



RBI Solar Installation Guide

Versatile IB Roof Mount Solution | RS-VS

IB (Integrated Bonding) Pitched Roof Mounting System for
Commercial & Residential Solar PV Applications



ETL Listed to
UL 2703
for Bonding and Grounding

RBI Solar RS-VS IB | Installation Guide 2019 v1

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UL 2703 LISTING SUMMARY

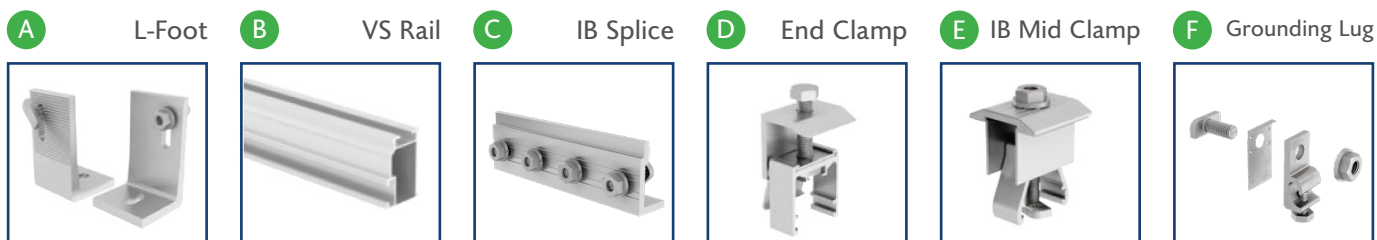
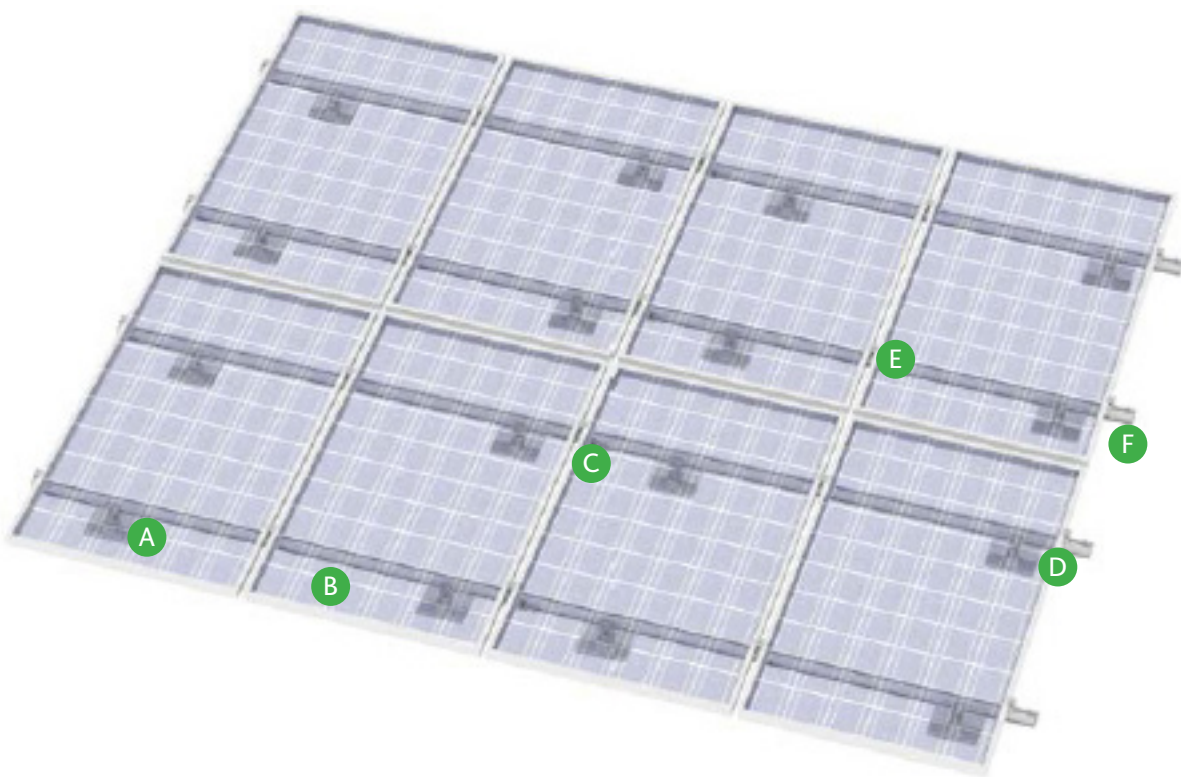
The entire RBI Solar Versatile Roof Mount Solution (VS and VS IB) is ETL Listed to UL 2703 for Bonding and Grounding. Some components, such as Flashing and L-Feet, are not in the ground path and therefore were not required to be evaluated under UL 2703.

RBI SOLAR WARRANTY

Installation instructions (and applicable building code) must be followed or product warranty is void. RBI Solar will not be responsible for any loss and/or liability for any claim resulting from installations that are not in accordance with installation guide instructions and/or applicable building code.

The RBI Solar Versatile Roof Mount Solution provides a simple, fast, and cost-effective flush mounting solution for PV modules on pitched roofs.

- End Clamps and Mid Clamps are designed for module frame thicknesses ranging from 30-50mm. Inventory and project planning are simplified with just one End Clamp and two Mid Clamp part numbers. Clamps snap into place anywhere along the RS-VS Rail.
- Bonding is simplified with integrated bonding (IB) Mid Clamp and Splice Connector.
- Installation time is reduced with pre-assembled End Clamps, IB Mid Clamps, IB Splice Connectors, and L-Feet.
- Installation confidence is improved with T-bolt alignment indicators on L-Foot attachments.
- Strength and long-life are assured with 304 stainless steel hardware and 6000 series mill finish aluminum alloy.
- Costs are reduced and rail attachment spans are increased with two optional high strength-to-weight ratio Rail designs.

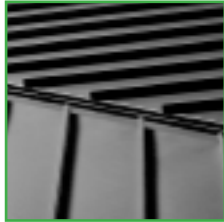


APPLICABLE ROOF TYPES

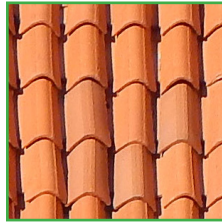
The RBI Solar RS-VS mounting system can be mounted to any roof type with the proper flashing method. Most code-compliant Flashing methods are compatible with the RBI Solar RS-VS system's L-Foot. The roof covering will dictate the proper Flashing method. For additional compatible roof attachment/flashing methods contact RBI Solar. Common roofing types are shown below.



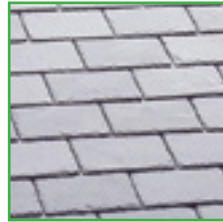
Asphalt Shingle



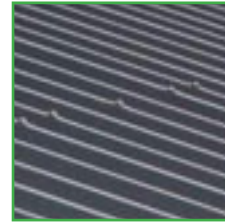
Standing-Seam



Curved Tile



Slate Tile



Trapezoidal



Membrane

The RBI Solar RS-VS mounting system carries a Class A fire rating from Intertek under UL 1703 on steep-sloped roofs when used with all Type 1, Type 2, and Type 3 modules. It is important to check the following items prior to installation on the roof:

- Verify roof rafter size, material, and span to ensure that the roof structure is sound and capable of supporting the additional load of the PV array within local climatic conditions (wind/snow loads).
- Measure roof surfaces and account for any obstacles such as chimneys, parapets, skylights, or roof vents.
- Confirm roof construction, type, and condition is suitable to last the life of the product.
- Confirm that the roof is fire resistant and rated for the application.
- Account for any roof access areas and required municipal set-back distances following the local jurisdiction.

FLASHING METHODS FOR ASPHALT SHINGLE ROOF

Note: The components in this section were not evaluated by Intertek since they are not on the grounding path.

