Installation Manual for Solstic Photovoltaic (PV) Mounting System
(For PV modules compatible with Wiley grounding clips)

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Solstice Manufacturing Company, LLC
Solstice Photovoltaic Module Mounting System (“Solstice System”)

Installation Manual
General Notes


It is critically important that these instructions be followed precisely in order to assure proper operation and successful installation of the system. Failure to follow instructions precisely may result in loss of efficiency, damage to the components of the system, or even catastrophic failure.

Every attempt has been made, through the use of both photographs and detailed descriptions, to make these instructions as clear and easy to follow as possible. Should any questions arise, either before or during installation, contact Solstice Manufacturing Company, LLC immediately for clarification before proceeding further.

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System Installation

This lightweight, durable system is designed to be installed on the ground or flat roofs without penetration to ground or roof. It is suitable for flat to moderately sloped roofs and can be easily integrated into new or re-roofing installations or readily installed over existing roofs.

The patented system is designed to resist hot and cold weather extremes, ultraviolet (UV) rays and moderate to severe wind uplift.
## Components Required

<table>
<thead>
<tr>
<th>Mid-Rail Channels</th>
<th>End-Rail Channels</th>
<th>Solstice Southernmost Row Support</th>
<th>Solstice Main Support</th>
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<tbody>
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<table>
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<tr>
<th>Mid-Rail Clip</th>
<th>End-Rail Clip</th>
<th>Serrated, Flanged Pre-Lubed 5/16”-18 SS Nuts</th>
<th>5/16” SS External Tooth Washers</th>
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<table>
<thead>
<tr>
<th>Acme Cable Clip</th>
<th>Wiley Grounding Clips</th>
<th>Sliding Rail Nut</th>
<th>Slip Sheet</th>
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<tbody>
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<table>
<thead>
<tr>
<th>5/16” SS Mid-Bolt (length depends upon module choice)</th>
<th>5/16”x ¾” SS End-Bolt</th>
<th>Grounding Lug</th>
<th>Ballast Block*</th>
</tr>
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*Ballast Blocks to be provided by Installer*

Before beginning an installation, it is important to conduct a thorough inventory of the components necessary to complete the project. It is advisable to have several extra components on hand in order to prevent unnecessary delays, especially those such as Wiley Grounding Clips, which can be inadvertently damaged during installation. If components are missing or extras are needed, contact Solstice Manufacturing Company, LLC immediately before proceeding further.
Tools Needed

<table>
<thead>
<tr>
<th>Tool</th>
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<tbody>
<tr>
<td>Torque wrench</td>
<td>Pliers</td>
</tr>
<tr>
<td>String line</td>
<td>Cordless screwdriver w/ torque adjustment</td>
</tr>
<tr>
<td>Chalk line</td>
<td>Hack saw</td>
</tr>
<tr>
<td>Measuring tape</td>
<td>Wire cutters</td>
</tr>
<tr>
<td>1/2” Wrench</td>
<td>Straight edge</td>
</tr>
<tr>
<td>1/2” Six point Socket</td>
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</table>

Safety Warnings

INSTALLER IS SOLELY RESPONSIBLE FOR TAKING SAFETY PRECAUTIONS. SOLSTICE MANUFACTURING COMPANY, LLC OFFERS THE FOLLOWING SAFETY WARNINGS TO ASSIST THE INSTALLER WITH ITS SAFETY PLANNING.

BEFORE INSTALLING OR USING THE SOLSTICE SYSTEM, READ ALL DIRECTIONS AND SAFETY INSTRUCTIONS.

THE INSTALLATION, ADJUSTMENT, OR REPAIR OF A PHOTOVOLTAIC SYSTEM INVOLVES RISK OF CONTACT WITH POTENTIALLY LETHAL VOLTAGES AND CURRENTS. NO ATTEMPT TO INSTALL OR SERVICE A PHOTOVOLTAIC SYSTEM SHOULD BE MADE BY ANYONE WHO IS NOT A QUALIFIED, TRAINED TECHNICIAN FAMILIAR WITH POWER ELECTRONIC EQUIPMENT.

