



Installation Guide

Three Phase Inverters with Synergy Technology

Model Name: SExxxK for Australia

Version 1.2

Disclaimers

Important Notice

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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.

Safety Warnings

Please review the following safety guidelines, and observe them when handling the equipment.

- Always power down the inverter before opening the unit. Perform the following steps:
 - Switch the inverter's ON/OFF switch to OFF, and wait five minutes for the capacitors to discharge
 - Cut off AC power to the inverter by turning off the circuit breakers on the distribution panel.
 - Turn the DC Safety Unit's switch (if applicable) to OFF.

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.
-

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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.

Warning!



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

WARNING!



When servicing or replacing SolarEdge equipment, instructions in the SolarEdge Inverter Installation Guide must be followed to maintain the integrity of the PV hazard control system. SolarEdge Power Optimizers and/or inverters may only be replaced with SolarEdge Power Optimizers and/or inverters. Third party equipment is not compatible with SolarEdge equipment.

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 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!



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: $V_{oc, max} + (PV \text{ string Length} - 1) * 1V$, where:

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



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>.



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.

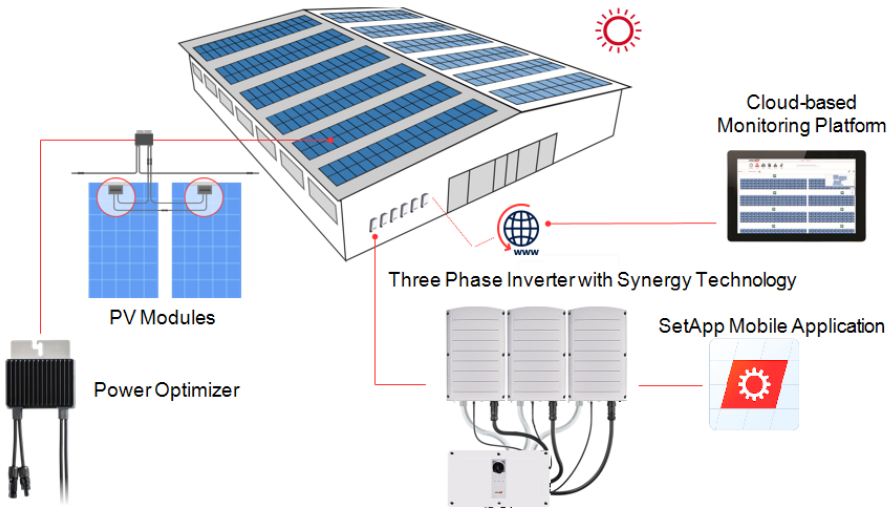


Figure 1: The SolarEdge power harvesting system components

Power Optimiser

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

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

- During fault conditions
- The Power Optimisers 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 Optimiser also transmits module performance data over the DC power line to the inverter.

Two types of Power Optimisers are available:

- Module add-on Power Optimiser – connected to one or more modules
- Smart modules - the Power Optimiser 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 Optimiser and transmits it to the SolarEdge Monitoring platform (requires a land-line or cellular connection to the Internet).

The inverter is comprised of two or three Synergy unit inverters (depending on the model) accompanied an external Synergy Manager unit. The Inverter may include two or three Synergy Units, depending on the inverter's model.

The Synergy Units 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 Optimiser selection per site size and enables report generation. You can create a project in Designer and export the site design with the PV array layout to the monitoring platform.

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:

- Standard flat-head screwdrivers set
- Non-contact Voltage detector
- 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

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 arrays to the Synergy Manager" on page 35
4. [Connecting AC and PV Strings to the Synergy Manager](#)
5. [Activating, Commissioning and Configuring the System](#)
6. [Setting Up Communication with the Monitoring Platform](#)

Chapter 2: Installing the Power Optimisers


Safety

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


WARNING!

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


CAUTION!

-  Power Optimisers are IP68/NEMA6P rated. Choose a mounting location where optimisers 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 Optimiser input or output cable connector is prohibited and will void the warranty.


CAUTION!

-  All PV modules must be connected to a Power Optimiser.

CAUTION!

-  If you intend to mount the Power Optimisers 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 Optimisers are safe. They carry only a low safety voltage before the inverter is turned ON. As long as the Power Optimisers are not connected to the inverter or the inverter is turned OFF, each Power Optimiser will output a safe voltage of 1V.

**CAUTION!**

Installing a SolarEdge system without ensuring compatibility of the module connectors with the Power Optimiser 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 Optimisers' 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 Optimisers 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 Optimiser connector; and the Inverter DC input connectors.
- 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 Optimisers in a PV string (PV string length), see the Power Optimiser datasheets. Refer to the Designer for PV string length verification. The Designer is available on the SolarEdge website at: .
- *Do not* use extension cables between a module and a Power Optimiser, between two modules connected to the same Power Optimiser, or between two Power Optimisers other than in the following cases:

Between a Power Optimiser and a module:

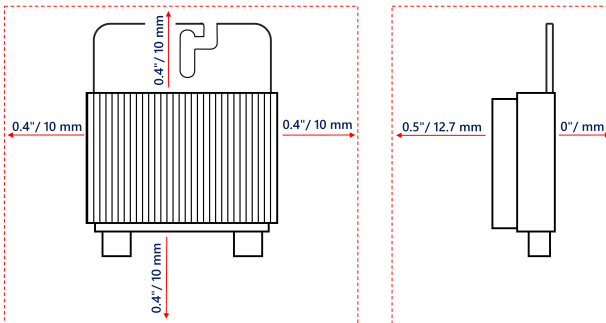
- Extension cables of up to 1.8 m are allowed for all Power Optimisers (0.9 m for DC+, and 0.9 m for DC-).
- P-Series Power Optimisers with the 4-type suffix in their part number (Pxxx-4xxxxxx) and the Mxxx-Series - extension cables of up to 16 m can be installed per Power Optimiser (8 m for DC+, and 8 m for DC-).

Between two Power Optimisers or between a Power Optimiser and the inverter:

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

Single Phase Inverters	Three Phase Inverters
All - 300 m	

- For connecting homerun DC cables from Power Optimisers to the inverter, use cables with the following cross-sections:
 - For MC4 connectors:
 - For DC terminal blocks inside the inverter or Safety Unit (if applicable):
- Frame-mounted Power Optimisers are mounted directly on the module frame, regardless of racking system (rail-less or with rails). For installation of frame-mounted Power Optimisers, refer to http://www.solaredge.com/sites/default/files/installing_frame_mounted_power_optimizers.pdf.
- The Power Optimiser can be placed in any orientation.
- If connecting more modules than Power Optimiser inputs in parallel, use a branch cable. Some commercial Power Optimiser models have a dual input.
- Position the Power Optimiser close enough to its module so that their cables can be connected.
- Make sure to use Power Optimisers that have the required output and input conductor length.
- Completely shaded modules may cause their Power Optimisers to temporarily shut down. This will not affect the performance of the other Power Optimisers in the PV string, as long as the minimum number of unshaded Power Optimisers connected in a PV string of modules is met. If under typical conditions fewer than the minimum Power Optimisers are connected to unshaded modules, add more Power Optimisers to the PV string. To allow for heat dissipation, maintain clearance shown in
- **All Power Optimisers, except for the P860 and P960 Power Optimisers**



P860, P960 and M1600 Power Optimisers

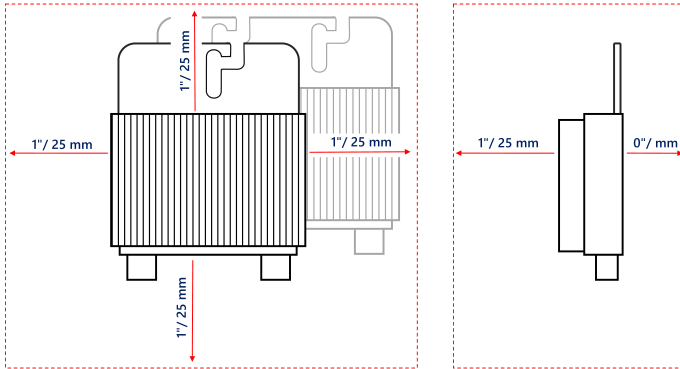


Figure 3: Power Optimisers clearance

- 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 Optimisers are not exceeding the maximum temperatures stated in their specifications.

