



PV Utility Interactive Inverter – U.S. Version

# Solis Three Phase Inverter

(25-40kW) **Installation and Operation Manual**

Ver 1.3

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**Please record the serial number of your inverter and quote this when you contact us.**



Ginlong Technologies Co., Ltd.

# Important notes

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- Product specifications are subject to change without notice. Every attempt has been made to make this document complete, accurate and up-to-date. Individuals reviewing this document and installers or service personnel are cautioned, however, that Ginlong reserves the right to make changes without notice and shall not be responsible for any damages, including indirect, incidental or consequential damages caused by reliance on the material presented including, but not limited to, omissions, typographical errors, arithmetical errors or listing errors in the material provided in this document.
- Ginlong accepts no liability for customers' failure to comply with the instructions for correct installation and will not be held responsible for upstream or downstream systems Ginlong's equipment has supplied.
- The customer is fully liable for any modifications made to the system; therefore, any hardware or software modification, manipulation, or alteration not expressly agreed with the manufacturer shall result in the immediate cancellation of the warranty.
- Given the countless possible system configurations and installation environments, it is essential to verify adherence to the following:
  - There is sufficient space suitable for housing the equipment.
  - Airborne noise produced depending on the environment.
  - Potential flammability hazards.
- Ginlong will not be held liable for defects or malfunctions arising from:
  - Improper use of the equipment.
  - Deterioration resulting from transportation or particular environmental conditions.
  - Performing maintenance incorrectly or not at all.
  - Tampering or unsafe repairs.
  - Use or installation by unqualified persons.
- This product contains lethal voltages and should be installed by qualified electrical or service personnel having experience with lethal voltages.

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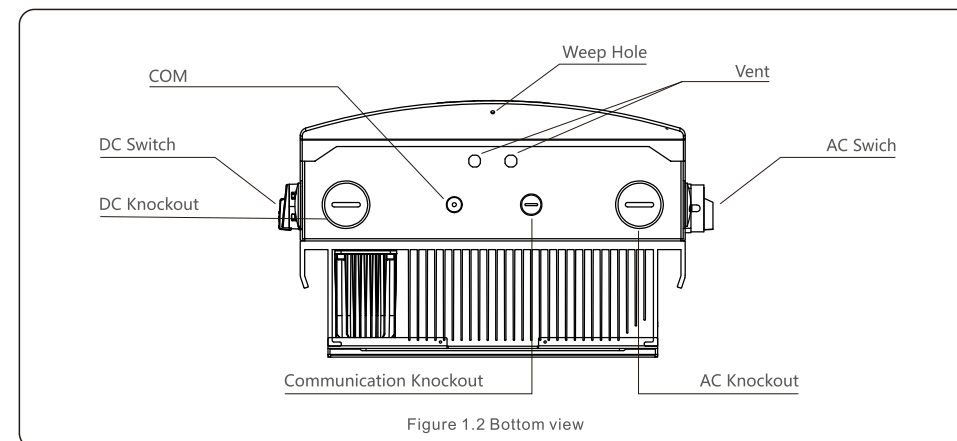
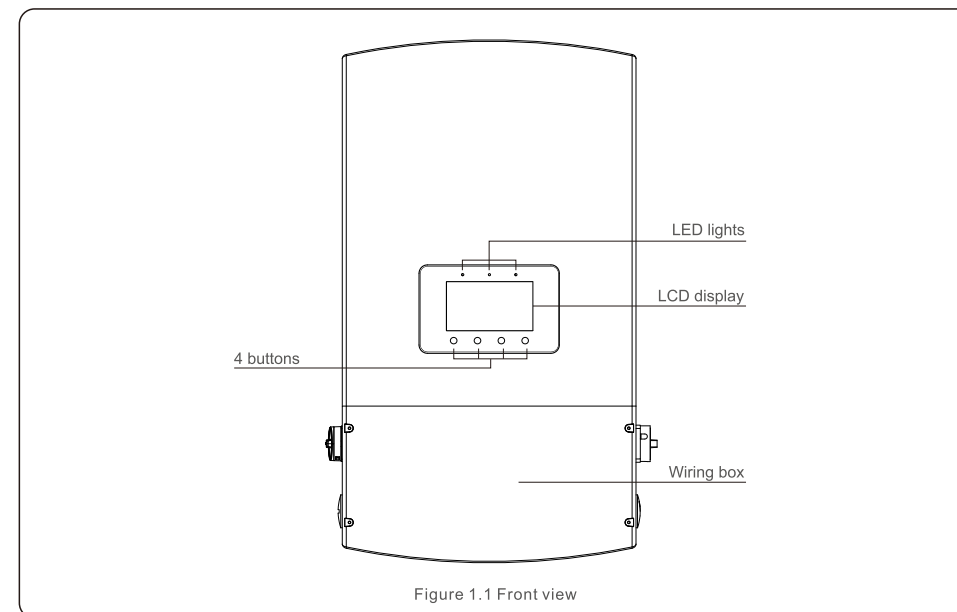
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## 1.1 Product Description

Solis U.S. Three Phase Inverters convert DC power from the photovoltaic (PV) array into alternating current (AC) power that can satisfy local loads as well as feed the power distribution grid.

This manual covers the Solis U.S. Three Phase Inverter models listed below:

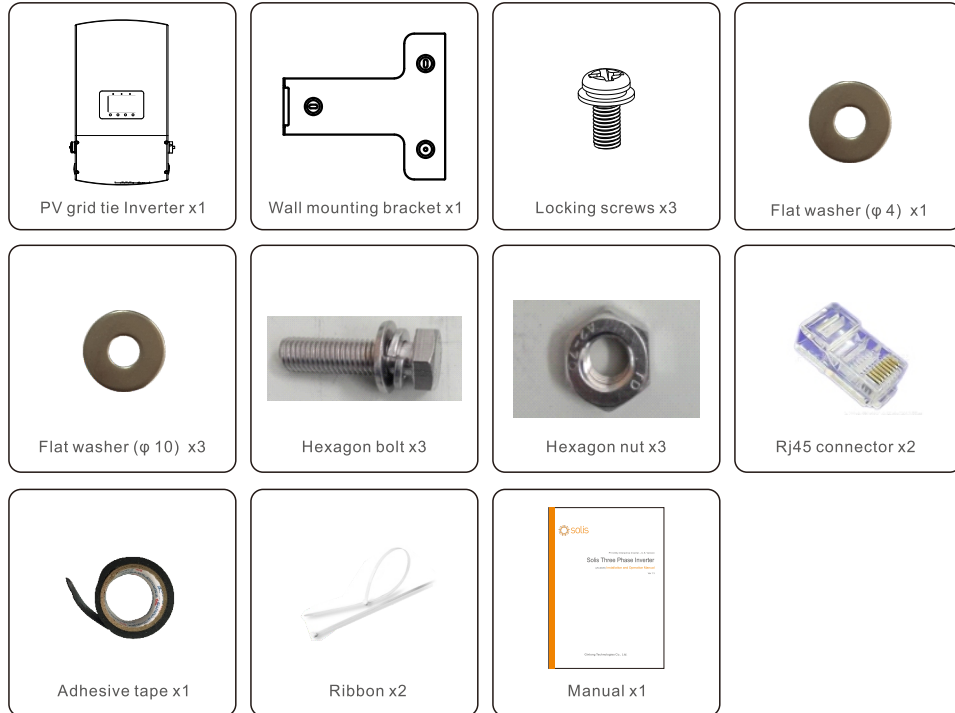
**Solis-25K-US Solis-30K-US Solis-36K-US Solis-40K-US Solis-36K-US-F Solis-40K-US-F**



# 1. Introduction

## 1.2 Unpacking and storage

When unpacking the inverter, please verify all the parts listed below are included:



### NOTE

The mounting bracket is already attached on fan model inverters (Solis-36K-US-F and Solis-40K-US-F), please see page 15 for details.

# 1. Introduction

## 1.2.1 Storage

If the inverter is not installed immediately, storage instructions and environmental conditions are below:

- Use the original box to repackage the inverter, seal with adhesive tape with the desiccant inside the box.
- Store the inverter in a clean and dry place, free of dust and dirt.
- The storage temperature must be between -16 and 140°F (-26 – 60°C) and humidity should be between 0 to 100%, non-condensing.
- Do not stack more than two (2) inverters high.
- Keep the box(es) away from corrosive materials to avoid damage to the inverter enclosure.
- Inspect the packaging regularly. If packing is damaged (wet, pest damages, etc.), repackage the inverter immediately.
- Store inverters on a flat, hard surface -- not inclined or upside down.
- After long-term storage, the inverter needs to be fully examined and tested by qualified service or electrical personnel before using.
- Restarting after a long period of non-use requires the equipment be inspected and, in some cases, the removal of oxidation and dust that has settled inside the equipment will be required.



**DO NOT STACK  
MORE THAN 2 HIGH**

Figure 1.3

## 2. Safety Instructions

Improper use may result in electric shock hazards or burns. This product manual contains important instructions that are required to be followed during installation and maintenance. Please read these instructions carefully before use and keep them in an easily locatable place for future reference.

### 2.1 Safety symbols

Safety symbols used in this manual, which highlight potential safety risks and important safety information, are listed below:



#### **WARNING**

Symbol indicates important safety instructions, which if not correctly followed, could result in serious injury or death.



#### **NOTE**

Symbol indicates important safety instructions, which if not correctly followed, could result in some damage or the destruction of the inverter.



#### **CAUTION, RISK OF ELECTRIC SHOCK**

Symbol indicates important safety instructions, which if not correctly followed, could result in electric shock.



#### **CAUTION, HOT SURFACE**

Symbol indicates safety instructions, which if not correctly followed, could result in burns.

### 2.2 General safety instructions



#### **WARNING**

Do not connect PV array positive (+) or negative (-) to ground – doing so could cause serious damage to the inverter.



#### **WARNING**

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

## 2. Safety Instructions



#### **WARNING**

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



#### **CAUTION**

The PV array (solar panels) supplies a DC voltage when exposed to light.



#### **CAUTION**

Risk of electric shock from energy stored in the inverter's capacitors. Do not remove cover until five (5) minutes after disconnecting all sources of supply has passed, and this can only be done by a service technician. The warranty may be voided if any unauthorized removal of cover occurs.



#### **CAUTION**

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



#### **WARNING**

The inverter can only accept a PV array as a DC input. Using any other type of DC source could damage the inverter.

### 2.3 Notice for use

The inverter has been constructed according to applicable safety and technical guidelines.

Use the inverter in installations that meet the following requirements ONLY:

- 1.The inverter must be permanently installed.
- 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 system design must meet inverter specifications.

To start-up the inverter, the Grid Supply Main Switch (AC) must be turned on, BEFORE the DC Switch is turned on. To stop the inverter, the Grid Supply Main Switch (AC) must be turned off before the DC Switch is turned off.

## 2. Safety Instructions

### 2.4 Protection Circuitry and Controls

To meet relevant codes and standards, the Solis U.S. three phase inverter line is equipped with protective circuitry and controls. These include Arc Fault Circuit Interrupter (AFCI) and Anti-Islanding Protection.

#### Arc Fault Circuit Interrupter AFCI:

Edition 2011 of the National Electrical Code®, Section 690.11, requires that all PV plants attached to a building are fitted with a means of detecting and interrupting serial electric arcs in the PV wiring and array. An electric arc with a power of 300W or greater must be interrupted by the AFCI in the time specified by UL 1699B. A triggered AFCI fault may only be reset manually. After clearing the source of the fault, the AFCI can be deactivated via the inverter front panel interface.

#### Anti-Islanding Protection:

Islanding is a condition where the inverter continues to produce power even when the grid is not present. Circuitry, along with firmware, has been designed to determine if the grid is present by adjusting the output frequency of the inverter. In the case of a 60Hz resonant system where the inverter is partially isolated from the grid, the inverter programming can detect if there is a resonant condition or if the grid is actually present. It can also differentiate between inverters operating in parallel and the grid.

## 3. Installation

### 3.1 Environmental considerations

#### 3.1.1 Select a location for the inverter

When selecting a location for the inverter, consider the following:



#### **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.

- The temperature of the inverter heat-sink can reach 167°F (75C).
- The inverter is designed to work in an ambient temperature range between -13°F to 140°F (-26 – 60C).
- If multiple inverters are installed on site, a minimum clearance of 20 inches should be kept between each inverter and all other mounted equipment. The bottom of the inverter should be at least 20 inches above of the ground or floor (see Figure 3.1).
- The LED status indicator lights and the LCD located on the inverter's front panel should not be blocked.
- Adequate ventilation must be present if the inverter is to be installed in a confined space.

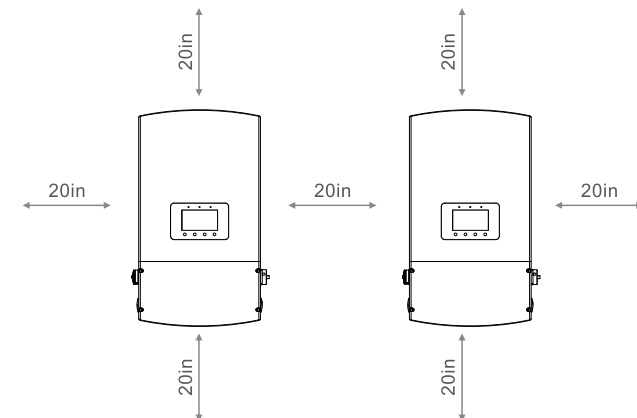


Figure 3.1 – Distances required between inverters



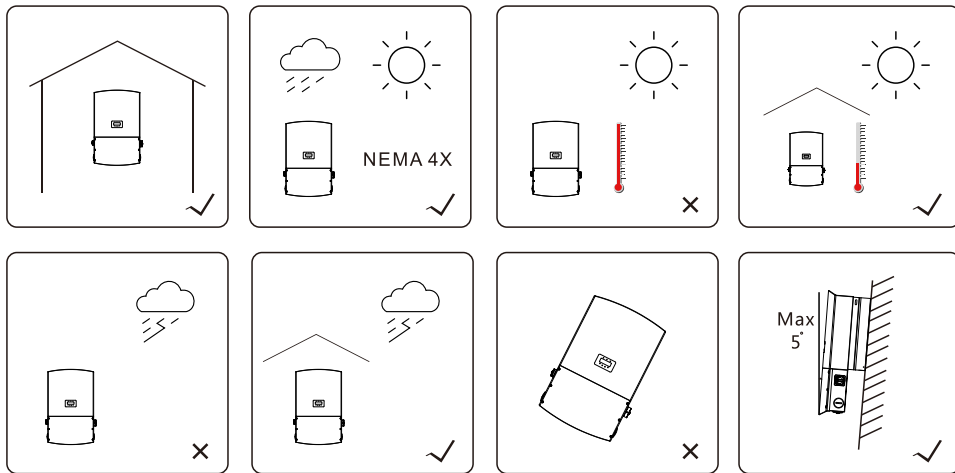
#### **NOTE**


Nothing should be stored on or placed against the inverter.

# 3. Installation

# 3. Installation

## 3.1.1.1 Examples of correct and incorrect installations



 **NOTE**  
Units with a fan may be mounted at 15 – 90 degrees off horizontal.

## 3.1.2 Other environmental considerations

### 3.1.2.1 Consult technical data

Consult the specifications section (section 9) for additional environmental conditions (protection rating, temperature, humidity, altitude, etc.).

### 3.1.2.2 Vertical wall installation

Solis inverters are typically convection cooled and must be mounted vertically (90 +/- 5 degrees off horizontal). Units with a fan may be mounted at 15 – 90 degrees off horizontal.

### 3.1.2.3 Avoiding direct sunlight

Installation of the inverter in a location exposed to direct sunlight should be avoided.

Direct exposure to sunlight could cause:

- Power output limitation (with a resulting decreased energy production by the system).
- Premature wear of the electrical/electromechanical components.
- Premature wear of the mechanical components (gaskets) and of the user interface.

### 3.1.2.4 Air circulation

Do not install in small, closed rooms where air cannot freely circulate. To prevent overheating, always ensure that the air flow around the inverter is not blocked.

## 3.1.2.5 Flammable substances

Do not install near flammable substances. Maintain a minimum distance of three (3) meters (10 feet) from such substances.

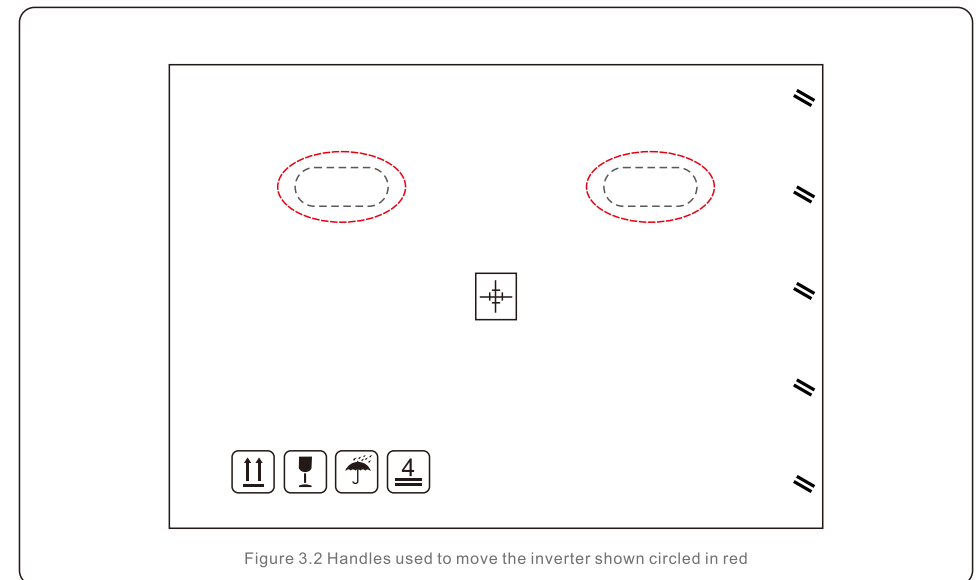
## 3.1.2.6 Living area

Do not install in a living area where the prolonged presence of people or animals is expected. Depending on where the inverter is installed (for example: the type of surface around the inverter, the general properties of the room, etc.) and the quality of the electricity supply, the sound level from the inverter can be quite high.

## 3.2 Product handling

Please review the instructions below for handling the inverter:

1. The red circles below denote cutouts on the product package. Push in the cutouts to form handles for moving the inverter (see Figure 3.2).



2. Two people are required to remove the inverter from the shipping box. Use the handles integrated into the heat sink to remove the inverter from the box (see Figure 3.3).



# 3. Installation

# 3. Installation

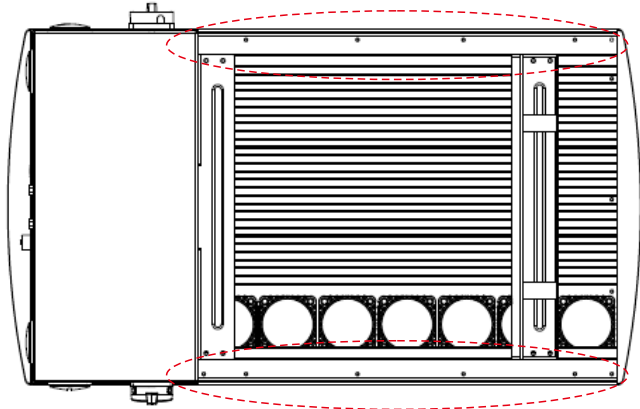


Figure 3.3 Handles shown circled in red are used to remove the inverter from the shipping box



**WARNING**

Due to the inverter's weight, contusions or bone fractures could occur when incorrectly lifting and mounting the inverter. When mounting the inverter, take its weight of 147 lb. (67 kg) into consideration. Use a suitable lifting technique when mounting.

