



Installation Guide

# Three Phase Inverter with Synergy Technology

P/N: SExxK-xxxxlxxxx

For Europe, APAC and South Africa

Version 1.1

# Disclaimers

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The images contained in this document are for illustrative purposes only and may vary depending on product models.

## Emission Compliance

This equipment has been tested and found to comply with the limits applied by the local regulations.

These limits are designed to provide reasonable protection against harmful interference. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, you are encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications not expressly approved by the party responsible for compliance may void the user's authority to operate the equipment.

### CAUTION!

Where EN55011 Class A is deemed applicable, the following requirements apply:

- This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.
  - ▲ ■ This equipment should be connected to inverters with a rated power > 20 kVA and is intended to be installed in a large photovoltaic power generating system by a professional.
  - This equipment should be physically separated from residential environments by a distance greater than 30 m, and can be equipped with additional filtering if necessary.
-

# Revision History

## Version 1.1 (May. 2021)

Added Synergy Unit connectors drawing

Version 1.0, April 2021: Initial release

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# HANDLING AND SAFETY INSTRUCTIONS

## Safety Symbols Information

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

### 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 product**. 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.

Disposal requirements under the Waste Electrical and Electronic Equipment (WEEE) regulations:



### NOTE

Discard this product according to local regulations or send it back to SolarEdge.



### Warning!

To reduce the risk of injury, read all instructions in this document.



### WARNING!

Using this equipment in a manner not specified by SolarEdge in this document may impair the protection provided by this equipment.

### WARNING!



The inverter cover must be opened only after switching the inverter ON/OFF/P switch located at the bottom of the inverter to OFF. This disables the DC voltage inside the inverter. Wait five minutes before opening the cover. Otherwise, there is a risk of electric shock from energy stored in the capacitors.



P = Program/Pair  
1 = ON  
0 = OFF

**WARNING!**

Before operating the inverter, ensure that the inverter AC power cable and wall outlet are grounded properly. This product must be connected to a grounded, metal, permanent wiring system, or an equipment-grounding conductor must be run with the circuit conductors and connected to the equipment grounding terminal or lead on the product.

**WARNING!**

Opening the inverter and repairing or testing under power must be performed only by qualified service personnel familiar with this inverter.

**WARNING!**

Do not touch the PV panels or any rail system connected when the inverter switch is ON, unless grounded.

**WARNING!**

SafeDC complies with IEC60947-3 when installing the system with a worst case SafeDC voltage (under fault conditions)  $< 120V$ .

The worst case voltage is defined as:  $V_{oc, max} + (String\ Length - 1) * 1V$ , where:

- $V_{oc, max}$  = Maximum  $V_{oc}$  (at lowest temperature) of the PV modules in the string (for a string with multiple modules, use the max value)
- String Length = number of Power Optimizers in the string

**CAUTION!**

This unit must be operated according to the technical specification datasheet provided with the unit.


**CAUTION!**

**HEAVY OBJECT.** To avoid muscle strain or back injury, use proper lifting techniques, and if required - a lifting aid.

**NOTE**

Use PV modules rated according to IEC 61730 class A.

**NOTE**

The symbol  appears at grounding points on the SolarEdge equipment. This symbol is also used in this manual.



## NOTE

SolarEdge inverters can be installed in sites with an alternative power source such as a generator. SolarEdge requires installing a physical or electronic interlock, which will signal to the inverter when the grid has been disconnected. Interlock procurement, installation, maintenance and support are the responsibility of the installer. Damage to the inverter due to incorrect interlock installation or use of an interlock that is incompatible with the SolarEdge system will render the SolarEdge warranty invalid.



For more information on connecting an alternative power source to SolarEdge inverter, refer to <https://www.solaredge.com/sites/default/files/se-inverter-support-of-voltage-sources.pdf>.



## NOTE

The following warning symbols appear on the inverter warning label:



Risk of electric shock



Risk of electric shock from energy stored in the capacitor. Do not remove cover until 5 minutes after disconnecting all sources of supply.



Hot surface – To reduce the risk of burns, do not touch.



Caution, risk of danger

# Chapter 1: Introducing the SolarEdge Power Harvesting System

The SolarEdge power harvesting solution is designed to maximize the power output from any type of solar Photovoltaic (PV) installation while reducing the average cost per Watt. *Figure 1* shows and the following sections describe the components of the SolarEdge power harvesting system.

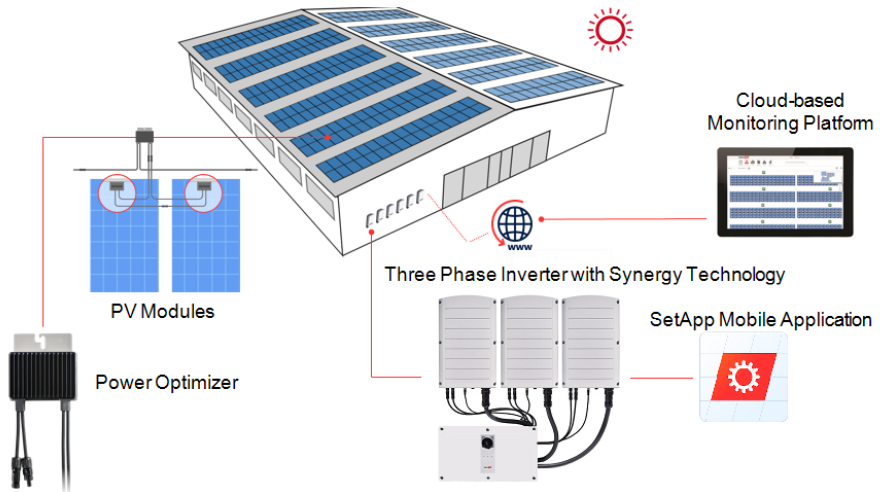


Figure 1: The SolarEdge power harvesting system components

## Power Optimizer

The Power Optimizers are DC-DC converters connected to PV modules to maximize power harvesting by performing independent Maximum Power Point Tracking (MPPT) at the module level.

The Power Optimizers regulate the string voltage at a constant level, regardless of string length and environmental conditions.

The Power Optimizers include a safety Voltage function that automatically reduces the output of each Power Optimizer to 1 Vdc in the following cases:

- During fault conditions
- The Power Optimizers are disconnected from the inverter
- The inverter ON/OFF/P switch is turned OFF

- The DC Disconnect Switch on the Synergy Manager is turned OFF
- The inverter AC breaker is turned OFF

Each Power Optimizer also transmits module performance data over the DC power line to the inverter.

Two types of Power Optimizers are available:

- Module add-on Power Optimizer – connected to one or more modules
- Smart modules - the Power Optimizer is embedded into a module

## Three Phase Inverter with Synergy Technology

The Three Phase Inverter with Synergy Technology (referred to as 'inverter' in this manual) efficiently converts DC power from the PV modules into AC power that can be fed into the main AC service of the site and from there to the grid. The inverter also receives the monitoring data from each Power Optimizer and transmits it to the SolarEdge Monitoring platform (requires a land-line or cellular connection to the Internet).

The inverter is comprised of one Synergy Manager with DC Disconnect Switch for disconnecting the DC power, depending on the inverter's model. The Inverter may include two or three Synergy Units, depending on the inverter's model.

The Synergy Unit are connected to the Synergy Manager via AC, DC and communication cables.

Each Synergy Unit operates independently and continues to work in case others stopped operating.

A chain of up to 31 inverters can be set to operate together via Modbus on RS485 line. When setting a chain of inverters, the inverter that manages communication interface to the internet is called Leader and the rest are Followers.

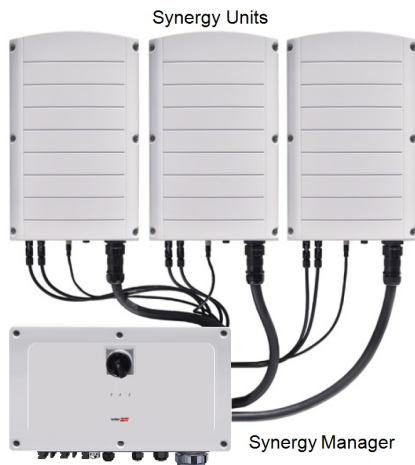


Figure 2: Synergy Manager with three Synergy Units

## Monitoring Platform

The monitoring platform enables monitoring the technical and financial performance of one or more SolarEdge sites. It provides past and online information on the system performance, both at the system and PV module levels.

## Designer

Designer recommends inverter and Power Optimizer selection per site size and enables report generation. You can create a project in Designer and export the site design with the string layout to the monitoring platform.

## Supported AC Grids

This section details the AC grids supported by SolarEdge inverters (model dependent). Ground connection is required for all grids, as described in "Connecting Ground and AC to the Synergy Manager" on page 39.

For overview of common AC grids and the compatibility of SolarEdge inverters, refer to [Grids Supported by SolarEdge Inverters](#).

## Installation Tools and Material List

Standard tools can be used during the installation of the SolarEdge system. The following recommend tools is required for installation:

- Allen screwdriver for 5mm screw type for the inverter cover, Synergy Manager cover and inverter side screws
- Allen screwdriver for M5/M6/M8 screw types
- Standard flat-head screwdrivers set
- Non-contact Voltage detector
- Cordless drill (with a torque clutch) or screwdriver and bits suitable for the surface on which the inverter and Power Optimizers will be installed. Use of an impact driver is not allowed.
- MC4 crimping tool
- Ring terminals crimping tool
- Wire cutters
- Wire strippers
- Voltmeter

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

- For Ethernet:
  - CAT6 twisted pair Ethernet cable with RJ45 connector
  - If using a CAT6 cable spool: RJ45 plug and RJ45 crimper
- For RS485:
  - Four- or six-wire shielded twisted pair cable
  - Watchmaker precision screwdriver set

For secondary grounding:

- Ring/lug terminal crimper tool for the Ground wire
- Ring/lug terminal
- Serrated washer
- Grounding screw
- Two washers

## Installation Procedure

The following procedures, are required for installing and setting up a new SolarEdge site. Some of these procedures also apply to modification of an existing site.

1. [Installing the Power Optimizers](#)
2. [Installing the Synergy Manager and Synergy Units](#)

3. [Connecting AC and PV Strings to the Synergy Manager](#)
4. [Activating, Commissioning and Configuring the System](#)
5. [Setting Up Communication with the Monitoring Platform](#)

# Chapter 2: Installing the Power Optimizers

## Safety

The following notes and warnings apply when installing the SolarEdge Power Optimizers. Some of the following may not be applicable to smart modules:

### WARNING!



When modifying an existing installation, turn OFF the inverter ON/OFF switch, the Synergy Manager and the AC circuit breaker on the main AC distribution panel.

### CAUTION!



Power Optimizers are IP68/NEMA6P rated. Choose a mounting location where optimizers will not be submerged in water.

### CAUTION!



This unit must be operated according to the operating specifications provided with the unit.

### CAUTION!



Cutting the Power Optimizer input or output cable connector is prohibited and will void the warranty.

### CAUTION!



All PV modules must be connected to a Power Optimizer.

### CAUTION!



If you intend to mount the Power Optimizers directly to the module or module frame, first consult the module manufacturer for guidance regarding the mounting location and the impact, if any, on module warranty. Drilling holes in the module frame should be done according to the module manufacturer instructions.

### IMPORTANT SAFETY FEATURE



Modules with SolarEdge Power Optimizers are safe. They carry only a low safety voltage before the inverter is turned ON. As long as the Power Optimizers are not connected to the inverter or the inverter is turned OFF, each Power Optimizer will output a safe voltage of 1V.

**CAUTION!**

Installing a SolarEdge system without ensuring compatibility of the module connectors with the Power Optimizer connectors may be unsafe and could cause functionality problems such as ground faults, resulting in inverter shut down. To ensure mechanical compatibility of the SolarEdge Power Optimizers' connectors with the PV modules' connectors 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 module connector manufacturer should explicitly verify compatibility with the SolarEdge Power Optimizer 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.

## Installation Guidelines

- For the minimum and maximum number of Power Optimizers in a string (string length), see the Power Optimizer datasheets. Refer to the Designer for string length verification. The Designer is available on the SolarEdge website at:

[https://www.solaredge.com/products/installer-tools/designer#/.](https://www.solaredge.com/products/installer-tools/designer#/)

- *Do not* use extension cables between a module and a Power Optimizer, between two modules connected to the same Power Optimizer, or between two Power Optimizers other than in the following cases:

### **Between a Power Optimizer and a module:**

- Residential Power Optimizers P300-P601 - extension cables up to 0.90 m can be installed per Power Optimizer (0.90 m for DC+ and 0.90 m for DC -).
- Power Optimizers with the 4-type suffix in their part number (Pxxx-4xxxxxx) - extension cables of up to 16 m can be installed per Power Optimizer (8 m for DC+ and 8 m for DC-).
- Power Optimizers manufactured starting from working week 42, 2019, as indicated in the serial number (Example: S/N SJ5019A-xxxxxxx - working week 50, 2019) - extension cables of up to 16 m can be installed per Power Optimizer (8 m for DC+ and 8 m for DC-).