Step 1: Mounting the Power Optimisers

For each of the Power Optimisers⁽¹⁾:

1. Determine the Power Optimiser mounting location and use the Power Optimiser mounting brackets to attach the Power Optimiser to the support structure. It is recommended to mount the Power Optimiser in a location protected from direct sunlight. For frame-mounted Power Optimisers follow the instructions supplied with the optimisers, or refer to 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 Optimiser 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 Optimiser.

Do not drill through the Power Optimiser or through the mounting holes.

3. Attach each Power Optimiser to the rack using M6 or M8 stainless steel bolts, nuts and washers or other mounting hardware. Apply torque of 9-10 N*m.
4. Verify that each Power Optimiser is securely attached to the module support structure.
5. Record Power Optimiser serial numbers and locations, as described in *Reporting and Monitoring Installation Data* on page 48.

Step 2: Connecting a PV module to a Power Optimiser

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 Optimisers:

⁽¹⁾Not applicable to smart modules.

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

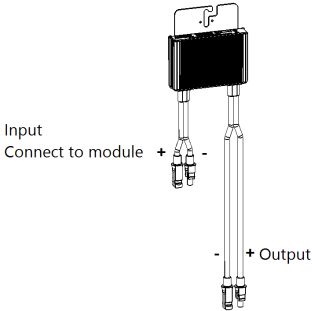


Figure 4: S-Series (left) and P-Series (right) Power Optimiser connectors

Step 3: Connecting Power Optimisers in PV strings

You can construct parallel PV strings of unequal length, that is, the number of Power Optimisers in each PV string does not have to be the same. The minimum and maximum PV string lengths are specified in the power datasheets. Refer to the SolarEdge Site Designer for PV 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 PV string's first Power Optimiser to the Plus (+) output connector of the PV string's second Power Optimiser.
2. To minimize electromagnetic interference (EMI), make sure to minimize the distance between the positive and negative DC cables.
3. Connect the rest of the Power Optimisers in the PV string in the same manner.

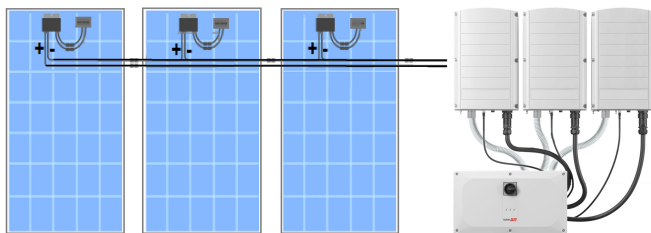


Figure 5: Power Optimisers connected in series

- If you intend to monitor the installation, using the SolarEdge Monitoring platform, record the physical location of each Power Optimiser, as described in *Creating Logical and Physical Layout using Installation Information* on page 49.

Step 4: Verifying Proper Power Optimiser Connection

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

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

In SolarEdge systems, due to the introduction of Power Optimisers 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 PV 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_systems_technical_note.pdf



→ To verify proper Power Optimiser connection:

- Measure the voltage of each PV string individually before connecting it to the other PV strings or to the inverter. Verify correct polarity by measuring the PV 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 PV string Voltage and verify correct polarity on the DC wires inside the Synergy Manager.

For troubleshooting Power Optimiser operation problems, refer to *Power Optimiser Troubleshooting* on page 66.

Proper Power Optimiser 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 Optimisers 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.

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

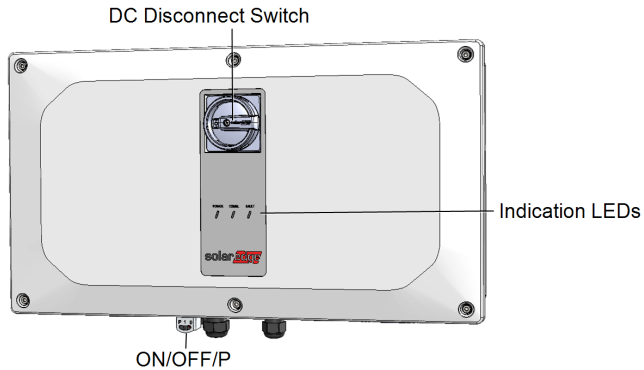


Figure 6: Synergy Manager Unit - Front interfaces



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.

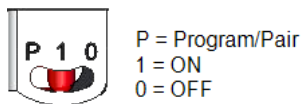


Figure 7: ON/OFF/P switch

- **ON (1)** - Turning this switch ON (after Power Optimiser pairing) starts the operation of the Power Optimisers, enables power production and allows the inverter to begin exporting power to the utility grid.
- **OFF (0)** - Turning this switch OFF reduces the Power Optimiser 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 less than 5 seconds , then released.	<ul style="list-style-type: none"> • Displays production information for 5 seconds on the SetApp screen. • Displays error type indications (if exist) for 5 seconds. • Activates the Wi-Fi access point for connecting to the SolarEdge Inverter SetApp 	While the switch is in P, all LEDs are ON
Switch moved to P for more than 5 seconds , 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⁽¹⁾/ flickering⁽²⁾/alternating⁽³⁾). 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

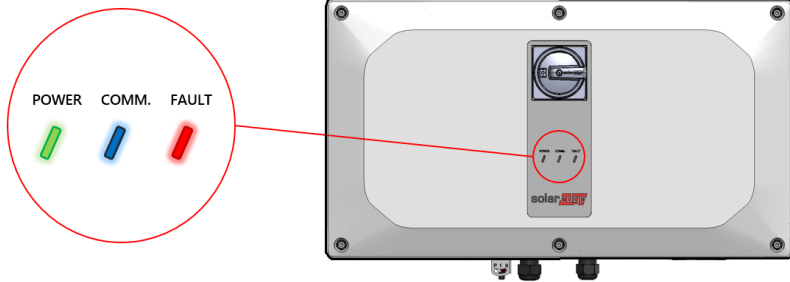


Figure 8: Indication LEDs

(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 Optimisers not paired	ON (1)	OFF	Blinking	<ul style="list-style-type: none"> • S_OK: ON • No S_OK: OFF 	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"> • S_OK: ON • No S_OK: OFF 	
Night mode (no production)		OFF	Flickering	<ul style="list-style-type: none"> • S_OK: ON • No S_OK: OFF 	
Inverter is OFF (Safe DC)	OFF (0)	OFF	Blinking	<ul style="list-style-type: none"> • S_OK: ON • No S_OK: OFF 	
Inverter is OFF (DC not safe)		Blinking	Blinking	<ul style="list-style-type: none"> • S_OK: ON • No S_OK: OFF 	
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 65

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.

NOTE



Models of the Three Phase Inverters with Synergy Technology are provided with either two or three Synergy Units. The following connection description refers to inverter models with three Synergy Units. In inverter models with two Synergy Units, the Manager Unit connects to the left and center Synergy Units.

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

Figure 9 shows the interconnecting cables of the inverter.

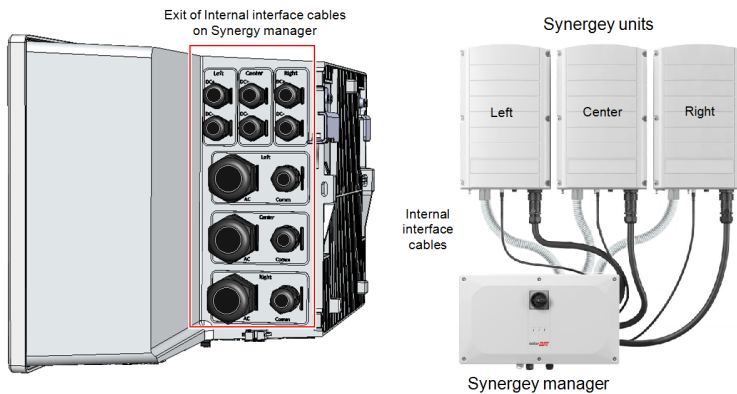


Figure 9: Inverter - interconnection cables

Synergy Manager External Cable Interface

The conduit entries, at the bottom side of the Synergy Manager, interfaces the inverter to the grid and PV arrays. 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.