## 3.3 Mounting the inverter

The inverter can be mounted to the wall or metal array racking. The mounting holes should be consistent with the size of the bracket or the dimensions shown below.

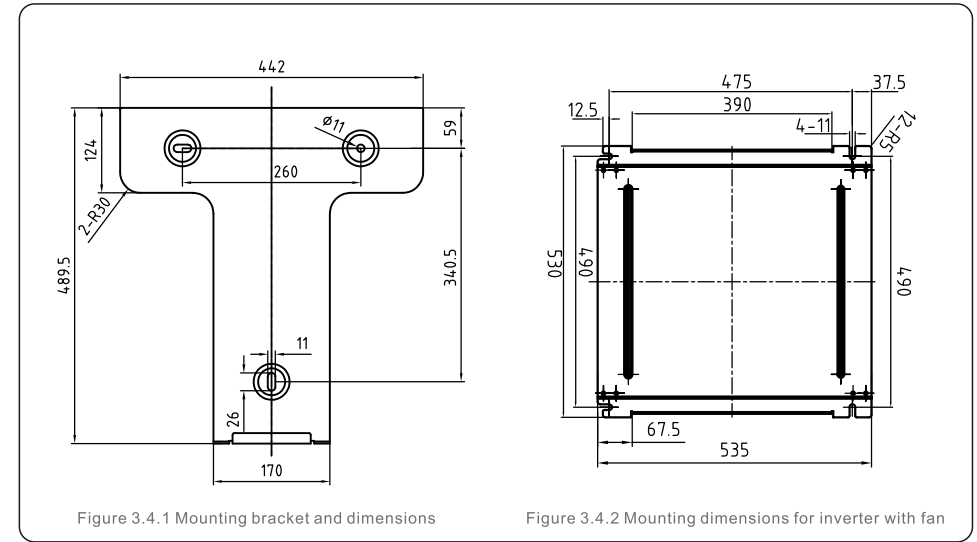


Figure 3.4.1 Mounting bracket and dimensions

Figure 3.4.2 Mounting dimensions for inverter with fan

The inverter must be mounted vertically ( $\pm 5^\circ$ ), 15–90 degrees for fan units, following the steps below.

1. Referring to Figure 3.4.1 or 3.4.2, select the mounting height of the bracket. For brick walls, the position of the holes should be suitable for expansion bolts.
2. Ensure the bracket is level and the mounting holes are in the correct positions depending on the mounting surface. Mark the surface through the bracket holes and drill the holes in the wall at the marks.
3. Use suitable fasteners and expansion bolts (if required) to attach the bracket to the wall.

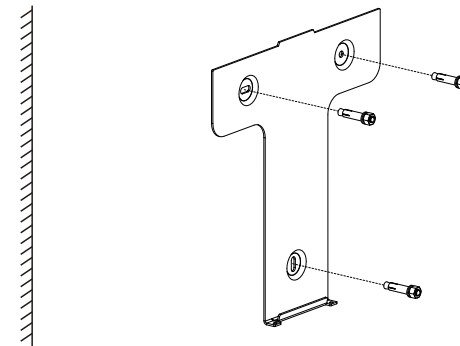


Figure 3.5 Fix the bracket to the wall

# 3. Installation

# 3. Installation



### WARNING

The inverter must be mounted vertically on a wall. Ensure the bracket is level before mounting inverter.

4. Lift the inverter and align the slot on the back of the inverter with the lip on the mounting bracket. Slowly lower the inverter onto the bracket until the inverter is secured on the bracket (see Figure 3.6).

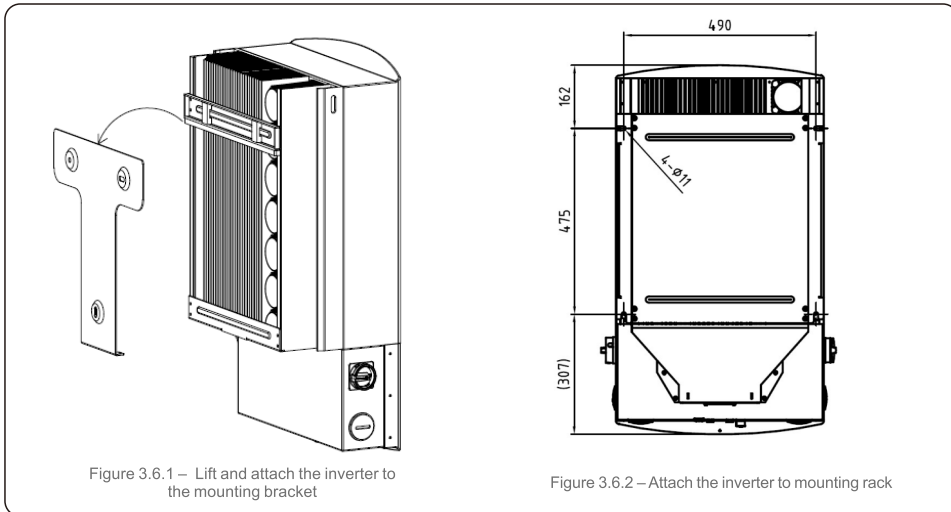


Figure 3.6.1 – Lift and attach the inverter to the mounting bracket

Figure 3.6.2 – Attach the inverter to mounting rack

5. Use two M4 x 9mm screws (supplied) to secure the inverter to the mounting bracket. Torque to 20 in-lbs (2 N-m).

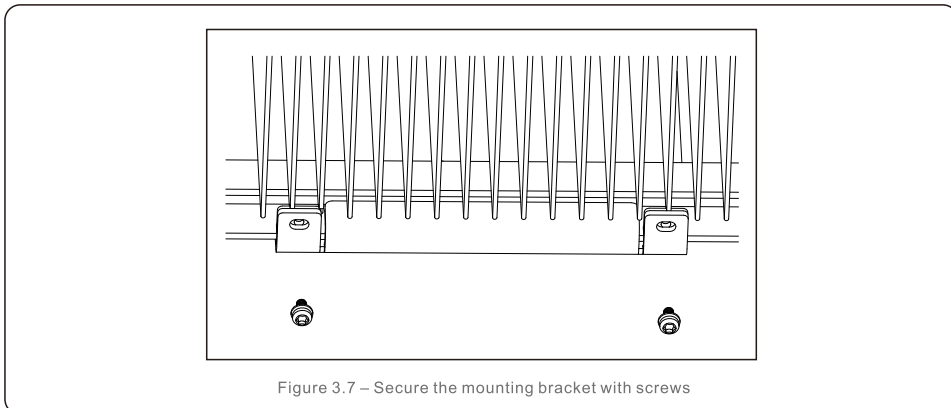


Figure 3.7 – Secure the mounting bracket with screws

## 3.4 Wiring box configuration

The Solis U.S. Three Phase Inverter wiring box is designed for easy access to all connection terminals, including monitoring communication ports. The wire box features a spacious work area and pre-drilled 1-1/2 inch (ID) knockouts on the bottom and sides of the cabinet.

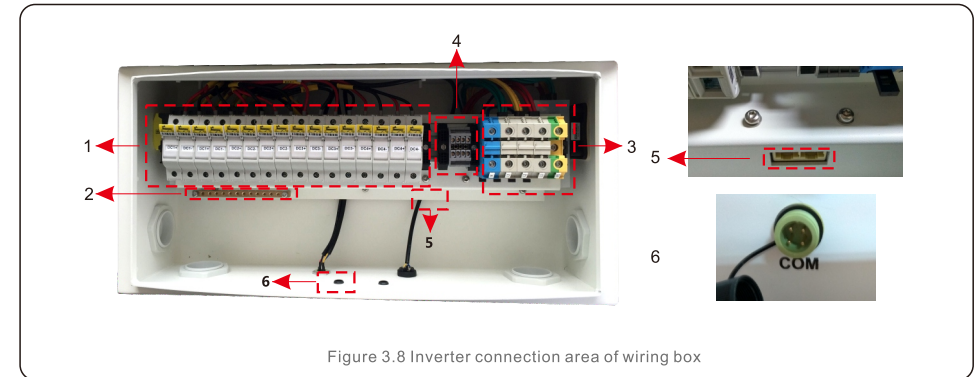


Figure 3.8 Inverter connection area of wiring box

# from Figure 14 above	Parts	Connection	Cable size	Torque
1	DC terminal	PV strings	12-6 AWG	30 in-lbs
2	Ground terminal	DC and AC ground	12-4 AWG	26 in-lbs
3	Grid terminal	Grid	8-2 AWG	26 in-lbs
4	RS-485 terminal	Communication cable	22-12 AWG	3.5-5.3 in-lbs
5	RJ45 terminal	Communication cable	Network cable	NA
6	COM terminal	Wi-Fi/GPRS stick	NA	NA

Table3.1 Connections list

## 3.5 DC connection



### WARNING

Before connecting the inverter, make sure the PV array open circuit voltage is within the limit of the inverter. Otherwise, the inverter could be damaged.



### WARNING

DO NOT connect the PV array positive or PV array negative cable to ground. This can cause serious damage to the inverter!



### WARNING

MAKE SURE the polarity of the PV array output conductors matches the DC- and DC+ terminal labels before connecting these conductors to the terminals inside the inverter wiring box.



### Caution:

If DC positive and negative connections are accidentally reversed (reverse polarity) or inverter is not powering on, DO NOT turn off the DC switch as it may damage the inverter or cause a fire.

The correct actions are:

\*Use a clip-on ammeter to measure the DC string current.

\*If it is above 0.5A, please wait until the current decreases to below 0.5A (sunset). String current above 0.5A is considered as under load.

\*Only after the current is below 0.5A, you are allowed to turn off the DC switch and disconnect the PV strings.

Note: Damage due to wrong connections or fire caused by removing string wires or opening fuse holders under load is not covered in the device warranty.

See Section 9 for acceptable wire sizes and Figure 10.1 for screw torque values for the AC and DC connections.

Both the DC and AC ground wires can be connected to the grounding terminal block (see Figure 3.9).



Figure 3.9 Grounding terminal block on the metal bracket

Requirements for the PV modules per MPPT input:

- All PV modules must be of the same type and power rating.
- All PV modules must be aligned and tilted identically.
- The open-circuit voltage of the PV array must never exceed the maximum input voltage of the inverter, even at the coldest expected temperature. (see Section 9 “Specifications” for input current and voltage requirements)
- Each string connected to a single MPPT must consist of the same number of series-connected PV modules.

### 3.5.1 DC connection high voltage danger notice



### CAUTION

RISK OF ELECTRIC SHOCK

Do not touch an energized DC conductor. There are high voltages present when PV modules are exposed to light causing a risk of death due to an electric shock from touching a DC conductor! Only connect the DC cables from the PV module to the inverter as described in this manual.



### CAUTION

POTENTIAL DAMAGE TO THE INVERTER DUE TO OVERVOLTAGE

The DC input voltage of the PV modules must not exceed the maximum rating of the inverter. (see Section 9 “Specifications”)

Check the polarity and the open-circuit voltage of the PV strings before connecting the DC cables to the inverter.

Confirm proper string length and voltage range before connecting DC cable to the inverter.

### 3.5.2 String sizing

For PV array sizing please refer Section 9 “Specifications” and utilize industry standard string sizing techniques as specified by your local code.

### 3.5.3 Recommended fusing section for each channel or connection

Solis Three phase inverters include an integrated wiring box which performs the combining of DC strings. The fuses and fuseholders in the wiring box are not rated to carry the current of multiple strings. Each DC string should be directly connected to the inverter. When using field combiners, the jumper bars must be used as shown below.

The sizing of the string fuses must take into account the two following conditions:

- 1). The nominal current rating of the selected fuse must not exceed the maximum fuse rating of the PV panels. Please refer to the applicable specifications for this value.

# 3. Installation

2). The fuse rating is determined based on the PV panel string current and on the sizing guidelines provided by the panel manufacturer or the local electrical code. In addition, the maximum fuse rating must not exceed the maximum input current of the inverter.

### 3.5.3.1 Maximum allowable amperage per fuse and channel

Figure 3.10 Shows eight (8) input channels for connecting DC strings. Each channel is protected by a fuse. The included fuses are rated at 15A. Replace fuses with like size and type. Do not exceed 20A fuse rating.

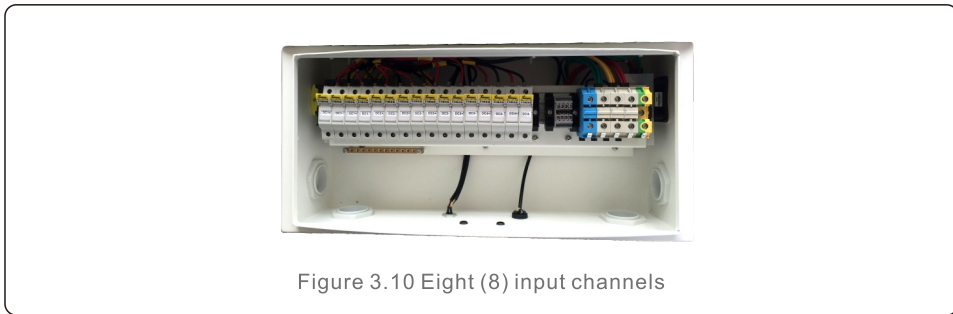


Figure 3.10 Eight (8) input channels



#### WARNING

If the amperage per connection is exceeded, the inverter could be damaged. Ensure all wire sizing procedures are completed per local codes and regulations. Ensure the AC grid and DC PV array connections have enough separation to prevent contact with each other.

### 3.5.4 Process of connecting DC wires to terminals

#### 3.5.4.1 Using fuse terminal

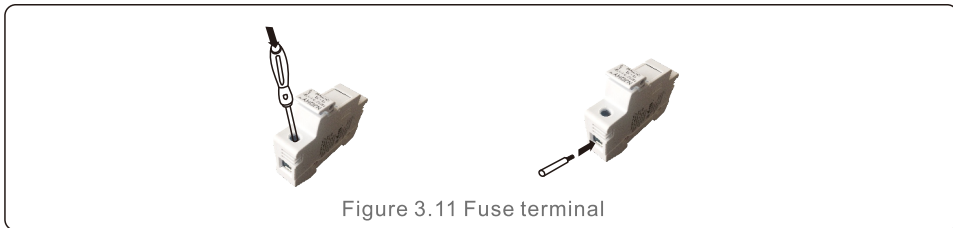


Figure 3.11 Fuse terminal

Loosen the screw to open wire cage. Strip cable insulation about 1/2 inch.

Check for proper string voltage and polarity. Do not close fuse holder until commissioning tests are completed.

Insert the wire and tighten screw to secure wire. Torque to 2.5 ft-lbs.

# 3. Installation

### 3.6 Making connections to the AC side of the inverter



#### WARNING

An automatic over-current device must be used between the inverter and the grid.

1. Connect three (3) AC conductors to the three (3) AC terminals marked "L1", "L2" and "L3". Refer to local code and voltage drop tables to determine the appropriate wire size and type.
2. Connect the neutral conductor (optional) to the blue terminal marked "N".
3. Connect the grounding conductor to the terminal marked "PE" (protective earth, the ground terminal).

The AC-side cage terminals ("rapid termination terminals") can accept wires ranging in size from 8AWG to 4AWG copper and aluminum (aluminum with bi-metallic terminal).

#### 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 3.2:

Inverter	Rated voltage(V)	Rated output power (kW)	Current rating for protection device (A)
Solis-25K-US	480V	25	50
Solis-30K-US	480V	30	50
Solis-36K-US	480V	36	60
Solis-40K-US	480V	40	60
Solis-36K-US-F	480V	36	60
Solis-40K-US-F	480V	40	60

Table3.2 Over-current protection device characteristics for Solis inverters

#### 3.6.1 Connecting the inverter to the utility grid

All electrical installations must be carried out in accordance with the local standards and the National Electrical Code® ANSI/NFPA 70 or the Canadian Electrical Code® CSA C22.1. The AC and DC electric circuits are isolated from the enclosure. If required by section 250 of the National Electrical Code®, ANSI/NFPA 70, the installer is responsible for grounding the system.

The grid voltage must be within the permissible range. The exact operating range of the inverter is specified in Section 9 "Specifications".

# 3. Installation

## 3.6.2 Wiring procedure



### CAUTION

RISK OF ELECTRIC SHOCK. Prior to starting the wiring procedure, ensure that the three-pole circuit breaker is switched off and cannot be reconnected.



### NOTE

Damage or destruction of the inverter's electronic components due to moisture and dust intrusion will occur if the enclosure opening is enlarged.



### CAUTION

Risk of fire if two conductors are connected to one terminal. If a connection of two conductors to a terminal is made, a fire can occur. NEVER CONNECT MORE THAN ONE CONDUCTOR PER TERMINAL.

1. Insert the conduit fitting into the opening and tighten from the inside using the counter nut.
2. Attach the conduit to the enclosure opening.
3. Insert the AC cable through the conduit into the inverter.
4. Strip the cable insulation approximately 1/2 in.
5. Release the screws to insert the wire
6. Use a maximum torque of 3Nm to fasten the screws
7. Connect the equipment grounding conductor to the terminal
8. Depending on the grid configuration, connect the optional neutral
9. Connect the conductors 3 line conductor to the terminals labeled L1, L2 and L3.  
Neutral is optional as inverters reference ground for voltage measurements (see Figure 3.12).

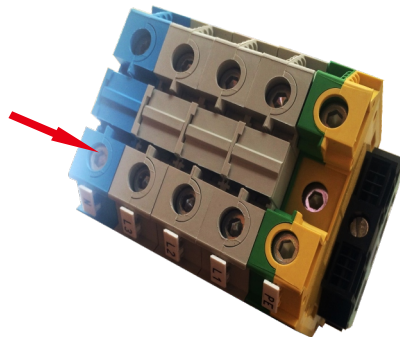


Figure 3.12

# 3. Installation

## 3.7 External ground connection point

An OPTIONAL external ground connection (PE) is provided on the right side of the inverter. To use the OPTIONAL external ground connection (see Figure 3.13):

1. Prepare the grounding conductor. Crimp a ring or fork (M4 size) terminal onto the grounding conductor.
2. Connect the grounding conductor (with crimped terminal) to the external ground connection point on the right side of the inverter. Use a maximum torque of 20 in-lbs (2N-m).

