

SUNPOWER®

Safety and Installation Instructions

United States and Canada

This document applies to all SunPower modules listed in Table 1.

This document includes references to SunPower **E-Series, X-Series, P-Series,** and NE modules. These modules do not have grounding restrictions and all are compatible with high-efficiency transformerless inverters.

Contents of this manual are subject to change without notice.
For the latest US & Canada manual please refer to www.sunpower.com/PVInstallGuideUS



SunPower Corporation
www.sunpower.com

For the latest for Europe, Asia, Australia, Latin America and Africa manual please refer to www.sunpower.com/PVInstallGuideIEC

For the latest US & Canada technical specifications please refer to www.sunpower.com/PVResidentialSTS (for residential modules)
www.sunpower.com/PVCommericalSTS (for commercial and utility modules)

Safety and Installation Instructions (United States and Canada)

1.0 Introduction

This manual provides safety and installation instructions for UL Listed SunPower photovoltaic (PV) modules that have the UL logo on the product label:



IMPORTANT! Please read this manual in its entirety before installing, wiring, or using this product in any way. Failure to comply with these instructions will invalidate the SunPower Limited Warranty for PV Modules.

1.1 Disclaimer of Liability

The installation techniques, handling, and use of this product are beyond company control. Therefore, SunPower assumes no responsibility for loss, damage or expense resulting from improper installation, handling, or use.

1.2 Underwriters Laboratories (UL) Listing Information

This product meets or exceeds the requirements set forth by UL 1703 and ULC/ORD-C1703-01 for PV Modules while –VC modules are listed to UL1741. These Standards cover flat-plate PV modules and panels intended for installation on buildings or those intended to be freestanding. To satisfy the Listing for this product the modules must be mounted with a rack or standoff structure. The Listing does not include integration into a building surface because additional requirements may apply. This product is not intended for use where artificially concentrated sunlight is applied to the module.

1.3 Limited Warranty

Module limited warranties are described in full in the SunPower warranty certificates obtainable at www.sunpower.com. In summary, the Limited Warranties do not apply to any of the following:

Modules which in SunPower's absolute judgment have been subjected to misuse, abuse, neglect or accident; alteration; or improper installation, application or removal. This includes, but is not limited to, installation, application, or removal by any party other than a SunPower authorized dealer; non-observance of SunPower's installation, user's and/or maintenance instructions; repair or modifications by someone other than an approved service technician of SunPower; power failure surges, lightning, flood, fire, accidental breakage, or other events beyond SunPower's control.

2.0 Safety Precautions

Before installing this product, read all safety instructions in this document.

DANGER! Module interconnection cables pass direct current (dc) and are sources of voltage when the module is under load and when it is exposed to light. **Direct current can arc across gaps and may cause injury or death if improper connection or disconnection is made; or if contact is made with module leads that are frayed or torn.** Do not connect or disconnect modules when a current source is energizing the conductors. Modules may contain high voltage when interconnected with other modules.

- All installations must be performed in compliance with the National Electrical Code (NEC) and any applicable local codes.
- For Canadian jurisdictions, installations shall be in accordance with CSA C22.1, Safety Standard for Electrical Installations, Canadian Electrical Code, Part 1
- There are no user-serviceable parts within the module. Do not attempt to repair any part of the module.
- Installation should be performed only by qualified personnel.
- Do not stand on, drop, scratch, or allow objects to fall on modules as it may damage them and void the warranty.

- Do not place anything on the modules, even for a moment because resulting residue may damage or stain the glass surface.
- If the front glass is broken, or the backsheet is torn, contact with any module surface or module frame can cause electric shock.
- Broken J-boxes or connectors are electrical hazards as well as laceration hazards. Installers should remove any such module from the array and contact SunPower for disposal instructions.
- Do not install or handle the modules when they are wet or during periods of high wind.
- Do not block drain holes or allow water to pool in or near module frames.
- SunPower recommends a conservative minimum cable bend radius of equal to or greater than 40 mm (1.5”).
- Unconnected connectors must always be protected from pollution (e.g dust, humidity, foreign particles, etc), prior to installation. Do not leave unconnected (unprotected) connectors exposed to the environment. A clean assembly environment is therefore essential to avoid performance degradation.
- Contact SunPower if maintenance is necessary.
- Save these instructions!