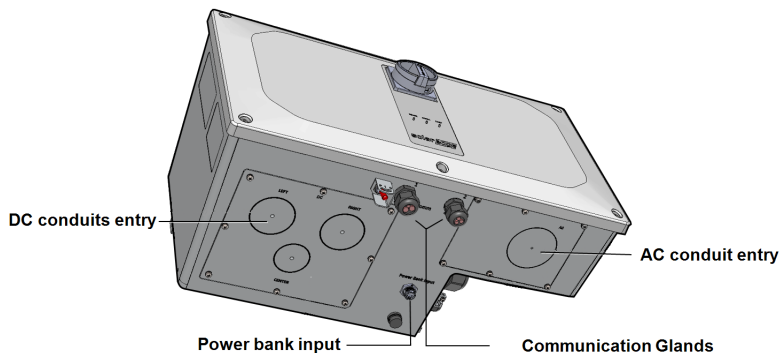


Figure 10: Synergy Manager - bottom view

- **AC Cable Entry:** AC cable gland for grid connection
- **AC Conduits Entry:** drill guides for conduits running AC cable from the grid
- **DC Conduits Entries:** drill guides for conduits running DC cables from the PV arrays
- **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 50.

Synergy Unit Interface Connectors

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



NOTE

Connect cables according to labels shown on the Synergy Manager.

- **DC connector** 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

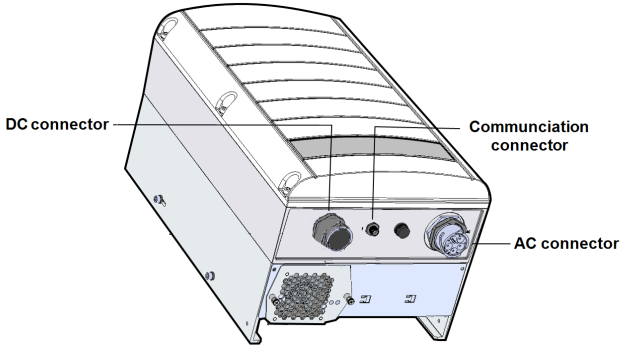


Figure 11: Synergy Unit Interface Connectors

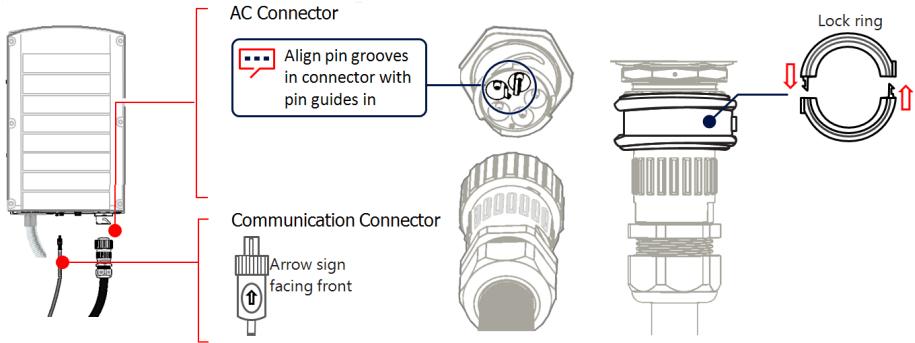


Figure 12: Synergy Unit AC and Communication Connectors

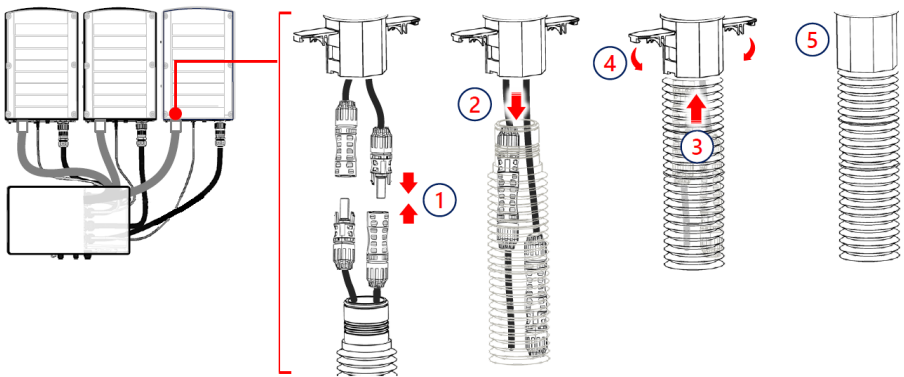


Figure 13: Synergy Unit DC Connector

Drilling Conduit Holes

This section describes how to drill AC and DC openings at the bottom of the Synergy Manager for connecting the AC and DC conduits.

This procedure must be performed before mounting the Synergy Manager.

→ To open conduit drill guides:

1. Ensure that the Safety Switch is set to OFF (0) and ON/OFF/P switch of the Synergy Manager is in OFF position.
2. Remove the screws securing the DC and AC panels and remove the panels from the bottom of the Synergy Manager enclosure.



CAUTION!

To avoid damage to the internal part of the Synergy Manager, always remove plates from unit before drilling holes.



NOTE

Unused conduit openings should always be sealed.

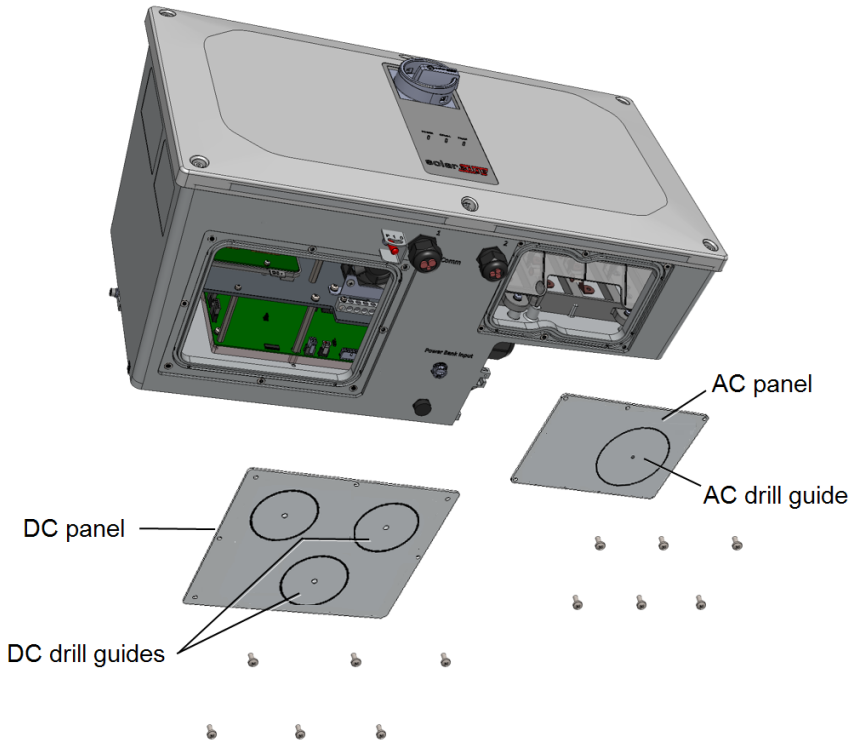


Figure 14: AC and DC panels with drill guides at the bottom of the Synergy Manager

3. Locate the drill guides for conduits on the DC and AC panels. Drill entry hole(s) for up to 5 cm conduit on the DC panel and 6.35 cm on the AC panel or drill entry hole for a single conduit, within the boundary marked on the inner side of the DC panel (see Figure 14).



