

SunModo PV Rack Mounting System
UL2703 Compliant



Please read carefully before installing

Product is tested to and recognized to UL 2703 standards for safety grounding and bonding equipment and meets UL 1703 fire standards.

SunModo PV Rack Mount System can be used to mount photovoltaic (PV) panels in a wide variety of locations. All installations shall be in accordance with NEC requirements in the USA. The self-bonding system is for use with PV modules that have a maximum series fuse rating of 30A. Mechanical design loads per UL 2703: Downward Pressure: 33.42 psf (1600.2 Pa), Upward Pressure: 22.28 psf (1066.8 Pa), Down-Slope: 5 psf (239.4 Pa).

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| <p>SunModo Corporation: Vancouver, Washington www.SunModo.com Ph: 360-844-0048 info@sunmodo.com</p> | <p>Document Number D10123-V002 ©2018 – SunModo Corp.</p> |  |
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Installer Responsibility:

Before ordering and installing materials, all system layout dimensions should be confirmed by field measurements. SunModo reserves the right to alter, without notice, any details, proposals or plans. Any inquiries that you may have concerning installation of the PV system should be directed to your SunModo Sales representative. Consult SunModo Sales for any information not contained in this manual. This manual is intended to be used as a guide when installing SunModo's EZ Standing Seam Clamps on pitched roofs. It is the responsibility of the installer to ensure the safe installation of this product as outline herein.

- Installer shall employ only SunModo products detail herein. The use of non SunModo components can void the warranty and cancel the letters of UL compliance.
- Installer shall guarantee that screws and anchors have adequate pullout strength and shear capacities.
- Installer shall adhere to the torque values specified in this Instruction Manual.
- Installer shall use anti-seize compound, such as Permatex anti-seize, lubricant is recommended for all threaded parts.
- Installer is responsible to install EZ Standing Seam Clamps over a Fire Resistant roof covering rated for the application.
- Installer is responsible to determine that the roof, its rafters, connections, and other architectural support components can sustain the array under all code level loading conditions.
- Installer shall adhere to all relevant local or national building codes. This takes account of those that supplant this document's requirements.
- Installer shall guarantee the safe placement of all electrical details of the PV array.
- Installer shall comply with all applicable local, state and national building codes, including periodic re-inspection of the installation for loose components, loose fasteners and any corrosion, such that if found, the affected components are to be immediately replaced.
- Installer to ensure the structural support members or footings for mounting the array can withstand all code loading conditions. Consult with licensed professional engineer for the appropriate loading conditions.
- Installer to follow all regional safety requirements during installation.
- This racking system may be used to ground and/or mount a PV module complying with UL 1703 only when the specific module has been evaluated for grounding and/or mounting in compliance with the included instructions.

Safety:

Review relevant OSHA and other safety standards before following these instructions. The installation of solar PV systems is a dangerous procedure and should be supervised by trained and experienced personnel.

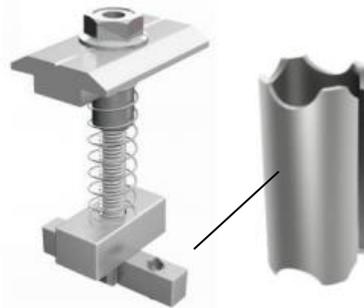
It is not possible for SunModo to be aware of all the possible job site situations that could cause an unsafe condition to exist. The installer of the roof system is responsible for reading these instructions and determining the safest way to install the roof system. These instructions are provided only as a guide to show a knowledgeable, trained erector the correct part placement one to another. If following any of the installation steps would endanger a worker, the erector should stop work and decide upon a corrective action. Provide required safety railing, netting, or safety lines for crew members working on the roof.

SunModo Self-Grounding System

SunModo developed a proprietary grounding and bonding system that is built into the mounting hardware for the rails, clamps and splices. We provide further grounding through all of the SunBeam racking components including the Pipe Caps, Beams, Posts and Post Base Plates. All hardware meet UL 2703 Grounding and Fire Standards tested by ETL.

