



Installation Guide
Smart Modules

Version 1.4

Disclaimers

Important Notice

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The content of these documents is continually reviewed and amended, where necessary. However, discrepancies cannot be excluded. No guarantee is made for the completeness of these documents.

Please note: This product is intended to provide remote shutdown of the SolarEdge PV harvesting system, to enable safer access to a building in the event of fire. This product DOES NOT reduce the risk of fire or protect firefighters or others accessing a building in the event of a fire.

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 in a residential installation. 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.

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Version History

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- Version 1.3 - (March 2020)
 - Modified Chapter 2 Mechanical Installation
 - Add Chapter 4 - Reporting and Monitoring Installation Data
- Version 1.2 - (March 2020)
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 - Modified Technical Specifications - Adding Smart Module Half-cut Cell Mono PERC Module with Integrated Power Optimizer
- Version 1.1 - (September 2019)
 - Added Appendix A - Module Mechanical and Electrical Rating is STC
 - Modified Technical Specifications for Europe
- Version 1.0 - (November 2018) initial release

Important Safety Instructions

SAVE THESE INSTRUCTIONS

General Safety

NOTE

- Consult and follow local codes and other applicable laws concerning required permitting as well as installation & inspection requirements, rules, and regulations.
- Modules and PV systems should be installed by authorized and qualified personnel.
- Follow all safety precautions of all components used in the system.
- Long periods of shading on the modules surface from the sun can result in cell power dissipation and overheating.
- Do not clean the glass surface with chemicals.
- Do not drop the PV module or drop objects onto the module.
- Do not attempt to disassemble the modules, and do not remove any attached components from the modules.
- Do not scratch or otherwise harm the back sheet ,the glass or the junction box. Do not pull or twist the cables or touch them with bare hands.
- Do not drill holes in the frame or scratch the insulating coating of the frame.
- Keep the module packed in the package until installation.
- Do not use modules near equipment or in places where gases, liquids or other flammable materials may be generated.
- External or otherwise artificially concentrated sunlight shall not be directed onto the front or back face of the module.



Installation Safety

NOTE

- Wear protective head gear, insulating gloves, safety shoes, and insulated tools when installing the modules.
- Do not install the modules in rain, snow, or otherwise wet or windy conditions.
- Modules may be covered with an opaque material during module installation and wiring to reduce risk of charge buildup and electrical shocks or burns.
- When mating connectors, make sure they are firmly connected.
- Due to the risk of electrical shock, do not perform any work if the junction box is wet.
- Do not touch the junction box and the end of output connectors with bare hands.
- Do not unplug the connectors under load.
- It is recommended not to work alone.
- Wear a safety belt if working far above the ground.
- Do not wear metallic jewelry, which can cause electric shock, while installing or troubleshooting the PV system.
- Follow the safety regulations for any and all other system components, including wires, connectors, charging regulators, batteries, inverters, etc.
- The cables must be protected from direct sunlight and away from areas of water collection.
- Do not damage the surrounding modules or mounting structure when replacing a module.
- Do not change any module components (diode, junction box, plug connectors, etc.).



NOTE

- A module's maximum reverse current is 15A. Using a blocking diode and maximum series overcurrent protective device in the combiner box are recommended for reverse current protection when more than four strings are connected in parallel. When used with a SolarEdge optimizer, it's not needed because the optimizer has reverse current protection.
 - When installing the modules on a roof, it is recommended to install over a fireproof and insulating roof covering.
 - Do not touch terminals, connectors and modules while the system is on.
 - Do not stand, walk, drop or put objects on the module.
 - Damaged modules (broken glass, torn back sheet, broken junction box, broken connectors, etc.) can be electrical hazards as well as laceration hazards. Contact with damaged module surfaces or module frame can cause electric shock. In such cases, remove the damaged module from array and contact the supplier for disposal instructions.
 - Do not block draining holes. When working above ground level, wear a safety belt.
 - Avoid use of sharp objects and tools that might damage the module.
-



Chapter 1: Introduction

This document provides detailed instructions and safety information regarding the installation, electrical connection and maintenance of following SolarEdge smart modules:

■ Smart 60-cell Mono PERC Module SPVxxx-60MMJ

Integrated with power optimizers, these high-performance modules are based on Passivated Emitter Rear Cells (PERC) technology. The module is powered by high-efficiency cells providing an effective solution for lowering the cost of the power produced over time in large and small PV systems.