2.1 Fire Rating

The module fire rating is Type 2 per UL1703, 2013 edition and Class C per UL1703, 2002 edition. Fire rating classification for any PV system using UL1703:2013 can only establish a fire rating in combination with the mounting system ratings normally found in the mounting system installation instructions.

3.0 Electrical Characteristics

Electrical characteristics of the modules are described in Table 1 below. Each module contains three bypass diodes. For all modules, the maximum series fuse rating is 15A. Under normal conditions, a photovoltaic module may experience conditions that produce more current and/or voltage than reported at Standard Test Conditions. Accordingly, the values of ISC and VOC marked on UL Listed modules should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor capacities, fuse sizes and size of controls connected to the module output. Refer to Section 690-8 of the NEC for an additional 1.25 Safety factor which may be applicable. For VC Modules (all modules ending in “-VC”), Vmax should be used instead of Voc when determining component voltage ratings. Refer to (www.sunpower.com/PVCommericalSTS) for details on voltage correction rules for VC modules.

Table 1: Electrical Characteristics¹

Module	Rated Power (W)	Voltage at Rated Power Vmpp (V)	Current at Rated Power, Imp (A)	Open Circuit Voltage Voc (V)	Short Circuit Current, Isc (A)	Maximum System Voltage UL Vmax (V)
SPR-X21-470-COM	470	77.6	6.06	91.5	6.45	1000
SPR-X21-460-COM	460	76.7	6.00	90.5	6.39	1000
SPR-X21-445-COM	445	75.4	5.90	89.0	6.28	1000
SPR-X22-360-COM	360	59.1	6.09	69.5	6.48	1000
SPR-X22-360						600
SPR-X21-350-BLK	350	58.3	6.04	68.2	6.44	600
SPR-X21-345-COM	345	57.3	6.02	68.2	6.39	1000
SPR-X21-345						600
SPR-X21-335	335	57.3	5.85	67.9	6.23	600
SPR-X21-335-BLK						600
SPR-X20-327-COM						1000
SPR-X20-327	327	57.3	5.71	67.6	6.07	600
SPR-X20-327-BLK						600
SPR-X22-275	275	44.8	6.14	52.7	6.54	600
SPR-X21-255	255	42.8	5.95	51	6.3	600

(Continued the next page)

¹ For models not shown here, please contact SunPower technical support or visit www.sunpower.com. Electrical parameters are measured at Standard Test Conditions (STC). The series fuse must have an interrupting rating that is equal to or greater than the maximum fault current that the fuse is required to interrupt, including contributions from all connected sources of energy. Refer to NEC Article 100, Part II as to what type of series fuse is acceptable for modules rated at higher than 600 V dc system voltage.

Module	Rated Power (W)	Voltage at Rated Power Vmpp (V)	Current at Rated Power, Imp (A)	Open Circuit Voltage Voc (V)	Short Circuit Current, Isc (A)	Maximum System Voltage UL Vmax (V)
SPR-X20-250-BLK	250	42.8	5.84	50.9	6.2	600
SPR-X19-240-BLK	240	42.8	5.61	50.6	5.98	600
SPV-X19-310-COM	310	57.3	5.41	67.2	5.82	1000
SPR-X19-310						600
SPR-X19-310-BLK						600
SPR-X19-240-BLK	240	42.8	5.61	50.6	5.98	600
SPR-E20-440-COM	440	72.9	6.04	86.5	6.5	1000
SPR-E20-435-COM	435	72.9	5.97	85.6	6.43	1000, 1500
SPR-E19-410-COM	410	72.9	5.62	85.3	6.01	1000
SPR-E20-327	327	54.7	5.98	64.8	6.46	600
SPR-E20-327-COM						1000
SPR-E19-320	320	54.7	5.86	64.7	6.24	600
SPR-E19-315	315	54.7	5.76	64.6	6.14	600
SPR-E19-310-COM	310	54.7	5.67	64.4	6.05	1000
SPV-E19-310-COM						
SPR-E18-305	305	54.7	5.58	64.2	5.96	600
SPR-E18-295-COM	295	54.2	5.45	63.3	5.83	1000
SPR-E20-245	245	40.5	6.05	48.8	6.43	600
SPR-E19-235	235	40.5	5.8	48.4	6.175	600
SPR-230NE-BLK	230	40.5	5.68	48.2	6.05	600
SPR-P17-320-COM	320	41.3	7.76	50.5	8.38	1000, 1500
SPR-P17-325-COM	325	41.6	7.82	50.7	8.43	1000, 1500
SPR-P17-330-COM	330	41.9	7.88	50.9	8.47	1000, 1500
SPR-P17-335-COM	335	42.2	7.94	51.1	8.51	1000, 1500
SPR-P17-340-COM	340	42.5	8	51.3	8.52	1000, 1500
SPR-P17-345-COM	345	42.8	8.06	51.5	8.57	1000, 1500
SPR-P17-350-COM	350	43.1	8.12	51.7	8.65	1000, 1500
SPR-P17-355-COM	355	43.4	8.18	51.9	8.68	1000, 1500
SPR-P17-360-COM	360	43.7	8.24	52.1	8.72	1000, 1500
SPR-P17-365-COM	365	44	8.3	52.3	8.77	1000, 1500
SPR-P17-370-COM	370	44.3	8.36	52.5	8.81	1000, 1500
SPV-P15-315-COM	315	42.6	7.4	51	8.3	1000, 1500

