



# SolarEdge Inverter Installation Guide

Version 2.0

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# Handling and Safety Instructions

During installation, testing and inspection adherence to the following handling and safety instructions is mandatory.

## Safety Symbols

The following safety symbols are used throughout this document. Familiarize yourself with the symbols and their meaning before installing or operating this instrument.

**WARNING!**

Denotes a hazard. It calls attention to a procedure that, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a warning note until the indicated conditions are fully understood and met.

**CAUTION:**

Denotes a hazard. It calls attention to a procedure that, if not correctly performed or adhered to, could result in **damage or destruction of the instrument**. Do not proceed beyond a caution sign until the indicated conditions are fully understood and met.

**NOTE:**

Denotes additional information about the current subject.

**IMPORTANT SAFETY FEATURE:**

Denotes information about safety issues.

## Instructions

**WARNING!**

Do not remove the inverter cover before five minutes have elapsed after disconnecting all sources of power. Only use lockable connectors for DC input. Otherwise, there is a risk of electric shock from energy stored in the capacitor.

**WARNING!**

Before operating the SolarEdge inverter, ensure that the power cable and wall outlet have been grounded properly.

**WARNING!**

Repairs or testing under power must only be performed by qualified SolarEdge technicians who are familiar with and qualified to work with the SolarEdge inverter.

**WARNING!**

This unit is not intended to be opened by a user. It must only be opened by a qualified technician for installation and maintenance purposes.

**CAUTION:**

This unit must be operated under the specified operating specifications, as described in the technical specification document.

**CAUTION:**

Optimizers are IP65 rated. Choose a mounting location where optimizers will not be submerged in water.

Unused connectors must be sealed. Exposed connectors may be unsafe or create functional problems, and will void the warranty. Do not leave the optimizers exposed to water unless the connectors are sealed, either by mating or by plugging with appropriate plugs (not provided).

**CAUTION:**

The inverters are IP65 rated. Unused connectors and glands should be sealed with the provided seals.

## Support and Contact Information

If you have technical problems concerning our products, please contact us:


<b>USA Canada:</b>	1877 360 5292
<b>Germany:</b>	089-45459730 and 089-4161703-39
<b>France:</b>	0800917410
<b>Belgium:</b>	080073041
<b>Italy:</b>	800 784 824
<b>United Kingdom:</b>	08002061058
<b>Israel:</b>	073 2403118
<b>Australia:</b>	1800149229
<b>Rest of World:</b>	+1 (650) 319-8843
<b>Fax:</b>	+972 73 240-3117

**Email to:**

- [support@solaredge.com](mailto:support@solaredge.com) (all locations, excluding Germany and North America)
- [support@solaredge.de](mailto:support@solaredge.de) (Germany)
- [support@solaredge.us](mailto:support@solaredge.us) (North America)

Before contact, please gather the following information:

- Inverter and power optimizer type.
- Serial number of the inverter and the power optimizer in question.
- The error indicated on the inverter screen or on the SolarEdge Monitoring Portal.
- System configuration information, including the type and number of modules connected and the number and length of strings.
- The communication method to the SolarEdge server.

The **Support**  option on the top right of the SolarEdge Configuration Tool's main window can be used to automatically collect all relevant information to be sent to SolarEdge Professional Services for support. This option is described in detail in the *SolarEdge Configuration Tool Software Guide*.

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# Chapter 1

## Introducing the SolarEdge Power Harvesting System

### What is the SolarEdge Power Harvesting Solution?

The SolarEdge power harvesting solution maximizes the power output from any type of solar PV installation while reducing the average cost per watt. The sections below describe each of the system's components.

#### SolarEdge Power Optimizer

SolarEdge power optimizers can be connected to existing PV modules in order to maximize power harvesting by locally performing Maximum Power Point Tracking (MPPT) at the PV module level.

The power optimizers keep the string voltage fixed, regardless of the length of the string and of the environmental conditions. Each SolarEdge power optimizer directly transmits performance data from every PV module over the power line.

Two types of power optimizers are provided by SolarEdge, as follows:

- **Module add-on solutions**, connected during installation to one or more PV module. P/N: OP250-LV, OP300-MV, OP400-MV and OP400-EV.
- **Module embedded solution (CSI)**, is supplied embedded into a PV module.

You may refer to the SolarEdge power optimizer datasheets in order to determine which power optimizer is most suitable for you requirements.

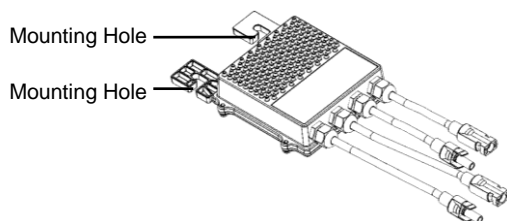
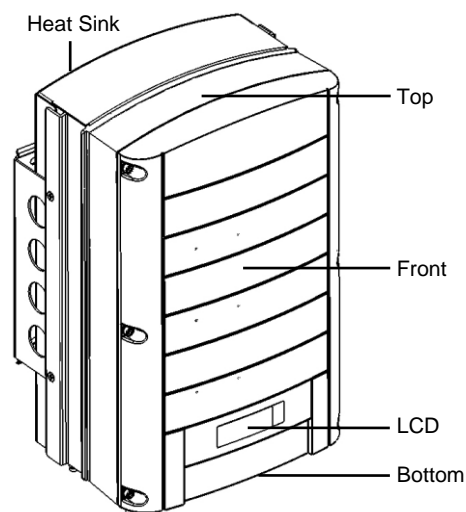


Figure 1: Add-On Box Solution

## SolarEdge Inverters

The SolarEdge Single Phase and Three Phase Inverters efficiently convert DC power received from the PV modules into AC power that can be fed into the main circuit board of the site and from there to the grid. The inverters also receive the monitoring data from each power optimizer and transmit it to a central server (called the Monitoring Server) through an Ethernet network to an external modem connection.



**Figure 2: SolarEdge Inverter**

### Inverter Package Contents

The following lists the contents of the inverter package:

- One inverter.
- One wall-mounting bracket.
- One box containing the following:
  - Two Allen screws for fastening the inverter to the wall-mounting bracket.
  - Installation Guide.
  - Quick Installation Guide.
  - Inverter activation instructions.

## SolarEdge Monitoring Portal

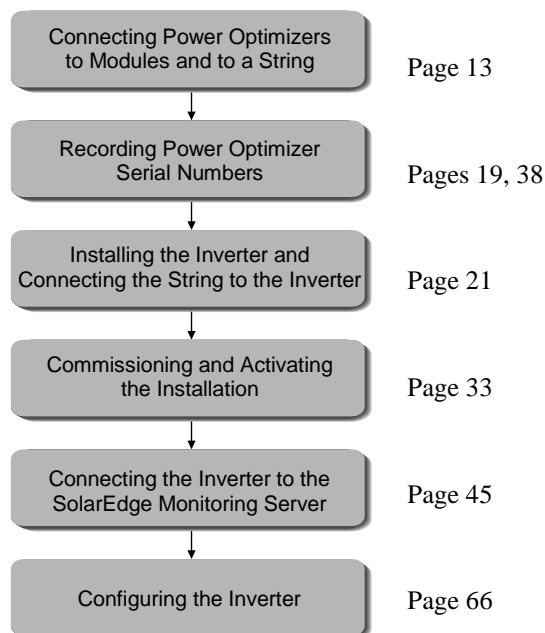
The SolarEdge Monitoring Portal enables you to monitor the technical and financial performance of one or more SolarEdge Photovoltaic sites. It provides information about present and past performance of each PV module individually and about the system as a whole.

**NOTE:**

You may refer to the *SolarEdge Monitoring Portal User Guide* for more information about this option.

## Installation Workflow

The following provides an overview of the workflow for installing and setting up a new SolarEdge site. Most of these procedures can also be used for adding components to an existing SolarEdge site.



# Transport and Storage

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## Inverter Transport

The SolarEdge inverter should be transported in its original packaging, facing up and without exposing the inverter to unnecessary shocks.

## Inverter Storage

Store the inverter in a dry place where ambient temperatures are always between -20°C and +50°C.

# Equipment List

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Standard tools can be used during the installation of the SolarEdge system. The following is a recommendation of the equipment to be used when installing a SolarEdge system:

- Allen screwdriver for M6 and M5 screw types.
- Drilling machine and bits suitable for a wall or pole, where the inverter mounting bracket is installed.
- Suitable screws for attaching the inverter mounting bracket to a wall.
- M6 (1/4") screws for attaching the power optimizer to the racking.
- MC4 crimper
- Toolbox, including wire cutters, wire strippers and screwdrivers
- Optional: Voltmeter, Electric screwdriver

For installing the communication option, you may also need the following:

- For Ethernet: RJ45 connectors
- For RS485: A three-wire cable. A four- or six-wire twisted pair telephone cable may be used.

An inverter has either RJ45/RJ11 connectors or block terminal connectors for communication. For RJ45/RJ11 connectors, you also require the following:

- For Ethernet:
  - CAT5 twisted pair Ethernet cable
  - RJ45 crimping tool
- For RS485:
  - RJ11 six-pin connector (also known as RJ25)
  - RJ11 crimping tool

# Chapter 2

## Installing the Power Optimizers

### Applicable Notes and Warnings

The following notes and warnings apply when installing the SolarEdge power optimizers:

**CAUTION:**

If installing directly on the module or module frame, first consult the module manufacturer for guidance regarding location and the impact on the module warranty.

**CAUTION:**

SolarEdge power optimizers and inverters use connectors from the following manufacturers:

- Multi Contact MC4
- Amphenol H4
- Tyco keyed connector
- Huber Suhner Raddox

Installing a SolarEdge system without ensuring compatibility of the module connectors with the optimizer connectors may be unsafe and could cause functionality problems such as ground faults, resulting in inverter shut down.

In order to ensure mechanical compatibility of the SolarEdge optimizers and the modules to which they are connected:

- Use identical connectors from the same manufacturer and of the same type on both the power optimizers and on the modules; or
- Verify that the connectors are compatible in the following way:
  - The connector manufacturer should explicitly verify compatibility with the SolarEdge connector; and
  - A third-party test report by one of the listed external labs (TUV, VDE, Bureau Veritas UL, CSA, InterTek) should be obtained, verifying the compatibility of the connectors.

**NOTE:**

The power optimizer may be placed in any orientation, meaning there is no up direction.

**NOTE:**

The power optimizer should be mounted in a location that is either ventilated or that has a free space of air around it for heat dissipation.

**NOTE:**

Mounting brackets are suited to either a flat surface or a pole and can be attached to any surface texture.

**IMPORTANT SAFETY FEATURE:**

PV modules with SolarEdge power optimizers are safe. They only carry a low safety voltage before the inverter is turned on.

**IMPORTANT SAFETY FEATURE:**

As long as the power optimizers are unconnected to the inverter or the inverter is OFF, the power optimizers will output a safe 1V voltage during installation.

**IMPORTANT NOTE:**

SolarEdge power optimizers are energized by the PV modules to which they are connected. String length must not be less than eight power optimizers when using a single phase inverter and sixteen power optimizers when using a three phase inverter, or the entire string may shut down. (Please refer to the power optimizer datasheets for the exact minimum and maximum number of power optimizers permitted in a string.)

**NOTE:**

Completely shaded PV modules may cause the affected power optimizers to temporarily shut down. This will not affect the performance of the other power optimizers in the string, as long as the minimum string length requirement is met when taking into account the lighted modules only. If under typical conditions modules connected to fewer than eight optimizers in a single phase system or to fewer than sixteen optimizers in a three phase system will remain unshaded, add more PV modules.

## Step 1, Mounting the Power Optimizers

- Determine the mounting location of each power optimizer. The power optimizer should be mounted in a place where it can be mounted securely using both mounting holes. It must also be located near enough so that the power optimizer can connect to a single PV module. Mark all mounting hole locations.
- Each power optimizer must be attached to the rack using both mounting holes.
- Drill the holes.

**CAUTION:**

Do not drill through the power optimizer or through the mounting holes. The vibrations created by the drill can damage the power optimizer and will void the warranty.

- Mount one power optimizer at each location using M6 (1/4") screws and washers.
- Verify that the power optimizer is securely attached.

## Step 2, Connecting Each PV Module to a Power Optimizer

**WARNING!**

Before performing this step, turn OFF the inverter by turning off the ON/OFF switch at the bottom of the inverter and the AC switch of the main circuit board. All inverters in an installation site should be switched OFF in this manner. This step is required to verify that the power optimizers will output a safe 1V voltage during installation.

### OP250-LV, OP300-MV, OP400-MV, OP400-EV

These power optimizers connect to a single PV module via its two inputs (a plus and a minus).

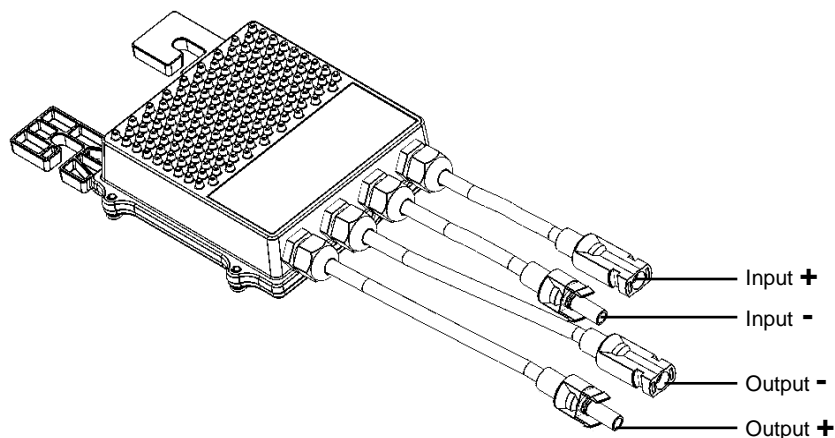


Figure 3: OP250-LV, OP300-MV, OP400-MV, OP400-EV

The following shows the required clearance around the power optimizer.

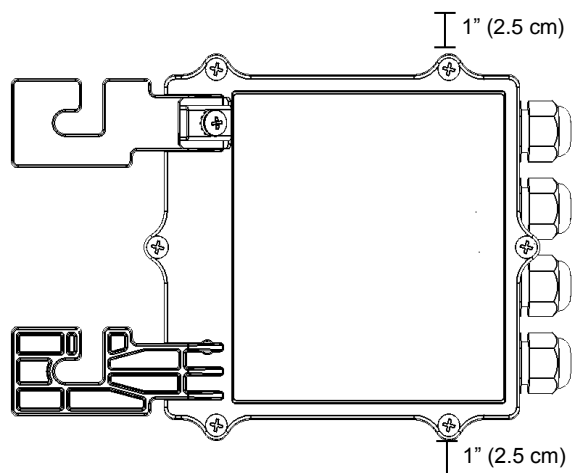


Figure 4: Clearance – Top View

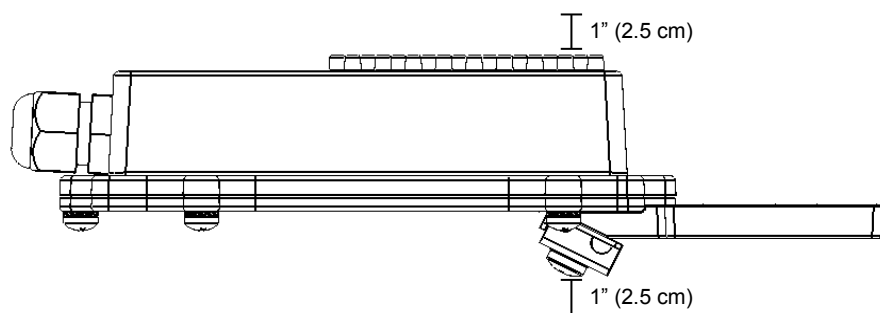


Figure 5: Clearance – Side View

## Connecting Power Optimizers

### ► To connect these power optimizers to the PV modules:

**WARNING!**

Verify that you have identified the inputs and outputs correctly. Do not connect PV modules to power optimizer outputs.

**NOTE:**

The power optimizer has reverse polarity protection. Even so, you must still verify the correct polarity by checking the PV module's polarity with a voltmeter. Some module manufacturers may use connector polarity that is different from that used by SolarEdge power optimizer inputs.

- The input connectors are shown in the figures above. The output connectors are in the middle of each side.

## Step 3, Connecting Power Optimizers in Strings

Power optimizers must be connected in series in order to construct strings.