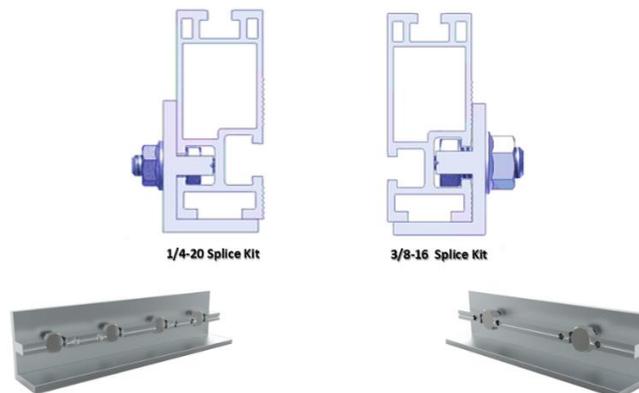
The basis of the system is our patented stainless steel floating grounding pin which is designed to be captive in the mounting components and provides a bonding path from the PV panel frames to the rails and rail splices, and finally to the ground lug. The self-grounding and bonding system is for use with PV modules that have a maximum series fuse rating of 30A. The maximum number of PV modules is limited by the system voltage, so in a system has multiple inverters, the SunModo racking system can theoretically go on forever.

Finally we have added a spring and Blue 242 Loctite to our Mid Clamp assemblies. The sprig keeps the Mid Clamp in the open position ready to receive the solar module. The Blue Loctite is a light bonding agent allowing the T-Bolt engagement into the Rail when the Collar Nut is turned from above. The Blue Loctite has the added benefit of being an anti-seize agent for stainless steel hardware in the area where it is applied. For additional anti-seize protection refer to the 'Tools Required for Installation' section of this document.



Mid Clamp with Ground Pins

Similarly, the rail splices the grounding pins, eliminating the need for extra bonding components.



Rail Splices with Grounding Pins

EZ Standing Seam Roof Mounting System Components



EZ 1" Mini Standing Seam Roof Mounting Kit includes:
1" Standing Seam Clamp
M10 Set Screw
M10 Flange Bolt

K50200-002
EZ 1" Mini Standing Seam Roof Mounting



EZ 1" Standard Standing Seam Roof Mounting Kit includes:
1" Standing Seam Clamp
2X M10 Set Screw
M10 Flange Bolt

K50200-001
EZ 1" Standard Standing Seam Roof Mounting



EZ 2" Mini Seam Roof Mounting Kit includes:
2" Standing Seam Clamp
M10 Set Screw
M10 Flange Bolt

K50210-002
EZ 2" Standing Seam Roof Mounting



EZ 2" Standing Seam Roof Mounting Kit includes:
2" Standing Seam Clamp
2X M10 Set Screws
M10 Flange Bolt

K50210-001
EZ 2" Standing Seam Roof Mounting



Aluminum L-Foot available in clear and black. 3/8" Flange Nut and Bolt included

K10066-001
Standard L-Foot Kit
K10096-001
Tall L-Foot Kit



Adjustable End Clamp Kit, fits panel height from 33 to 50 mm.

K10299-001
K10299-BK1

Adjustable End Clamp Kit, fits panel height from 30 to 46 mm.

K10299-002
K10299-BK2



End Clamp Kit, fits panel height from 31 to 50 mm. For last 3 digits, see table on last page.

K10224-1XX
K10224-1XX-BK



Grounding Mid Clamp Kit for standard rail; fits panel height from 31 to 50 mm. For last 3 digits, see table on last page. **May be repositioned until torqued to final value.**

K10180-001
K10180-BK1
For single-use only



Grounding End Clamp Kit with shared rail adaptor for standard rail; fits panel height from 31 to 50 mm. For last 3 digits, see table on last page. **May be repositioned until torqued to final value.**

K10183-1XX
K10183-1XX-BK
For single-use only



Grounding Mid Clamp Kit with shared rail adaptor for standard rail; fits panel height from 31 to 50 mm. **May be repositioned until torqued to final value.**

K10182-001
K10182-001-BK
For single-use only



Grounding Lug Kit with Grounding Spacer and 1/4-20 T-Bolt. **May be repositioned until torqued to final value.**

K10179-001
For single-use only



Helio Rails: Features both 1/4" and 3/8" side slots, and 1/4" top slot for clamping PV panels. Available in 84", 124", 164" and 206" lengths. Last 3 digits denote rail length. 4 stock sizes in clear and black.

