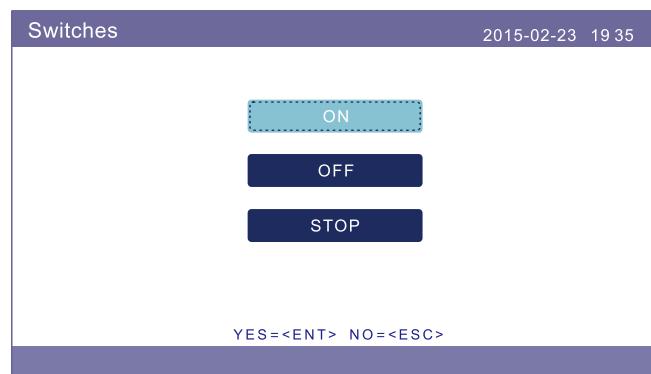


Figure 5.26 Set Switches

5. Operation

NOTE:

ON: AC Relay is ON

OFF: AC Relay is OFF

Stop: AC Relay is ON, but stop generating power

5.6.3 Battery Control

This section is used to select the corresponding battery and set the battery wakeup function.

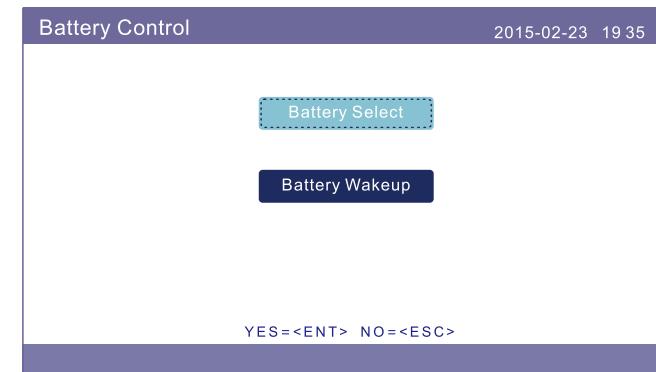


Figure 5.27 Battery Control

5.6.3.1 Battery Select

This product is compatible with the following battery modules:

Brand	Model	Setting
BYD	Battery-BoxH	Select"B-BOX HV"
LG	RESU10H	Select"LG_HV"

If hybrid inverter is not connected to a battery, select "No Battery" to avoid alarms.

For above compatible battery modules, Only two parameters need to be defined:

* OverDischg SOC (10%~40%, default 20%)

--Inverter will not discharge the battery when the OverDischg SOC is reached.

Battery self-discharge is unavoidable, SOC may go lower than the limit if the battery can't get charged for a long period of time.

* ForceCharge SOC (5%~OverDischg SOC, default 10%)

--To prevent the battery going into sleep mode, when the ForceCharge SOC is reached, inverter will charge the battery using the power from either PV or Grid.

5. Operation

5. Operation

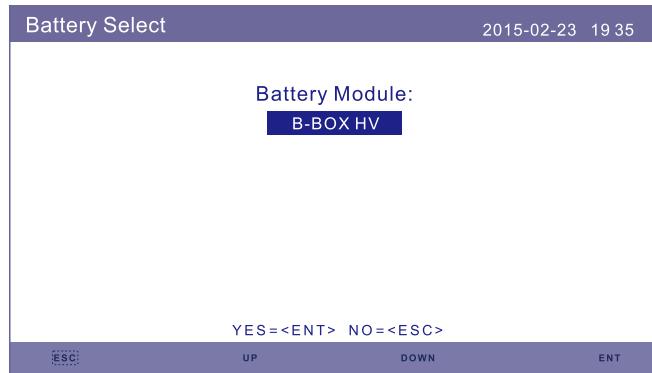


Figure 5.28 Battery Select

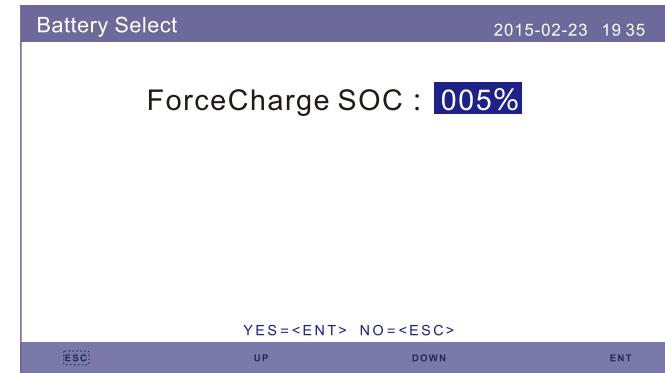


Figure 5.30 ForceCharge SOC



Figure 5.29 Over Discharge SOC.

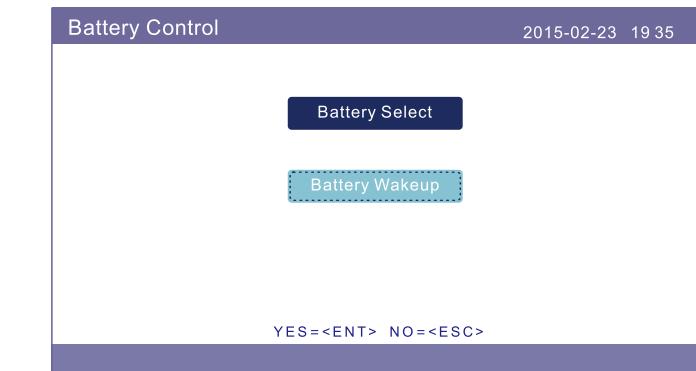


Figure 5.31 Battery Wakeup

This function should be activated only after the installation. In the case of a low battery voltage shutdown, the inverter will shut-down. This setting can be enabled, so when the inverter detects PV or grid it wakes up the battery. This function conflicts with the battery reverse polarity protection(If the installer connects cables with wrong polarity, the inverter can protect itself from damage).To avoid the possible damage during installation, do not active battery wakeup function before finishing the first commissioning.

5. Operation

5.6.4 Backup Control

This section is used to set the configuration of the backup port.

