Solis

Solis RHI-HV Series Hybrid Inverter
Instruction Manual

Ginlong Technologies Co., Ltd.

No. 57 Jintong Road, Binhai Industrial Park, Xiangshan, Ningbo,

Zhejiang, 315712, P.R.China.

Tel: +86 (0)574 6578 1806

Fax: +86 (0)574 6578 1606

Email:info@ginlong.com

Web:www.ginlong.com

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 Certified

Comply with CA Rule 21／
Certified to UL 1741 SA
Certified to UL Std. No. 1741-Second Edition
& CSA-C22.2 No.107.1-16

C US

Ginlong Technologies Co., Ltd.

Contents

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 3 different models which are grid support transformerless utility interactive inverters:

RHI-1P5K-HVES-5G, RHI-1P7.6K-HVES-5G, RHI-1P10K-HVES-5G

LED Indicators

Display

Keys

DC Switch

Figure 1.1 Front side view

PV   BAT   BMS   COM1   COM2   Meter   AC-BACKUP   AC-GRID

Figure 1.2 Bottom side view
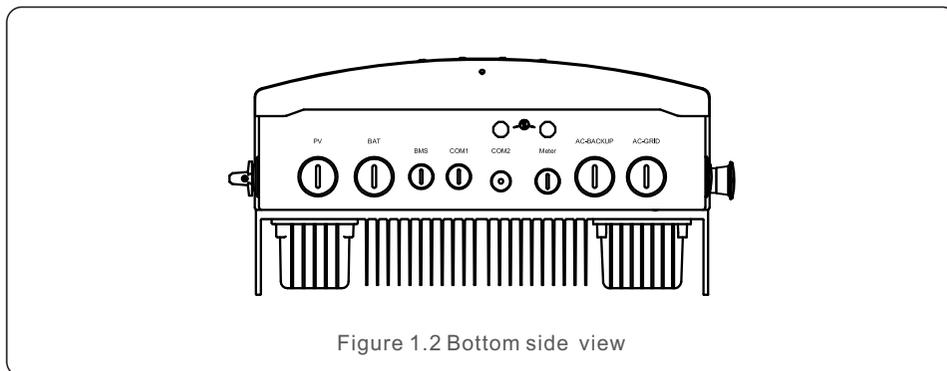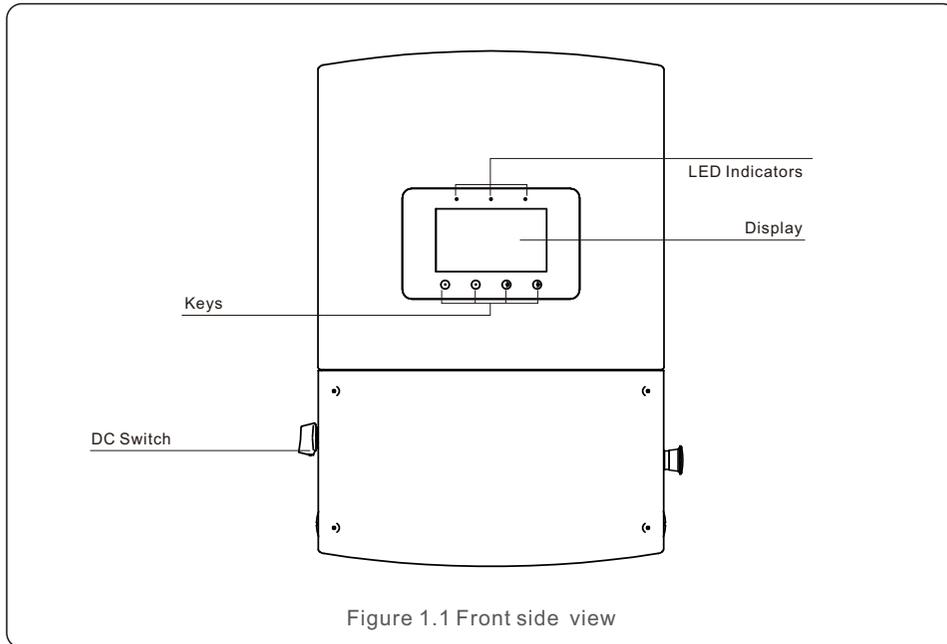
1.2 Packaging

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

Inverter x1

Back plate x1

Expansion bolt x4

Hexagon bolt x2

External meter x1

CT x2

Manual

User manual x1
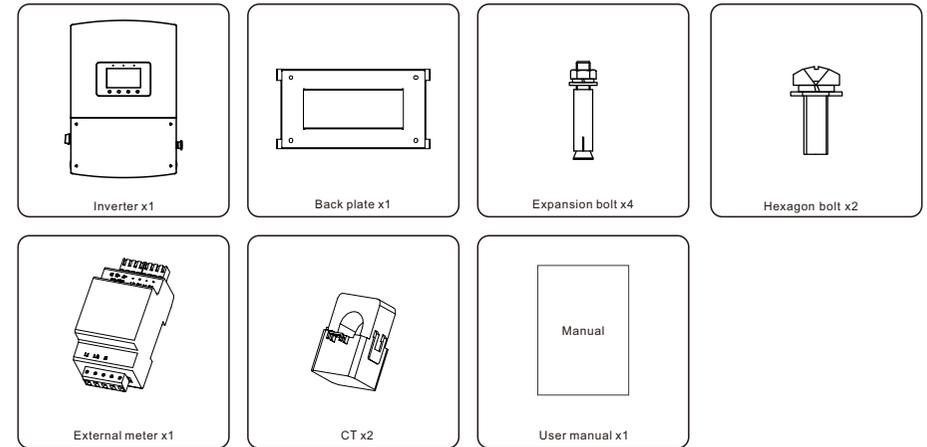
If anything is missing, please contact your local Solis distributor.

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.

NOTE:
If you want to cut off the MLRSD, push the button in the middle of the RSD-Estop. And rotate the button clockwise to reset the function.

2.2 General Safety Instructions

Save These Instructions:
This manual contains important instructions that shall be followed during installation and maintenance of the inverter.

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

WARNING:
Please do not 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:
Operator must put on the technicians' gloves during the whole process in case of any electrical hazards.

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℃ (167℉).
To avoid risk of burns, do not touch the surface of the inverter while it is 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.

2. Safety & Warning

⚠️ **WARNING:**
Operations below must be accomplished by licensed technician or Solis authorized person.

⚠️ **WARNING:**
AC-BACKUP of RHI-HV series is forbidden to connect to the grid.

⚠️ **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.

3 Phase LOAD

1 Phase LOAD
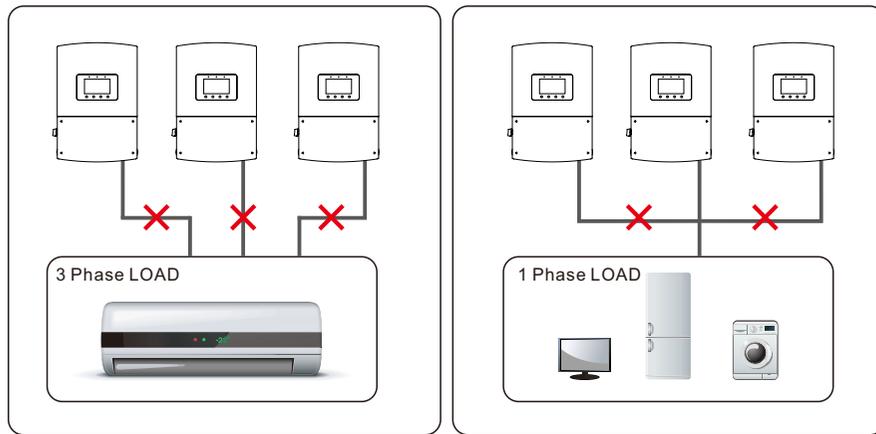
2.3 Notice For Use

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).

ESC   UP   DOWN   ENTER

Figure 3.1 Keypad

3.3 Terminal Connection

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

BMS   Vent   AC-BACKUP

AC-GRID

DC   RSD E-STOP

BAT

Commnication   COM2   Meter
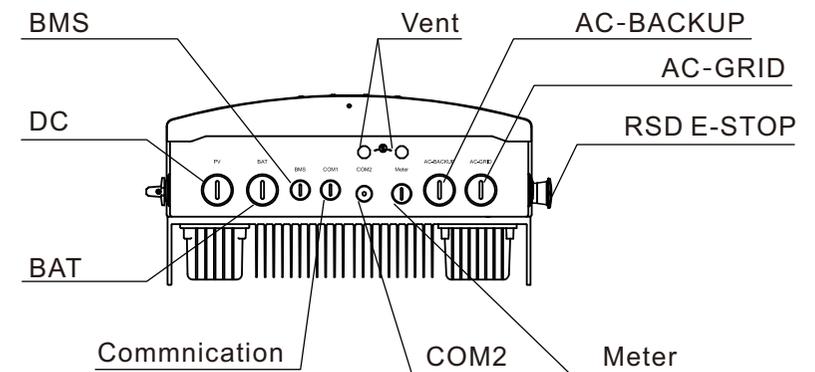
Figure 3.2 Front Panel Display

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.
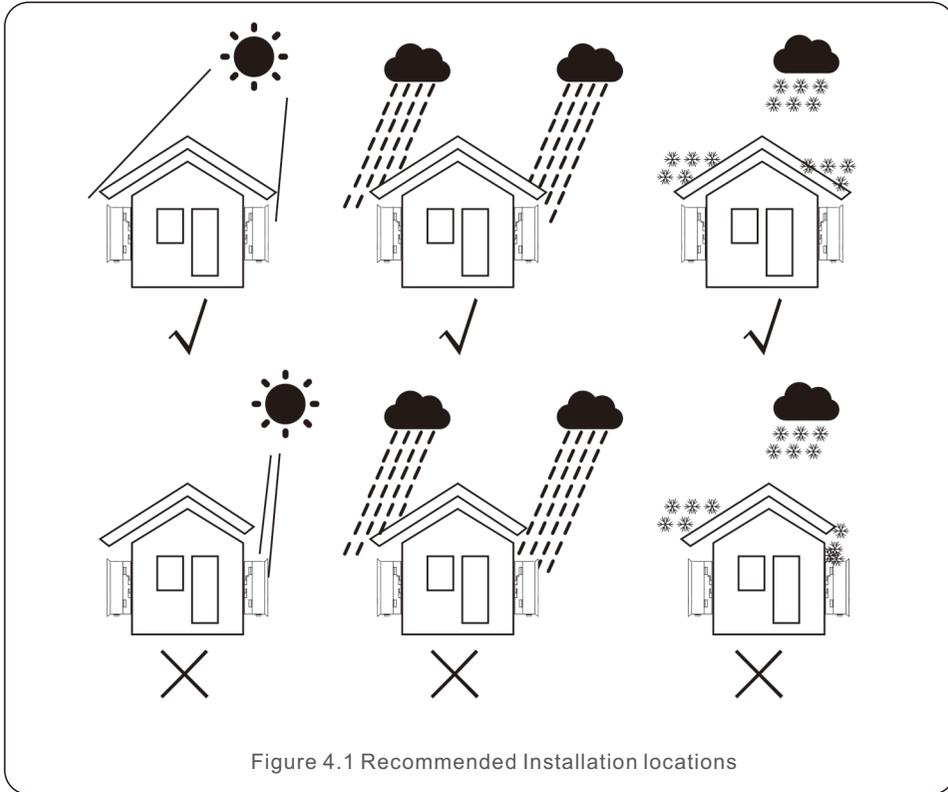
Figure 4.1 Recommended Installation locations

- 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.

300mm (11.8in) 300mm (11.8in)

300mm (11.8in) 300mm (11.8in) 300mm (11.8in)

500mm (19.6in) 500mm (19.6in)
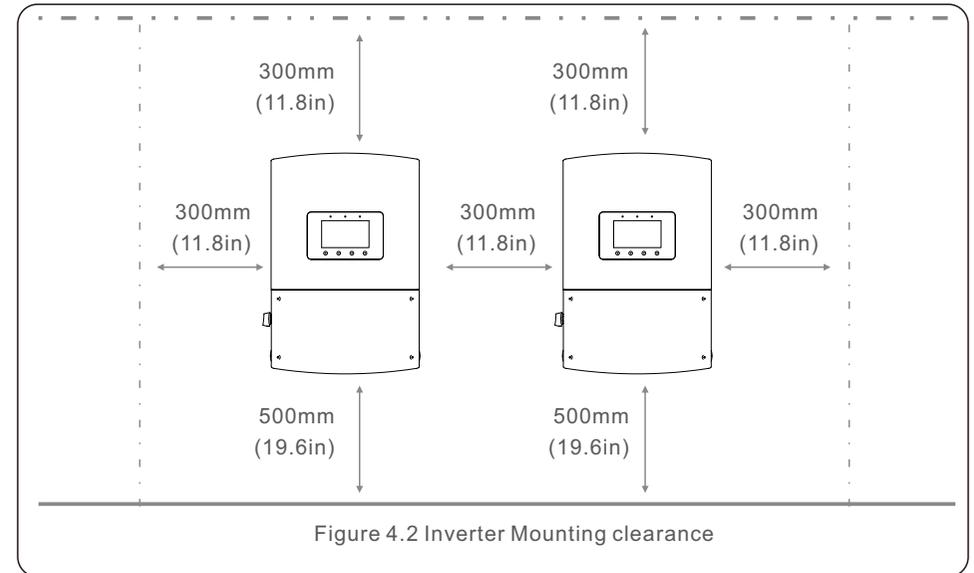
Figure 4.2 Inverter Mounting clearance

- 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.