A20144-XXX (Clear)
A20144-XXX-BK (Black)
HR250 (Standard Rail)

A20145-XXX (Clear)
A20145-XXX-BK (Black)
HR350 (Heavy Rail)

A20146-XXX (Clear)
A20146-XXX-BK (Black)
HR500 (Super Rail)



Metal Rail End Caps available for Helio Standard and Heavy rails (optional)

A20284-001
A20284-BK1 (Black)
HR250 (Helio Standard)

A20285-001
HR350 (Helio Heavy)

A20263-001
HR500 (Helio Super)



3/8" Slot Rail Splice Kit with 2X 3/8-16 hex bolts and flange nuts with integral grounding. **May be repositioned until torqued to final value.**

K10178-001
HR250/HR350 3/8" Splice
For single-use only



1/4" Slot Rail Splice Kit with 4X bolts and flange nuts with integral grounding. **May be repositioned until torqued to final value.**

K10177-001
K10177-BK1
HR250/HR350 1/4" Splice
For single-use only

K10250-001
K10250-001-BK
HR500 1/4" Splice
Requires bond jumper



HR150 (Open Rail): Features wire management channel and both 1/4" and 3/8" side slots, and 1/4" top slot for clamping PV panels. Available in 124" and 166" lengths. Last 3 digits denote rail length. 4 stock sizes in clear anodized and black.

A20242-XXX (Clear)
A20242-XXX-BK (Black)
HR150 (Open Rail)



1/4" Slot Open Rail Splice Kit with 4X 1/4-20 Bolts and Flange Nuts with integral grounding. **May be repositioned until torqued to final value.**

K10236-001
HR150 Splice Kit
For single-use only



Rail End Cap available for HR150 rails (optional)

A20250-001 (Clear)
A20250-BK1 (Black)
HR150 Rail End Cover



HR150 Channel Clip: snaps into the open rail to manage wire bundles where needed. Available in clear and black.

A20252-001 (Clear)
A20252-BK1 (Black)
HR150 Wire Cover



The HR150 family of products are shown assembled above. Two HR150 Rails are spliced together with an HR150 Rail Splice. PV electrical wires are shown routed in the channels of the HR150 Rails, retained with two HR150 Channel Clips snapped into place.

List of Compliant PV Modules

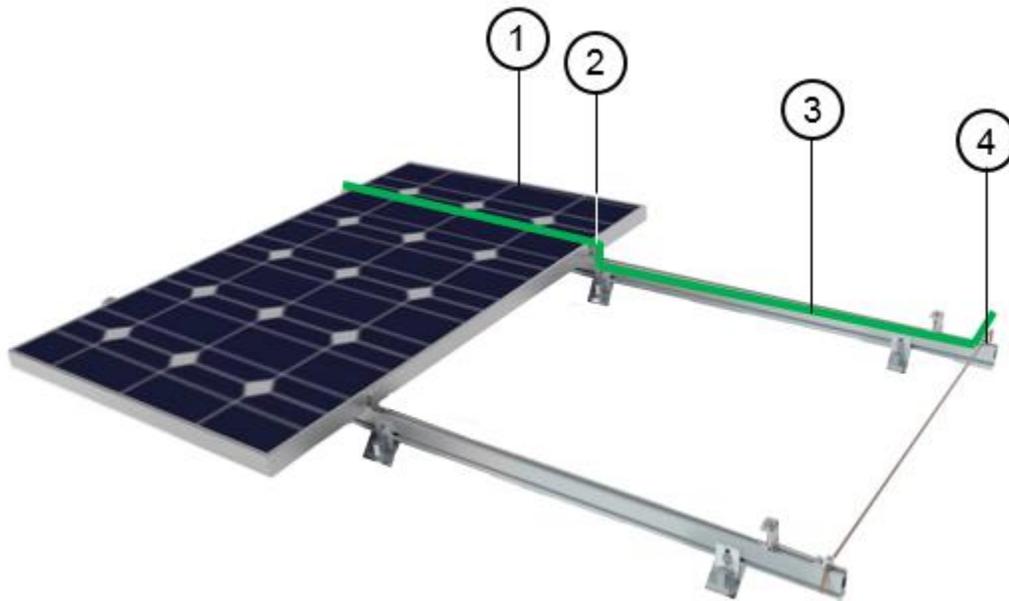
UL 2703 Qualified Modules for use with SunModo PV Racking Systems