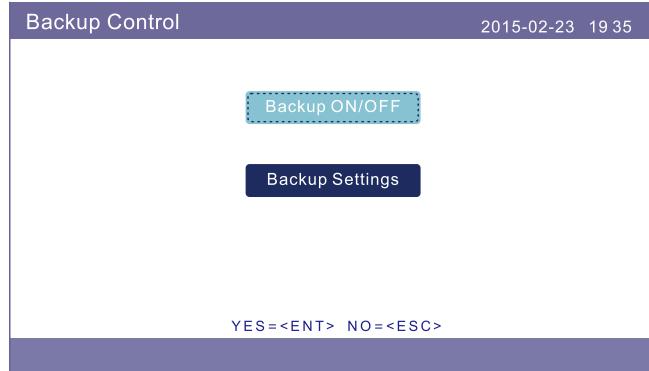


Figure 5.32 Backup Control

5.6.4.1 Backup ON/OFF

This switch can enable/disable the electrical connection of the backup port.

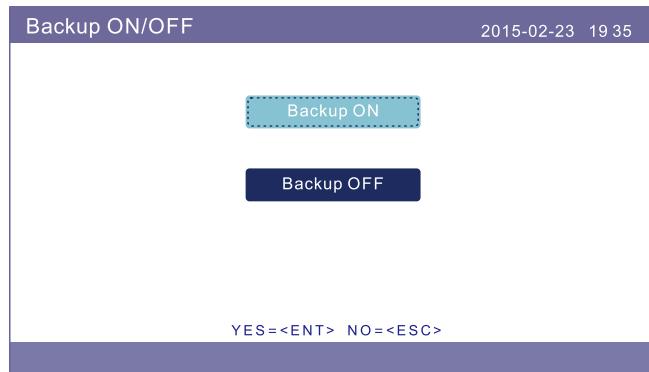


Figure 5.33 Backup ON/OFF

5.5.4.2 Backup Settings

This section shows the parameter of the backup port.

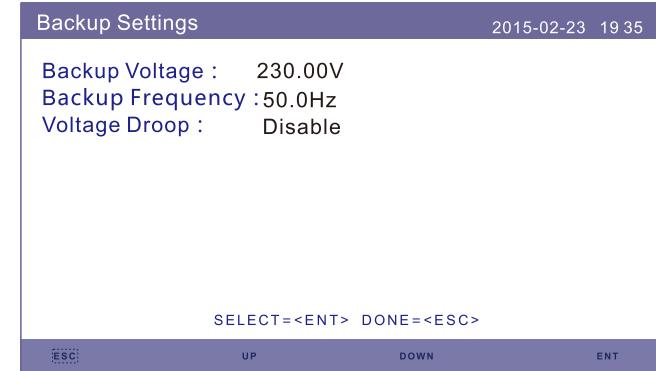


Figure 5.34 Backup Settings

5.6.5 Storage Energy Set

There are two settings available in this section which are Meter select and Storage Mode Select.

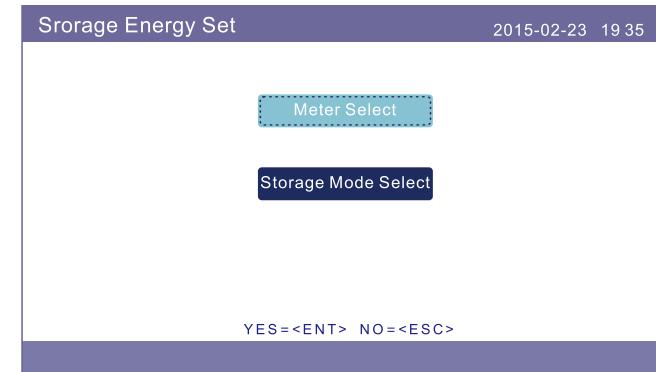


Figure 5.35 Storage Energy Set

5. Operation

5.6.5.1 Meter Select

The setting is used to select the meter type based on the actual configuration.

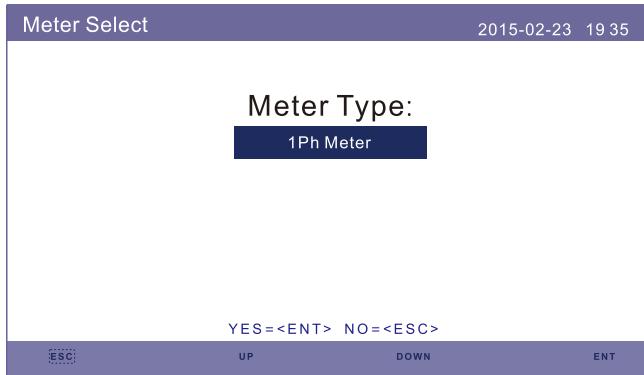
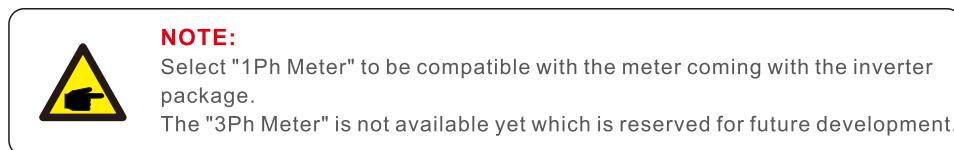


Figure 5.36 Storage Energy Set

5.6.6.2 Storage Mode Select

There are two optional modes:

1. Time Charging
2. Off-grid Mode

The default mode is called "AUTO" mode (which is not shown and can't be selected).

The "AUTO" mode logic is: Store excess PV energy into the battery and then use it to support loads instead of exporting to the grid. (Maximize system self-consumption rate).

To change back to the default mode, simply set all the other modes as OFF.