4.2 Mounting the Inverter

Dimensions of mounting bracket:
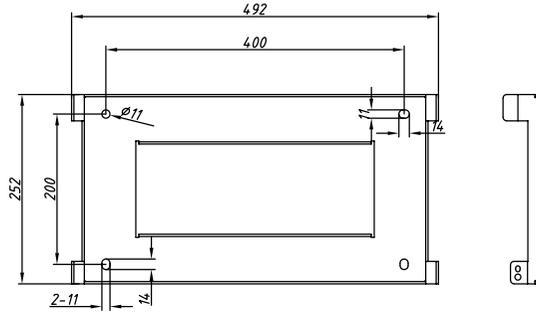
Figure 4.3 Inverter wall mounting

Once a suitable location has been found according to 4.1 using figures 4.3 and 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.

Bracket

Suitable fixing screws
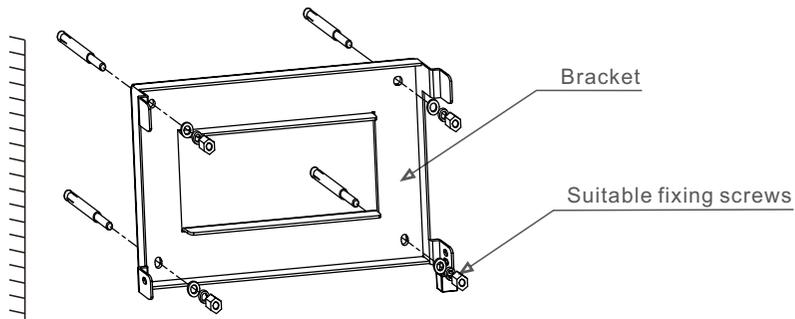
Figure 4.4 Fix bracket on the wall

⚠ **WARNING:**
The inverter must be mounted vertically.

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)
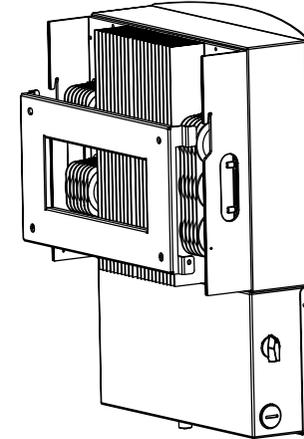
Figure 4.5 Wall Mount Bracket

NOTE:

The installation shall meet the National Electrical Code, ANSI/NFPA 70 and Canadian Electrical Code wiring methods.

	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

4.3 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
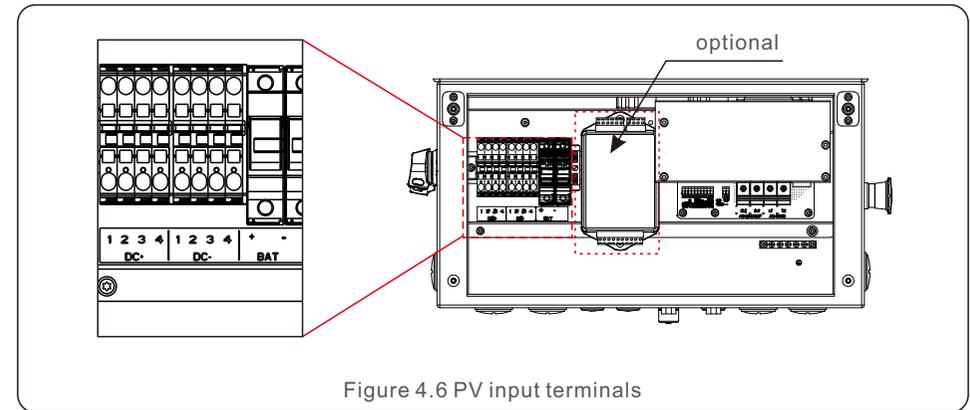
Figure 4.6 PV input terminals

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

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.

BL1   BL2   L1   L2
AC-BACKUP   AC-GRID

Figure 4.7 AC output terminals

40 mm
18 mm - 19 mm
N
L2
L1

40 mm
18 mm - 19 mm
L2
L1
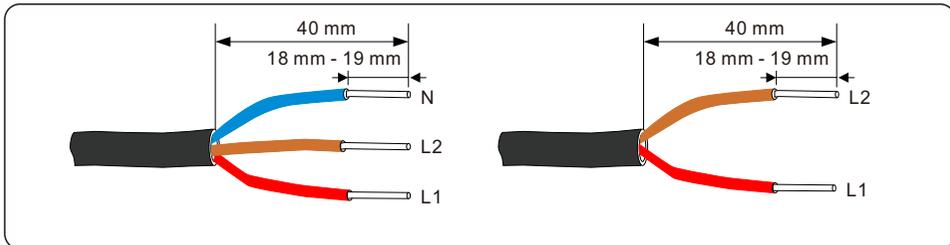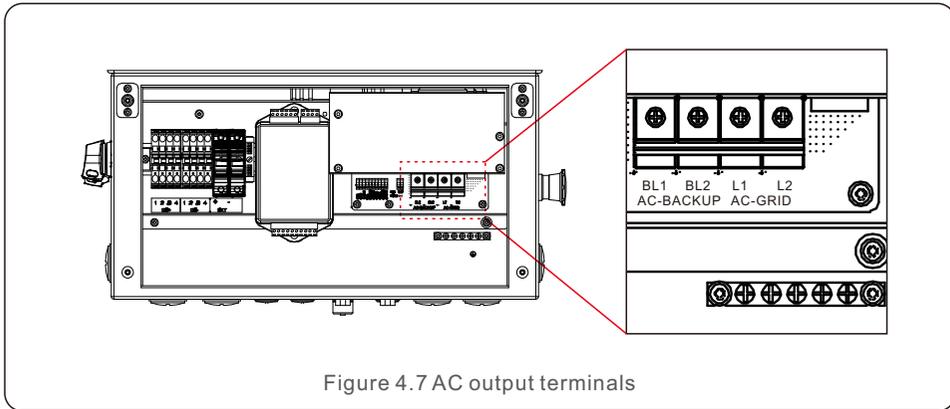
WARNING:

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.

For detailed information about the autotransformer please refer to Solis auto-transformer quick installation guide.

Over-Current Protection Device (OCPD) for the AC side

To protect the inverter's AC connection line, we recommend installing a device for protection against over-current and leakage, with the following characteristics noted in Table 4.2:

Inverter	Rated voltage(V)	Rated output current (Amps)	Current for protection device (A)
RHI-1P5K-HVES-5G	208/240	24/21	30/30
RHI-1P7.6K-HVES-5G	208/240	36.5/31.7	50/40
RHI-1P10K-HVES-5G	208/240	48/41.7	60/60

Table 4.2 Rating of grid OCPD

4.5 Battery Fuse Terminals

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

PV   BAT   BMS   COM1   COM2   Meter   AC-BACKUP   AC-GRID

BAT

Figure 4.8 Connected to the battery fuse terminals
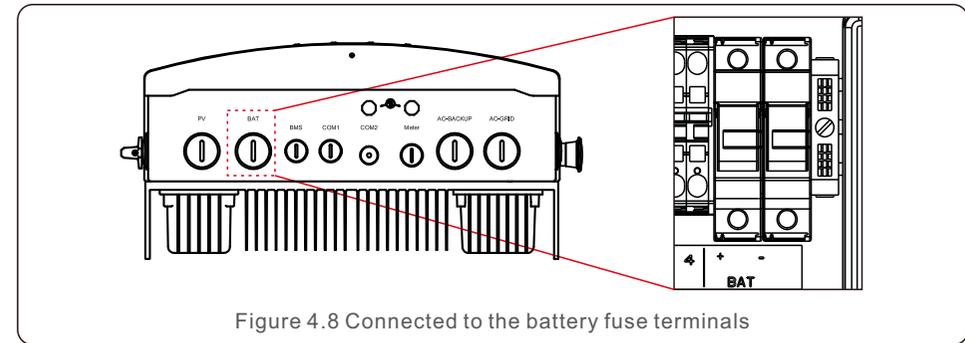
Cross sectional area	10~8 AWG
Exposure length	12 mm
Torque	2~4N.m

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.

Note:
Before connecting the battery, please carefully read the user manual of the battery and perform the installation exactly as the battery manufacturer requests.

4.6 Communication Terminals

Figure 4.9 Communication port
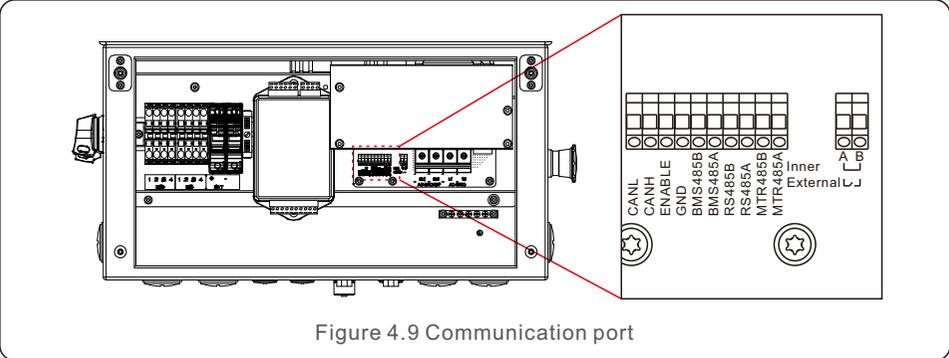
From left to right, the communication terminals consist of ten ports.

NO.	Symbol	Wire Requirement	Comments
1	CANL		Battery communication depends on different battery types. Refer to Section 4.6.2 for details.
2	CANH		
3	ENABLE		
4	GND	22-16AWG Recommend:18AWG Exposure length: 11mm	
5	BMS485B		
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.
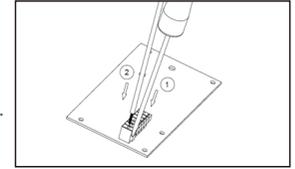
4.6.1 Meter Communication
Communication Terminals: MTR485B and MTR485A.

Figure 4.10 Meter terminals
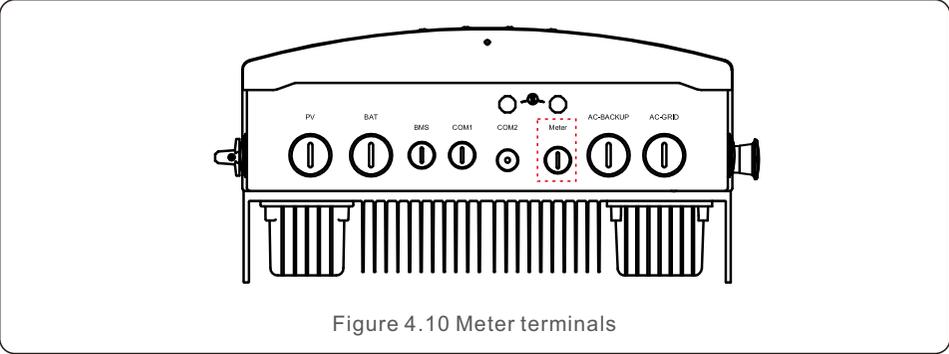
The Solis RHI-HV 5G series inverter integrates export power control function which requires an external meter to detect the power flow.
The following figure shows the corresponding connection of the meter.

The connection diagram is based on the grid topology with neutral grounded.

Detailed information about different grid topology please refer to the Appendix of the inverter manual.

Figure 4.7 Meter (AGF-AE-D)
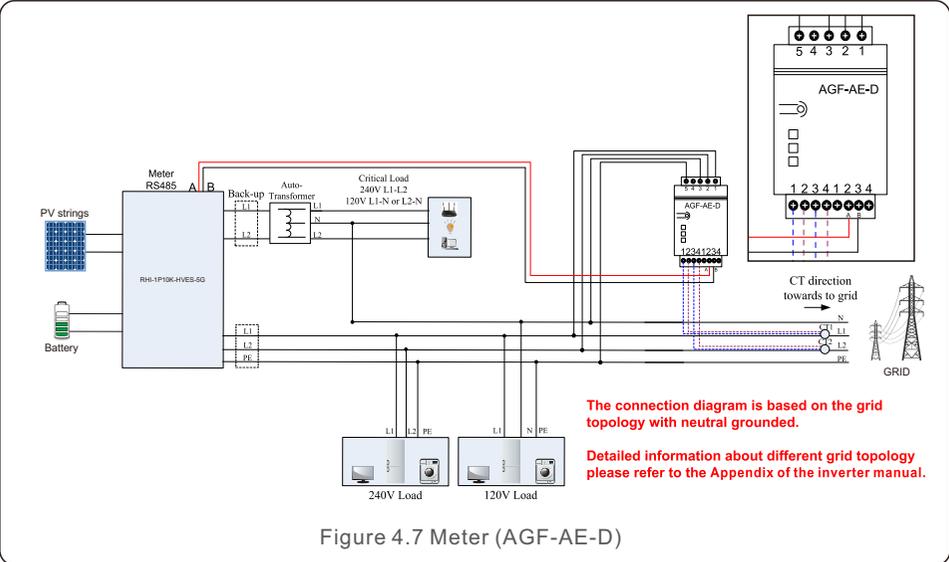
4.6.2 Battery Communication

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.