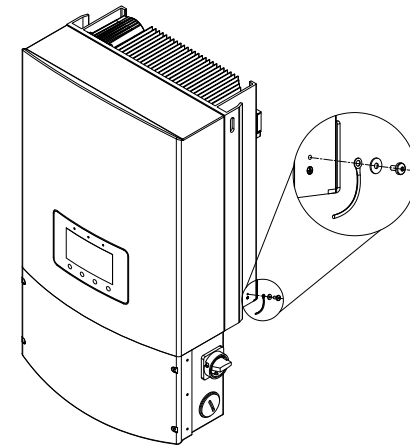
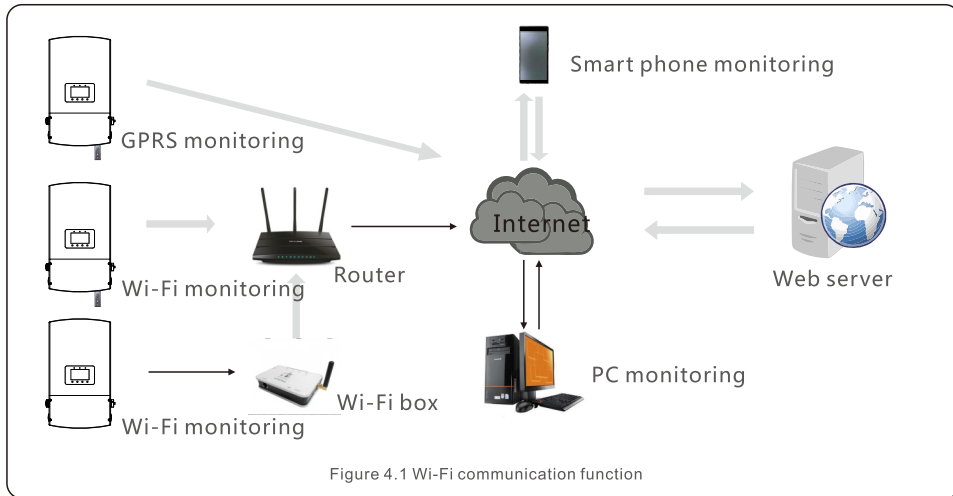


Figure 3.13 Connect the external grounding conductor

# 4. Comm. & Monitoring

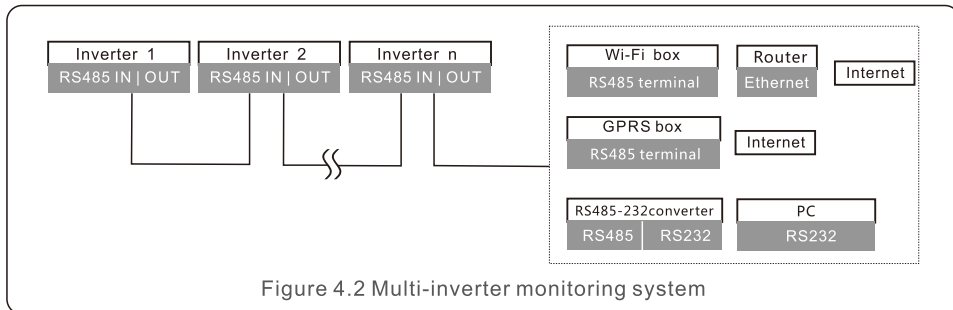
## Overview

There are three (3) sets of terminals used for RS485 communication.  
 Terminal 4 (Figure 3.10) has screw terminals for a multiple inverter communication solution using a standard MODBUS cable such as Belden stranded cable.  
 Terminal 5 is a standard RJ45 terminal and is used for creating a daisy chain connection between inverters as well as the wired data monitoring.  
 Terminal 6 is a 4-pin connector which is matched with Solis Monitoring communication products such as the Wi-Fi stick and cables.  
 Inverter monitoring Connection  
 The inverter can be monitored by Wi-Fi functions. All the communication functions are optional (Figure 4.1). Please refer to the communication connection instructions.



## Monitoring system for multiple inverters

Multiples of inverters can be monitored in series using RS485 (as shown in Figure 4.2). All 3 connectors support this type of inverter connection.



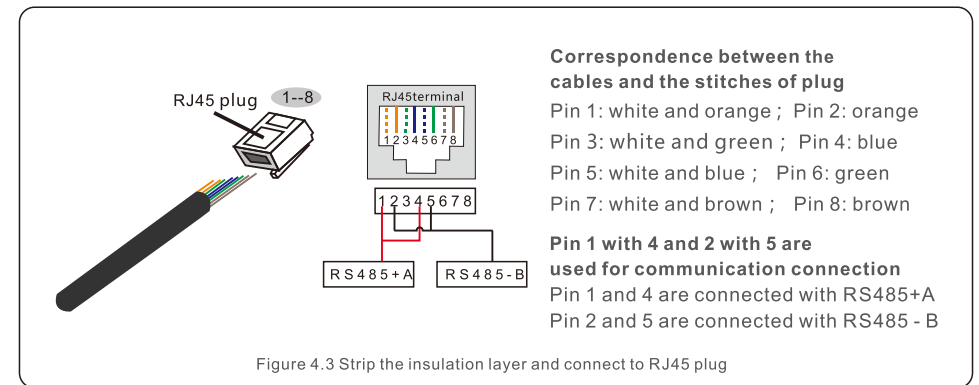
# 4. Comm. & Monitoring

## RS485 communication connection of RJ45 network port

When using terminal 5 (RJ45 connector) to connect, use the following wiring sequence.  
 Connect the Ethernet cable according to the TIA/EIA 568B standard. Insert the wire into the RJ45 plug and then use a standard network cable crimping tool fix the connector to the cable.

## 4.1 RS485

### 4.1.1 Wiring a single inverter and daisy chain inverter



### 4.1.2 Maximum allowable inverters using RS485

Maximum allowable inverters per RS 485 daisy chain is 32pcs.

Please contact monitoring supplier for detail information.

### 4.1.3 120-ohm ( $\Omega$ ) resistor placement

120 $\Omega$  resistor placement for end of line communication.

Please contact monitor supplier for detail information.

# 5. Commissioning

## 5.1 Selecting the appropriate grid standard

### 5.1.1 Verifying grid standard for country of installation

Solis inverters are used worldwide and feature preset standards for operating on any grid. Although the grid standard is set at the factory, it is essential the grid standard be verified for the country of installation before commissioning.

The menu for changing the grid standard or for creating a custom standard is accessible as described in Section 6.7 and below.



#### WARNING

Failure to set the correct grid standard could result in improper operation of the inverter, inverter damage or the inverter to not operate at all.

## 5.2 Changing the grid standard

### 5.2.1 Procedure to set the grid standard



#### NOTE

This operation is for service technicians only. The inverter is customized according to the local standard before shipping. There should be no requirement to set the standard.



#### NOTE

The "User-Def" function can only be used by the service engineer and changing the protection level must be allowed by the local utility.

1. From the main screen on the display, select ENTER. There are 4 submenu options, use the UP/DOWN arrows to highlight ADVANCED SETTINGS. Press enter to select.

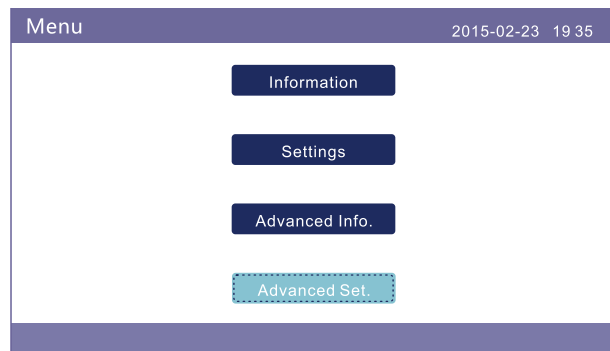


Figure 5.1

# 5. Commissioning

2. The LCD screen will show that a password is required. The default password is "0010", press the DOWN key to move cursor, press the UP key to change the highlighted digit.

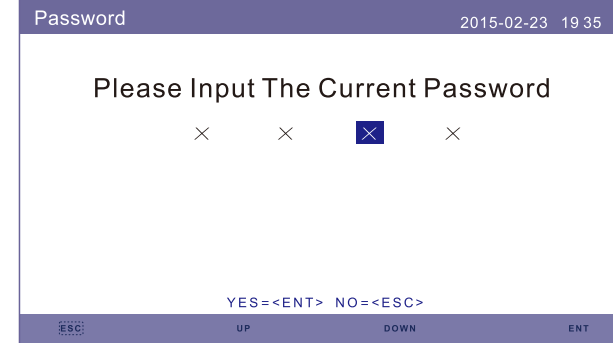


Figure 5.2

3. Use the UP/DOWN keys to highlight the SELECT STANDARD option. Press enter to select.

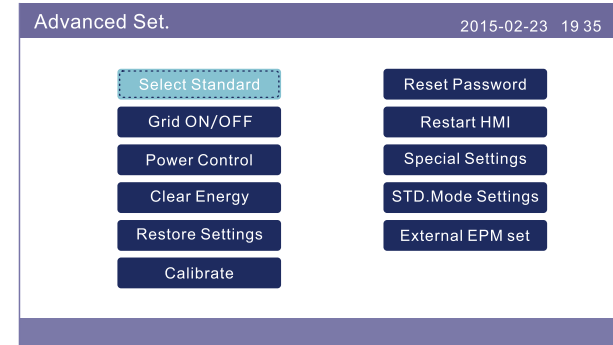


Figure 5.3

# 5. Commissioning

4. Select the grid standard for the country of installation (see Figure 3).

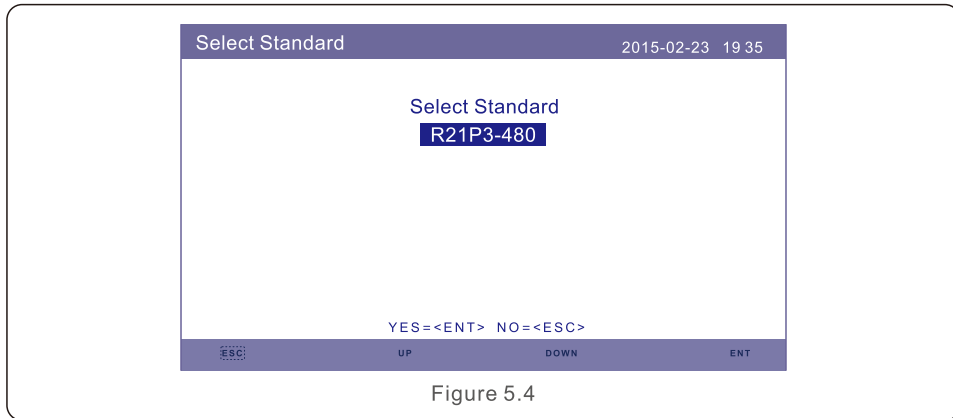


Figure 5.4

Press the UP or DOWN key to select the standard (AS4777, VDE4105, UL-1741, G59/3, CQC, User-Def function, etc.). Press the ENTER key to confirm the setting. Press the ESC key to cancel changes and return to the previous menu.

UI1741 is default setting for the U.S. and Canada markets. UL1741-A is the standard for inverters with AFCI function.

5. Once the grid standard has been selected, select SAVE AND SEND on the following screen to save the new grid setting.

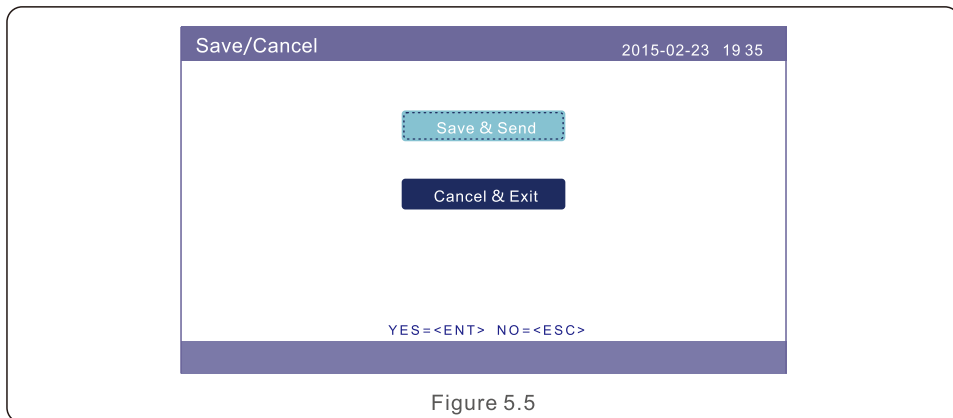


Figure 5.5

# 5. Commissioning

## 5.3 Setting a custom grid standard



### WARNING

- Failure to set the correct grid standard could result in improper operation of the inverter, inverter damage or the inverter to not operate at all.
- Only certified personnel should set the grid standard.
- Only set the grid configuration that is approved by your location and national grid standards.

1. Please refer to section 6.7 "Advanced Settings" for procedures to create a custom grid configuration for User-Def menu option.

## 5.4 Preliminary checks



### WARNING

High Voltage.  
AC and DC measurements should be made only by certified electricians.

### 5.4.1 DC Connections

Verify DC connections.

1. Lightly tug on each DC cable to ensure it is fully captured in the terminal.
2. Visually check for any wire strands that may not be inserted in the terminal.
3. Check to ensure the terminal screws are the correct torque.

### 5.4.2 AC Connections

Verify AC connections.

1. Lightly tug on each AC cable to ensure it is fully captured in the terminal.
2. Visually check for any wire strands that may not be inserted in the terminal.
3. Check to ensure the terminal screws are the correct torque.

### 5.4.3 DC configuration

Verify DC configuration.

#### 5.4.3.1 VOC and Polarity

Measure VOC, and check string polarity.



# 5. Commissioning

## 5.4.3.1.1 Check string voltage

To measure the open circuit voltage (VOC) and polarity of the individual strings, perform the following steps:



### WARNING

When the fuse holders are closed, parallel strings on the same MPPT are connected together. If there is a voltage difference between the parallel strings such as different string lengths, current will flow between the parallel strings. Opening and closing the fuse holder in this instance is the same as opening and closing under load. Damage to equipment and /or injury to personnel may occur.

1. Ensure that all fuse holders are open.
2. Connect the positive lead of the meter to the positive string cable of the string under test. Connect the negative lead of the meter to the negative string cable of the string under test.
3. Measure the voltage present between the positive and negative pole of each string. If the open circuit voltage of the string is near the maximum value accepted by the inverter, verify the string length. Low ambient temperatures cause an increase in the string voltage causing damage to the inverter.
4. Check the polarity of the string. All digital meters have a negative ("-") indicator that indicates when a voltage is negative; in this case a string connected in reverse polarity.



### WARNING

Input voltages higher than the maximum value accepted by the inverter (see "Specifications" in Section 9) may damage the inverter. Although Solis inverters feature reverse polarity protection, prolonged connection in reverse polarity may damage these protection circuits and/or the inverter.

## 5.4.3.2 Leakage to ground

Measure leakage to ground.

# 5. Commissioning

## 5.4.3.2.1 Detection of leakage to ground

Solis inverters are transformer less and do not have an array connection to ground.

Any measurement of a fixed voltage between ground and either the positive or negative string voltage indicates a leakage (ground fault) to ground and must be corrected prior to energizing the inverter or damage to the inverter may result.

To measure leakage to ground, perform the following steps:

1. Ensure that all fuse holders are open.
2. Ensure that neither negative nor positive DC conductors are connected to the ground strip.
3. Measure each string positive connection to ground.
4. Measure each string negative connection to ground.
5. Verify the voltage is "floating", not a consistent voltage to ground. Make sure you notice the units of the measurement. mV is not the same as V.
6. Do not close the fuse holder and connect the strings if a leakage to ground has been detected. Improper operation and damage to the inverter may result.

## 5.4.4 AC configuration

Verify AC configuration.

### 5.4.4.1 Measure VAC and frequency

Measure VAC and verify voltage is within local grid standards.

1. Measure each phase to ground (L-G).
2. Measure phases to the other phases in pairs (L-L). PH A to PH B, PH B to PH C and PH C to PH A.
3. If the meter is equipped, measure the frequency of each phase to ground.
4. Ensure each measurement is within local grid standards and the inverter specifications as noted in Section 9 "Specifications".

# 5. Commissioning

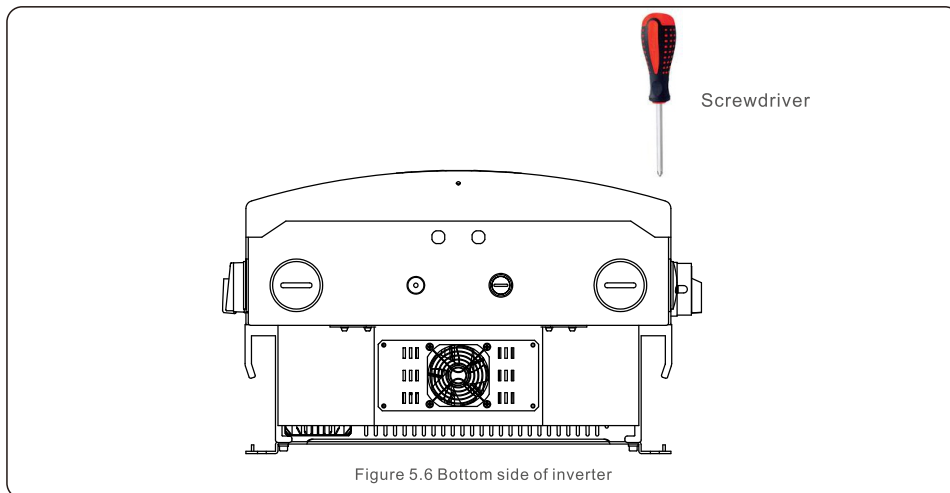
## 5.4.4.2 Phase rotation test

A phase rotation test is recommended to ensure the phases have been connected in the appropriate order. Solis inverters do not rely on specific phase rotation connections. However, the local utility may require a specific phase rotation or a record of the phase configuration of the installation.

## 5.4.5 AC Secure inverter wiring box

Close the inverter wiring box cover. Apply pressure to the cover to collapse the integrated gasket.

Tighten the 4 screws on the wiring box cover to the appropriate torque setting.



# 6. Normal operation

## 6.1 Start-up procedure

To start-up the inverter, it is mandatory that the steps below are followed in the exact order outlined.

1. Ensure the commissioning checks in Section 5 have been performed.
2. Switch the AC switch ON.
3. Switch the DC switch ON. If the PV array (DC) voltage is higher than the inverter's start-up voltage, the inverter will turn on. The red DC POWER LED and LCD will be continuously lit.
4. Solis inverters are powered from the DC side. When the inverter detects DC power that is within start-up and operating ranges, the inverter will turn on. After turn-on, the inverter will check internal parameters, sense and monitor AC voltage, hertz rate and the stability of the supply grid. During this period, the green OPERATION LED will flash and the LCD screen will show INITIALIZING. This tells the operator that the inverter is preparing to generate AC power.
5. After the locally mandated delay (300 seconds for IEEE-1547 compliant inverters), the inverter will start generating AC power. The green OPERATION LED will light continuously and the LCD screen will show GENERATING.



### CAUTION

The inverter's surface temperature can reach up to 75°C (167°F). To avoid risk of burns, do not touch the surface when the inverter is in the operational mode. Additionally, the inverter must be installed out of the reach of children.

## 6.2 Shutdown procedure

To stop the inverter, it is mandatory that the steps below are followed in the exact order outlined.

1. Switch AC switch OFF.
2. Wait approximately 30 seconds (during this time, the AC side capacitors are dissipating energy). If the inverter has DC voltage above the start-up threshold, the red POWER LED will be lit. Switch the DC switch OFF.
3. Confirm all LED's switch OFF (~one (1) minute).



### CAUTION

Although the inverter DC disconnect switch is in the OFF position and all the LED's are OFF, operators must wait five (5) minutes after the DC power source has been disconnected before opening the inverter cabinet. DC side capacitors can take up to five (5) minutes to dissipate all stored energy.