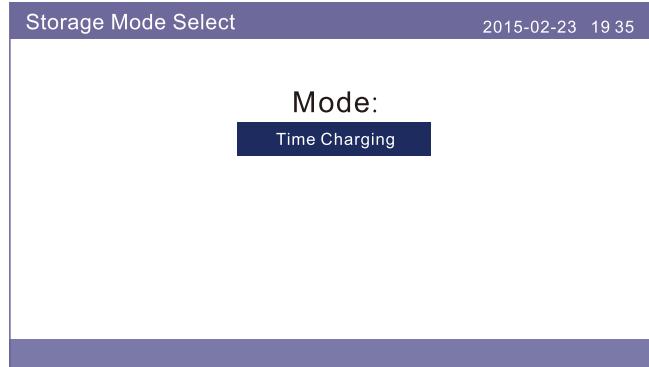


Figure 5.37 Storage Mode Select

5.6.6 STD.Mode Settings

These settings are reserved for maintenance personels or technicians only.
Do not change anything without instructions.

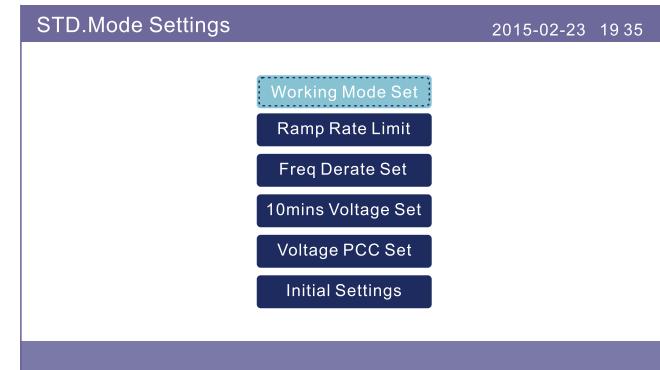


Figure 5.38 STD.Mode Settings

5. Operation

5.6.7 Software Update

The software update includes the HMI and DSP. Corresponding firmware version can be checked in this setting. Press "ENT" to enter the upgrading mode.

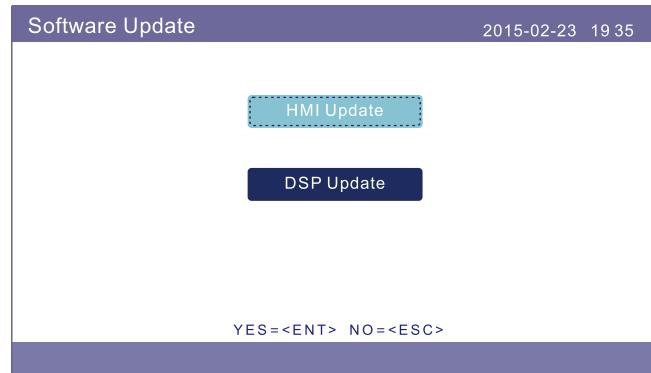


Figure 5.39 Software Update

5.6.8 Export power Set

This function is to set the export power control.

1.Backflow Power. 2. ON/OFF. 3.Failsafe ON/OFF

Setting 1&3 are only valid when Setting 2 is set to "ON"



Figure 5.40 Export power Set

5.6.8.1 Backflow Power

Determine the allowed backfeed power. (System export to the grid)



Figure 5.41 Backflow Power

5.6.8.2 ON/OFF

Enable/Disable the function.

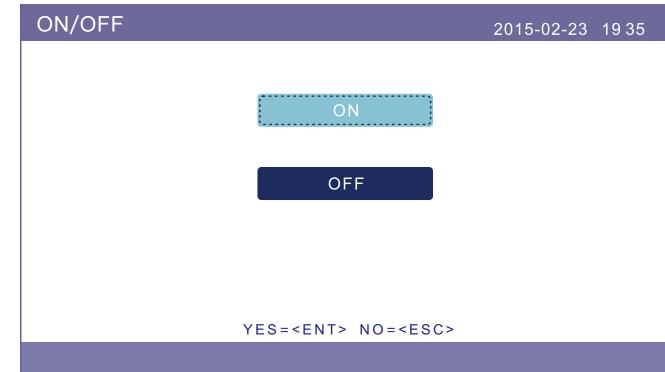


Figure 5.42 ON/OFF

5. Operation

5.6.8.3 FailSafe ON/OFF

When this Failsafe function is ON, the inverter will shutdown once it loses communication with the meter in case of any backflow power exceeding the limit.

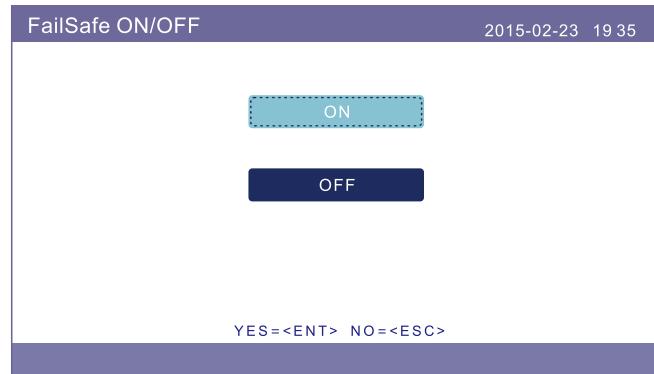


Figure 5.43 FailSafe ON/OFF

5.6.9 Calibrate

Warranty or maintenance may result in resetting total generating data, this function allow the maintenance personnel to amend the total generating data of replacement inverter to the original one.

By using our data monitoring hardware, the data on monitoring website can automatically synchronize with the preset total generating power of inverter.

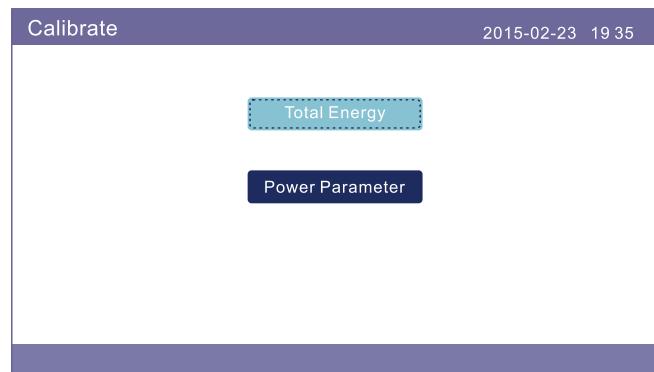


Figure 5.44 Calibrate

5. Operation

Total Energy

Total Energy: 0000056kWh

YES=<ENT> NO=<ESC>
ESC UP DOWN ENT

Figure 5.45 Total Energy

Power Parameter

Power Para: 1.000

YES=<ENT> NO=<ESC>
ESC UP DOWN ENT

Figure 5.46 Power Parameter

5. Operation

5.6.10 Reset Password

Reset Password: In this page, user can reset the inverter password, but the admin password is always valid.