Electrical parameters for VC modules

Module	Rated Power (W)	Maximum Voltage Vmax (V)	Voltage at Rated Power Vmpp (V)	Current at Rated Power, Imp (A)	Open Circuit Voltage Voc (V)	Short Circuit Current, Isc (A)	Maximum System Voltage UL Vmax (V)
SPR-E20-435-COM-VC	435	76	72.9	5.97	64.2	6.43	1000

Tempco (Vmax) for VC Modules: 0mv/C

Tempco (Vmpp) for VC Modules: -265.4mV/C

Rated electrical characteristics are within 10% of measured values at Standard Test Conditions of: 1000W/m², 25°C cell temperature and solar spectral irradiation of AM 1.5 spectrum.

4.0 Electrical Connections and System Monitoring

Modules may be connected in series or parallel to achieve the desired electrical output provided certain conditions are met.

SunPower recommends using the same brand connector in a PV system. Currently approved compatible connectors found on SunPower modules are: Tyco Solarlok PV4 and PV4S, Yukita (YS-254/YS-255) and Multicontact MC4 (PVKBT4/6II, PVKST4/6II). SunPower warrants the connectors delivered on SunPower supplied modules and harnesses as being compatible.

4.1 System Voltage Monitoring

SunPower's VC modules include a proprietary technology that limits the maximum voltage available at the terminals of the PV module. Model SPR-E20-435-COM-VC shall be used only in a system that contains multiple model SPR-E20-435-COM-VC modules operating together. If the VC modules fail to regulate the PV system's DC voltage, the inverter will trip off line when the voltage exceeds 1,000V. Model SPR-E20-435-COM-VC shall be used only in a system where the system's inverter is providing Electrical Supervision in compliance with

UL 991 functional safety requirements. One of the following inverters may be used:

- 1 - SMA Solar Technology AG Sunny Central Kodiak, models SC 2200-US and SC 1850-US.

If the inverter is reporting that the system voltage has exceeded 1,000V, a SunPower qualified field service technician will need to inspect the system to resolve the error.

4.2 System Surge Protection

SunPower's VC modules must be protected using an Erico, UL Recognized model DSD501000DCSP1, surge arrester located in the combiner box.

4.3 Equipment Grounding

To reduce the possibility of electrical shock, ground the frame of the module or array per NEC before wiring the circuit. In order to install in accordance with their UL Listing, SunPower modules must be grounded using grounding hardware that meets requirements for grounding systems in UL 467, UL 1703, or UL 1741; on anodized aluminum frames. SunPower recommends using one of the following methods of grounding the module frame. In addition, to avoid corrosion due to the use of dissimilar metals SunPower recommends stainless steel between copper and aluminum. For the Generation 5 (G5) frame, only methods 1 and 2 apply.