| Evaluated PV Modules | |
|----------------------|--|
| Module manufacturer | Model numbers |
| Boviet Solar | BVM6610M-250, BVM6610M-255, BVM6610M-260, BVM6610M-265, BVM6610M-270, BVM6610M-275, BVM6610M-280, BVM6612M-325, BVM6612M-330, BVM6612M-335, BVM6612M-340, BVM6612M-345, BVM6612M-350, BVM6610P-250, BVM6610P-255, BVM6610P-260, BVM6610P-265, BVM6610P-270, BVM6612P-310, BVM6612P-315, BVM6612P-320, BVM6612P-325, BVM6612P-330 |
| C-Sun | CSUN290-72P, CSUN295-72P, CSUN300-72P, CSUN305-72P, CSUN310-72P, CSUN285-72M, CSUN290-72M, CSUN295-72M, CSUN300-72M, CSUN305-72M, CSUN310-72M, CSUN315-72M, CSUN320-72M, CSUN235-60M, CSUN240-60M, CSUN245-60M, CSUN240-60P, CSUN245-60P, CSUN250-60P, CSUN255-60P, CSUN260-60P |
| Canadian Solar | CS3K-FG, CS3K-MS-FG, CS3U-MS, CS3U-MS-FG, CS3U-P, CS3U-P-FG, CS6K-M, CS6K-MS, CS6K-MS-FG, CS6K-MS-FG, CS6K-P, CS6K-P-FG, CS6P-P, CS6P-M, CS6U-M, CS6V-P, CS6V-M, CS6X-P |
| ET Solar | ET-P672300WW, ET-P672305WW, ET-P672310WW, ET-P672315WW |
| Hanwha Q Cells | Q.PRO L-G2 305, Q.PRO L-G2 310, Q.PRO L-G2 315 |
| Hareon | HR-280P-24/Ba, HR-285P-24/Ba, HR-290P-24/Ba, HR-295P-24/Ba, HR-300P-24/Ba, HR-305P-24/Ba, HR-310P-24/Ba |
| Hyundai | HiS-M300TI, HiS-M305TI, HiS-M310TI, HiS-M315TI, HiS-M320TI, HiS-M325TI, HiS-S325TI, HiS-S330TI, HiS-S335TI, HiS-S340TI, HiS-S345TI, HiS-S350TI |
| Itek Energy | IT250HE, IT255HE, IT260HE, IT265HE, IT270HE, IT275HE, IT280HE, IT285HE, IT290HE, IT295HE, IT300HE, IT305HE, IT310HE, IT295SE, IT300SE, IT305SE, IT310SE, IT315SE, IT350SE, IT355SE, IT360SE, IT365SE |
| JA Solar | JAP6 72-300/3BB, JAP6 72-305/3BB, JAP6 72-310/3BB, JAP6 72-315/3BB, JAP6 72-320/3BB |
| Kyocera | KD315GX-LFB, KU260-6MCA, KU265-6MCA, KD255GX-LFB2, KD260GX-LFB2, |

| | |
|----------------------------|---|
| LG | LG275S1C-G4, LG280S1C-G4, LG285S1C-G4, LG300N1C-G4, LG300N1K-G4, LG300N1T-G4, LG305N1C-G4, LG305N1K-G4, LG310N1C-G4, LG310N1K-G4, LG310N1T-G4, LG315N1C-G4, LG320N1C-G4, LG335S2W-G4, LG340S2W-G4, LG360N2W-B3, LG365N2W-B3, LG365N2W-G4, LG370N2W-G4, LG375N2W-G4, LG380N2W-G4, LG385N2W-G4, LG390N2W-A5, LG395N2W-A5, LG400N2W-A5 |
| Mitsubishi | PV-MLE270HD, PV-MLE275HD, PV-MLE280HD |
| Panasonic | VBHN285J40 |
| Phono Solar Tech | PS255M-20/U, PS260M-20/U, PS265M-20/U, PS270M-20/U, PS275M-20/U, PS280M-20/U PS300P-24T, PS305P-24T, PS310P-24T PS315P-24T, PS320P-24T, PS325P-24T |
| Renesola | JC 255 M-24/Bbs, JC 260 M-24/Bbs, JC 265 M-24/Bbs, JC 270 M-24/Bbs, JC 250 M-24/Bb, JC 255 M-24/Bb, JC 260 M-24/Bb, JC 305 M-24/Abs, JC 310 M-24/Abs, JC 315 M-24/Abs, JC 320 M-24/Abs, JC 325 M-24/Abs, JC 330 M-24/Abs, JC 335 M-24/Abs, JC 330 S-24/Abs, JC 335 S-24/Abs, JC 340 S-24/Abs, JC 345 S-24/Abs, JC 270 S-24/Bbs, JC 280 S-24/Bbs, JC 285 S-24/Bbs |
| Sanyo | HIP-190BA3, HIP-195BA3, HIP-200BA3, HIP-205BA3, HIT-N215A01, HIT-N220A01, HIT-N225A01 |
| Silfab | SLA280M, SLA285M, SLA290M, SLA295M, SLA300M SLG335M, SLG340M, SLG345M, SLG350M, SLG355M, SLG360M |
| SolarWorld (V2.5 frame) | Sunmodule SW series: SW 220 mono and poly, SW 225 poly, SW 230 poly, SW 235 poly, SW 240 mono and poly, SW 245 mono and poly, SW 250 mono, SW 255 mono, SW 260 mono, SW 265 mono, SW 270 mono Sunmodule Plus series: 285W mono, 280W mono, 275W mono, 270W mono, 265W mono, 260W mono, 255W mono, 250W mono Sunmodule Protect 275W mono Sunmodule Protect 270W mono Sunmodule Protect 265W mono Sunmodule SW 245 - 255 poly / Pro-Series |