# 6. Normal operation

During normal operation, the LCD shows the inverter's current status. The screen will display current power generation, total generation, a bar chart showing AC power generation over time, etc. Press the button labeled ESC to switch from the "home dashboard" (i.e., the initial interface for owners and operators) to other screens showing details of daily and monthly generation. Press the ENTER button to switch to the Main Menu. Pressing the ESC button will always return to the previous screen. See Figure 6.1 for an operational flow overview.

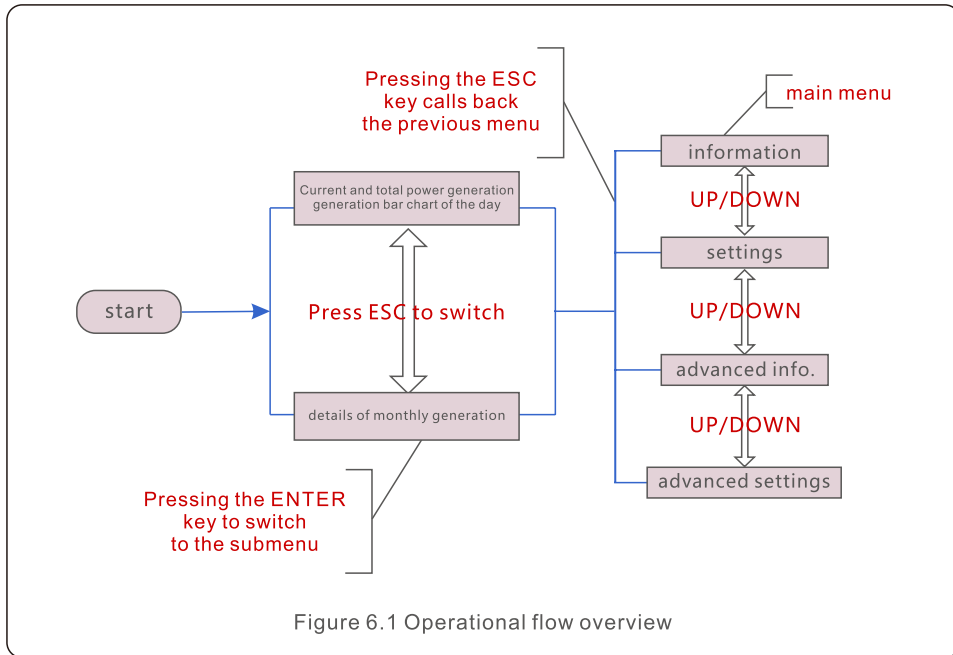


Figure 6.1 Operational flow overview

## 6.3 7" LCD front panel display interface

The initial interface of the inverter (see Figure 6.2) shows the current operational status, current power, the day/month/year power generation, and total generation. Looking at the bar chart, owners and operators can view AC generation information over time.

# 6. Normal operation

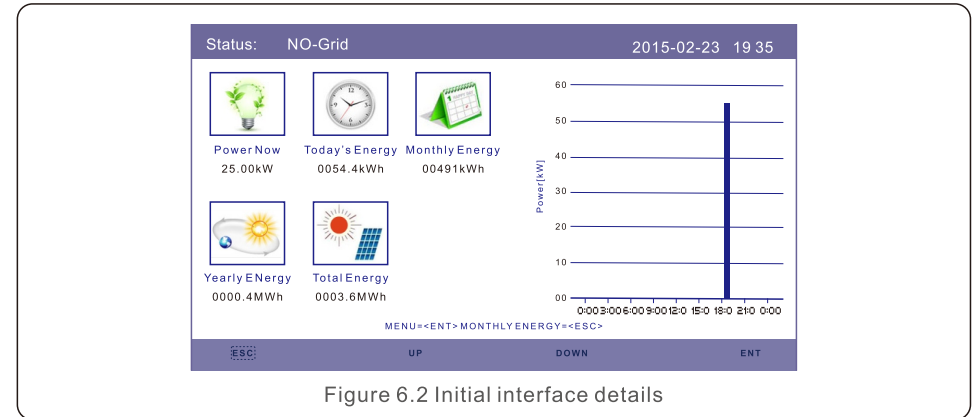


Figure 6.2 Initial interface details

Press the UP or DOWN key to display the inverter yearly/monthly energy detail screen (see Figure 6.3). In the current interface, press the ENTER key to move the cursor, press the UP or DOWN key to view yearly/monthly energy detail.

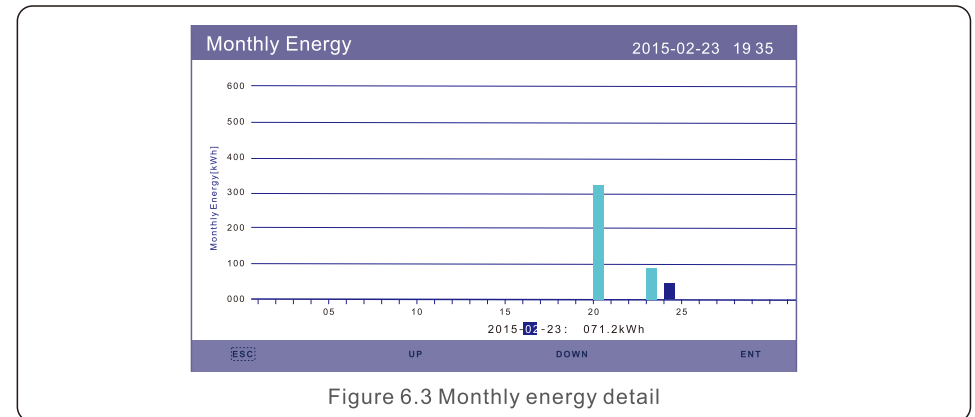


Figure 6.3 Monthly energy detail

# 6. Normal operation

## 6.3.1 Main menu

There are four sub-menus in the main menu as shown in Figure 6.4. Press ESC from the home screen to access this menu.

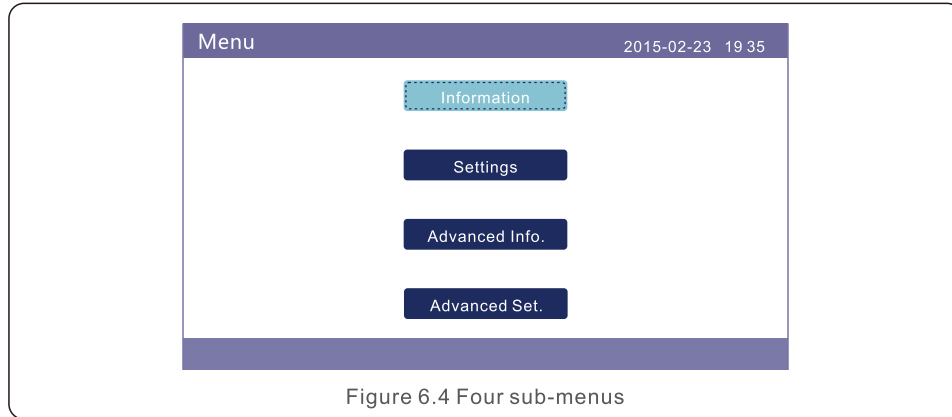


Figure 6.4 Four sub-menus

## 6.4 Sub-menu “Information”

The inverter LCD provides access to operational data and information (see Figures 6.5 and 6.6). Select the "Information" sub-menu. Move to the next page by scrolling UP or DOWN.

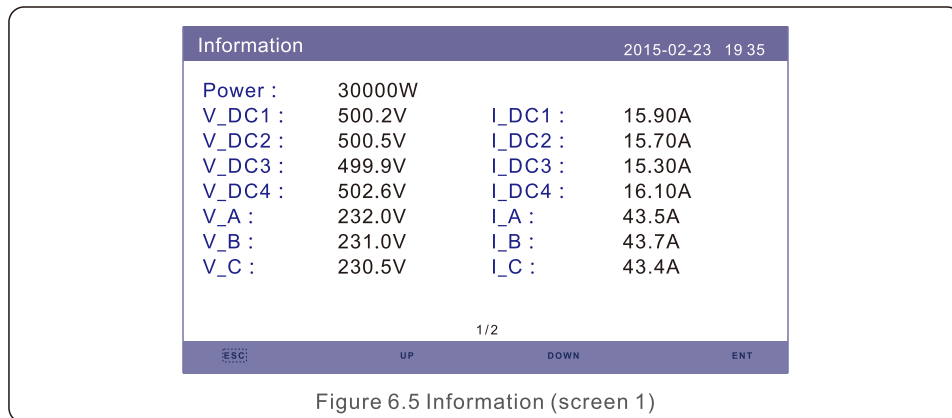


Figure 6.5 Information (screen 1)

# 6. Normal operation

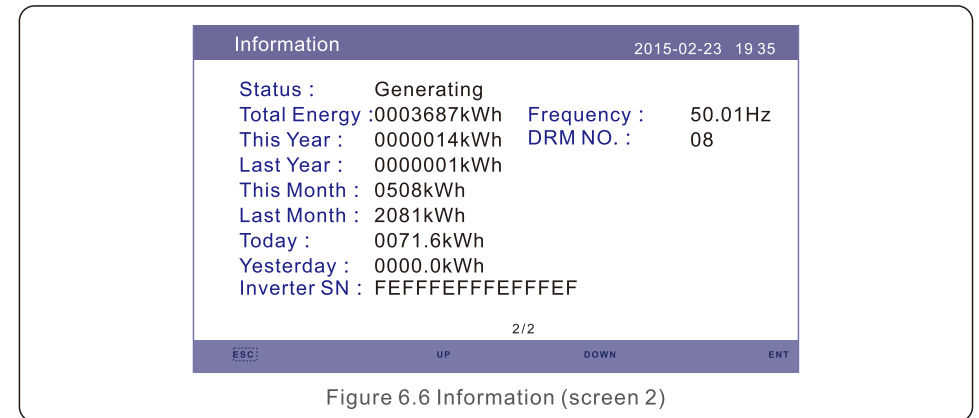


Figure 6.6 Information (screen 2)

## 6.5 Sub-Menu “Settings”

Figure 6.7 shows the interface as it is displayed when the Settings menu is selected. Press the UP or DOWN key to select different options, and press the ENTER key to enter the submenu.

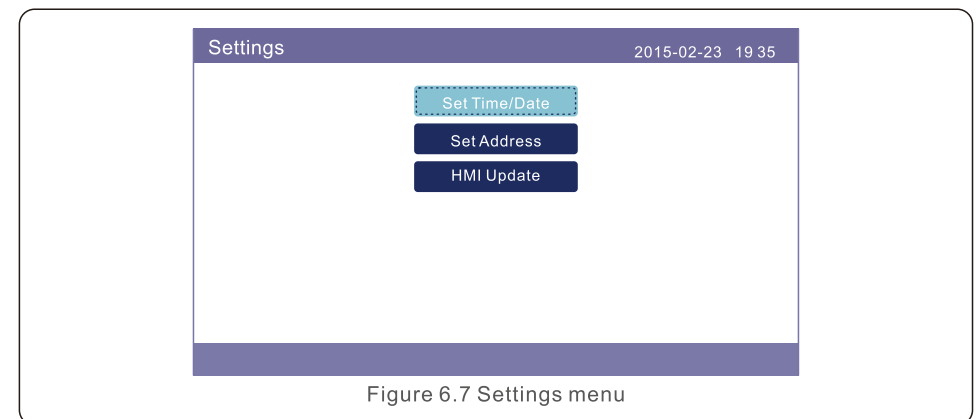
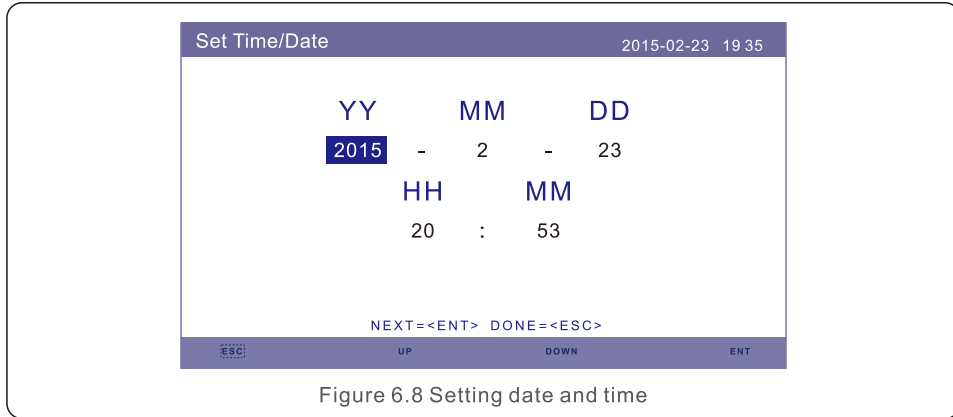


Figure 6.7 Settings menu

# 6. Normal operation

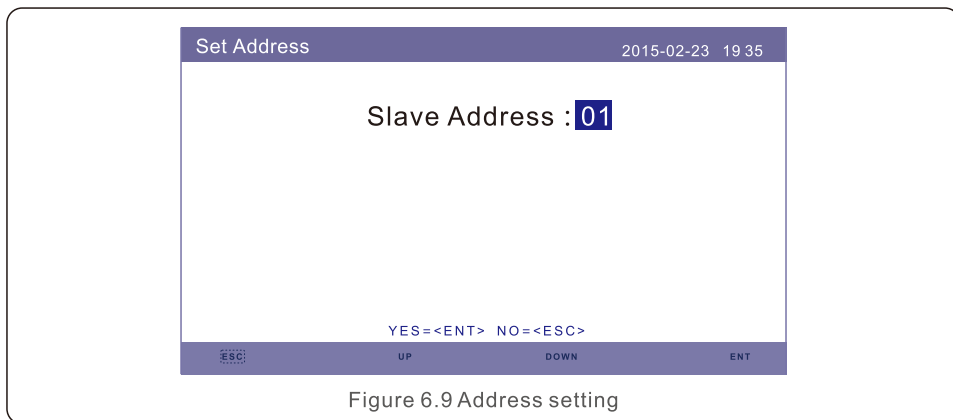
## 6.5.1 Setting time

This function allows time and date setting. The time is displayed as a 24-hour clock. When this function is selected, the LCD will display as shown in Figure 6.8. Press the UP or DOWN key to set time and date. Press the ENTER key to move from one option to the next (from left to right). Press the ESC key to save the settings and return to the previous menu.



## 6.5.2 Setting inverter address for communications

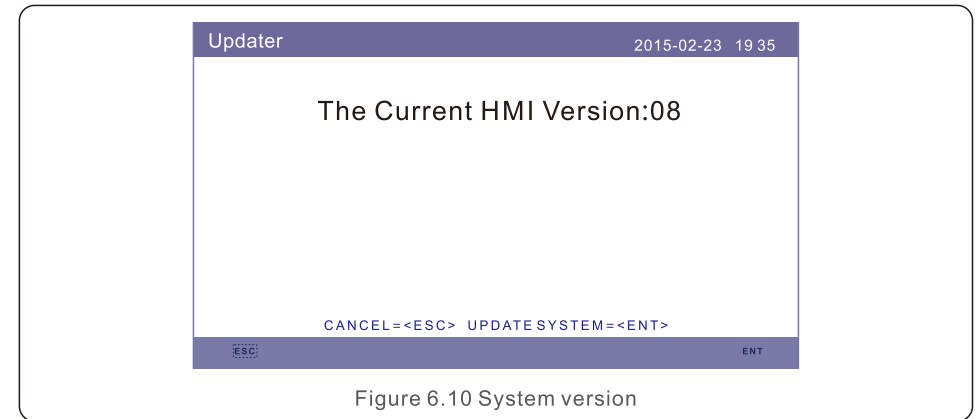
This function is used to set the address of an inverter for communication purposes. The address can be assigned from "01" to "99" (see Figure 6.9). The default address of the inverter is "01". Press the UP or DOWN key to set the address. Press the ENTER key to save the settings. Press the ESC key to cancel the change and return to the previous menu.



# 6. Normal operation

## 6.5.3 Current system version

This function is used to view the current system version. See Figure 6.10.



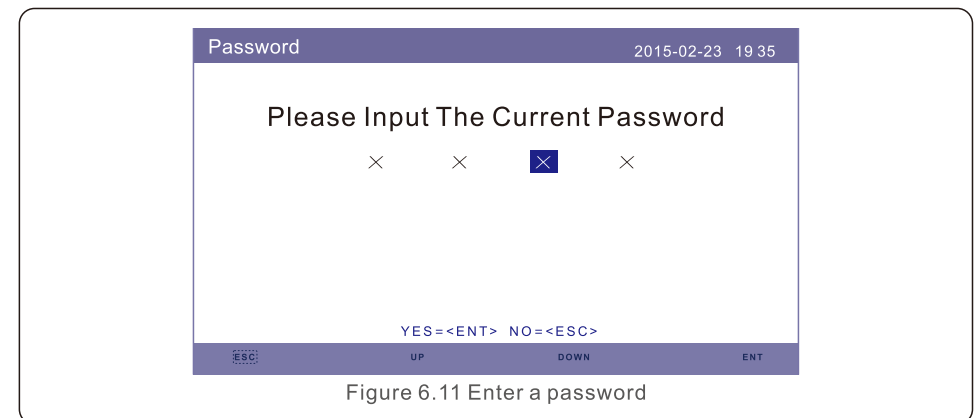
## 6.6 Sub-menu "Advanced Info" – Technicians only



### NOTE

Password required – restricted access – authorized technicians only. Unauthorized access will void the warranty

Select Advanced Info from the main menu. The LCD screen will show that a password is required, as shown in Figure 6.11. The default password is "0010", press the DOWN key to move cursor, press the UP key to change the digit. Press ENTER to accept the password.



# 6. Normal operation

After entering the correct password, the LCD will show the menu shown in Figure 6.12.

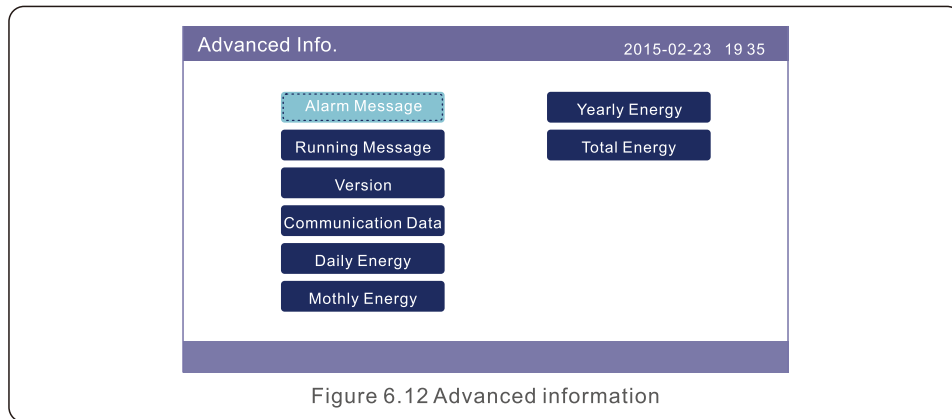


Figure 6.12 Advanced information

The screen can be scrolled manually by pressing the UP or DOWN key. Pressing the ENTER key gives access to a submenu.

## 6.6.1 Alarm Message

The display shows the last ten (10) or less alarm messages (see Figure 6.13). Screens can be scrolled manually by pressing the UP or DOWN key.