NOTE

In some models, the DC panel has three drill entry hole(s) for up to 7.62 cm conduits.

4. Position the DC and AC panels back at the bottom of the Synergy Manager and torque the screws to 2.6N*m.

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 .

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 Optimisers can be installed at a minimum distance of 50 m 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 Optimiser.

For SolarEdge inverters installed at a distance of 200 m 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 15*)

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 15*).

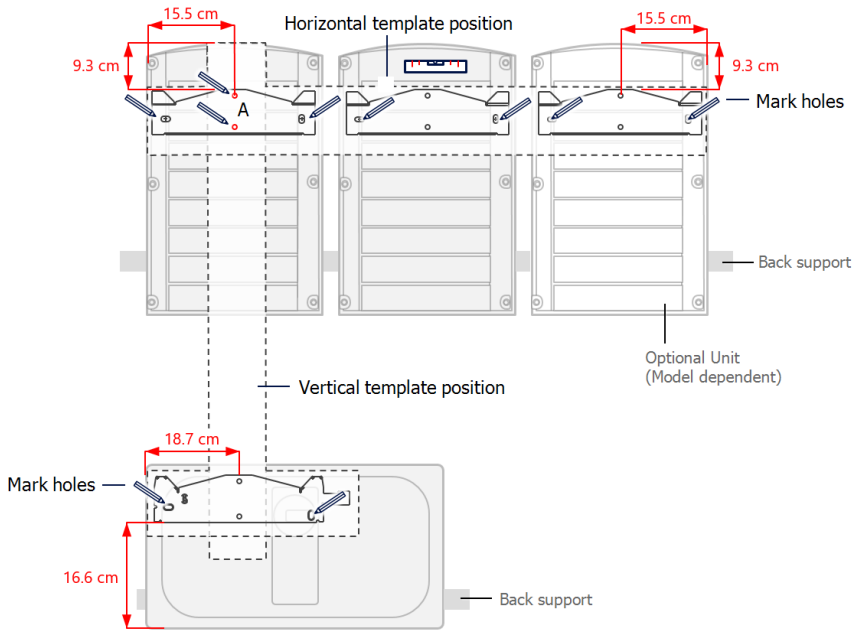


Figure 15: Marking the drilling holes locations

4. Place the mounting templates vertically against the wall and mark the drilling hole locations for the bracket 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 Wires to the Synergy Manager" on page 37.

- 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 17*).
- 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 16*).

**NOTE**

For the center Synergy Unit, use both side screws.

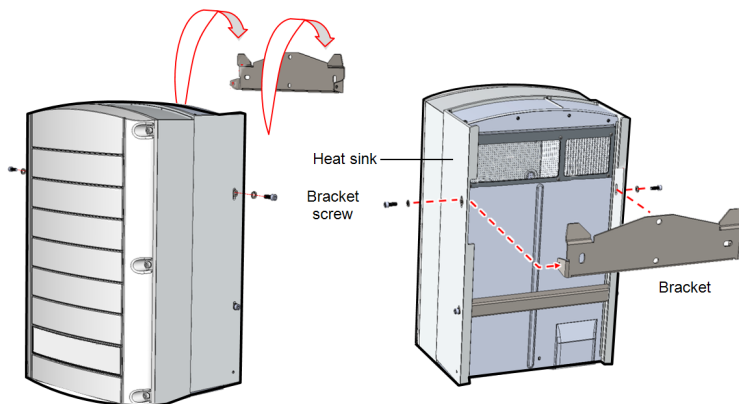


Figure 16: Hanging the Synergy Unit

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 17*).
 - c. Insert the supplied bracket screw through the right side of the heat sink and into the bracket.

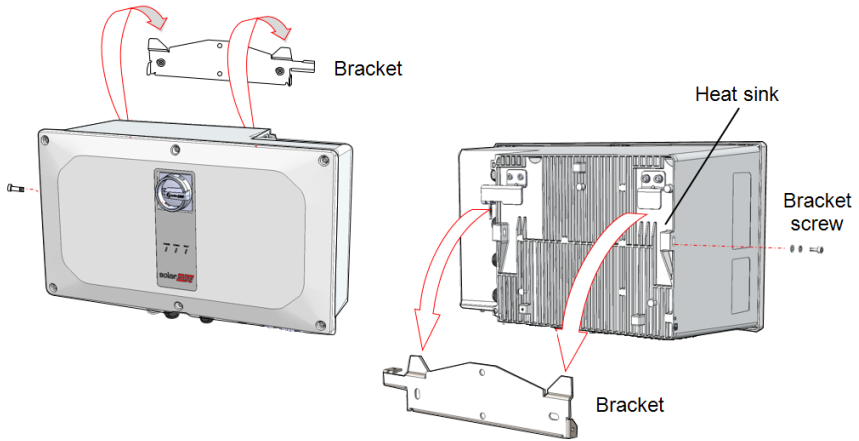


Figure 17: Hanging the Synergy Manager

Horizontal Mounting of the Inverter

The inverter can be installed horizontally, on a flat surface, at any tilt above 10° (see *Figure 18*). 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](#).

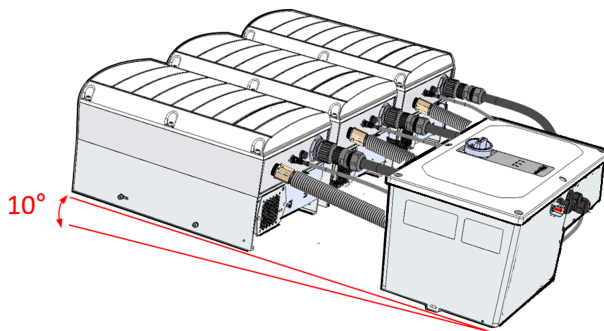


Figure 18: Horizontal mounting of the Inverter

Chapter 4: Connecting AC and PV arrays to the Synergy Manager

For recommended circuit breaker size per model, refer to: Application Note:

[Determining the Circuit Breaker Size.](#)

Operational settings including grid protection settings may be reviewed periodically as part of a routine maintenance procedure.

Connecting the AC Grid to the Synergy Manager

The Synergy Manager is provided with up to three PV arrays connection via conduits.

Figure 19 shows an open Synergy Manager with DC connection to PV arrays.

Synergy manager with three PV arrays routed via conduits

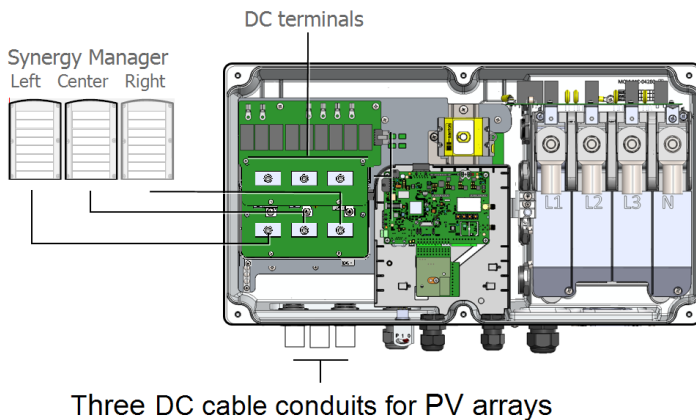


Figure 19: Synergy Manager - DC connection to PV arrays

NOTE



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

Connecting the PV arrays to the Synergy Manager

The inverter is designed with three DC input terminals. Nevertheless, each input may connect to several parallel PV arrays 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 DC wires to a Synergy Manager with DC wire terminals:

1. Thread wires with a maximum of 50 mm² cross section conductor through the DC conduit.
2. Route the DC wires to the DC+ and DC- terminals on the DC+ and DC- boards of the Synergy Manager (see DC+ and DC-labels on DC boards).