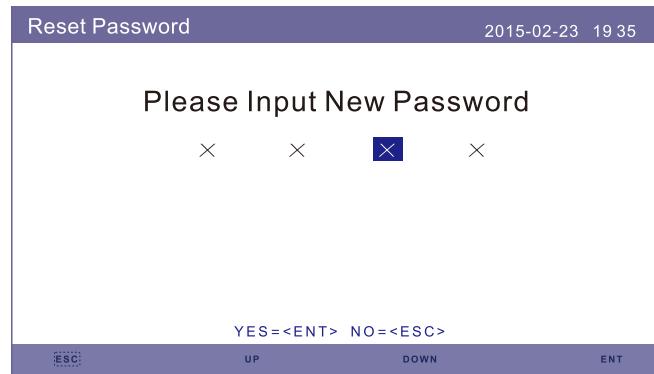


Figure 5.47 Reset Password

5.6.11 Restart HMI

This function is to reboot the LCD screen.

6. Commissioning

6.1 Preparation of Commissioning

- Ensure all the devices are accessible for operation, maintenance and service.
- Check and confirm that the inverter is firmly installed.
- Space for ventilation is sufficient for one inverter or multiple inverters.
- Nothing is left on the top of the inverter or battery module.
- Inverter and accessories are correctly connected.
- Cables are routed in safe place or protected against mechanical damage.
- Warning signs and labels are suitably affixed and durable.

6.2 Commissioning Procedure

If all the items mentioned above meet the requirements, proceed as follows to start up the inverter for the first time.

Step1: Switch on the AC circuit breaker

Step2: Switch on the hybrid inverter DC switch (Single switch for both PV and battery)

Step3: Set inverter "Time/Date", "Select Standard", "Battery Select", "Meter Select", "Storage Mode Select" by following the instructions in Section 5 of the manual.

Step4: If the system is working properly, the "Power" and "Generation" LED lights will be ON.

If the system is working abnormally, the "Power" will be ON and "Alarm" will be flashing.

Check the hybrid inverter troubleshooting list to fix the problem.

7. Troubleshooting

Solis RHI Series inverter does not require any regular maintenance. However, cleaning the heatsink will help inverter dissipating heat and increase the lifetime of inverter. The dirt on the inverter can be cleaned with a soft brush.

CAUTION:



Do not touch the surface when the inverter is operating. Some parts may be hot and cause burns. Turn OFF the inverter (refer to Section 6.2) and let it cool down before you do any maintenance or cleaning of inverter.

The LCD and the LED status indicator lights can be cleaned with cloth if they are too dirty to be read.

Note:



Never use any solvents, abrasives or corrosive materials to clean the inverter.

The inverter has been designed in accordance with international grid tied standards for safety, and electromagnetic compatibility requirements. Before delivering to the customer the inverter has been subjected to several test to ensure its optimal operation and reliability.

In case of a failure the LCD screen will display an alarm message. In this case the inverter may stop feeding energy into the grid. The alarm descriptions and their corresponding alarm messages are listed in Table 7.1:

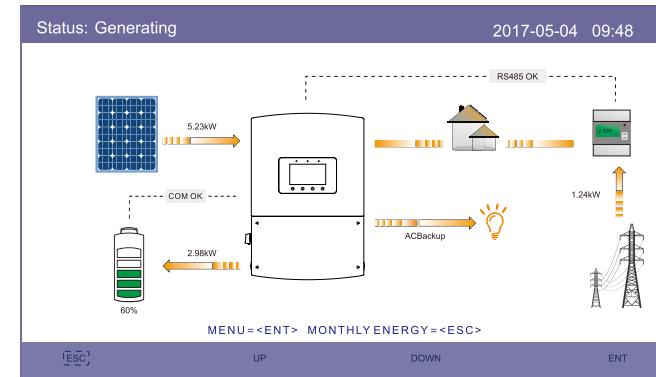
7. Troubleshooting

When faults occur, the "Fault" state will be shown on the main screen.

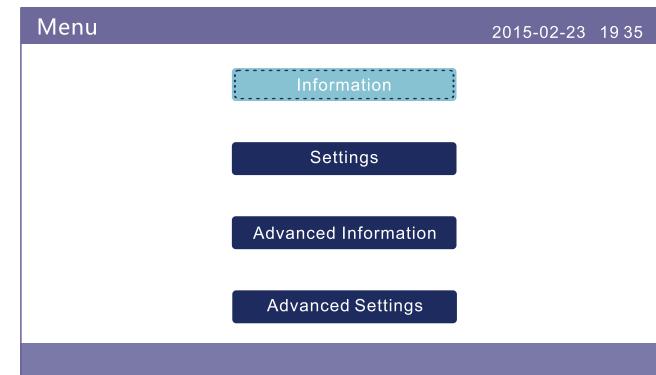
Follow the steps below to check what fault occurs.

Steps: Enter → Down → Advanced Information → Enter → Alarm Message.

Step1: Press ENTER.



Step2: Press DOWN to select Advanced Information, then press ENTER.



7. Troubleshooting

Step3: Press DOWN to select Alarm Message, then press ENTER.