- 1) Attach a lay-in lug (IlSCO GBL-4DBT, Burndy CL50-DB-T or Tyco Solklip 1954381-2) to one of the grounding holes on the module frame, and attach the ground conductor to the lug. Use stainless steel hardware (bolt, washers, and nut). Use an external-tooth star washer between the lug and the module frame in order to pierce the anodizing and establish electrical contact with the aluminum frame. The assembly must end with a nut that's torqued to 20–25 in-lb (for a #10-32 bolt). A lock washer or other locking mechanism is required to maintain tension between the bolt and the assembly. The conductor must be attached to the ground lug using the lug's set screw. Refer to NEC 690.
- 2) SunPower modules may also be grounded through the use of SunPower IFF clips which are UL Listed (1703 and 1741). IFF clip torque value is 35–45 in-lbs for a 1/4-20 or M6 bolt, but may be higher in specific applications. When using IFF clips, the module mounting system must be grounded as per NEC 250.
- 3) SunPower modules may also be grounded through the use of an Everest Solar Systems Mid or End Clamp assembly. The assembly consists of a stainless M-K2 slot nut, WEEB KMC grounding clip, Everest Solar aluminum End or Mid clamp, stainless M8 bolt and stainless Belleville lock washer. The WEEB is placed under the bottom edge of the module and the clamp is placed on the top edge of the module. The bolt captures the Belleville washer, the clamp, the WEEB and the M-K2 nut and must be torqued to min. 10.3 ft-lbs. This method is valid when the modules are being secured to Everest Solar aluminum Dome D1000, Dome S1000 or Dome SD mounting components. A SunPower IFF clip #509206 may be substituted for the actual Everest Mid Clamp itself, but only when the modules are being installed using SunPower's D10 or S10 product; with 72- and 96-cell modules only. The IFF clip must be torqued to 35-45 in-lbs. When the end clamp is used for securing the last module in a row, the last module must be separately grounded when servicing the adjacent module.

Note: Method 4 is evaluated to UL 1703 by ETL. As such, the use of these devices is not considered part of the UL Listing of these modules.

- 4) If the Unirac SOLARMOUNT system is used for mounting the modules, grounding is achieved using either a BURNDY Wiley WEEB-UMC or WEEB-UGC-1 grounding clip in combination with Unirac's Mid or End clamps and 1/4-20 bolt and flanged nut, torqued to 120 in-lbs. If the Solarmount-I system is used grounding is achieved with the UniRac UGC-2 grounding clips in combination with UniRac's Mid or End clamps and Sliders with a 1/4-20 bolt and flanged nut torqued to 120 in-lbs.

Note: Method 5 was evaluated to UL 2703 by TUV. As such, the use of these devices is not considered part of the UL Listing of these modules.

- 5) SunPower modules may also be grounded using a WEEB-9.5NL ground clip in between the module and supporting structure. This combination is secured with a 1/4" stainless steel rivet or a 1/4-20 by 3/4" zinc-plated bolt with zinc-plated K-nut torqued to min. 6 ft-lbs to secure the module to minimum

12 ga. G90 coated steel or Z-purlin, either painted or unpainted. The WEEB-9.5NL is for single use only.

- Other grounding methods may be used in conjunction with a module mounting system tested to UL2703. For these installations, the SunPower module and frame style must be tested and part of the instructions for the listed mounting product. The SunPower module must be installed in accordance with these instructions as well as the mounting system's listed instructions.
- SunPower G5-frame modules may be grounded through the use of an InvisiMount™ mid clamp that bonds the module frame to the InvisiMount™ rail. InvisiMount™ rail sections must be bonded and connected to a grounding conductor using methods and materials specified in the InvisiMount™ manual.

When using methods 2, 3, 4, 5 or 6 the module mounting structure must be grounded as per NEC 250. To ensure system safety and structural integrity, strict adherence to application-specific SunPower documentation is required.

4.4 System Grounding

Review the Table 2 below for the proper grounding techniques for the installation of your particular SunPower modules.

Table 2: Module Grounding Key

Module Model Grounding Key ²		
SunPower P-Series, E-Series, X-Series, and NE modules have no grounding restrictions:		Legacy modules must be positively grounded:
All model numbers starting with "SPR-PYY", "SPR-EYY" or "SPR-XY"	SPR-ZZZNE-BLK-D SPR-ZZZNE-WHT-D	SPR-ZZZE-WHT-D SPR-ZZZ-WHT-D SPR-ZZZE-BLK-D SPR-ZZZ-BLK-D
IMPORTANT! For optimal performance, SunPower modules listed above as needing positive grounding must be configured as described. Failure to comply with this requirement will reduce system performance and invalidate SunPower's Limited Power Warranty for PV Modules.		

5.0 Module Mounting

The SunPower Limited Warranty for PV Modules is contingent upon modules being mounted in accordance with the requirements described in this section.