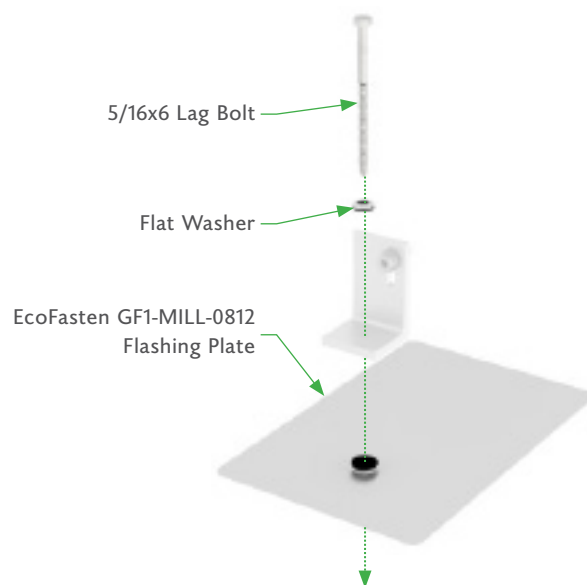
RBI Solar RS-VS Flashing Set with Lag Bolt

This code-compliant flashing set is used for residential or commercial (wood structure) applications of asphalt shingles. This set can be purchased from RBI Solar with either black or mill finish flashing plates.



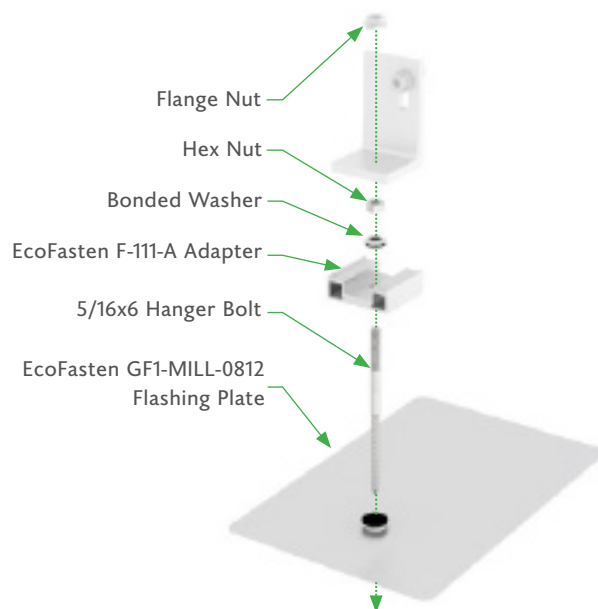
RBI Solar RS-VS GF Flashing Set with Lag Bolt

This code-compliant flashing set is used for residential or commercial asphalt shingle applications. This set can be purchased from RBI Solar with mill finish flashing plates.



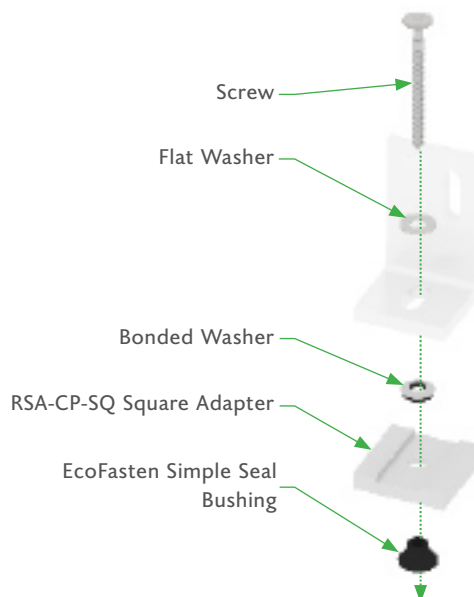
RBI Solar RS-VS Flashing Set with Hanger Bolt

This code-compliant flashing set is used for residential or commercial asphalt shingle applications. This set can be purchased from RBI Solar with mill finish flashing plates.



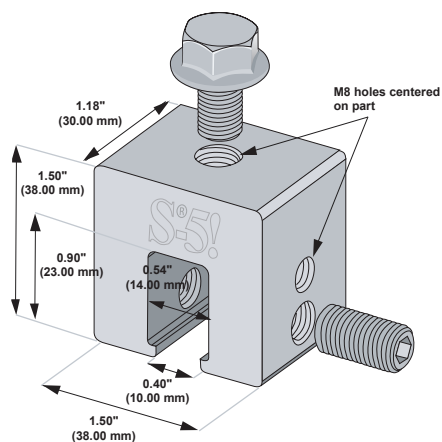
RBI Solar RS-VS Flashing Set with Simple Seal

This code-compliant flashing set is used for residential (wood frame) applications with metal roofs. This set uses a Ecofasten Simple Seal to provide water-tight penetration at each attachment point. For commercial projects with steel purlins, project-specific steel screws must be locally sourced by the customer. RBI Solar has a Simple Seal Adapter Kit that includes all components shown, except for the screw.



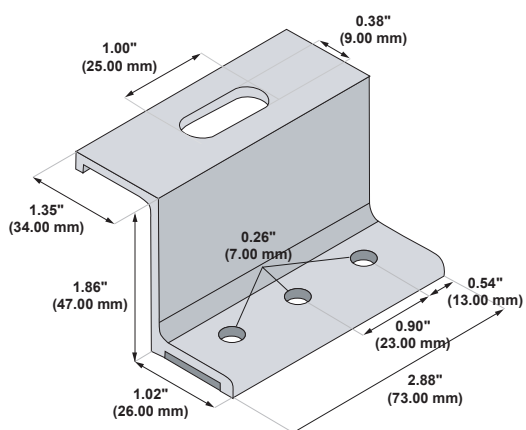
RBI Solar RS-VS Compatibility with S-5! Clamps

The RBI Solar RS-VS L-Foot can attach to all S-5! products used in projects with standing seam and corrugated metal roof panels. Below are the common brackets used in the industry.



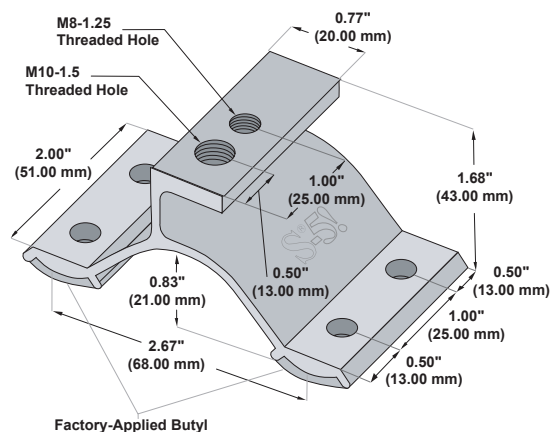
S-5-U Mini

Used for standing-seam metal roofing applications



VersaBracket-47

Used for exposed fastener metal roofing applications

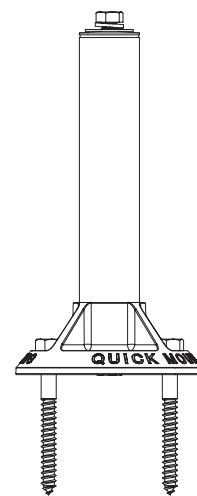
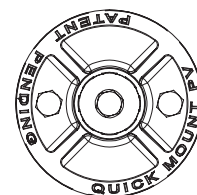
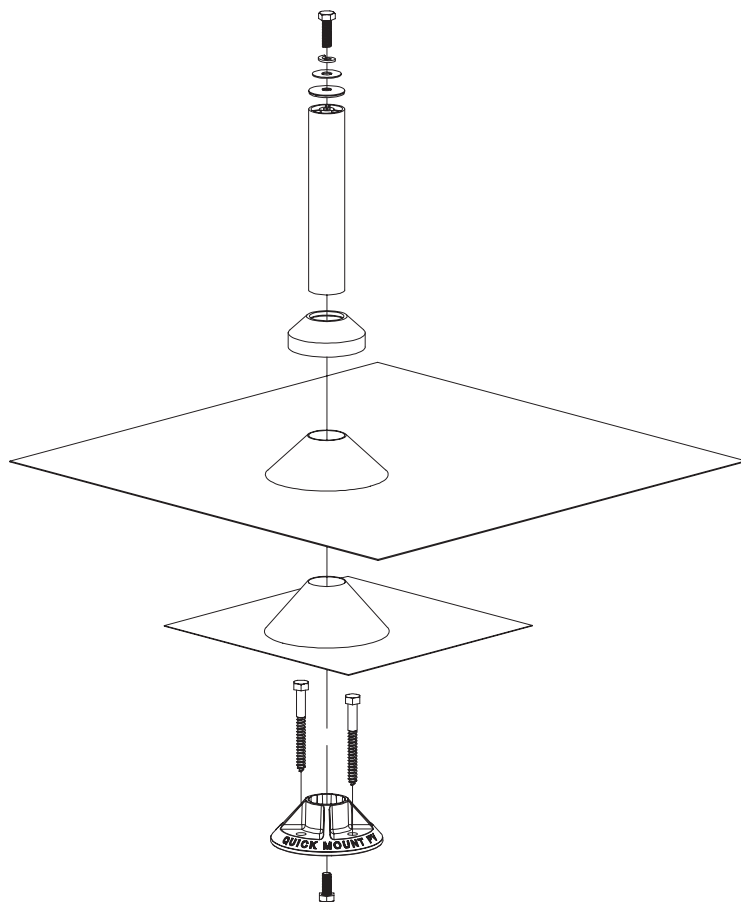