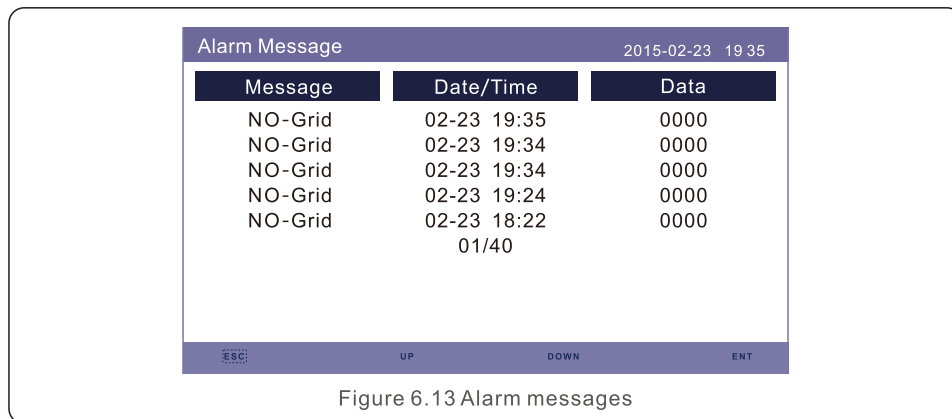


Figure 6.13 Alarm messages

# 6. Normal operation

## 6.6.2 Running Message

The screen shows the inverter's internal operational parameters (see Figure 6.14).

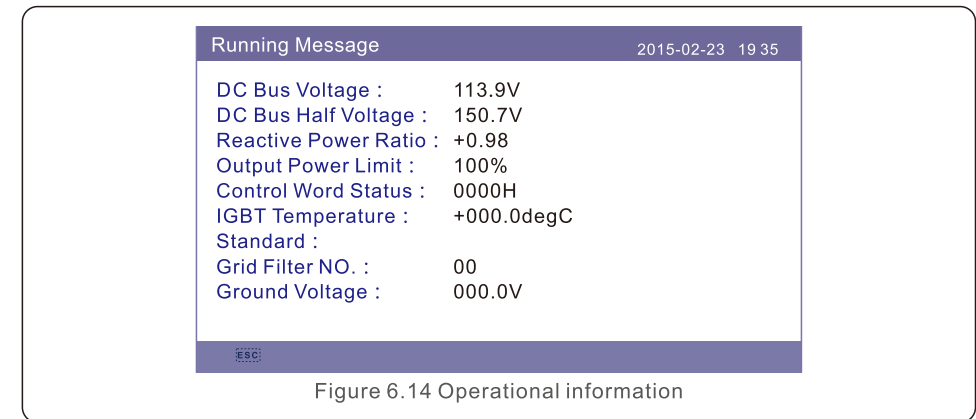


Figure 6.14 Operational information

## 6.6.3 Version

The screen shows the inverter's current hardware and software versions (see Figure 6.15).

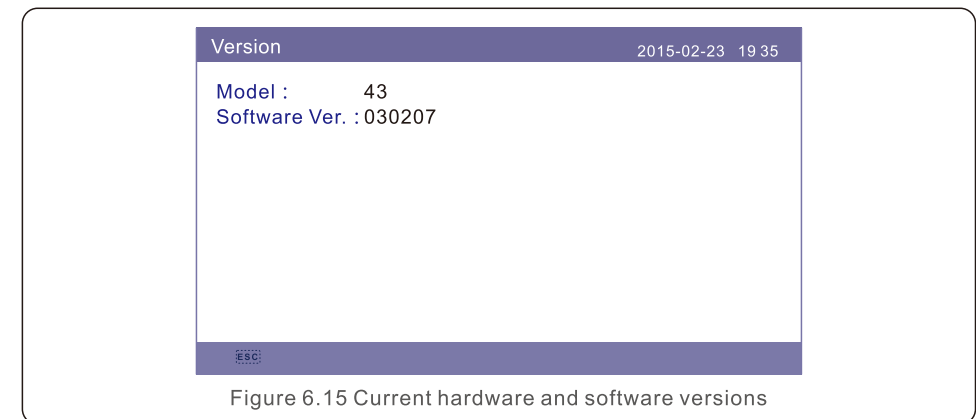


Figure 6.15 Current hardware and software versions

# 6. Normal operation

## 6.6.4 Communication Data

The screen shows the inverter's internal communication data (see Figure 6.16), which is for service technicians only.

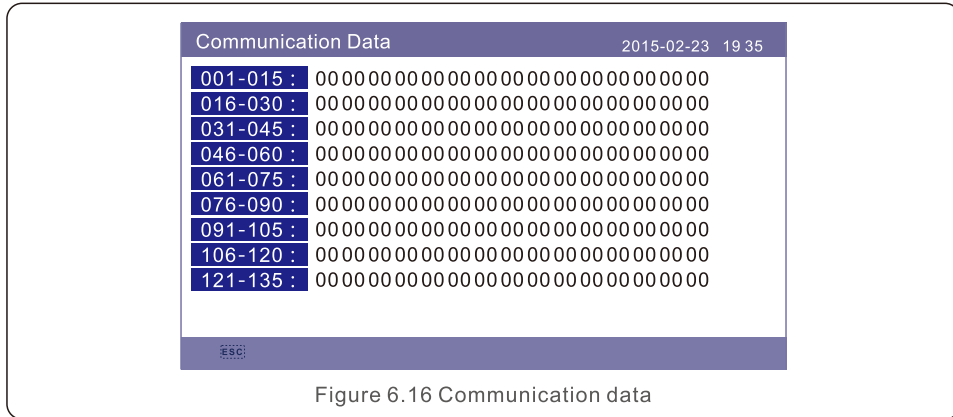


Figure 6.16 Communication data

## 6.6.5 Daily Energy

The screen shows the inverter's daily energy detail (see Figure 6.17). Press the ENTER key to move cursor or press the UP or DOWN key to select energy data for a different date.

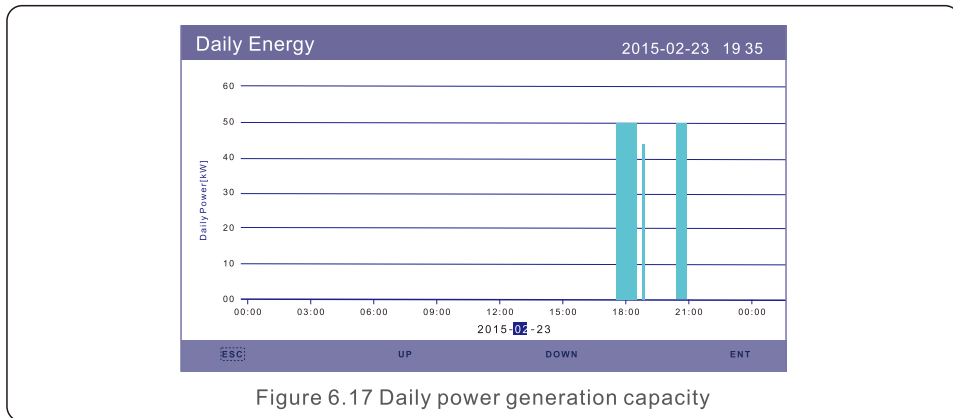


Figure 6.17 Daily power generation capacity

# 6. Normal operation

## 6.6.6 Monthly Energy

The screen shows the inverter's daily energy detail for the month (see Figure 6.18). Press the ENTER key to move cursor, and press the UP or DOWN key to select energy details for a different month.

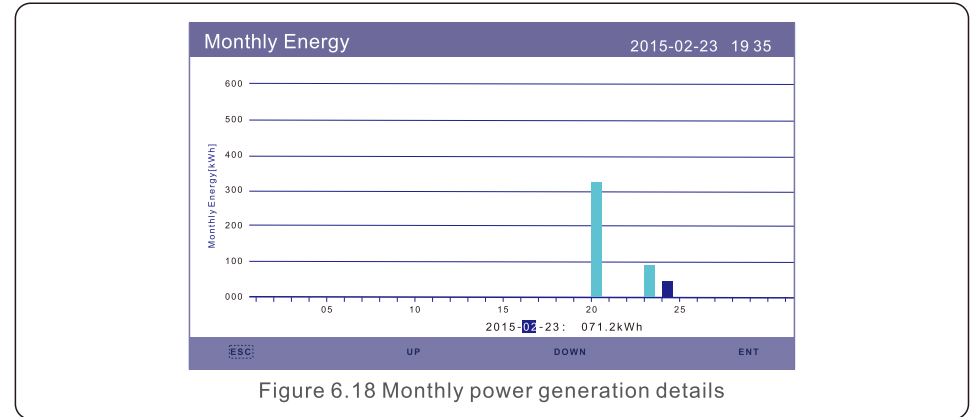


Figure 6.18 Monthly power generation details

## 6.6.7 Yearly Energy

The screen shows the inverter's monthly energy detail for the year (see Figure 6.19). Press the UP or DOWN key to switch to view monthly energy of a different year.

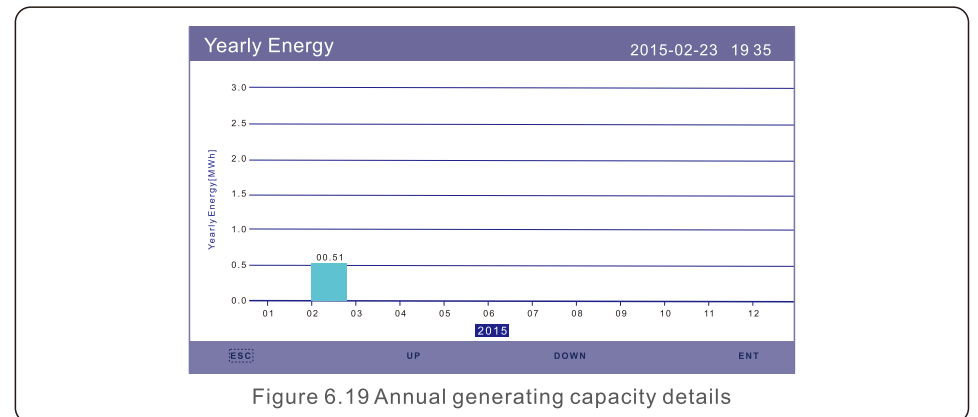
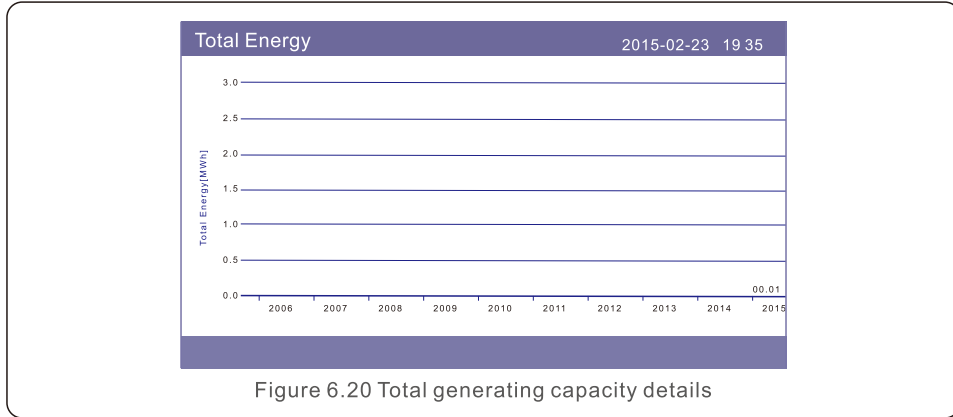


Figure 6.19 Annual generating capacity details

# 6. Normal operation

## 6.6.8 Total Energy

The screen shows the inverter total energy (lifetime) detail (see Figure 6.20).



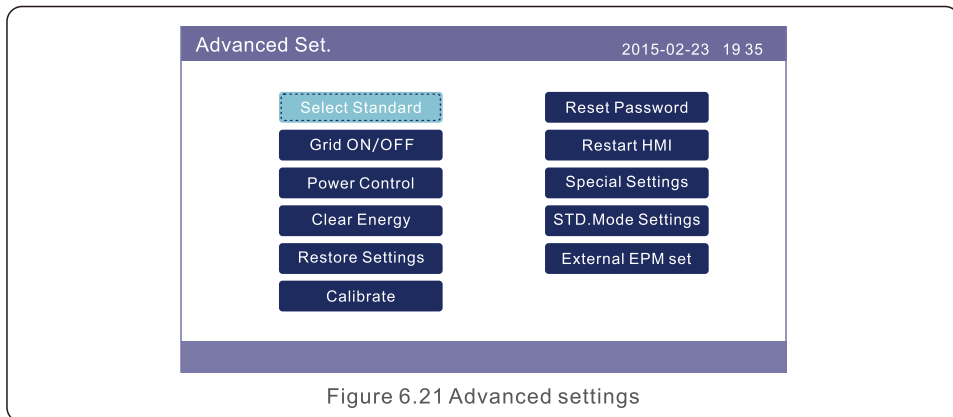
## 6.7 Sub-menu “Advanced Settings” – Technicians only



### 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 will void the warranty.

Select Advanced Settings from the main menu (see Figure 6.21) to access the following options. Enter password as described in Section 6.6.



# 6. Normal operation

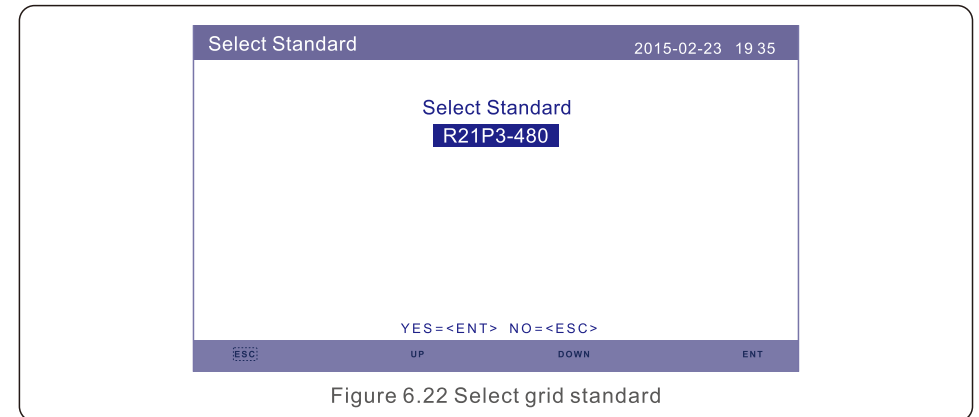
## 6.7.1 Select Standard



### NOTE

This is for service technicians only. The inverter is customized according to the local standard before shipping. There should be no requirement to set the standard. The "User-Def" function can be only used by the service engineer, and changing the protection level must be approved by the local grid company.

Select grid standard (see Figure 6.22).



Press the UP or DOWN key to select the standard (AS4777, VDE4105, R21P3-480, G59/3, CQC, User-Def function, etc.). Press the ENTER key to confirm the setting. Press the ESC key to cancel changes and return to the previous menu.

Rule 21 uses the standard R21P3-480 for applications not requiring arc fault and R21P3-480-A for applications requiring arc fault protection.

Standard UL-480 and UL-480-A are used where Rule 21 is not required.

Selecting the User-Def sub menu will access to the following sub menu (see Figure 6.23). The User-Def screen shows the parameters that can be adjusted for local grid conditions (see Figure 6.23). This section is for service technicians only.



# 6. Normal operation

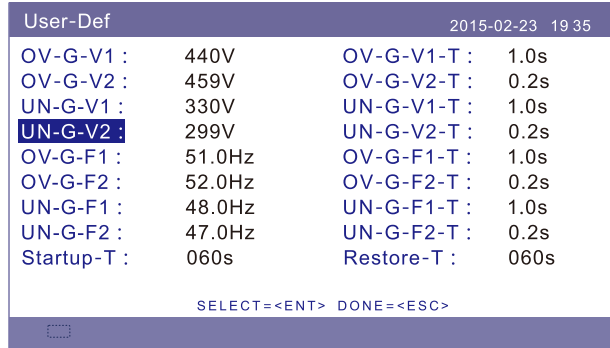


Figure 6.23 User-Def selections

Below is the range for each setting for use in the User-Def function. You may change the limit manually thus creating a custom grid profile by using this function.

OV-G-V1: 236---335V	OV-G-F1: 60.2-63Hz
OV-G-V1-T: 0.1---9S	OV-G-F1-T: 0.1---9S
OV-G-V2: 248---341V	OV-G-F2: 61-63Hz
OV-G-V2-T: 0.1---1S	OV-G-F2-T: 0.1---9S
UN-G-V1: 173---236V	UN-G-F1: 57-59.5Hz
UN-G-V1-T: 0.1---9S	UN-G-F1-T: 0.1---9S
UN-G-V2: 132---219V	UN-G-F2: 57-59Hz
UN-G-V2-T: 0.1---1S	UN-G-F2-T: 0.1---9S

Table 6.1 Setting ranges for User-Def

# 6. Normal operation

Setting value	480V Rated (L-L)	480V Rated (L-N)
Vup-Limit1	528<V<576	305<V<333
Time1	1S	1S
Vup-Limit2	V≥576	V≥333
Time2	0.16S	0.16S
Vdw-Limit1	288≤V<422	166≤V<244
Time1	2S	2S
Vdw-Limit2	V<288	V<166
Time2	0.16S	0.16S
Fup-Limit1	60.5Hz < F < 62Hz	60.5Hz < F < 62Hz
Time1	2S	2S
Fup-Limit2	F > 62Hz	F > 62Hz
Time2	0.16S	0.16S
Fdw-Limit1	57Hz < F < 59.5Hz	57Hz < F < 59.5Hz
Time1	2S	2S
Fdw-Limit2	57Hz < F	57Hz < F
Time2	0.16S	0.16S

Table 6.2 Baseline Inverter Settings



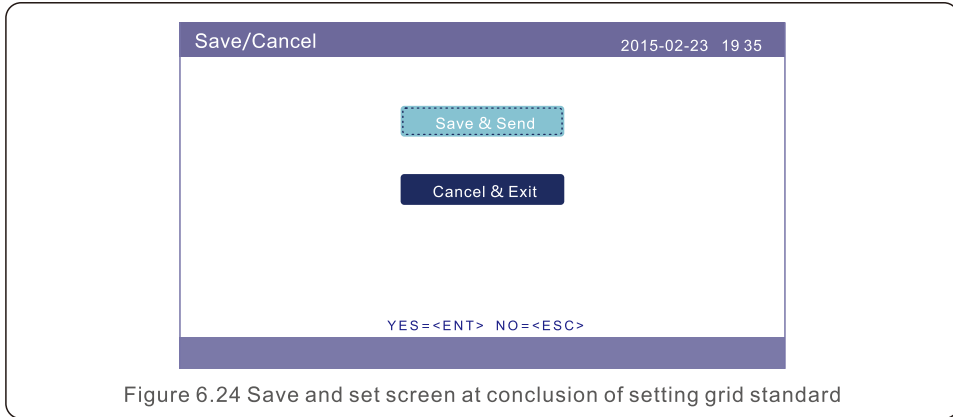
**NOTE**

The initial value of the User-Def standard is for reference only. It does not represent a correct value suitable for use.

Press the UP or DOWN key to scroll through items. Press the ENTER key to edit the highlighted item. Press the UP or DOWN key again to change the setting. Press the ENTER key to save the setting (see Figure 6.27). Press the ESC key to cancel the change and return to the previous menu.