5.1 Site Considerations

SunPower modules should only be mounted in locations that meet the following requirements:

Operating Temperature: All SunPower modules must only be mounted in environments that ensure they will operate within the following temperatures:

Operating Temperature range	-40°C to +85 °C -40°F to +185 °F
Ma. Ambient Temperature for VC modules	60 °C or 140 °F

Care should be taken to provide ventilation behind or underneath the modules, especially in hot environments.

Design Strength: SunPower modules are designed to meet a maximum positive (or up/down, e.g. wind) and negative (or downward, e.g. static or snow load) design pressure described in the Table 3. Design strength of 2400Pa wind load corresponds approximately to a wind speed of 130 km/h (approximately ±800 Pa, per IEC reference) with a safety factor of 3 for gusty winds. Modules have also been evaluated by UL for a maximum negative or positive design load of 30 psf.

Figure 1: Mounting locations for SunPower Modules shows where to mount to the module frame. Table 3 defines mounting options, attachment locations and resulting load rating achieved for each module configuration.

Figure 1: Mounting locations for SunPower modules

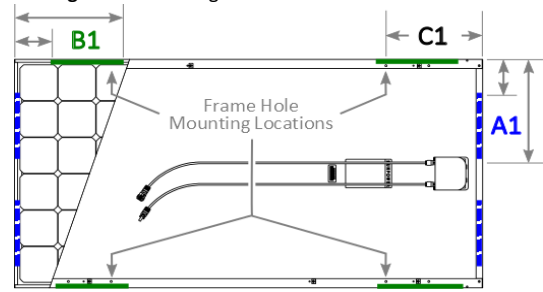


Table 3: Mounting Configurations and Load Resistance

Module size	Module Configuration	Mounting configuration (valid mounting location in mm)				Load rating ³ Wind (up & down) / Snow (down) / Cyclonic Wind (back) (units in Pa)
		End mount (A1)	Pressure clamp or clip (B1)	Frame holes (C1)	Oasis Center mount For Oasis Only	
72 cell	G5 (black)		300-400			4000 / 8000 / NA
		50-300	50-400			4000 / 4000 / NA
96 cell	G5 (black)		300-400			3000 / 6000 / NA
		50-400	50-400			3000 / 3000 / NA
72 cell	G3 (black)	50-250	150-380	322		2400 / 5400 / 7500
96 cell	G3 (black)		150-380	322		
96 cell	Silver		150-380	322		
96 cell	Silver	50-350 ⁴				1300 / 2400 / 2700
128 cell & P17-COM	Any		400-460	433		2400 / 5400 ⁵ / 7500
	Any				Center	2160 / 5100 / NA
	Any	50-350 ⁴				1300 / 2400 / 2700
128 cell	G6		505.5	400 about center	400 about center	2400 / 2400 / NA(*)

(*) UL testing is performed at 45 psf or 2156 Pa with 1.5 FOS with 1.0 FOS

3) Safety factor of 1.67 has been included in wind load values, and 1.1 included in snow load values, unless otherwise noted. UL tested load rating is ≥ 30psf (1436 Pa) with 1.5x safety factor for all mounting configurations. Cyclonic wind tested per AS/NZS4040.2 Static strength test regime, AS/NZS1170.2 Structural Design Actions – Wind Actions.

4) In order to support load rating in the table, end mount requires that the short side frame is supported along its entire length by BOS railing

5) Safety factor 1.06 is included

Excluded Operating Environments

Certain operating environments are not recommended for SunPower modules, and are excluded from the SunPower Limited Warranty.

Performance Series Mounting Orientation

Commercial Performance Series (P-Series) modules are designed to be installed in landscape orientation. In landscape orientation, P-series modules maintain higher power under row to row shading and edge soiling.

5.2 Mounting Configurations

Modules integrated into or mounted over a roofing system must be mounted over a fire-resistant roof covering rated for the application. Modules may be mounted at any angle, from horizontal to vertical. To reduce soiling, modules should be mounted at a minimum of 10 degrees.

Residential (black) module frames have two profile types, G3 and G5. Commercial (silver) module frames have permanently attached stacking pins. **Mounting system hardware used with commercial modules must account for the presence of these stacking pins.** Mechanical specifications for modules are shown in Table 4.

In order to prevent water from entering the junction box, which could present a safety hazard, modules should be oriented with the junction box in the

² YY is a number ranging from 15 to 22 and ZZZ is panel wattage.

uppermost position and *not* be mounted such that the cell faces downward (e.g. on a tracking structure that positions the modules with the junction box facing skyward during sleep mode).