**IMPORTANT SAFETY FEATURE:**

As long as the power optimizers are unconnected to the inverter and the inverter is OFF, the power optimizers will output a safe 1V voltage during installation.

- The full string can either be directly connected to the inverter or connected in parallel to another strings and then together they are connected to the inverter.
- You can construct and connect in parallel strings of unequal length, meaning the number of power optimizers in each string does not have to be the same.
- The power optimizer output cables are labeled + and –.
- Connect the Plus (+) connector of the output wire of the first power optimizer in the string to the Minus (-) connector of the second power optimizer in the string. Repeat this step for each power optimizer in the string. This procedure is similar to the standard procedure for connecting PV modules.

**WARNING!**

Make sure that the Plus (+) and the Minus (-) connector cables are firmly and totally inserted.

**IMPORTANT NOTE:**

Be sure to record power optimizer serial numbers during their installation, as this information may be required later for troubleshooting.

The SolarEdge Monitoring Portal can be used to access SolarEdge site information, as described in the *Step 4, Reporting and Monitoring Installation Data* section on page 38.

## Verifying Proper Power Optimizer Connection

### ► To verify proper power optimizer connection:

- Make sure the PV modules are exposed to sunlight during this process. Otherwise, the power optimizers may not be on.
- Verify each string individually before connecting it to the other strings or to the inverter.
- Each power optimizer connected to a PV module initially produces a safe voltage of 1 V. A string with properly connected power optimizers should produce 1 V per power optimizer in the string. For example, if 10 power optimizers are connected in a string, then 10 V should be produced. Use a voltmeter with at least 0.1 V measurement accuracy to verify that the total voltage produced is in accordance with the number of power optimizers in the string.
  - If 0 V is measured for the string, check for a disconnection of the outputs of one of the power optimizers.
  - If the voltage is lower than the quantity of power optimizers (for example, 9 V when 10 power optimizers are connected), verify whether one or more of the power optimizers are not connected, meaning they were skipped during the string connection process. If they are all connected, verify whether one or more of the PV modules is not connected properly to its power optimizer.
  - If the voltage is too high, then apply the CAUTION below.

**CAUTION:**

If the measured voltage is too high, the installation may not have a safe low voltage. **PROCEED WITH CARE!!**

Please note that a deviation of up to 2V for a full string is considered normal.

A voltage that is higher than the quantity of power optimizers may be caused by one of the following reasons:

- An extra power optimizer is connected in the string.
- The output of a PV module may be connected in the string instead of the output of a power optimizer.
- A malfunction of one of the power optimizers.

Perform the following if the total string voltage is too high:

- Verify that only power optimizers are connected in the string and that no PV module outputs are connected without a power optimizer.
- Disconnect the wires that connect the power optimizers in the string.
- Measure that there is 1V safety voltage for each individual power optimizer in order to locate the power optimizer that does not output the proper voltage.
- If a malfunctioning power optimizer is located, check its connections, polarity, module and voltage.
- If a malfunction cannot be bypassed or resolved, skip the malfunctioning power optimizer, thus connecting a shorter string.
- Do not continue before finding the problem and removing the malfunctioning power optimizer.

**IMPORTANT SAFETY FEATURE:**

After a PV module is connected to the power optimizer, the power optimizer outputs a safe voltage of 1 V. We suggest verifying this output for the first few power optimizers that you connect in order to verify their proper connection. Take note that if you use a tracker, the power optimizer will turn ON only if the tracker is tracking the sun and at least 2 W of power are provided by the PV module.

## Step 4, Recording Installation Information

Be sure to record power optimizer serial numbers during their installation, as this information may be required later for troubleshooting, and is necessary for proper physical layout on the monitoring website.

The serial number(s) of the inverter(s) must be specified in order to open a new site.

For more information about recording and monitoring installation data, see page 38.

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# Chapter 3

## Installing the Inverter

The SolarEdge inverter can be installed either before or after the PV modules and power optimizers have been installed.

### Identifying the Inverter

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Refer to the stickers on the side of the inverter that specify its **Serial #** and its **Electrical Ratings** including its **Nom Output Power**. Please provide the serial number when contacting the SolarEdge support line. The serial number is also required when requesting to open a new site in the SolarEdge Monitoring Portal.

### Selecting the Mounting Location

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This process involves attaching the inverter mounting bracket to a wall or pole and then mounting the inverter onto it.

#### Chassis Clearance

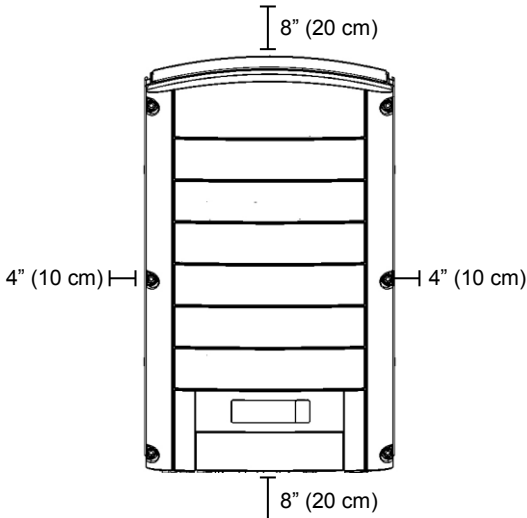
The heat dissipation solution requires the following clearance areas between the inverter chassis and all types of obstructions, such as wires and walls:

- 8” (20 cm) to the top and bottom of the chassis

- 4" (10 cm) to the right and left of the chassis

**NOTE:**

If more than one inverter is installed side by side, the distances between them must exceed 4" (10 cm).



**Figure 6: Chassis Clearance**

# Mounting the Inverter

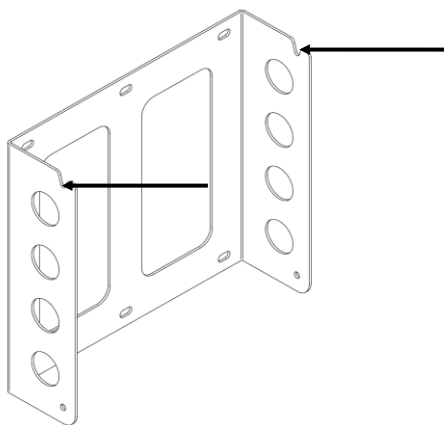
**CAUTION:**

Make sure that you have read the previous sections in this chapter before starting the mounting process that is described below.

The inverter package provides the inverter and the mounting bracket that is required to connect it to the wall. Standard tools (not provided) can be used during its installation.

## ► To mount the SolarEdge inverter:

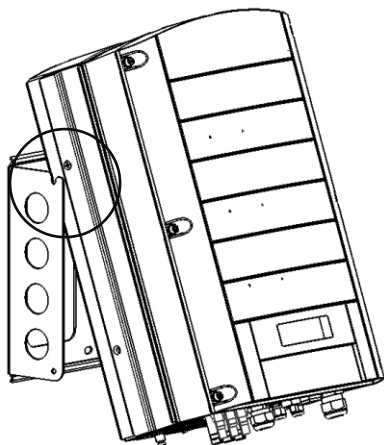
- 1** Attach the provided bracket to a wall or pole, as follows:
  - Ensure that the U-shaped part of the bracket is positioned on the top, as shown below:



**Figure 7: Positioning the U-shaped Part of the Bracket**

- When mounting on a wall, bolt the four outer-most holes of the bracket. Other holes may be used to stabilize the bracket or when the outer-most holes cannot be used.
  - When mounting on a pole, bolt the inner holes of the bracket.
- 2** Verify that the bracket is firmly attached to the wall or pole.

- 3** Hang the inverter on the bracket using the screws on the inverter's top, as shown below:



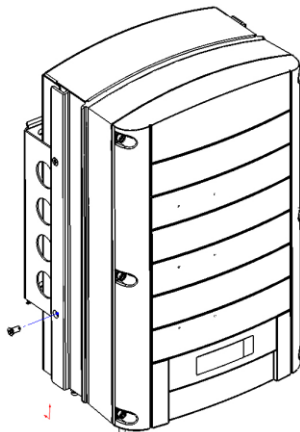
**Figure 8: Hanging the Inverter on the Bracket**



**CAUTION:**

Do not rest the connectors at the bottom of the inverter on the ground at any time, as it may damage them. If you need to rest the chassis on the ground, lay it on its back, front or side, not on its bottom.

- 4** Let the chassis lay flat against the wall or pole. Then, screw the two Allen screws into the right and left sides of the bottom of the bracket. The screws go through the heat sink on either side into the bracket, as shown below:



**Figure 9: Inserting the Screws through the Bottom of the Heat Sink**

# Connecting the Inverter

## Inverter Connection Overview

The SolarEdge inverter can be configured in the field for an AC grid, including AC voltage and frequency. If the inverter's default settings are not suited to the country of the installation site, then please refer to page 72 for a description of how to configure the inverter for the required country.

With the SolarEdge Configuration Tool, you can configure the inverter's AC settings to different settings than those provided by default for the country of the installation site, or perform other modifications. A full description of the Configuration Tool is provided in the *SolarEdge Configuration Tool Software Guide*.

Refer to the following table to determine the correct fuse size to use at the connection point of the SolarEdge inverter to the grid:

Inverter	Maximum Output Current	Suggested Fuse
SE3000	16.5 A	20 A
SE3500	19.5 A	25 A
SE4000	22 A	25 A
SE4000-16A	16 A	20 A
SE5000	27 A	32 A
SE6000	27 A	32 A
SE7k	11.5 A	16 A
SE8k	13.5 A	16 A
SE9k	15.5 A	20 A
SE10k	17.5 A	20 A
SE12.5k	19.5 A	25 A

**NOTE**

For more wiring information, you may refer to the Application Note called *SolarEdge Recommended AC Wiring*, which can be accessed from the SolarEdge website.

**NOTE**

You should also refer to the technical specifications in *Appendix B, Technical Specifications* on page 85. Pay special attention to the inverter specifications because they may differ slightly in different countries.

**WARNING!**

It is essential to connect the PE (ground) wiring before connecting the AC Line and Neutral wires.

**NOTE**

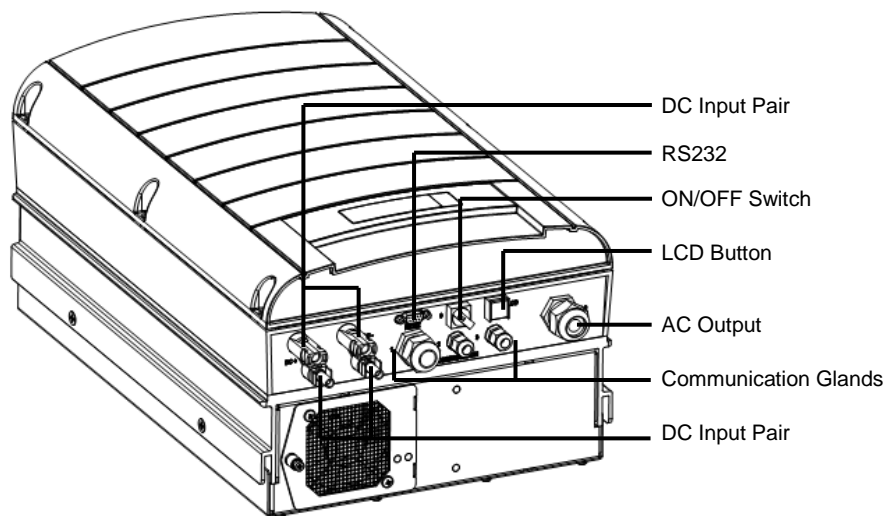
Functional Electrical Earthing of DC-side negative or positive is prohibited because the SolarEdge inverter has no transformer.

Earthing of PV array module frames and mounting equipment (equipotential bonding) for the PV array modules is acceptable.

## Connecting the SolarEdge Inverter

### Connectors and Cables

The following shows the inverter connectors:



**Figure 10: Inverter Connectors**

The following describes each connector, the wire requirements and gauge of its associated cable. All the inverter connectors are located at the bottom of the inverter, as described below:

- **ON/OFF Switch:** Turning this switch ON starts the operation of the power optimizers. Turning it OFF reduces the power optimizer voltage to a low safety voltage.
- **LCD Button:** Pressing this button lights up the LCD for 30 seconds. In addition, you can press this button to access configuration menu options, as described on page 74.

#### ■ **RS232 or USB Connector:**

- Provides a configuration, control and management connection to a locally connected PC or laptop, or to an external modem (RS232 only) for connection to the SolarEdge Monitoring Portal. You may refer to the *Creating an RS232 (UART) Connection* section on page 47 for a description of how to set up this communication option to the SolarEdge Monitoring server.

You may refer to the *SolarEdge Monitoring Portal User Guide* for more information about the monitoring capacities.

- **Other Communication Options (Ethernet (LAN) or ZigBee):** Two other types of communication options can be used to connect the inverter to the SolarEdge Monitoring Portal. They are installed through the three cable glands. You may refer to the *Chapter 6, Setting Up Communication* on page 45 for a description of how to set up these communication options to the SolarEdge Monitoring server.

#### ■ **AC Output:**

**AC Cable External Gauge:** M25 (11-17mm diameter).

Each of the AC wires (Line, Neutral and PE) must be a copper wire with a cross-section of 4-16 mm<sup>2</sup>.

- **DC Cable:** PV connectors.

## **Connecting the Inverter**

### **Opening the Cover**

#### **► To connect AC wires to internal inverter terminals:**

- 1** Turn OFF the AC on the AC wires to be connected to the inverter by disconnecting the circuit breakers on the main circuit board.
- 2** Turn off the ON/OFF switch at the bottom of the inverter.
- 3** Turn off the DC switch on the main circuit board, if one exists.
- 4** If the inverter was on prior to disconnecting the switch, then wait at least five minutes before opening the cover of the inverter.



#### **WARNING!**

Do not open the cover of the inverter before you turn OFF the ON/OFF switch at the bottom of the inverter and the DC switch of the main circuit board.

- 5** Unscrew the Allen screws on the cover of the chassis (on its front) and lift the cover up.

**6 Connecting the AC Wires:** Strip off the isolation and expose the wires in the AC cable, as follows:

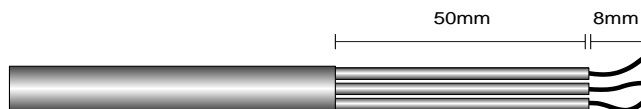
Single phase inverters – three wires:

- Protective Earth (PE) wire
- Neutral (N)
- Line 1 (L)

Three phase inverters – five wires:

- Protective Earth (PE) wire
- Neutral (N)
- Line 1 (L)
- Line 2 (L)
- Line 3 (L)

The lengths of the wires to strip are as follows:



**Figure 11: Wire Lengths to Strip**

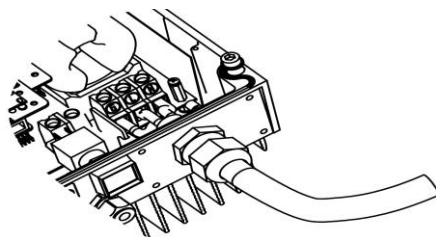
- Strip 8 mm for contact.
- Individual cable length 50 mm.



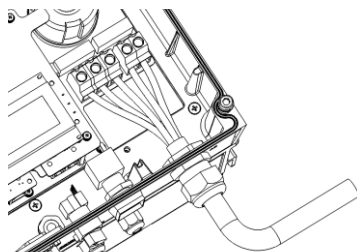
**WARNING!**

Make sure to connect the PE (ground) connector first.

**7** Insert the cable through the AC cable gland on the right and connect the wires to the appropriate terminal connectors according to their labels: PE, L and N in the single phase inverter, PE, L1, L2, L3 and N in the three phase inverter.



**Figure 12: Inserting the Cable Through the AC Cable Gland – Single Phase Inverter**



**Figure 13: Inserting the Cable Through the AC Cable Gland – Three Phase Inverter**

- 8 Tighten the screws of each wire terminal according to the following torque:
  - Tightening moment of terminal 0.5-0.6 Nm.
  - Gland torque 2.8-3.3 Nm.
- 9 Verify that there are no whiskers in each terminal connector and that the unused ports of the terminals are sealed.

### ► To connect DC cables to the inverter:

- Connect the DC connectors from the photovoltaic installation to the DC+ and DC- connectors as indicated.