Figure 4.12 BYD Battery Communication
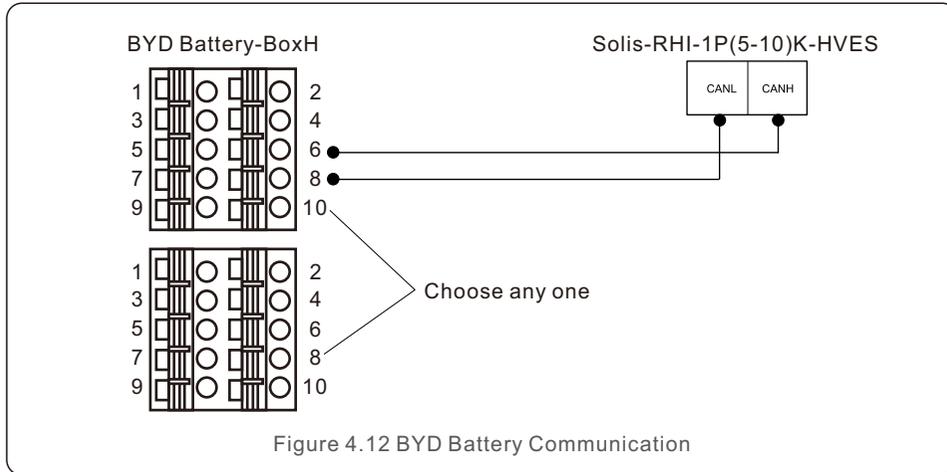
• LG Battery

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

The detailed connection is shown in the following figure.

Figure 4.13 LG Battery Communication
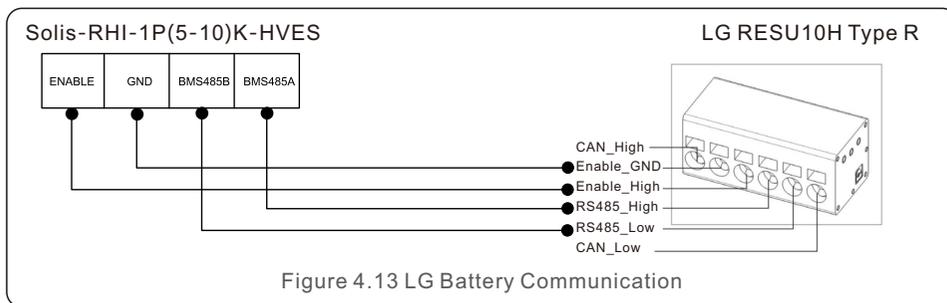
Note:

When working with LG batteries under OFF-GRID condition, due to the circuit design of the battery, some specific loads may cause the inverter to give battery alarm or protection. It is a normal situation and will be recovered when the grid is available.

4.6.3 RS485 Communication

Communication Terminals: RS485B and RS485A.

Figure 4.14 RS485 Communication
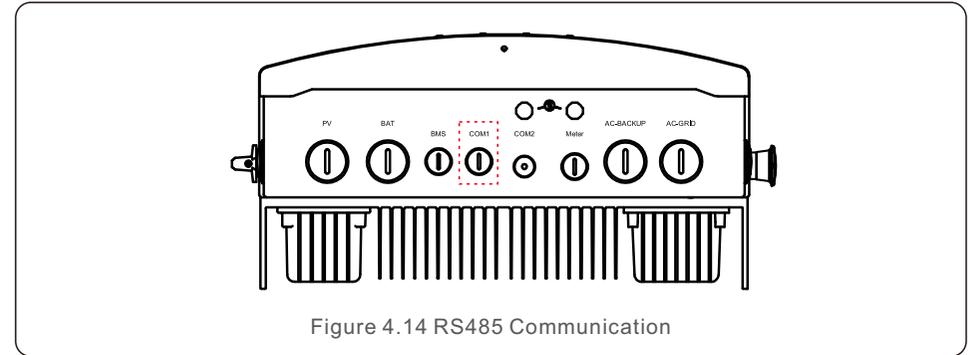
This pair of RS485 terminals is reserved for external communication.

4.6.4 Monitoring/Upgrade Communication.

Communication Port: COM2.

Figure 4.15 Monitoring/Upgrade Communication
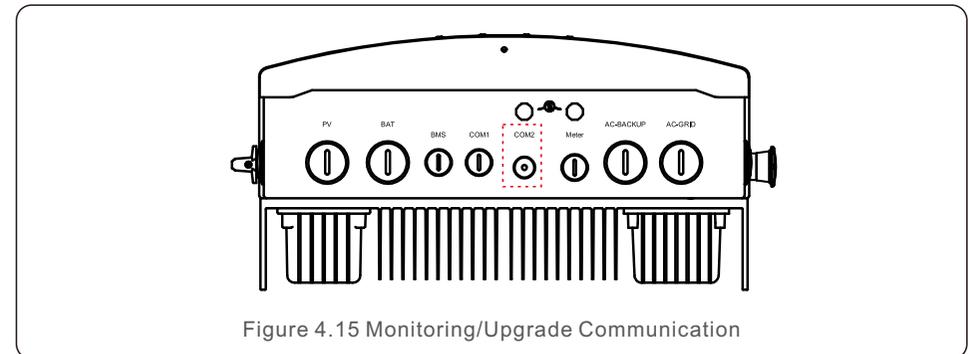
COM2 is a 4-pin RS485 communication port which is used to connect Solis datalogging stick.

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

4.7 External Ground Connection

An external ground connection is provided at the right side of inverter.

Prepare OT terminals: M4. Use proper tooling to crimp the lug to the terminal.

Connect the OT terminal with ground cable to the right side of inverter. The torque is 2N.m.
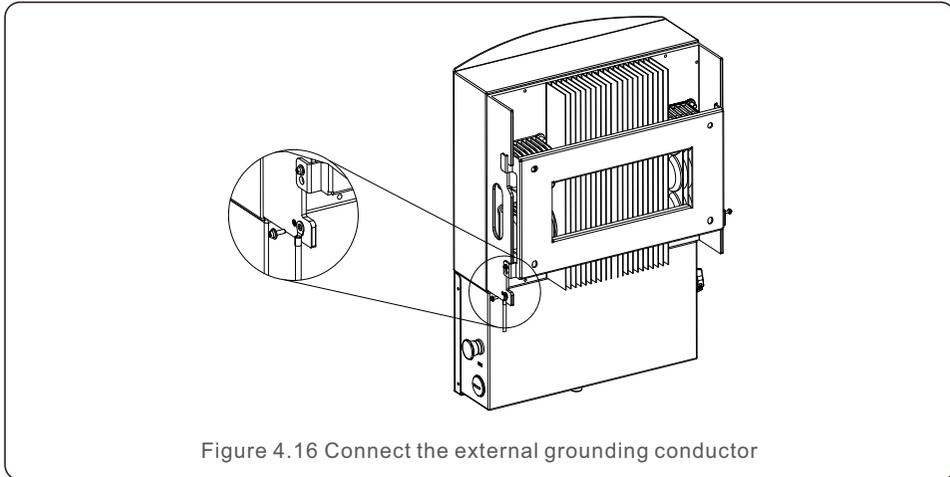
Figure 4.16 Connect the external grounding conductor

4.8 LED Indicators

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

● POWER　　　　● OPERATION　　　　● ALARM

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
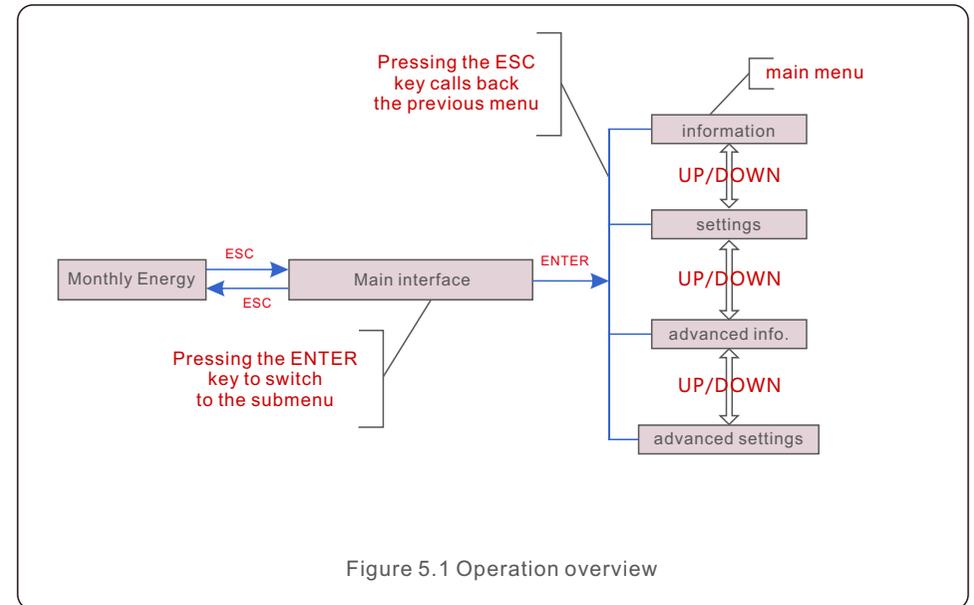
Figure 5.1 Operation overview

5.1 Initial Display

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

Set Language　　　　2015-02-23　19 35

English

中文

YES=<ENT> NO=<ESC>
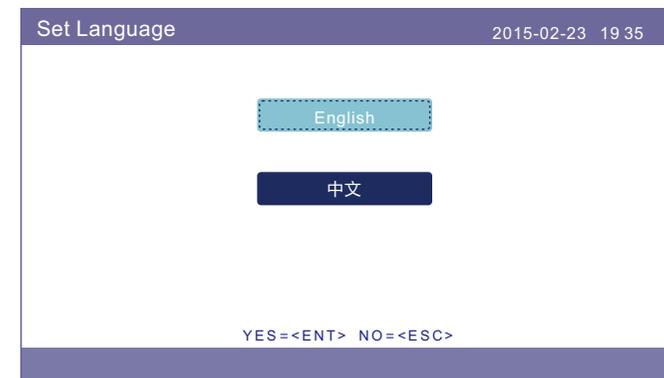
Figure 5.2 Set Language

After setting the language, press "ESC" to access the main page.
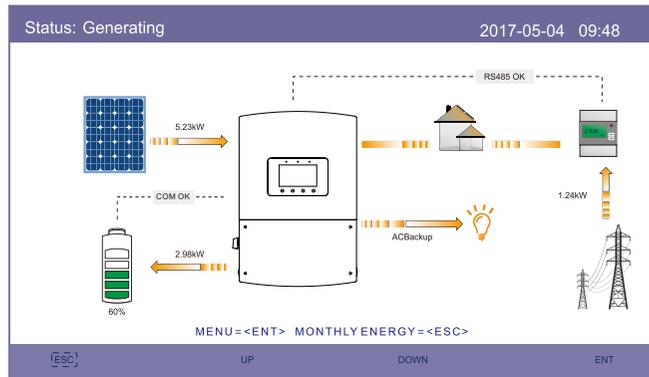
Figure 5.3 Main Page

On the main page,

Press "ESC" : View the yield data on 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.