For 128-cell and P-Series modules a minimum of 4" of clearance between the module frames and the structure (or grade) is required; for all other modules a minimum of 1.5" of clearance is required. The required clearance between installed modules is a minimum of ¼ inch distance.

The module is only UL Listed for use when its factory frame is fully intact. Do not remove or alter the module frame, and do not create additional mounting holes because doing so may compromise the integrity of the frame.

Modules may be mounted using the following methods only:

- 1) **Frame Holes:** Secure the module to the structure using the factory mounting holes. Four 1/4" stainless steel bolts, with nuts, washers, and lock washers are recommended per module; tightened to a min. torque of 10 in-lbs. Refer to Table 4 for the module dimensions and hole locations. This method has been certified by a third-party organization according to UL 1703. For frame hole mounting, modules must be secured using the holes located at 322mm from the short end of the module for 72 and 96 cell modules and 433mm from the end of the module for 128 cell modules. For carport installations the supporting structure has been pre-drilled. For 128 cell modules for carport assembly, modules must be secured using only the holes located 433mm from the ends of the module and hardware described above in Section 4.1, Item 5. See Figure 2 for carport assembly details.
- 2) **Clamps or Clips:** Mount the module with the IFF clips on the longer sides of the module. The centerline of the clips must be 50mm-400mm for G5 frame (150–380mm for G3 frame) from the corner of the module. Ensure that the clamps are of sufficient strength to allow for the maximum design pressure of the module. The IFF clip hardware must be tightened to a torque of 35-45 in-lbs. Clamps that secure to the top of the frame must not deform the top flange. Clamps must apply force collinear with the 'wall' of the module frame and not only to the top flange. Clamps or installation procedures that put excessive force on the top flange will deform the frame, void the module warranty and risk glass breakage. **Figure 1a** illustrates locations for top frame clamp force. Avoid clamping within 50mm of module corners to reduce risk of frame corner deflection and glass breakage. When clamping to the module frame, torque should never exceed 120 in-lbs to reduce chances of frame deformation. Maximum allowable torque may be less than 120 in-lbs depending on clamp design. Mounting systems should be evaluated for compatibility before installing.
- 3) **End Mount:** End mounting is the attachment of the shorter side of the module frame to a supporting rail using IFF clips tightened to a torque of 35-45 in-lbs. The centerline of the clips must be 50-400mm from the corner of the module. The end-mounting rail and clips or clamps must be of sufficient strength to allow for the maximum design pressure of the module. Verify this capacity before installation.
- 4) **Everest Solar Mounting System:** An Everest Solar Mid or End Clamp can be used to secure the shorter ends of the module. When using Everest Solar mounting hardware. The Everest Solar stainless M-K2 Slot nut is placed in the channel of the aluminum Dome D1000, Dome S1000 or Dome SD mounting component. The WEEB KMC grounding clip is placed under the bottom edge of the module. The Mid or End clamp is placed over the top edge of the module frame and secured to the M-K2 slot nut using a stainless M8 bolt and stainless Belleville washer tightened to a min. of 10.3 ft-lbs. A SunPower IFF clip #509206 may be substituted for the Everest Mid Clamp, but only when the modules are being installed using SunPower's D10 or S10 product. Two clamps must be used on each of the shorter ends of the module; on 72- and 96-cell modules mounted in landscape orientation only.
- 5) **Helix Mounting System:** See UL2703 Helix system installation manual for details.
- 6) **SunPower-specified or SunPower-supplied mounting systems:** Mount modules with strict adherence to SunPower documentation, using hardware systems supplied by or specified by SunPower.

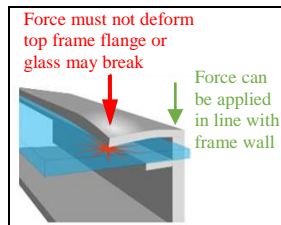


Figure 1a: Clamp Force Locations

5.3 Module Handling

Use gloves when handling modules. The module glass is sensitive to oils and abrasive surfaces, which may lead to scratches and irregular soiling. Do not place modules such that the glass comes in contact with abrasive surfaces, and minimize any contact with the glass in general. Do not place anything on the modules, even for a moment. Never lift or move the module using the cables or the junction box under any circumstances. Remove any fingerprints by washing the module glass as described in Section 6.0 below.

6.0 Maintenance and Cleaning

Trained SunPower dealer or trained SunPower support personnel should inspect all modules annually for safe electrical connections, sound mechanical connections, and freedom from corrosion.