■ Smart Half-cut Cell Mono PERC Modules SPVxxx-R60LWMG/SPVxxx-R60LBMG

Integrated with power optimizers, these high-performance modules are based on Smart Half-cut Cell Mono PERC Module. Half-cell solar modules, are solar cells that are cut in half during manufacturing. This technology increases the power output of a module by lowering resistance of the module.

All instructions, mechanical and electrical requirements should be read and understood before attempting installation.

When installing the module, installers must conform to all safety precautions detailed in this guide .

Limitation of Liability

Because the use of this manual and the conditions or methods of installation, operation, use and maintenance of photovoltaic (PV) products are beyond SolarEdge control, SolarEdge does not accept responsibility and expressly disclaims liability for loss, damage, or expense arising out of or in any way connected with such installation, operation, use or maintenance. SolarEdge reserves the right to change the manual without prior notice.

Modules rated for use in this application class may be used in systems operating at greater than 50V DC or 240W, where general contact access is anticipated. Modules qualified for safety through IEC 61730-1 and this part of IEC 61730 within this application class are considered to meet the requirements for safety class II.

Where common grounding hardware (nuts, bolts, star washers, spilt-ring lock washers, flat washers, etc.) is used to attach a listed grounding/bonding device, the attachment must be made in conformance with the grounding device manufacturer's instructions.

Chapter 2: Mechanical Installation

Installation Considerations and Environmental Conditions

Install smart modules at sites that meet the following requirements:

- Ambient temperature: -40 to 85 °C
- Operating temperature: -40 to 85 °C
- Maximum altitude: 2000 m
- Mechanical load on modules (e.g., from wind or snow):

Smart 60-cell Mono PERC Module	Front Load	Rear Load
Design Load	3600 Pa	2400 Pa
Test load (safety factor of 1.5)	5400 Pa	3600 Pa
Smart Half-cut Cell Mono PERC Module	Front Load	Rear Load
Mechanical Load	5400 Pa	2400 Pa

Table 1: Mechanical load on modules

- To maintain the modules' Class C fire rating, the fire class of the roof and building materials should be higher than Class C. The fire safety rating of this module is valid only when mounted in the manner specified in the mechanical mounting instructions.
- Do not install modules at locations that come with direct contact of water collections, salt water or any aggressive environmental condition.
- Do not install the modules near flames or flammable materials or locations with hazardous materials.
- Do not make any modifications to the module frame.
- Top or bottom clamping methods will vary and are dependent on the mounting structures. Follow the mounting guidelines recommended by the mounting system supplier.
- Clamp material should be anodized aluminum alloy or stainless steel
- Each module must be securely fastened at a minimum of four points on two opposite sides. The clamps should be positioned symmetrically.

Installation Method

Clamping the Smart 60-cell Mono PERC Module

Modules can be laid on rails, either on the long side of the frame (*Figure 1*) or on the short side of the frame.

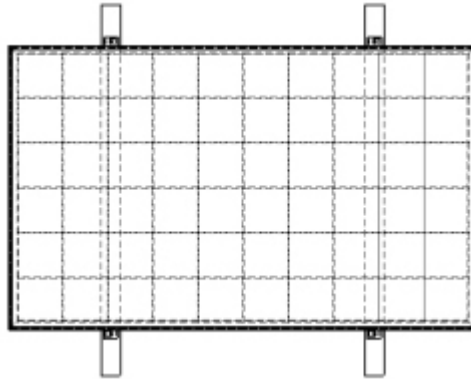


Figure 1: Connecting modules by clamps on long side of frame

Attach each aluminum mounting clamp with an M8 bolt, a plain washer, a spring washer, and an M8 nut. At least 4 clamps should be used to fasten the modules on the supporting rails.