| | |
|----------------------------|---|
| SolarWorld (33mm frame) | Sunmodule Pro-Series: 250W poly, 255W poly, 260W poly 315W XL mono, 320W XL mono, 325W XL mono, Sunmodule Plus: 260W mono, 270W mono, 275W mono, 280W mono, 285W mono |
| Stion | STO-135A, STO-140A, STO-145A, STO-150A |
| SunEdison | F310EzD, F315EzD, F320EzD, F325EzD, F330EzD, F335EzD, F310EzC, F315EzC, F320EzC, F325EzC, F330EzC, F335EzC, R330EzC, R335EzC, R340EzC, R345EzC, R350EzC, R355EzC |
| SunPower | X21-355-BLK, X21-345, SPR-E20-327, SPR-E19-320 |
| Trina | TSM-225 PC/PA05, TSM-230 PC/PA05, TSM-235 PC/PA05, TSM-240 PC/PA05, TSM-245 PC/PA05 |
| Yingli | YL230P-29b, YL235P-29b, YL240P-29b, YL245P-29b |

Fault Current Path Diagram



Items are listed in the fault current path in order from the PV Panel to the Grounding Lug:

1. PV Panel
2. Grounding Mid Clamp Kit
3. Helio Rail HR150, HR250, HR350 and/or HR500
4. Grounding Lug

Fault Current Path 

Tools Required for Installation

Electric Drill or Impact Driver.
Note that the use of an impact driver is strongly discouraged for all stainless nut and bolt hardware.



3/8" Socket wrench



Sockets for 3/8" drive sockets, 7/16", 1/2", 9/16" and 1-1/16"



Torque Wrench 3/8" drive, 0 to 35 ft. lbs.



Anti-seize compound (Permatex 80071 or equivalent).



Tape measure



Saws for cutting aluminum posts and rails as necessary



Chalk line or laser



Torque Values for Pitched Roof System

These values must be adhered to, both for mechanical strength and to insure the performance of the integral grounding and bonding features. It is required that a torque wrench be used to measure the bolt torque during final assembly, and it is recommended that anti-seize compound be applied to the screw threads.

| Hardware | Torque lbs. |
|---|----------------------------|
| 1/4-20 Bolts and Hex Flange Nut | 7.5 ft. lbs. |
| 1/4-20 Ground Lug, Flange Nut with 7/16 Hex Head | 7.5 ft. lbs. |
| 1/4-20 Ground Lug, Setscrew with 1/8 Allen drive. | 4.2 ft. lbs. (50 in. lbs.) |
| 1/4-20 Mid or End Clamp, Female Standoff with 7/16" Hex Head Collar Nut | 7.5 ft. lbs. |
| 3/8-16 Nuts | 15 ft. lbs. |
| M10 Bolts | 17 ft. lbs. |
| M10 Set Screws (for steel panels) | 10 ft. lbs. |
| M10 Set Screws (for aluminum panels) | 8 ft. lbs. |