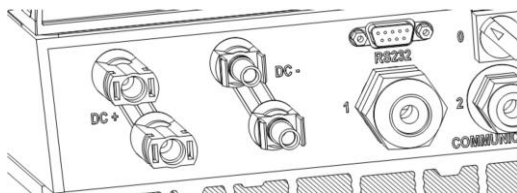


Figure 14: Connecting the DC Cables to the Inverter

If more than two strings are required, they can be connected in parallel in an external combiner box before connecting a unified DC connection to the inverter.



#### NOTE:

Due to the SolarEdge architecture, the parallel strings may be of different lengths and therefore do not necessarily need to be connected to an identical number of power optimizers.

## Completing the Inverter Installation

After completing all connections, the inverter must be activated. Refer to the activation instructions supplied with the inverter.

In most cases, the inverter is preconfigured before delivery. After activating the inverter, you must **verify that the inverter is configured to the proper country**, as described on page 72.

If not, then you must configure the inverter to the site's requirements using the inverter's internal buttons or by using the SolarEdge Configuration Tool connected to an RS232 or USB port. For more information, you may refer to the *Configuring the Inverter Using the LCD Panel and User Buttons* section on page 67.

If you plan to use the SolarEdge Monitoring Portal to access SolarEdge site information, you will need to add a physical connection for the proper communication option. Connecting the inverter to the SolarEdge Monitoring Server via a LAN, an external modem connected to an RS232 port, or a ZigBee modem is described in *Chapter 6, Setting Up Communication* on page 45.

## Closing the Cover

### ► To close the cover:

- 1** Shut the chassis cover and secure it by tightening the screws.
- 2** For proper sealing, first tighten the corner screws and then the two central screws. The recommended order can be seen in the following figure:

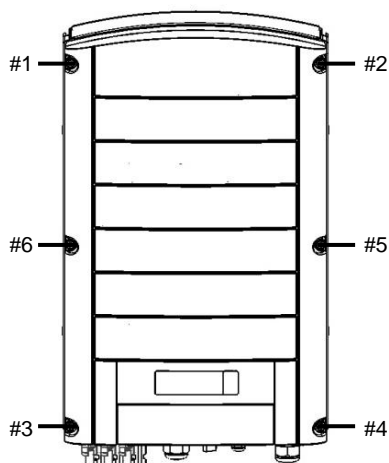


Figure 15: Tightening the Screws

## Residual Current Device



### IMPORTANT SAFETY FEATURE:

All SolarEdge inverters incorporate a certified internal Residual Current Device (RCD) in order to protect against possible electrocution and fire hazard in case of a malfunction in the PV array, cables or inverter.

An external **RCD is required** in some countries. In these cases, the installer must check which type of RCD is required by the relevant electric code. **SolarEdge recommends using a type-A RCD. The recommended RCD value is 100mA or 300mA unless a lower value is required by the specific local electric codes.** When required by local regulations, the use of an RCD type B is permitted.

In installations where the local electric code requires the use of a lower leakage RCD, the discharge current may trip the RCD. The following steps can be taken in order to avoid this problem:

- 1** It is important to select an appropriate RCD in order to ensure proper operation of the installation. Although the RCD used in such cases is a 30mA RCD, it may still trip at 15mA (according to IEC 61008). Good quality RCDs will trip at a higher value.
- 2** Configure the trip voltage of the inverters' internal RCD to a lower current than the trip current of the external RCD. The internal RCD may still trip if the current is higher than the allowed current, but because the internal inverter RCD automatically resets when the residual currents are low it does not require a manual reset. You may consult with the SolarEdge support center for assistance with this issue.
- 3** Certain PV modules (with low capacitance leakage to the frame) are preferable.

Refer to the SolarEdge Application Note *RCD Selection for SolarEdge Inverters* for a full discussion of the subject.

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# Chapter 4

## Commissioning the Installation

### Commissioning – Workflow

The following workflow describes how to activate the system, commission the installation and verify the proper functioning of the system.

- **Step 1, Activating the System**, page 33
- **Step 2, Pairing Power Optimizers to the Inverter**, page 35
- **Step 3, Verifying Proper Operation**, page 37
- **Step 4, Reporting and Monitoring Installation Data**, page 38


**NOTE:**

Keep this manual accessible and preferably near the inverter.

### Step 1, Activating the System

This section describes how to perform the initial activation stages of the SolarEdge system.

These stages are performed after the inverter and power optimizers have been installed and the power optimizers have been connected to the inverter.

#### ► To activate the SolarEdge installation:

- 1** Power OFF the inverter by turning off the ON/OFF switch at the bottom of the inverter and the DC switch (if exists).
- 2** Turn on the AC to the inverter. The following message appears on the inverter's LCD panel:

V a c [ v ]	V D c [ v ]	P a c [ w ]
2 3 0 . 7	1 4 . 1	0 . 0
P _ O K :	0 0 0 / 0 0 0	< S _ O K >
		O F F

- 3** If the site is installed with an external DC switch between the power optimizers and the inverter(s), then turn it ON.
- 4** Verify that **P\_OK** appears, which indicates a connection to the power optimizers. The number 0 indicates that no power optimizer has been paired to this inverter. If you are re-pairing the power optimizers and inverters, the number indicates the number of power optimizers that have been paired in the past. If **P\_OK** does not appear, check the power optimizer, strings and DC input connections.
- 5** If the inverter is connected to the SolarEdge Monitoring server, verify that **S\_OK** appears. This denotes that the connection to the server is successful.
- 6** Verify that the **Vac [v]** on the LCD panel specifies the grid's correct AC output voltage, in Volts.
- 7** Verify that the **Vdc [v]** on the LCD panel specifies the DC input voltage, in Volts. There should be a safety voltage of 1 V for each power optimizer connected to the inverter.

**NOTE:**

A measurement error on the inverter LCD of  $\pm 3$  V is OK.

**NOTE:**

If the LCD panel shows 0 V:

- Verify that the PV modules are not shaded or otherwise obstructed.
- Check for proper power optimizer, string and DC input connection.
- Verify the correct polarity of the DC input connection.

- 8** Verify that **Pac [w]** on the LCD Panel specifies **0** as the AC output power, in Watts. This is because the inverter is still off.

**WARNING!**

Verify that the ON/OFF indicator on the LCD panel, described above, reads OFF.

## Step 2, Pairing Power Optimizers to the Inverter

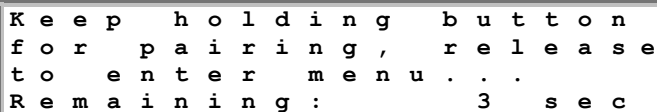
After all connections are made, all the power optimizers must be logically paired to their inverter before they can start working with it. This step describes how to pair power optimizers to the inverter, meaning to assign each inverter to the power optimizers from which it will produce power.

**NOTE:**

The power optimizer does not start producing power until it is paired with an inverter.

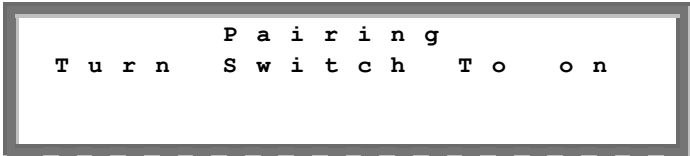
### ► To pair the power optimizers to the inverter:

- 1 Turn the ON/OFF switch at the bottom of the inverter to OFF. Press and hold down the inverter's LCD Light button for about **10 seconds**. The following screen is displayed:



K e e p   h o l d i n g   b u t t o n  
f o r   p a i r i n g ,   r e l e a s e  
t o   e n t e r   m e n u . . .  
R e m a i n i n g :            3   s e c


Continue to hold for five seconds more and you will see this screen:



P a i r i n g  
T u r n   S w i t c h   T o   o n

- 2 Turn the ON/OFF switch at the bottom of the inverter to ON within five seconds. If you do not turn ON the inverter ON/OFF switch within five seconds, the inverter then exits pairing mode.

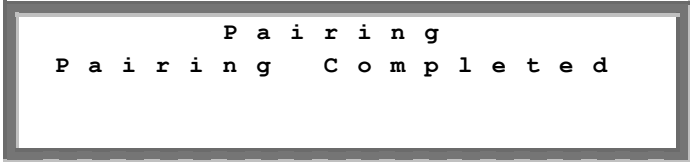
The following screen is then displayed indicating that the inverter is performing the process of pairing and is assigning power optimizers to the inverter.



P a i r i n g  
R e m a i n i n g   [ S e c ] :   1 0 4

This message displays a countdown of the seconds until it completes the pairing process. If pairing fails, an error is displayed. This error appears only if the above steps were not followed. If an error appears, then follow the pairing steps again.

After commissioning succeeds, the following message is displayed:



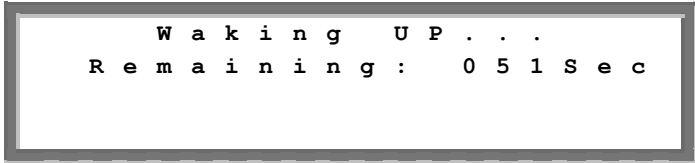
P a i r i n g  
C o m p l e t e d

- 3** Since at this stage the ON/OFF switch at the bottom of the inverter is ON, the power optimizers start producing power and the inverter starts converting AC.

**WARNING!**

After you turn ON the ON/OFF switch of the inverter, the DC cables carry a high voltage and the power optimizers no longer output a safe 1 V output.

After the initial connection to the AC and before the inverter starts converting, it will first monitor the grid for the time span required by regulations (the inverter LED flickers green). While the inverter is in Standby mode, the following message is displayed:



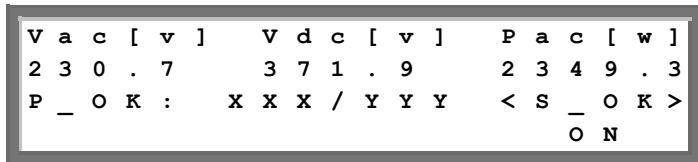
W a k i n g   U P   . . .  
R e m a i n i n g :   0 5 1 S e c

During this time, the inverter monitors the grid and verifies correct grid voltage and frequency. This message indicates how many seconds remain until the inverter will be in Production mode. This amount of time is in accordance with the regulations of each country, and is typically between three to five minutes.

The inverter then automatically goes to Production mode and produces power (the inverter LED is steady green).

## Step 3, Verifying Proper Operation

After the proper wake-up delay time is over, the following message appears on the inverter's LCD panel:



### ► To verify proper operation:

- 1 Verify that the inverter LED is steady green.
- 2 Verify that the ON/OFF indicator on the LCD panel, described above, reads **ON**.
- 3 Verify that **P\_OK** appears to indicate a connection to the power optimizers. Also, verify that **S\_OK** appears, if the inverter is connected to the SolarEdge Monitoring Server.
- 4 Verify that the total number of power optimizers connected to the inverter appears next to the **P\_OK** indicator on the LCD panel. If this number is too low, then it may mean that one or more of the power optimizers are not connected properly or the pairing process may have not been completely successful, for example due to complete shading of one of the modules or insufficient sunlight during the pairing process.



#### NOTE:

It can take up to 15 minutes for all power optimizers to transmit their telemetries and to be counted on the LCD screen.

- 5 Verify that the **Vac [v]** on the LCD panel specifies the grid's correct AC output voltage in Volts.
- 6 Verify that the **Vdc [v]** on the LCD panel specifies the DC input voltage in Volts, which should be between 250 V and 450 V in the single phase inverter and between 550 V and 950 V in the three phase inverter.
- 7 Verify that **Pac [w]** on the LCD Panel specifies the **total** AC output power produced, in Watts.

***Congratulations! Your SolarEdge power harvesting system is now operational.***

## Step 4, Reporting and Monitoring Installation Data

The SolarEdge Monitoring Portal enables you to access SolarEdge site information, as described in the *SolarEdge Monitoring Portal User Guide*, as well as receive up-to-date information from the installation site for viewing in a physical or logical view.

After a site is opened in the SolarEdge Monitoring Server, you can access all the monitored data about that site.

### ► To register a new site, go to:

<http://monitoring.solaredge.com/>

The serial number(s) of the inverter(s) must be specified in order to open a new site.

The SolarEdge Monitoring Server also enables you to display a logical and physical schematic layout of the installed power optimizers, as follows:

- **Logical Layout:** Shows a schematic logical layout of the components in the fields, meaning inverters, clusters, strings and modules and their electrical connectivity. This view enables you to see a logical view of which modules are connected in each string, which strings are connected to each inverter and so on.
- **Physical Layout:** Shows a schematic physical layout of the components in the fields, meaning inverters, clusters, strings and modules and their electrical connectivity. This view enables you to see a **physical bird's eye view** of the installation site showing which modules are connected in each string, which strings are connected to each inverter and so on.

This window enables you to:

- View the latest performance of specific components.
- Find underperforming components, such as modules, by comparing their performance to that of other components of the same type.
- Pinpoint the location of alerted components.
- See how components are connected to each other.

In order to enable the SolarEdge Monitoring Portal to show the strings and the physical location of power optimizers, you may first supply the physical and logical mapping of the installed power optimizers.

**IMPORTANT NOTE:**

Even if you do not report the physical and logical mapping of the installed power optimizers to SolarEdge, the SolarEdge Monitoring Portal will still show the logical layout indicating which power optimizers are connected to which inverters. However, it will not show strings or the physical location of power optimizers.

This process prepares the SolarEdge Monitoring Portal for receiving up-to-date information from the installation site and for displaying it in a physical or logical view.

The inverter may be connected to the SolarEdge Monitoring Server via a LAN or an external SolarEdge GSM modem connected to the RS232 port. Alternatively, you can connect the inverter to another inverter that is already connected to the server.

The inverter-to-inverter connection is made by an RS485 bus or a ZigBee modem. This connection enables the inverters to send the latest data collected from the power optimizers and inverters to the SolarEdge Monitoring Server.

If the inverter is properly connected to the internet, as described in the *Step 3, Verifying Proper Operation* section on page 37, then the **S\_OK** appears in the inverter's LCD screen.

## Providing Installation Information

**IMPORTANT NOTE:**

Be sure to record power optimizer serial numbers during their installation, as this information may be required later for troubleshooting.

## iPhone Site Mapper

SolarEdge provides an iPhone Site Mapper that helps you collect information about your installation. This application leads you through the process of scanning the labels on each inverter and power optimizer. It then helps you transmit this collected information to SolarEdge's Monitoring Portal (which was described on the previous pages). The SolarEdge iPhone Mapping Application can be downloaded from the SolarEdge website.

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# Chapter 5

## Replacing and Adding System Components

### Modifying an Existing Installation

This section describes how to modify an existing installation that has been operating properly for a while.

#### ► To modify an existing installation:

- 1 Shut down the inverter by turning OFF its ON/OFF switch and the DC switch of the main circuit board. The inverter goes into Shutdown mode and displays the following message:



DC VOLTAGE NOT SAFE!  
DO NOT DISCONNECT!  
VDC : 72.0

This message is displayed until the DC is safe. The default safety voltage is 50 V.



#### **WARNING!**

Do not touch the DC power connections until the DC voltage is at a safe level. Doing so may cause personal damage, damage to the device and/or danger of fire.

- 2 Switch off the AC to the inverter.



#### **WARNING!**

If you cannot see the inverter panel, or there is a malfunction indicated on the LCD panel, then switch off the AC to the inverter and wait five minutes for the input capacity of the inverter to discharge.

- 3 You can now add or remove power optimizers, add or remove strings, change connections of power optimizers or strings or replace the inverter.

- 4 Perform the *Commissioning – Workflow*, as described on page 33.

**NOTE:**

If you are permanently dismantling the installation or part of it, make sure to use the disposal method dictated by the regulations of the country in which the inverters are installed.

► **To move one or more power optimizers from one inverter to another in the same site:**

- 1 Turn both inverters OFF, as described above.
- 2 Remove the necessary power optimizers from their inverter and connect them to the strings of the other inverter.
- 3 Perform the *Commissioning – Workflow*, as described on page 33, on the inverter to which power optimizers were added and only then perform the *Commissioning – Workflow* on the inverter from which power optimizers were removed.

**CAUTION:**

Commissioning must first be performed on the inverter to which power optimizers were added, and only then on the inverter from which power optimizers were removed. Otherwise, the inverter to which power optimizers were added may be damaged.

## Three Phase Inverters – Replacing the Fans

The three phase inverter has two fans, one is accessible from the outside of the inverter (called Fan 1) and the other is internal and requires a SolarEdge technician to replace it (called Fan 2).