**Between two Power Optimizers or between a Power Optimizer and the inverter:**

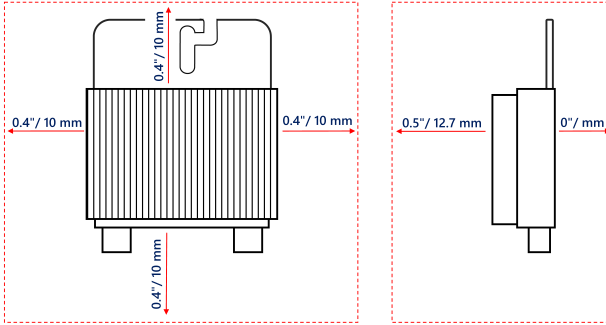
- Extension cables can be installed between Power Optimizers only from row to row, around obstacles or pathways within a row and from the end of the string to the inverter. The total length of the extension cables must not exceed the following values:

Single Phase Inverters	Three Phase Inverters
All - 300 m	SE17K and below - 300 m / 1000 ft SE20K and above - 700 m / 2300 ft

- For connecting homerun DC cables from Power Optimizers to the inverter, use cables with the following cross-sections:
  - For MC4 connectors: 2.5-10 mm<sup>2</sup>
- Frame-mounted Power Optimizers are mounted directly on the module frame, regardless of racking system (rail-less or with rails). For installation of frame-mounted Power Optimizers, refer to [http://www.solaredge.com/sites/default/files/installing\\_frame\\_mounted\\_power\\_optimizers.pdf](http://www.solaredge.com/sites/default/files/installing_frame_mounted_power_optimizers.pdf).
- The Power Optimizer can be placed in any orientation.
- If connecting more modules than Power Optimizer inputs in parallel, use a branch cable. Some commercial Power Optimizer models have a dual input.
- Position the Power Optimizer close enough to its module so that their cables can be connected.
- Make sure to use Power Optimizers that have the required output and input conductor length.
- Completely shaded modules may cause their 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 number of unshaded Power Optimizers connected in a string of modules is met. If under typical conditions fewer than the minimum Power Optimizers are connected to unshaded modules, add more Power Optimizers to the string.

■ To allow for heat dissipation, maintain clearance as specified below.

**All Power Optimizers, except for the P860 and P960 Power Optimizers**



**P860, P960 and M1600 Power Optimizers**

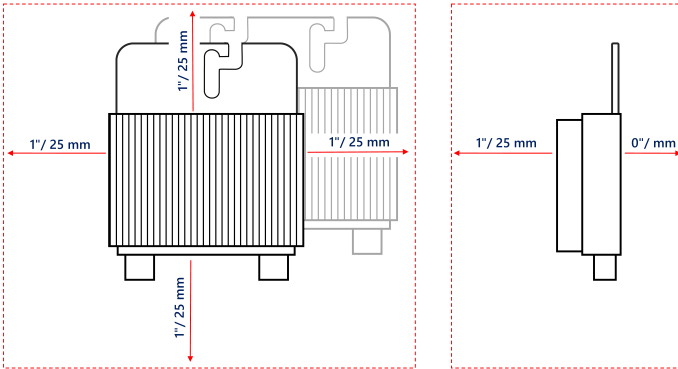


Figure 3: Power Optimizers clearance

■ When installing PV modules in a confined space such as Building-integrated photovoltaic (BIPV) modules, ventilation measures may be required to ensure that the Power Optimizers are not exceeding the maximum temperatures stated in their specifications.

## Step 1: Mounting the Power Optimizers

For each of the Power Optimizers<sup>(1)</sup>:

1. Determine the Power Optimizer mounting location and use the Power Optimizer mounting brackets to attach the Power Optimizer to the support structure. It is recommended to mount the Power Optimizer in a location protected from direct sunlight. For frame-mounted Power Optimizers follow the instructions supplied with the optimizers, or refer to [https://www.solaredge.com/sites/default/files/installing\\_frame\\_mounted\\_power\\_optimizers.pdf](https://www.solaredge.com/sites/default/files/installing_frame_mounted_power_optimizers.pdf).
2. If required, mark the mounting hole locations and drill holes.



### CAUTION!



Drilling vibrations may damage the Power Optimizer and will void the warranty. Use a torque wrench or an electric drill with adjustable clutch that meets the mounting torque requirements. *Do not* use impact drivers for mounting the Power Optimizer.

*Do not* drill through the Power Optimizer or through the mounting holes.

3. Attach each Power Optimizer to the rack using M6 stainless steel bolts, nuts and washers or other mounting hardware. Apply torque of 9-10 N\*m.
4. Verify that each Power Optimizer is securely attached to the module support structure.
5. Record Power Optimizer serial numbers and locations, as described in *Reporting and Monitoring Installation Data* on page 50.

## Step 2: Connecting a PV module to a Power Optimizer

### NOTE



Improper wiring may cause electrical faults in a PV system. To avoid electrical faults, verify proper locking of connectors and avoid cable tension and friction. Proper planning, materials and installation reduce the risk of electric arcs, short-circuits and ground faults in the PV system.

### NOTE



Images are for illustration purposes only. Refer to the label on the product to identify the plus and minus input and output connectors.

For each of the Power Optimizers:

<sup>(1)</sup>Not applicable to smart modules.

- Connect the Plus (+) output connector of the module to the Plus (+) input connector of the Power Optimizer.
- Connect the Minus (-) output connector of the module to the Minus (-) input connector of the Power Optimizer.

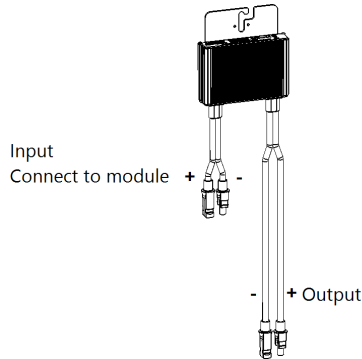


Figure 4: Power Optimizer connectors

### Step 3: Connecting Power Optimizers in Strings

You can construct parallel strings of unequal length, that is, the number of Power Optimizers in each string does not have to be the same. The minimum and maximum string lengths are specified in the power datasheets. Refer to the SolarEdge Site Designer for string length verification.

#### NOTE



The DC bus of each unit is separate and not shared for all units. Therefore, in addition to following the inverter design rules, each unit should follow the unit design rules as detailed in the Technical Specifications.

1. Connect the Minus (-) output connector of the string's first Power Optimizer to the Plus (+) output connector of the string's second Power Optimizer.
2. To minimize electromagnetic interference (EMI), make sure to minimize the distance between the positive and negative DC cables.

For detailed instructions, see:

<https://www.solaredge.com/sites/default/files/se-emi-performance-application-note.pdf>



3. Connect the rest of the Power Optimizers in the string in the same manner.

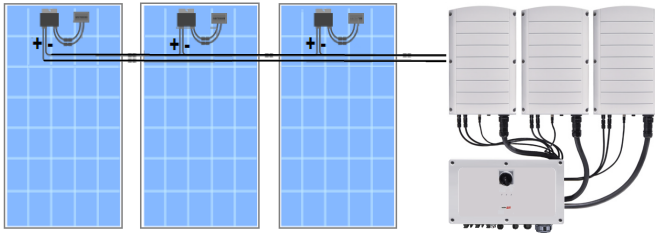


Figure 5: Power Optimizers connected in series

- If you intend to monitor the installation, using the SolarEdge Monitoring platform, record the physical location of each Power Optimizer, as described in *Creating Logical and Physical Layout using Installation Information* on page 51.

## Step 4: Verifying Proper Power Optimizer Connection

When a module is connected to a Power Optimizer, the Power Optimizer outputs a safe voltage of 1V ( $\pm 0.1V$ ). Therefore, the total string voltage should equal 1V times the number of Power Optimizers connected in series in the string. For example, if 10 Power Optimizers are connected in a string, then 10V should be produced.

Make sure the PV modules are exposed to sunlight during this process. The Power Optimizer will only turn ON if the PV module provides at least 2W.

In SolarEdge systems, due to the introduction of Power Optimizers between the PV modules and the inverter, the short circuit current  $I_{SC}$  and the open circuit voltage  $V_{OC}$  hold different meanings from those in traditional systems.

For more information about the SolarEdge system's string voltage and current, refer to the  *$V_{OC}$  and  $I_{SC}$  in SolarEdge Systems Technical Note*, available on the SolarEdge website at:

[https://www.solaredge.com/sites/default/files/isc\\_and\\_voc\\_in\\_solaredge\\_sytems\\_technical\\_note.pdf](https://www.solaredge.com/sites/default/files/isc_and_voc_in_solaredge_sytems_technical_note.pdf)



→ To verify proper Power Optimizer connection:

- Measure the voltage of each string individually before connecting it to the other strings or to the inverter. Verify correct polarity by measuring the string polarity with a voltmeter. Use a voltmeter with at least 0.1V measurement accuracy.



### NOTE

Since the inverter is not yet operating, you may measure the string Voltage and verify correct polarity on the DC wires inside the Synergy Manager .

For troubleshooting Power Optimizer operation problems, refer to *Power Optimizer Troubleshooting* on page 68.

Proper Power Optimizer connection can also be verified in the Designer application.

For more information, refer to

<https://www.solaredge.com/products/installer-tools/designer#/>.



## Chapter 3: Installing the Synergy Manager and Synergy Units

This section, describes how to install the inverter. Install the Synergy Manager and Synergy Unit either before or after the PV modules and Power Optimizers have been installed.

The inverter is provided with a mounting template that ensures correct installation location of the Synergy Manager and all Synergy Unit mounting brackets. The template ensures that all the Synergy Unit inter-connecting cables can reach the Synergy Units and correct distance between the units ensures proper heat dissipation.

First, mount the Synergy Units and then the Synergy Manager. The Synergy Units can be installed in any order.



### CAUTION!

Do not rest the connectors at the bottom of the units on the ground, as it may damage them. To rest a unit on the ground, lay it on its back.

### Synergy Manager Package Contents

- Synergy Manager
- Synergy Units
- Installation template
- Mounting bracket kit
- Two Allen screws for fastening the unit to the mounting bracket
- Cable lock(s)
- Quick Installation guide

### Synergy Unit Package Contents

- Synergy Unit
- Mounting bracket kit
- Two Allen screws for fastening the unit to the mounting bracket

### Identifying the Units

Stickers on the Synergy Manager and Synergy Units show Serial Numbers.

When creating a site in the SolarEdge Monitoring platform or contacting SolarEdge support, provide the inverter's serial number.

## Front Interface of Synergy Manager

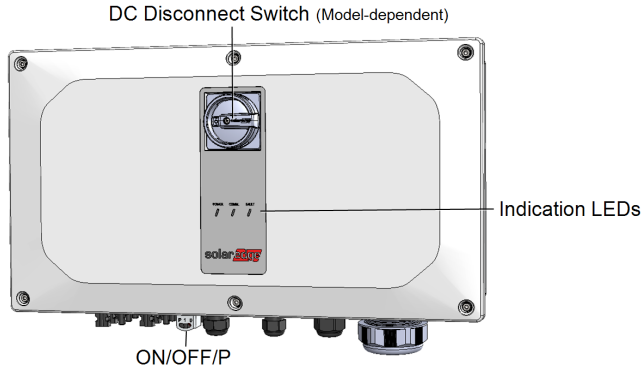


Figure 6: Synergy Manager Unit - Front interfaces



**NOTE**

Some models Synergy Manager do not include DC Disconnect Switch.

### DC Disconnect Switch

The DC Disconnect Switch is a manually operated safety switch for disconnecting the DC power of the SolarEdge system.

**NOTE**

When the Synergy Manager is OFF (for example during maintenance) it may be locked to prevent a safety hazard:



1. Move the switch to the Lock position.
2. Insert the lock through the knob opening and lock.



### ON/OFF/P Switch

Figure 7 shows the ON/OFF/P switch of the Synergy Manager.



P = Program/Pair  
 1 = ON  
 0 = OFF

Figure 7: ON/OFF/P switch



- **ON (1)** - Turning this switch ON (after Power Optimizer pairing) starts the operation of the Power Optimizers, enables power production and allows the inverter to begin exporting power to the utility grid.
- **OFF (0)** - Turning this switch OFF reduces the Power Optimizer Voltage to a low safety voltage and inhibits exportation of power. When this switch is OFF, the control circuitry remains powered up.

P Position duration	Function	Comments
Switch moved to P for <b>less than 5 seconds</b> , then released.	<ul style="list-style-type: none"> <li>• Displays production information for 5 seconds on the SetApp screen.</li> <li>• Displays error type indications (if exist) for 5 seconds.</li> <li>• Activates the Wi-Fi access point for connecting to the SolarEdge Inverter SetApp</li> </ul>	While the switch is in P, all LEDs are ON
Switch moved to P for <b>more than 5 seconds</b> , then released.	Starts pairing	

**WARNING!**



For inverters with manual Rapid Shutdown (PVRSS) functionality - Upon PVRSS, the internal circuitry remains up, therefore the inverter cover must be opened only after shutting off the inverter ON/OFF switch. This disables the DC Voltage inside the inverter (Synergy Manager). Wait five minutes before opening the cover. Otherwise, there is a risk of electric shock from energy stored in the capacitors.

## Indication LEDs

LEDs indication consists on color and state (on/ off/ blinking<sup>(1)</sup>/ flickering<sup>(2)</sup>/alternating<sup>(3)</sup>). The LEDs indicate different system information, such as errors or performance.

Figure 8 shows the Indication LEDs of the Synergy Manager.