5.2 Main Menu

There are four submenus in the Main Menu:

1. Information   2. Settings   3. Advanced Information   4. Advanced Settings
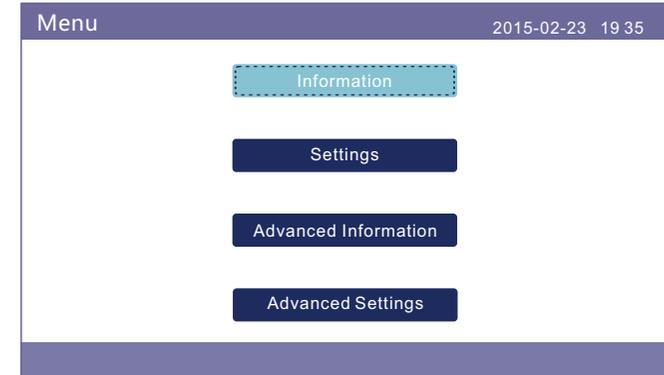
Figure 5.4 Main Menu

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

```
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




ESC
```

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




ESC
```

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




ESC
```

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%




ESC
```

Figure 5.9 BMS information

Meter Info   2015-02-23 19 35

External :   Internal :
Meter VoltageL1 : 000.0V   Meter Voltage : 000.0V
Meter CurrentL1 : 00.00A   Meter Current : 00.00A
Meter VoltageL2 : 000.0V   Meter Power :   +000000W
Meter CurrentL2 : 00.00A   Meter Energy :   0000000.00kWh
Meter Power :   +000000W   Output Energy : 0000000.00kWh
Meter Energy :   0000000.00kWh
Output Energy :   0000000.00kWh

ESC
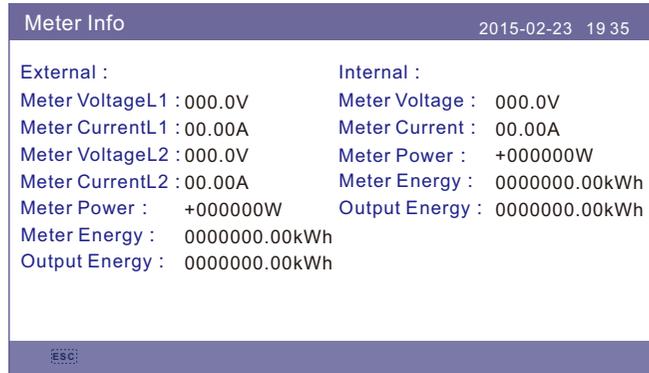
Figure 5.10 Meter Info

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.

Settings   2015-02-23 19 35

Set Time/Date

Set Address

Set Language
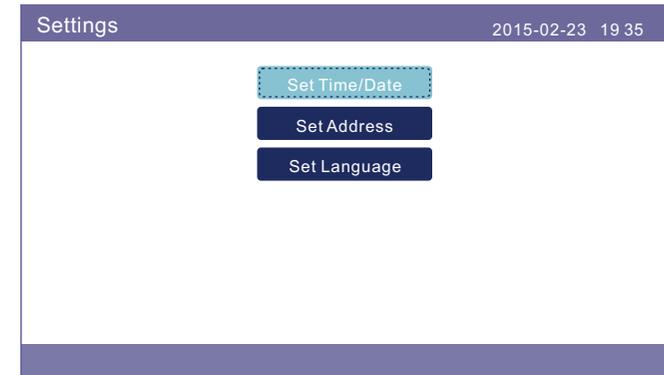
Figure 5.11 Setting

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.

Set Time/Date   2015-02-23 19 35

        YY   MM   DD
       2015   -   2   -   23

             HH   MM
             20   :   53

        NEXT=<ENT> DONE=<ESC>
ESC   UP   DOWN   ENT
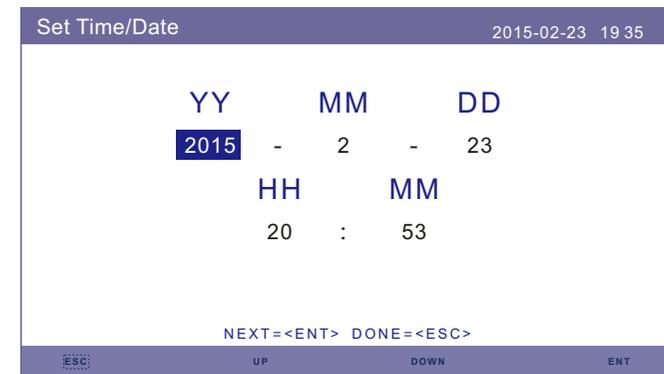
Figure 5.12 Set Time

5.4.2 Set Address

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

Set Address	2015-02-23 19 35
Slave Address : 01	
YES=<ENT> NO=<ESC>	
ESC UP DOWN ENT	

Figure 5.13 Set Address

5.4.3 Set Language

Set system language. Chinese and English are available.

Set Language	2015-02-23 19 35
English	
中文	
YES=<ENT> NO=<ESC>	
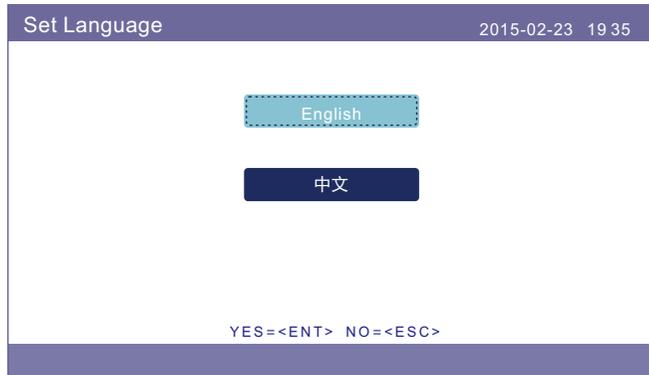
Figure 5.14 Set Language

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**

Advanced Information	2015-02-23 19 35
Alarm Message	
Warning Message	
Running Status	
Communication Data	
Yield Profile	
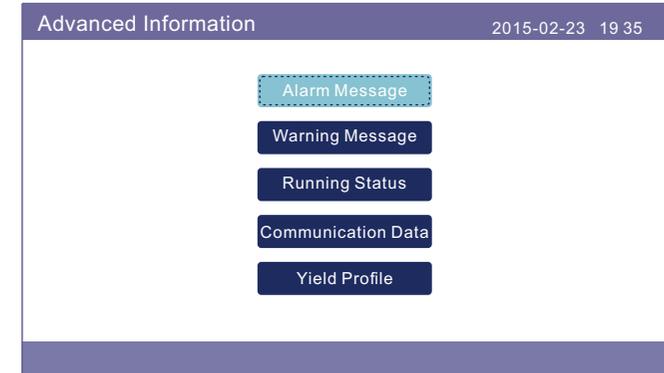
Figure 5.15 Advanced information

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		2015-02-23 19 35
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	
ESC UP DOWN ENT		

Figure 5.16 Alarm Message

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.

Warning Message		2015-02-23 19 35
Message	Date/Time	Data
	NO message.	

ESC	UP DOWN	ENT

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).

Running Status	2015-02-23 19 35
General Status	
Advanced Status	
ESC	
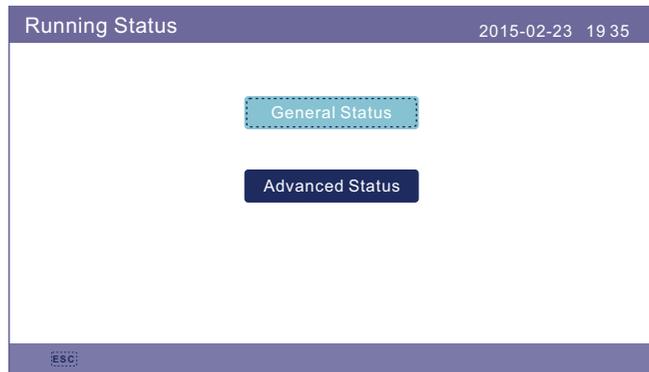
Figure 5.18 Running Status

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 :	

ESC
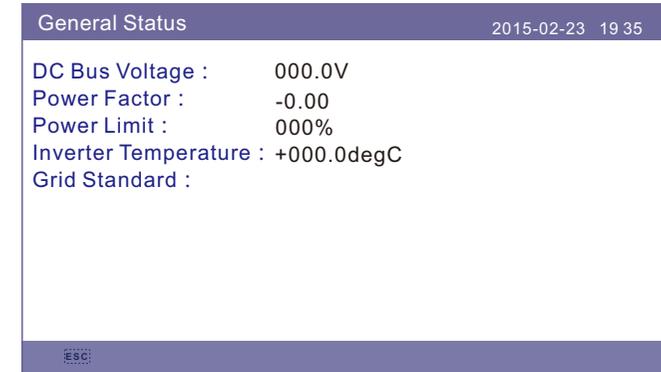
Figure 5.19 General Status

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

ESC
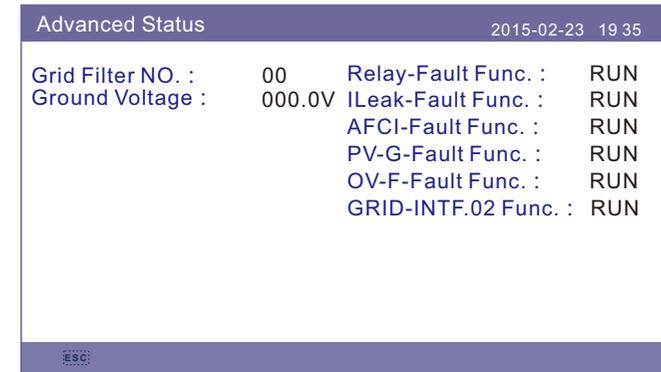
Figure 5.20 Advanced Status

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

ESC

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

5.6 Advanced Settings - Technicians Only

NOTE:
This function is for authorized technicians only. Improper access and operation may result in abnormal results and damage to the inverter. Password required – restricted access – authorized technicians only. Unauthorized access may void the warranty.

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
	× × ⊠ ×
	YES=<ENT> NO=<ESC>
ESC	UP DOWN ENT
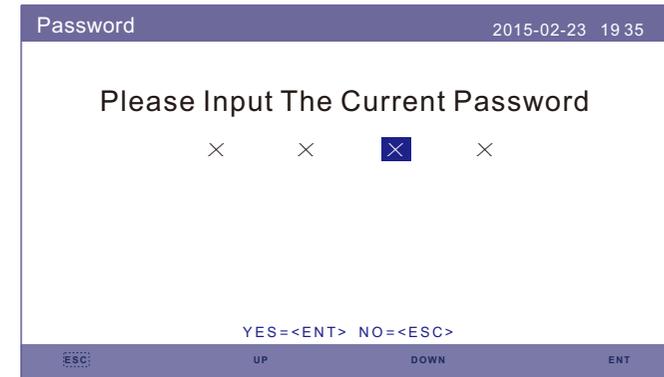
Figure 5.23 Enter Password

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	
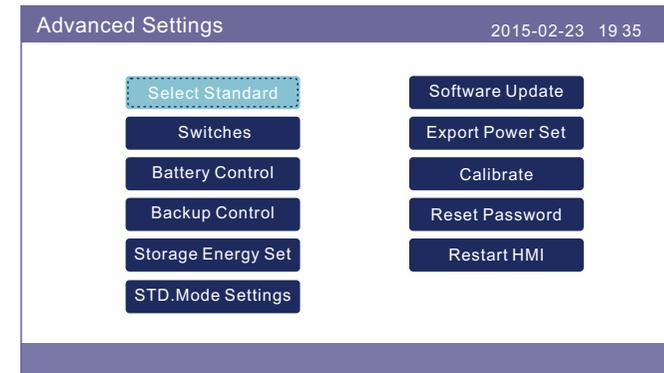
Figure 5.24 Advanced Settings

5.6.1 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 return 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.

```
Select Standard                    2015-02-23  19 35



            Select Standard:
              UL-240V




          YES=<ENT>  NO=<ESC>
```
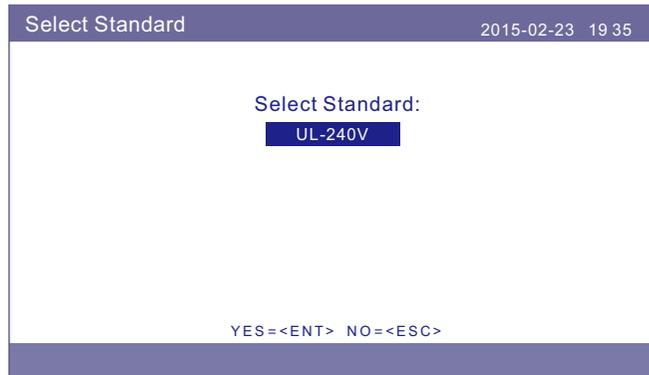
Figure 5.25 Select Standard

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).