Alarm Message	Failure description	Solution
ARC-FAULT	ARC detected in DC circuit	1. Check if there's arc in PV connection and restart inverter.
AFCI Check FAULT	AFCI module self check fault	1. Restart inverter or contact installer.
DCinj-FAULT	High DC injection current	1. Restart inverter or contact installer.
DSP-B-FAULT	Comm. failure between main and slave DSP	1. Restart inverter or contact installer.
DC-INTF	DC input overcurrent	1. Restart inverter. 2. Identify and remove the string to the fault MPPT. 3. Change power board.
G-IMP	High grid impedance	1. Use user define function to adjust the protection limit if it's allowed by electrical company.
GRID-INTF01/02	Grid interference	1. Restart inverter. 2. Change power board.
IGBT-OV-I	Over IGBT current	
IGFOL-F	Grid current tracking fail	1. Restart inverter or contact installer.
IG-AD	Grid current sampling fail	
ILeak-PRO 01/02/03/04	leakage current protection	1. Check AC and DC connection. 2. Check inverter inside cable connection.
INI-FAULT	Initialization system fault	1. Restart inverter or contact installer.
LCD show initializing all the time	Can not start-up	1. Check if the connector on main board or power board are fixed. 2. Check if the DSP connector to power board are fixed.
NO-Battery	Unconnected battery	1. Ensure the battery is connected properly. 2. Verify the output battery voltage is correct.
No power	Inverter no power on LCD	1. Check PV input connections. 2. Check DC input voltage (single phase >120V, three phase >350V). 3. Check if PV+/- is reversed.
NO-GRID	No grid voltage	1. Check connections and grid switch. 2. Verify the grid voltage is correct on the AC Terminals inside the inverter wiring box.
OV-BUS	Over DC bus voltage	1. Check inverter inductor connection. 2. Check driver connection.

7. Troubleshooting

Alarm Message	Failure description	Solution
OV-DC01/02/03/04	Over DC voltage	1. Reduce the module number in series.
OV-DCA-I	DC input overcurrent	1. Restart inverter. 2. Identify and remove the string of the faulted MPPT. 3. Change power board.
OV-G-V01/02/03/04	Over grid voltage	1. Resistance of AC Cable is too high. Increase the gauge of grid cables. 2. Adjust the protection limit if it's allowed by electrical company.
OV-G-I	Over grid current	1. Restart inverter. 2. Change power board.
OV-G-F01/02	Over grid frequency	1. Use user define function to adjust the protection limit if it's allowed by electrical company.
OV-IgTr	AC side transient overcurrent	1. Restart inverter. 2. Return-factory repair.
OV-ILLC	LLC hardware overcurrent	
OV-VBackup	Bypass overvoltage fault	
OV-TEM	Over Temperature	1. Check inverter surrounding ventilation. 2. Check if there's sunshine direct on inverter in hot weather.
OV-Vbatt1	The detection of battery overvoltage	1. Verify the protection point for over voltage is set correctly. 2. Restart inverter.
OV-Vbatt-H	Battery overvoltage hardware fault	1. Check if any part of the battery input circuit is tripped, ie. battery fuses, battery circuit breaker. 2. Restart inverter.
Over-Load	Bypass overload fault	1. Check the load of backup port is over 3kw or not. 2. Reduce the load of backup port, then restart inverter.
PV ISO-PRO01/02	PV isolation protection	1. Remove all DC input, reconnect and restart inverter one by one. 2. Identify which string cause the fault and check the isolation of the string.
RelayChk-FAIL	Relay check fail	1. Restart inverter or contact installer.

Alarm Message	Failure description	Solution
UN-BUS01/02	Under DC bus voltage	1. Check inverter inductor connection. 2. Check driver connection.
UN-G-F01/02	Under grid frequency	1. Use user define function to adjust the protection limit if it's allowed by electrical company.
UN-G-V01/02	Under grid voltage	
12Power-FAULT	12V power supply fault	1. Restart inverter or contact installer.

Table 7.1 Fault message and description

NOTE:



If the inverter displays any alarm message as listed in Table 7.1; please turn off the inverter and wait for 5 minutes before restarting it. If the failure persists, please contact your local distributor or the service center.

7. Troubleshooting

If you have any technical problems with the hybrid system, please contact the Solis after-sale service. It is recommended to gather the following information before making the contact in order to get timely support.

Item	Details	Supplemental Info
Inverter SN		SN from nameplate
Inverter Firmware Version		6 digits of number or letter (Check the inverter user manual for the path)
Alarm message		Code showing on the inverter LCD
DC connections		Solar modules, numbers, configuration
Detailed description of the problem		
Battery SN, Firmware version		Check battery user manual for the path
Is it connected to Solis Monitoring Portal		Yes/No
Take pictures showing all the cable connections in the system (Videos preferred)		If available

8. Specifications

Technical Data	RHI-1P5K-HVES-5G	RHI-1P6K-HVES-5G
Input DC (PV side)		
Max. input power	7000W	8400W
Max. input voltage		500Vdc
Rated voltage		330Vdc
Start-up voltage		120Vdc
MPPT voltage range		90-450V
Full load MPPT voltage range	115-450V	140-450V
Max. input current		26A/26A
Max. short circuit current		40A/40A
MPPT number/Max input strings number		2/4
Battery		
Battery Type		Li-ion
Battery voltage range		120 - 500Vdc
Peak Power		7000W
MaxCharge/discharge current		20A
Communication		CAN/RS485
Output AC(Back-up)		
Rating output power		6000W
Max. apparent output power		7000W
Back-up switch time		<10ms
Rated output voltage		1Φ/PE, 240 V
Rated frequency		60Hz
Rated output current		25A
Output AC(Grid side)		
Rated output power	5000W	6000W
Max. apparent output power	7000VA	8400VA
Rated grid voltage		1Φ/PE, 240 V/208 V
Rating grid frequency		60Hz
Rating grid output current	24A/21A	28.8A/25A
Max. output current	40A/40A	40A/40A
Power Factor	>0.99 (0.8 leading - 0.8 lagging)	