CorruBracket

Used for corrugated metal roofing applications

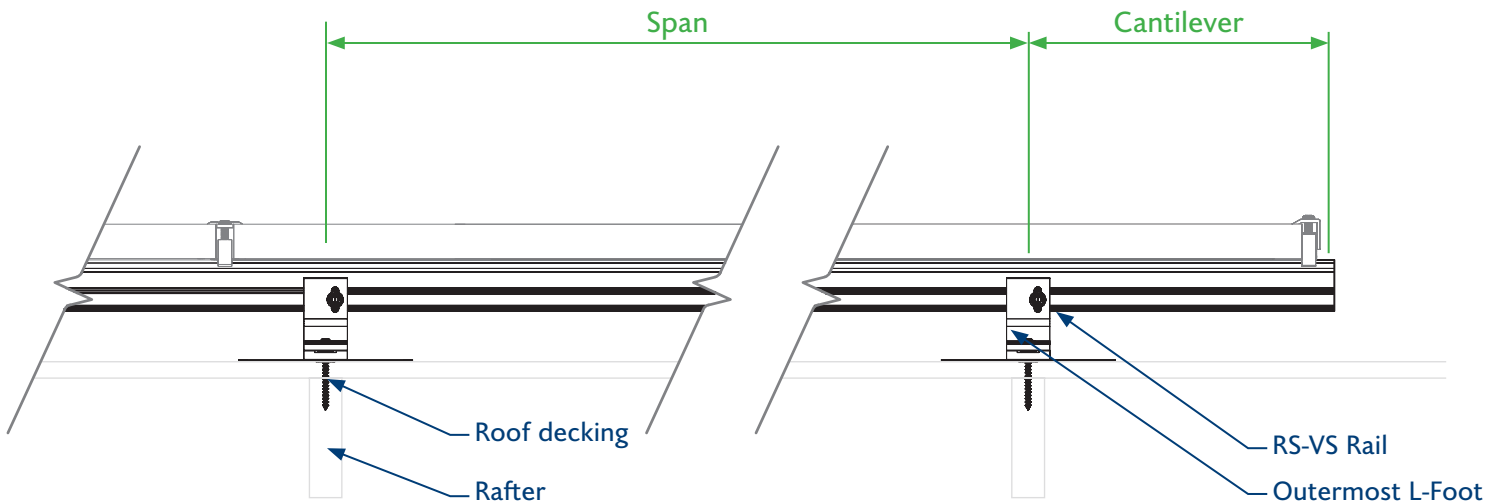
RBI Solar RS-VS Compatibility with Quick Mount PV

The RBI Solar RS-VS L-Foot can attach to all Quick Mount PV flashing components.



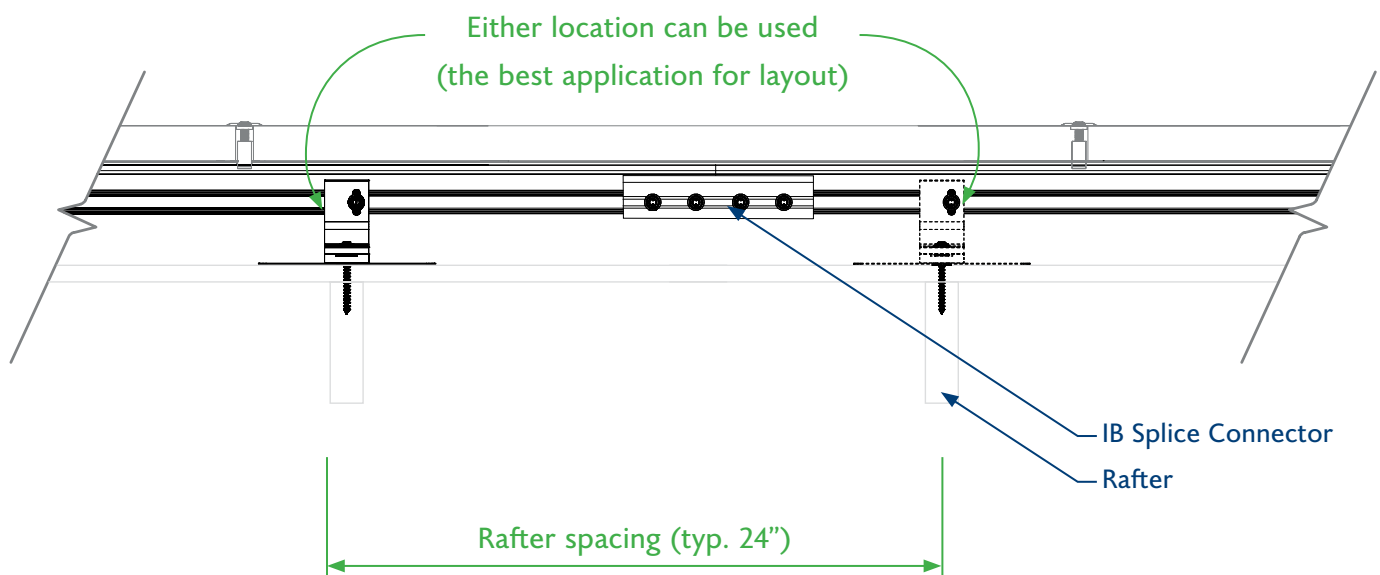
RAIL SUPPORT LOCATIONS

Stress on the RBI Solar RS-VS Rail is proportional to the loading and the length of the Rail between supports. Span is the center-to-center distance between RBI Solar RS-VS Rail supports (L-Feet). Cantilever is the distance from the outermost L-Foot support to the end of the Rail. Cantilever can not exceed 33% of the rated Rail span. Download span charts on our company website to determine spans and cantilevers for your specific application.



Rail Supports Near Splice Connectors

Continuous runs of modules require the introduction of Splice Connectors at Rail breaks. There must be one L-Foot on one side of each Splice Connector. It does not necessarily have to be the closest rafter, just the one that makes sense for your particular layout.



RAIL DESIGN

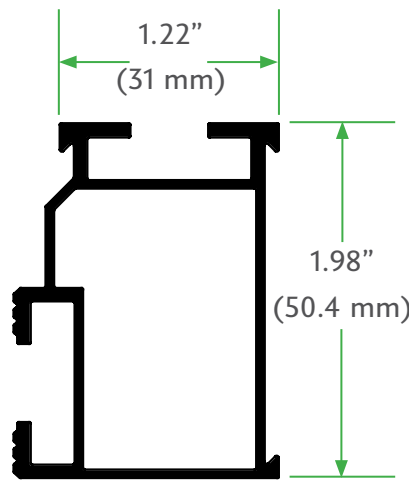
There are two sizes of 6063-T6 aluminum extruded, mill finish Rail designs available. The VS-R is an economical Rail used for most applications. The VS-C Rail is better suited for applications requiring longer spans or higher wind and snow loads.