```
Switches                           2015-02-23  19 35


                 ON

                OFF

                STOP


          YES=<ENT>  NO=<ESC>
```
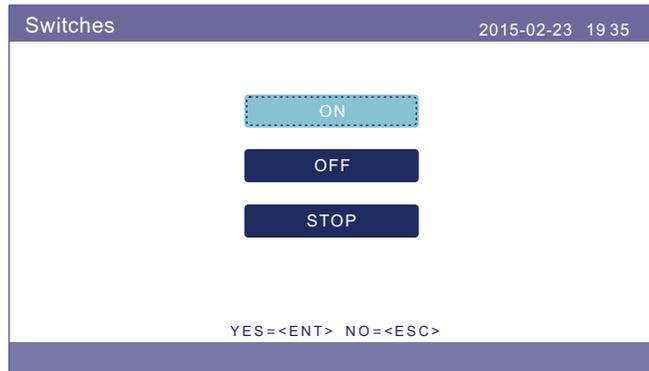
Figure 5.26 Set Switches

```
NOTE:
ON: AC Relay is ON.
OFF: AC Relay is OFF.
Stop: AC Relay is ON, but power generation.
```

5.6.3 Battery Control

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

```
Battery Control                    2015-02-23  19 35


              Battery Select


              Battery Wakeup



          YES=<ENT>  NO=<ESC>
```
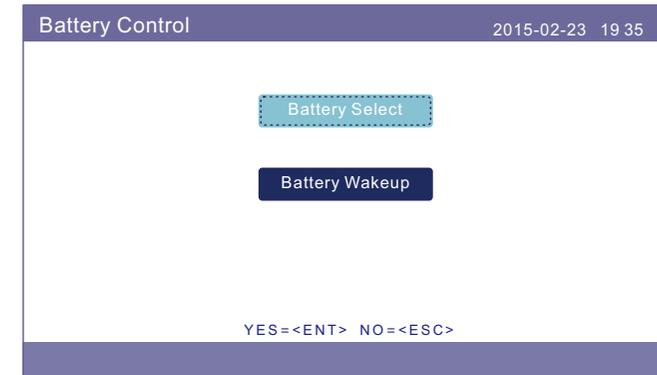
Figure 5.27 Battery Control

5.6.3.1 Battery Select

This product is compatible with the following battery modules:

Brand	Model	Setting
BYD	Battery-BOXH5.0/7.5/10 (UL 9540)	Select"B-BOX"
LG Energy Solution	RESU10H (UL 9540)	Select"LG Chem"
Soluna	15K PACK HV	Select"Soluna"

If hybrid inverter is not connected to a battery, then 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.

Battery Select   2015-02-23 19 35

Battery Module:
B-BOX HV

YES=<ENT> NO=<ESC>

ESC   UP   DOWN   ENT
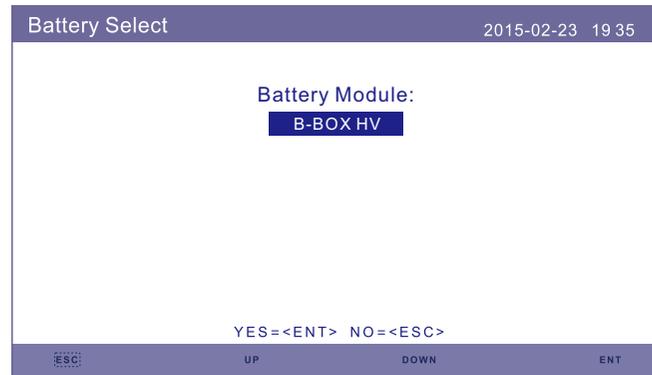
Figure 5.28 Battery Select

Battery Select   2015-02-23 19 35

ForceCharge SOC : 005%

YES=<ENT> NO=<ESC>

ESC   UP   DOWN   ENT
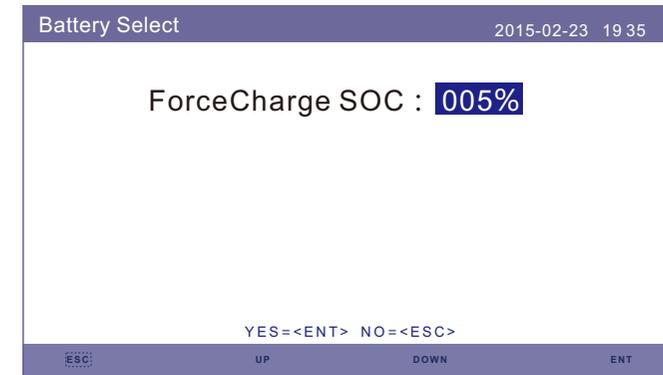
Figure 5.30 ForceCharge SOC

5.6.3.2 Battery Wakeup

Battery Select   2015-02-23 19 35

OverDischg SOC : 020%

YES=<ENT> NO=<ESC>

ESC   UP   DOWN   ENT

Figure 5.29 Over Discharge SOC.

Battery Control   2015-02-23 19 35

Battery Select

Battery Wakeup

YES=<ENT> NO=<ESC>
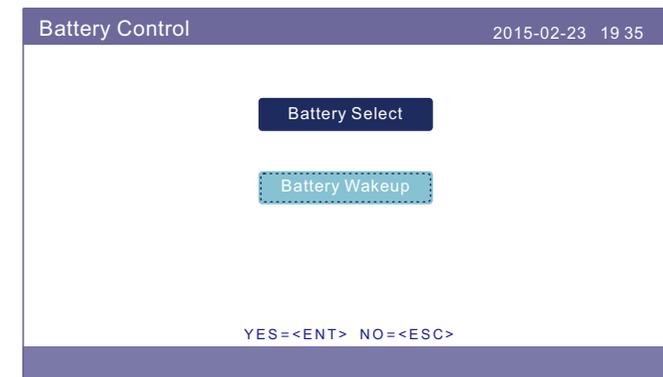
Figure 5.31 Battery Wakeup

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 activate battery wakeup function before finishing the first commissioning.

5.6.4 Backup Control

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

```
Backup Control                    2015-02-23  19 35



              Backup ON/OFF


             Backup Settings




           YES=<ENT>  NO=<ESC>
```
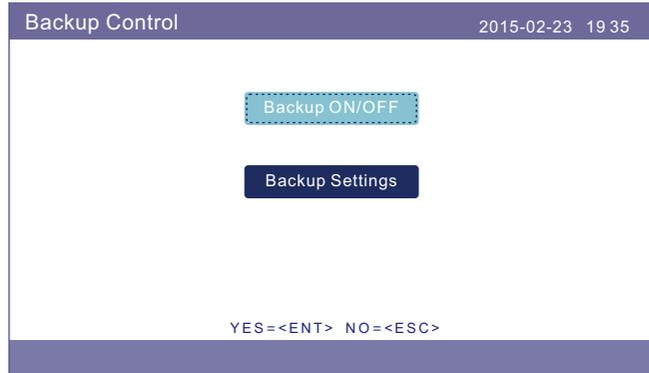
Figure 5.32 Backup Control

5.6.4.1 Backup ON/OFF

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

```
Backup ON/OFF                     2015-02-23  19 35



                Backup ON


               Backup OFF




           YES=<ENT>  NO=<ESC>
```
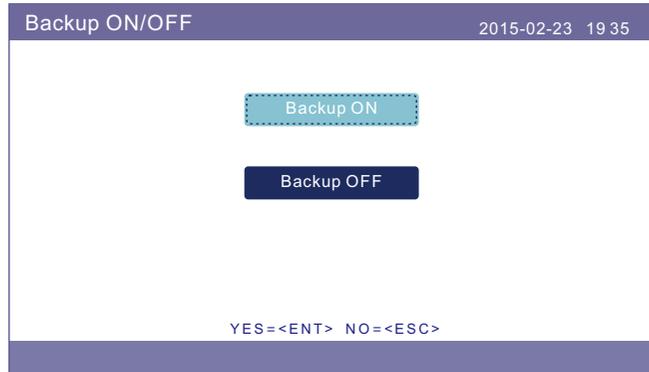
Figure 5.33 Backup ON/OFF

5.5.4.2 Backup Settings

This section shows the parameter of the backup port.

```
Backup Settings                   2015-02-23  19 35

  Backup Voltage :      230.00V
  Backup Frequency : 50.0Hz
  Voltage Droop :       Disable




          SELECT=<ENT>  DONE=<ESC>
  ESC          UP          DOWN          ENT
```
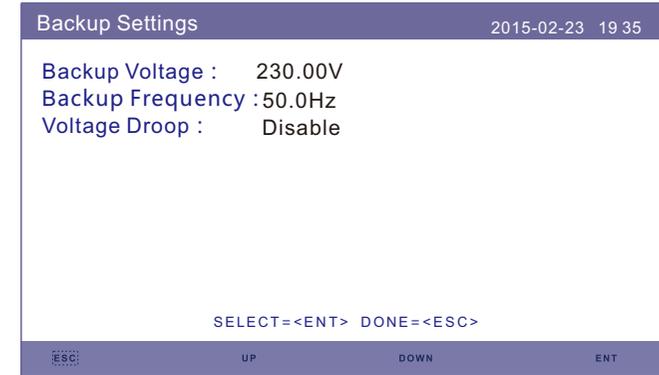
Figure 5.34 Backup Settings

5.6.5 Storage Energy Set

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