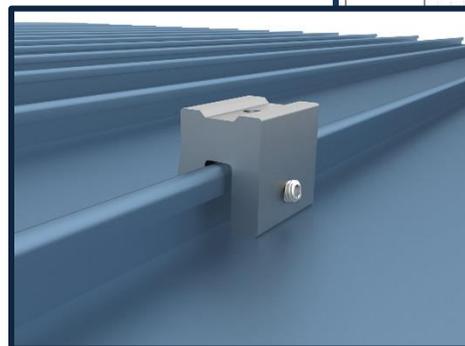
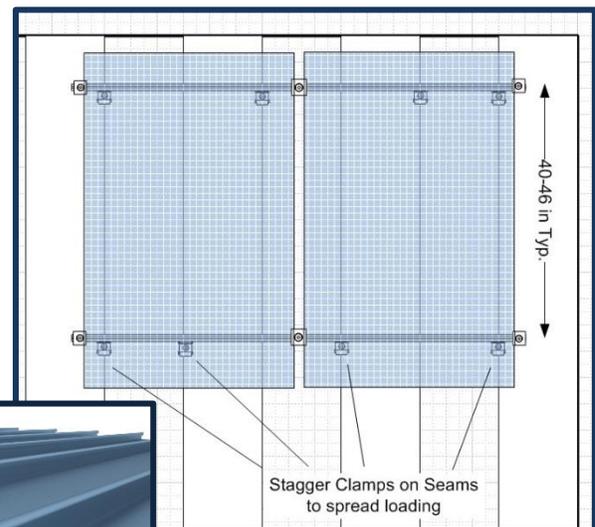
Portrait Panel Configuration:

With a full range of components the EZ Standing Seam Roof Mounting System can be configured in an endless variety of designs.

A typical portrait roof layout features two East-West rails mounted to North-South seams using the EZ Standing Seam Roof Mounting System. Mid Clamps are used between PV panels, they will produce 1/2" spacing between PV panel frames. End Clamps are used to secure PV panels at the ends of a row.

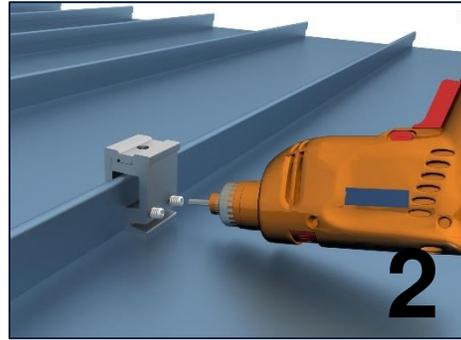
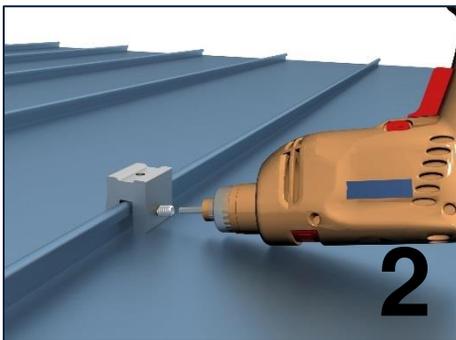
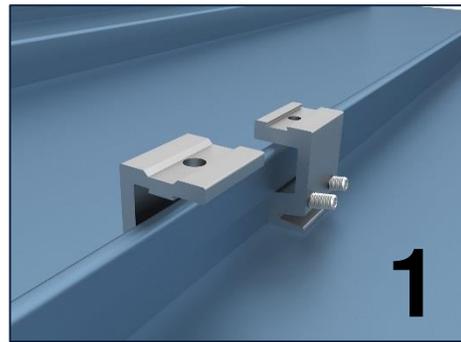
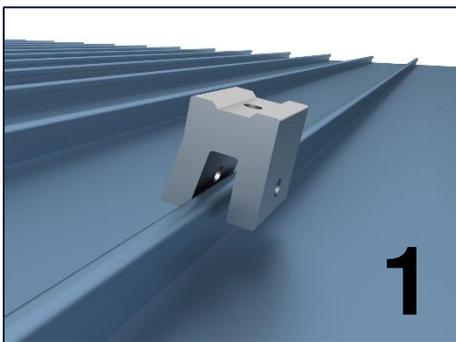


The EZ Standing Seam Roof Mounting System can be mounted in a staggered fashion so that the loads are shared across the seams. Consult a structural engineer for attachment frequency and roof construction.