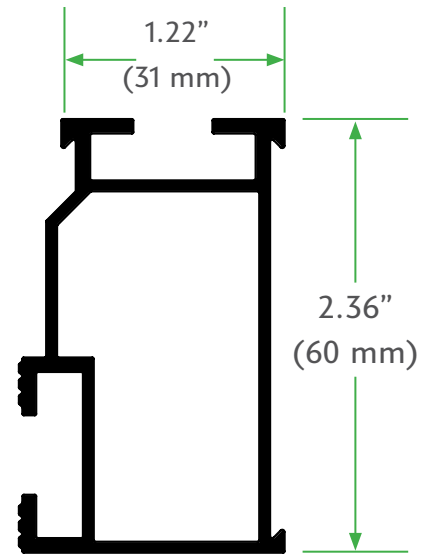
VS-R



VS-C



VS-R



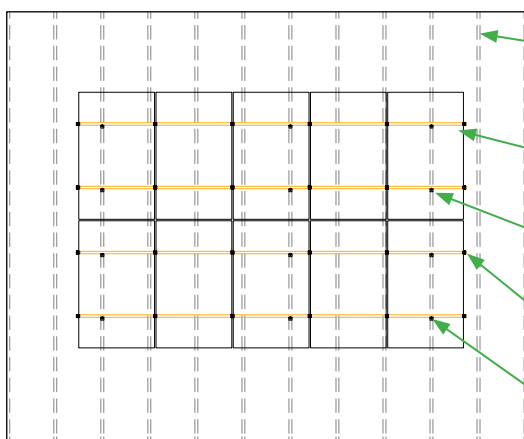
VS-C

MODULE ORIENTATION

RBI Solar RS-VS Rails should run perpendicular to structural members. The orientation of the modules is dependent on the direction of the structure you are attaching to. Trying to run the Rails parallel to the structural members limits the spacing between Rails to the spacing of the structure. This makes it very difficult to clamp down on the module in the proper locations.

Portrait Orientation

- Residential wood construction
- Standing seam metal (using S-5!)



- Rafters/standing seams run N-S
- Rails run E-W
- Clamp down modules on long side

Landscape Orientation

- Commercial construction
- Standing seam metal (attaching to Purlin)

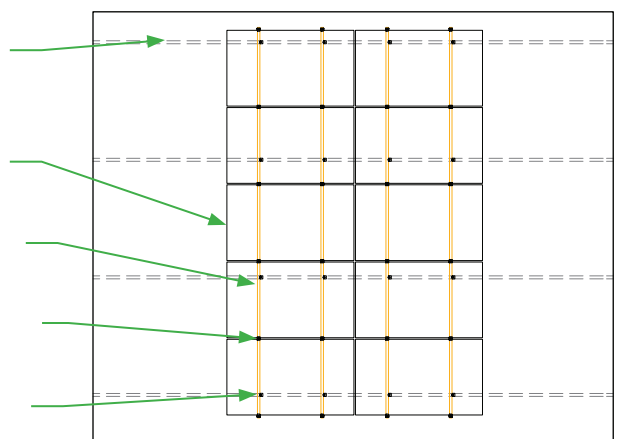
Rafters/purlins/
standing seams

Modules

RS-VS Rails

End/Mid Clamps

L-feet



- Purlins run E-W
- Rails run N-S
- Clamp down modules on long side

RAIL SUPPORT LOCATIONS

Required Tools for Mounting RBI Solar RS-VS Assembly

- Socket wrench
- Torque wrench , 0-10 ft-lbs
- 13 mm hex deep socket

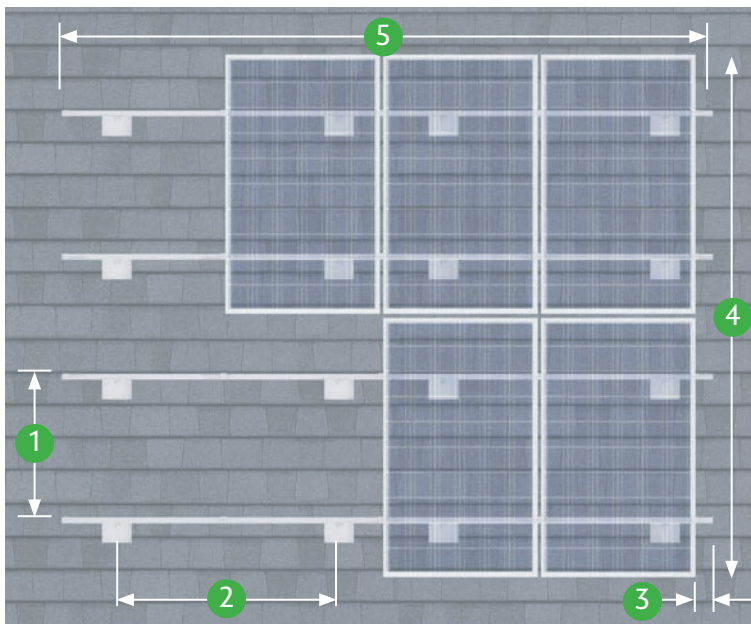
Notes:

1. Do not use power tools for installation when a torque value is required.
2. All hardware necessary for installation is provided by RBI Solar. (Excluding roof penetrations.)

Recommended Tools & Materials

- Cutoff saw (excess rail)
- Nail pry-bar (flashing beneath shingles)
- Drill bit - 1/4" (pilot hole)
- Digital laser stud finder
- Tape measure, level & chalk

RBI SOLAR RS-VS LAYOUT

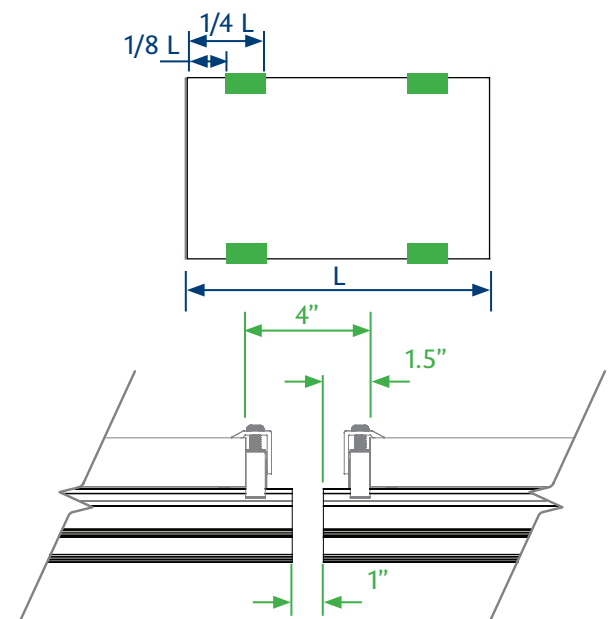


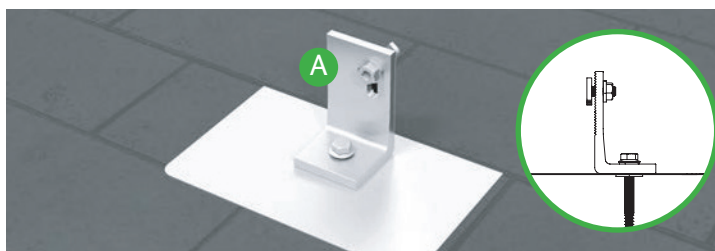
Plan the layout of the components per the dimensions below:

- 1 Approximately 2/3 to 3/4 of the module length (please refer to module manufacturer's specifications)*
- 2 For L-Foot spacing, please refer to the RBI Solar RS-VS Design Guide. Note that at least one L-Foot should be placed near each Splice Connection.
- 3 1½" minimum to allow for End Clamp attachment
- 4 Quantity of modules in the vertical direction times (module length + 0.75")
- 5 Quantity of modules in the horizontal direction times (module Length + 0.75") + 3"(min.)**

* Most PV module manufacturers have specific locations or zones where top-down clamps can be installed. Typically, this zone falls within 1/8 and 1/4 the length of the module.