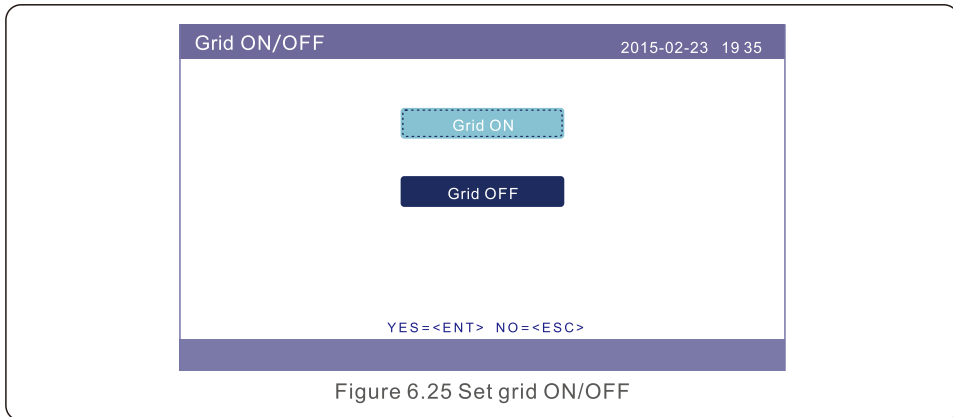
# 6. Normal operation

When changes are complete, select ENTER. The following screen appears. Select "SAVE & SEND" to write the custom grid settings to memory and begin using them.



## 6.7.2 Grid ON/OFF

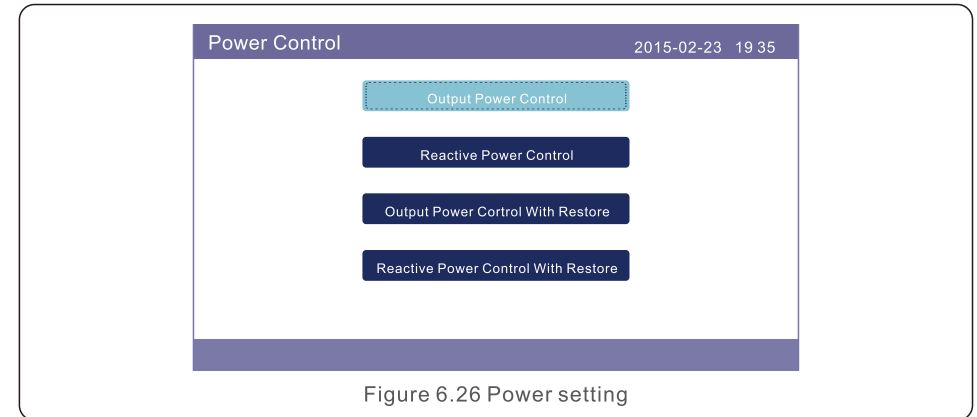
This function is used to start or stop the inverter from generating power (see Figure 6.25). This function may be used to manually disable an inverter during maintenance without turning off the AC switch. Press the UP or DOWN key to move the cursor. Press the ENTER key to execute the setting. Press the ESC key to return to the previous menu.




# 6. Normal operation

## 6.7.3 Power Control


Active and reactive power can be set through the Power Control option (see Figure 6.26).



 **NOTE** This function should be accessed by qualified maintenance personnel only. The inverter operating in the wrong power setting will prevent the inverter from reaching maximum power.

## 6.7.4 Clear Energy and Restore Settings

Clear Energy will reset the inverter's yield. Restore Settings will reset all the settings to factory default.

 **NOTE** These two functions should be accessed by qualified maintenance personnel only. Operating the inverter with the wrong settings will prevent the inverter from working properly.

## 6.7.5 Calibrate

Warranty or maintenance may result in resetting total generating data. This function allows maintenance personnel to amend the total generating data of the replacement inverter to the original one (see Figure 6.27). By using our data monitoring hardware, the data on the monitoring website can automatically synchronize with the preset total generating power of the inverter.

# 6. Normal operation

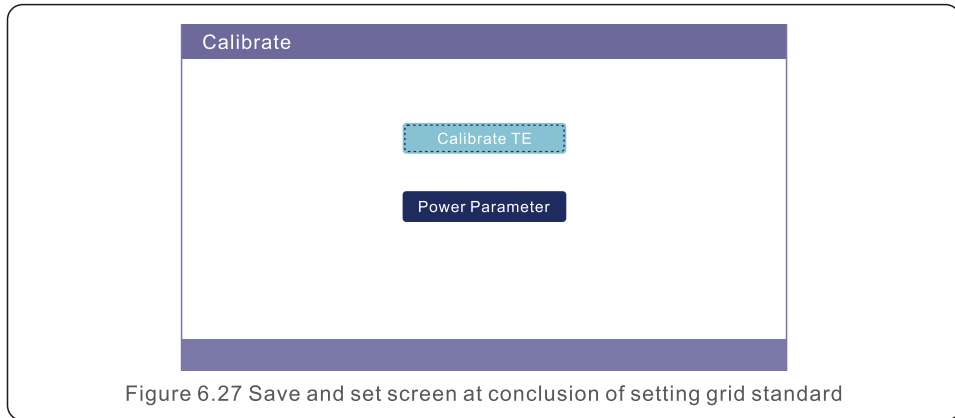


Figure 6.27 Save and set screen at conclusion of setting grid standard

Press the DOWN key to move the cursor. Press the UP key to revise the value. Press the ENTER key to execute the setting. Press the ESC key to return to the previous menu.

## 6.7.6 Reset Password

First enter the current password (see Figure 6.28), by pressing the DOWN key to move the cursor, and press the UP key to revise the digit.

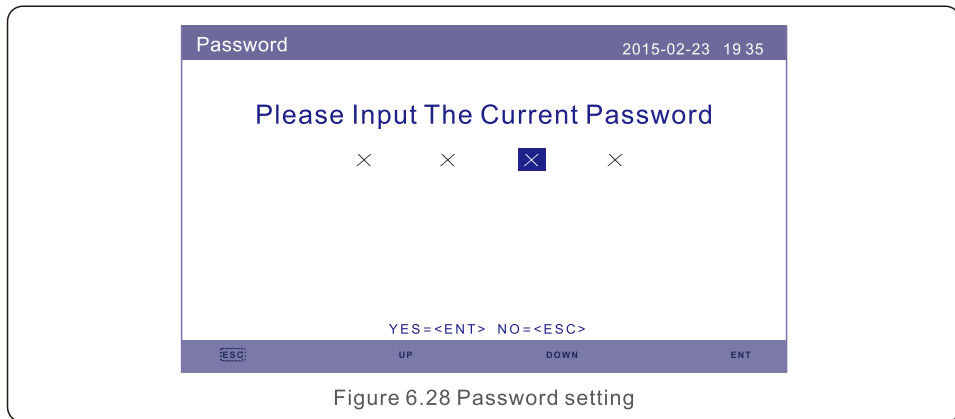


Figure 6.28 Password setting

# 6. Normal operation

After entering the current password, you can create a new password. Upon confirming the new password, press the ENTER key to execute the new setting (see Figure 6.29).

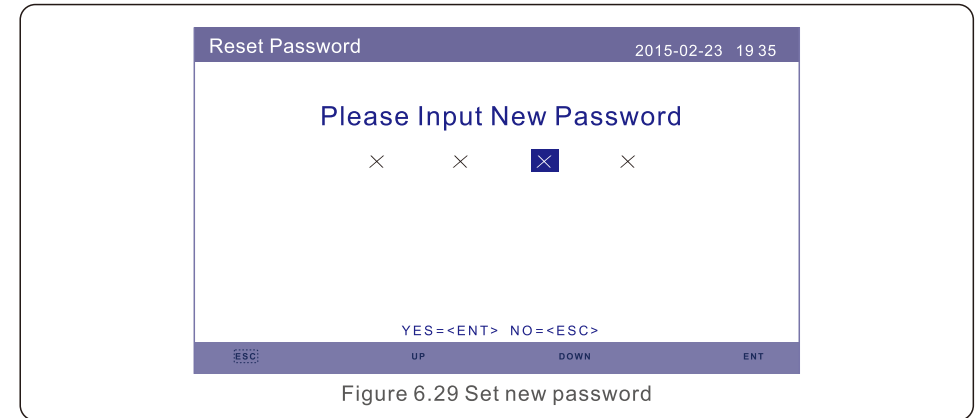
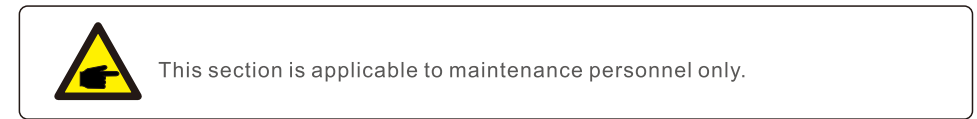


Figure 6.29 Set new password

## 6.7.7 Restart HMI

The function reboots the HMI and LCD display.

## 6.7.8 Special Settings



There are 4 items in special settings submenu.

- 1. Special\_1 Set
- 2. LVRT Control
- 3. IgZero Set
- 4. VgCompensation

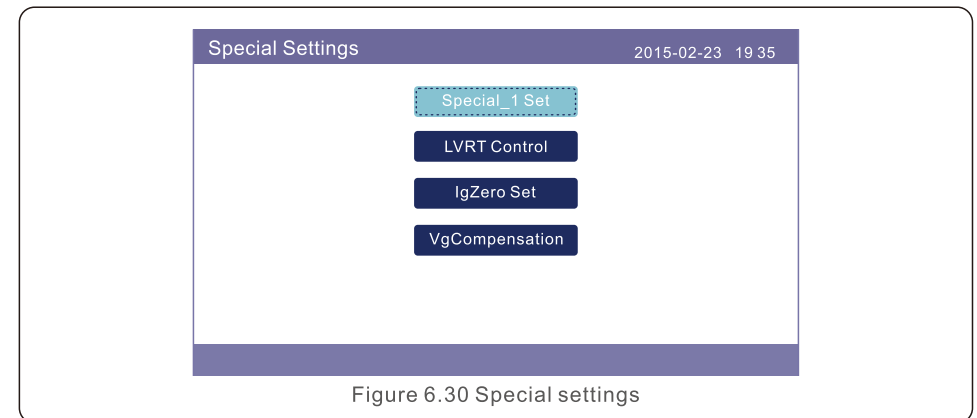


Figure 6.30 Special settings

# 6. Normal operation

## 6.7.8.1 Special\_1 Set

There are 10 items in special\_1 Set submenu.

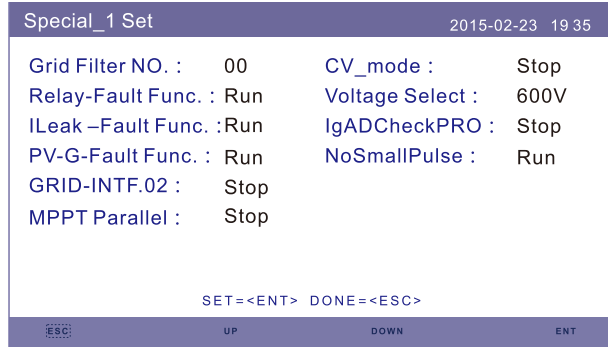


Figure 6.31 Special\_1 set

### 6.7.8.1.1 Grid Filter No.

Press the ENTER to show the submenu of Grid Filter Set.

Press the UP/DOWN key to select the value.

Press the ENTER key to save the setting and return to the previous menu.



This function is applicable by maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

### 6.7.8.1.2 Relay-Fault Func



This function is applicable by maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

### 6.7.8.1.3 ILeak-Fault Func



This function is applicable by maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

### 6.7.8.1.4 PV-G-Fault Func



This function is applicable by maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

# 6. Normal operation

## 6.7.8.1.5 GRID-INTF.02



This function is applicable by maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

## 6.7.8.1.6 MPPT Parallel

This is used for parallel strings into different inverters MPPTs.

Press Enter and press up or down to change the settings.

Selecting RUN will enable parallel strings setup. All MPPT channels will operate in parallel.

Selecting STOP disables parallel string setup. All MPPT channels will operate independently.



This function is applicable by maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

## 6.7.8.1.7 CV\_mode

Selecting RUN will enable fixed input voltage. The inverter will not operate if the input voltage is lower than the set voltage.

Selecting STOP will disable this function.



This function is applicable by maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

## 6.7.8.1.8 Voltage Select

Select the value of fixed input voltage. And the increment is 10V.



This function is applicable by maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

## 6.7.8.1.9 IgADCheckPRO



This function is applicable by maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

## 6.7.8.1.10 NoSmallPulse



This function is applicable by maintenance personnel only.

# 6. Normal operation

## 6.7.8.2 LVRT Control

There are 5 items in LVRT Control submenu.

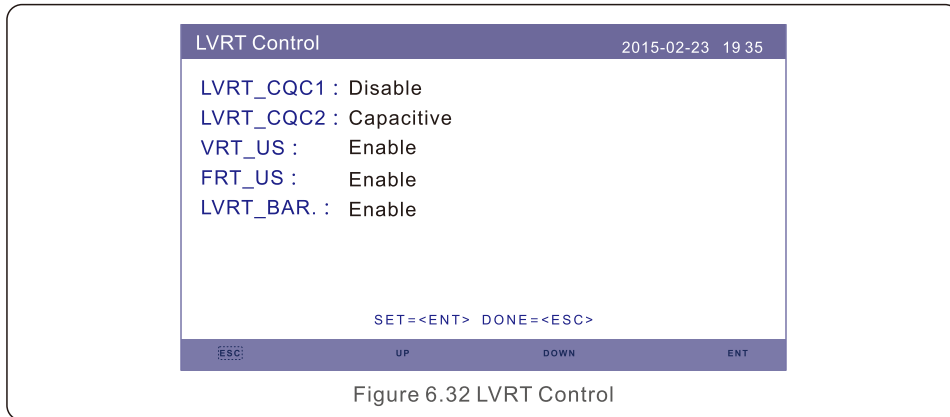


Figure 6.32 LVRT Control

Items 1, 2, and 5 are not used for the US, the function VRT\_US (voltage ride through) and FRT\_US (frequency ride through) operation are used for UL1741SA. Selecting the setting to Enable will enable the inverter grid protection limits in accordance with UL1741SA requirements. Selecting Disable will reset the inverter to IEEE 1547 requirements.

## 6.7.8.3 IgZero Set

This function is used for DSP adjustment settings which involves current compensation, leakage current limitation, insulation resistance limitation, etc. There are 6 items in IgZero Set submenu.

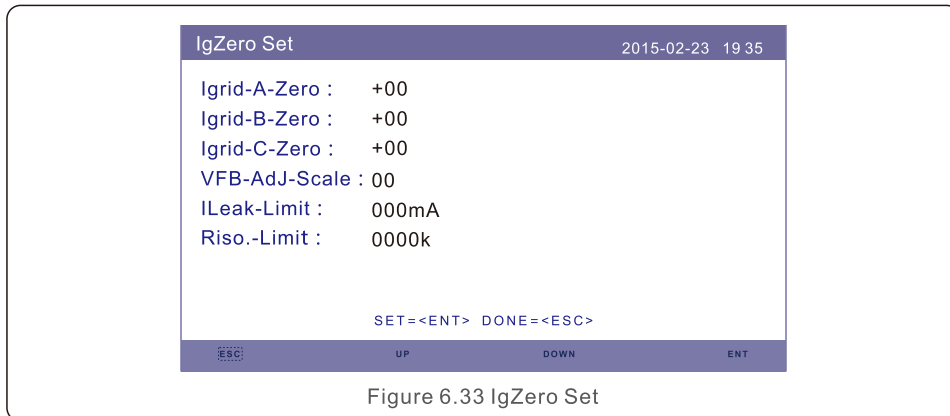


Figure 6.33 IgZero Set

# 6. Normal operation

## 6.7.8.4 VgCompensation

This function is used to calibrate inverter output voltage. There are 3 items in VgCompensation submenu.

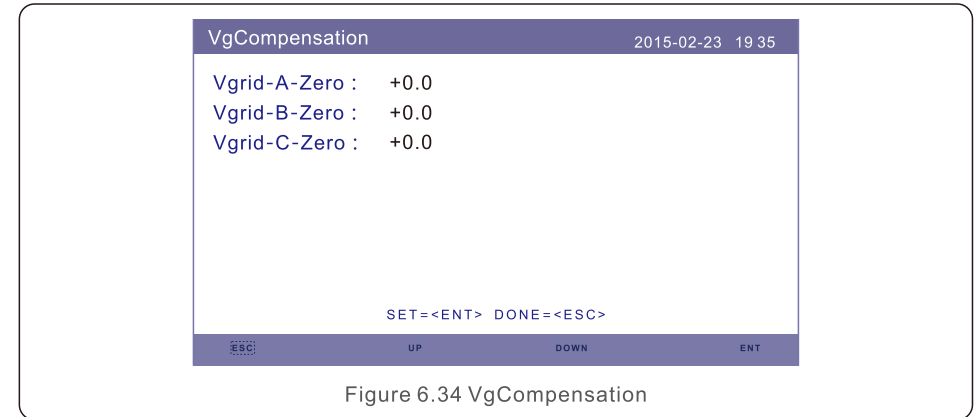


Figure 6.34 VgCompensation

## 6.7.9 STD. Mode Settings

There are 6 items in the STD. mode settings submenu.

1. Working Mode Set
2. Power Rate Limit
3. Freq Derate Set
4. 10mins Voltage Set
5. Voltage PCC Set
6. Initial Settings

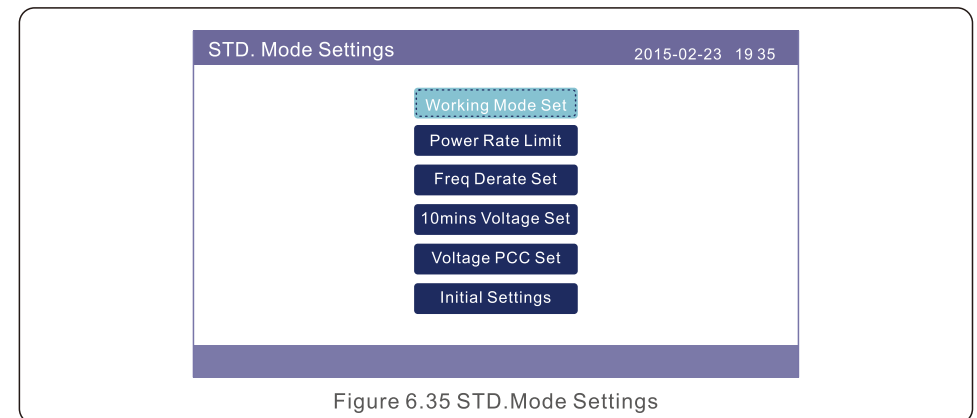


Figure 6.35 STD. Mode Settings

# 6. Normal operation

## 6.7.9.1 Working Mode Set

There are TWO situations with different grid standards selected.

### 6.7.9.1.1 With UL Standard selected



**NOTE**

The following modes are for "UL-480V", "UL-480V-A".

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.



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.