8. Specifications

Efficiency	
Max efficiency	98%
European efficiency	97.5%
Protection	
Ground fault monitoring	Yes
Residual current monitoring unit	Yes
Integrated AFCI (DC arc-fault circuit protection)	Yes
DC reverse polarity protection	Yes
Rapid Shutdown NEC 2017	Built-in MLRSD Sunspec Transmitter
Compliant MLRSD Products	APSmart RSD-S-PLC
Protection class/Over voltage category	I/II
General data	
Dimensions(W/H/D)	514*717*250(mm)/20.2*28.1*7.8(in)
Weight	66.1lb/30kg
Operation temperature range	-25°C ~ +60°C/-13°F ~ +140°F
Protection degree	NEMA 4X
Noise emission (typical)	<30dB(A)
Max.operation altitude	2000m
Grid connection standard	IEEE1547A, UL 1741-SA, ISO-NE, Rule 21 phase2 & 3
Safty/EMC standard	UL 1741, UL 1741SA, UL1998, UL1699B, CAN/CSA C22.2 107.1-1, FCC Part 15 Class B
Compatible batteries	BYD B-Box H5.0/7.5/10, LG Chem RESU10H
Feature	
DC connection	2 knockout for 1" conduit at side and bottom, Fuse screw terminal
AC connection	3 knockout for 1" conduit at side and bottom, Screw clamp terminal (Max. 7 AWG)
Display	7.0"LCD color screen display
Communication	Rs485, Optional:Wi-Fi, GPRS
Warranty	10 years standard (Extend to 20 years)

8. Specifications

Technical Data	RHI-1P7K-HVES-5G	RHI-1P7.6K-HVES-5G
Input DC (PV side)		
Max. input power	9800W	10600W
Max. input voltage	500Vdc	
Rated voltage	330Vdc	
Start-up voltage	120Vdc	
MPPT voltage range	90-450V	
Full load MPPT voltage range	160-450V	175-450V
Max. input current	26A/26A	
Max. short circuit current	40A/40A	
MPPT number/Max input strings number	2/4	
Battery		
Battery Type	Li-ion	
Battery voltage range	120 - 500Vdc	
Peak Power	7000W	
MaxCharge/discharge current	20A	
Communication	CAN/RS485	
Output AC(Back-up)		
Rating output power	6000W	
Max. apparent output power	7000W	
Back-up switch time	<10ms	
Rated output voltage	1Φ/PE, 240 V	
Rated frequency	60Hz	
Rated output current	25A	
Output AC(Grid side)		
Rated output power	7000W	7600W
Max. apparent output power	9800VA	10600VA
Rated grid voltage	1Φ/PE, 240 V/208 V	
Rating grid frequency	60Hz	
Rating grid output current	33.7A/29.2A	36.5A/31.7A
Max. output current	40A/40A	40A/50A
Power Factor	>0.99 (0.8 leading - 0.8 lagging)	

8. Specifications

Efficiency	
Max efficiency	98%
European efficiency	97.5%
Protection	
Ground fault monitoring	Yes
Residual current monitoring unit	Yes
Integrated AFCI (DC arc-fault circuit protection)	Yes
DC reverse polarity protection	Yes
Rapid Shutdown NEC 2017	Built-in MLRSD Sunspec Transmitter
Compliant MLRSD Products	APSmart RSD-S-PLC
Protection class/Over voltage category	I/II
General data	
Dimensions(W/H/D)	514*717*250(mm)/20.2*28.1*7.8(in)
Weight	66.1lb/30kg
Operation temperature range	-25°C ~ +60°C/-13°F ~ +140°F
Protection degree	NEMA 4X
Noise emission (typical)	<30dB(A)
Max.operation altitude	2000m
Grid connection standard	IEEE1547A, UL 1741-SA, ISO-NE, Rule 21 phase2 & 3
Safty/EMC standard	UL 1741, UL 1741SA, UL1998, UL1699B, CAN/CSA C22.2 107.1-1,FCC Part 15 Class B
Compatible batteries	BYD B-Box H5.0/7.5/10, LG Chem RESU10H
Feature	
DC connection	2 knockout for 1" conduit at side and bottom, Fuse screw terminal
AC connection	3 knockout for 1" conduit at side and bottom, Screw clamp terminal (Max. 7 AWG)
Display	7.0"LCD color screen display
Communication	Rs485, Optional:Wi-Fi, GPRS
Warranty	10 years standard (Extend to 20 years)

8. Specifications

Technical Data	RHI-1P8K-HVES-5G	RHI-1P9K-HVES-5G
Input DC (PV side)		
Max. input power	11200W	12600W
Max. input voltage	500Vdc	
Rated voltage	330Vdc	
Start-up voltage	120Vdc	
MPPT voltage range	90-450V	
Full load MPPT voltage range	185-450V	210-450V
Max. input current	26A/26A	
Max. short circuit current	40A/40A	
MPPT number/Max input strings number	2/4	
Battery		
Battery Type	Li-ion	
Battery voltage range	120 - 500Vdc	
Peak Power	7000W	
MaxCharge/discharge current	20A	
Communication	CAN/RS485	
Output AC(Back-up)		
Rating output power	6000W	
Max. apparent output power	7000W	
Back-up switch time	<10ms	
Rated output voltage	1Φ/PE, 240 V	
Rated frequency	60Hz	
Rated output current	25A	
Output AC(Grid side)		
Rated output power	8000W	9000W
Max. apparent output power	11200VA	12600VA
Rated grid voltage	1Φ/PE, 240 V/208 V	
Rating grid frequency	60Hz	
Rating grid output current	38.5A/33.3A	43.3A/37.5A
Max. output current	50A/50A	50A/50A
Power Factor	>0.99 (0.8 leading - 0.8 lagging)	