1. Lull / Fork lift operators must be aware of passing workers.
2. Be cautious of sharp corners and edges.
3. Be cautious of electrical shock while making module to module connections.
4. System is low to the ground do not strain back leaning over during installation.
5. Pans are heavy and can strain muscles if not carried properly.
6. Pans are large and can catch wind and blow away.
7. Unloading pans from truck, pallets may have displaced weight and can fall over when unloaded.
8. Be sure all tools (drills, etc.) are safe to use (no punctures, splinters or frayed wires).
9. Low pans / ballast blocks can become a tripping hazard.
10. Pans become slippery when wet.
11. Use the legs to raise and lower pans while keeping the back vertical.
12. Do not open more pallets of pans than will be installed that day.
13. Due to potential of high winds, pans must be set with support brackets every 10-20 pans until modules are installed.
14. Put protective covers over the end rails on each row.
15. Install ballast blocks as soon as possible after the pans have been set in a row.
16. Use PPE (gloves, head protection and safety glasses) during the installation process.
17. Due to sharp corners, care must be taken to protect roof during installation process.
18. These installation instructions are for use by qualified personnel only.
19. The photovoltaic modules can supply lethal DC voltages.
20. Site access is intended for authorized personnel only.
21. The electrical quick-connects are not for current interrupt. Do not disconnect under load.
22. The inverters contain energy storage devices that require 15 minutes to safely discharge potentially lethal voltages.
23. Do not install with wet roof conditions, e.g. rain, snow or ice.
24. Broken PV modules should be handled with caution.
25. System work within 6 feet of roof edge requires fall protection.

ALL ELECTRICAL INSTALLATIONS MUST BE COMPLETED IN ACCORDANCE WITH THE LOCAL AND NATIONAL ELECTRICAL CODE (NEC). INSTALLERS MUST REFERENCE THE NEC, IN PARTICULAR ARTICLES 690 AND 250 TO ASSURE PROPER COMPLIANCE WITH WIRING AND GROUNDING REGULATIONS FOR THE SYSTEM. ALL FEDERAL, STATE & LOCAL GUIDELINES & OSHA REGULATIONS MUST BE FOLLOWED.

Roof Inspection

All roofs intended for installation of the Solstice Manufacturing Company must be in good condition and have adequate drainage. Following installation of an approved membrane, or prior to installation over an existing approved membrane:

- Inspect the membrane for blisters, cracks, sponginess, evidence of poor drainage (ponding or lines of discoloration) and other problem areas.
- Survey the roof to ensure that all measurements and the locations of all roofing penetrations (if required) and structures are consistent with the design drawings.
- If hazardous communication equipment such as microwave, cell phone or radio frequency towers or antennae, are present, the building owner should be consulted for safe operating procedures.

Note: Although the Solstice Manufacturing Company should not affect the roof warranty, you should check with the roof manufacturer prior to the installation of the system.

Roof Preparation

INSTALLER IS SOLELY RESPONSIBLE FOR TAKING SAFETY PRECAUTIONS. SOLSTICE MANUFACTURING COMPANY, LLC, OFFERS THE FOLLOWING SAFETY WARNINGS TO ASSIST INSTALLER WITH ITS SAFETY PLANNING.

Before any work can be done on the roof, the following steps must be taken to ensure worker safety and roof integrity:
• All workers must be informed of safety issues and hazards related to the Solstice Manufacturing Company and other relevant precautions as stipulated in OSHA Hazard Communication guidelines.

• All hazardous areas, such as the roof perimeter, must be properly marked or barricaded, per OSHA fall protection regulations.

• All loose gravel **must** be removed from the areas of the roof that are intended for system installation, after which the roof should be re-examined (this does not apply to roofs that are ballasted or covered with fine gravel).

• The membrane should be cleaned of any debris and dirt either by broom or by power vacuum.

• Clear access and egress routes must be identified and maintained. If ladders are used, they must be tied off and be used and maintained according to OSHA regulations.

• There must be a reliable and immediate means of contacting Emergency Medical Services.

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### Lifting Materials to Roof

**INSTALLER IS SOLELY RESPONSIBLE FOR TAKING SAFETY PRECAUTIONS. SOLSTICE MANUFACTURING COMPANY, LLC OFFERS THE FOLLOWING SAFETY WARNINGS TO ASSIST INSTALLER WITH ITS SAFETY PLANNING.**

When hoisting materials to the roof, the following safety precautions must be observed:

• Hard hats must be worn by all employees at all times during crane operation.