NOTE

Make sure to use clamps with the following properties:



The dimensions for the middle clamps are: $a \geq 40$ mm, $b \geq 26$ mm, $c = 8$ mm, $d \geq 28$ mm, and $\varnothing = 9$ mm (See *Figure 2*)

The recommended torque for tightening the bolts and nuts is 28 N*m when the bolts and nuts have property is Class 8.8.

→ To fasten the module:

1. Place the module on two supporting rails (not provided). The rails should be made from stainless material or treated with an anti-corrosion process (e.g., anodic oxidation treatment).
2. If the rail does not have grooves compatible with M8 bolts, suitable holes should be drilled for securing the module frame.
3. Secure each clamp by attaching a plain washer, spring washer, and nut, in that order.

- Close-ups of the middle clamps and the side clamps are indicated in *Figure 2* and *Figure 3*.

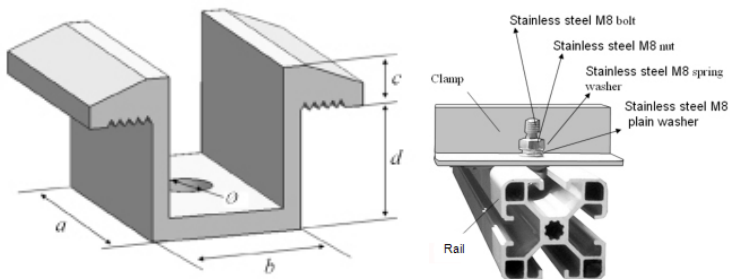


Figure 2: Middle clamps (left) and side clamps (right)

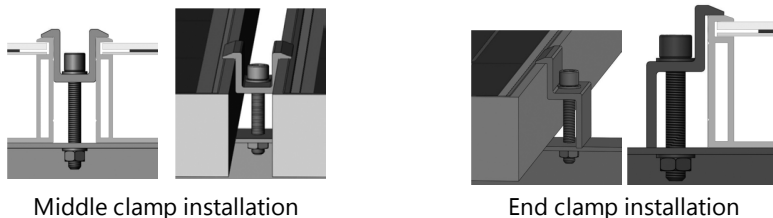


Figure 3: End clamp and middle clamp installation

- For mounting the supporting rails on the long side of the frame, slide bolts through the rail grooves next to the 4 clamp locations. The module may be clamped only in the permitted clamping range. For exact frame clamping locations refer to area C in *Figure 4* and *Table 2*.

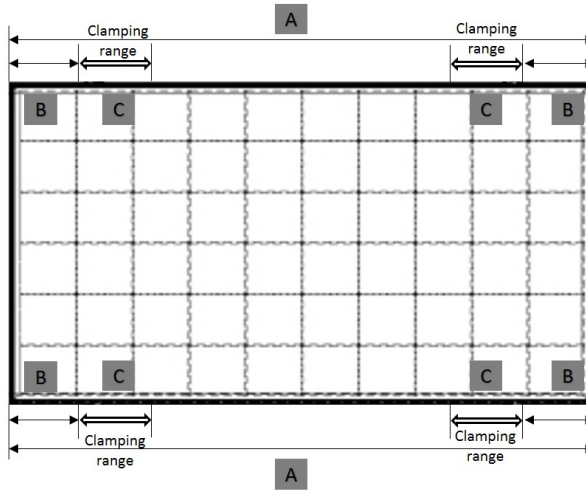


Figure 4: Long side clamping range

Module Type	Series Dimension	A	B	C Clamping Range
SPVxxx-60MMJ	1650*992*40 mm	1650 mm	200 mm	210 mm

Table 2: Module dimensions for mounting rails on the long side of the frame

- For mounting the supporting rails on the short side of the frame, slide bolts through the rail grooves next to the 4 clamps locations. The module may be clamped only in the permitted clamping range. For the exact locations refer to area F in Figure 5 and Table 3.