Generally, the main LED indications are:

- COMM. ON - the inverter is communicating with the monitoring platform
- POWER ON - the system is producing
- POWER blinking - AC is connected but the system is not producing power
- FAULT ON - system error

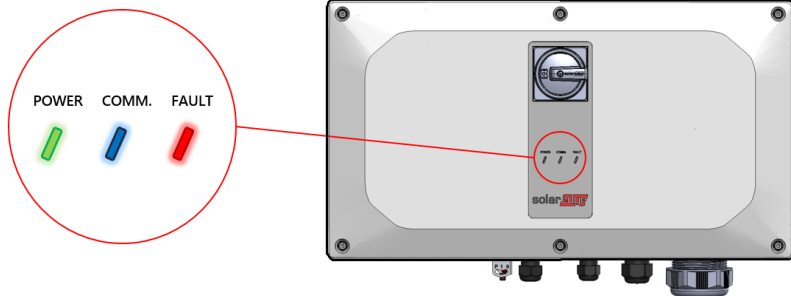


Figure 8: Indication LEDs

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(1)Blinking = Turns ON and OFF for the same duration

(2)Flickering = Turns ON for 100 mS and turns OFF for 5 seconds

(3)Alternating = Alternate LEDs flash

Indication	ON/ OFF/ P switch position	LED			Comment
		FAULT	POWER	COMM.	
Power Optimizers not paired	ON (1)	OFF	Blinking	<ul style="list-style-type: none"> <li>• S_OK: ON</li> <li>• No S_OK: OFF</li> </ul>	S_OK: ON communication with the monitoring platform is established
Pairing		Blinking	Blinking	Blinking	
Wake-up/ Grid Monitoring		OFF	Blinking	Blinking	
System Producing		OFF	ON	<ul style="list-style-type: none"> <li>• S_OK: ON</li> <li>• No S_OK: OFF</li> </ul>	
Night mode (no production)		OFF	Flickering	<ul style="list-style-type: none"> <li>• S_OK: ON</li> <li>• No S_OK: OFF</li> </ul>	
Inverter is OFF (Safe DC)	OFF (0)	OFF	Blinking	<ul style="list-style-type: none"> <li>• S_OK: ON</li> <li>• No S_OK: OFF</li> </ul>	
Inverter is OFF (DC not safe)		Blinking	Blinking	<ul style="list-style-type: none"> <li>• S_OK: ON</li> <li>• No S_OK: OFF</li> </ul>	
Inverter configuration or reboot	ON / P	ON	ON	ON	
Inverter firmware upgrade	ON / P	Alternating	Alternating	Alternating	The upgrade process can take up to 20 minutes
Error	Any	ON	ON/ OFF/ Blinking/ Flickering	ON/ OFF / Blinking/ Flickering	Refer to <i>Errors and Troubleshooting</i> on page 67

The following table describes production percentage of AC information by LED color and ON/OFF/P switch position.

Indication	ON/ OFF/ P switch position	LED color			Comment
		Red	Green	Blue	
Percentage of AC Production: 0 - 33 %	ON (1)	OFF	ON	OFF	This indicates power production as percentage of rated peak AC output power
Percentage of AC Production: 33 - 66 %		OFF	OFF	ON	
Percentage of AC Production: 66 - 100 %		OFF	ON	ON	

## Inverter Interconnection Cable Interfaces

The cables on the right hand side of the Synergy Manager, interfaces the Synergy Manager to the Synergy Unit of the inverter.

To connect cables, follow the writing shown next to each cable on the panel.

*Figure 9* shows the interconnecting cables of the inverter.

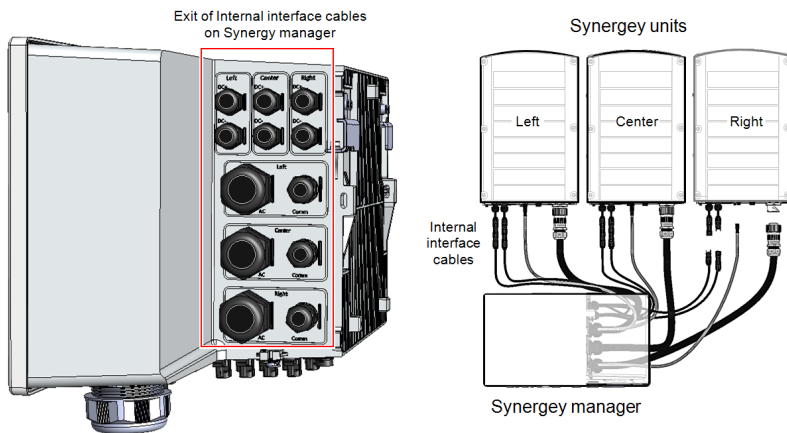


Figure 9: Inverter - interconnection cables

## Synergy Manager External Cable Interface

The connectors and glands, at the bottom side of the Synergy Manager, interfaces the inverter to the grid and PV strings. The communication glands, support communication cables connecting the inverter to the SolarEdge Monitoring platform and external power bank used for setting up the inverter in sites with no available grid power.

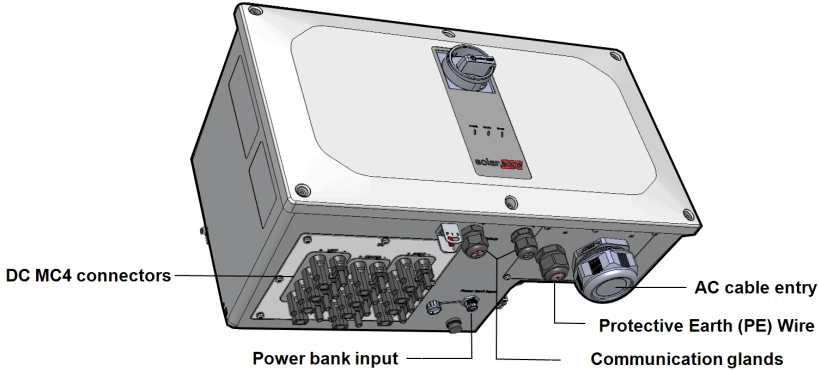


Figure 10: Synergy Manager with MC4 connectors - bottom view

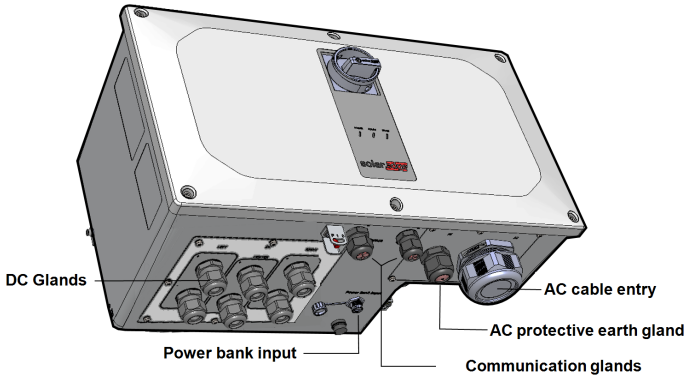


Figure 11: Synergy Manager with glands - bottom view

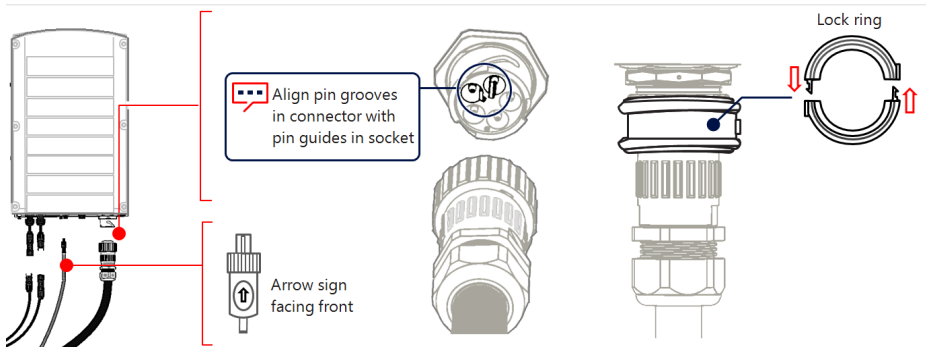
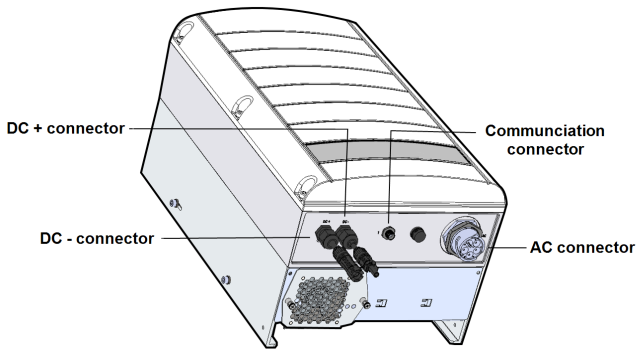
- **Protective Earth (PE) Wire Entry:** PE gland for connecting Protective Earth (PE) wire
- **AC Cable Entry:** AC cable gland for grid connection
- **DC Connectors:** MC4 cable connectors for connecting the PV Strings
- **Power Bank Input:** power bank connection enables inverter pre-commissioning when AC power is not connected

- **Communication Glands:** two communication glands for connecting communication and antenna cables. Refer to *Setting Up Communication with the Monitoring Platform* on page 53.

## Synergy Unit Interface Connectors

The Synergy Unit connectors are used to interface the Synergy Unit to the Synergy Manager:

- **DC connectors:** for DC input from the Synergy Manager
- **Communication connector:** for communication with the Synergy Manager
- **AC connector:** for supply of AC power to the Synergy Manager



## Mounting and Connecting the Synergy Manager and Synergy Units

This section provides instructions for vertical installation of the inverter and horizontal Inverter installed horizontally on a flat surface.

### NOTE



Make sure the mounting surface or structure can support the weight of 82 kg (for inverter with two Synergy Units) or 114 kg (for inverter with three Synergy Units) of the inverter and brackets. Make sure that the mounting surface is at least 116.8 cm x 100.8 cm.

### CAUTION!



**HEAVY OBJECT.** To avoid muscle strain or back injury, use proper lifting techniques, and if required - a lifting aid.

### CAUTION!



SolarEdge inverters and Power Optimizers can be installed at a minimum distance of 50 m / 164 ft from the shoreline of an ocean or other saline environment, as long as there are no direct salt water splashes on the inverter or Power Optimizer.

For SolarEdge inverters installed at a distance of 200 m / 655 ft or closer to the shoreline, special brackets purchased separately from SolarEdge and SS304 stainless screws are required.

### → To mount the inverter:

1. Determine the inverter mounting location on a wall or stud framing. It is recommended to mount the inverter in a location protected from direct sunlight.

### NOTE



When installing the inverter on a stud framing or a rail, avoid wobbly installation by adding back support at the lower back side of the Synergy Manager and Synergy Units (See *Figure 12*)

2. Allow for proper heat dissipation, follow the guidelines specified in [Application Note - Clearance Guidelines](#).



### NOTE

Some Inverter models are provided with only two Synergy Units.

3. Level the mounting template horizontally against the wall and mark the drilling hole locations for the bracket of the Synergy Units (see pencil icons in *Figure 12*).

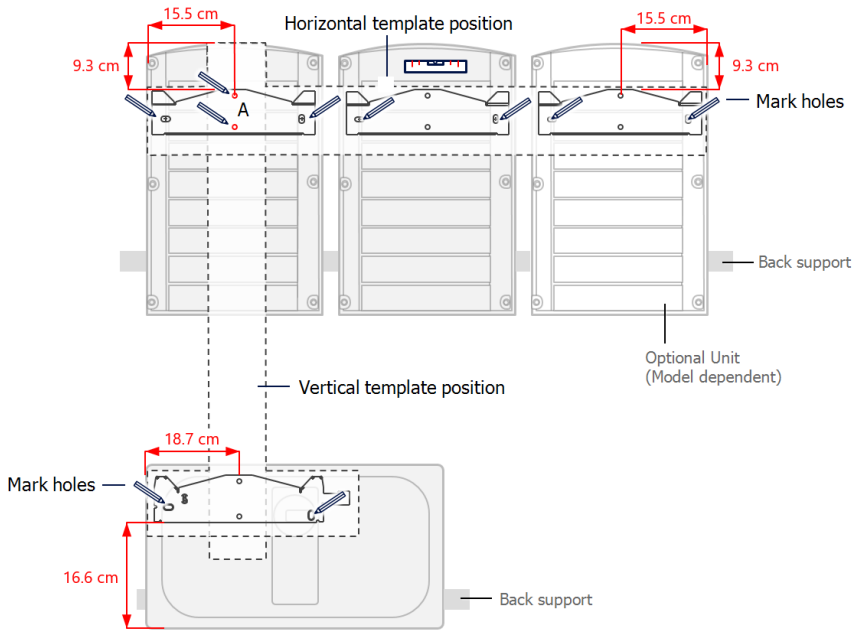


Figure 12: Marking the drilling holes locations

4. Place the mounting templates vertically against the wall and mark the drilling hole locations for the barcket of the Synergy Manager. Make sure that the template aligns with the two drilling holes marked A.
5. Drill two holes for each bracket and mount the brackets.
6. Position and secure the mounting brackets to the wall using at least two screws per bracket. Tighten the screws all the way and verify that the brackets are firmly attached to the mounting surface.
7. Mount the Synergy Units:

**NOTE**

When installing the Synergy Units, always install the center Synergy Unit first.

**NOTE**

The grounding wire can be installed on either side of the Synergy Unit chassis. When installing three Synergy Units, connect the chassis grounding wire to the center Synergy Unit before hanging the left or right Synergy Units. Refer to: "Connecting Ground and AC to the Synergy Manager" on page 39.



- Lift the Synergy Unit from the sides, or hold it at the top and bottom of the unit to lift into place.
- Align the two indentations in the enclosure with the two triangular mounting tabs of the bracket, and lower the unit until it rests on the bracket evenly (see *Figure 14*).
- For the right or left Synergy Units, insert only one screw through the outer (exposed) side of the unit and into the bracket. Tighten the screws with a torque of 4.0 N\*m (see *Figure 13*).

**NOTE**

For the center Synergy Unit, use both side screws.