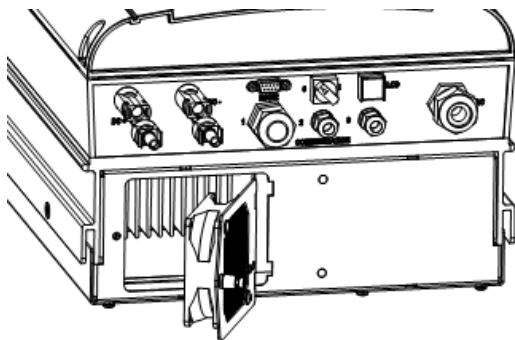


Figure 16: Inverter Fan 1

### ► To replace Fan 1:

- 1 Unscrew the single screw of the fan cover, shown above, using a Philips screw driver.
- 2 Open the fan door.
- 3 Disconnect the fan door connector, as shown below:

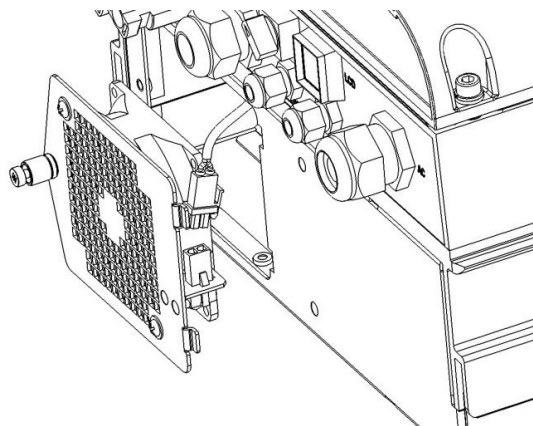


Figure 17: Fan Door Connector

- 4** Unscrew the two screws connecting the fan to the cover.
- 5** Replace the fan unit with the new one and screw it using the two screws.
- 6** Connect the fan door connector.
- 7** Check the *Fan Health Status* screen to make sure that the fan was installed properly, as described in the *Fan Health Status Window – Three Phase Inverters* section on page 66.

# Chapter 6

## Setting Up Communication

### Communication Dataflow

The SolarEdge site information can be accessed remotely using the SolarEdge Monitoring Portal, as described in the *SolarEdge Monitoring Portal User Guide*. In order to transfer monitoring data from a SolarEdge site to the SolarEdge Monitoring Portal, a communication connection must be set up, as described in this chapter. Communication setup is not required for power harvesting and is needed only when using the monitoring portal.

Power optimizers send information to the SolarEdge inverter via DC lines. No added wires or configurations are required for this purpose. The inverter sends this information to the SolarEdge Monitoring Server through the Internet. The sections below describe how to set up this connection.

### Connector Panel

The connector panel on the inverter appears as shown below:

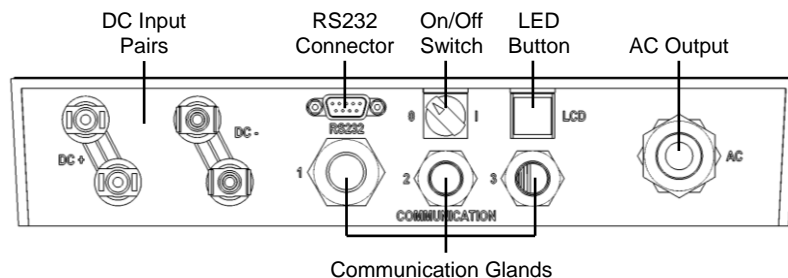


Figure 18: Connector Panel

Each communication gland on the panel is numbered, as described in the following table.

Gland	Size (in mm)	Function	Wire Size
1	20	Ethernet connection (CAT5/6) or ZigBee antenna	4.5 – 7 mm
2 + 3	16	RS485, ZigBee antenna, phase balancer, power reducer	2 – 7 mm

Be sure that the communication type in use connects to the appropriate gland.

## Communication Types

The following types of communication can be used to transfer the monitored information from the inverter to the SolarEdge Monitoring Server:

- **RS232 (UART):** page 47, This communication option is provided in all inverters by default. It is used to connect to an external SolarEdge GSM modem that has an RS232 port.
- **Ethernet:** page 49, Enables the connection of the inverter directly to a LAN.
- **RS485:** page 54, Enables the connection of multiple inverters through the same bus, such that connecting only one inverter to the Internet is sufficient to provide communication services to all the inverters on the bus.

**NOTE:**

In addition, there are two types of wireless communication options that are available and purchased separately. They are: ZigBee and GSM. Refer to relevant documentation for details about their installation.

Ethernet and RS485 are connected to a connector inside the inverter. An inverter communication board has either RJ45/RJ11 connectors or block terminal connectors for communication.

The following shows the location of the RJ45/RJ11 communication connectors:

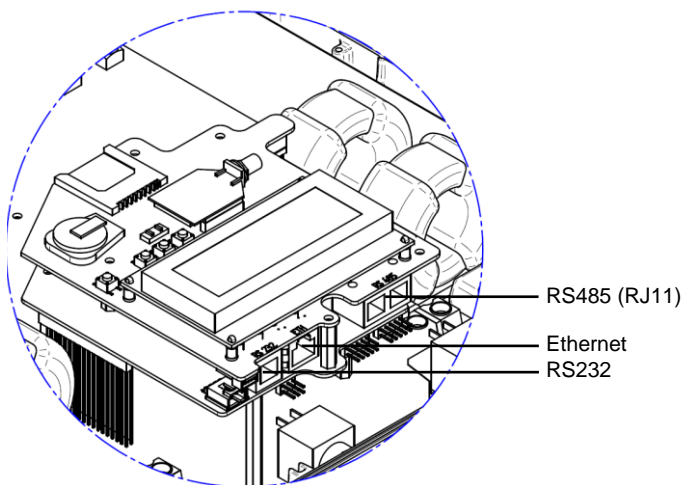


Figure 19: Ethernet and RS485 – RJ45/RJ11 Connectors

The following shows the location of the block terminal communication connectors:

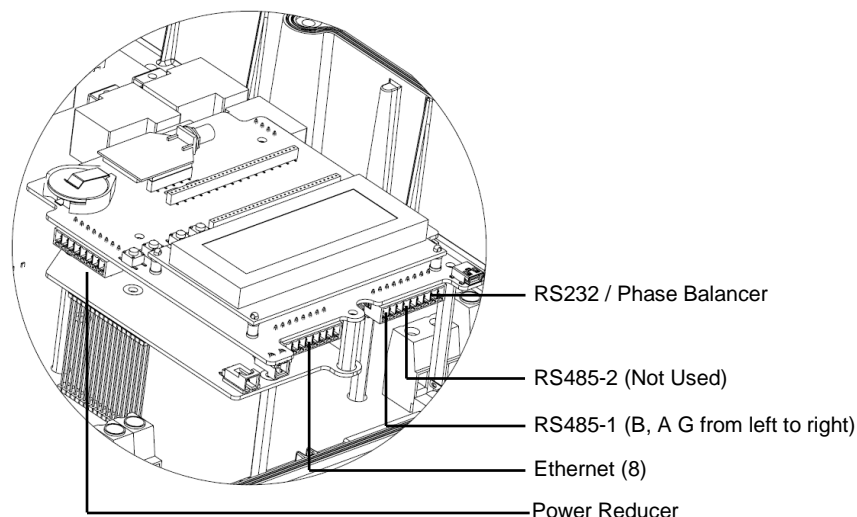


Figure 20: Block Terminal Connectors

## Creating an RS232 (UART) Connection

This communication option is provided in all inverters by default. It enables you to connect the inverter via modems supplied by SolarEdge. You may refer to the SolarEdge website for a list of the types of modems offered. Each modem is provided with its own user manual which should be reviewed.



### NOTE:

When connecting via RS232, make sure to use a shielded connector so as not to interfere with other devices in the vicinity.

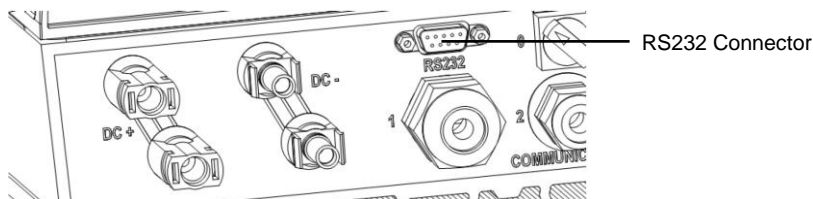


Figure 21: RS232 Connector

**IMPORTANT SAFETY FEATURE:**

The RS232 connector on the bottom of the inverter is safe to touch during normal operation of the inverter

► **To configure RS232 communication to the SolarEdge Monitoring Server:**

- 1** Using the user buttons, select the **RS232** option under the **Communication** ➔ **Server** menu, as described in the *Configuring the Inverter Using the LCD Panel and User Buttons* section on page 67.
- 2** Follow the instructions of your SolarEdge modem for model-specific configuration options.
- 3** Connect the modem to the inverter through the RS232 connector, which is the nine-pin connector on the bottom of the inverter. There is no need to open the inverter cover.

To verify the connection, you may refer to the *Verifying the Connection* section on page 59.

The internal RS232 terminal block connector located on the communication board, shown in Figure 20, can also be used for phase balancing. You may refer to the *SolarEdge Phase Balancing User Guide* for more details.

# Creating an Ethernet (LAN) Connection

This communication option enables you to use an Ethernet connection to connect the inverter to a LAN.

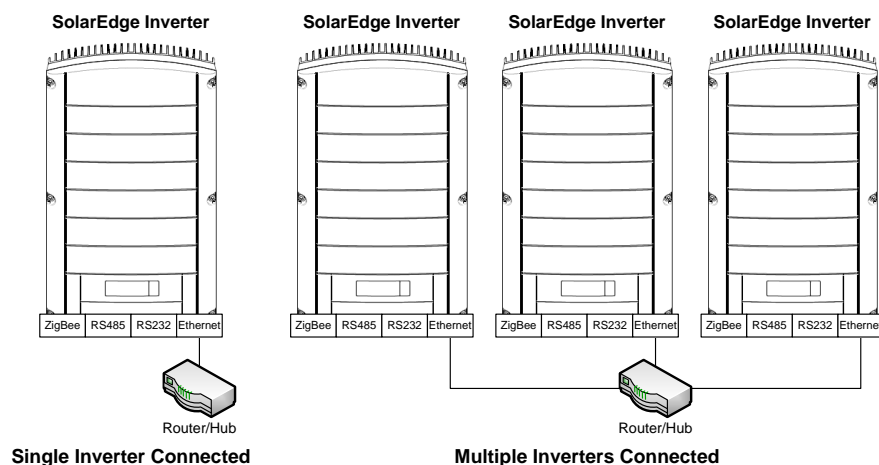


Figure 22: Example of Ethernet Connection

## ► To connect the Ethernet communication to the SolarEdge Monitoring server:

- 1 Open the cover of the inverter, as described in the *Opening the Cover* section on page 27.
- 2 Using the user buttons, choose the **LAN** option under the **Communication** ➔ **Server** menu, as described in the *Configuring the Inverter Using the LCD Panel and User Buttons* section on page 67.
- 3 Configure the **LAN** options under the **Communication** menu (DHCP and IP configurations), as described in the *Configuring the Inverter Using the LCD Panel and User Buttons* section on page 67.
- 4 Prepare to connect the Ethernet cable to the Ethernet connector on board in the inverter, as follows:
  - Insert the Ethernet wire via the large cable gland on the bottom of the inverter. The inverter glands come pre-sealed from the factory. Removing the sealing is needed to insert the cable.

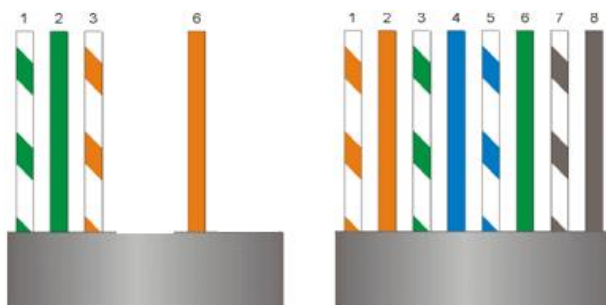
**CAUTION:**

If a gland is opened and not used, then make sure to reseal it. Otherwise, it may affect the inverter's functionality.

**CAUTION:**

The internal side of the gland includes an o-ring, which should be used to ensure proper sealing.

- Remove the cable's external isolation using the crimping tool or cable cutter and expose 8 wires. Standard cables have 8 wires (4 twisted pairs), as shown in the diagram below, on the right. For Ethernet communication, 4 wires (2 twisted pairs) are used, as shown in the diagram below, on the left. Wire colors may differ from one cable to the next.



**Figure 23: Preparing Connector Wiring**

Only wires numbered 1, 2, 3 and 6 in the diagram on the left above need to be connected.

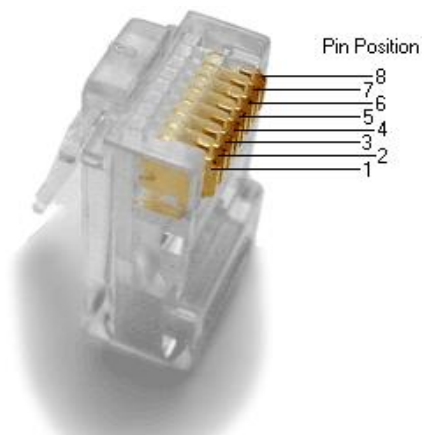
**NOTE:**

One to eight wires can be connected. Only 1, 2, 3 and 6 are mandatory.

- 5** An inverter has either RJ45/RJ11 connectors or block terminal connectors for communication.

If the inverter has RJ45/RJ11 communication connectors, then connect as follows:

- Insert the 4 wires into the RJ45 connector. Make sure to use pins 1, 2, 3 and 6.

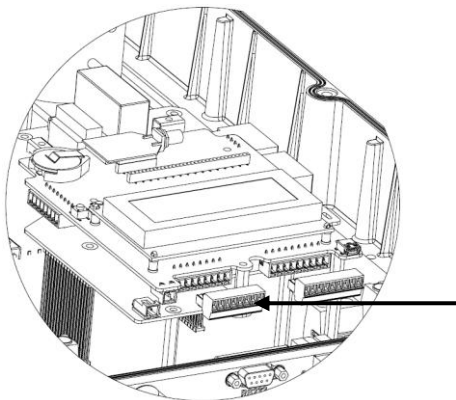


**Figure 24: Inserting Wires into the RJ45 Connector**

- Use the Ethernet crimper to crimp the wires.
- Connect the Ethernet connector to the RJ45 plug on the board in the inverter, as shown in Figure 19.

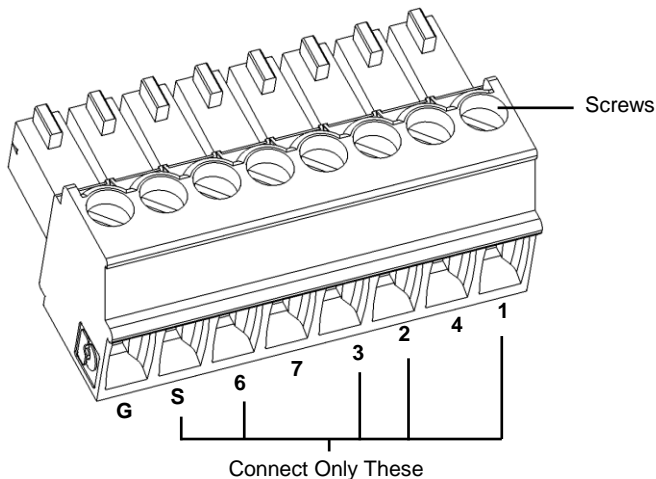
If the inverter has block terminal communication connectors, then connect as follows:

- The Ethernet block terminal is already inserted into the inverter when it is delivered. Pull out the Ethernet block terminal, as shown on the left below:



**Figure 25: Removing the Ethernet Block Terminal**

- Loosen the screws of connectors 1, 2, 3, 6 and S on the Ethernet block terminal, as shown below:



**Figure 26: Ethernet Block Terminal**



**NOTE:**

Wires 1-7 may be connected. Only 1, 2, 3, 6 and S are mandatory.