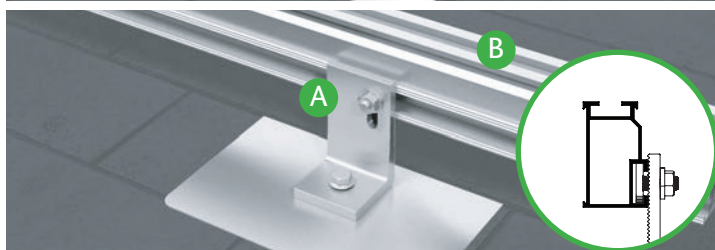
** In order to allow for thermal expansion in the system, 5 should not exceed 40 ft. or a run of 12 modules. After 12 modules (or 40 ft.), there should be a break in the Rail without a splice.





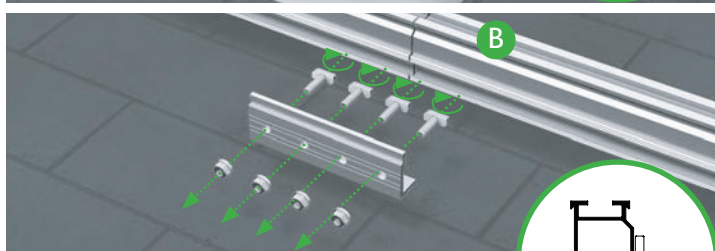
Step 1. Flashing & L-feet

Select and install the proper code compliant Flashing per the manufacturer's instructions. Attach **A** L-Feet to Flashing components.



Step 2. Rails

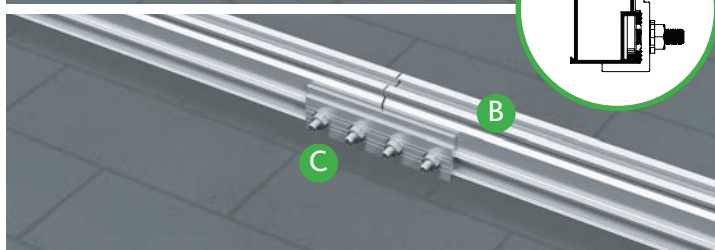
Attach the **B** Rails to the **A** L-Feet using the pre-assembled T-bolts and nuts. To ensure the T-bolts are aligned properly, make sure the line on the end of the T-bolt is perpendicular to the Rail. Tighten T-bolt to 10 ft-lbs.



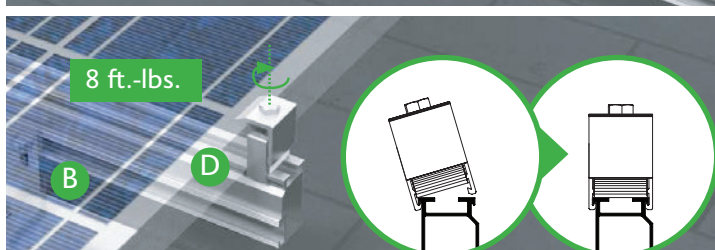
Step 3. Splice Connectors

C IB Splice Connectors are required to connect **B** Rails together and electrically bond them. Rails can be flush against each other or be spaced apart up to 1/4".

IMPORTANT: At least ONE L-foot must be installed close to each IB splice connector. See RBI Solar RS-VS Layout for additional information.



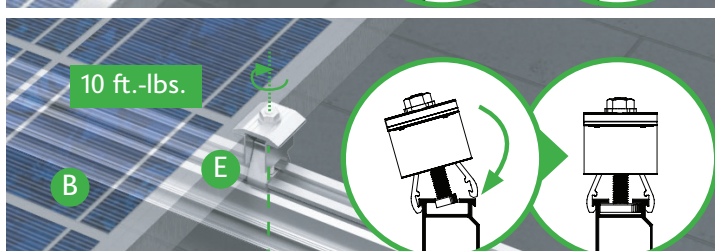
Insert the **C** Splice in the side of the **B** Rail with the four T-bolt heads lined-up with the channel openings and center the splice between the two Rails. Tighten T-bolts to 10 ft-lbs.



Step 4. End Clamps

Snap the **D** End Clamp onto the **B** Rail as shown. Secure the modules by tightening Clamp to 8 ft-lbs.

IMPORTANT: Do NOT apply additional anti-seize to the clamps.

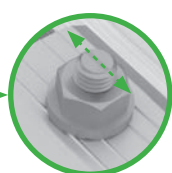


Step 5. IB Mid Clamps

Snap the **E** IB Mid Clamp onto the **B** Rail with the T-bolt head lined-up with the channel opening. Slide the next module against the IB Mid Clamp and tighten to 10 ft-lbs.

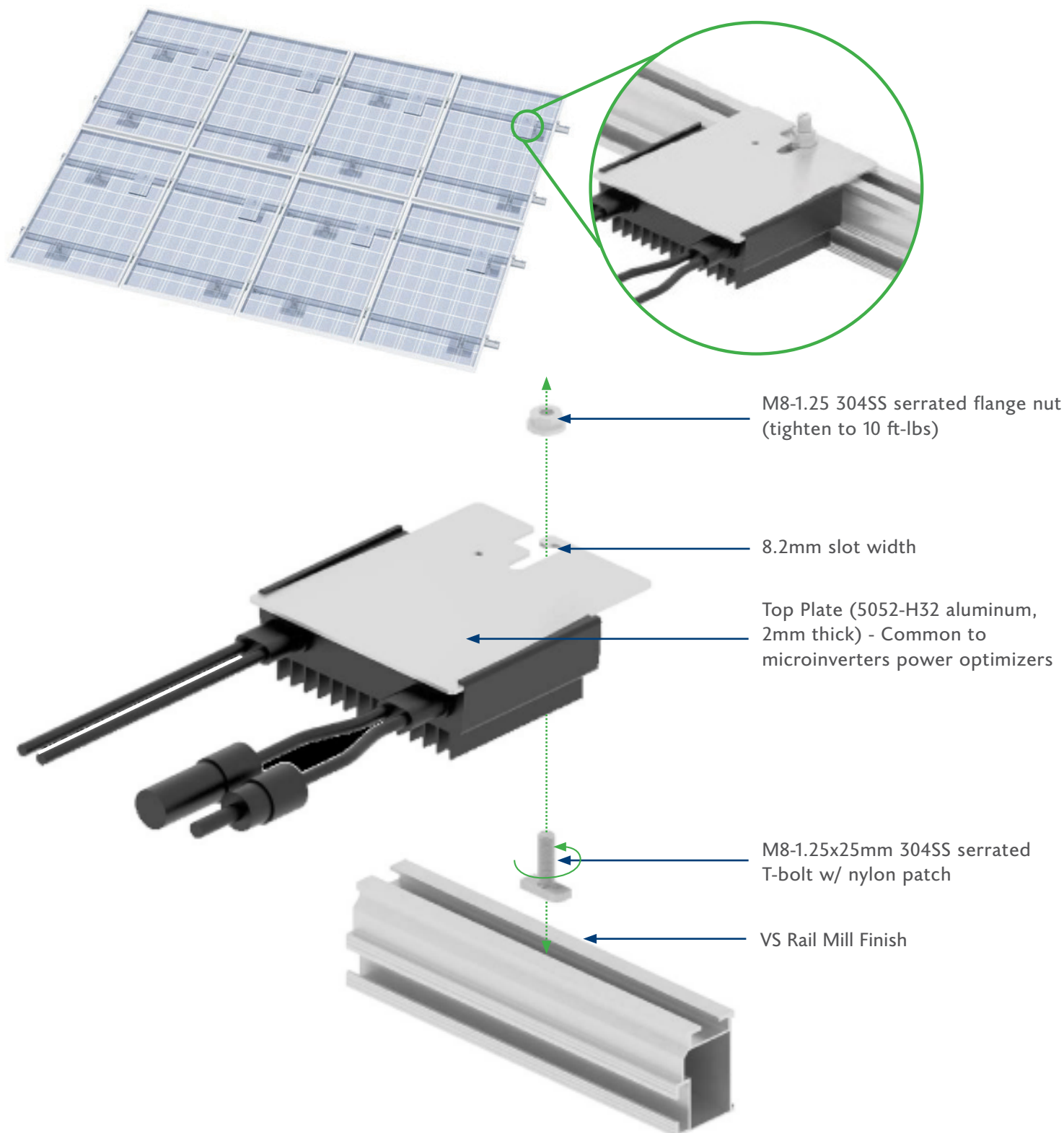
IMPORTANT: Do NOT apply additional anti-seize to the clamps.