```
Srorage Energy Set                2015-02-23  19 35



               Meter Select


            Storage Mode Select




           YES=<ENT>  NO=<ESC>
```
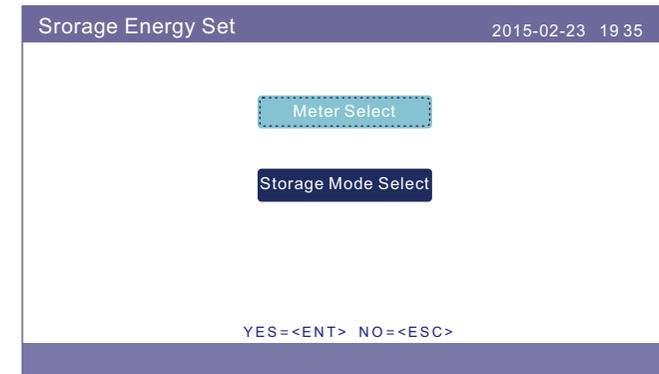
Figure 5.35 Storage Energy Set

5.6.5.1 Meter Select

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

> **NOTE:**
> Select "1Ph Meter" to be compatible with the meter that comes with the inverter package.
> The "3Ph Meter" is not available yet which is reserved for future development.

Meter Select	2015-02-23 19 35

Meter Type:

1Ph Meter

YES=<ENT> NO=<ESC>

ESC   UP   DOWN   ENT
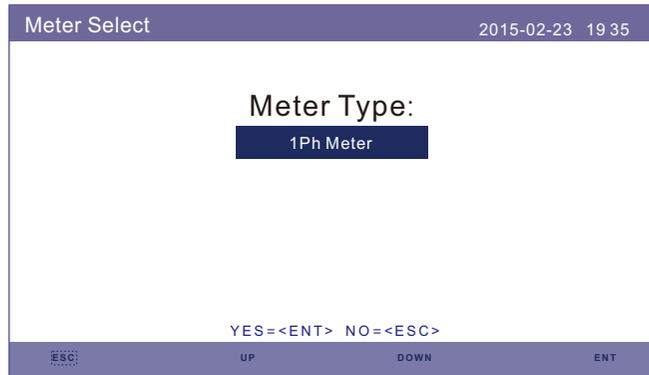
Figure 5.36 Storage Energy Set

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 not 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.

Storage Mode Select	2015-02-23 19 35
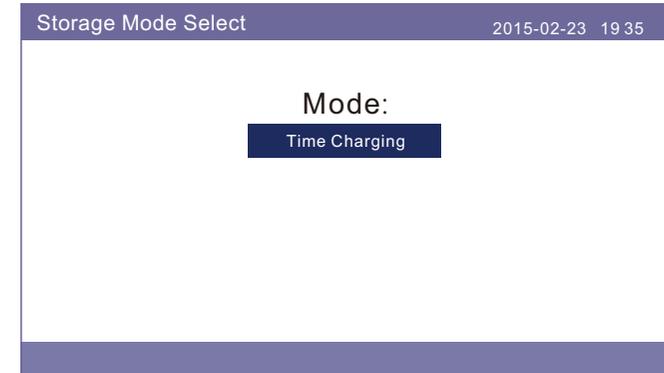
Mode:

Time Charging

Figure 5.37 Storage Mode Select

Time Charging Mode:

"Optimal Income" is the switch to turn on/off the Time Charging Mode.

Customer can define the charge/discharge current as well as when to charge/dischage the battery.

Time Charging	2015-02-23 19 35

Optimal Income : **Stop**
I_Charge :   050.0A
I_Discharge :   050.0A

	HH MM	HH MM		HH MM
T_Charge :	22 : 00	--- 08 : 00	Total Time :	10 : 00
T_Discharge :	08 : 00	--- 22 : 00	Total Time :	14 : 00

NEXT=<ENT> DONE=<ESC>

Figure 5.38 Time Charging

Off Grid Mode:

Enable the mode for off-grid systems.

The AC Grid Port must be physically disconnected.
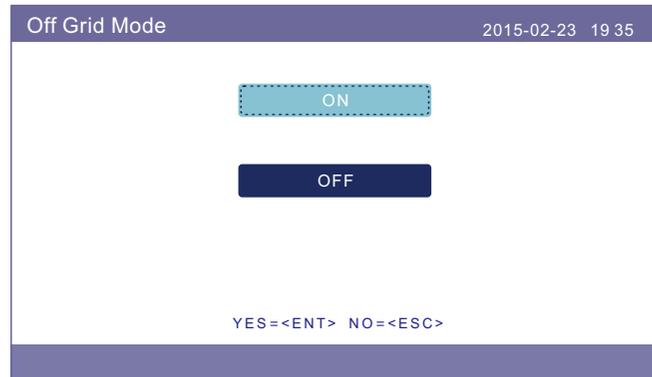
Figure 5.39 Off-Grid Mode

5.6.6 STD.Mode Settings

These settings are reserved for maintenance personnel and technicians. Do not change anything without instructions.

Selecting "STD Mode. Settings" displays the sub-menu shown below:

1. Working Mode Set   2. Ramp Rate Limit   3. Freq Derate Set

4. 10mins Voltage Set   5. Voltage PCC Set   6. Initial Settings
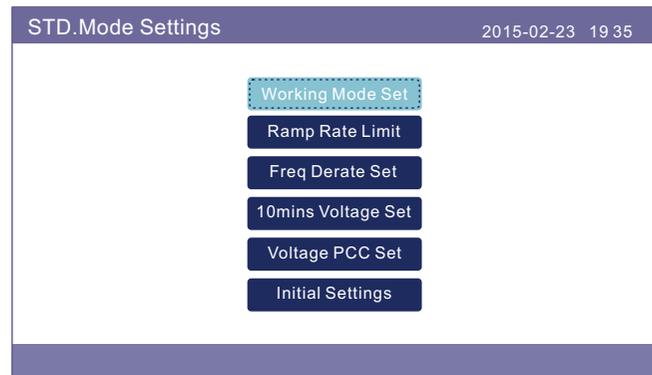
Figure 5.40 STD.Mode Settings

5.6.6.1 Working Mode Set

There are TWO situations with different grid standards selected.

5.6.6.1.1 With UL Standard selected

NOTE:
The following modes are for "UL-240V", "UL-240V-A".

NOTE:
Parameter Accuracy:
Voltage:1%; Current:1%; Frequency:0.06Hz; Power:4%; Time:0.12s; PF:0.01.

Solis US version inverters have Seven working modes:

1. NULL 2. Volt-watt 3. Volt-Var 4. Fixed-PF 5. Reac-power 6. P-factor 7. VgWatt-UL

Based on UL1741SA, working mode 1,3,4,7 can be used by grid operator.

1.NULL

Description: Inverter is not under any working mode.

2. Volt-Watt (Not Required)

Description: Inverter will change the active output power based on voltage change.

Note: This Setting is NOT required by UL1741SA Standards.

NOTE:
This function is for maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

3. Volt-Var (Default)

Description: Inverter will change the reactive output power based on voltage change.
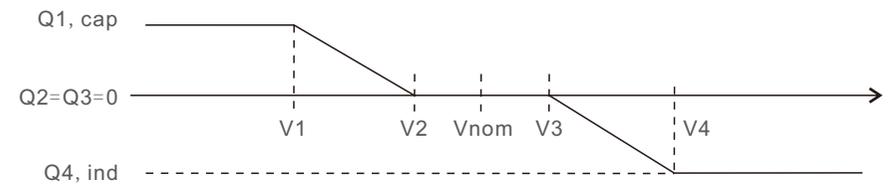
Figure 5.41 Volt-Var curve for Q(V)

Default Settings for UL1741SA:

Q1: (0-60%) Default +30%   Q4: (-60%-0%) Default -30%

Rated 240V Grid

V1:(192-240V) Default 210V   V2: (192-240V) Default 236V

V3:(240-288V) Default 243V   V4: (240-288V) Default 264V

Rated 208V Grid

V1:(166-208V) Default 182V   V2: (166-208V) Default 205V

V3:(208-240V) Default 211V   V4: (208-240V) Default 229V

Volt-Var	2015-02-23 19 35
Voltage1:	210.0V
Voltage2:	236.0V
Voltage3:	243.0V
Voltage4:	264.0V
Leading:	+030%
Leading:	-030%

SET=<ENT> DONE=<ESC>
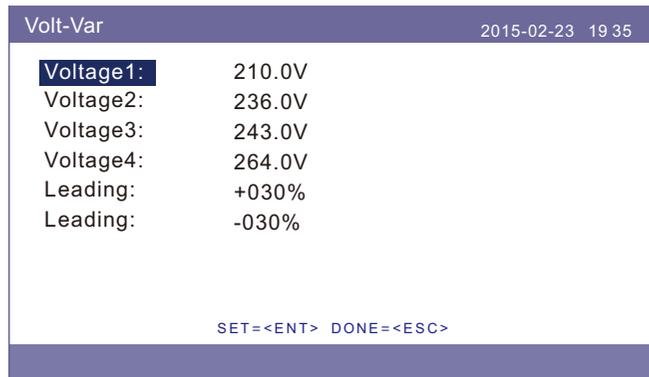
Figure 5.42 Volt-Var

4.Fixed-PF

Description: Inverter will output power with fixed power factor.

Setting Range: -0.8 to +0.8   Default value is PF = 1

Fixed-PF	2015-02-23 19 35
Power Factor:	+1.00

YES=<ENT> NO=<ESC>
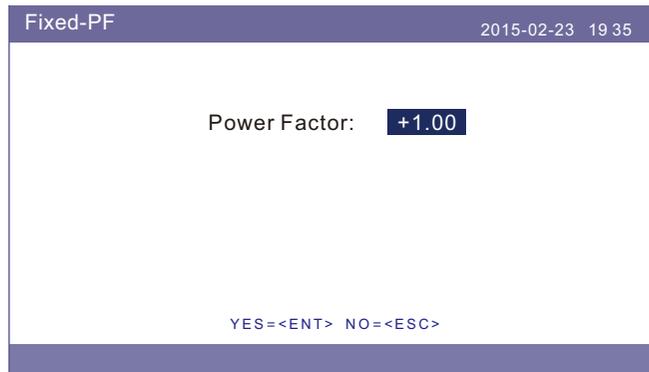
Figure 5.43 Fixed-PF

Figure 5.44 PF Range

5. Reac-Power (Not Required)

Description: Inverter will generate reactive power based on changing output power.

Note: This Setting is NOT required by UL1741SA Standards.

NOTE:
This function is for maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

6. P-Factor (Not Required)

Description: Inverter will change power factor based on changing output power.

Note: This Setting is NOT required by UL1741SA Standards.

NOTE:
This function is for maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

7.VgWatt-UL

Description: Inverter will change the active output power based on voltage change.

Note: This is the Volt-Watt Setting for UL1741SA Standards.

Figure 5.45 Volt−Watt characteristic

Default Settings for UL1741SA:

Rated 240V Grid

V1:less than V2

V2:less than Vstart

V3 (Vstart): (240-288V) Default264V

V4 (Vstop): (264-312V) Default 288V

P1:100% P2:100% P3: 100% P4:0%

Rated 208V Grid

V1:less than V2

V2:less than Vstart

V3 (Vstart): (208-250V) Default229V

V4 (Vstop): (229-270V) Default 250V

P1:100% P2:100% P3: 100% P4:0%

Volt-Var	2015-02-23 19 35
Voltage1:	210.0V
P-Limit1:	100%
Voltage2:	236.0V
P-Limit2:	100%
Voltage3:	264.0V
P-Limit3:	100%
Voltage4:	288.0V
P-Limit4:	000%
SET=<ENT> DONE=<ESC>	

Figure 5.46 Vgwatt-UL

5.6.6.1.2 With Rule21 Standard selected

NOTE:
The following modes are for "R21P3-240", "R21P3-24A".

NOTE:
Parameter Accuracy:
Voltage:1%; Current:1%; Frequency:0.06Hz; Power:4%; Time:0.12s; PF:0.01.

Solis US version inverters have Ten working modes:

1. NULL 2. Volt-watt 3. Volt-Var 4. Fixed-PF 5. Reac-power 6. Power-PF 7. VgWatt-UL

Based on Rule21, working mode 1,2,3,4 can be used by grid operator.

NOTE:
The other three working mode"P1-V-Watt","P1-V-Var" and
"P1-V-P&V-Q" are NOT applicable for settings.

1.NULL (Mode Reset)

Description: Inverter is not under any working mode.

2. Volt-Watt

Description: Inverter will change the active output power based on voltage change.

Note: This is the Volt-Watt Setting for Rule21 Standards.
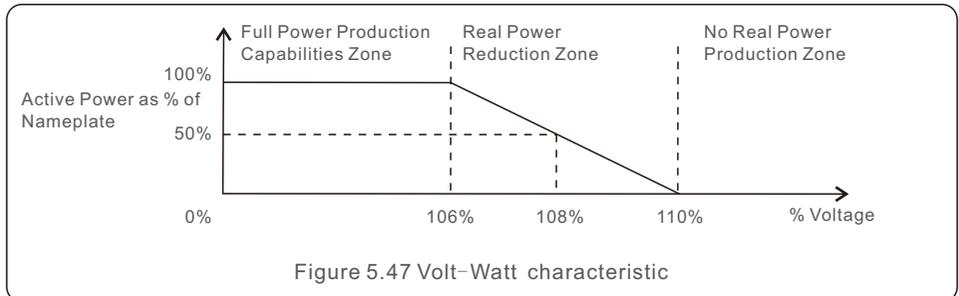
Figure 5.47 Volt-Watt characteristic

Default Settings for Rule21 Standards:

Rated 240V Grid

V1:less than Vstart

V2 (Vstart): (240-288V) Default 254V

V3 (Vstop): (240-288V) Default 264V

V4: larger than Vstop

P1:100% P2:100% P3: 0% P4:0%

Rated 208V Grid

V1:less than Vstart

V2 (Vstart): (208-250V) Default 221V

V3 (Vstop): (208-250V) Default 229V

V4: larger than Vstop

P1:100% P2:100% P3: 0% P4:0%

3. Volt-Var

Description: Inverter will change the reactive output power based on voltage change.

Figure 5.48 Volt-Var curve for Q（V）
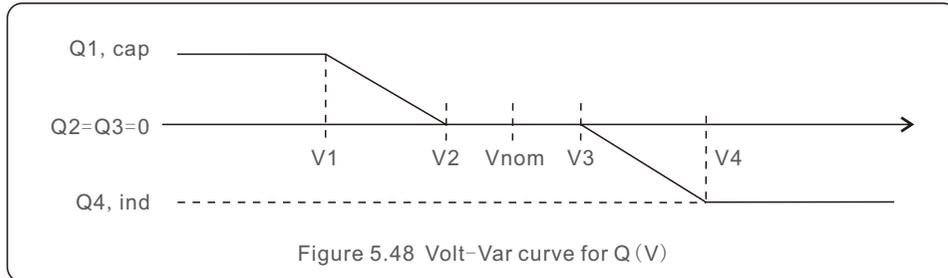
Default Settings for Rule21 Standard:

Q1: (0-60%) Default +30%   Q4: (-60%-0%) Default -30%

Rated 240V Grid

V1:(192-264V) Default 220.8V   V2: (192-264V) Default 232.1V

V3:(240-288V) Default 248.0V   V4: (240-288V) Default 256.8V

Rated 208V Grid

V1:(166-229V) Default 191V   V2: (166-229V) Default 201V

V3:(208-250V) Default 215V   V4: (208-250V) Default 223V

Figure 5.49 Volt-Var

4.Fixed-PF

Description: Inverter will output power with fixed power factor.

Setting Range: -0.8 to +0.8

Default value is PF = 1

Figure 5.50 Fixed-PF

Figure 5.44 PF Range

5. Reac-Power (Not Required)

Description: Inverter will generate reactive power based on changing output power.

Note: This Setting is NOT required by Rule21 Standards.

NOTE:
This function is for maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

6. P-Factor (Not Required)

Description: Inverter will change power factor based on changing output power.

Note: This Setting is NOT required by Rule21 Standards.

> ⚠️ **NOTE:**
> This function is for maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

7.VgWatt-UL (Not Required)

Description: Inverter will change the active output power based on voltage change.

Note: This Setting is NOT required by Rule21 Standards.

> ⚠️ **NOTE:**
> This function is for maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

8. Enable both Volt-Var and Volt-Watt modes

Description: Rule21 requires both Volt-var and Volt-watt modes can be enabled.

To set both modes (Volt-var in high priority)

Step 1: Select and set Volt-watt mode at first.

Step 2: Enter "Working Mode" again and select and set Volt-var mode then.

Step 3: To check the priority, a new mode will appear as "V-Q & V-P" which indicates (Q) Volt-var is in high priority.

```
Working Mode Set                          2015-02-23  19 35

                    Work Mode:
                    V-P&V-Q




                YES=<ENT>  NO=<ESC>
ESC          UP            DOWN            ENT
```
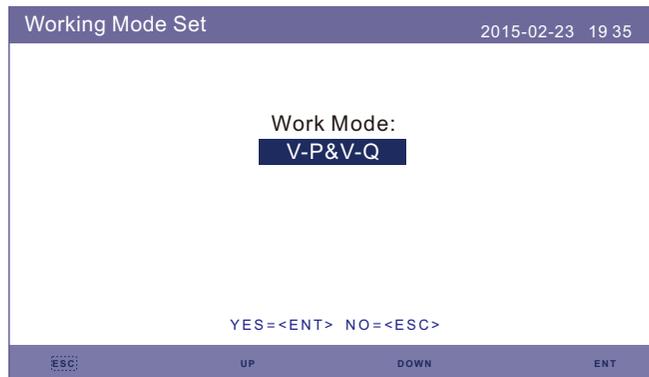
Figure 5.51 Work Mode

To set both modes (Volt-watt in high priority)

Step 1: Select and set Volt-var mode at first.

Step 2: Enter "Working Mode" again and select and set Volt-watt mode then.

Step 3: To check the priority, a new mode will appear as "V-P & V-Q" which indicates (P) Volt-watt is in high priority.

```
Working Mode Set                          2015-02-23  19 35

                    Work Mode:
                    V-Q&V-P




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

Figure 5.52 Work Mode

To reset dual-mode or exit the dual-mode situation

Step 1: Select "Null" mode at first.

Step 2: Enter "Working Mode" again. Redo above dual-mode setting steps to reset OR set other modes to exit dual-mode situation.

> ⚠️ **NOTE:**
> To check the Volt-watt and Volt-var priority, simply enter the working modes.
> V-Q&V-P indicates Volt-Var First   V-P&V-Q indicates Volt-Watt First

5.6.6.2 Ramp Rate Limit

This function is used for changing power ramp up rate.

When the inverter initializes or string MPPT changes, the ramp up rate is limited.

The default setting is stop (disable).

The setting range is from 10% to 600%, This will change the power change rate per minute.