- Insert the ends of wires 1, 2, 3 and 6 into the connectors shown above.
- Insert the aluminum shield of the cable into the S connector.
- Close the screws of the Ethernet block terminal.
- Reinsert the Ethernet block terminal into the communication board. The Ethernet block terminal can only be inserted with the screws facing the wall (towards the inverter heat-sink).

**NOTE:**

Make sure to push in the Ethernet block terminal firmly so that it is inserted as far in as it goes.

- 6** Connect the other end of the Ethernet cable to the Ethernet plug of the Ethernet hub or router. You can connect more than one inverter to the same hub or to different hubs, as required. Each inverter sends its monitored data independently to the SolarEdge Monitoring server. All connections are initiated from the inverter so that no port forwarding is required.
- 7** Close the inverter cover, as described in the *Closing the Cover* section on page 30.
- 8** Verify the connection, as described in the *Verifying the Connection* section on page 59.

**NOTE:**

If your network has a firewall, then you may need to configure it to enable the connection to the following address:

- **Destination Address:** prod.solaredge.com
- **Port:** 22222

## Creating an RS485 Bus Connection

The RS485 option enables you to create a bus of connected inverters. Using this option, inverters are connected to each other in a chain, meaning the first inverter in the chain is connected to the next inverter in the chain via its RS485 connector. The first inverter in the chain and the last inverter in the chain must be terminated.

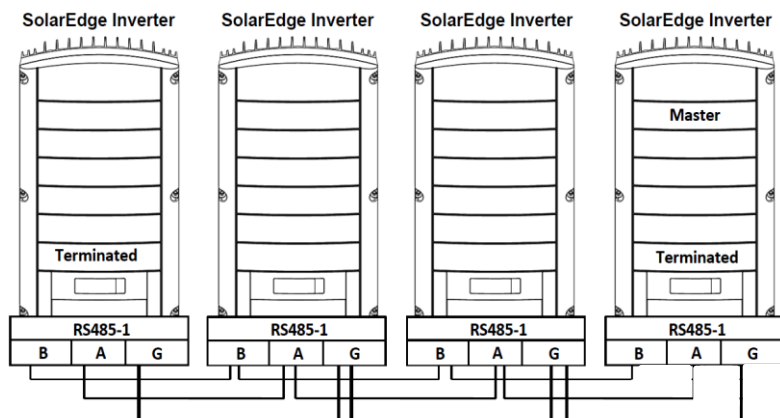


Figure 27: Example of RS485 Bus Connection

Each inverter must be connected according to the instructions below.

### ► To connect the RS485 communication bus:

- 1 Open the cover of the inverter, as described in the *Opening the Cover* section on page 27.
- 2 Using the user buttons, select the **RS485** option under the **Communication ➔ Bus menu**, as described in the *Configuring the Inverter Using the LCD Panel and User Buttons* section on page 67.
- 3 For all slave devices, using the user buttons, select the **RS485** option under the **Communication ➔ Server menu**, as described in the *Configuring the Inverter Using the LCD Panel and User Buttons* section on page 67.

- 4** An inverter has either RJ45/RJ11 connectors or block terminal connectors for communication.

If the inverter has RJ45/RJ11 communication connectors, then connect as follows:

- The RS485 bus uses a three-wire cable and a six-wire RJ11 connector (also known as RJ25). Insert the wire via one of the small cable glands. The glands come from the factory pre sealed. Removal of the sealing is required in order to insert the cable.

**CAUTION:**

If a gland is opened and not used, be sure to reseal it. Otherwise, it may affect the inverter's functionality.

- After inserting the wire, crimp a connector using a standard telephone wire crimper. Two pins (numbered 2 and 3) must be connected. The two wires must both belong to the same twisted pair, which is usually indicated by similarly colored wire. In addition, a grounding wire that is connected to pin number 6 must also be connected. For this purpose, you can use any remaining wire of the telephone cable. The wiring on the next inverter should be the same.



**Figure 28: Crimping the Wires**

- Connect the RS485 cable connector to either of the RS485 plugs on boards in the inverter.
- Connect the other end of the RS485 cable of the first inverter through the gland to the RS485 connector on the board of the next inverter in the chain, as described above.
- You can use both RS485 connectors to wire up to two inverters – one to the left and one to the right

If the inverter has block terminal connectors, then connect as follows:

- The RS485/RS232 block terminal is already inserted into the inverter when it is delivered. Pull out the block terminal, as shown on the left below:

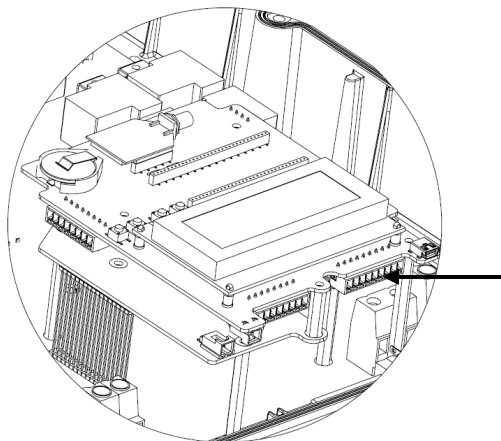


Figure 29: Removing the RS485/RS232 Block Terminal



**CAUTION:**

Do not insert wires into the connectors labeled RS485-2

- Loosen the screws of each of the connectors **B**, **A** and **G** on RS-485-1.

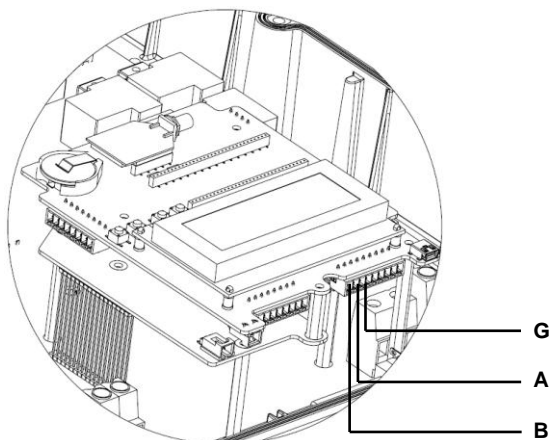


Figure 30: RS485/RS232 Block Terminal

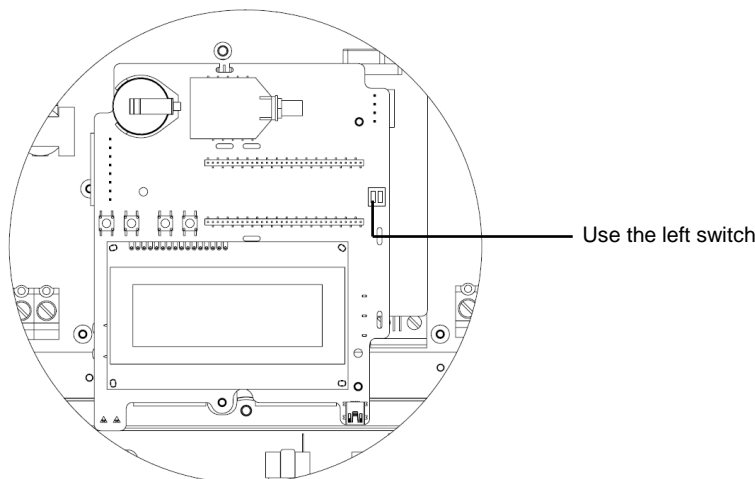
- The RS485 bus uses a three-wire cable. Insert the cable via one of the small cable glands.

- Connect wires into the **B**, **A** and **G** terminals on RS-485-1.
- All **B** wires on all inverters should be connected.
- All **A** wires on all inverters should be connected.
- All **G** wires on all inverters should be connected.
- Do not cross-connect **B**, **A** and **G** wires Do not insert wires into the connectors labeled RS485-2.
- Connect the other inverters in the chain. You can use any color wire to connect between each connector **A** on one inverter to connector **A** on the other inverter, as long as you use the same color wire for all **A** connectors. The same goes for connecting between **G** connectors and for connecting between **B** connectors. Figure 27 conceptually depicts this connection schema.
- Reinsert the block terminal into the communication board.
- The RS485 block terminal can only be inserted with the screws facing the wall (towards the inverter heat-sink).

**NOTE:**

Make sure to push in the RS485 block terminal firmly so that it is inserted as far in as it goes.

- 5** The two inverters at the ends of the chain (meaning the first inverter and the last inverter) must be terminated by switching a termination dip-switch inside the inverter to ON. The switch is marked SW6 and it is the switch closest to the ESC button, as shown below:



**Figure 31: RS485 Termination Switch**

**NOTE:**

Only the two inverters at the ends of the chain should be terminated for best performance. The other inverters in the chain should have the termination switch OFF.

- 6** Choose a single inverter to be the connection point between the RS485 bus and the SolarEdge Monitoring Server.
- 7** Connect the Master, as described above, to the SolarEdge Monitoring Server via either Ethernet, as described in the *Creating an Ethernet (LAN) Connection* section on page 49, or RS232, as described in the *Creating an RS232 (UART) Connection* section on page 47.

Ensure that you select either the **Ethernet** or **RS232** option under the **Communication → Server** menu, as described in the *Configuring the Inverter Using the LCD Panel and User Buttons* section on page 67.

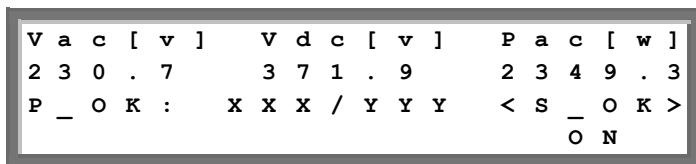
- On the Master inverter under the **Communication** menu, configure the **RS485** option of the inverter to MASTER, as described in the *Configuring the Inverter Using the LCD Panel and User Buttons* section on page 67.
  - Select the **Slave Detect** option to initiate automatic detection of the Slave inverters that are connected to this Master inverter. This verifies that they are configured as Slaves.
  - The Master should report the correct number of slaves. If it does not, verify the connections and terminations as described above.
- 8** Verify the connection of the Master to the SolarEdge Server, as described in the *Verifying the Connection* section below.

A power reduction interface terminal block is located on the communication board, shown in Figure 20. You may refer to the *SolarEdge Power Reduction Interface User Guide* for more details.

## Verifying the Connection

### ► To verify the connection:

- 1 Verify that the DC circuit breaker is OFF.
- 2 Verify that the inverter's ON/OFF switch is still OFF.
- 3 Turn ON the AC to the inverter by using the circuit breakers on the main circuit board.
- 4 Wait for the inverter to connect to the SolarEdge Monitoring Server. This may take up to two minutes.
- 5 Verify that the LCD panel displays a window similar to the following:



- **S\_OK:** Verify that **S\_OK** appears on the panel to indicate a functioning connection to the SolarEdge Monitoring Server, which was validated during the last two minutes.



#### NOTE:

If the **S\_OK** indication is not displayed, then perform the following:

- Use another method (unrelated to the SolarEdge inverter) to check whether the network and modem are operating properly. For example, connect a laptop to the Ethernet modem and connect to the Internet.
- Check whether a firewall or another device is blocking transmission.
- Check the configuration of the inverter.

## Troubleshooting Communication

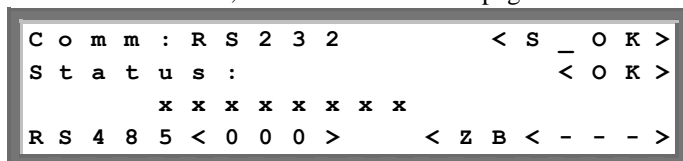
### ► To troubleshoot a communication problem:

- 1 Check that the modem or hub/router is functioning properly.
- 2 Check that the connection to the internal connector on the inverter board is performed properly through its gland at its bottom.
- 3 Check that the selected communication option (RS232, Ethernet [LAN], RS485 or ZigBee) is configuring properly using the inverter's LCD panel.
- 4 Check whether a firewall or another type of network filter is blocking communication.

## ► To troubleshoot Ethernet communication:

When the inverter has Ethernet communication, then the *Communication Status* window, as described on page 65, can be used to identify the location of the error.

Instructions for reaching this screen are provided in the *Inverter LCD Panel and User Buttons* section, which is described on page 62.



This window displays the inverter's communication settings. When Ethernet communication is used, an additional row appears in this screen. It is shown as a row of eight xs in the picture above. This row is comprised of a string of 1s and may also have one or more 0s. The location of the first 0 (from the left) indicates the error location, according to the following order from left to right:

- **1st:** The Ethernet cable is not connected properly. Check the cable pin-out assignment and cable connection.
- **2nd:** The DHCP IP is not configured properly. Check the router and inverter configuration.
- **3rd:** Ping to the first hop switch/router failed (LAN error).
- **4th:** Ping to google.com failed (the internet connection is not operating).
- **5th:** Ping to the redundant SolarEdge server #1 failed. Check the address of the SolarEdge server, as described on page 53.
- **6th:** Ping to the redundant SolarEdge server #2 failed. Check the address of the SolarEdge server, as described on page 53.
- **7th:** Ping to the redundant SolarEdge server #3 failed. Check the address of the SolarEdge server, as described on page 53.
- **8th:** Communication with the SolarEdge server failed. Check the address of the SolarEdge server, as described on page 53.

# Chapter 7

## Inverter User Interface

### Inverter LCD Panel and LEDs

The front of the inverter has a small LCD panel and three LEDs, as shown below:

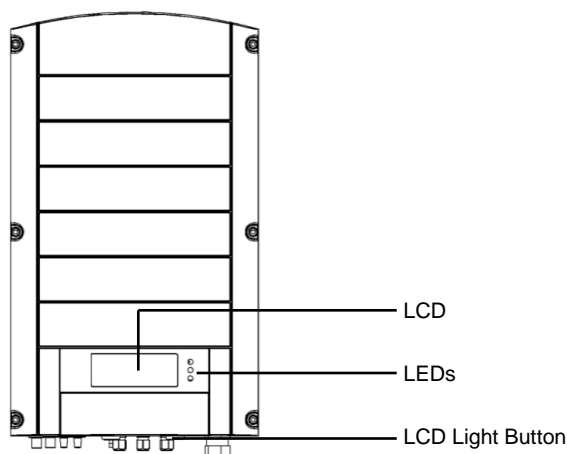


Figure 32: Inverter – Front

The LCD panel has three LED indicators, as follows:

- **Power Production (Green):** Indicates whether the inverter is producing power or not, as follows:
  - **On:** The inverter is producing power.
  - **Blinking:** The inverter is in Standby mode, meaning it is preparing to produce power. The inverter is in Standby mode until enough power is generated. The inverter then automatically goes to Production mode and produces power.
  - **Off:** The inverter is not producing power. This may be during Night mode, when the ON/OFF switch is OFF or when an error occurs.
- **Module Communication (Yellow):** This LED blinks quickly each time monitoring information is received from a power optimizer. In addition this LED blinks while the inverter is being shut down.

- **Fault (Red):** Indicates that an error has occurred. You may refer to the *Appendix A, Errors and Troubleshooting* on page 77 for more information. In addition, this LED blinks while the inverter is being shut down.

All LEDs are on while the inverter is being configured using the buttons inside the inverter.

## Inverter LCD Panel and User Buttons

The following describes the various stages and times of day that you may use the LCD panel and user buttons:

- **Normal operation:** The LCD panel allows the user to check that the inverter is working properly. You may refer to the *Normal Operation* section on page 62 for a description of this window. Use the LCD button to toggle through the informative displays.
- **Inverter startup:** After the inverter is turned on and begins producing power, the LCD panel displays the inverter's status in the *Main Inverter Status* window that shows the total voltage and power, as described in the *Main Inverter Status Window* section on page 64.
- **Inverter shutting down:** The inverter automatically goes into Night mode and turns off the LCD when it is no longer supplied power by at least one string of minimum length.
- **After installation of the inverter:** The field technician must perform basic configuration of the inverter, as described in the *Configuring the Inverter Using the LCD Panel and User Buttons* section on page 67.
- **Error messages:** In the event of a problem, an error message may be displayed on the LCD panel. You may refer to *Appendix A, Errors and Troubleshooting* on page 77 and the *Configuring the Inverter Using the LCD Panel and User Buttons* section on page 67 for more information.

### Normal Operation

Pressing the inverter's LCD light button located on its bottom turns on the LCD's backlight and displays the messages on the LCD panel.

The backlight is displayed for 30 seconds. This length of time is configurable, as described on page 72.