CAUTION!



The DC boards have three pairs of DC terminals. Each pair is connected to a single Synergy Unit (Left, Center and Right).

When installing a system with more than 3 PV 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 ().

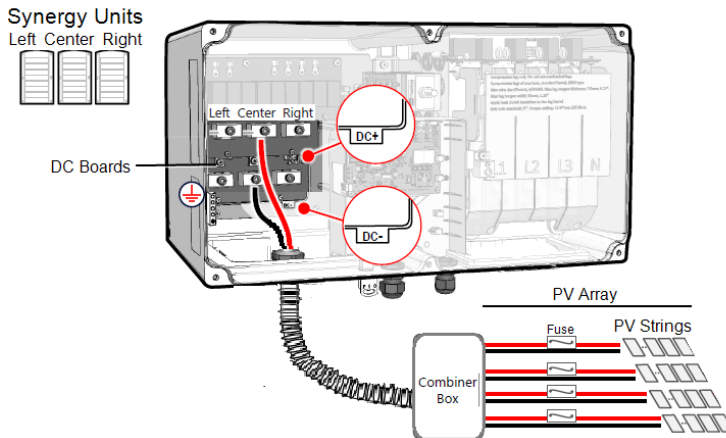


Figure 20: Connecting the DC wires to the Synergy Manager

3. Loosen the Allen screws of the DC terminals.
4. Strip the wire insulation from the end of the DC wires.

NOTE

Before connecting aluminum wires to the lugs:



- a. Remove oxide from the exposed wires with emery paper or a steel wire brush
- b. Clean dust with a cloth and Isopropyl alcohol (IPA)
- c. Coat wires with a designated antioxidant aluminum wire grease immediately after cleaning

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.

5. Insert the DC wires into the DC terminals and fasten the Allen screw with a torque of 5 N*m for 25 mm² wires or 8 N*m for 35mm² to 50 mm²wires.

**CAUTION!**

Ensure that each Plus (+) wire is connected to its corresponding (-) terminal.

6. Close the Synergy Manager cover and secure it by tightening the six screws with a torque of 3.5 N*m.

CAUTION!

When installing a system with more than three PV arrays 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 Wires 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 wire configurations can be used to connect the Synergy Manager:

- L1, L2, L3, PE wires
- L1, L2, L3, N, PE wires

**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 mm² cross section conductor (For inverter models SE50K and SE66.6K use 95 mm²)
- Use PE wire with a maximum of 70 mm² cross section conductor (For inverter models SE50K and SE66.6K use 95 mm²)

**CAUTION!**

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

Chassis Grounding

If required, ground the Synergy Manager and Synergy units as shown in *Figure 21*. Use a grounding cable, a grounding screw, two washers, a ring terminal and a serrated washer. Connect the grounding cable to the grounding point on the left or right side of the unit.

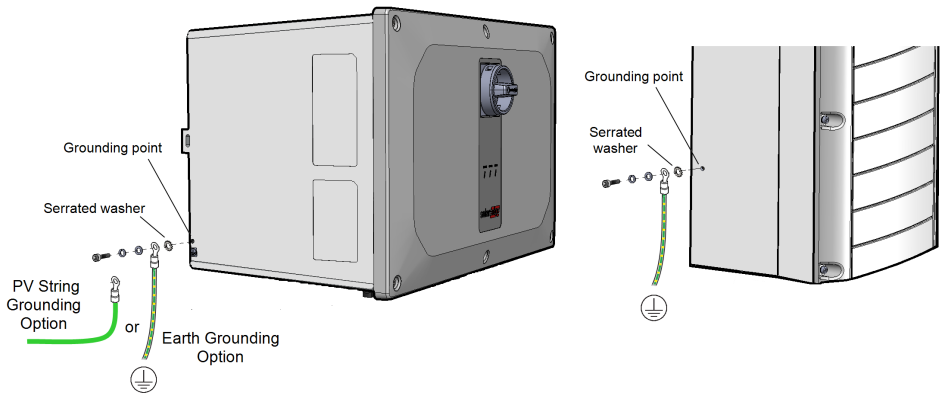


Figure 21: Chassis grounding of the Synergy Manager and Synergy Units

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.

- Strip 10 to 11 mm of insulation from the PE wire.
- Connect the PE wire to the PE terminal and fasten the Allen screw with a torque of 5 N*m for wires of 16 mm² to 25 mm² or 8 N*m for wires of 35 mm² to 70 mm².

NOTE

Before connecting lugs to aluminum wires:



- Remove oxide from the exposed wires with emery paper or a steel-wire brush
- Clean dust with a cloth and Isopropyl alcohol (IPA)
- Coat wires with a designated antioxidant aluminum wire grease immediately after cleaning

**NOTE**

Use ferrule when connecting a fine stranded wire of up to 50 mm².

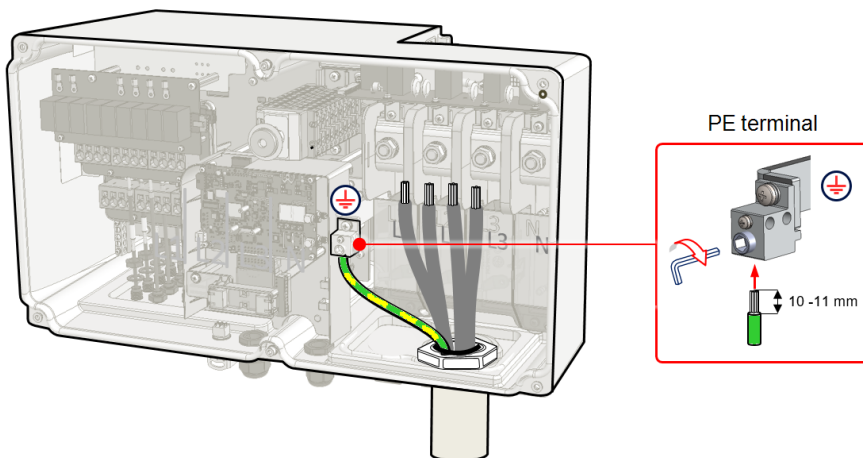


Figure 22: Connecting the Protective Earth (PE) wire

**NOTE**

Ground the conduit nut if required by regulation.

→ To connect AC wires to the Synergy Manager:

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

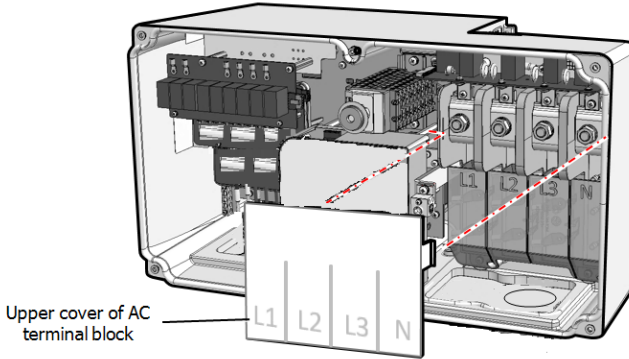


Figure 23: Upper cover of AC terminal block

3. Strip the required length of insulation from the AC cable and AC wires.
4. Crimp lugs on the AC wires.

NOTE

Before crimping lugs to aluminum wires:



- a. Remove oxide from the exposed wires with emery paper or a steel wire brush
- b. Clean dust with a cloth and Isopropyl alcohol (IPA)
- c. Coat wires with a designated antioxidant aluminum wire grease immediately after cleaning

**CAUTION!**

For aluminum wires, **USE ONLY** aluminum lugs.