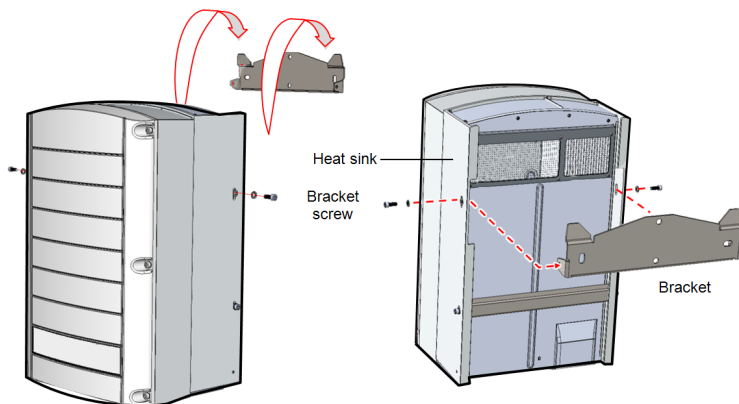


Figure 13: Hanging the Synergy Unit

8. Hang the Synergy Manager:
  - a. Lift the Synergy Manager from its sides.
  - b. Align the two indentations in the enclosure with the two triangular mounting tabs of the bracket, and lower the unit until it rests on the bracket evenly (see *Figure 14*).
  - c. Insert the supplied bracket screw through the right side of the heat sink and into the bracket.

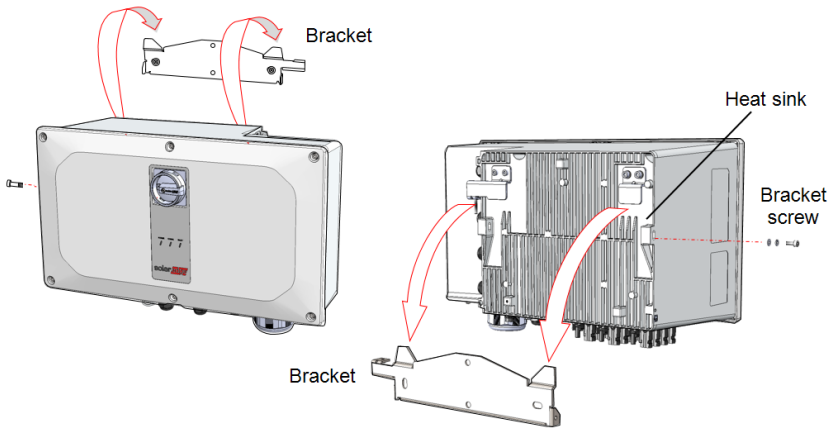


Figure 14: Hanging the Synergy Manager

## Horizontal Mounting of the Inverter

The inverter can be installed horizontally, on a flat surface, at any tilt above  $10^\circ$  (see *Figure 15*). The inverter can be installed under or near the PV modules, thus saving roof space and using the PV modules for shading the inverter.

For more information on horizontal mounting, refer to [Horizontal Mounting of Three Phase Inverters](#).

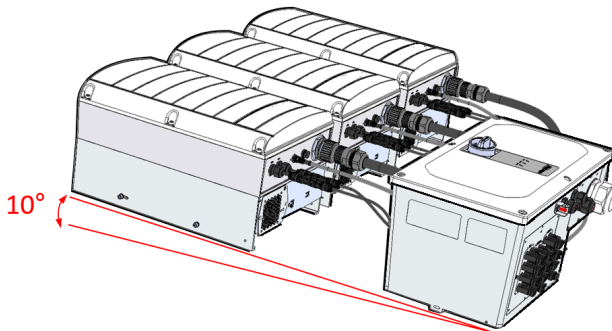


Figure 15: Horizontal mounting of the Inverter

## Chapter 4: Connecting AC and PV Strings to the Synergy Manager

This section describes how to connect the inverter to the AC grid, and to the PV strings (also referred to as DC Strings).

### Grid Connection Guidelines



#### NOTE

In most countries, SolarEdge three phase inverters are required by regulation to have neutral connection at all times (only grids with neutral connection are supported).

In some countries, the SolarEdge three phase inverters can be connected to 220/230/480V delta grids. For more information prior to system installation refer to:

- Three Phase Inverters for Delta Grids application note  
[https://www.solaredge.com/sites/default/files/se\\_three\\_phase\\_inverters\\_for\\_delta\\_grids.pdf](https://www.solaredge.com/sites/default/files/se_three_phase_inverters_for_delta_grids.pdf).
- Supported Countries application note to confirm compatibility  
[http://www.solaredge.com/sites/default/files/se\\_inverters\\_supported\\_countries.pdf](http://www.solaredge.com/sites/default/files/se_inverters_supported_countries.pdf); installing without confirmation may void the inverter warranty.

For recommended circuit breaker size per model, refer to: Application Note: [Determining the Circuit Breaker Size](#).

For more wiring information, refer to the *SolarEdge Recommended AC Wiring Application Note*, available on the SolarEdge website at <http://www.solaredge.com/files/pdfs/application-note-recommended-wiring.pdf>.

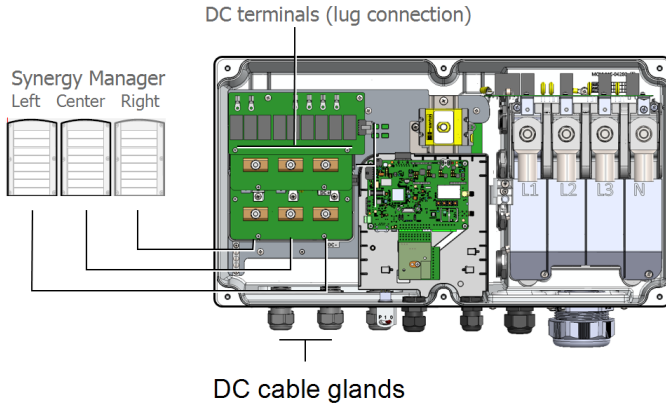
### Connecting the AC Grid to the Synergy Manager

The Synergy Manager is provided with two methods of DC connection to the PV strings:

- Up to three PV strings connection via cable glands
- Up to 12 PV strings connection via MC4 connectors

Figure 16 shows an open Synergy Manager with various types of DC connection of PV strings.

### Synergy manager with three PV strings routed via glands



### Synergy manager with 12 PV strings connected via MC4 connectors

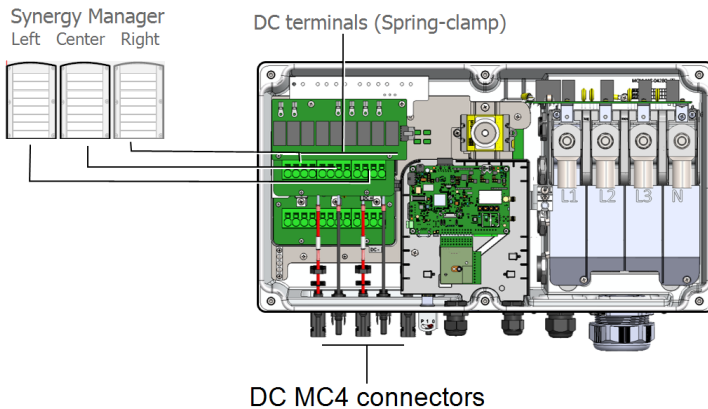


Figure 16: Synergy Manager - DC connection methods

**NOTE**

Functional electrical earthing of DC-side negative or positive poles is prohibited because the inverter has no transformer. Grounding (earth ground) of module frames and mounting equipment of the PV array modules is acceptable.

**NOTE**

SolarEdge fixed input Voltage architecture enables the parallel strings to be of different lengths. Therefore, they do not need to have the same number of Power Optimizers, as long as the length of each string is within the permitted range.

**WARNING!**

Turn OFF the AC before connecting the AC terminals. If connecting equipment grounding wire, connect it before connecting the AC Line and Neutral wires.

## Connecting the PV Strings to the Synergy Manager

The inverter is designed with three DC input terminals. Nevertheless, each input may connect to several parallel PV strings via an external combiner box. The combiner box should be installed and connected before connecting to the Synergy Manager. This simplifies the commissioning of the inverter by allowing testing and servicing near the inverter.

→ To connect the strings to the Synergy Manager with MC4 connectors:

Connect the DC connectors of each string to the DC+ and DC- connectors according to the labels on the Synergy Manager.

When connecting cables from a combiner box, ensure that the cable pairs are marked with DC+ and DC- symbols.

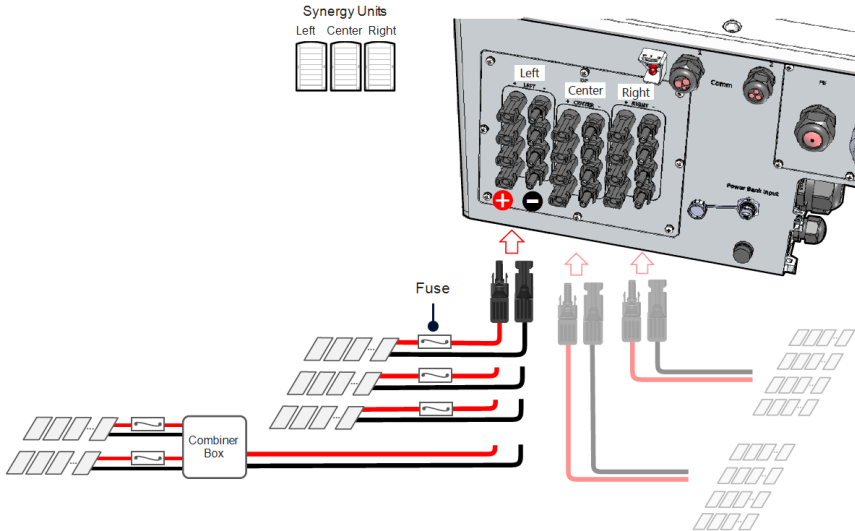


Figure 17: Synergy Manager with MC4 Connectors

→ To connect the DC wires to the Synergy Manager with DC wire lugs:

1. Thread 12 - 20 mm diameter wires with a maximum of 50 mm<sup>2</sup> cross section through the DC gland/.
2. Route the DC wires to the DC+ and DC- terminals on the DC+ and DC- boards of the Synergy Manager (see labels DC boards).

#### CAUTION!

The DC board has three pairs of DC terminals - each pair is connected to single Synergy Unit (Left, Center and Right).



When installing a system with more than 3 strings per a single Synergy Unit (whether connected directly or via a combiner box), fuses are required. In SolarEdge system, 25A fuses must be used.

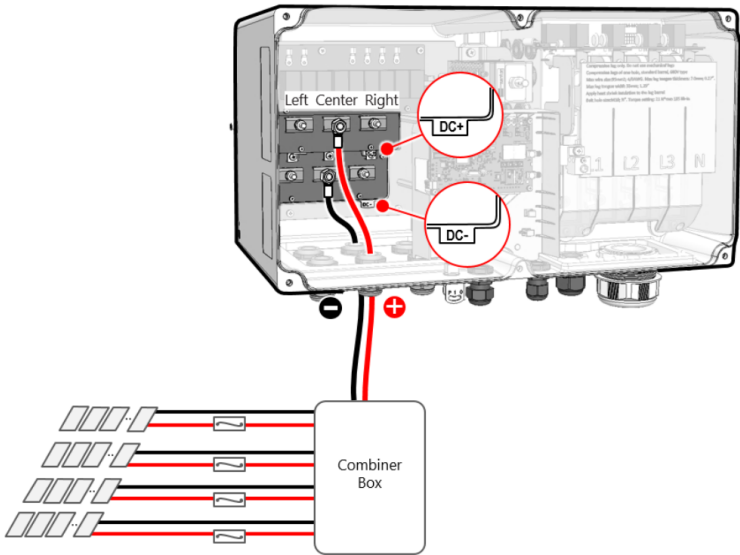


Figure 18: Connecting the DC wires to the Synergy Manager

3. Remove the nuts from the DC terminals.
4. Strip the wire insulation from the end of the DC wires.

**NOTE**

Before connecting aluminum wires to lugs:



- a. Remove Oxide from the exposed wires.
- b. Clean with Isopropyl alcohol (IPA).
- c. Coat wires with an electrical connection grease/material.

5. Crimp the lugs on the DC wires and use heat shrink to insulate the lug barrels.

**CAUTION!**



For aluminum wires, USE ONLY Bi-metal lugs or aluminum lugs that support copper and aluminum conductors.

For copper wires, USE ONLY copper tin-plated lugs.

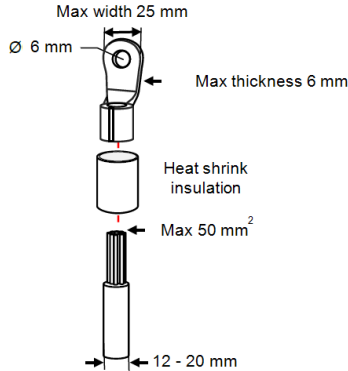


Figure 19: Attaching lugs to the DC wires

**NOTE**

Functional electrical earthing of DC-side negative or positive poles is prohibited because the inverter has no transformer. Grounding (earth ground) of module frames and mounting equipment of the PV array modules is acceptable.

- Fasten the nut of the DC terminals with a torque of 5.7 N\*m.

**CAUTION!**

Ensure that the Plus (+) wire is connected to the + terminal and that the Minus (-) wire is connected to the Minus (-) terminal connector.

- Close the Synergy Manager cover and secure it by tightening the six screws with a torque of .

**CAUTION!**

When installing a system with more than three strings per a single Synergy Unit (whether connected directly or via a combiner box), fuses are required. In SolarEdge system, 25A fuses must be used.