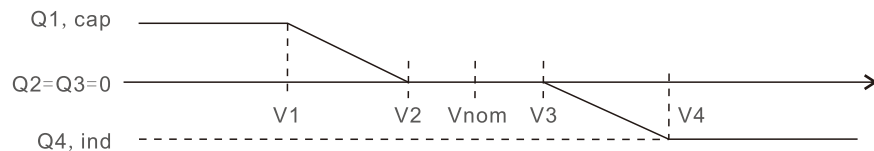


Figure 6.24 Volt-Var curve for Q (V)

# 6. Normal operation

Default Settings for UL1741SA:

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

Rated 480V Grid

V1:(221-279V) Default 242V    V2: (221-279V) Default 273V

V3:(277-320V) Default 281V    V4: (277-320V) Default 305V

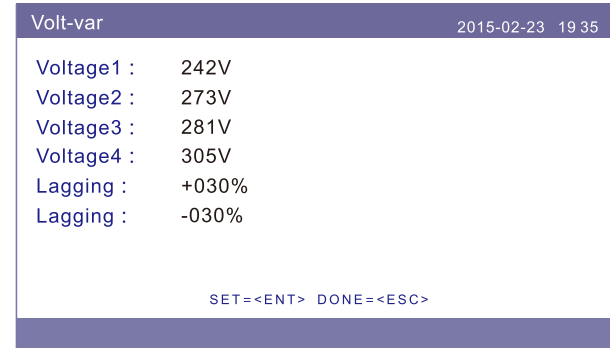


Figure 6.34 Volt-var

#### 4.Fixed-PF

Description: Inverter will output power with fixed power factor.

Setting Range: -0.8 to +0.8

Default value is PF = 1

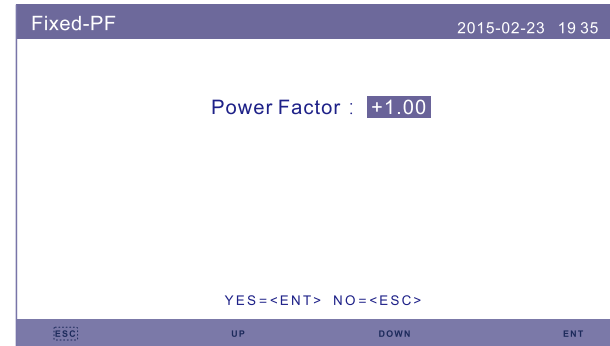


Figure 6.34 Fixed-PF

# 6. Normal operation

## 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.



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.



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.

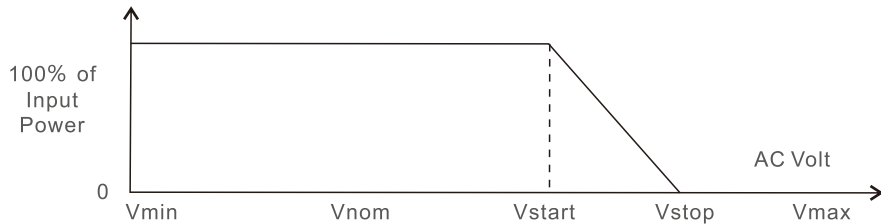


Figure 6.28 Volt-Watt characteristic

Default Settings for UL1741SA:

Rated 480V Grid

V1: less than V2

V2: less than Vstart

V3 (Vstart): (277-333V) Default 305V

V4 (Vstop): (305-360V) Default 333V

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

# 6. Normal operation

VgWatt-UL		2015-02-23 19:35
Voltage1 :	242V	
P-Limit1 :	100%	
Voltage2 :	273V	
P-Limit2 :	100%	
Voltage3 :	305V	
P-Limit3 :	100%	
Voltage4 :	333V	
P-Limit4 :	000%	
SET=<ENT> DONE=<ESC>		

Figure 6.34 VgWatt-UL

## 6.7.9.1.2 With Rule21 Standard selected



### NOTE

The following modes are for "R21P3-480", "R21P3-48A".

Solis US version inverters have Ten working modes:

1. Null
2. Volt-watt
3. Volt-Var
4. Fixed-PF
5. Reac-power
6. P-factor
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.

# 6. Normal operation

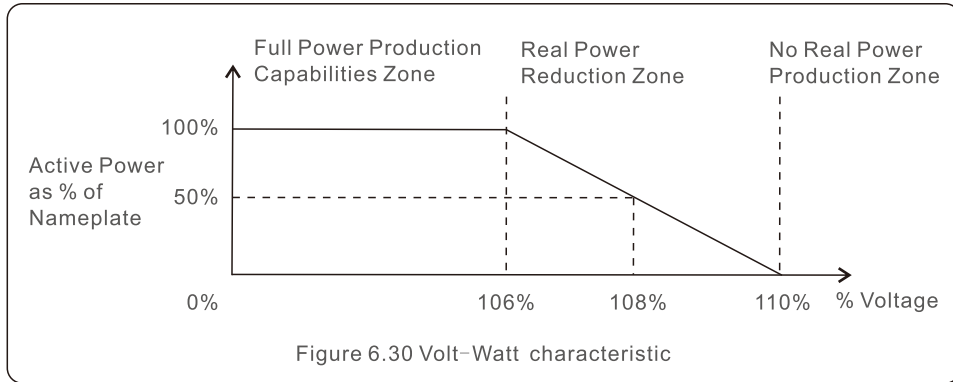
## 1. Null (Mode Reset)

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.



Default Settings for Rule21 Standards:

Rated 480V Grid

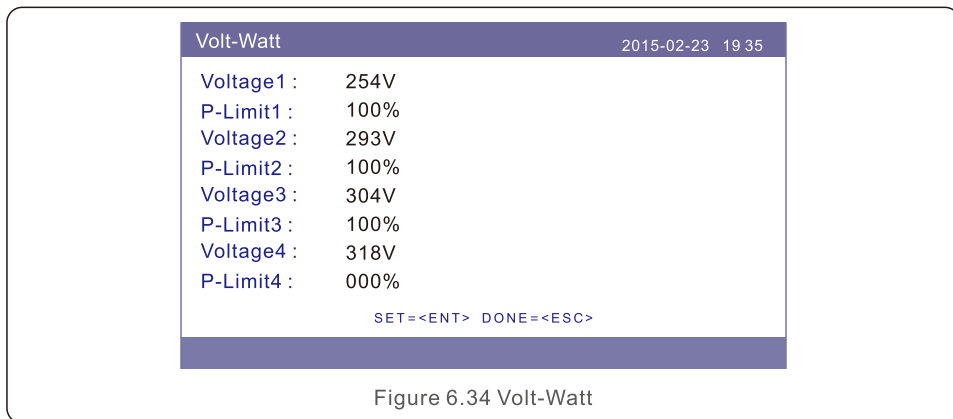
V1: less than Vstart

V2 (Vstart): (221-304V) Default 293V

V3 (Vstop): (277-332V) Default 304V

V4: larger than Vstop

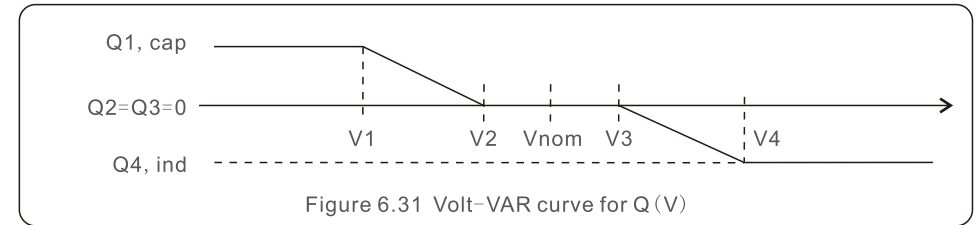
P1:100% P2:100% P3:0% P4:0%



# 6. Normal operation

## 3. Volt-Var

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



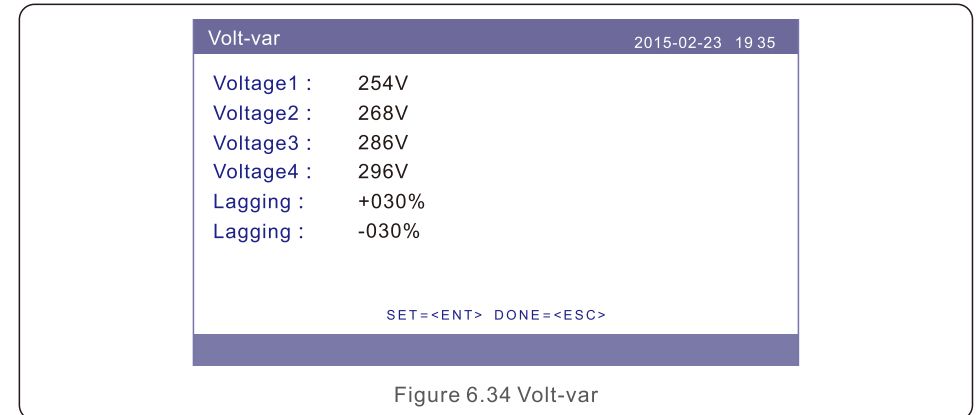
Default Settings for Rule21 Standard:

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

Rated 480V Grid

V1:(221-277V) Default 254V V2: (221-304V) Default 268V

V3:(277-332V) Default 286V V4: (277-332V) Default 296V





# 6. Normal operation

## 4.Fixed-PF

Description: Inverter will output power with fixed power factor.

Setting Range: -0.8 to +0.8

Default value is PF = 1

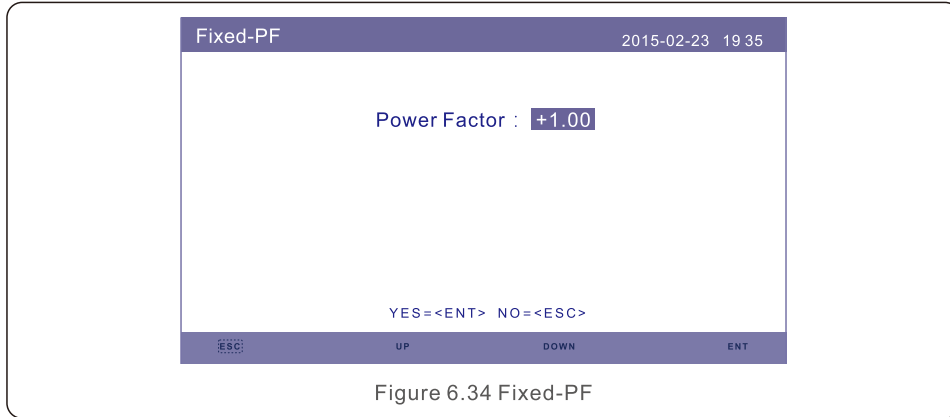


Figure 6.34 Fixed-PF

## 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.



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.



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

# 6. Normal operation

## 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.



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.

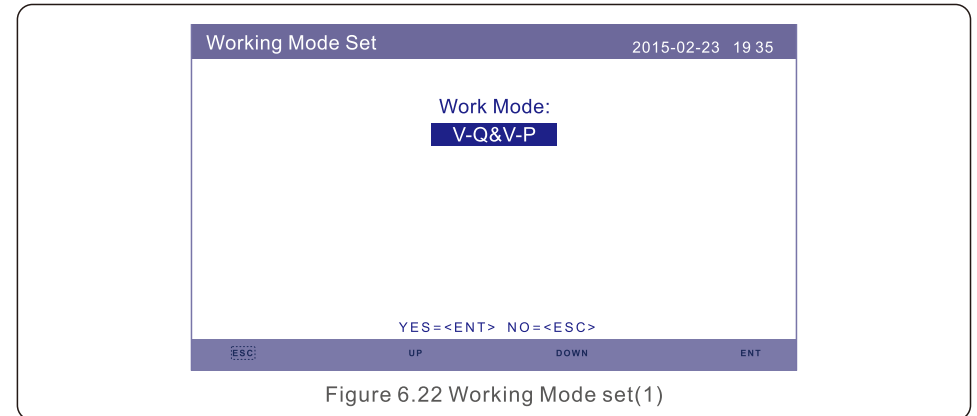


Figure 6.22 Working Mode set(1)

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.

# 6. Normal operation

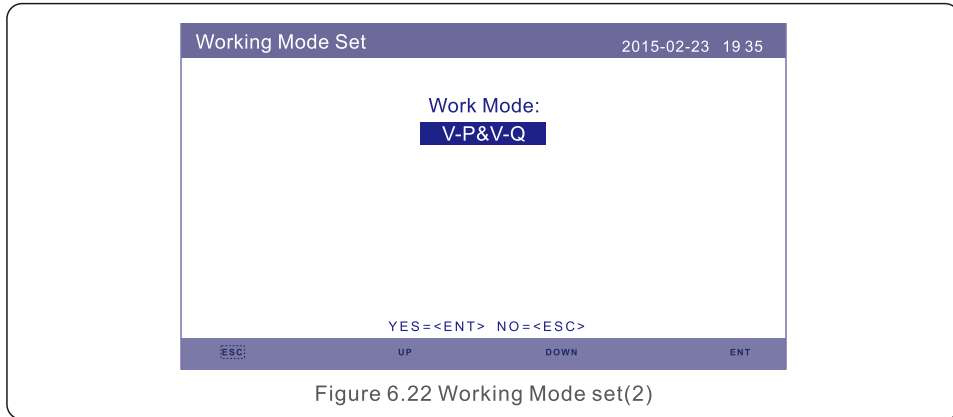


Figure 6.22 Working Mode set(2)

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

### 6.7.9.2 Power Rate Limit

This function is used for change power Ramp-up rate. When inverters start up or input string MPPT changes, Inverter power ramp-up rate is limited in this menu.

The setting range from 5% to 600%, means inverter power change rate per minute.

Values are not allowed to change. If they are set, they may not conform to the UL 1741 SA standard.

# 6. Normal operation

### 6.7.9.3 Freq Derate Set

Mode 04 is used for UL 1741 SA frequency derating setting.

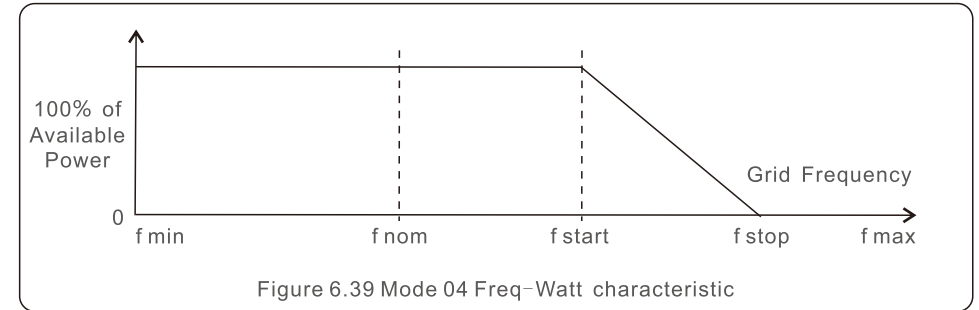


Figure 6.39 Mode 04 Freq-Watt characteristic

Over frequency load shedding F start range 59.936~60.036Hz, default setting 60.036Hz.

Descending rate: 5%Pn/0.1Hz.

F stop can set the range: 61-64Hz default setting 62Hz. Recovery rate: 5%Pn/0.1Hz.

Mode 08 is used for Rule21 Freq-Watt setting.

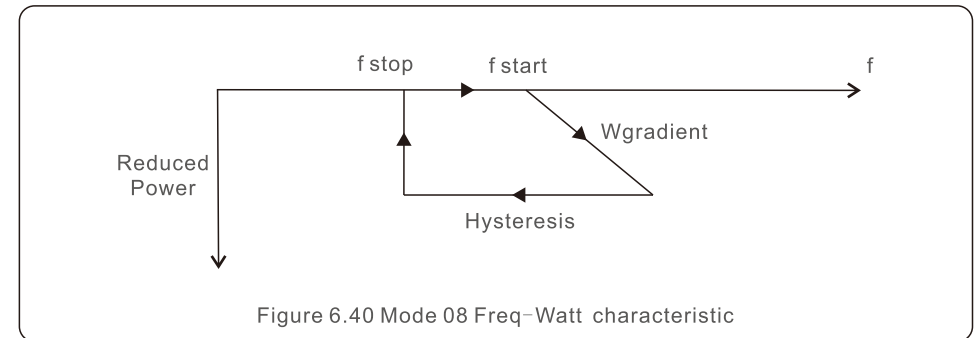


Figure 6.40 Mode 08 Freq-Watt characteristic

Start Freq: This is the frequency that active power reduction starts.

WGradient: This is the active power reduction rate in terms of the frequency.

Stop Freq: This is the frequency that stops the correction cycle.

Hysteresis: This indicates whether hysteresis is enabled.



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

# 6. Normal operation

## 6.7.9.4 10mins Voltage Set

This function is disabled and not used for the US.



This function is applicable by maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

## 6.7.9.5 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.



This function is applicable by maintenance personnel only, wrong operation will prevent the inverter from reaching maximum power.

## 6.7.9.6 Initial Settings

In initial settings it will reset each work mode back to default.

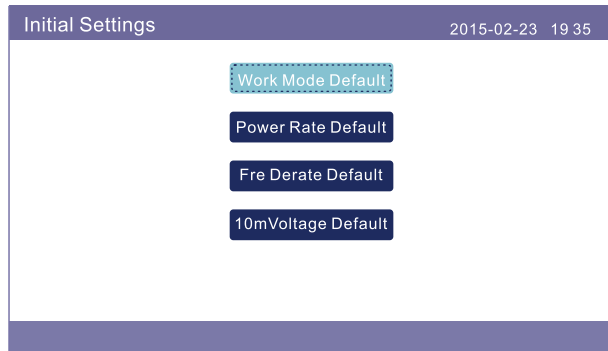


Figure 6.40 Initial Settings

# 6. Normal operation

## 6.7.10 External EPM set

This setting is for export power control. Please don't change settings in this item.

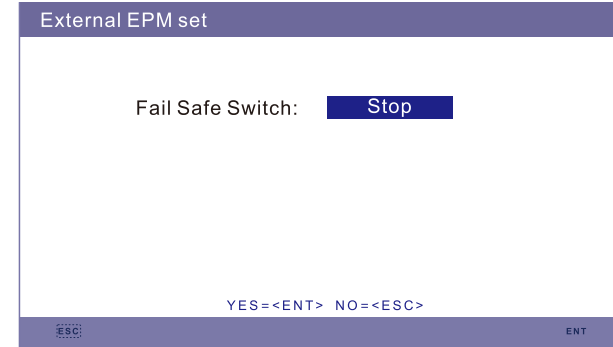


Figure 6.41 External EPM set

## 6.8 Arc fault current interrupt (AFCI) function

The Solis Three Phase inverter series can be supplied with an integrated AFCI module which can detect and interrupt a serial arc in the DC circuit(s). If an arc fault occurs, the AFCI module will detect the arc and interrupt the circuit. The fault can only be cleared manually. An arc fault indicates an irregularity in the DC portion of the PV system. This could be a faulty PV panel, a bad DC connector or even a short circuit in the DC cabling. Check the entire DC portion of the system to ensure there is no evidence of an arc fault. After confirming the DC portion of the array or effecting repairs of the array, press <ESC> for three (3) seconds, after which the inverter will restart. If the fault happens again, turn off and restart the inverter. If the fault still happens, contact Solis Support Service.



Figure 6.42 Arc fault

# 7. Maintenance

The Solis U.S. Three Phase series inverters do not require any regular maintenance. However, cleaning the dust off the heat sink will help dissipate heat away from the inverter, which will increase the life of the inverter.