Periodic cleaning of module glass has resulted in improved performance levels, especially in regions with low levels of annual precipitation; therefore SunPower recommends periodic cleaning of the modules.

To clean a module, wash its glass surface with potable, non-heated water. Normal water pressure is adequate, but pressurized water (up to 1500 psi) may be used. Some fingerprints, stains, or accumulations of dirt on the glass may be removed with over-the-counter glass cleaners (such as Windex® or equivalent), or with a 3% soap-and-water solution. For smaller systems, wet the module glass with the solution, let it stand for five minutes, and then wet them again and use a soft sponge or seamless cloth to wipe the glass surface in a circular motion. For large systems, wet the modules with the cleaning solution, let them stand for five minutes, and then rinse them with high-pressure water or a soft squeegee. Do not use harsh industrial-strength cleaning materials such as scouring powder, steel wool, scrapers, blades, or other sharp instruments to clean the module glass. Use of such materials will void the product warranty.

Figure 2: Carport Assembly

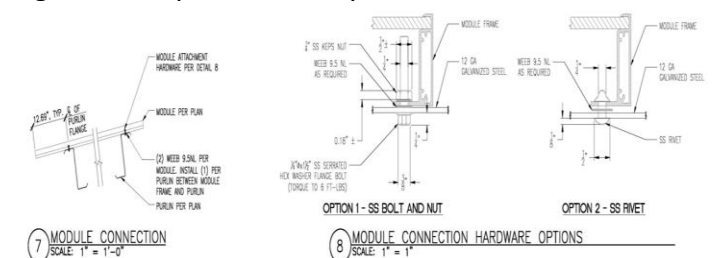


Table 4: Module Frame Details

Platform	Module mounting and ground hole detail		Frame Profile
RESIDENTIAL G3 FRAME ONLY			
Residential Modules	72 CELL MODULE FRAME DETAIL 	96 CELL MODULE FRAME DETAIL 	SIDE FRAME PROFILE
			END FRAME PROFILE
RESIDENTIAL G5 FRAME ONLY (a.k.a., INVISIMOUNT COMPATIBLE FRAME)			
Residential Modules	72 CELL MODULE (NO MOUNTING HOLES) 	96 CELL MODULE (NO MOUNTING HOLES) 	SIDE FRAME PROFILE
			END FRAME PROFILE
FOR COMMERCIAL (SILVER FRAME) MODULES ONLY, INCLUDES STACKING PINS			
Commercial Modules	96 CELL COMMERCIAL MODULE 	128 CELL COMMERCIAL MODULE 	SIDE FRAME PROFILE
			With Stacking Pins END FRAME PROFILE

*See Product Rating Label for Maximum System Voltage.

Platform	Module mounting and ground hole detail	Frame Profile
Commercial Modules	<p style="text-align: center;">P-SERIES MODULE</p> <p>4X Ø6.6mm [0.26in] Mounting Clip Holes 4X Ø4.8mm [0.19in] Drain Holes 6X Ø4.2mm [0.17in] Ground Holes 16X Ø6.8mm [0.27in] Mounting Holes 4X Ø7.0mm [0.28in] Stacking Pins</p> <p>(A) CABLE LENGTH: 600 mm +20/-10 mm [23.6 in +0.8/-0.4 in] (B) STACKING PINS (C) LONG SIDE: 32 mm [1.3 in] SHORT SIDE: 22 mm [0.9 in]</p> <p>300.0mm [11.8in] 539.0mm [21.2in] 1200.0mm [47.2in] 1423.0mm [56.0in] 2067mm [81.4in]</p> <p>998.0mm [39.3in] 954.0mm [37.6in]</p> <p>398mm [15.7in] (B)</p> <p>46mm [1.8in] 3.2mm [.13in]</p>	<p style="text-align: center;">SIDE FRAME PROFILE</p> <p style="text-align: center;">END FRAME PROFILE</p>
	FOR GEN 6 FRAME MODULE ONLY	
	<p style="text-align: center;">128 CELL MODULE</p> <p>1058mm (5mm x 15mm slot) [41.7in] 400mm (6.7mm Ø) [15.7in]</p> <p>1049mm [41.3in] 2069mm [81.5in]</p>	<p style="text-align: center;">SIDE FRAME PROFILE</p> <p style="text-align: center;">END FRAME PROFILE</p>