## Connecting Ground and AC to the Synergy Manager

This section describes how to connect AC and Ground (also referred to Protective Earth - PE) to the Synergy Manager.

The following cable and wire configurations can be used to connect the Synergy Manager:

- AC cable with L1, L2, L3, PE wires
- AC cable with L1, L2, L3, N, PE wires



- AC cable with L1, L2, L3 wires and an external PE (Protective Earth) wire
- AC cable with L1, L2, L3, N wires and an external PE wire

**WARNING!**

To avoid shock hazard conditions, the PE wire must be connected to the inverter before connecting the AC wires.

- Use AC line wires with a maximum of 120 mm<sup>2</sup> cross section (For inverter models SE50K to SE80K, use 95 mm<sup>2</sup>)
- Use PE wire with a maximum 70 mm<sup>2</sup> cross section (For inverter models SE50K to SE80K, use 50 mm<sup>2</sup>).
- Use a PE wire with outer diameter of 9 to 16 mm (wire with insulation).
- Use AC gland supports a cable of 30 - 50 mm in diameter.

**CAUTION!**

Over-current protection for the AC output must be provided by the installer.

## Chassis Grounding

If required, ground the units as described in the following figure using a grounding cable, a grounding screw, two washers, a ring terminal and a serrated washer. Connect the grounding cable to the grounding point on either side of a unit and to either the mounting hole or grounding screw. You can connect grounding to the Synergy Manager and to each of the Synergy Unit, as required.

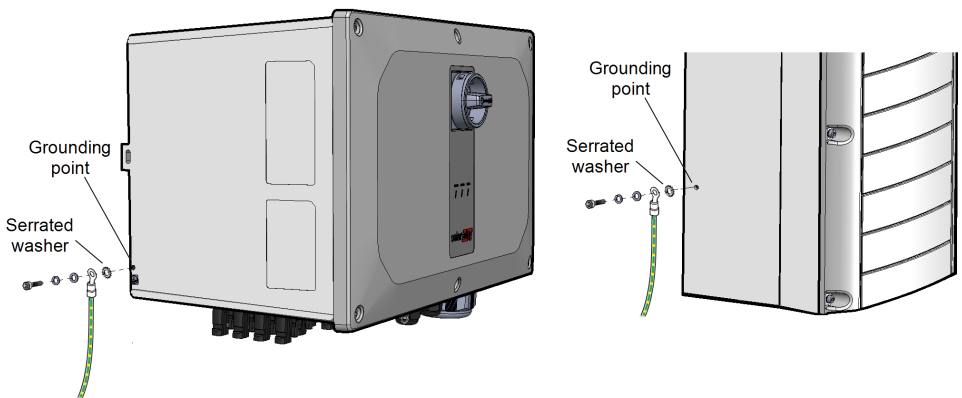


Figure 20: Chassis grounding of the Synergy Manager and Synergy Units

## Connecting Protective Earth (PE)

### WARNING!



Turn OFF the AC before connecting the AC terminals. When connecting equipment Grounding wire, connect it before connecting the AC Line and Neutral wires.

→ To connect Protective Earth (PE) to the Synergy Manager:

1. Turn OFF and secure the main AC circuit breaker in OFF position at the circuit breakers panel.
2. Release the six Allen screws and carefully remove the cover of the Synergy Manager.

### CAUTION!



When removing the cover, make sure not to damage internal components. SolarEdge will not be held responsible for any components damaged as a result of incautious cover removal.

3. Open the AC cable gland and insert the cable through the AC gland.
4. Expose 10 - 11 mm of the PE wire insulation.
5. Connect the PE wire to the PE terminal and fasten the Allen screw with a torque of 15 N\*m.



### NOTE

When using a stranded wire, use of ferrule is at the installer discretion.

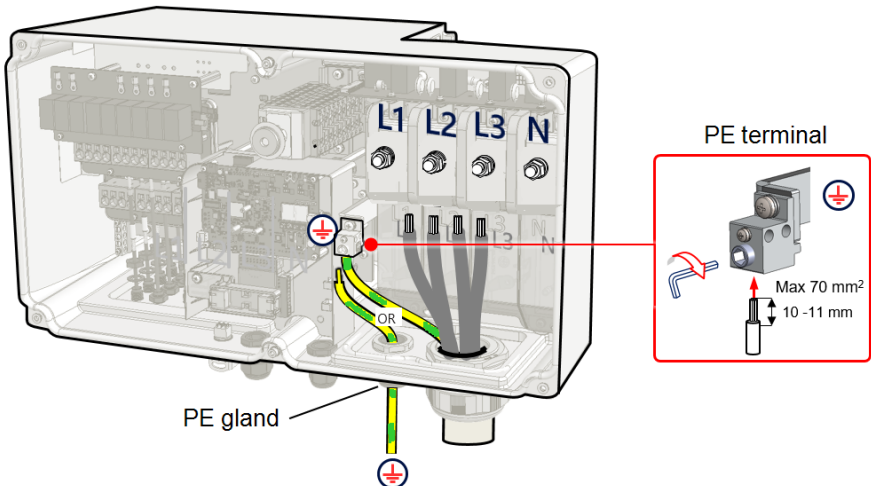


Figure 21: Connecting of PE (grounding) wire

-or-

Route a separate PE wire through the PE gland. Connect the wire to the PE terminal and fasten the Allen screw with a torque of 15 N\*m. Secure the PE gland with a torque of 12 N\*m.

→ To connect AC:

1. Verify that the main AC circuit breaker in OFF position at the circuit breakers panel.
2. Remove the AC terminal block cover.

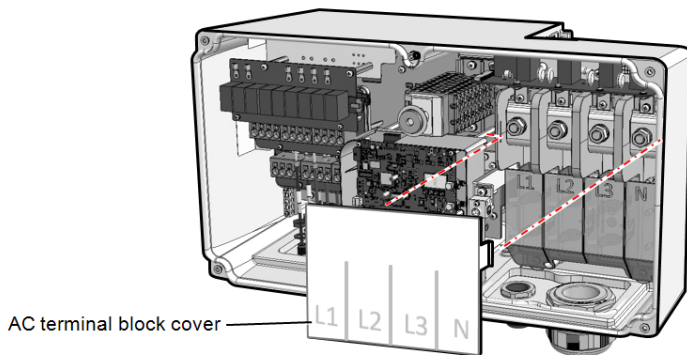


Figure 22: AC terminal block cover

3. Strip the required length of insulation from the AC cable and AC wires.
4. Remove the nuts from the AC terminals.
5. Before connecting aluminum wires to the lugs:
  - a. Remove Oxide from the exposed wires
  - b. Clean with Isopropyl alcohol (IPA)
  - c. Coat wires with oxide inhibiting substance
6. Crimp lugs on the AC wires.

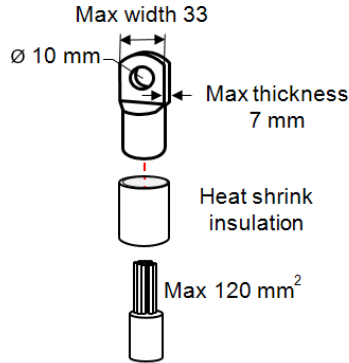


Figure 23: AC wire and lug

Lug parameters:

- Bolt hole size: 10mm
  - Compression lugs of the one-hole, standard barrel, 600V type.
  - Maximum wire size:  $120 \text{ mm}^2$  (For inverter models SE50K to SE80K, use  $95 \text{ mm}^2$ )
  - Maximum lug tongue thickness: 7mm
  - Maximum lug tongue width:  $\leq 33 \text{ mm}$
7. Use heat shrink to isolate the lug barrels.
  8. Connect the lug of the AC wires according to the labels on AC terminal. Fasten the nuts of the AC terminal with a torque of 21 N\*m.



#### NOTE

For easy installation of the AC wires, start connecting the wires from right to left: N → L3 → L2 → L1 (See Figure 24).

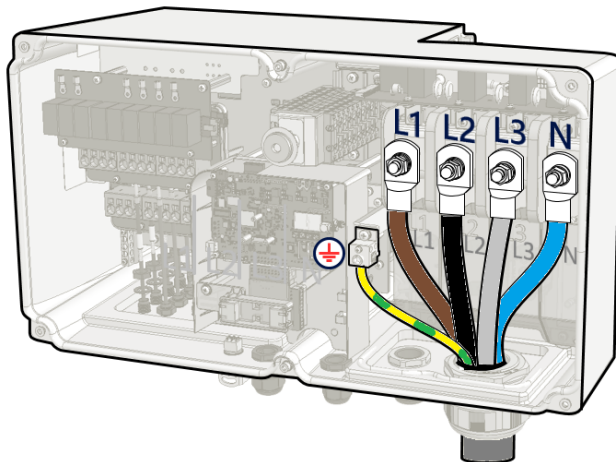


Figure 24: Connecting wires to the AC terminals

9. Place the AC terminal cover over the AC terminals and push until a click is heard. Close the Synergy Manager cover and secure it by tightening the six screws with a torque of 3.5 N\*m.

## Chapter 5: Activating, Commissioning and Configuring the System

After the solar system is installed, it is important to activate and commission the solar system. Activation and commission of the system is performed using the inverter SetApp mobile application.

The solar system can be activated and commissioned in the following stages of system stage:

- On-grid: The inverter is connected to a utility grid
- Pre-commissioning (Off-grid): The inverter is not connected to a grid to enable:
  - Early validation and fault detection of system components, such as inverters, Power Optimizer, PV modules before activation
  - Ensure system integrity before connecting to the grid

During the activation and commissioning, the inverter discovers and communicates with all connected components in the solar system such as: optimizers, peripheral communication devices and other linked inverters. When commissioning is performed, the user is required to set the grid parameters and backup Voltage information (if used).

Before starting the activation and commissioning, verify the all the communication hardware is properly connect. For communication options, refer to: *Setting Up Communication with the Monitoring Platform* on page 53.

Before arriving to the site, download SolarEdge SetApp application to your mobile device from Apple App Store or Google Play .

Before Activation and commissioning, download the SetApp application from:



For downloading SetApp, Internet connection, one-time registration and logging are required. No registration is required for using the SetApp.

## On-grid Commissioning of the inverter

### Step 1: Activating the Installation

During system activation, a Wi-Fi connection is created between the mobile device and the inverter and the system firmware is upgraded.

#### Before activation

- Download, register (first time only) and login to SetApp on your mobile device. Verify that the application is updated with the latest version.
- If applicable, turn on all devices (battery, Energy Meter) connected to the inverter, so that the devices may be auto-detected.

#### → To activate the inverter:

1. Turn ON the AC circuit breaker on the main distribution panel.
2. Open SetApp and follow the on-screen instructions (scan the inverter barcode; move the ON/OFF/P switch to P position for 2 seconds and release).  
SetApp creates a Wi-Fi connection, upgrades the inverter firmware and activates the inverter.
3. When the activation is complete, do one of the following:
  - Select **Connect to Another Device** to continue activating additional inverters.
  - Select **Start Commissioning** for pairing and other system configuration.

### Step 2: Commissioning and Configuring the Installation

This section describes how to use the SetApp menus for commissioning and configuring the inverter settings.

Menus may vary in your application depending on your system type.

#### → To access the Commissioning screen:

Do one of the following:

- During first time installation: Upon activation completion, in the SetApp, tap **Start Commissioning**.
- If the inverter has already been activated and commissioned:
  - If not already ON - turn ON AC to the inverter by turning ON the circuit breaker on the main distribution panel.
  - Open SetApp and follow the on-screen instructions (scan the inverter QR code, move the ON/OFF/P switch to P position for 2 seconds and release).

The mobile device creates a Wi-Fi connection with the inverter and displays the main Commissioning screen.

### Setting Country, Grid and Language

The inverter must be configured to the proper settings in order to ensure that it complies with the country grid code and functions.

1. From the **Commissioning** screen select **Country & Grid**.
2. From the **Country & Grid** drop-down list, select the required option and tap **Set Country & Grid**.
3. From the **Language** drop-down list, select your language and tap **Set Language**.

### Pairing

1. From the **Commissioning** menu, select **Pairing**.
2. Tap **Start Pairing**.
3. When **Pairing Complete** is displayed, the system startup process begins:  
Since the inverter is ON, the Power Optimizers start producing power and the inverter starts converting AC.

#### WARNING!



When you turn ON the inverter ON/OFF/P switch, the DC cables carry a high Voltage and the Power Optimizers no longer output a safe output.

When the inverter starts converting power after the initial connection to the AC, the inverter enters Wake up mode until its working voltage is reached. This mode is indicated by the flickering green inverter LED.

When working voltage is reached, the inverter enters Production mode and produces power. The steadily lit green inverter LED indicates this mode.

4. Tap **OK** to return to the **Commissioning** menu.

## Communication

Communication settings can be configured only after communication connections are complete. Refer to *Setting Up Communication with the Monitoring Platform* on page 53.

- Select **Monitoring Communication** to configure communication with the monitoring platform.
- Select **Site Communication** to configure communication between multiple SolarEdge devices or external non-SolarEdge devices, such as batteries or loggers.



## Power Control

Power control options are detailed in the *Power Control Application Note*, available on the SolarEdge website at: [https://www.solaredge.com/sites/default/files/application\\_note\\_power\\_control\\_configuration.pdf](https://www.solaredge.com/sites/default/files/application_note_power_control_configuration.pdf).

The Grid Control option may be disabled. Enabling it opens additional options in the menu.