### CAUTION

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

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



### NOTES

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

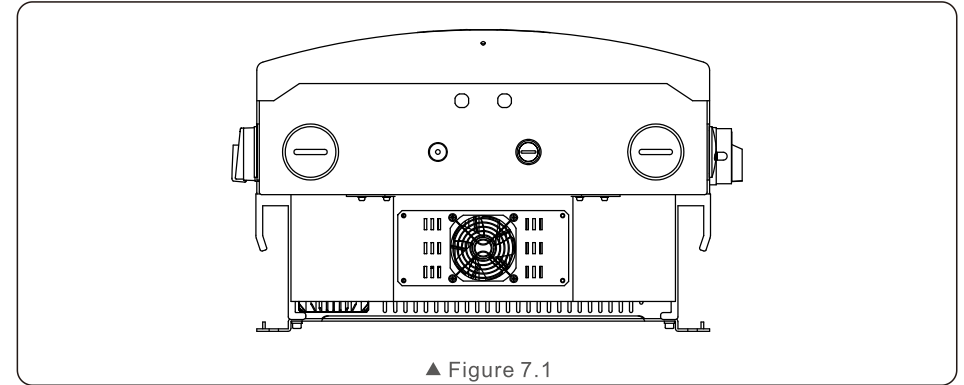
## 7.1 For inverter model with Fan

The function of fan is to keep the inverter cooling when the inverter was working. It will affect the power of the inverter If fan works abnormally. So It is important to ensure the fan run efficiently and replace the damaged fan.

Replacement steps are as follows:

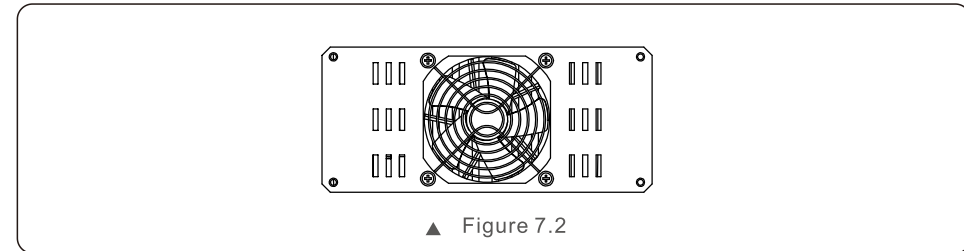
1. Turn AC switch to the 'OFF' position.
2. After 30 seconds, switch the DC switch to the 'OFF' position.
3. Wait for at least 5 minutes.

# 7. Maintenance



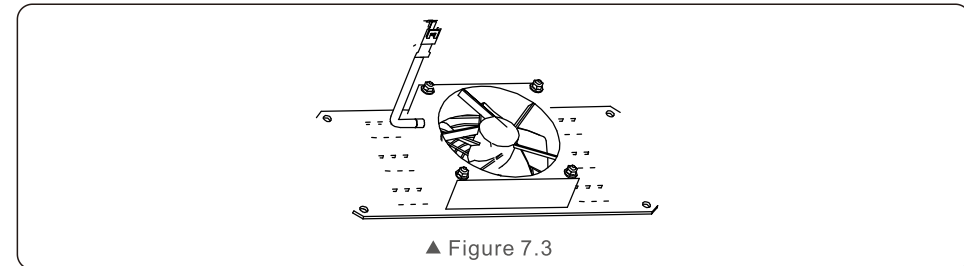
▲ Figure 7.1

4. Loosen the screws and remove the fan plate carefully from the bottom of the inverter.



▲ Figure 7.2

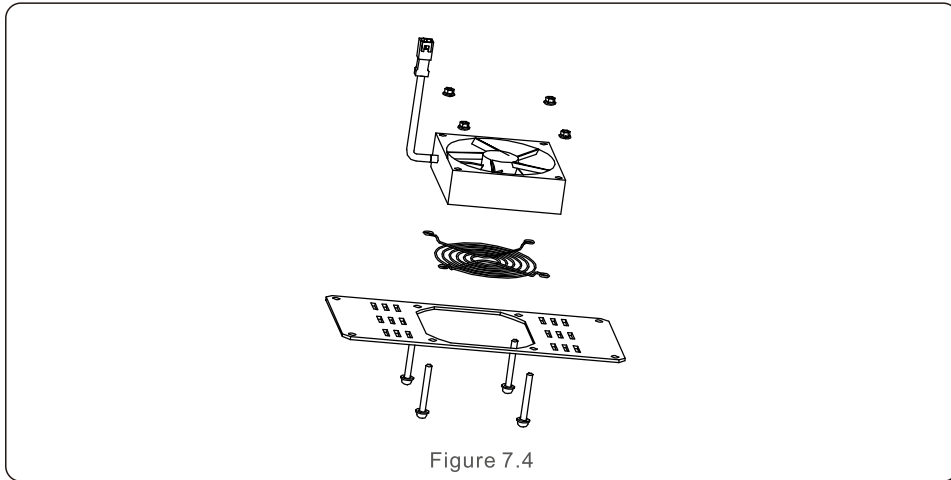
5. Disconnect the power cable and remove the fan assembly from the inverter.



▲ Figure 7.3

# 7. Maintenance

6. Remove the screws that hold the fan to the plate. Replace or clean the fan as required.



7. Reassemble the fan assembly.

8. Reconnect the electrical connections and reinstall the fan assembly.

9. Restart the inverter by turning the AC switch to 'ON' then the DC switch to 'ON'.

# 8. Troubleshooting

## 8.1 Current alarm – front LCD panel

### 8.1.1 Running messages

Running messages can be viewed in the LCD panel (refer to LCD operation in section 6.4).

## 8.2 Alarm history

### 8.2.1 Viewing alarm history

To the process to view the last 10 (or less) alarm codes, refer to LCD Operation 6.6.1.

## 8.3 Error messages

### NOTES

The first step to clearing alarms as listed in Table 9, is to reset the inverter. To reset the inverter, turn off the inverter (refer to Section 6.2) and wait for five (5) minutes before restarting it (refer to Section 6.1). If the failure persists, please first contact your local distributor and then Ginlong Support Service.

If you need to contact Ginlong Support Service at <http://www.ginlong.com/>



Please have the following information available when contacting technical support:

1. Inverter serial number.
2. The inverter distributor/dealer (if available).
3. Installation date.
4. The description of problem (e.g., the alarm message displayed on the LCD and the status of the LED status indicator lights. Other readings obtained from the Information sub menu (refer to Section 6.4) will also be helpful.).
5. PV array configuration (e.g. number of panels, panel capacity, number of strings, etc.).
6. Your contact details.

### 8.3.1 Troubleshooting guide

Solis inverters are designed in accordance with international grid standards, safety standards and electromagnetic compatibility requirements. Before delivery to the customer, the inverter has been subjected to intensive testing to ensure its optimal operation and reliability. In case of failure, the LCD screen may display an alarm message, stop feeding energy into the grid or both. Typical failure descriptions and their corresponding alarm messages are listed in Table 9 on the following pages.

# 8. Troubleshooting

Alarms	Cause	Solution
No Information (Blank Screen)	<ul style="list-style-type: none"> <li>• Input voltage low/missing</li> <li>• Polarity reversed</li> <li>• Main board damaged</li> </ul>	<p><b>Test – DC switch OFF</b></p> <ul style="list-style-type: none"> <li>• Check PV connections</li> <li>• Check polarity</li> <li>• Check voltage &gt;120V Single, &gt;350V three</li> </ul> <p><b>Test – DC Switch ON</b></p> <ul style="list-style-type: none"> <li>• Check voltage &gt;120V Single, &gt;350V three</li> <li>• If DC voltage is "0" replace inverter</li> </ul>
Initializing (Inverter stuck in this mode)	<ul style="list-style-type: none"> <li>• Inverter is waiting for driving signal</li> </ul>	<p><b>Test – DC switch OFF</b></p> <ul style="list-style-type: none"> <li>• Check PV connections</li> <li>• Check polarity</li> <li>• Check voltage &gt;120V Single, &gt;350V three</li> </ul> <p><b>Test – DC Switch ON</b></p> <ul style="list-style-type: none"> <li>• Check voltage &gt;120V Single, &gt;350V three</li> <li>• A cable may have been damaged or loosened in shipping replace inverter</li> </ul>
OV-G-V: Over Grid Voltage	<ul style="list-style-type: none"> <li>• Inverter detects grid voltage as too high</li> </ul>	<p><b>Test – DC switch OFF</b></p> <ul style="list-style-type: none"> <li>• Check AC at the inverter</li> <li>• If AC measures high, adjust upper limit with permission from utility</li> </ul> <p><b>Test – DC Switch ON, full power</b></p> <ul style="list-style-type: none"> <li>• Check AC at inverter test points</li> <li>• Compare with LCD</li> <li>• If AC measures high, cables between inverter and interconnect are too small</li> <li>• Check ampacity and voltage drop calculations</li> </ul>
UN-G-V: Under Grid Voltage	<ul style="list-style-type: none"> <li>• Inverter detects grid voltage as too low</li> </ul>	<p><b>Test – DC switch OFF</b></p> <ul style="list-style-type: none"> <li>• Check AC at the inverter test points</li> <li>• If AC measures low, adjust lower limit with permission from utility</li> <li>• Check LCD voltage reading, may be a bad measurement circuit</li> </ul> <p><b>Test – DC Switch ON</b></p> <ul style="list-style-type: none"> <li>• Check grid standard</li> <li>• Replace inverter</li> </ul>

# 8. Troubleshooting

Alarms	Cause	Solution
OV-G-F: Over Grid Frequency	<ul style="list-style-type: none"> <li>• Inverter detects grid Frequency as too high</li> </ul>	<p><b>Test – DC switch OFF</b></p> <ul style="list-style-type: none"> <li>• Check frequency at the inverter test points</li> <li>• If Frequency measures high, adjust upper limit with permission from utility</li> <li>• Check LCD reading, may be a bad measurement circuit</li> </ul> <p><b>Test – DC Switch ON</b></p> <ul style="list-style-type: none"> <li>• Check grid standard</li> <li>• Replace inverter</li> </ul>
NO-GRID	<ul style="list-style-type: none"> <li>• Inverter does not detect the grid</li> </ul>	<p><b>Test – DC switch OFF</b></p> <ul style="list-style-type: none"> <li>• Check AC at the inverter test points</li> <li>• L-L, L-GND</li> <li>• Do NOT tell me 240VAC</li> <li>• Check LCD reading, may be a bad measurement circuit</li> </ul> <p><b>Test – DC Switch ON</b></p> <ul style="list-style-type: none"> <li>• Check grid standard</li> <li>• Replace inverter</li> </ul>
OV-DC: DC voltage is too high	<ul style="list-style-type: none"> <li>• Inverter detects High DCV</li> </ul>	<p><b>Test – DC switch OFF</b></p> <ul style="list-style-type: none"> <li>• Check DC at the inverter test points</li> <li>• If DCV is high, too many panels in the string</li> </ul> <p><b>Test – DC Switch ON</b></p> <ul style="list-style-type: none"> <li>• Check LCD reading, may be a bad measurement circuit</li> <li>• Replace inverter</li> </ul>
OV-BUS: DC BUS voltage is too high	<ul style="list-style-type: none"> <li>• Inverter detects High DCV on internal bus</li> </ul>	<p><b>Test</b></p> <ul style="list-style-type: none"> <li>• Measure DC and AC voltages</li> <li>• Compare with LCD</li> <li>• Replace inverter</li> <li>• Internal damage</li> <li>• Wire came loose during shipping</li> </ul>
UN-BUS: DC BUS voltage is too low	<ul style="list-style-type: none"> <li>• Inverter detects low DCV on internal bus</li> </ul>	<p><b>Test</b></p> <ul style="list-style-type: none"> <li>• Measure DC and AC voltages</li> <li>• Compare with LCD</li> <li>• Replace inverter</li> <li>• Internal damage</li> <li>• Wire came loose during shipping</li> </ul>

# 8. Troubleshooting

# 9. Specifications

Alarms	Cause	Solution
GRID-INTF: Grid unstable	<ul style="list-style-type: none"> <li>Inverter detects grid instability, internal fault current high</li> </ul>	<p><b>Test – With DC Switch OFF</b></p> <ul style="list-style-type: none"> <li>Measure AC voltage</li> <li>Test AC line for THD</li> <li>Test – With DC Switch ON</li> </ul> <p><b>Test AC line for THD</b></p> <ul style="list-style-type: none"> <li>Multiple inverters/turn one off</li> <li>Impedance matching adjustment or box</li> <li>Internal damage</li> <li>Wire came loose in shipping</li> </ul>
INI-FAULT: Initialization Protection	<ul style="list-style-type: none"> <li>Master and Slave DSP have different values</li> </ul>	<p><b>Reset Inverter</b></p> <ul style="list-style-type: none"> <li>DC switch OFF</li> <li>Wait until all lights/LCD turn off</li> <li>DC switch ON</li> <li>Replace inverter</li> </ul>
OV-TEM: Temperature Protection	<ul style="list-style-type: none"> <li>Inverter detects high ambient temperature &gt;60C</li> </ul>	<p><b>Inspect installation</b></p> <ul style="list-style-type: none"> <li>Check heatsink for obstructions/ventilation</li> <li>Is inverter in direct sunshine</li> <li>Measure ambient temperature near inverter</li> <li>If temp is in range replace inverter</li> </ul>
PV ISO-PRO 01/02: Ground Protection	<ul style="list-style-type: none"> <li>Inverter detects low DC insulation resistance</li> </ul>	<p><b>Inspect installation</b></p> <ul style="list-style-type: none"> <li>Reset inverter</li> <li>Note weather conditions when alarm occurs</li> <li>Measure insulation resistance</li> <li>If normal, measure in SAME weather as alarm</li> <li>Physically check cables</li> <li>Replace inverter</li> </ul>
ARC-FAULT	<ul style="list-style-type: none"> <li>Inverter detects arc in DC circuit</li> </ul>	<p><b>Inspect installation</b></p> <ul style="list-style-type: none"> <li>Check cable with string tester</li> <li>Physically check cables</li> <li>Inspect panel junction boxes</li> <li>Inspect cable connections</li> <li>Reset inverter</li> <li>Replace inverter</li> </ul>
Screen OFF with DC applied	<ul style="list-style-type: none"> <li>Inverter internally damaged</li> </ul>	<ul style="list-style-type: none"> <li>Do not turn off the DC switches as it may damage the inverter.</li> <li>Please wait for sunset and confirm the string current is less than 0.5A with a clip-on ammeter and then turn off the DC switch. String current above 0.5A is under load.</li> <li>Note: Damage due to wrong connections or fire caused by removing string wires or opening fuse holders under load is not covered in the device warranty.</li> </ul>

Table 8.1 Fault messages and descriptions

Model	Solis-25K-US	Solis-30K-US
Max DC input power	37500W	45000W
Max DC input voltage	1000Vdc	
MPPT operation range	200~800Vdc	
Max DC input current	72A (18A per MPPT)	
Number of MPPT/strings per MPPT	4/2	
Rated output power	25kW	30kW
Max. output power	25kW	30kW
Rated grid voltage	480Vac	
Grid voltage range	422.4~528Vac	
Operation phase	Three phase	
Rated grid output current	30.1Aac	36.1Aac
Output power factor range	0.8leading ... 0.8lagging	
Grid current THD	<3%	
DC injection current	<50mA	
Rated grid frequency	60Hz	
Max. Efficiency	>98.6%	
Protection	DC reverse-polarity protection, AC short circuit protection; islanding protection; temperature protection, etc.	
Size	23.4*37.2*14.4 in (595*945*356.5mm)	
Weight	147.7lb (67kg)	
Topology	Transformerless	
Internal consumption	<1W(Night)	
Running temperature	-25°C~60°C/-13°F-140°F	
Ingress protection	NEMA 4X	
Interface	RS485 WIFI GPRS(Optional)	
Design lifetime	>20years	
Operating Range Utility Frequency	59.5-60.5Hz	
Compliance	CAN/CSAC22.2 N107.1, UL1741, IEEE1547 UL1998, UL1699B, FCC part 15, Class B	
Operation Surroundings Humidity	0~100% Condensing	
Connections	2 knockout for 1-1/4" and 1-1/2" conduit at bottom, side	

# 9. Specifications

Model	Solis-36K-US	Solis-40K-US
Max DC input power	54000W	
Max DC input voltage	1000Vdc	
MPPT operation range	200~800Vdc	
Max DC input current	72A (18A per MPPT)	
Number of MPPT/strings per MPPT	4/2	
Rated output power	36kW	40kW
Max. output power	36kW	40kW
Rated grid voltage	480Vac	
Grid voltage range	422.4~528Vac	
Operation phase	Three phase	
Rated grid output current	43.3Aac	48.1Aac
Output power factor range	0.8leading ... 0.8lagging	
Grid current THD	<3%	
DC injection current	<50mA	
Rated grid frequency	60Hz	
Max. Efficiency	>98.6%	
Protection	DC reverse-polarity protection, AC short circuit protection; islanding protection; temperature protection, etc.	
Size	23.4*37.2*14.4 in (595*945*356.5mm)	
Weight	147.7lb (67kg)	
Topology	Transformerless	
Internal consumption	<1W(Night)	
Running temperature	-25°C~60°C/-13°F-140°F	
Ingress protection	NEMA 4X	
Interface	RS485 WIFI GPRS(Optional)	
Design lifetime	>20years	
Operating Range Utility Frequency	59.5-60.5Hz	
Compliance	CAN/CSAC22.2 N107.1, UL1741, IEEE1547 UL1998, UL1699B, FCC part 15, Class B	
Operation Surroundings Humidity	0~100% Condensing	
Connections	2 knockout for 1-1/4" and 1-1/2" conduit at bottom, side	

# 9. Specifications

Model	Solis-36K-US-F	Solis-40K-US-F
Max DC input power	54000W	
Max DC input voltage	1000Vdc	
MPPT operation range	200~800Vdc	
Max DC input current	72A (18A per MPPT)	
Number of MPPT/strings per MPPT	4/2	
Rated output power	36kW	40kW
Max. output power	36kW	40kW
Rated grid voltage	480Vac	
Grid voltage range	422.4~528Vac	
Operation phase	Three phase	
Rated grid output current	43.3Aac	48.1Aac
Output power factor range	0.8leading ... 0.8lagging	
Grid current THD	<3%	
DC injection current	<50mA	
Rated grid frequency	60Hz	
Max. Efficiency	>98.6%	
Protection	DC reverse-polarity protection, AC short circuit protection; islanding protection; temperature protection, etc.	
Size	23.4*37.2*14.4 in (595*945*356.5mm)	
Weight	154lb (70kg)	
Topology	Transformerless	
Internal consumption	<1W(Night)	
Running temperature	-25°C~60°C/-13°F-140°F	
Ingress protection	NEMA 4X	
Interface	RS485 WIFI GPRS(Optional)	
Design lifetime	>20years	
Operating Range Utility Frequency	59.5-60.5Hz	
Compliance	CAN/CSAC22.2 N107.1, UL1741, IEEE1547 UL1998, UL1699B, FCC part 15, Class B	
Operation Surroundings Humidity	0~100% Condensing	
Connections	2 knockout for 1-1/4" and 1-1/2" conduit at bottom, side	



# 10. Appendices

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## 10.1 Appendix A

<b>Part</b>	<b>Torque</b>
AC Terminal	2.2-4.4 ft-lbs
DC Fuse Terminal	2.5 ft-lbs
Screw For Wiring Box Cover	1.3-1.4 ft-lbs
Ground Terminal	2.2 ft-lbs

Figure 10.1