If these values are changed the inverter may not conform to UL 1741 SA or IEEE 1547 standard.

```
Ramp Rate Limit                        2015-02-23  19 35

  Power Rate:        016%
  RateP_Sts-US:      Disable
  Ramp_up-US:        000%
  Reconnect-US:      000%




            SET=<ENT>  DONE=<ESC>

 ESC          UP            DOWN            ENT
```
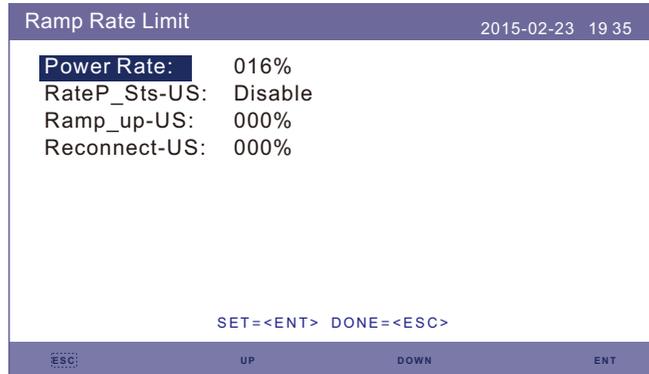
Figure 5.53 Power Rate Limit

5.6.6.3 Freq Derate Set

This setting is applicable when UL Standards are selected.

Mode 04 is used for UL 1741 SA frequency derating.

Mode 08 is used for Rule21 frequency derating.

Within this mode the user can set the frequency start, stop points, etc,.

```
Freq. Derate Set                       2015-02-23  19 35



            Ferq Derate Mode:
                NULL




            YES=<ENT>  NO=<ESC>

 ESC          UP            DOWN            ENT
```
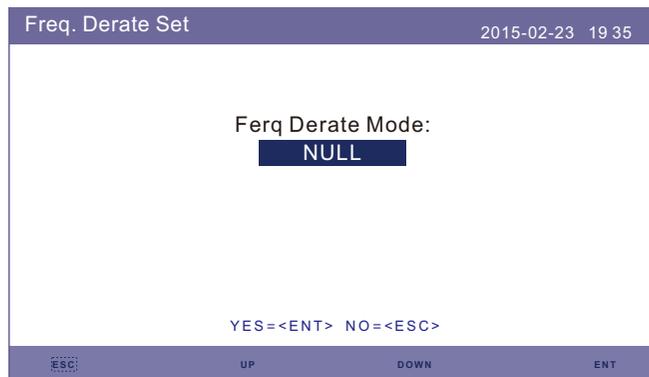
Figure 5.54 Freq Derate Set

5.6.6.4 10mins Voltage Set

This function is disabled and not used for the US.

NOTE:
This function is for maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

5.6.6.5 Initial Settings

This setting will allow the working modes from 6.5.8.1 to 6.5.8.4 to be set back to default.

```
STD.Mode Settings                      2015-02-23  19 35




            Working Mode Default

            Ramp Rate Default

            Freq Derate Sdefault

            10minVoltage Default

            DRM ON/OFF

```
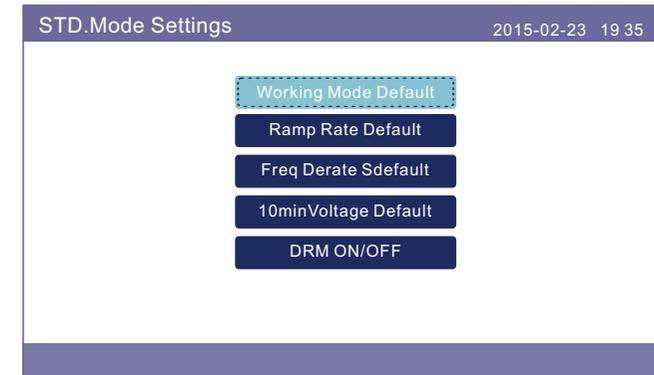
Figure 5.55 Initial Settings

5.6.6.7 Voltage PCC Set

Set the voltage at the PCC point.

This setting is required by RULE 21 requirements.

PCC: Point of Common Coupling, the point where a Local EPS is connected to an Area EPS.

NOTE:
This function is for maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

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.

Software Update	2015-02-23 19 35

HMI Update

DSP Update

YES=<ENT> NO=<ESC>

Figure 5.56 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 and 3 are only valid when Setting 2 is set to "ON"

Export power Set	2015-02-23 19 35

Backflow Power

ON/OFF

FailSafe ON/OFF

Figure 5.57 Export power Set

5.6.8.1 Backflow Power

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

Backflow Power	2015-02-23 19 35

Backflow Power : +1200W

YES=<ENT> NO=<ESC>

| ESC | UP | DOWN | ENT |
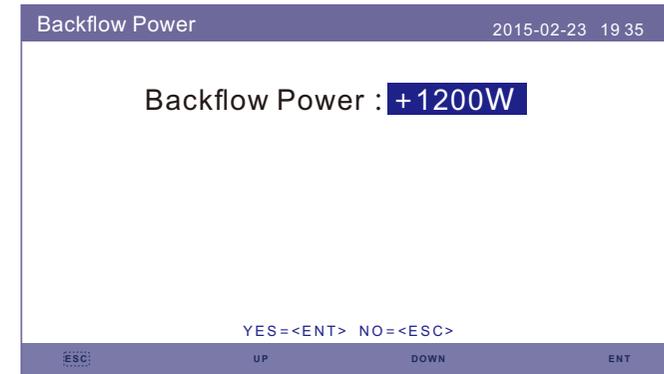
Figure 5.58 Backflow Power

5.6.8.2 ON/OFF

Enable/Disable the function.

ON/OFF	2015-02-23 19 35

ON

OFF

YES=<ENT> NO=<ESC>
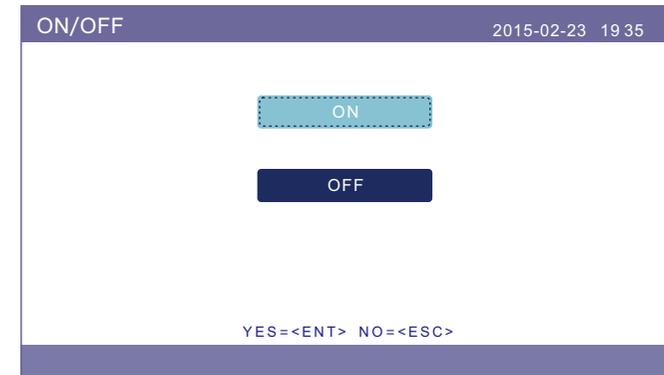
Figure 5.59 ON/OFF

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 exceeds the limit.
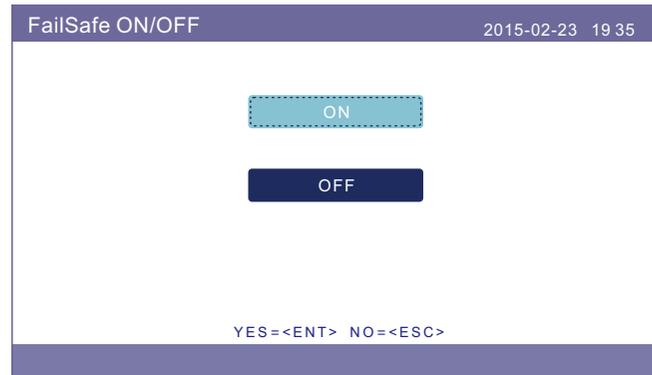
Figure 5.60 FailSafe ON/OFF

5.6.9 Calibrate

Warranty or maintenance may result in resetting the total generation data.
This function allow the maintenance personnel to load the total generation data of the original inverter into the replacement.

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

Figure 5.61 Calibrate
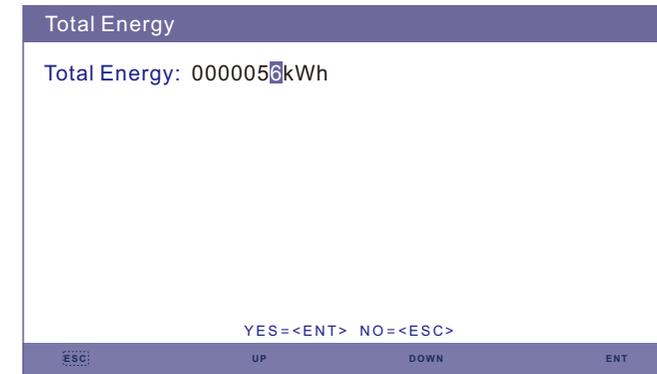
Figure 5.62 Total Energy
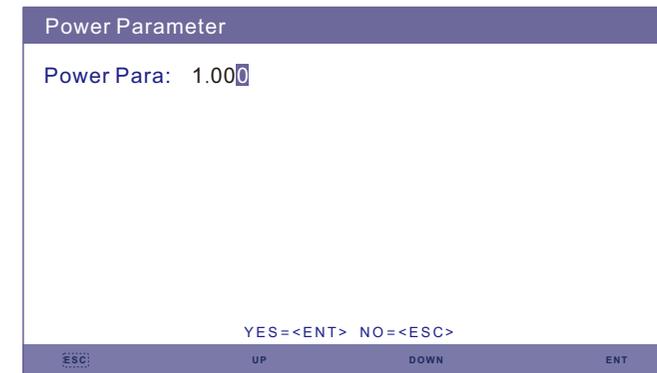
Figure 5.63 Power Parameter

5. Operation

5.6.10 Reset Password

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

Reset Password	2015-02-23 19 35

Please Input New Password

×   ×   ⊠   ×

YES=<ENT> NO=<ESC>

| ESC | UP | DOWN | ENT |

Figure 5.64 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 safely and protected against mechanical damage.
- Warning signs and labels are correctly (properly) affixed and durable.

6.2 Commissioning Procedure

If all the items mentioned above meet the requirements then 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" light will be ON and "Alarm" light will be flashing. Check the hybrid inverter troubleshooting list to fix the problem.

> **NOTE:**
> Before turn off the DC switch, please ensure the loads and grid are OFF or disconnected and the PV is OFF as well, otherwise it may cause damages on the DC switch.

Solis RHI Series inverter does not require any regular maintenance. However, cleaning the heatsink will help the inverter dissipate 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 could 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 being delivered to the customer the inverter is subjected to several tests to ensure reliability 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:

When faults occur, the "Fault" state will be shown on the main screen. Follow the steps below to determine which fault has occurred.

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

Step1: Press ENTER.
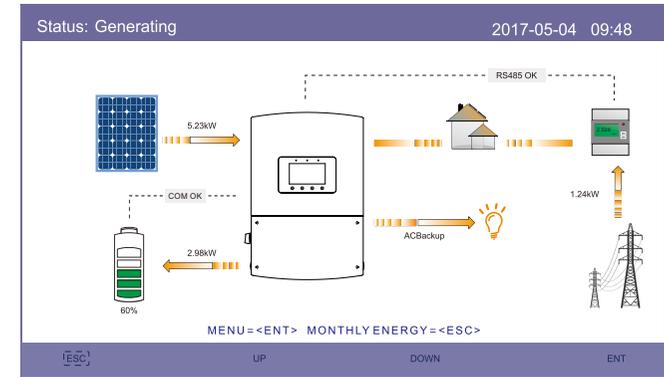
Step2: Press DOWN to select Advanced Information, then press ENTER.
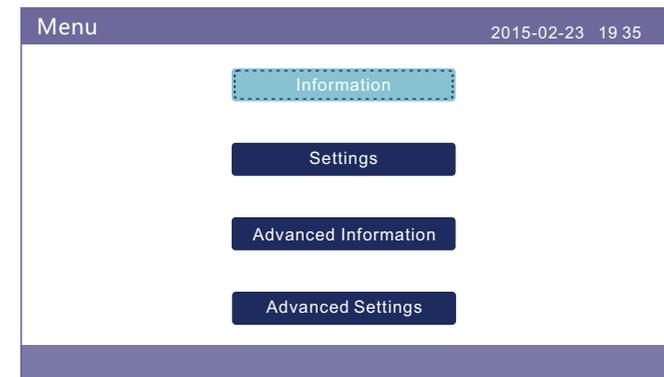
Step3: Press DOWN to select Alarm Message, then press ENTER.

Advanced Information   2015-02-23 19 35

Alarm Message

Warning Message

Running Status

Communication Data

Yield Profile

Alarm Message	Failure description	Solution
ARC-FAULT	ARC detected in DC circuit	1. Check if there is an arc in the 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 related to the faulty MPPT. 3. Change power board.
G-IMP	High grid impedance	1. User design function allows the protection limit to be adjusted if it is 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 connectors on the main board or power board are secure. 2. Check if the DSP connection to the power board is secure.
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.

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 is permitted by electrical company.
OV-G-I	Over grid current	1. Restart inverter. 2. Change power board.
OV-G-F01/02	Over grid frequency	1. User design function allows the protection limit to be adjusted if it is permitted by electrical company.
OV-IgTr	AC side transient overcurrent	1. Restart inverter. 2. Return-factory repair.
OV-ILLC	LLC hardware overcurrent	
OV-VBackup	Backup overvoltage fault	
OV-TEM	Over Temperature	1. Check inverter surrounding ventilation. 2. Determine if there is direct sunlight on the inverter during 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	Backup overload fault	1. Check the load of Backup port is over rating output power 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.