The following screens appear, one after the other, when you press the LCD light button:

- **Initial Inverter Status Window**, below
- **Main Inverter Status Window**, page 64
- **Energy Meter Window**, page 64
- **Telemetry Window**, page 64
- **ID Status Window**, page 65
- **Communication Status Window**, page 65
- **IP Status Window**, page 66
- **Fan Health Status Window – Three Phase Inverters**, page 66

You can toggle between these windows by clicking the LCD light button.

### Initial Inverter Status Window

V a c [ v ]	V d c [ v ]	P a c [ w ]
2 3 0 . 7	3 7 1 . 9	2 3 4 9 . 3
P _ O K :	x x x / y y y	< S _ O K >
		O N

- **Vac [v]:** Specifies the AC output voltage, in Volts.
- **Vdc [v]:** Specifies the DC input voltage, in Volts.
- **Pac [w]:** Specifies the AC output power, in Watts.
- **P\_OK XXX/YYY:** Indicates a functioning DC line-communication connection to the SolarEdge power optimizers, which indicates that telemetry information was received within the last 10 minutes. XXX is the number of paired power optimizers for which telemetries have been received by the inverter in the last hour. YYY is the number of paired power optimizers identified during the most recent pairing process. Both XXX and YYY should be the same. If they are not, it may indicate an access issue or pairing requirement that require your attention.
- **S\_OK:** Indicates a functioning connection to the SolarEdge Monitoring Server, which was validated during the last two minutes. This connection is not mandatory for power generation.
- **ON/OFF:** Indicates the position of the inverter ON/OFF Switch.

## Main Inverter Status Window

After you press the inverter's LCD light button to display the window shown above, you can press it again to display the *Inverter Main Status* window. This is the most informative window during the normal course of events, because it provides a quick overview of power, voltage and inverter heat sink temperature, as described below:

V a c [ v ]	V D c [ v ]	P a c [ w ]
2 3 0 . 7	3 7 1 . 9	3 2 1 0 . 0
F a c [ H z ]	P B s _ O k	T e m p
5 0 . 0	1 1	2 8 . 2

## Energy Meter Window

After you press the inverter's LCD light button to display the window shown above, you can press it again to display the *Inverter Energy Meter* window. This window displays the total energy [Wh] produced during the last day, month and year of the inverter, as described below:

D a y [ W h ]	:	0 . 0
M o n t h [ K W H ]	:	0 . 0
Y e a r [ K W h ]	:	0 . 0
T o t a l [ K W H ]	:	0 . 0



### NOTE:

The production data is accumulated according to an internal real-time clock. If the inverter is connected to the SolarEdge Monitoring Server, it will automatically set the clock's time. If not, you may use the SolarEdge Configuration Tool to set the clock setting.

## Telemetry Window

After you press the inverter's LCD light button to display the window shown above, you can press it again to display the *Inverter Telemetry* window. This window displays the telemetry of the last power optimizer to report its telemetry to the inverter, as described below. The display changes as each power optimizer sends its telemetry information. Each power optimizer sends its telemetry once within each 5-minute period.



### NOTE:

This window is unique in that its backlight is ON by default for 15 minutes after you press the LCD light button (and not 30 seconds like other windows). This length of time can be configured, as described on page 72.

**NOTE:**

In order to verify proper installation, a technician may want to view the *Telemetry* window for some time in order to see that all power optimizers report their telemetries.

```

M o d u l e #       : M 3 2 5 6
E n e r g y [ W h ] :      0 . 0
V d c _ O [ V ]    :    6 9 . 5
V d c _ I [ V ]    :    2 9 . 5
  
```

Clicking the LCD light button again redisplay the *Initial Inverter Status* window, as described on page 63.

## ID Status Window

After you press the inverter's LCD light button to display the window shown above, you can press it again to display the *Inverter ID* window. This window describes the software version and which country for which the inverter is configured.

```

I D       :   # # # # # # # #   # #
D S P 1 / 2 : 1 . 0 2 1 0 / 1 . 0 0 3 4
C P U : 0 0 0 2 . 0 1 1 1
C o u n t r y : G B R
  
```

## Communication Status Window

After you press the inverter's LCD light button to display the window shown above, you can press it again to display the *Inverter Communication Status* window. This window displays the communication settings.

```

C o m m : R S 2 3 2           < S _ O K >
S t a t u s :                 < O K >

R S 4 8 5 < 0 0 0 >          < Z B < - - - >
  
```

## IP Status Window

After you press the inverter's LCD light button to display the window shown above, you can press it again to display the *Inverter IP Status* window. This window describes the Ethernet configuration.

I P	1	9	2	.	1	6	8	.	2	.	1	1	9
M S K	2	5	5	.	2	5	5	.	2	5	5	.	0
G W	1	9	2	.	1	6	8	.	2	.	1		
M A C	0	-	2	7	-	0	2	-	0	0	-	3	9 - 3 6

## Fan Health Status Window – Three Phase Inverters

After you press the inverter's LCD light button to display the window shown above, you can press it again to display the *Fan Health Status* window. This window provides information about the health of the inverter's two fans, as described below:

F a n	H e a l t h	I n d i c a t o r
F A N # 1 :	R e p l a c e	
F A N # 2 :	O p e r a t i n g	

Each fan can have one of the following statuses:

- Operating
- Replace
- Not Working

When a fan has the status **Replace**, the display blinks constantly until it is replaced, as long as the unit is not in night mode.

The Fault LED does not light when in Replace status.

The **Error** section displays an error if the fan is faulty. You may refer to *Appendix A, Errors and Troubleshooting* on page 77 for a description of the error.

Clicking the LCD light button again redisplay the *Initial Inverter Status* window, as described on page 63.

# Configuring the Inverter Using the LCD Panel and User Buttons

After installation of the inverter, a field technician can verify and perform basic configurations of the inverter. This section describes the various LCD messages and possible configurations using the user buttons.

**NOTE:**

This process can also be performed using the SolarEdge configuration tool by connecting a PC or laptop to the inverter via its RS232/USB management port. This tool is described in the *SolarEdge Configuration Tool User Guide*.

## ► To configure the inverter:

- 1 Verify that the inverter's ON/OFF switch is OFF.
- 2 Press the LCD Light button once to turn ON the backlight.

**WARNING!**

If configuration actions are performed after the system has been working,, the following message is displayed:

DC VOLTAGE NOT SAFE!  
DO NOT DISCONNECT!  
VDC : 72.0

This message is displayed until the DC is safe.

The default safety voltage is 50 V.

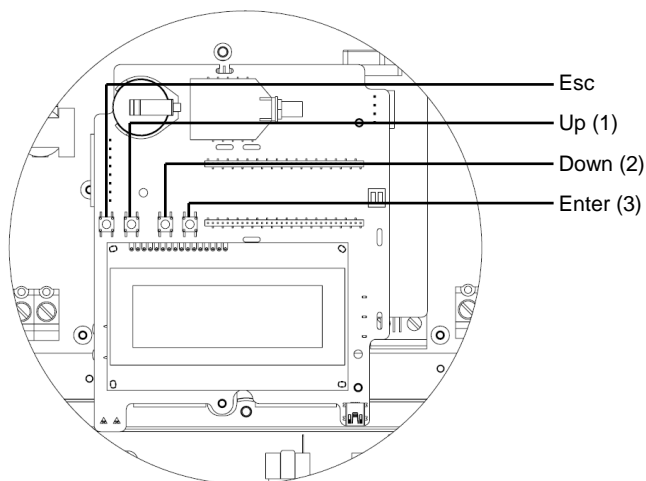
Do not open the cover or open DC connectors until the voltage is indicated as safe or until at least five minutes have passed.

- 3 The following configuration procedures are performed with the inverter cover open. Open the cover, as described in the *Opening the Cover* section on page 27.

**NOTE:**

There are two options for configuring the inverter. One is performed by pressing the external LCD button, which provides access to the most commonly used options. If you only want to perform pairing, you can do so without opening the inverter cover, as described in the *LCD Button Menu Options* section on page 74.

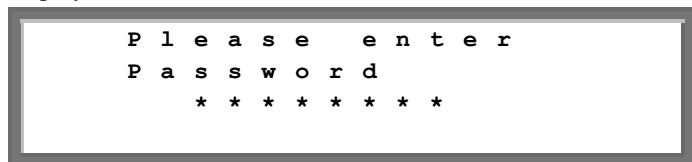
Four buttons for controlling the LCD panel menus are then accessible, as shown below:



**Figure 33: LCD Panel Menu Buttons**

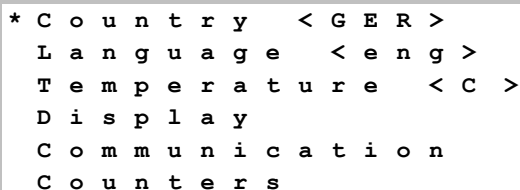
- **Esc:** Goes to the beginning of the currently entered parameter or to the previous menu.
- **Up (1):** Goes up one option in a menu.
- **Down (2):** Goes down one option in a menu.
- **Enter (3):** Confirms the entry or selection of a parameter.

- 4** Press the **Enter** button for at least five seconds. The following message is displayed:



The inverter is now in Setup mode and all its LEDs are lit. The inverter automatically exits Setup mode if no buttons are pressed for more than two minutes.

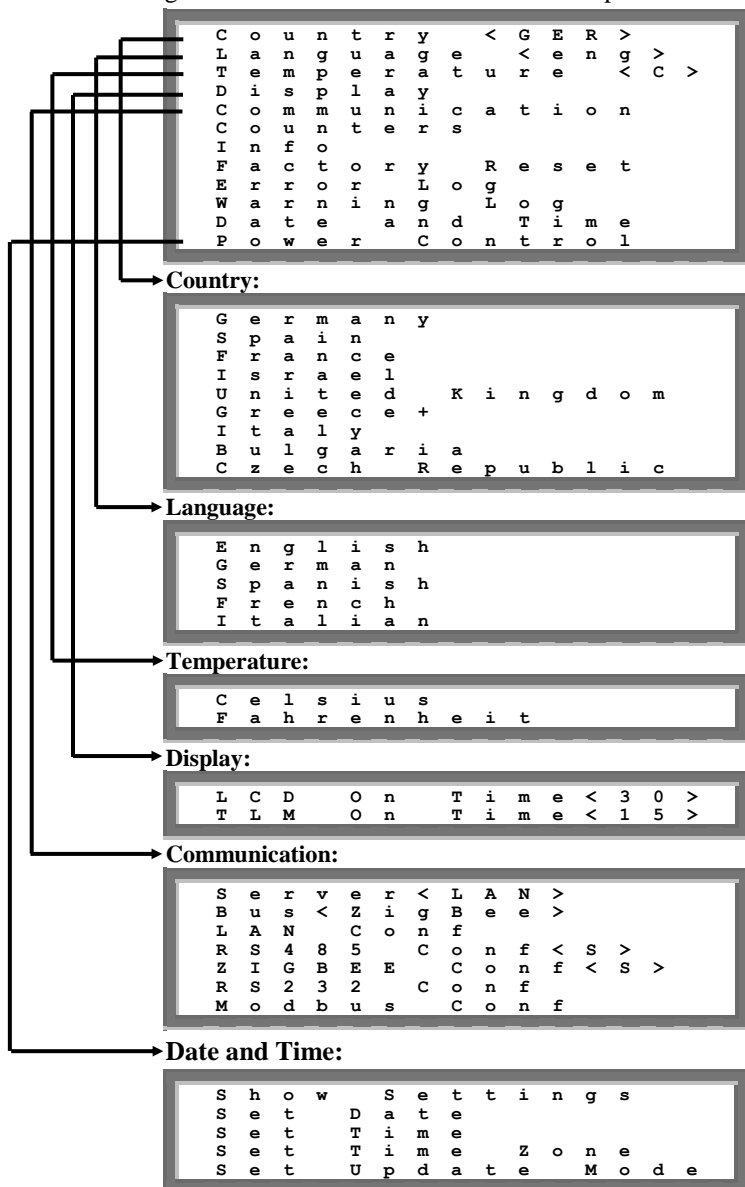
- 5** Use the three right-most buttons inside the inverter (the **UP-1**, **Down-2** and **Enter-3** buttons), shown above, to type in the following default password: **12312312**. Inverter passwords are eight digits long, each digit being between 1 and 3. The following message is displayed:



\* C o u n t r y < G E R >  
L a n g u a g e < e n g >  
T e m p e r a t u r e < C >  
D i s p l a y  
C o m m u n i c a t i o n  
C o u n t e r s

Configure each of these menu options.

The following shows a hierarchical tree of the menu options:



Each menu option is described below.

Use the **Up** and **Down** buttons inside the inverter to move the asterisk (\*) to the relevant menu option and then press the **Enter** button to select it. Use the three rightmost buttons to type in a number if required.

The figure on the following page shows a hierarchical tree of the menu options for the **Communications** menu.

### Communication:

```
S e r v e r < L A N >
B u s < Z i g B e e >
L A N C o n f
R S 4 8 5 C o n f < S >
Z I G B E E C o n f < S >
R S 2 3 2 C o n f
M o d b u s C o n f
```

### Server:

```
L A N
R S 2 3 2
R S 4 8 5
Z i g b e e
N o n e
```

### Bus:

```
Z i g b e e P 2 P
Z i g b e e M P
R S 4 8 5 M a s t e r
R S 4 8 5 S l a v e
N o n e
```

### LAN Conf:

```
I P C o n f i g < E n >
S e t D H C P
S e t I P
S e t M a s k
S e t G a t e w a y
S e t D N S
S e t S e r v e r A d d r
S e t S e r v e r P o r t
```

### ZIGBEE Conf:

```
M o d e < P 2 P S l a v e >
P A N I D
S c a n C h a n n e l
L o a d Z B D e f a u l t s
```

### RS232 Conf:

```
G S M
D i r e c t
```

### Modbus Conf (see next page)

```
M o d b u s S e t < E n >
S e t P r o t o c o l T y p e
S e t D e v i c e I D
S e t C h a n n e l
F a c t o r y R e s e t
```

## Inverter Configuration Menu Options

- 1 Select the **Country** option to specify the country in which the inverter is installed. This parameter may arrive pre-configured. If so, verify that it is set to the proper country.



### WARNING!

The inverter must be configured to the proper country in order to ensure that it functions properly with that country's grids.



### NOTE:

If an inverter is not configured to any country, then it does not turn ON.

If no country is configured, its value is **<NONE>**. A list of countries is displayed. A + near the country indicates that another menu will be displayed after selection. After selecting the country, you are asked to confirm your selection in the confirmation screen. Toggle to **YES** and press **Enter** to confirm.

- 2 Select the **Language** option to select the language in which the LCD panel should display. The inverter may arrive pre-configured to the local language.
- 3 Select the **Temperature** option to select the units in which the temperature is displayed, as shown below:  
The display shows either **<C>** or **<F>** according to whether **Celsius** or **Fahrenheit** was selected. The default is **Celsius**.
- 4 Select the **Display** option to display the following three options:

- **LCD On Time <30>**: Specifies the number of seconds that the LCD panel backlight is ON after the LCD light button is pressed. **<30>** represents the default value of 30 seconds.
- **TLM On Time <15>**: Specifies the number of minutes that the LCD panel backlight is ON while viewing the *Telemetry* window. The default is **15** minutes.
- **SW Version**: Displays version information describing various firmware inverter processors, as follows:

I D	:	0 0 0 0 0 0 0 F
D S P 1	V e r :	1 . 8 8
D S P 2	V e r :	0 . 8 1
C P U	V e r :	1 . 4 7 2 7

- **ID**: Displays the inverter ID, which should be the same as the last part of the inverter ID that appears on the inverter. You may refer to the *Identifying the Inverter* section on page 21 for more details.
- The next three numbers represent the firmware versions of various processors.

**NOTE:**

Please have these numbers ready when you contact SolarEdge support.

- 5** Select the **Communication** option to define and configure the communication option used by the inverter to communicate with the SolarEdge Monitoring Server.

```
S e r v e r < L A N >
B u s < Z i g B e e >
L A N   C o n f
R S 4 8 5   C o n f < S >
Z I G B E E   C o n f < S >
R S 2 3 2   C o n f
M o d b u s   C o n f
```

- Select option **Server** to select which communication method is used to communicate between this inverter and the SolarEdge Monitoring Portal.
- Select options **LAN**, **RS232**, **RS485** or **Zigbee** to configure the communication method to the SolarEdge Monitoring Portal. Refer to *Chapter 6, Setting Up Communication* on page 45 for a full description of these communication options:

You can also select the **None** option if no server communication is required.