8. Specifications

Efficiency	
Max efficiency	98%
European efficiency	97.5%
Protection	
Ground fault monitoring	Yes
Residual current monitoring unit	Yes
Integrated AFCI (DC arc-fault circuit protection)	Yes
DC reverse polarity protection	Yes
Rapid Shutdown NEC 2017	Built-in MLRSD Sunspec Transmitter
Compliant MLRSD Products	APSmart RSD-S-PLC
Protection class/Over voltage category	II/II
General data	
Dimensions(W/H/D)	514*717*250(mm)/20.2*28.1*7.8(in)
Weight	66.1lb/30kg
Operation temperature range	-25°C ~ +60°C/-13°F ~ +140°F
Protection degree	NEMA 4X
Noise emission (typical)	<30dB(A)
Max.operation altitude	2000m
Grid connection standard	IEEE1547A, UL 1741-SA, ISO-NE, Rule 21 phase2 & 3
Safty/EMC standard	UL 1741, UL 1741SA, UL1998, UL1699B, CAN/CSA C22.2 107.1-1, FCC Part 15 Class B
Compatible batteries	BYD B-Box H5.0/7.5/10, LG Chem RESU10H
Feature	
DC connection	2 knockout for 1" conduit at side and bottom, Fuse screw terminal
AC connection	3 knockout for 1" conduit at side and bottom, Screw clamp terminal (Max. 7 AWG)
Display	7.0"LCD color screen display
Communication	Rs485, Optional:Wi-Fi, GPRS
Warranty	10 years standard (Extend to 20 years)

8. Specifications

Technical Data	RHI-1P10K-HVES-5G
Input DC (PV side)	
Max. input power	14000W
Max. input voltage	500Vdc
Rated voltage	330Vdc
Start-up voltage	120Vdc
MPPT voltage range	90-450V
Full load MPPT voltage range	230-450V
Max. input current	26A/26A
Max. short circuit current	40A/40A
MPPT number/Max input strings number	2/4
Battery	
Battery Type	Li-ion
Battery voltage range	120 - 500Vdc
Peak Power	7000W
MaxCharge/discharge current	20A
Communication	CAN/RS485
Output AC(Back-up)	
Rating output power	6000W
Max. apparent output power	7000W
Back-up switch time	<10ms
Rated output voltage	1Φ/PE, 240 V
Rated frequency	60Hz
Rated output current	25A
Output AC(Grid side)	
Rated output power	10000W
Max. apparent output power	14000VA
Rated grid voltage	1Φ/PE, 240 V/208 V
Rating grid frequency	60Hz
Rating grid output current	48A/41.7A
Max. output current	60A/60A
Power Factor	>0.99 (0.8 leading - 0.8 lagging)

8. Specifications

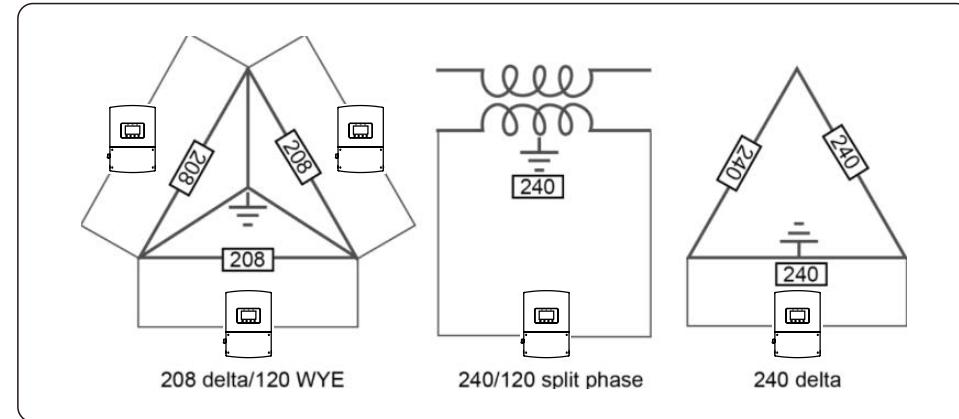
Efficiency	
Max efficiency	98%
European efficiency	97.5%
Protection	
Ground fault monitoring	Yes
Residual current monitoring unit	Yes
Integrated AFCI (DC arc-fault circuit protection)	Yes
DC reverse polarity protection	Yes
Rapid Shutdown NEC 2017	Built-in MLRSD Sunspec Transmitter
Compliant MLRSD Products	APSmart RSD-S-PLC
Protection class/Over voltage category	II/II
General data	
Dimensions(W/H/D)	514*717*250(mm)/20.2*28.1*7.8(in)
Weight	66.1lb/30kg
Operation temperature range	-25°C ~ +60°C/-13°F ~ +140°F
Protection degree	NEMA 4X
Noise emission (typical)	<30dB(A)
Max.operation altitude	2000m
Grid connection standard	IEEE1547A, UL 1741-SA, ISO-NE, Rule 21 phase2 & 3
Safty/EMC standard	UL 1741, UL 1741SA, UL1998, UL1699B, CAN/CSA C22.2 107.1-1, FCC Part 15 Class B
Compatible batteries	BYD B-Box H5.0/7.5/10, LG Chem RESU10H
Feature	
DC connection	2 knockout for 1" conduit at side and bottom, Fuse screw terminal
AC connection	3 knockout for 1" conduit at side and bottom, Screw clamp terminal (Max. 7 AWG)
Display	7.0"LCD color screen display
Communication	Rs485, Optional:Wi-Fi, GPRS
Warranty	10 years standard (Extend to 20 years)

9. Appendix

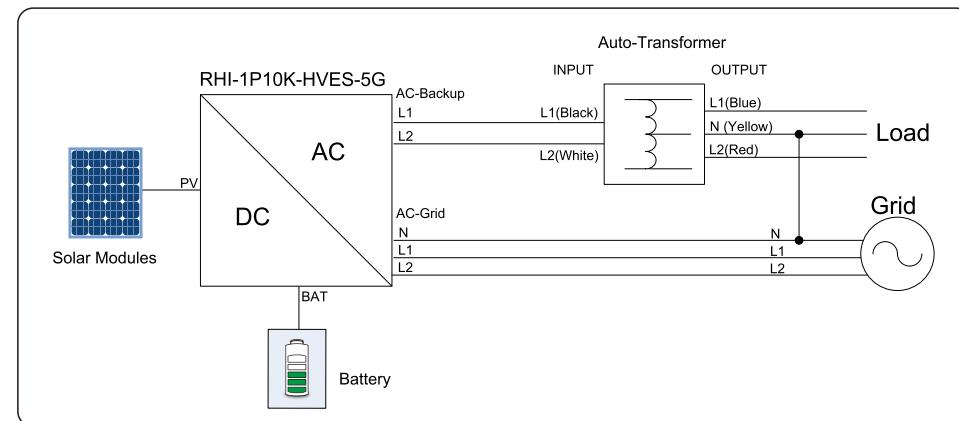
9.1 Solutions for different grid topology

This product is designed for the following two types of grid topology.