• The crane lifting area must be secured and roped off when lifting materials to the roof.

• OSHA fall protection regulations must be followed.

• It is essential that at least one employee be designated to direct pedestrian traffic and make sure that all people are aware of materials being lifted overhead.

• Under no circumstance should personnel be located under the lifted pallet.

• One person must remain in constant communication (visual or radio) with the crane operator during a hoist.

• The designated lifting area must have room for staging materials and the crane must be able to lift materials to a location on the roof near the array installation.

• A local certified crane operator must certify the site to select the best crane and location for lifting Solstice Manufacturing Company, LLC materials to the roof.

• When staging materials on the roof, the live load specifications of the roof must not be exceeded by the weight of the pallets or any other objects placed on the roof. To avoid risk, be sure the pallets are sufficiently spread out across the roof.

• Do not lift materials to the roof during rainy, snowy or icy conditions or during high winds.

**NOTE:** Contact Solstice Manufacturing Company, LLC for project specific ballast schedule and wind load requirements.
Installation Procedure

Task #1: If installing the system on a roof, chalk lines must be snapped or string lines set at starting location inward into the array as per array layout. At the starting corner of the array make sure that the north/south and east/west lines are square to each other. Lay out pans against the chalk line or string line.

Note: Begin with an end-rail channel and leave about 5 inches between the Solstice supports to allow later attachment of mid-rail channel.

Task #2: Layout spacing between rows using dimensions on E-5 PV Module Mounting details drawings.

Figure 1: Installation of south most and main pans

Figure 2: PVC spacers shown here cut to the precise pan to pan spacing.
Task #3: Place an external tooth washer on 5/16” Studs.

Figure 3: Installation of the external tooth washer on mounting support.

Task #4: With flange facing towards the tray, lace mid-rail over external tooth washers and over studs to join two Solstice supports together at both the north side and the south side of the support row.

Figure 4: Installation of mid-rail on Solstice support.
Task #5: Place serrated pre-lubed nut on each stud and hand tighten.

![Figure 5: Installation of serrated pre-lubed nut.](image)

Note: Tighten only enough to prevent the nut from slipping off the studs. The mid-rail must be flush with the outer edge of the Solstice support.

Task #6: Once the row is fully assembled, tighten nut securing mid/end-rails to supports to a torque of 12 ft-lb. A calibrated driver must be used to ensure proper torque.

Note: Make sure the external tooth washer is located between the mid/end-rails and the Solstice supports.
Figure 6: Tighten nuts with calibrated ratchet or screw gun.

**Caution:** Do not apply more than 12 ft. lbs. of torque to avoid stripping the threads and studs.

Task #7: Verify assembled rails are positioned parallel to Solstice supports as shown.

Figure 7a: Assembled rails to Solstice support. Note the orientation of the rail flanges.
Figure 7b: Assembled rails on Solstice supports with slip sheet.

This is how the assembled lower and upper rail and adjacent solstice supports should appear.

Figure 7c: South support and north support ready for clips.

Task #8: Add ballast in accordance with supplied ballast schedule.

Figure 8: Ballast on supports
Task #9: Install rigid PVC schedule 40 sleeves using stainless steel or Galvanized beam clamps with conduit straps between module rows for photovoltaic source circuit conductors (“home run” wires) and attach equipment grounding conductor to Solstice supports.

![PVC sleeves installed](image1)

Figure 9: PVC sleeves installed for PV source circuit conductors, with ground wire installed

Task #10: Layout all photovoltaic source circuits (“home runs”) for array per string diagram.

![Home run wiring](image2)

Figure 10: Home run wiring installed

Note: All source circuit conductors and equipment grounding conductors that run perpendicular to a row of modules must be installed in a PVC sleeve. Largest PVC Sleeve to be used is 2”
Task #11: Place a lock washer on a mid-bolt.

![Figure 11: Placement of lock washer on mid-bolt.](image)

Task #12: Place the bolt and lock washer in a mid-rail clamp.

![Figure 12: Placement of bolt and lock washer on mid-rail clamp.](image)

Note: Make sure that the lock washer is between the hex head of the bolt and the top of the clamp.
Task #13: Install a Wiley grounding clip on the bottom of the Mid-rail clamp.