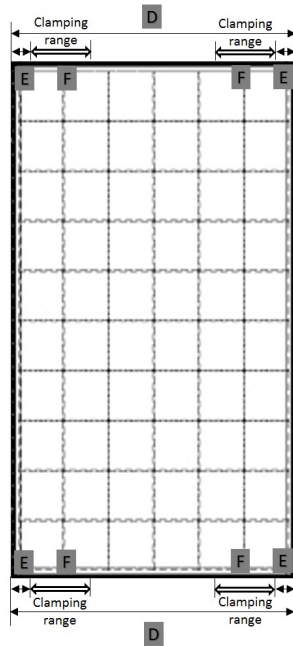


Figure 5: Short side clamping range

Module Type	Series Dimension	D	E	F Clamping Range
PVxxx-60MMJ / SPVxxx-60MMJ	1650*992*40 mm	992 mm	50 mm	150 mm

Table 3: Modules dimensions for mounting rails on the short side of the frame

Clamping the Smart Half-cut Cell Mono PERC Module

Modules can be laid on rails, either on the long side of the frame (See Figure 6).

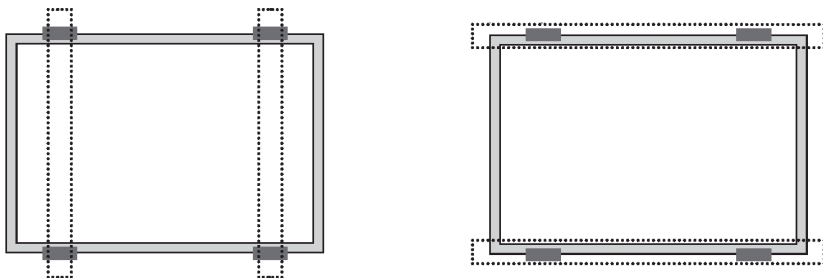


Figure 6: Connecting the SPVxxx-R60LWMG/SPVxxx-R60LBMG Modules by clamps to a frame. Attach each aluminum mounting clamp with an M8 (5/16") bolt, nut. Tightening torque should be within 17~23 Nm (12.5~17.0 ft-lbs) coarse thread bolts. Secure each clamp by attaching a plain washer, spring washer, and nut, in that order.

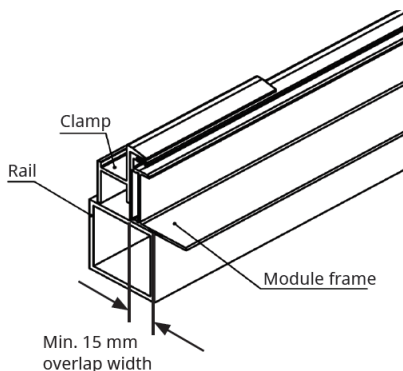


Figure 7: Attaching mounting clamp

- Ensure the clamps overlap the module frame by at least 5 mm (0.2 in)
- Ensure the clamps overlap length is at least 40 mm (1.57 in)
- Ensure the clamp's thickness is at least 3 mm (0.12 in)

NOTE



For configurations where the mounting rails run parallel to the frame, precautions should be taken to ensure the bottom flange of the module frame overlaps the rail by 15 mm (0.59 in) or more.

→ To fasten the module:

1. Place the module on two supporting rails (not provided). The rails should be made from stainless material or treated with an anti-corrosion process (e.g., anodic oxidation treatment).
2. If the rail does not have grooves compatible with M8 bolts, suitable holes should be drilled for securing the module frame.
3. Secure each clamp by attaching a plain washer, spring washer, and nut, in that order.