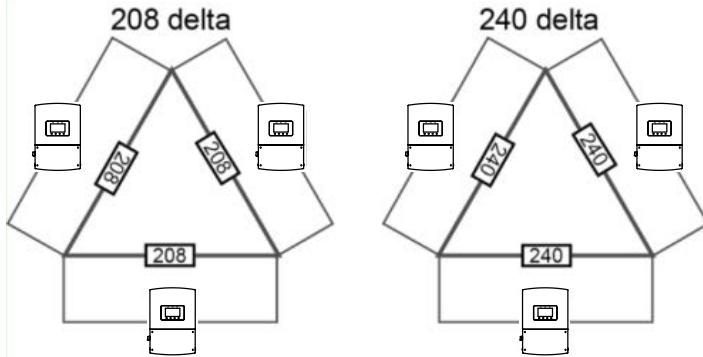
Type 1: Grid with Neutral grounded



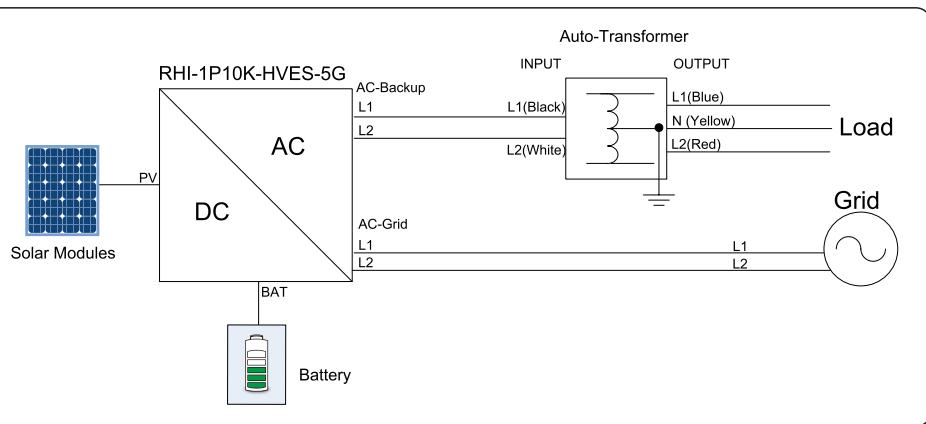
Please follow the below circuit diagram to configure the connection:



Type 2: Grid without Neutral



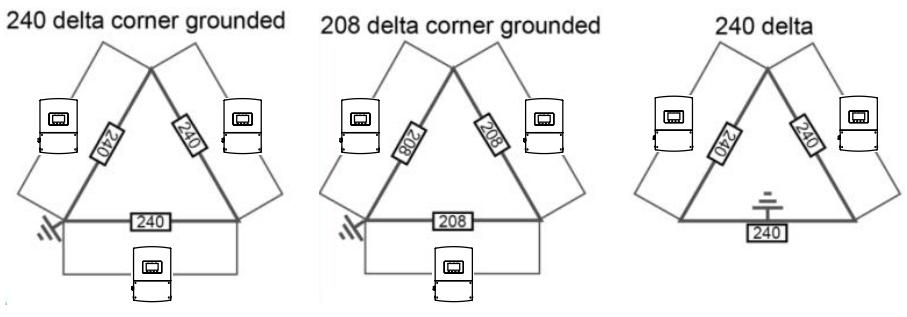
Please follow the below circuit diagram to configure the connection:
(Use the central tap N of the auto-transformer to ground the neutral):



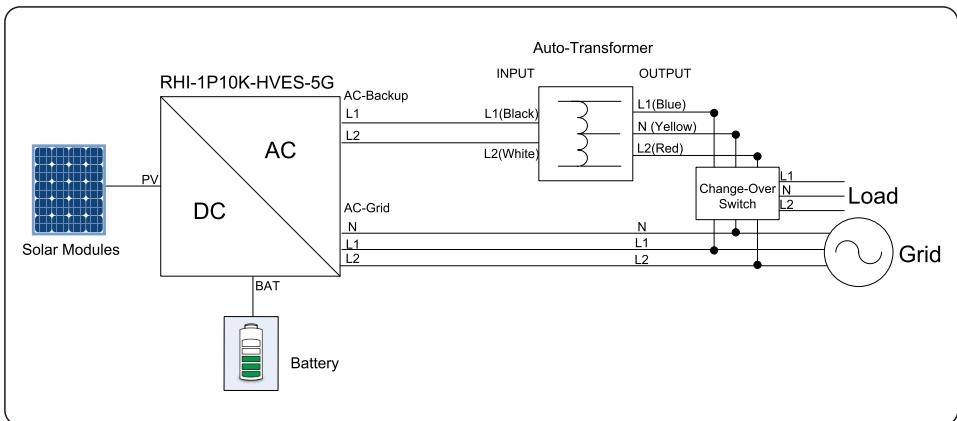
Type 3: Special grid topology

For the following grid topology, the standard hybrid inverter is NOT applicable.
Please contact Solis to purchase necessary accessories to be compatible with them.
Requirements:

1. A special contactor box (Automatic change-over switch box)
2. Special firmware update



Please follow the below circuit diagram to configure the connection:



NOTE:

With the change-over switch installed and the firmware updated, the hybrid inverter's backup port WILL NOT supply power unless the grid fails. When the grid fails, the contactor switches inside the box will switch on the backup port and the loads will be supported by the backup port only (Power from battery and PV).