Figure 13: Placement of grounding clip on mid-rail clamp.

Note: Install Wiley grounding clip so that tabs on the sides of the clips point downward toward the rail.

Task #14: Place a sliding rail nut at the bottom of the bolt and tighten the sliding rail nut just enough to prevent it from slipping off the bolt to complete assembly of the mid-clamp.

Figure 15: Configuration with sliding rail nut at bottom of bolt.
Task #15: Slide the assembled mid-rail clamp in the mid-rail groove with the Wiley grounding clip oriented as shown in figure 16.

![Figure 15: Installation of mid-clamp assembled into mid-rail.](image)

Task #16: Center the assembled mid-rail clamp on the mid-rail.

![Figure 16: Placement of mid-clamp assembly centered on mid-rail.](image)

Note: Wiley grounding clips need to be installed on **every upper mid-rail**. The only lower mid-rails that require Wiley grounding clips are those that secure the inside edge of the first and last module in a row.
Task #17: Assemble the end-rail clamps with ¾” end-bolt, lock washer, end-rail clamp and sliding rail nut. NO Wiley grounding clips are needed.

Figure 17: Assembled end-rail clamps placed approximately 1 inch in from outer end of end-rails.

Task #18: Confirm that the assembled Solstice supports and rails appear as shown below.

Figure 18a: Assembled mid-rail on Solstice supports ready for modules.
Task #19: Attach Wiley Cable clip to the bottom of the module frame to hold modules cables.

Figure 18b: Assembled mid-rail and end-rails on Solstice supports ready for modules.

Figure 19: Wire clip on back of Module
Task #20: Install module cable into Wiley cable clip.

![Figure 20: Wire attached to back of module](image)

Task #21: Install additional clips after electrical connections are made as needed in order to keep cables off the ground.

Figure 21: Cable attached to Wiley Cable clip.
Task #22: To start a row, place the first module on the rails so that the mid-clamps are centered on the mid-rails.

Figure 22a: Install module with mid-clamps centered on mid-rails.

Figure 22b: Mid-clamp alignment with Module frame, with the outer edge of the clamp ½” from the upper or lower edge of the module.

Notes: 1. The centering of the first mid-clamp is critical in order to ensure proper alignment of subsequent modules. All leads are to be draped over supports for subsequent connections.
2. The mid-clamp alignment with the edge of the module frame (1/2” from the upper or lower edge of the module) is critical to properly support the module.
Task #23: Place end-rail clamps on the module and tighten only enough to hold the module in place until the location of the next module can be established.

![Figure 23: Placement of end-rail clamps on module.](image)

Note: Be sure to align the end-rail clamp ½” from the edge of the module, as was done for the mid-rail clamps as illustrated in figure 23b.

Task #24: Slide the assembled mid-rail clamps against the edge of the module.

![Figure 24: Placement of lower mid-rail clamp on module](image)
Task #25: Position module under mid-rail clamp, assuring that the mid-rail clamp is centered on the mid-rail. Ensure that the bottom edge of the mid-rail clamp is ½” from the lower edge of the module, as shown in Figure 25. Also, for lower mid-rails requiring Wiley grounding clips as described in task #16, ensure that the Wiley ground clip is located between the module and the rail, and is in direct contact with the frame of the module in order to ground it to the adjacent module frame and the mounting system.

Figure 25: Centering of the mid-rail clamp with the sliding rail nut under the module.

Task #26: Insert the edge of the next module into the other side of the mid-rail clamps.

Figure 26: Placing the next module.

Note: Be sure to slide the edge of the module smoothly into the channel in order to avoid damage to the module or the Wiley ground clip.
Task #27: Line up the outer edges of the two modules precisely with the edge of the rail flange, thus ensuring proper alignment.

![Figure 27](image1.png)

Figure 27: Placement of the next module.

Task #28: Check to be sure that the modules are flush with each other and the rail flange, and that the lower mid-rail clamp is at the correct location on the module.

![Figure 28](image2.png)

Figure 28: Pulling mid-rail clamp into place on the modules

Note: Confirm alignment before proceeding to the next task.
Task #29: Tighten the bolt on the mid-rail clamp to fasten the modules securely together.