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

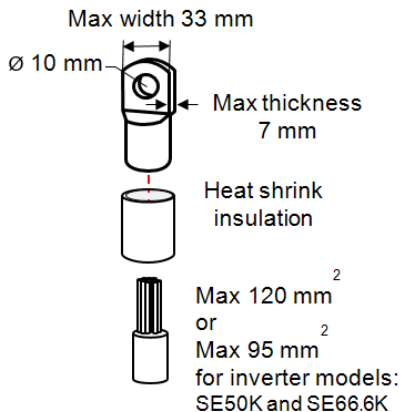


Figure 24: Crimping a lug on an AC wire

Lug parameters:

- Bolt hole diameter size: 10mm
 - Compression lugs of the one-hole, standard barrel, 600V type.
 - Maximum wire size: 120mm² (For inverter models SE50K, SE55K, SE66.6K, SE80K use 95>mm²)
 - Maximum lug tongue thickness: 7mm
 - Maximum lug tongue width: ≤ 33mm
5. Use heat shrink to isolate the lug barrels.
 6. Remove the nut of the AC terminals.
 7. Connect the lug of the AC wires according to the labels on AC terminal block. Fasten the nut of the AC terminals with a torque of 21 N*m.



NOTE

For easy installation of the AC wires, start connecting the wires from left to right: L1 → L2 → L3 → N (See *Figure 25*).

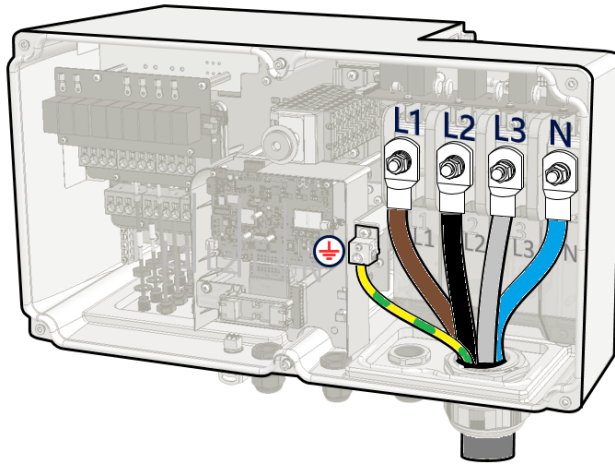


Figure 25: Connecting AC wires to the AC terminals

8. Place the upper cover of the AC terminal block and push until a lock 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 Optimiser, 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 50.

Before arriving at 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. Turn-on the DC Disconnect Switch (if applicable).
3. 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.
4. 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. Unless these settings are selected, the inverter will not start production.

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**. If unsure, which regional grid code (Australia A, B, or C) to select, contact your local grid operator to confirm the settings.
3. If relevant, from the **Language** drop-down list, select your language and tap **Set Language**.
4. From the **Commissioning** screen, select **Power Control** and make sure all settings are correct.
5. From the **Commissioning** screen, select **Grid Protection** and make sure all settings are correct.
6. To save the information to a read-only file, tap the **PDF** icon (iOS) or the **JPEG** icon (Android) at the bottom of the screen.

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 Optimisers start producing power and the inverter starts converting AC.

WARNING!



When you turn ON the ON/OFF/P switch, the DC cables carry a high Voltage and the Power Optimisers 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 50.

- 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.

Step 3: Verifying Proper Activation and Commissioning

1. Select **Information** and verify that the correct firmware versions are installed on each inverter. To save the information to a read-only file, tap the **PDF** icon (iOS) or the **JPEG** icon (Android) at the bottom of the screen.
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), USB-C to 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. Turn the DC Disconnect Switch on the Synergy Manager to ON position (if applicable).
4. 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.

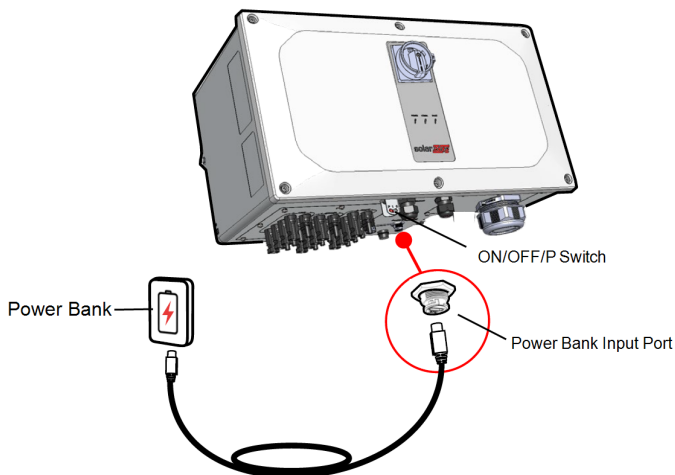


Figure 26: Pre-commissioning the inverter

5. Start SetApp on your mobile device and follow the on-screen instructions.

6. When instructed, hold the ON/OFF/P Switch in P position and release within two seconds and continue to follow the on-screen instructions.
7. Disconnect the power bank and cover the power bank input port.
8. Turn-off the DC Disconnect Switch and the ON/OFF/P Switch.
9. Wait until the inverter turns-off (all LEDs turn-off).

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 50.

The Monitoring Platform

The monitoring platform provides enhanced PV performance monitoring and inverter yield assurance through immediate fault detection and alerts at the module, PV array 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 Optimisers, PV arrays, modules, meters and sensors, as well as their electrical connectivity. This view enables you to see which modules are connected in each PV array, which PV arrays 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 Optimisers, the monitoring platform will show the logical layout, indicating which Power Optimisers are connected to which inverter, but will not show PV strings or the physical location of Power Optimisers.

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 in the new site created in the monitoring platform. When the communication between the 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 optimisers. To map the locations, use one of the methods described in the next sections.

Designer

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

For more information, refer to

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



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 Optimiser 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!



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

When configuring the communication parameters, make sure that the ON/OFF/P switch is in P position, and the 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 an Local Area Network (LAN) Connection" on page 54.

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 59.

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.

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 27 shows the communication glands of the Synergy Manager and *Table 1* describes the glands.

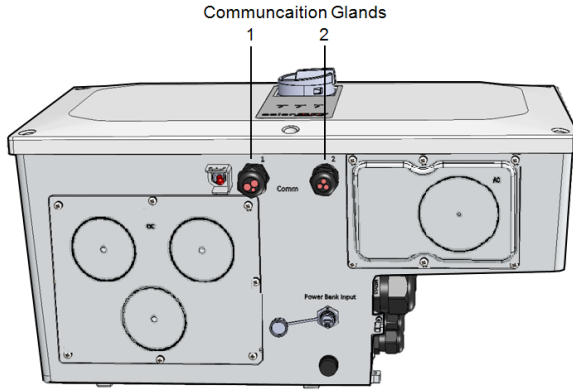


Figure 27: Synergy Manager - Communication Glands

Table 52 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	Ethernet cable (CAT6), Power reduction cable
		2.5-5 mm	
	2	Two large openings	External antenna cable, RS485-1 and RS485 -2 cables (CAT6)
		4.5-7 mm	
	2	One small opening	External antenna cable
		4 mm	

Communication Board

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

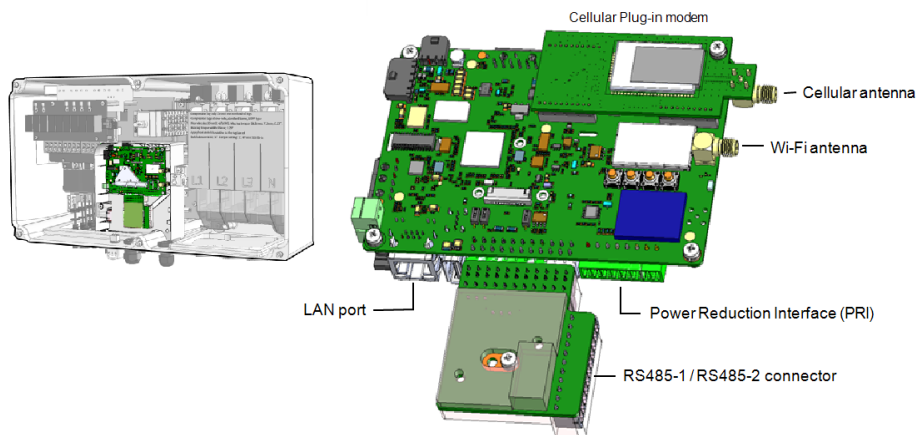


Figure 28: Synergy Manager - communication board

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:

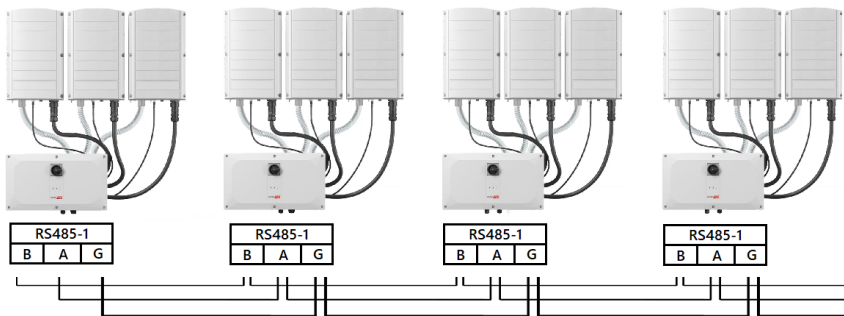
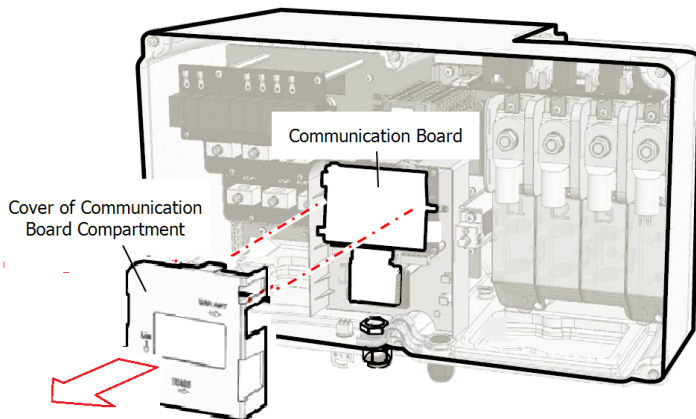


Figure 29: Ethernet connection options

→ To connect the Ethernet cable:

1. Remove of the cover of the communication board compartment.



2. Remove the nut of the COMM1 gland.

CAUTION!

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

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

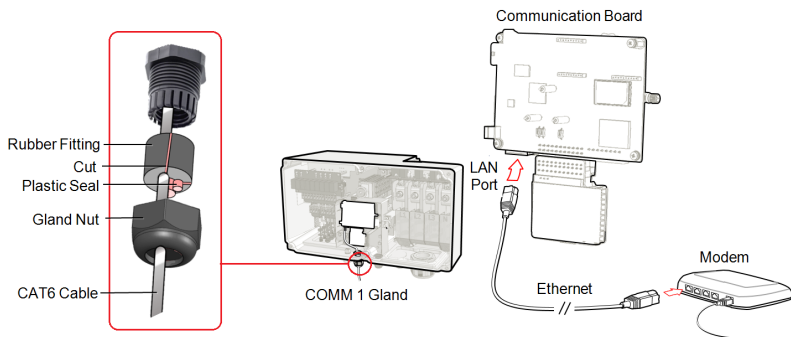


Figure 30: Inserting the Ethernet (CAT6) cable

8. Route the Ethernet cable to the communication board and plug to the LAN port.
9. Crimp an RJ45 plug on the Ethernet cable.
10. Tighten the gland nut with a torque of .
11. Close the cover of the communication board compartment.

Ethernet (CAT6) Cables

CAT6 cables have eight wires (four twisted pairs), as shown in the pin layout of the Ethernet connector in *Figure 31*. 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 ⁽¹⁾		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

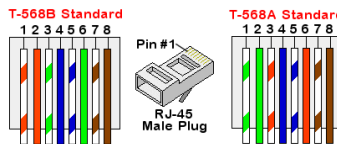


Figure 31: Ethernet connector - pin layout

- 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 31*.

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

- Use a crimping tool to crimp the connector.
- Connect the Ethernet connector to the RJ45 port on the communication board as shown in *Figure 30*.
- For the switch/router side, use a pre-terminated 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.

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 68

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 DC Disconnect Switch of the Synergy Manager.

WARNING!

ELECTRICAL SHOCK HAZARD. Do not touch uninsulated wires when the Synergy Manager 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 43 "Activating, Commissioning and Configuring the System" on page 43 .
- 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 62



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 61.

RS485 wiring specifications:

- Cable type: CAT6
- Maximum nodes: 32
- Maximum distance between first and last devices: 1 km /3300 ft

NOTE



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 in *Figure 32*.

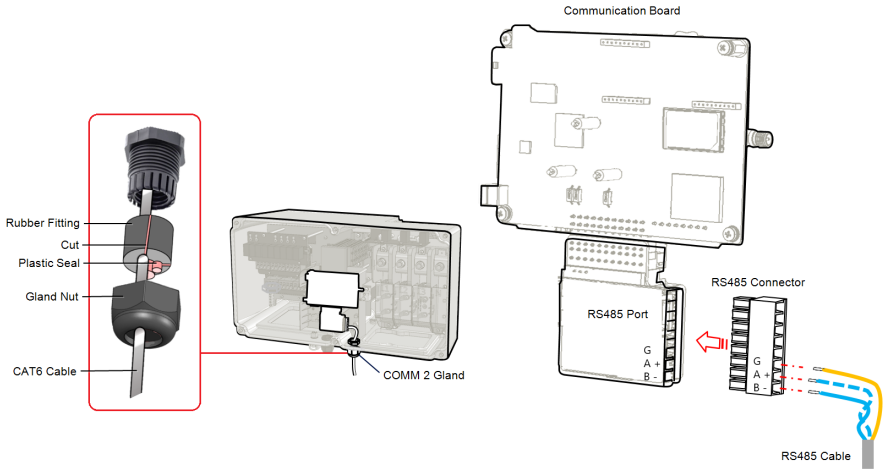


Figure 32: RS485 terminal block on the communication board

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

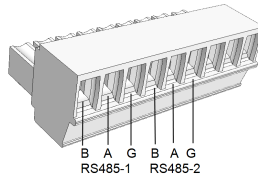


Figure 33: RS485 terminal block

- 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:

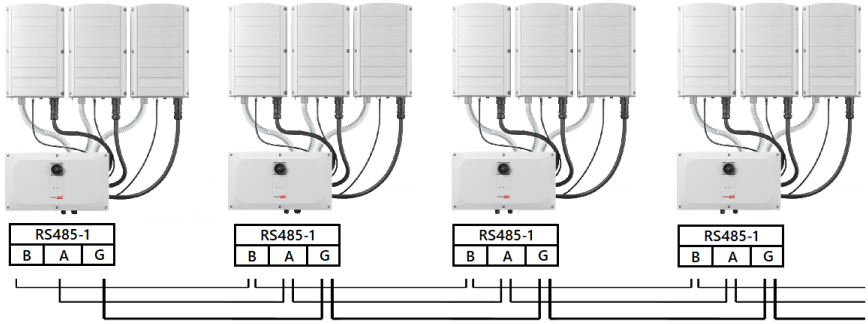


Figure 34: Connecting the inverters in chain



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.

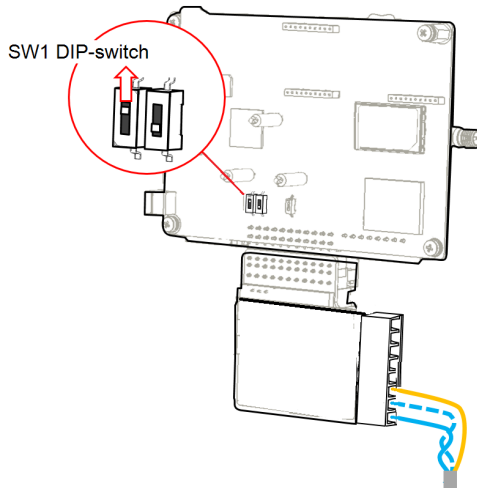


Figure 35: RS485 termination DIP-switch (SW1)

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).