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 theproblem		
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

Technical Data	RHI-1P5K-HVES-5G	RHI-1P7.6K-HVES-5G
Input DC (PV side)		
Recommended max. PV power	7000W	10600W
Max. input voltage	500V	
Rated voltage	330V	
Start-up voltage	120V	
MPPT voltage range	90-450V	
Full load MPPT voltage range	115-450V	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 - 500V	
Battery Capacity	50 - 2000Ah	
Maximum Charging Power	7kW	
Maximum Charge/discharge current	20A	
Communication	CAN/RS485	
Output AC(Back-up)		
Rated output power	6kW	
Max. apparent output power	7kVA	
Back-up switch time	<10ms	
Rated output voltage(L-L)	240 V	
Rated output voltage(L-N)*	120 V	
Rated frequency	60Hz	
Rated output current	25A	
THDv(@linear load)	<3%	
Input AC (Grid side)		
Input voltage range	190-280V	
Max. input current	48A	
Frequency range	49.5-60.5 Hz	

Output AC(Grid side)		
Rated output power	5kW	7.6kW
Max. apparent output power	5kVA	7.6kVA
Operation phase	1Φ/PE	
Rated grid voltage	208V / 240 V	
The grid voltage range	167-239 V (for 208 V rated)/192-276 V (for 240 V rated)	
Rating grid frequency	60 Hz	
AC grid frequency range	59.5 Hz-60.5 Hz	
Rating grid output current	24.0A/21.0A	36.5A/31.7A
Max. output current	40.0A/40.0A	40.0A/50.0A
Power Factor	>0.99 (0.8 leading - 0.8 lagging)	
THDi	<3%	
Efficiency		
Max efficiency	98.0%	
EU efficiency	97.5%	
Protection		
Ground fault monitoring	Yes	
Residual current mornitoring 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)	20.2*28.1*8.18 in (539*717*250 mm)
Weight	66.1 lbs (30 kg)
Topology	Transformerless
Operation temperature range	-25~+60 ℃/-13~+140 ℉
Ingress protection	NEMA 4X
Noise emission	<30 dB (A)
Cooling concept	Natural convection
Max.operation altitude	2000m
Grid connection standard	IEEE1547A, UL 1741 SA, ISO-NE, CA Rule 21 phase III
Safty/EMC standard	UL 1741 CRD, IEEE 1547, UL 1699B, UL 1998, UL 9540, CAN/CSA C22.2.107.1-1, FCC, Part 15 Class B, SRD-UL1741
Compatible batteries	BYD B-Box H5.0/7.5/10, LG Chem RESU10H Type R
Features	
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
Display	7.0"LCD color screen display
Communication	RS485, Optional:Wi-Fi, GPRS
Warranty	10 years standard (Extand to 20 years)

Technical Data	RHI-1P10K-HVES-5G
Input DC (PV side)	
Recommended max. PV power	14000W
Max. input voltage	500V
Rated voltage	330V
Start-up voltage	120V
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 - 500V
Battery Capacity	50 - 2000Ah
Maximum Charging Power	7kW
Maximum Charge/discharge current	20A
Communication	CAN/RS485
Output AC(Back-up)	
Rated output power	6kW
Max. apparent output power	7kVA
Back-up switch time	<10ms
Rated output voltage(L-L)	240 V
Rated output voltage(L-N)*	120 V
Rated frequency	60Hz
Rated output current	25A
THDv(@linear load)	<3%
Input AC (Grid side)	
Input voltage range	190-280V
Max. input current	48A
Frequency range	49.5-60.5 Hz

Output AC(Grid side)	
Rated output power	10kW
Max. apparent output power	10kVA
Operation phase	1Φ/PE
Rated grid voltage	208V / 240 V
The grid voltage range	183-228 V (for 208 V rated)/211-264 V (for 240 V rated)
Rating grid frequency	60 Hz
AC grid frequency range	59.5 Hz-60.5 Hz
Rating grid output current	48.0A/41.7A
Max. output current	60.0A/60.0A
Power Factor	>0.99 (0.8 leading - 0.8 lagging)
THDi	<3%
Efficiency	
Max efficiency	98.0%
EU efficiency	97.5%
Protection	
Ground fault monitoring	Yes
Residual current mornitoring 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)	20.2*28.1*8.18 in (539*717*250 mm)
Weight	66.1 lbs (30 kg)
Topology	Transformerless
Operation temperature range	-25～+60 ℃/-13～+140 ℉
Ingress protection	NEMA 4X
Noise emission	<30 dB (A)
Cooling concept	Natural convection
Max.operation altitude	2000m
Grid connection standard	IEEE1547A, UL 1741 SA, ISO-NE, CA Rule 21 phase III
Safty/EMC standard	UL 1741 CRD, IEEE 1547, UL 1699B, UL 1998, UL 9540, CAN/CSA C22.2.107.1-1, FCC, Part 15 Class B, SRD-UL1741
Compatible batteries	BYD B-Box H5.0/7.5/10, LG Chem RESU10H Type R
Features	
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 (Extand to 20 years)

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
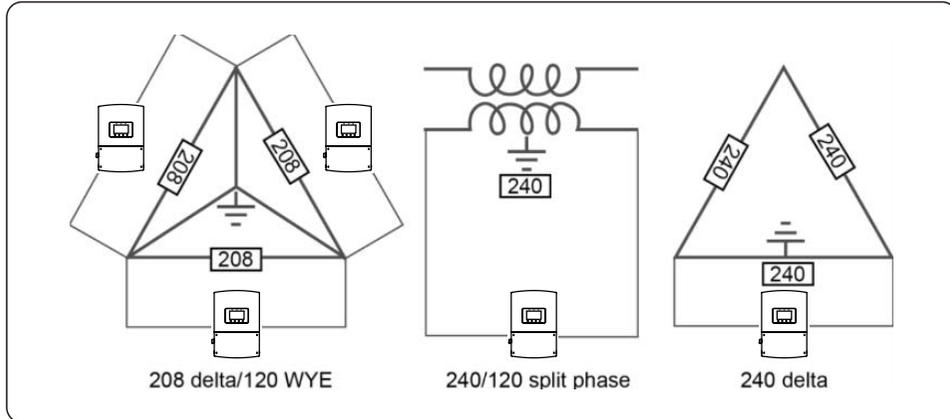
208 delta/120 WYE   240/120 split phase   240 delta

Please follow the below circuit diagram to configure the connection:
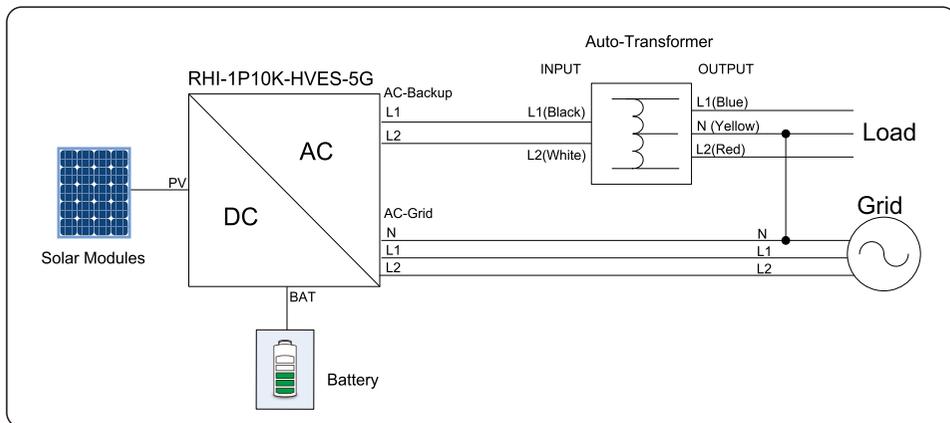
Type 2: Grid without Neutral

208 delta   240 delta
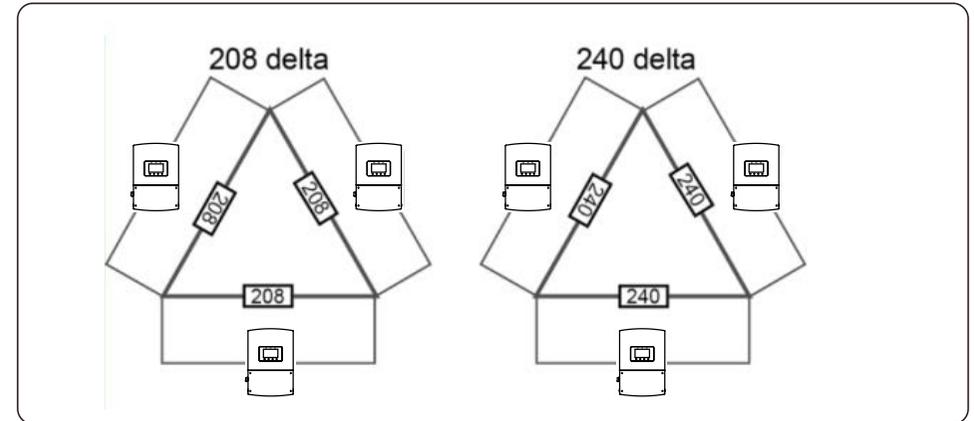
Please follow the below circuit diagram to configure the connection
(Use the central tap N of the auto-transformer to ground the neutral):
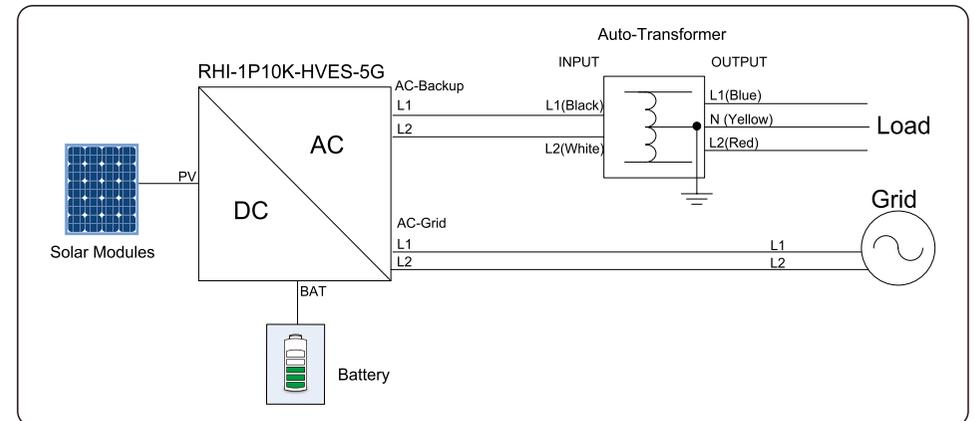
9. Appendix

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
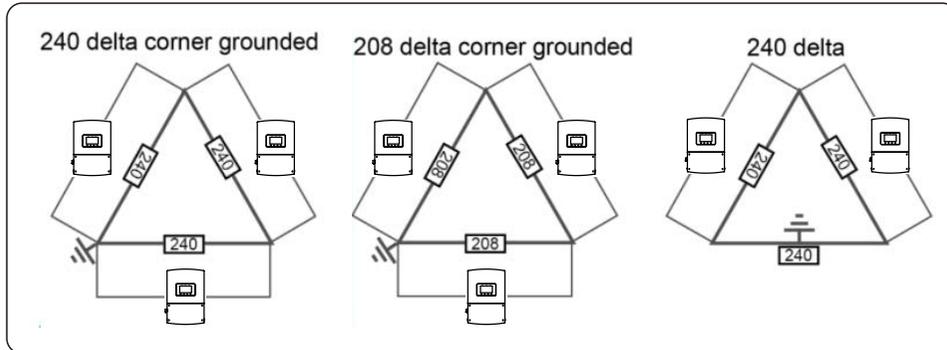
Please follow the below circuit diagram to configure the connection:
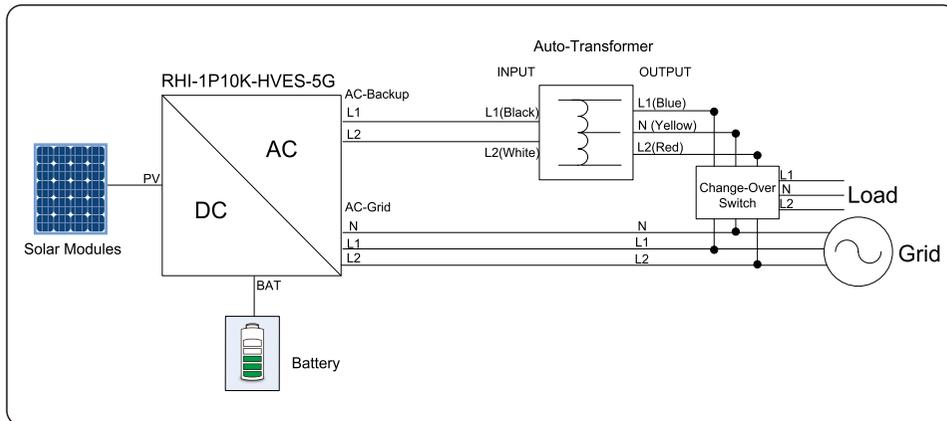
NOTE:

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).