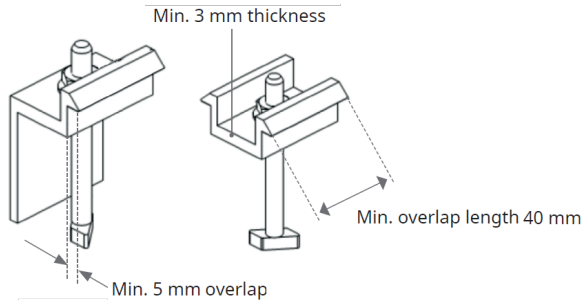


Figure 8: Clamping the SPVxxx-R60LWMG/SPVxxx-R60LWMG Modules

6. For mounting the supporting rails on the frame, slide bolts through the rail grooves next to the four clamp locations. Clamp positions are of crucial importance for the reliability of the installation. The clamp center lines must only be positioned within the ranges indicated in *Figure 9 and Table 4*, depending on the configuration and load.

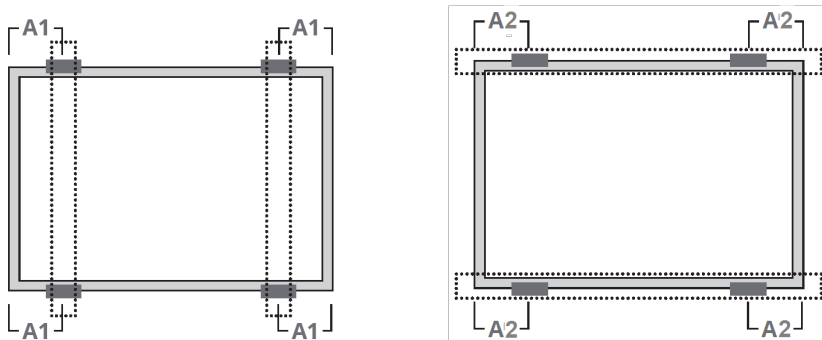


Figure 9: Side Clamping Ranges of the SPVxxx-R60LWMG/ SPVxxx-R60LBMG Modules

Module	Series Dimension	A1 Range	A2 Range
SPVxxx-R60LWMG/ SPVxxx-R60LBMG	1776*1052*40 mm	340 – 550 mm	410 – 490 mm

Table 4: Mounting dimensions for rails on the Monocrystalline PERC module with half-cut cell technology and integrated power optimizer

Chapter 3: Electrical Installation

Details for electrical installation in accordance with the IEC61730-1.

Installation

- The maximum system voltage of the Smart Module 60-cell Mono PERC with Integrated Power Optimizer (module SPVxxx-60MMJ) is 1000 V. The maximum system voltage of the Smart Module Half-cut Cell Mono PERC with Integrated Power Optimizer is 1500 V (module SPVxxx-R60LWMG) and 1000V (module SPVxxx-R60LBMG).
- The power optimizers regulate the string voltage at a constant level, regardless of string length and environmental conditions.
- Under normal conditions, a module might produce more current and/or voltage than reported at standard test conditions⁽¹⁾. The requirements of the National Electrical Code (NEC) in Article 690 shall be followed to address these increased outputs. In installations not under the requirements of the NEC, the values of I_{sc} and V_{oc} marked on this module should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor capacities, over current device ratings, and size of controls connected to the PV output.
- Each series-connected string of modules shall be provided with the maximum series overcurrent protective device, specified as 15A for the Smart Module 60-cell Mono PERC module with Integrated Power Optimizer series and 20A for the Smart Module Half-cut Cell Mono PERC Module with Integrated Power Optimizer series.
- Use a cable with a cross section of 4 mm² (12AWG) that can withstand the maximum possible system open-circuit voltage and make sure that all connections are safe and tight.
- The cable minimum bending radius should be 43 mm.
- Bypass diodes are included in module junction boxes to avoid decreased module performance. Check the relevant specifications for the specific diodes of the junction box.
- For the smart module electrical data and temperature coefficients, refer to the technical specification sections in this manual.