11. Tighten the nut of the COMM2 gland in a torque of 4 N*m.

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 Disconnect Switch on the Synergy Manager (if applicable).
4. Access SetApp, as described in *Communication* on page 46.
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 . For proper sealing, first tighten the corner screws and then the two central screws.
2. Commission the inverter as describe in "**Activating, Commissioning and Configuring the System**" on page 43.
3. Access SetApp and select **Status** from the **Configuring** screen.
4. In the **Summary** section, under **Server Comm.**, make sure **S_OK** is displayed together with the selected communication option.
5. 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 36, shows an Example of Alternative Power Source System.

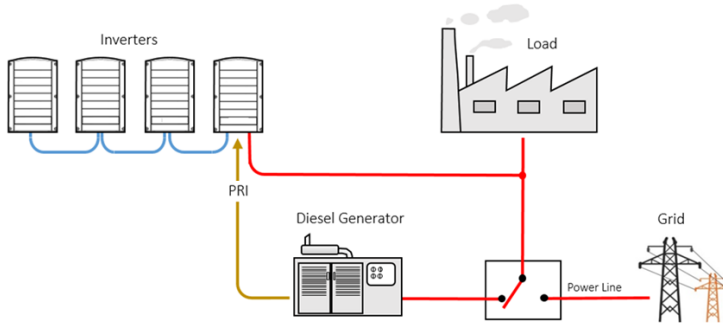


Figure 36: Example of Alternative Power Source System

The Power reduction Interface (PRI) terminal block on the communication board (See *Figure 37*) is used signaling the inverter to switch to Alternative Power Source mode.

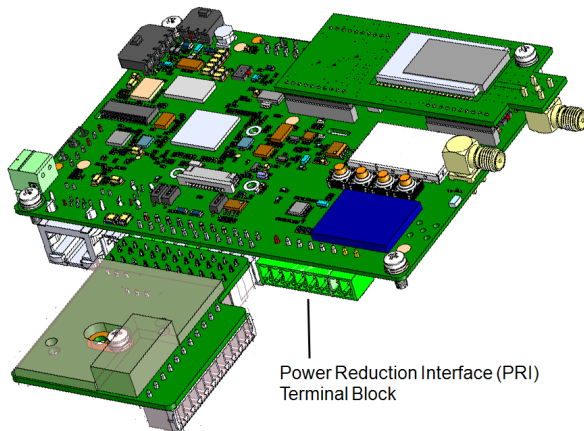


Figure 37: PRI Terminal Block Location on the Communication Board of the Inverter

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
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 Optimiser Troubleshooting

Malfunction	Possible Cause and Corrective Action
Pairing failed	<p>Power Optimisers 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>
PV string Voltage is 0V	<p>Power Optimiser (s) output is disconnected.</p> <p>Connect all Power Optimiser outputs.</p>
PV string voltage not 0V but lower than number of Power Optimisers	<p>Power Optimiser(s) not connected in the PV string.</p> <p>Connect all Power Optimisers.</p>
	<p>Panel(s) not connected properly to Power Optimiser inputs (not applicable to smart modules).</p> <p>Connect the modules to the Power Optimiser inputs.</p>
	<p>PV string reverse polarity.</p> <p>Check PV string polarity using a voltmeter and correct if needed.</p>

Malfunction	Possible Cause and Corrective Action
<p>PV string Voltage is higher than number of Power Optimisers</p> <p>WARNING! If the measured voltage is too high, the installation may not have a safe low voltage. PROCEED WITH CARE! A deviation of $\pm 1\%$ per PV string is reasonable.</p> 	<p>Extra Power Optimiser(s) connected in the PV string (not applicable to smart modules). Check if an extra Power Optimiser is connected in the PV string. If not – proceed to next solution.</p> <p>A module is connected directly to the PV string, without a Power Optimiser (not applicable to smart modules). Verify that only Power Optimisers are connected in the PV string and that no module outputs are connected without a Power Optimiser. If the problem persists, proceed to the next step.</p> <p>Power Optimiser(s) malfunction.</p> <ol style="list-style-type: none"> 1. Disconnect the wires connecting the Power Optimisers in the PV string. 2. Measure the output voltage of each Power Optimiser to locate the Power Optimiser that does not output 1V safety Voltage. If a malfunctioning Power Optimisers located, check its connections, polarity, module, and Voltage. 3. Contact SolarEdge Support. Do not continue before finding the problem and replacing the malfunctioning Power Optimiser. If a malfunction cannot be bypassed or resolved, skip the malfunctioning Power Optimiser, thus connecting a shorter PV string.

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 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.

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

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 being 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 the 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 the DC SPD, refer to:

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

Wi-Fi Antenna

The Wi-Fi Antenna is provided with a user manual. For more information, refer to:

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

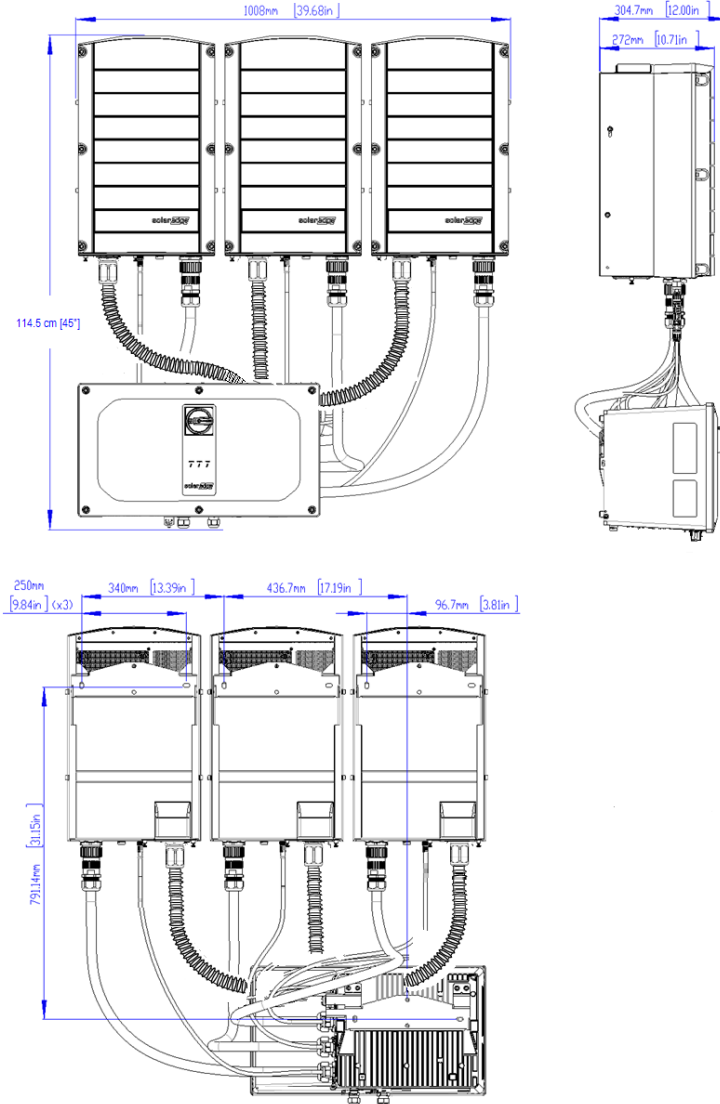
Cellular Plug-in

The cellular plug-in provides wireless communication between the inverter and the SolarEdge monitoring platform. The Cellular Plug-in kit is provided with an antenna and user manual. For more information on the Cellular Plug-in, refer to:

https://www.solaredge.com/sites/default/files/cellular_gsm_installation_guide_for_inverters_with_setapp.pdf

Appendix C: Mechanical Specifications

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



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