![Figure 29: A lower mid-rail clamp being tightened.](image)

Task #30: When tightening upper mid-rail clamps pull them up to correct position on the module frame (upper edge of clamp ½” from upper edge of module) and tighten to 15 ft. lbs. of torque.

![Figure 30a: Mid-rail clamp in correct position, being tightened to 15 ft. lbs. of torque.](image)
Task #31: Tighten the end-rail clamps at both ends of the row to a torque of 15 ft. lbs.

Figure 31: End-rail clamp being tightened
Task #32: Confirm that the mid-rail clamps, modules, and Solstice supports appear as shown in Figure 32, with ballast in the front (south) support section of the Solstice south support.

![Completed row of modules with ballast blocks installed.]

Figure 32: Completed row of modules with ballast blocks installed.

Task #33: Repeat tasks outlined above to complete entire array
SOLSTICE™ Warranty

Solstice Manufacturing Company, LLC (“Warrantor”) warrants that its SOLSTICE™ photovoltaic module mounting system, when installed and maintained in accord with SOLSTICE™ written instructions, shall remain free of manufactured defect due to faulty material or workmanship for a period of ten (10) years following the initial date of shipment (“Warranty Period”).

This Warranty is limited to the original SOLSTICE™ system installation, and is transferable when the product remains installed in its original location. This Warranty does not cover damage in transit, nor in storage or handling before and during system installation. This Warranty does not cover damage caused or contributed to by improper placement, assembly or maintenance, by misuse, abuse or accident, by failures or flaws in other supporting or connected systems, by lightning, acts of God, theft, vandalism or other exceptional event, or by service under conditions more severe than the limits of code standards and product specifications in effect at time of sale. This Warranty does not cover overall photovoltaic system design and selection decisions made by others, nor does it cover parts and materials connected or related to the SOLSTICE™ system but not manufactured or supplied by Warrantor. All warranty claims must be received within the Warranty Period for the warranty to be valid.

This Warranty shall be void if the SOLSTICE™ system is not installed and maintained in complete accord with Warrantor’s written instructions. This Warranty shall be void if the SOLSTICE™ system, including any component supplied or specified by Warrantor, is modified, substituted, or replaced without prior written authorization by Warrantor, or is utilized in any application or condition contrary to or exceeding Warrantor’s written instructions or specifications.

If the SOLSTICE™ system should fail to perform within the terms of this Warranty, Warrantor shall, at its sole election, repair the defective product, provide a replacement, or provide a refund not to exceed the documented original material purchase price of the particular unit or units that have a manufactured defect. To obtain warranty service, the Purchaser shall contact Warrantor by telephone at 908-284-0096 or by E-mail to sales@solticemanufacturing.com. Based on the reported problem, Warrantor shall work with the Purchaser, at no charge between either party, to ascertain the extent and validity of the Warranty claim. If requested by Warrantor, the Purchaser shall provide access for on-site inspection, installation photos, or other reasonable support documentation. The Purchaser shall not undertake or attempt unauthorized repairs, and Warrantor shall not be liable for repair or corrective action by the Purchaser or any third-party without prior written approval from Warrantor.

THIS WARRANTY SHALL BE IN LIEU OF ANY OTHER WARRANTY, EXPRESS OR IMPLIED. WARRANTOR MAKES NO REPRESENTATION OR WARRANTY WITH RESPECT TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. WARRANTOR’S LIABILITY SHALL BE LIMITED TO REPAIRING THE DEFECTIVE PRODUCT, PROVIDING A REPLACEMENT FOR THE DEFECTIVE PRODUCT, OR PROVIDING A REFUND NOT TO EXCEED THE DOCUMENTED ORIGINAL PURCHASE PRICE OF THE PARTICULAR UNIT OR UNITS THAT HAVE A MANUFACTURED DEFECT. IN NO CASE SHALL WARRANTOR BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL, OR SPECIAL DAMAGES.

If any provision of this Warranty is held invalid or unenforceable, it shall be severed and all other provisions shall remain in full force and effect. The exclusive jurisdiction for disputes under this Warranty shall be the Courts of the County of Hunterdon, New Jersey, and the parties hereby consent to such jurisdiction notwithstanding any choice of laws or other law or agreement to the contrary.

Be advised that this Warranty grants the Purchaser specific legal rights which may vary according to the state in which the SOLSTICE™ system is installed.