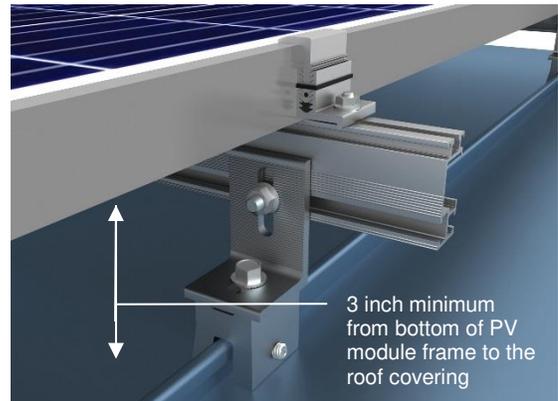
EZ Standing Seam Roof Mounting System Installation:

1. Select the correct EZ Standing Seam Roof Mounting System to fit your roof. Snap a line or use a laser to line up the clamps on the roof panel seams.
2. Tighten to the torque value appropriate for your roof panel material. Tighten to 10 ft. lbs. of torque for steel panels and 8 ft. lbs. of torque for aluminum panels.
3. Install the L-Foot to the Standing Seam Clamp in the desired orientation. Then attached the HR Series Rail to the L-Foot.



Minimum Panel Height

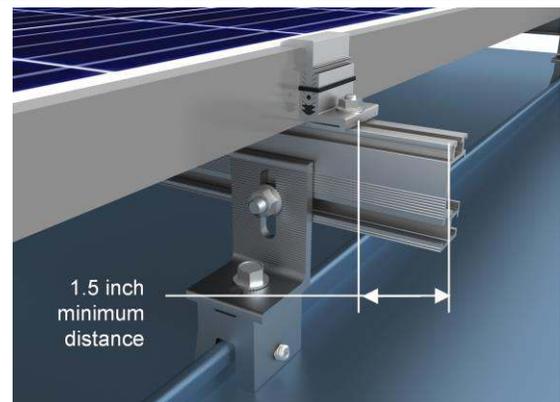
Minimum leading edge height to meet a UL1703 PV module fire standard is 3 inches.



End Clamp Attachment

There must be a minimum of 1.5 inches of Rail extending beyond the PV panel frame.

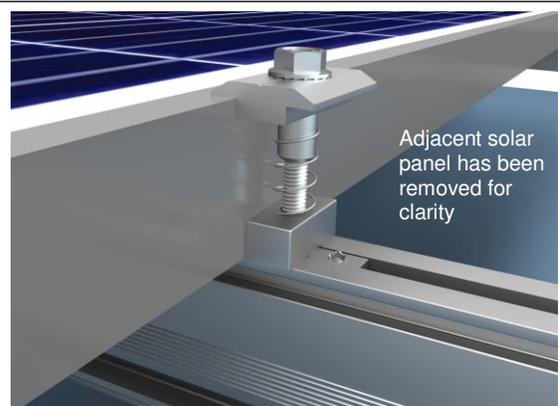
Clamp the PV panel frame by inserting the T-Bolt into the Rail slot. Position the End Clamp firmly against the PV panel frame and secure using the 1/4-20 Collar Bolt. Using a 7/16" socket, torque to 7.5 ft. lbs.



Mid Clamp Attachment

Insert the T-Bolt in the Rail slot and turn clockwise 90° to engage the head into the slot. Insert Grounding T-Bolt Holder to lock T-Bolt in place.

Thread the 1/4-20 Collar Bolt onto the top of the T-Bolt as shown. After positioning the Mid Clamp firmly against the PV panel frame, using a 7/16" socket, tighten to 7.5 ft. lbs.



Landscape Panel Configuration:

The EZ Standing Seam Roof Mounting System conveniently accommodates landscape configurations to minimize roof time and parts required. Our Shared Rail Adaptors End Clamps and Mid Clamps kit converts standard HR Rail to shared rail to allow landscape mounting of PV panels on E-W rails. Because the rails are shared, a two-up installation would require only three rails as compared to four for a standard mid and end clamp system.