⁽¹⁾Standard Test Conditions (STC): 1000 W/m², cell temperature 25°C, air mass AM 1.5

Grounding

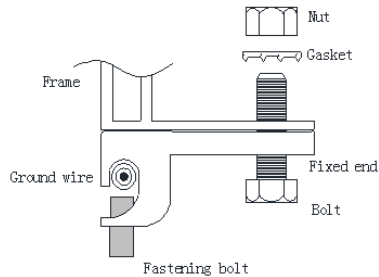


Figure 10: Grounding the aluminum frame with a copper wire

- Use the marked 5.5 mm grounding holes to ground the anodized aluminum frame. Use an M5 nut, an M5 gasket, and an M5 bolt, fastening bolt and a ground wire. All nuts, bolts, and gasket should be made of stainless steel. See *Figure 10*.
- Secure the ground wire on fixed end through fastening bolt (note that the copper wire cannot be attached directly to the aluminum).
- Insert the bolt through the fixed end and then through the hole in the aluminum frame.
- Add the gasket and nut on the other side of the bolt and tighten to secure all parts. The tightening torque should be $2.1 \pm 0.1 \text{ N}\cdot\text{m}$.

Modules Wiring

When planning PV modules installation, consider cable lengths on the roof and other facets, extension cables and branch cables if requested.

Before powering up the inverter, verify that the wiring cross sections are correct. Ensure that the measured open circuit Voltage (Voc) and short-circuit current (Isc) do not exceed the specifications.

If modules have been pre-installed but the string has not been connected to the inverter yet, the module connectors should be connected to each other or kept covered to avoid dust and moisture penetration inside the connectors.

Figure 11: Wiring Schemes of PV modules

Chapter 4: Reporting and Monitoring Installation Data

The Monitoring Platform

The monitoring platform provides enhanced PV performance monitoring and 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, 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 after the inverter was installed, 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 modules or 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 create a virtual map of a PV site for enhanced monitoring and easier maintenance using one of the two scanning options:

- Scan the smart module's 2D bar-code located on the front of the module
- Scan the power optimizer 2D bar-code

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 module and power optimizer serial numbers in the system physical layout.

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

- [Scanning a smart panel using the SolarEdge Mapper App](#)



Upon scanning the smart module or the power optimizer, the Mapper activates a dedicated mapping process to ensure that the power optimizer inputs are assigned to their module(s). You can approve each input assignment separately.

Physical Layout Editor

If you are a registered installer, access the monitoring platform site creation page at <https://monitoring.solaredge.com/solaredgeweb/p/home#createSites>



If you have not yet signed up, go to

<https://monitoring.solaredge.com/solaredgeweb/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. Fill out the Physical Layout Template (downloadable from the SolarEdge website <http://www.solaredge.com/files/pdfs/physical-layouttemplate.pdf>) using the detachable 2D barcode stickers on each power optimizer.



Once the form is completed, use the Mapper to scan the 2D codes and create the map in the monitoring platform. Optionally, you can send the sticker sheet to SolarEdge Support for physical layout creation.

Chapter 5: Maintenance and Disposal

- Regularly carry out a visual inspection for dirt, dust, bird dropping, leaves, and other detritus covering the modules.
- If there is a build-up of dirt or dust on the module surface, wash the module with clean non-heated water and a gentle implement (a sponge for example). Never use chemicals on the surface of the module.
- If there is snow, use a soft-bristled brush to clean the surface of the modules.
- Regular electrical and mechanical inspection by a licensed professional will keep the system safe and operating at optimal efficiency.

Support Contact Information

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



<https://www.solaredge.com/service/support>

Before contact, make sure to have the following information at hand:

- Model and serial number of the product in question.
- The error indicated on the product SetApp mobile application LCD screen or on the monitoring platform or by the LEDs, if there is such an indication.
- System configuration information, including the type and number of modules connected and the number and length of strings.
- The communication method to the SolarEdge server, if the site is connected.
- The product's software version as it appears in the ID status screen.

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