**NOTE:**

This menu shows only the actual communication options installed in the inverter, based on the ordering options selected. If a communication option is not installed in the inverter, the relevant number does not appear in the menu.

- 6** Select the **Counters** option to reset all telemetry counters that are displayed in the *Energy Meter* window, which is described in the *Energy Meter Window* section on page 64.

```
T h i s   a c t i o n   w i l l
R e s e t   a l l   c o u n t e r s

P l e a s e   S e l e c t : N O
```

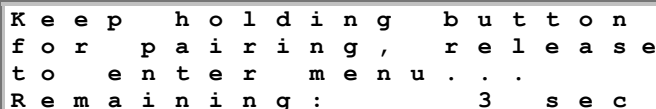
- 7** Single phase inverters: Select the **Phase Balance** option to enable/disable the inverter's power balancing option, which enables the connection of three single-phase inverters to a three-phase grid.
- 8** Select the **Info** option to display the Printed Circuit Board ID and the inverter's firmware version numbers.
- 9** Select the **Factory Reset** option to perform a general reset of the inverter to its default settings.

- 10** Select the **Error Log** option to display the last five errors.
- 11** Select the **Warning Log** option to display the last five warnings.
- 12** Select the **Date and Time** option to set the date and time of the inverter.

## LCD Button Menu Options

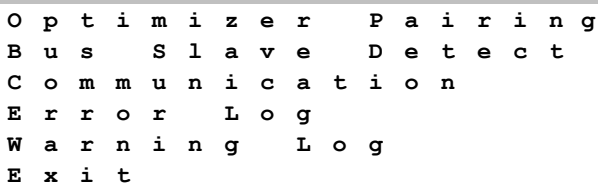
The LCD button can also be used for communication setup and to display the Error log and Warning Log without having to open the inverter

To access the external LCD button menu options, press and hold down the LCD button until the following message is displayed:



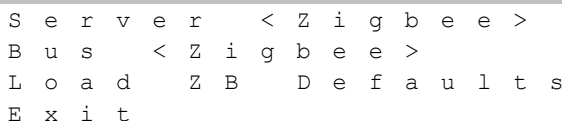
Keep holding button  
for pairing, release  
to enter menu...  
Remaining: 3 sec

Continue to hold down the button to continue the normal pairing function, which is displayed and described on page 35. Releasing the button displays the following menu:



Optimizer Pairing  
Bus Slave Detect  
Communication  
Error Log  
Warning Log  
Exit

### Communication Submenu:



Server < Zigbee >  
Bus < Zigbee >  
Load ZB Defaults  
Exit

The options presented in these menus are the same as those described in the *Inverter Configuration Menu Options* section on page 72, although they are organized slightly differently.

When using these menus, a short press scrolls down to the next menu option and a long press selects the item. You can use the **Exit** options in these menus to move up one menu level.

# Configuring the Inverter Using the SolarEdge Configuration Tool

---

Two options are provided for configuring the system:

- Using the LCD panel, as described in this guide.
- Using the SolarEdge configuration tool, which provides a standard Windows GUI. This tool can be accessed by connecting a computer or laptop to the inverter through the RS232/USB connector.

This tool provides several additional options than are not accessible using the LCD manual, such as enabling a firmware upgrade of the inverter and retrieving a list of the serial numbers of the power optimizers connected to the inverter for quickly verifying that all power optimizers have been installed properly. You may refer to the *SolarEdge Configuration Tool Software Guide*.

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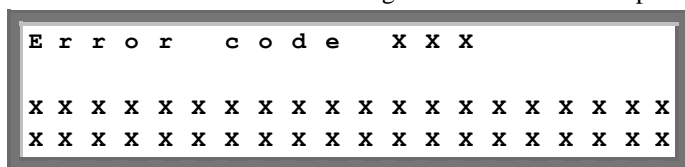
# Appendix A

## Errors and Troubleshooting

The inverter LCD panel displays a message when an error occurs.

This appendix lists the error messages that may appear on the inverter's LCD panel, describes their meaning and describes how to troubleshoot each one.

Each message may comprise up to two lines of 20 characters each. The following shows the format of an error message on the inverter LCD panel:



Each error message is displayed for 30 seconds. If the error no longer exists, the inverter displays the Waking Up message.

The following table lists the error messages that appear on the inverter and describes how to troubleshoot each one.

Error # Single Phase Inverters	Error # Three Phase Inverters	LCD Message	Description	Troubleshooting
4, 5, 6, 8, 11, 12, 18-23, 39, 42, 45, 48, 132- 133, 140	45, 48, 50-53, 94, 108-113	SW Error	Internal software error.	If this fault persists, contact SolarEdge support.
9, 13		AC Current Surge	The internal hardware that measures AC current has measured substantially high output currents. This may occur because of changes in the AC voltage or a switching load near the site.	If this fault persists: <ul style="list-style-type: none"> <li>Check the AC connection to the inverter.</li> <li>Ask the grid operator whether a large surge source or irregular load exists near the site.</li> <li>If the grid does not have problems contact SolarEdge support.</li> </ul>

Error # Single Phase Inverters	Error # Three Phase Inverters	LCD Message	Description	Troubleshooting
10, 37-38	76-77, 90	Ground Current - RCD	Ground current surge. The internal hardware that measures ground fault has measured substantially high ground currents.	<p>Ground faults may occur due to insufficient insulation to the ground.</p> <p><b>DO NOT TOUCH UN-INSULATED WIRES! EXTREME CARE MUST BE TAKEN WHEN TROUBLESHOOTING THIS ERROR. ELECTROCUTION RISK EXISTS!</b></p> <ul style="list-style-type: none"> <li>▪ Only a qualified technician should handle this problem, and only after taking proper precautions.</li> <li>▪ Shut OFF the inverter by turning the ON/OFF switch at the bottom of the inverter OFF and disconnecting the AC switch.</li> <li>▪ Wait five minutes for the input capacitors to discharge.</li> <li>▪ Disconnect the DC inputs.</li> <li>▪ For each DC string, measure the DC voltage between DC- and GND and DC+ and GND with a 1Kohm resistor in parallel to the volt meter. If a voltage higher than 2 V is measured, then the fault is in this string.</li> <li>▪ Do not connect strings with a grounding fault to the inverter.</li> <li>▪ A certified PV installer must fix the faulty string before connecting it to the inverter.</li> </ul>

Error # Single Phase Inverters	Error # Three Phase Inverters	LCD Message	Description	Troubleshooting
14	58/59/60	AC Voltage Too High (Line 1/2/3)	AC voltage surge. The internal hardware that measures AC voltage has measured substantially high <b>instantaneous</b> output voltage.	<p>If this fault persists:</p> <ul style="list-style-type: none"> <li>Check the AC connection to inverter.</li> <li>Ask the grid operator whether a large surge source or irregular load exists near the site.</li> <li>Verify that the gauge of the AC output wire size is large enough, and if not, use a larger gauge wire.</li> </ul>
15	102	DC Voltage Too High	DC overvoltage. The input DC voltage exceeds the maximum level that is supported.	<p>The SolarEdge system should normally eliminate DC overvoltage errors. When DC overvoltage is detected, the inverter shuts off the power optimizers and restarts the inverter.</p> <p>If this fault persists:</p> <ul style="list-style-type: none"> <li>Turn the inverter OFF. After at least five minutes, the LCD panel should show a safety voltage of 1 V *string length. If it does not, check which string is malfunctioning and check its connections to the inverter.</li> <li>Verify that no PV modules are connected directly to the inverter without a power optimizer.</li> <li>Recommission all inverters in the site, as described in <i>Chapter 4, Commissioning the Installation</i> on page 33.</li> </ul>
16, 27	123	Measurement Error	Internal hardware error.	If this fault persists, contact SolarEdge support.

Error # Single Phase Inverters	Error # Three Phase Inverters	LCD Message	Description	Troubleshooting
17	104	Temperature Too High	Over temperature.	<p>If this fault persists, then:</p> <ul style="list-style-type: none"> <li>▪ Verify that there are proper clearance distances around the inverter, as described in the <i>Chassis Clearance</i> section on page 21.</li> <li>▪ Make sure that the heat-sink fins are clear of dirt and obstacles.</li> <li>▪ Check whether the inverter is installed in an area that is too hot.</li> <li>▪ Reinstall in a cooler location.</li> </ul>
24		Faulty Temp. Sensor	Broken or unconnected Temperature sensor.	If this fault persists, contact SolarEdge support.
25	121	Isolation Fault	The inverter detected that the PV solar generator is not properly isolated from ground earth. Isolation is checked every time the inverter starts operation.	<p>If this fault persists:</p> <ul style="list-style-type: none"> <li>▪ Check the PV installation for isolation problems and ground leakage.</li> <li>▪ Only a certified PV installer must fix a faulty string before connecting it to the inverter.</li> </ul>
26	122	Faulty AC Relay	The AC relay failed during wake-up tests.	<p>If this fault persists:</p> <ul style="list-style-type: none"> <li>▪ Disconnect inverter from AC grid.</li> <li>▪ Contact SolarEdge support.</li> </ul>
28		RCD Sensor Error	The RCD measurement mechanism has failed during the wake-up test phase.	If this fault persists, contact SolarEdge support.

Error # Single Phase Inverters	Error # Three Phase Inverters	LCD Message	Description	Troubleshooting
29-30		Phase Balance Error	The monitoring hardware that checks the balance of each phase (L1-N and L2-N) has exceeded its limit. This error is checked only in the USA.	<ul style="list-style-type: none"> <li>Check the grid connection.</li> <li>Check the GND wire connection.</li> <li>Check the L1, L2 and Neutral wire connections.</li> <li>Verify symmetric load between L1 and L2.</li> <li>Consult the local grid authority.</li> </ul>
31, 33	64/65/66	AC Voltage Too High (Line 1/2/3)	Grid voltage is above the limit permitted in this country.	<ul style="list-style-type: none"> <li>Turn off the inverter and verify AC grid voltage.</li> <li>If the inverter is located far from the connection point to the grid, then use a wider gauge AC wire.</li> <li>Consult the grid operator.</li> <li>If permitted by local authorities, use the SolarEdge Configuration Tool to change the settings. Refer to the <i>SolarEdge Installation Tool User Guide</i> for mode detail.</li> </ul>
32, 41	61/62/63, 67/68/69	AC Voltage Too Low (Line 1/2/3)	Grid Voltage is below the limit permitted in this country.	<ul style="list-style-type: none"> <li>Consult the grid operator.</li> <li>If permitted by local authorities, use the SolarEdge Configuration Tool to change the settings. Refer to the <i>SolarEdge Installation Tool User Guide</i> for mode detail.</li> </ul>
34, 35	79/80/81, 82/83/84	AC Freq Too High / Low (Line 1/2/3)	Grid frequency is above / below the limit permitted in this country.	<ul style="list-style-type: none"> <li>Consult the grid operator.</li> <li>If permitted by local authorities, use the SolarEdge Configuration Tool to change the settings. Refer to the <i>SolarEdge Installation Tool User Guide</i> for mode detail.</li> </ul>

Error # Single Phase Inverters	Error # Three Phase Inverters	LCD Message	Description	Troubleshooting
36	72/74/75	DC Injection (Line 1/2/3)	DC feed detected on the AC output.	If this fault persists, contact SolarEdge support.
40		Islanding	AC grid voltage malfunctions. The inverter has shut off due to islanding.	When AC voltage returns, the inverter should restart after some time (time depends on country grid connection codes)  If this fault persists, then consult with the grid operator whether frequent AC disruptions have occurred at the site.
43		Isolation Fault	PV Isolation fault. The inverter has detected the PV solar generator is not properly isolated from ground earth. The isolation is checked every time before the inverter starts operation.	If the problem persists: <ul style="list-style-type: none"> <li>Check the PV installation for isolation problems and ground leakage.</li> <li>Only a certified PV installer must fix the faulty string before connecting it to the inverter.</li> </ul>
44	44	No Country Selected	The inverter is not configured to any country.	Select the country, as described on page 72.
46 (single phase inverter)		Phase Unbalance		Change the <b>Phase Balance</b> option in the inverter's LCD menu to <b>Disable</b> .
134	95, 106, 120, 125-126	HW Error	Internal hardware error.	If this fault persists, contact SolarEdge support.

Error # Single Phase Inverters	Error # Three Phase Inverters	LCD Message	Description	Troubleshooting
144		Islanding – Passive	AC grid voltage malfunctions. The inverter has shut off due to islanding.	<p>When AC voltage returns the inverter should restart after some time (time depends on country grid connection codes)</p> <p>If the problem persists, then consult with the grid operator whether frequent AC disruptions have occurred at the site.</p>
145		UDC Max	DC overvoltage. The input DC voltage exceeds the maximum level that is supported.	<p>The SolarEdge system should normally eliminate DC overvoltage errors. When DC overvoltage is detected, the inverter shuts off the power optimizers and restarts the inverter.</p> <p>If the problem persists, then:</p> <ul style="list-style-type: none"> <li>▪ Turn OFF the ON/OFF switch at the bottom of the inverter. After at least five minutes, the LCD panel should show a low safety voltage equal to 1 V *string length. Otherwise, check which string is malfunctioning and recheck its connections to the inverter.</li> <li>▪ Verify that no PV modules are connected directly to the inverter without a power optimizer.</li> <li>▪ Recommission all inverters in the site, as described in <i>Chapter 4, Commissioning the Installation</i> on page 33.</li> </ul>

Error # Single Phase Inverters	Error # Three Phase Inverters	LCD Message	Description	Troubleshooting
146	103, 119	UDC Min / DC Voltage Too Low	The input DC voltage is below the minimum level that is supported.	Turn the inverter off and then on. If this fault persists, contact SolarEdge support.
	49	Communication Error	Internal software error.	If this fault persists, contact SolarEdge support.
	78	Grid Sync Error	Grid voltage or frequency is unstable.	If this fault persists, contact SolarEdge support.
	91/92/93, 96/97/98	AC Over Current Line 1/2/3	Grid error.	If this fault persists, contact SolarEdge support.
	99-101	AC Voltage Too High Line 1/2/3	Grid error.	Turn the inverter off and then on. If this fault persists, contact SolarEdge support.
	105	Temperature Too Low	Under temperature.	If this fault persists, reinstall the inverter in a warmer place.
	124	Ground Current – RCD	Internal hardware error.	If this fault persists, contact SolarEdge support.

## Appendix B

## Technical Specifications

The tables in this appendix provide the technical specifications of the SolarEdge system components.

## Single Phase Inverter

[illegible]

## SolarEdge Installation Guide – MAN-01-00057-2.0

	SE2200	SE3000	SE3500	SE4000	SE4000-16A	SE5000	SE6000	
Input								
Recommended Maximum DC Power* (Module STC)	2400	3200	3700	4200	4200	5300	6200	W
Transformer-less, Ungrounded	Yes							
Maximum Input Voltage	500							Vdc
Nominal DC Input Voltage	350							Vdc
Maximum Input Current	8.5	11.5	13.5	15.5	15.5	19.5 <sup>iv</sup>	23	Adc
Reverse-Polarity Protection	Yes							
Ground-Fault Isolation Detection	600 kΩ Sensitivity							
Maximum Inverter Efficiency	97.8							%
European Weighted Efficiency	97.6	97.6	97.5	97.5	97.5	97.4	97.4	%
Nighttime Power Consumption	< 2.5							W
Additional Features								
Supported Communication Interfaces	RS485, RS232, USB, Ethernet, Zigbee (optional)							
Standards Compliance								
Safety	IEC-62103 (EN50178), Draft IEC-62109							
Grid Connection Standards	VDE 0126-1-1, AS-4777, RD-1663, DK 5940							
Emissions	IEC61000-6-2, IEC61000-6-3, IEC61000-3-11, IEC61000-3-12, FCC part15 class B							
RoHS	Yes							
Installation Specifications								
AC Output	Cable Gland - Diameter 11-17							mm
DC Input	MC4							
Maximum Installation Height	2000m							

	SE2200	SE3000	SE3500	SE4000	SE4000-16A	SE5000	SE6000	
Dimensions (HxWxD)	540 x 315 x 172			540 x 315 x 191				mm
Weight	19			20.5				kg
Cooling	Natural Convection							
Operating Temperature Range	-20 to +50**							°C
Protection Rating	IP65 – Outdoor and Indoor							
Bracket Mounted (Bracket Provided)								

\* Higher input DC power may be installed; analyze yearly AC performance.