IMPORTANT: Be sure that the T-bolt indicator line is parallel to the small ribs on the **E** IB Mid Clamp. This alignment is required for proper attachment.



RBI SOLAR ACCESSORY MOUNTING INSTALLATION

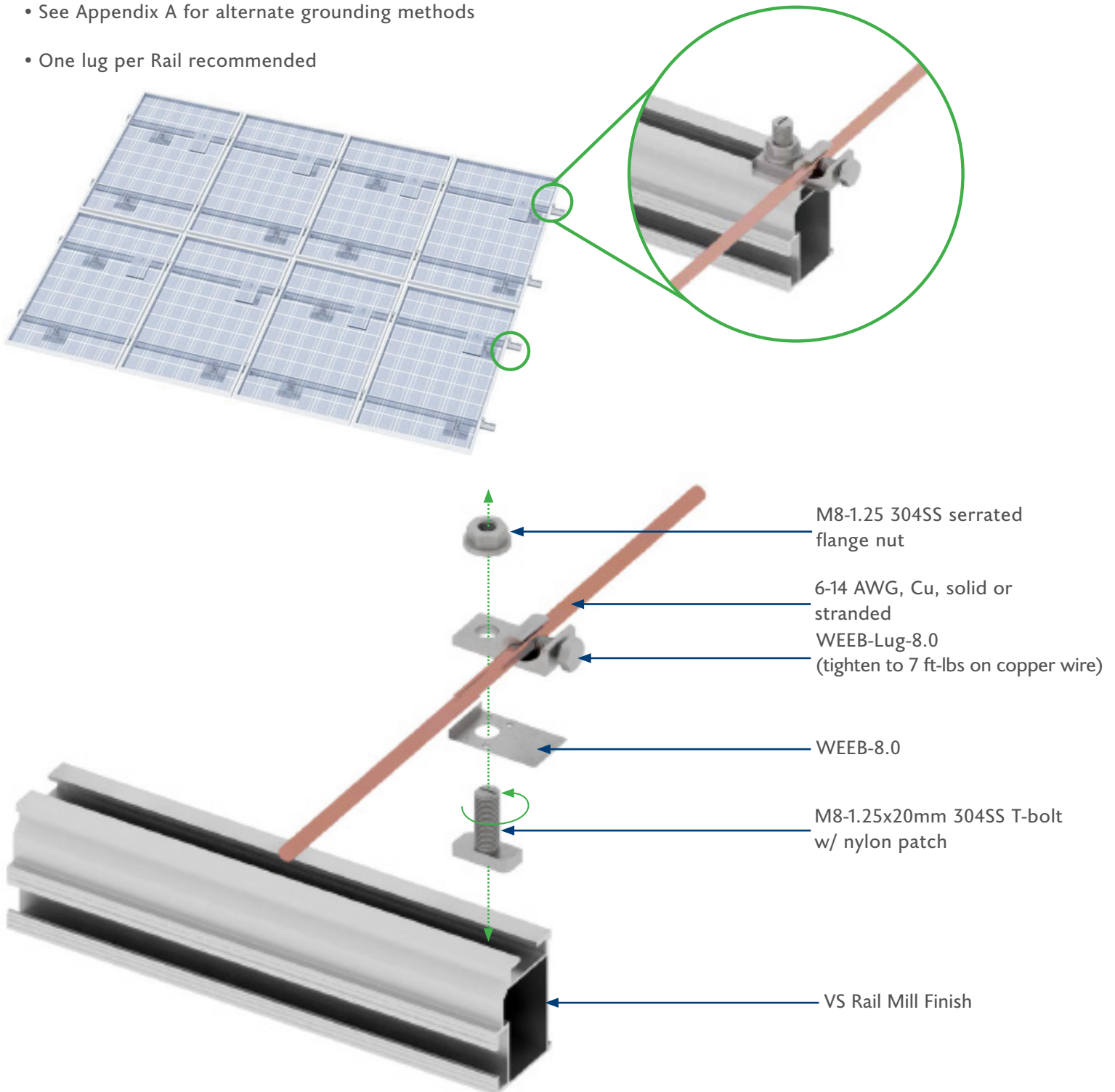
As part of the UL 2703 Listing, Solar Edge Power Optimizer top plates and other microinverters & power optimizers with top plates that meet the requirements listed below can be bonded to the rest of the system. After installing the provided hardware, tighten to 10 ft-lbs.



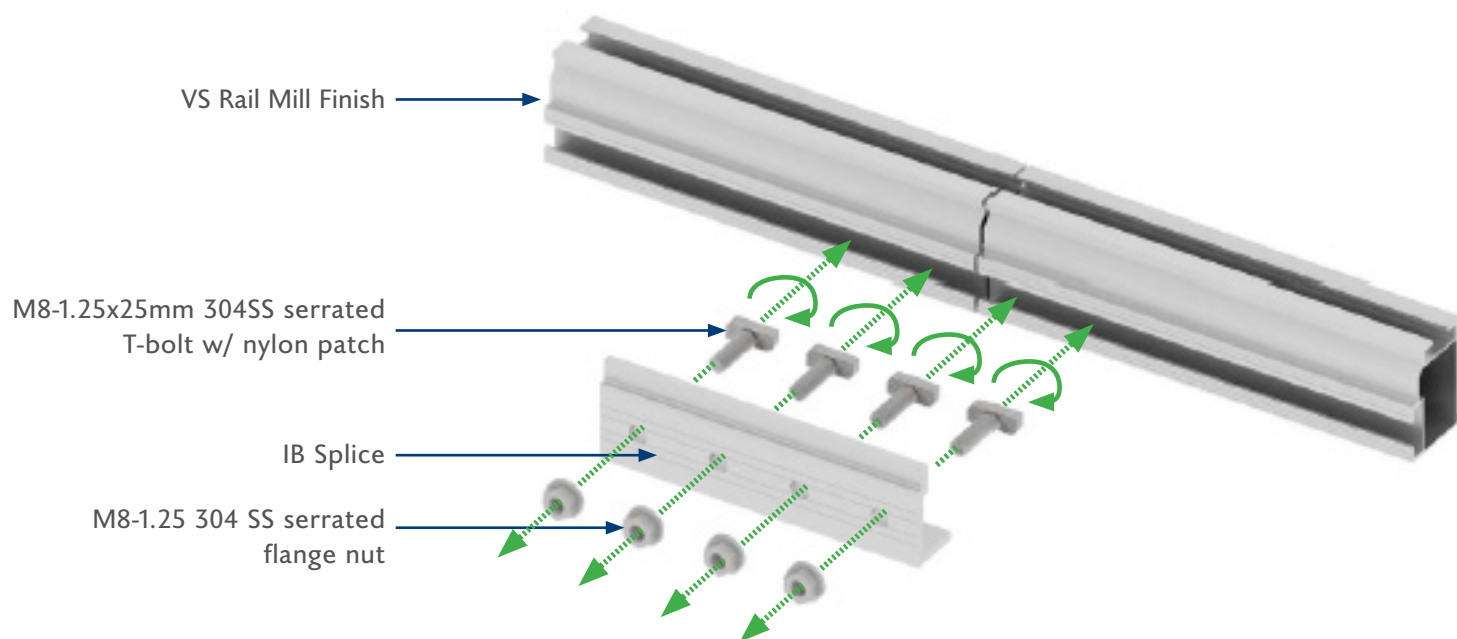
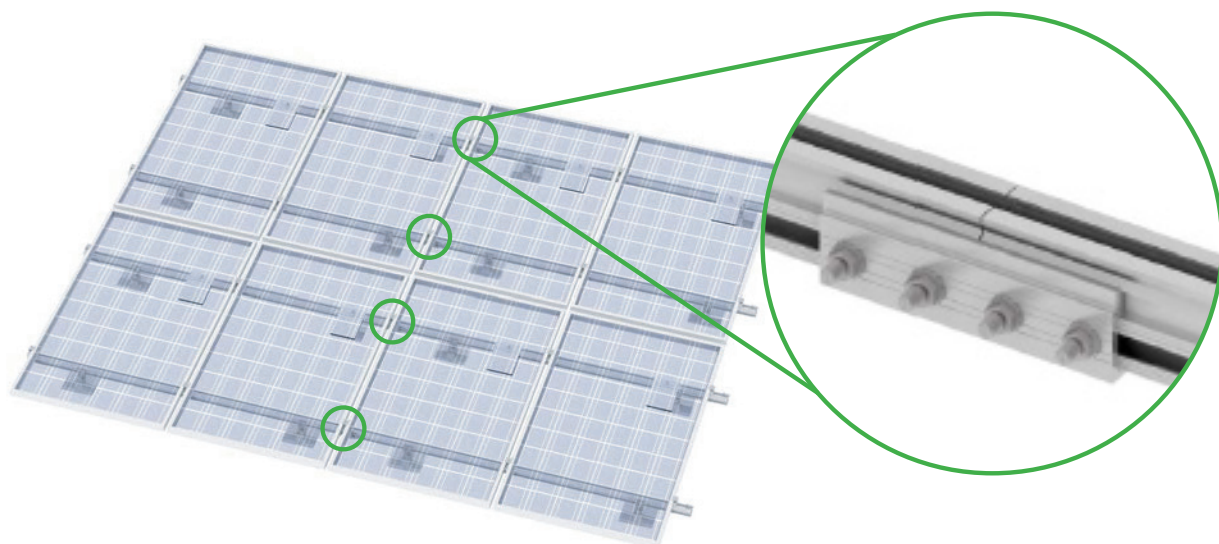
EGC/GEC Grounding at Ends (tighten to 10 ft-lbs)