The Energy Manager option is used for setting power export limitation, as described in the *Export Limitation Application Note*, available on the SolarEdge website at: [https://www.solaredge.com/sites/default/files/feed-in\\_limitation\\_application\\_note.pdf](https://www.solaredge.com/sites/default/files/feed-in_limitation_application_note.pdf).

## Step 3: Verifying Proper Activation and Commissioning

1. Select **Information** and verify that the correct firmware versions are installed on each inverter.
2. Select **Status** and verify that inverter is operating and producing power.
3. Verify that additional configurations were properly set by viewing the relevant Status screens.
4. Verify that the green inverter LED is steadily lit.

Your SolarEdge power harvesting system is now operational.

## Pre-commissioning (Off-Grid)

The following items are required for Pre-commissioning:

- Mobile device with SolarEdge SetApp application
- Power bank: 60W output port, USB-C Power Delivery (PD): 20V 3A (not provided)
- USB cable: 3.3 ft (1 meter), male to male, USB-C (not provided)



### IMPORTANT NOTE

Commissioning should be performed in full daylight.



### NOTE

When pre-commissioning multiple inverters, each inverter need to be commission individually.

→ To pre-commission the inverter:

1. Turn OFF and secure the AC circuit breaker in OFF position in the circuit breakers panel.

2. Verify that SolarEdge SetApp is installed on your mobile device.
3. Remove the cover from the Power Bank input port at the bottom of the Synergy Manager. Connect the USB cable between the Power Bank and the input port - Upon connection, all LEDs light steady for one minute, and then alternate blue / green.

**NOTE**

Alternating red / blue LEDs indicate a problem with the power bank.

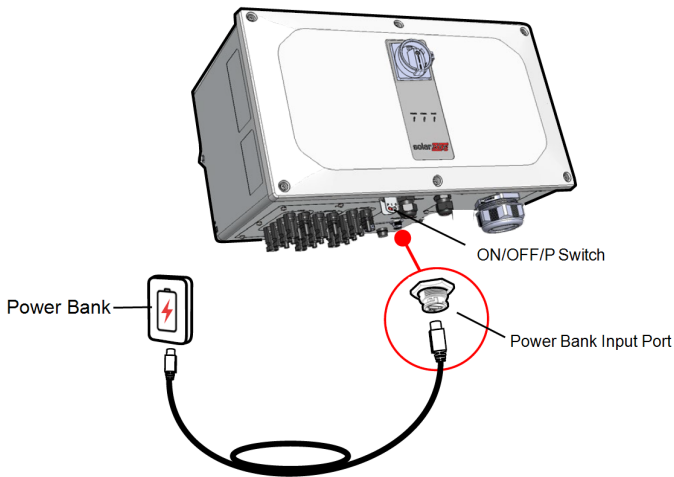


Figure 25: Pre-commissioning the inverter

4. Start SetApp on your mobile device and follow the on-screen instructions.
5. When instructed, hold the ON/OFF/P Switch in P position and release within two seconds.
6. If the Synergy Manager is equipped with a DC Disconnect Switch, turn it to ON position.
7. Continue to follow the on-screen instructions to set the inverter.
8. When instructed, disconnect the power bank and cover the power bank input port.
9. Turn-off the DC Disconnect Switch or the ON/OFF/P Switch.
10. Wait until the inverter shut off (all LEDs turn-off).
11. Turn-on the DC Disconnect Switch and ON/OFF/P Switch.

## Reporting and Monitoring Installation Data

Monitoring the site requires connecting the inverter to the monitoring platform, using any of the wired or wireless options available from SolarEdge. Refer to *Setting Up Communication with the Monitoring Platform* on page 53.

### The Monitoring Platform

The monitoring platform provides enhanced PV performance monitoring and inverter yield assurance through immediate fault detection and alerts at the module, string and system level.

Using the platform, you can:

- View the latest performance of specific components.
- Find under-performing components, such as modules, by comparing their performance to that of other components of the same type.
- Pinpoint the location of alerted components using the physical layout.

The monitoring platform enables accessing site information, including up-to-date information viewed in a physical or logical view:

- **Logical Layout:** Shows a schematic tree-layout of the components in the system, such as: inverters, Power Optimizers, strings, modules, meters and sensors, as well as their electrical connectivity. This view enables you to see which modules are connected in each string, which strings are connected to each inverter, and so on.
- **Physical Layout:** Provides a bird's eye view of the actual placement of modules in the site, and allows pinpoint issues to the exact location of each module on a virtual site map.

If you do not report the mapping of the installed Power Optimizers, the monitoring platform will show the logical layout indicating which Power Optimizers are connected to which inverter, but will not show strings or the physical location of Power Optimizers.

The monitoring platform includes a built-in help system that guides you through the monitoring functionality.

For more information, refer to <https://www.solaredge.com/products/pv-monitoring#/>.



## Creating Logical and Physical Layout using Installation Information

To display a logical layout, insert the inverter serial number in the new site created in the monitoring platform. When the communication between the inverter and the monitoring server is established, the logical layout is displayed.

To display a physical layout, you need to map the locations of the installed power optimizers. To map the locations, use one of the methods described in the next sections.

### Designer

Designer recommends inverter and Power Optimizer selection per site size and enables report generation. You can create a project in Designer and export the site design with the string layout to the monitoring platform.

For more information, refer to

<https://www.solaredge.com/products/installer-tools/designer#/>.



### Mapper Application

Use the Mapper smart phone application to scan the Power Optimizer and inverter 2D barcodes and create a virtual map of a PV site for enhanced monitoring and easier maintenance.

The Mapper application is integrated with the Monitoring platform and enables:

- Simple on-site registration of new systems.
- Creating, editing and verifying system physical layout.
- Scanning and assigning the Power Optimizer serial number to the correct module in the system physical layout.

For detailed information, refer to the *Mapper* demo movies:

- [Creating new sites using the Mapper mobile application](#)



- [Mapping existing sites using the Mapper mobile application](#)



### Physical Layout Editor

1. If you are a registered installer, access the monitoring platform site creation page at <https://monitoring.solaredge.com/solaredge-web/p/home#createSites>. If you have not yet signed up, go to <https://monitoring.solaredge.com/solaredge-web/p/createSelfNewInstaller>.
2. Fill out all required information in the screen, which includes information about your installation, as well as details about its logical and physical mapping.



## Chapter 6: Setting Up Communication with the Monitoring Platform

The inverter sends the following information to the monitoring platform:

- Power Optimizer information received via the DC power lines (the PV output circuit)
- Inverter information
- Information of any other connected devices

This chapter describes how to set up communication between:

- The inverter and the monitoring platform through the Internet (wired/ wireless)
- Multiple inverters for a leader-follower configuration

Communication setup is not required for power harvesting, however it is needed for using the monitoring platform.

### CAUTION!



When connecting the communication cables, make sure that the ON/OFF/P switch at the bottom of the inverter is turned OFF, and the AC is turned OFF.

When configuring the communication parameters, make sure that the ON/OFF/P switch is in P position, and the AC is turned ON.

## Communication Options

The following types of communication can be used to transfer the monitored information from the inverter to the monitoring platform.

### NOTE



This guide refers to 3rd party communication products, such as internet switches and routers that are not supported by SolarEdge. For detailed information on how to install and use the products, refer to the respective publication provided with each product.

## Ethernet

Ethernet is used for a LAN connection. For connection instructions refer to "Creating a Local Area Network (LAN) Connection" on page 57.

## RS485

RS485 is used for the connection of multiple SolarEdge devices on the same bus in a leader-follower configuration. RS485 can also be used as an interface to external devices, such as meters and third party data loggers.

- RS485-1: Enables the connection of multiple devices (inverters/Commercial Gateway) over the same bus, such that connecting only one device to the internet is sufficient to provide communication services for all the devices on the bus.
- RS485-2: Enables connection of multiple SolarEdge devices and of non-SolarEdge devices over the same bus.

For connection instructions refer to *Creating an RS485 Bus Connection* on page 61.

## Wi-Fi

This built-in communication option enables using a Wi-Fi for connecting to the Monitoring platform. It requires an external antenna, available from SolarEdge, that can be purchased separately and assembled during system installation. The Wi-Fi Antenna is provided with a user manual. Refer to

<https://www.solaredge.com/sites/default/files/se-wifi-zigbee-antenna-installation-guide.pdf>

## Cellular

Cellular Plug-in (purchased separately) provides cellular communication to connect one or several inverters to the Monitoring platform. Cellular communication depends on the purchased data plan.

The Cellular Plug-in is provided with an antenna and user manual. Refer to

[https://www.solaredge.com/sites/default/files/cellular\\_gsm\\_installation\\_guide\\_for\\_inverters\\_with\\_setapp.pdf](https://www.solaredge.com/sites/default/files/cellular_gsm_installation_guide_for_inverters_with_setapp.pdf)

## Communication Connectors

The Synergy Manager has communication glands for connecting communication cables to support the various communication options of the inverter. Unused openings should remain sealed.

The Synergy Manager is equipped with two glands designated for routing communication cables.

Figure 26 shows the communication glands of the Synergy Manager and Table 1 describes the glands.

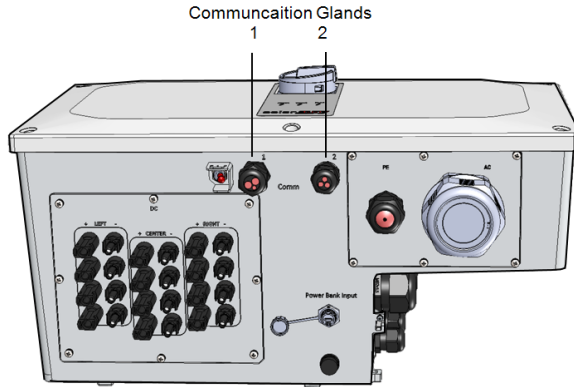


Figure 26: Synergy Manager - Communication Glands

Table 55 describes the openings of the communication glands of the Synergy Manager.

**Table 1: Synergy Manager - Communication Glands**

Gland#	Opening	Functionality
Synergy Manager	1	Three large openings 2.5-5 mm Ethernet cable (CAT6), Power reduction cable
	2	Two large openings 4.5-7 mm External antenna cable, RS485-1 and RS485 -2 cables (CAT6)
	One small opening 2-4 mm	External antenna cable



## Communication Board

The communication board is located, inside the Synergy Manager and serves as the communication hub of the inverter.

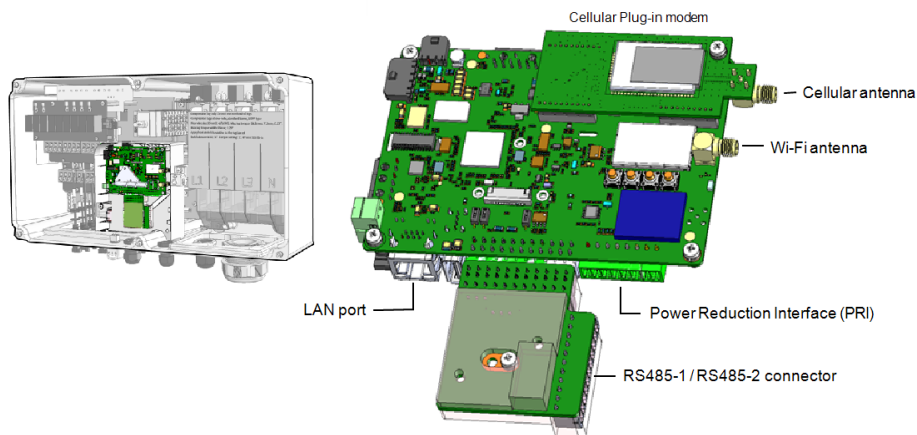


Figure 27: Synergy Manager - communication board

The Communication Board includes the following interface connectors:

- Cellular antenna - Antenna port for a Cellular Plug-in modem connecting the inverter to the internet.
- Wi-Fi Antenna - Wireless LAN antenna port for connecting the inverter to an internet modem
- Power Reduction Interface (PRI) - Connecting the Inverter to a power reduction device, such as a generator.  
For more information, refer to: [Power Control Configuration - Application Note](#)
- RS485-1 / RS485-2 connector - Two Modbus ports for connecting multiple inverters, over the one line to the Internet. The ports are also used for connecting peripheral devices such as meters, a batteries and a third party data logger.
- LAN port - Ethernet cable port for connecting the inverter to an internet modem

## Removing the Synergy Manager Cover

To access the communication board, remove the Synergy Manager cover.

→ To remove the Synergy Manager cover:

1. Turn OFF the inverter ON/OFF/P switch, and wait until the green LED is blinking , indicating that the DC Voltage is safe (below 50V), or wait five minutes before continuing to the next step.
2. Turn OFF the inverter DC Disconnect Switch.
3. Disconnect the AC to the inverter by turning OFF the circuit breakers on the distribution panel.
4. Release the six Allen screws of the cover and remove the Synergy Manager cover.

#### CAUTION!



When removing the cover, make sure not to damage internal components. SolarEdge will not be held responsible for any components damaged as a result of incautious cover removal.

## Creating an Local Area Network (LAN) Connection

This communication option, enables connection to the SolarEdge monitoring platform via Ethernet.

Ethernet cable specifications:

- Cable type – a shielded Ethernet cable (CAT6) should be used
- Maximum distance between the inverter and the router – 100 m/ 330 ft.