\*\* For inverter power de-rating refer to the application note at the following link: <http://www.solaredge.com/files/pdfs/se-temperature-derating-note.pdf>

<sup>i</sup> 4600 in Germany and in the Czech Republic

<sup>ii</sup> 16 in the UK, Poland, Portugal and Denmark

<sup>iii</sup> 25 in Germany and the Czech Republic

<sup>iv</sup> 17.5 in Germany and the Czech Republic

## Three Phase Inverter

	SE7k	SE8k	SE9k	SE10k	SE12.5k	SE15k	
<b>Output</b>							
Rated AC Power Output	7000	8000	9000	10000	12500	15000	VA
Maximum AC Power Output	7000	8000	9000	10000	12500	15000	VA
AC Output Voltage – Line to Line / Line to Neutral (Nominal)	380/220; 400/230						Vac
AC Output Voltage Range	184 – 264.5						Vac
AC Frequency	50/60 ± 5						Hz
Maximum Continuous Output Current (per Phase)	11.5	13	14.5	16	20	23	A
Residual Current Detector / Residual Current Step Detector	300 / 30						mA
Grid Supported – Three Phase	3 / N / PE ; 230 / 400						V
Utility Monitoring, Islanding Protection, Country Configurable Thresholds	Yes						

## SolarEdge Installation Guide – MAN-01-00057-2.0

	SE7k	SE8k	SE9k	SE10k	SE12.5k	SE15k	
Input							
Recommended Maximum DC Power (Module STC)	7700	8800	9900	11000	13000	13700	W
Transformer-less, Ungrounded	Yes						
Maximum Input Voltage	950						Vdc
Nominal DC Input Voltage	750						Vdc
Maximum Input Current	12	13.5	15	16.5	21	22	Adc
Reverse-Polarity Protection	Yes						
Ground-Fault Isolation Detection	600 kΩ Sensitivity						
Maximum Inverter Efficiency	98						%
European Weighted Efficiency	97.7	97.6	97.6	97.5	97.4	97.4	%
Nighttime Power Consumption	< 2.5						W
Additional Features							
Supported Communication Interfaces	RS485, RS232, Ethernet, Zigbee (optional)						
Standards Compliance							
Safety	IEC-62103 (EN50178), Draft IEC-62109, UL1741						
Grid Connection Standards	VDE-AR-N-4105, VDE 0126-1-1, AS-4777, RD-1663, DK 5940, IEEEE1547, NEC						
Emissions	IEC61000-6-2, IEC61000-6-3, IEC61000-3-11, IEC61000-3-12, FCC part15 class B						
WEEE, RoHS	Yes						
Installation Specifications							
AC Output	Cable Gland - diameter 11-17						mm
DC Input	MC4						
Maximum Installation Height	2000						m
Dimensions (W x L x H)	540 x 315 x 260						mm
Weight	32						kg
Operating Temperature Range	-20 – +60*						°C
Cooling	Fan (user replaceable)						
Protection Rating	IP65 – Outdoor and Indoor						
Bracket Mounted (Bracket Provided)							

\* For inverter power de-rating refer to the application note at the following link: <http://www.solaredge.com/files/pdfs/se-temperature-derating-note.pdf>

# OP250-LV, OP300-MV, OP400-MV and OP400-EV

	OP250-LV	OP300-MV/OP400-MV	OP400-EV	
Input				
Rated Input DC Power	250	300/400	400	W
Absolute Maximum Input Voltage	55	75	125	Vdc
MPPT Operating Range	5 - 55	5 - 75	15-125	Vdc
Maximum Input Current	10		7	Adc
Reverse-Polarity Protection	Yes			
Maximum Efficiency	99.5			%
Weighted Efficiency	98.8			%
Overvoltage Category	II			
Output During Operation (Power Optimizer Connected to Operating Inverter)				
Maximum Output Current	15			Adc
Operating Output Voltage	5 - 60			Vdc
Total Maximum String Voltage (Controlled by Inverter) - US and EU 1-ph	500			Vdc
Total Maximum String Voltage (Controlled by Inverter) - EU 3-ph	950			Vdc
Output During Standby (Power Optimizer Disconnected from Inverter or Inverter Off)				
Safety Output Voltage per Power Optimizer	1			Vdc
PV System Design				
Minimum Number of Power Optimizers per String (1 or More Modules per Power Optimizer)	8 (1-ph system) / 16 (3-ph system)			
Maximum Number of Power Optimizers per String (1 or More Modules per Power Optimizer)	25 (1-ph system) / 50 (3-ph system)			
Maximum Power per String	5250 (1-ph system) / 11250 (3-ph system)			W
Parallel Strings of Different Lengths or Orientations	Yes			

	OP250-LV	OP300-MV/OP400-MV	OP400-EV	
Standard Compliance				
EMC	FCC Part15 Class B, IEC61000-6-2, IEC61000-6-3			
Safety	IEC-62103 (class II safety), UL1741			
Material	UL-94 (5-VA), UV Resistant			
RoHS	Yes			
Installation Specifications				
Dimensions (W x L x H)	120 x 130 x37 / 4.72 x 5.11 x 1.45			mm/in
Weight	450 / 1.0			g / lb
Maximum Installation Height	2000m			
Output PV Wire	0.95 m / 3 ft length ; 6 mm <sup>2</sup> ; MC4			
Input Connector	MC4 / MC3 / Tyco / H+S			
Operating Temperature Range	-40 – +65 / -40 – +150			°C/°F
Protection Rating	IP65 / NEMA 4			
Relative Humidity	0 - 100			%

# Appendix C

## Power Optimizer Mechanical Specifications

This appendix presents the mechanical specifications for the SolarEdge power optimizers.

Use M6 (1/4") screws and washers to secure the power optimizer units to the racking.

**NOTE:**

SolarEdge does not provide the screws, nuts or washers because the required sizes and lengths vary for different racks.

**CAUTION:**

Before installing directly on the module or module frame, first consult the module manufacturer for information about the proper positioning and its impact on the module warranty.

- Mark all mounting hole locations.
- Each power optimizer must be attached to the rack using both mounting holes.
- Drill the holes.

**CAUTION:**

Do not drill through the power optimizer or through the mounting holes. The strong vibrations created by the drill can damage the power optimizer.

## OP250-LV, OP300-MV, OP400-MV, OP400-EV Power Optimizers

The following figure shows the mechanical specifications for the OP250-LV, OP300-MV, OP400-MV and OP400-EV power optimizers:

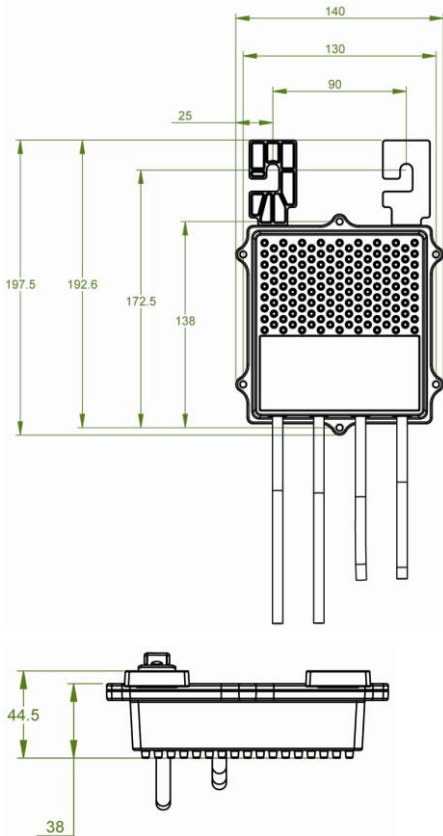


Figure 34: Power Optimizer Mechanical Specifications

# Appendix D

## Safe DC

When AC supply to the inverter is shut off, by shutting off the AC breaker at the site, or when the inverter ON/OFF switch is turned to OFF, the DC voltage drops to a safe voltage of 1V per optimizer.

The SolarEdge inverters are certified for compliance with IEC 60947-3:1999 + Corrigendum: 1999 + A1:2001 + Corrigendum 1:2001 + A2:2005; DIN EN 60947-3; VDE 0660-107:2006-03; IEC 60364-7-712:2002-05 and DIN VDE 0100-712:2006-06 as a disconnection device for PV generators, meaning that they can replace a DC disconnect.

In compliance with this standard, the disconnection mechanism operates as follows:

- Turn the inverter ON/OFF switch, located at the bottom of the inverter, to OFF, or disconnect the AC by shutting off the AC breaker at the site.
- The DC voltage displayed on the inverter LCD begins to decrease. If the AC breaker was shut off, the LCD does not display. In this case, wait five minutes.
- When the DC voltage reaches a safe voltage then the PV connectors at the input to the inverter can be disconnected. A galvanic separation then exists between the PV array and the inverter.

The disconnection is safe even under single fault conditions.



### WARNING!

The Safe DC voltage is only guaranteed when using modules of up to:

- 95Voc when using the single phase inverter
- 70Voc when using the three phase inverter

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# Appendix E

## Limited Product Warranty

This SolarEdge Limited Warranty covers defects in workmanship and materials of the products for the applicable warranty period set out below:

**Power optimizers:** 25 years commencing on the earlier of: (i) 3 months from the date the power optimizers are delivered by SolarEdge; and (ii) the installation of the power optimizers, *provided, however*, that for the power optimizer, the Warranty Period shall not exceed the warranty period provided by the applicable module manufacturer.

**Inverters:** 12 years commencing on the earlier of: (i) 3 months from the date the Inverters are delivered by SolarEdge; and (ii) the installation of the Inverters.

The Limited Warranty does not apply to ancillary equipment and components sold separately from the Products, such as, for example, cables, wires and connectors, whether supplied by SolarEdge or others.

The Limited Warranty only applies to the buyer who has purchased the Products from an authorized seller of SolarEdge for use in accordance with their intended purpose. The Limited Warranty may be transferred from buyer to any assignee, and will remain in effect for the time period remaining under the foregoing warranties, *provided* that the Products are not moved outside its original country of installation and any reinstallation is done in accordance with the installation directions and use guidelines accompany the Products (collectively the “Documentation”).

If, during the applicable Warranty Period, buyer discovers any defect in workmanship and materials and seeks to activate the Limited Warranty, then buyer shall, promptly after such discovery, report the defect to SolarEdge by sending an email to [support@solaredge.com](mailto:support@solaredge.com) with the following information: (i) a short description of the defect, (ii) the Product’s serial number, and (iii) a scanned copy of the purchase receipt or warranty certificate of the applicable Product.

Upon buyer’s notification, SolarEdge shall determine whether the reported defect is eligible for coverage under the Limited Warranty. The Product’s serial number must be legible and properly attached to the Product in order to be eligible for Warranty coverage. If SolarEdge determines that the reported defect is not eligible for coverage under the Limited Warranty, SolarEdge will notify buyer accordingly and will explain the reason why such coverage is not available. If SolarEdge determines that the reported defect is eligible for coverage under the Limited Warranty, SolarEdge will notify buyer accordingly, and SolarEdge may, in its sole discretion, take any of the following actions:

- repair the Product at SolarEdge’s facilities or on-site; or
- issue a credit note for the defective Product in an amount up to its actual value at the time buyer notifies SolarEdge of the defect, as determined by SolarEdge, for use toward the purchase of a new Product; or
- provide Buyer with replacement units for the Product.

SolarEdge will determine whether the Product should be returned to SolarEdge and, if SolarEdge so determined, the Return Merchandise Authorization (“RMA”) Procedure (set out below) will be invoked. Where replacement Products are sent, SolarEdge generally sends such products within 48 hours. The repaired Product or replacement parts or Product, as applicable, shall continue to be covered under the Limited Warranty for the remainder of the then-current Warranty Period for the Product.

Where the RMA Procedure is invoked by SolarEdge, SolarEdge will instruct buyer how to package and ship the Product or part(s) to the designated location. SolarEdge will bear the cost of such shipment, upon receipt of the Product or part(s), SolarEdge will, at its expense and sole discretion, either repair or replace the Product or part(s).

SolarEdge will deliver the repaired or replaced Product or part(s) to buyer at buyer’s designated location. SolarEdge will bear the cost of such shipment. SolarEdge may elect to ship replacement Product and/or part(s) prior to receipt of the Product and/or part(s) to be returned to SolarEdge as per the above.

Where SolarEdge decides to repair the Product or part(s), warranty coverage includes labor and material costs necessarily incurred to correct the Product defect; and where SolarEdge decides to replace the Product or part(s) to which the Limited Warranty applies, warranty coverage includes the cost of the replacement the Product or part(s). In addition, SolarEdge shall bear shipping costs in respect to the foregoing, as set out above. All other costs, including, without limitation, travel and boarding costs of SolarEdge service personnel that are incurred for repairs of Products on-site, as well as costs related to buyer’s employees and contractors repair or replacement activities, are not covered by the Limited Warranty and, unless otherwise agreed in writing in advance by SolarEdge, shall be borne by the buyer.

**Warranty Exclusions:** This Limited Warranty will not apply if (a) buyer is in default under the General Terms and Conditions or other Agreement governing the purchase of the Product, or (b) the Product or any part thereof is:

- damaged as a result of misuse, abuse, accident, negligence or failure to maintain the Product;
- damaged as a result of modifications, alterations or attachments thereto which were not pre-authorized in writing by SolarEdge;
- damaged due to the failure to observe the applicable safety regulations governing the proper use of the Product;
- installed or operated not in strict conformance with the Documentation, including without limitation, not ensuring sufficient ventilation for the Product as described in SolarEdge installation guide;
- opened, modified or disassembled in any way without SolarEdge’s prior written consent;
- used in combination with equipment, items or materials not permitted by the Documentation or in violation of local codes and standards;
- damaged or rendered non-functional as a result of power surges, lightning, fire, flood, pest damage, accident, action of third parties, or other events beyond SolarEdge’s reasonable control or not arising from normal operating conditions; or

- damaged during or in connection with shipping or transport to or from buyer where buyer arranges such shipping or transport.

This Limited Warranty does not cover cosmetic or superficial defects, dents, marks or scratches which do not influence the proper functioning of the Product.

FOR TRANSACTIONS IN WHICH THE PRODUCTS ARE NOT DEEMED TO BE CONSUMER PRODUCTS PURSUANT TO THE MAGNUSON-MOSS WARRANTY ACT, THE LIMITED WARRANTIES SET OUT HEREIN ARE IN LIEU OF ANY OTHER WARRANTIES WITH RESPECT TO THE PRODUCTS PURCHASED BY BUYER FROM SOLAREEDGE, WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL (INCLUDING ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE), ALL OF WHICH ARE EXPRESSLY EXCLUDED TO THE FULLEST EXTENT PERMITTED BY APPLICABLE LAW. FOR ALL OTHER TRANSACTIONS, THE DURATION AND EXTENT OF ANY IMPLIED WARRANTIES IS LIMITED TO THE FULLEST EXTENT ALLOWED BY LAW.

Claims by buyer that go beyond the warranty terms set out herein, including claims for compensation or damages, are not covered by the Limited Warranty, insofar as SolarEdge is not subject to statutory liability. In such cases, please contact the company that sold you the Product. Eventual claims in accordance with the law on product liability remain unaffected.

Coverage under the Limited Warranty is subject to buyer complying with the foregoing notification requirements and cooperating with SolarEdge's directions. SolarEdge's sole obligation and buyer's exclusive remedy for any defect warranted hereunder, is limited to those actions expressly stated above. Such actions are final and do not grant any further rights, in particular with respect to any claims for compensation.

Unless otherwise specified in an executed Agreement with SolarEdge, the Limited Warranty and related provisions set out herein are subject to SolarEdge's General Terms and Conditions, including, without limitation, the provisions thereof which relate to disclaimer of warranties, limitation of liability and governing law and jurisdiction.

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If you have technical problems concerning our products,  
please contact our Support lines:

North America	(Toll free) 1877 360 529 2
Australia	(Toll free) 1800 149 229
Germany	089 454 597 30
France	(Toll free) 0800 917 410
Italy	(Toll free) 0800 784 824
United Kingdom	(Toll free) 0800 206 105 8
Belgium	(Toll free) 0800 730 41
Israel	073 240 311 8
Rest of world	+ 1 (0) 650 319 884 3
Fax	+ 972 (0) 73 240 311 7
Email to:	support@solaredge.com

[www.solaredge.com](http://www.solaredge.com)

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