NOTES:

- Only one lug per module row required
- See Appendix A for alternate grounding methods
- One lug per Rail recommended



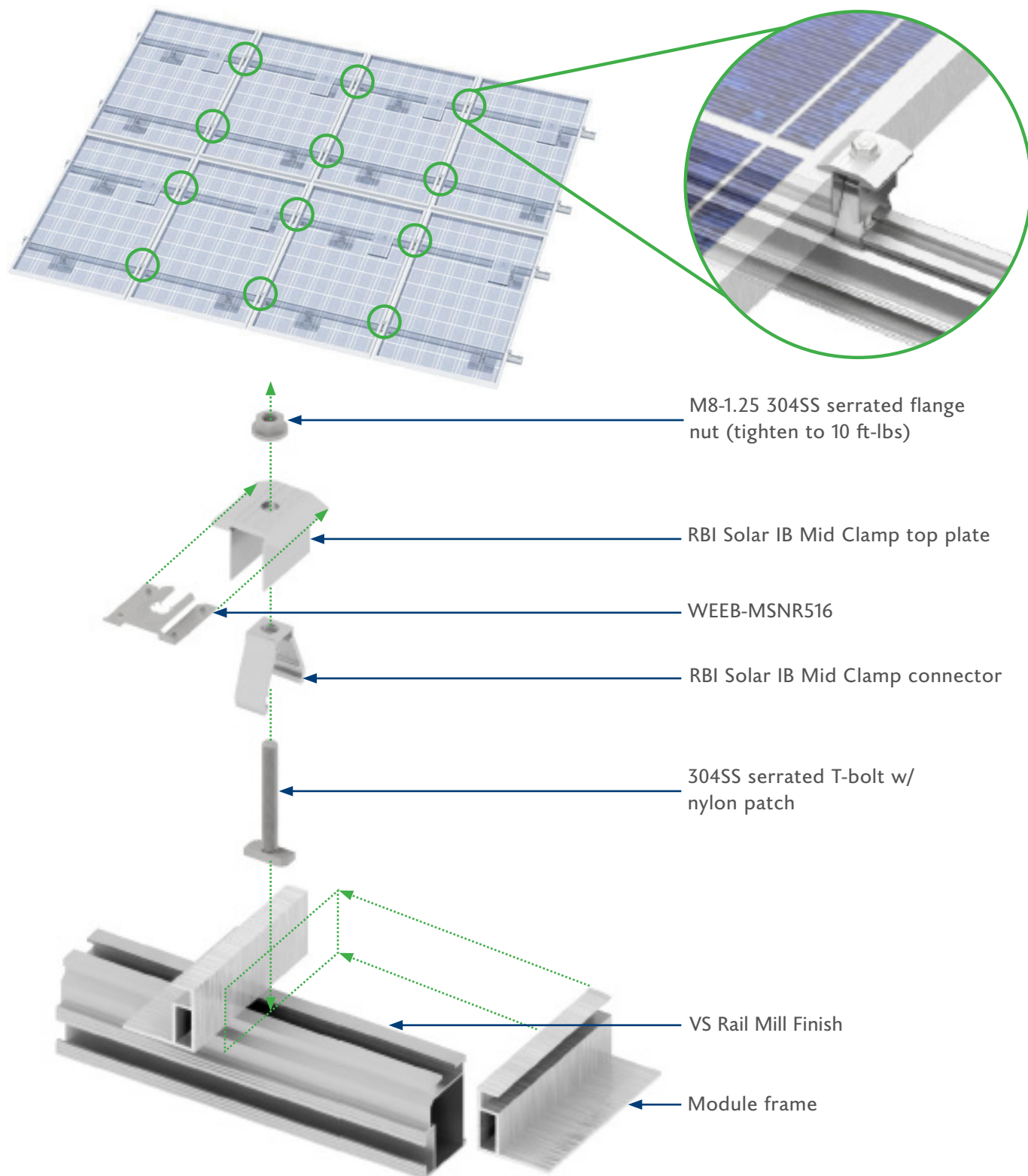
Rail-to-Rail Grounding at IB Splice (tighten to 10 ft-lbs)

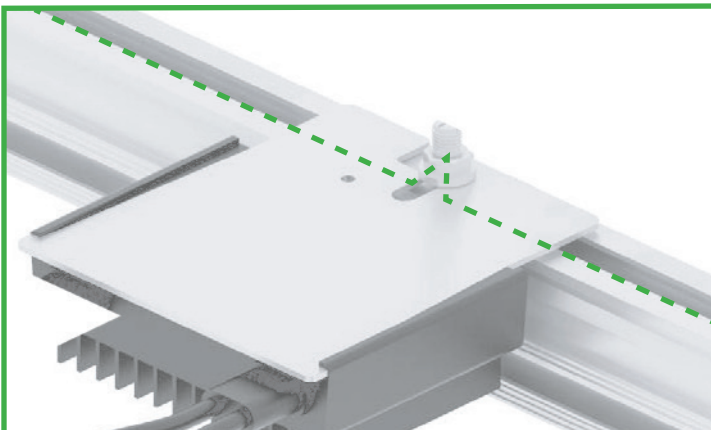


Module-to-Module and Module-to-Rail Grounding at IB Mid Clamp (tighten to 10 ft-lbs)

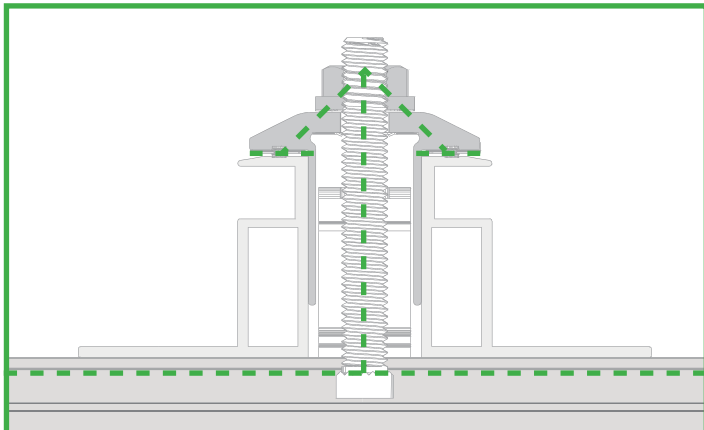
NOTE:

The End Clamp and Mid Clamp connectors are not bonded to the system. The serrated T-bolt and WEEB MSNR516 are what properly bonds the modules together and the modules to the Rail.