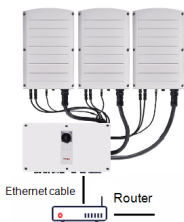
#### NOTE



If using an Ethernet cable longer than 10 m / 33 ft in areas where there is a risk of induced Voltage surges by lightning, it is recommend to use external surge protection devices. For details refer to:

[http://www.solaredge.com/files/pdfs/lightning\\_surge\\_protection.pdf](http://www.solaredge.com/files/pdfs/lightning_surge_protection.pdf)

Single Inverter Connection



Multiple Inverter Connection

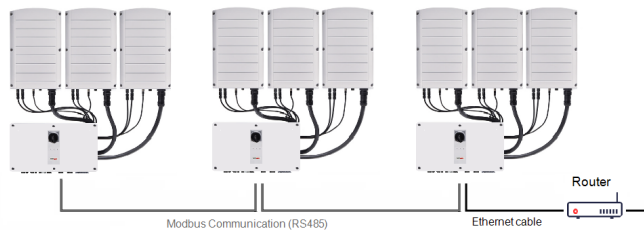


Figure 28: Ethernet connection options

→ To connect the Ethernet cable:

1. Remove the nut of the COMM1 gland.

**CAUTION!**



The gland includes a rubber waterproof fitting, which should be used to ensure proper sealing.

2. Insert the CAT6 Ethernet cable through the gland nut.
3. Remove the rubber fitting.
4. Remove the plastic seal from the rubber fitting.
5. Route the LAN cable through the gland opening in the Synergy Manager.
6. Insert the CAT6 Cable through the cut into the rubber fitting.

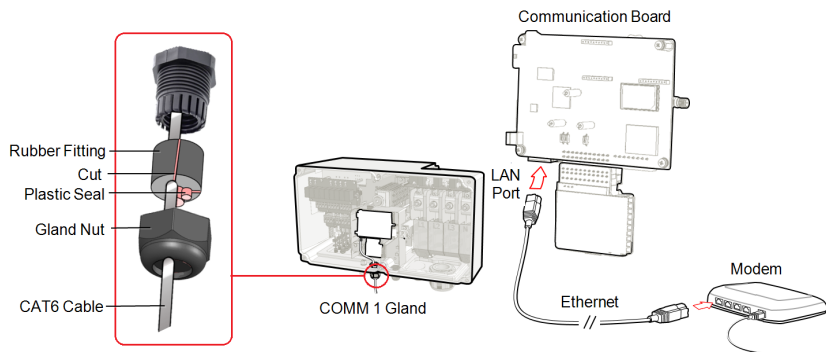


Figure 29: Inserting the Ethernet (CAT6) cable

7. Route the Ethernet (CAT6) cable to the communication board and plug to the LAN port.
8. Crimp an RJ45 plug onto the Ethernet cable (see Ethernet (CAT6) Cables).
9. Tighten the gland nut with a torque of 5.5 N\*m.

## Ethernet (CAT6) Cables

CAT6 cables have eight wires (four twisted pairs), as shown in the pin layout of the Ethernet connector in *Figure 30*. Wire colors may differ from one cable to another. You can use either wiring standard, as long as both sides of the cable have the same pin-out

and color-coding.

RJ45 Pin #	Wire Color <sup>(1)</sup>		10Base-T Signal
	T568B	T568A	100Base-TX Signal
1	White/Orange	White/Green	Transmit+
2	Orange	Green	Transmit-
3	White/Green	White/Orange	Receive+
4	Blue	Blue	Reserved
5	White/Blue	White/Blue	Reserved
6	Green	Orange	Received-
7	White/Brown	White/Brown	Reserved
8	Brown	Brown	Reserved

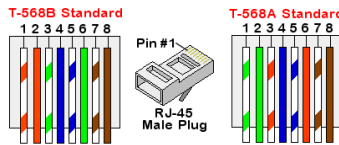


Figure 30: Ethernet connector - pin layout

- Use a non-crimped cable to connect via the gland to the RJ45 port on the inverter's communication board or, if using a spool of cable, connect as follows:
  - Insert the cable through the gland.
  - Remove the cable's external insulation using a crimping tool or cable cutter and expose eight wires.
  - Insert the eight wires into an RJ45 connector, as shown in *Figure 30*.
  - Use a crimping tool to crimp the connector.
  - Connect the Ethernet connector to the RJ45 port on the communication board as shown in *Figure 29*.
- For the switch/router side, use a pre-crimped cable or use a crimper to prepare an RJ45 communication connector.
- Connect the cable RJ45 connector to the RJ45 port of the Ethernet router or switch.
- You can connect more than one inverter to the same switch/router or to different switches/routers, as needed. Each inverter sends its monitored data independently to the SolarEdge Monitoring platform.

(1)The connection does not support RX/TX polarity change. Supporting crossover Ethernet cables depends on the switch capabilities.

## NOTE



There are no LED indicators on the Ethernet connector, if the inverter is not communicating with the Monitoring platform through a LAN refer to "Troubleshooting Communication" on page 70

## LAN Configuration

1. The inverter is configured by default to LAN. If reconfiguration is required:
  - a. Verify the ON/OFF/P switch is OFF.
  - b. Verify the AC is on.
  - c. Close the cover and turn ON the Synergy Manager.

## WARNING!



ELECTRICAL SHOCK HAZARD. Do not touch uninsulated wires when the Connection Unit cover is removed.

- d. Use the SolarEdge SetApp to access the **Commissioning** main menu screen as described in "Activating, Commissioning and Configuring the System" on page 45"Activating, Commissioning and Configuring the System" on page 45 .
  - e. From the **Commissioning** screen, tap **Communication**.
  - f. Select **Configure Ethernet**, to configure the connection.
2. Verify the connection, as described in "RS485 Bus Configuration" on page 64

## NOTE



The system automatically establishes communication with the monitoring platform as it is configured to LAN by default.

## NOTE



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

- Destination Address: **prodssl.solaredge.com**
- Modbus TCP Port: **443** (for incoming and outgoing data)

## Creating an RS485 Bus Connection

The RS485 option enables creating a bus of connected inverters, consisting of up to 31 follower inverters and 1 leader inverter. Using this option, inverters are connected to each other in a bus (chain), via their RS485 connectors. The first and last inverters in the chain must be terminated as described on page 63.

RS485 wiring specifications:

- Cable type: Shielded Ethernet cable with a minimum of 3-wire twisted pair (CAT6 cable may be used)
- Wire cross-section area: 0.2- 1 mm<sup>2</sup> (CAT6 cable should be used)
- Maximum nodes: 32
- Maximum distance between first and last devices: 1 km /3300 ft

### NOTE

If using a cable longer than 10 m/33 ft in areas where there is a risk of induced voltage surges by lightning, it is recommended to use surge protection devices. For details refer to:



[https://www.solaredge.com/sites/default/files/lightning\\_surge\\_protection.pdf](https://www.solaredge.com/sites/default/files/lightning_surge_protection.pdf).

If grounded metal conduits are used for routing the communication wires, a lightning protection device is not required.

The following sections describe how to physically connect the RS485 bus and how to configure the bus.

→ **To connect the RS485 communication bus:**

1. Release the six Allen screws and carefully remove the Synergy Manager cover.
2. Remove the seal from one of the openings in communication gland #2 and insert the wire through the opening.
3. Pull out the 6-pin RS485 terminal block connector, as shown below.

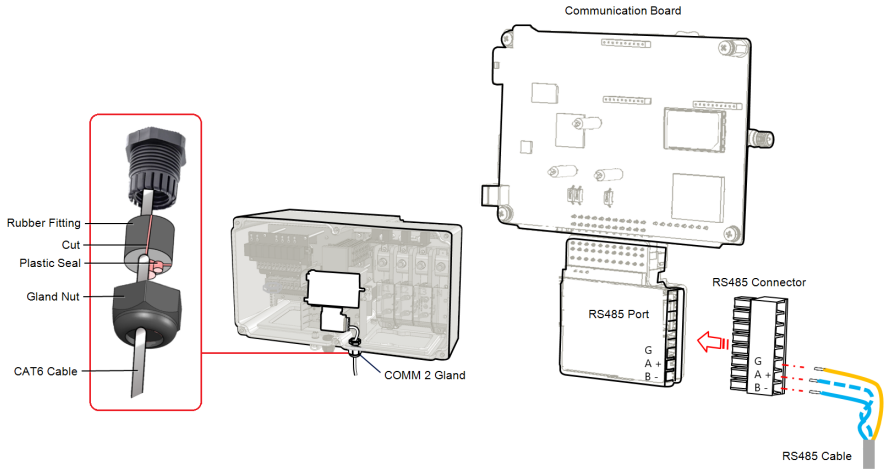


Figure 31: RS485 terminal block on the communication board

- Loosen the screws of pins A(+), B(-), and G on the left of the RS485 terminal block (RS485-1 or RS485-2).

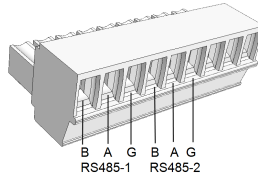


Figure 32: RS485 terminal block

- Insert the wire ends into the **G**, **A** and **B** pins shown above. Use Four- or six-wire twisted pair cable for this connection.

You can use any color wire for each of the **A**, **B** and **G** connections, as long as:

- The same color wire is used for all A pins the same color for all B pins and the same color for all G pins
- The wire for G is not from the same twisted pair as A or B.

- For creating an RS485 bus - connect all B, A and G pins in all inverters. The following figure shows this connection schema:

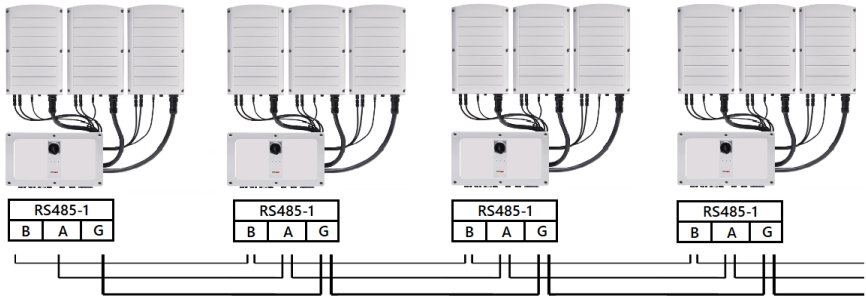


Figure 33: Connecting the inverters in chain

**NOTE**

Do not cross-connect B, A and G wires.

7. Tighten the terminal block screws.
8. Check that the wires are fully inserted and cannot be pulled out easily.
9. Push the RS485 terminal block firmly all the way into the connector on the right side of the communication board.
10. Terminate the first and last SolarEdge device in the chain by switching a termination DIP-switch inside the inverter to ON (move the left switch up). The DIP-switch is located on the communication board and is marked SW1.

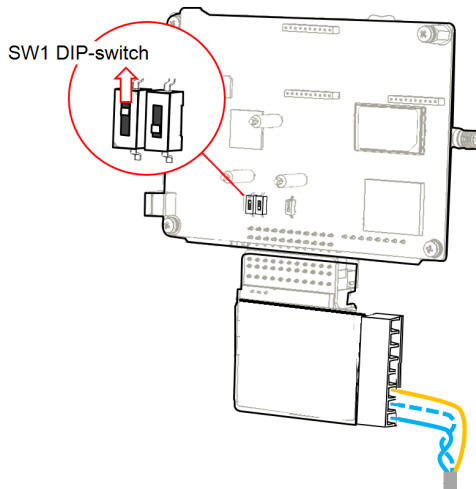


Figure 34: RS485 termination DIP-switch (SW1)



## NOTE



Only the first and last SolarEdge devices in the chain should be terminated. The other inverters in the chain should have the termination switch OFF (down position).

## RS485 Bus Configuration

→ To connect to the monitoring platform:

1. Designate a single inverter as the connection point between the RS485 bus and the monitoring platform. This inverter will serve as the leader inverter.
2. Connect the leader to the monitoring platform using Ethernet (refer to *Creating an Ethernet (LAN) Connection* above).

→ To configure the RS485 bus:

All inverters are configured by default as followers. To configure the leader:

1. Make sure the inverter's ON/OFF/P switch is off.
2. Make sure that the AC circuit breaker on the main distribution panel is on.
3. Turn on the DC Safety Unit (if applicable).
4. Access SetApp, as described in *Communication* on page 47.
5. From the **Commissioning** screen, select **Site Communication** > **RS485-2** > **Protocol** > **SolarEdge** > **SolarEdge Leader**.
6. Return to the **RS485-2** screen and select **Follower Detect**.  
The system starts automatic detection of the follower inverters connected to the leader inverter. The inverter should report the correct number of followers. If it does not, verify the connections and terminations in all inverters in the chain.
7. To check the follower IDs and last communication time, select **RS485-2** > **Follower List**.
8. Verify the connection of the leader to the monitoring platform, as described below.

## Verifying the Connection

After connecting and configuring a communication option, perform the following steps to check that the connection to the Monitoring platform has been successfully established.

1. If the Synergy Manager cover is not closed, close it: Attach the cover and secure it by tightening the screws with a torque of 10.3 N\*m / 7.6 lb.\*ft. For proper sealing,

first tighten the corner screws and then the two central screws.

2. Access SetApp and select **Commissioning > Status**.
3. In the **Summary** section, under **Server Comm.**, make sure **S\_OK** is displayed together with the selected communication option.
4. Scroll down to the **Communication** section and check that the communication options are as required.

## Signaling Options

### Alternative Power Source

Energy-generation systems (such as PV inverters) connected to the grid may consist of different types of energy generating sources.

In some cases, when grid power is disconnected, PV inverters operate in parallel with other voltage sources, such as generators.

When inverters operate concurrently with generators, they may be subjected to voltage and frequency fluctuations that exceed trips, which are preset according to regional grid connection requirements. To support simultaneous operation of the inverter and a generator, the inverter extends its Voltage and frequency operating range once it receives a Power Reduction Interface (PRI) signal indicating that grid power is unavailable (“Alternative Power Source mode”). When the grid power is restored, the inverter automatically reverts to its default country setting, which includes the original Voltage and frequency operating range.