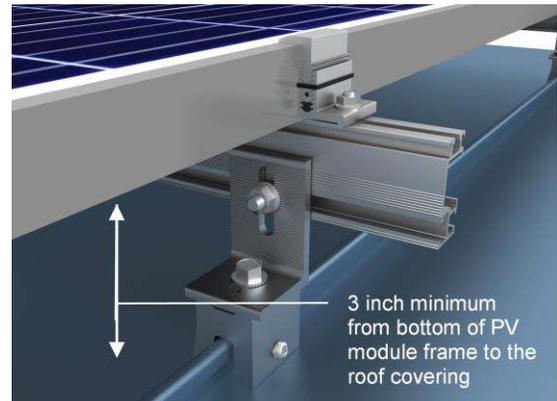
These pre-assembled Mid Clamps have a unique T-Bolt locking feature that ensure the T-Bolt remains vertical and in full contact with the rail to eliminate pull out. The spring-loaded top clamp and open collar nut accommodates module frames from 31 to 50 mm. The added Loctite easily engages the T-Bolt from the top of the collar nut. The shared rail adaptor converts standard rail to shared rail to allow landscape mounting of PV panels on E-W rails.



The SunModo self-grounding system that includes the pre-assembled universal bonding clamp eliminates separate module grounding hardware and saves installation cost.

Minimum Panel Height

Minimum leading edge height to meet a UL1703 PV module fire standard is 3 inches.

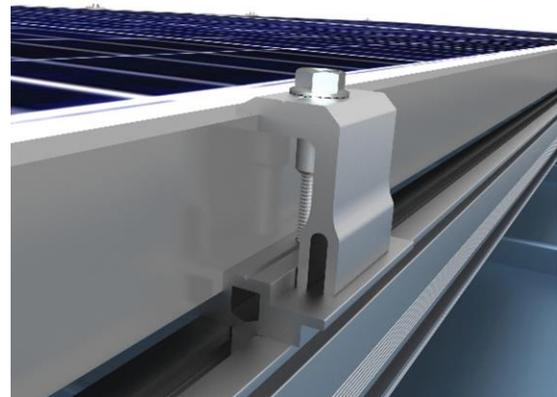


Shared Rail End Clamp Attachment

End Clamps are used at the ends of a row of PV panels.

Insert the T-Bolt in the Rail slot and turn clockwise 90° to engage the head into the slot. Insert Grounding T-Bolt Holder to lock T-Bolt in place.

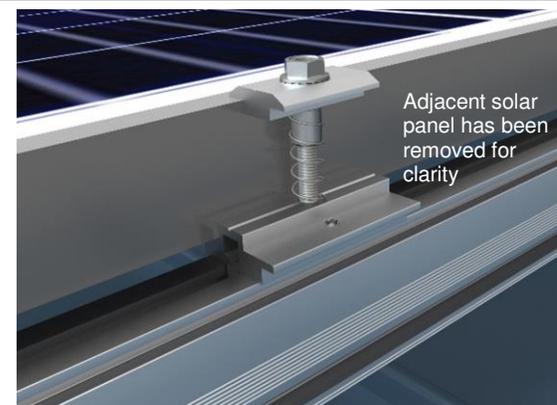
Thread the 1/4" Collar Bolt onto the top of the T-Bolt as shown. After positioning the End Clamp firmly against the PV panel frame, using a 7/16" socket, tighten to 7.5 ft. lbs.



Shared Rail Mid Clamp Attachment

Insert the T-Bolt in the Rail slot and turn clockwise 90° to engage the head into the slot. Insert Grounding T-Bolt Holder to lock T-Bolt in place.

Thread the 1/4" Collar Bolt onto the top of the T-Bolt as shown. After positioning the Mid Clamp firmly against the PV panel frame, using a 7/16" socket, tighten to 7.5 ft. lbs.



Ground Wire Attachment

The picture shows a grounding lug mounted on one Rail per row of panels, and a #6 solid copper grounding wire connecting the Ground Lugs to the building ground per NEC 690.47.



Ground Lug Installation

One Rail per row of panels should have a Ground Lug for fastening the ground conductor to the array. The Ground Lug is mounted on the top or side of the Rail using a special 1/4" T-Bolt, Grounding Spacer, and Flange Nut. Grounding Lugs K10179-001, and detailed installation document D10003 are available from SunModo separately.



Rail End Covers

Rail End Covers can be attached to the mounting rails as shown.





EZ Standing Seam Roof
Mounting System

See www.sunmodo.com for current warranty documents and information.

SunModo Corporation
Ph: 360-844-0048