Figure 35, shows an Example of Alternative Power Source System.

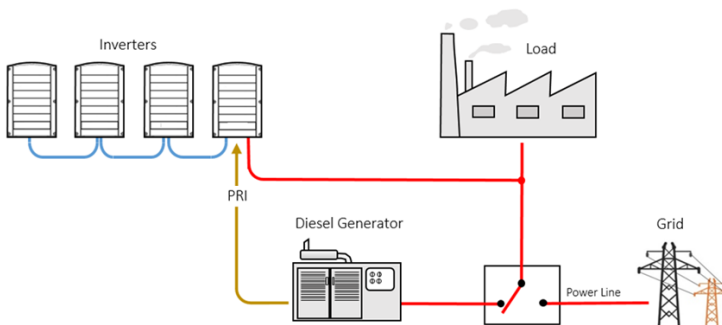


Figure 35: Example of Alternative Power Source System

The Power reduction Interface (PRI) terminal block on the communication board (See Figure 36) is used signaling the inverter to switch to Alternative Power Source mode.

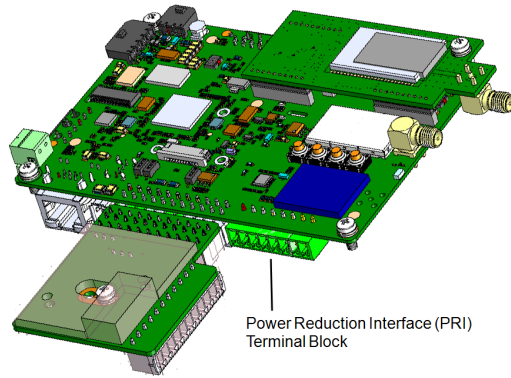


Figure 36: PRI Terminal Block Location on the Communication Board of the Inverter

For detailed connection and configuration of the inverter in alternative power source mode, refer to: <https://www.solaredge.com/sites/default/files/se-inverter-support-of-voltage-sources.pdf>

# Appendix A: Errors and Troubleshooting

This chapter describes how to troubleshoot general system problems. For further assistance, contact SolarEdge Support.

## Identifying Errors

Errors may be indicated in various system interfaces: On the inverter bottom panel, a red LED indicates an error. In the monitoring platform and SetApp, errors are displayed with codes.

For more information on the codes displayed for error and warning messages, refer to <http://www.solaredge.com/sites/default/files/se-inverter-installation-guide-error-codes.pdf>. This document describes errors that appear in SetApp, monitoring platform, and LCD (for inverters with LCD). To identify the error types, use the methods described below.



→ To identify the error type using the inverter LEDs:

1. Move the ON/OFF/P switch to **P** position for **2 seconds** and release it.
2. Observe the LED lights and use the following table to identify the error type. For more information, refer to <https://www.solaredge.com/leds>.



Error Type	Inverter LED Color and State		
	Red	Green	Blue
Arc detected	ON	OFF	OFF
Isolation or RCD problem	Blinking	OFF	OFF
Grid error	OFF	ON	OFF
High temperature	OFF	Blinking	OFF
Pairing failed	OFF	OFF	ON
Other issue	OFF	OFF	Blinking

→ To identify the error type using the monitoring platform:

1. Open the site dashboard and click the **Layout** icon.
2. Right-click the inverter and select **Info** from the menu. The inverter details window is displayed.
3. Click the **Errors** tab. The list is displayed.

## Power Optimizer Troubleshooting

Malfunction	Possible Cause and Corrective Action
Pairing failed	<p>Power Optimizers are shaded.</p> <p>If you connected the inverter to the monitoring platform, retry pairing remotely (during sunlight). Make sure to leave the inverter ON/OFF/P switch ON and that S_OK appears in the status screen.</p>
String voltage is 0V	<p>Power Optimizer (s) output is disconnected.</p> <p>Connect all Power Optimizer outputs.</p>
String voltage not 0V but lower than number of Power Optimizers	<p>Power Optimizer(s) not connected in the string.</p> <p>Connect all Power Optimizers.</p>
	<p>Panel(s) not connected properly to Power Optimizer inputs (not applicable to smart modules).</p> <p>Connect the modules to the Power Optimizer inputs.</p>
	<p>String reverse polarity.</p> <p>Check string polarity using a voltmeter and correct if needed.</p>

Malfunction	Possible Cause and Corrective Action
<p data-bbox="101 512 490 571">String Voltage is higher than number of Power Optimizers</p> <div data-bbox="113 587 490 791" style="border: 1px solid black; padding: 5px;"> <p data-bbox="176 587 295 611"><b>WARNING!</b></p> <p data-bbox="176 624 490 791">If the measured voltage is too high, the installation may not have a safe low voltage. <b>PROCEED WITH CARE!</b> A deviation of <math>\pm 1\%</math> per string is reasonable.</p> </div>	<p data-bbox="499 185 1008 244">Extra Power Optimizer(s) connected in the string (not applicable to smart modules).</p> <p data-bbox="499 260 996 319">Check if an extra Power Optimizer is connected in the string. If not – proceed to next solution.</p> <p data-bbox="499 335 974 427">A module is connected directly to the string, without a Power Optimizer (not applicable to smart modules).</p> <p data-bbox="499 443 1008 571">Verify that only Power Optimizers are connected in the string and that no module outputs are connected without a Power Optimizer. If the problem persists, proceed to the next step.</p> <p data-bbox="499 579 840 603">Power Optimizer(s) malfunction.</p> <ol data-bbox="499 619 1008 1118" style="list-style-type: none"> <li data-bbox="499 619 996 678">1. Disconnect the wires connecting the Power Optimizers in the string.</li> <li data-bbox="499 694 1008 901">2. Measure the output voltage of each Power Optimizer to locate the Power Optimizer that does not output 1V safety Voltage. If a malfunctioning Power Optimizers located, check its connections, polarity, module, and voltage.</li> <li data-bbox="499 917 1008 1118">3. Contact SolarEdge Support. Do not continue before finding the problem and replacing the malfunctioning Power Optimizer. If a malfunction cannot be bypassed or resolved, skip the malfunctioning Power Optimizer, thus connecting a shorter string.</li> </ol>

## Troubleshooting Communication

### Troubleshooting Ethernet (LAN) Communication

The possible errors and their troubleshooting are detailed in the following table:

Error Message	Possible Cause and Troubleshooting
LAN cable disconnected	Physical connection fault. Check the cable pin-out assignment and cable connection.
No DHCP	IP settings issue. Check the router and inverter configuration. Consult your network IT.
Configure Static IP or set to DHCP	
Gateway not responding	Ping to router failed. Check the physical connection to the switch/ router. Check that the link LED at the router /switch is lit (indicating phy-link). If OK - contact your network IT, otherwise replace the cable or change it from cross to straight connection.
No Internet connection	Ping to google.com failed. Connect a laptop and check for internet connection. If internet access is unavailable, contact your IT admin or your internet provider. For Wi-Fi networks, ensure that user-name and password are as defined in the internet provider AP/ router.

### Troubleshooting RS485 Communication

- If the message **RS485 Leader Not Found** appears in the Status screen, check the connections to the leader device and fix if required.
  
- If after follower detection the number of followers displayed for the leader under **RS485-1 > Follower Detect** is lower than the actual number of followers, refer to the following application note to identify missing followers and troubleshoot connectivity problems:
   
[https://www.solaredge.com/sites/default/files/troubleshooting\\_undetected\\_RS485\\_devices.pdf](https://www.solaredge.com/sites/default/files/troubleshooting_undetected_RS485_devices.pdf)

## Additional Troubleshooting

1. Check that the modem or hub/router is functioning properly.
2. Check that the connection to the internal connector on the communication board is properly done.
3. Check that the selected communication option is properly configured.
4. Use a method independent of the SolarEdge device to check whether the network and modem are operating properly. For example, connect a laptop to the Ethernet router and connect to the Internet.
5. Check whether a firewall or another type of network filter is blocking communication.



## Appendix B: Adding Optional Components

This appendix describes the optional components available for the inverter. Before ordering component, verify that your inverter model supports the component and that the component is not already provided with the inverter.

Ordered Installation and replacement kits for components include procedures for removal and installation of the components.

### NOTE



Replaced component or part may require to be disposed according local regulations. If you wish to discard components or parts, contact your local authorities and ask for the correct method of disposal.

### AC Surge Protection Device (SPD)

The AC SPD is a device designed to protect the inverter from Voltage spikes and surge attempts forming on the AC grid lines. The SPD limits the Voltage supplied to the inverter by either blocking or shorting to ground Voltages above a safe threshold. The SPD is installed inside the inverter and communicates with the SolarEdge Monitoring platform for reporting surge protection events and faults.

For installation and configuration of AC SPD, refer to:

<https://www.solaredge.com/sites/default/files/se-synergy-manager-ac-spd-installation-guide.pdf>

### DC Surge Protection Device (SPD)

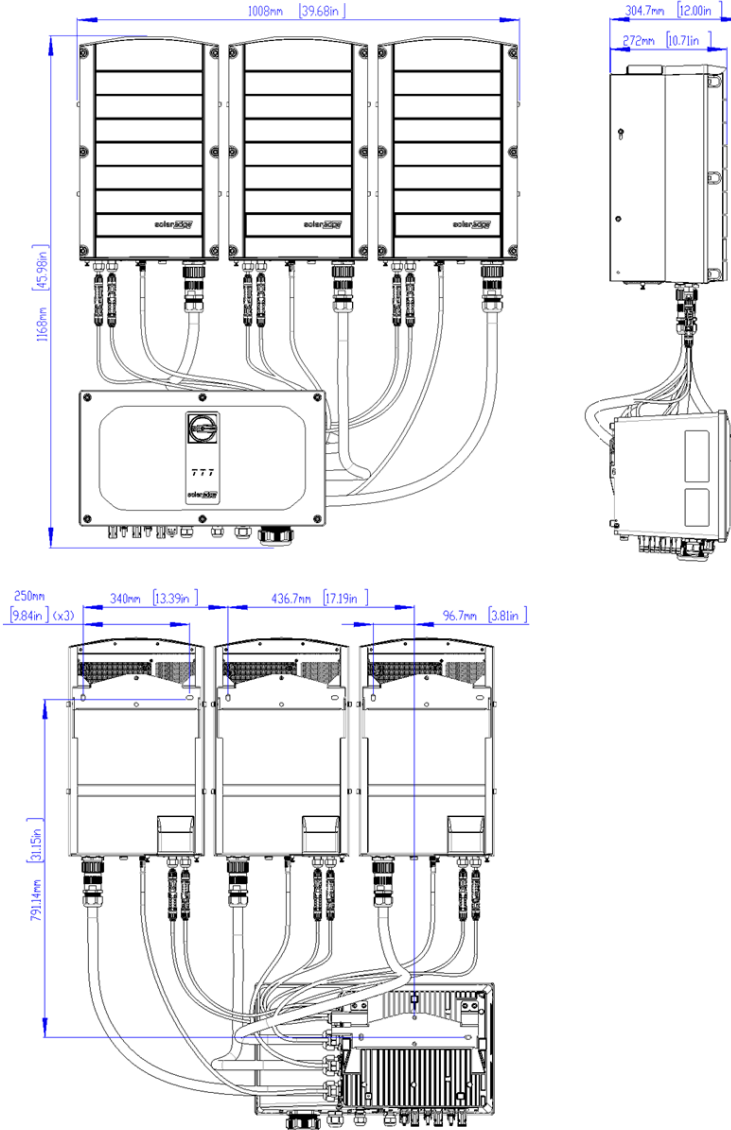
The DC SPD is a device designed to protect the inverter from Voltage spikes and surge attempts, forming on the PV DC lines, mainly induces by lightning. The SPD limits the Voltage supplied to the inverter by either blocking or shorting to ground Voltages above a safe threshold. The SPD is installed inside the inverter and communicates with the SolarEdge Monitoring platform for reporting surge protection events and faults.

For installation and configuration of DC SPD, refer to:

<https://www.solaredge.com/sites/default/files/se-synergy-manager-dc-spd-installation-guide.pdf>

# Appendix C: Mechanical Specifications

The following figure shows the dimensions of the Three Phase Inverter with Synergy Technology.



## Appendix D: SafeDC™

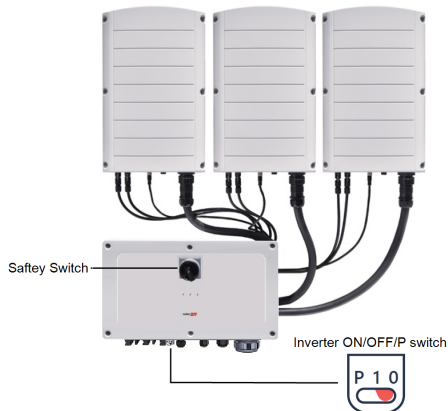
When AC supply to the inverter is shut off (by shutting off the AC breaker at the site), or when the inverter ON/OFF/P switch is turned to OFF, the DC Voltage drops to a safe Voltage of 1V per Power Optimizer.

The SolarEdge inverters are certified for compliance with the following standards as disconnection devices for PV generators, meaning that they can replace a DC disconnect:

- 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
- DIN VDE 0100-712:2006-06.

In compliance with these standards, follow the instructions below to disconnect the DC power:

1. Move the Connection Unit safety switch to the OFF position, as shown in the following image.



2. Move the inverter ON/OFF/P switch to OFF (0), as shown in *Appendix D*.
3. Disconnect the AC to the inverter by turning OFF the circuit breakers on the distribution panel.

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