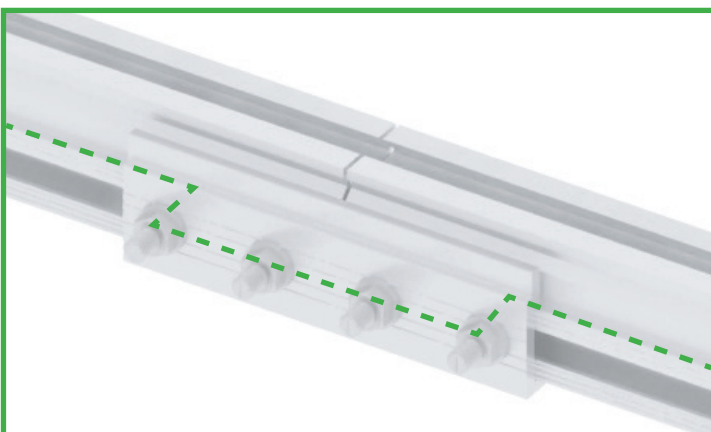




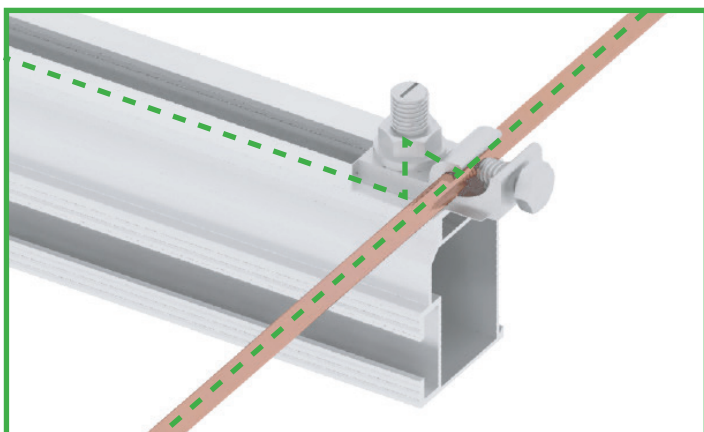
Serrated T-bolt and serrated nut bond the power optimizer flat plate to Rail.



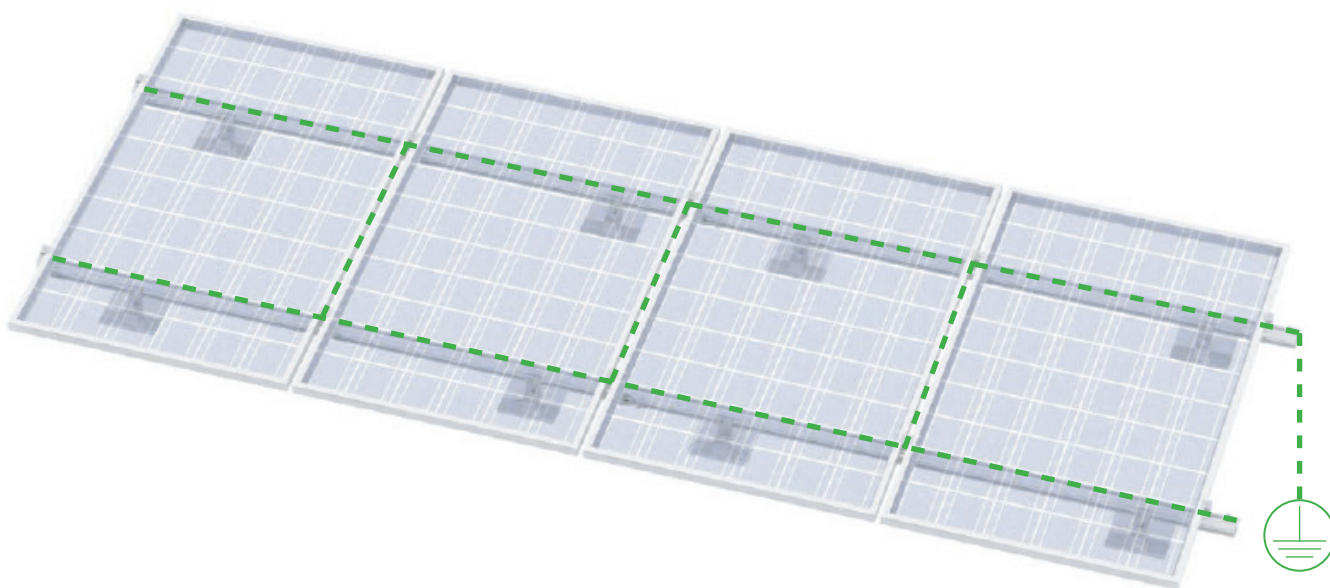
Integrated WEEB bonds module to module. Serrated T-bolt and serrated nut extend that bond to the Rail.



Serrated T-bolts and serrated nuts bond both Rails and the IB Splice Connector.

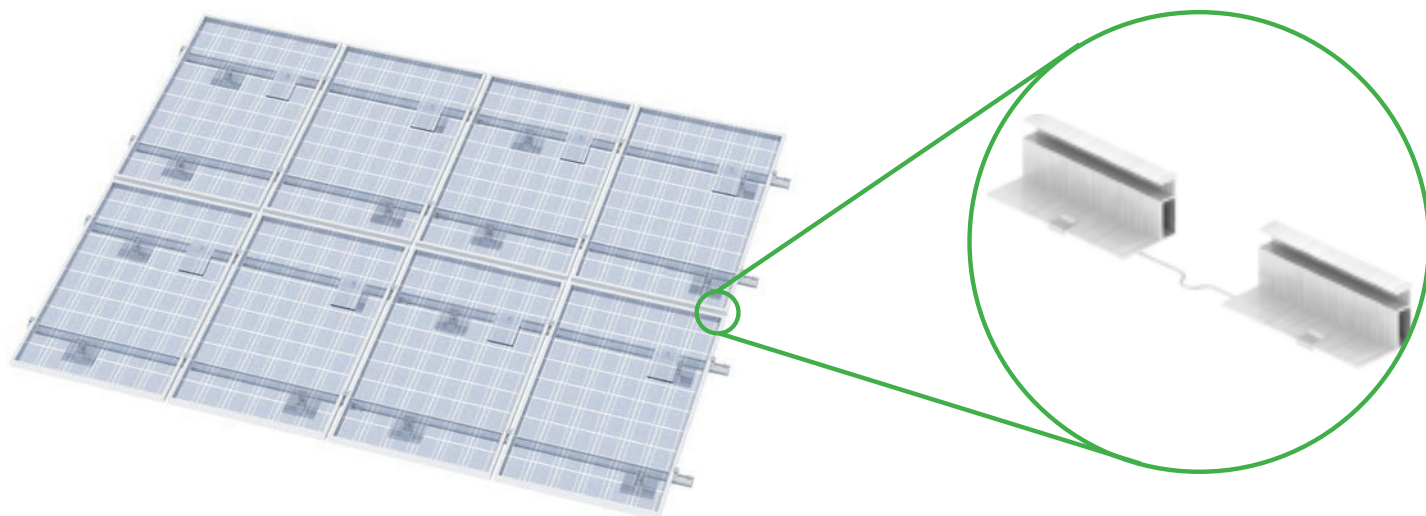


WEEB Clip bonds the rail to the lug. Grounding Lug bonds rail to copper EGC/CGE.



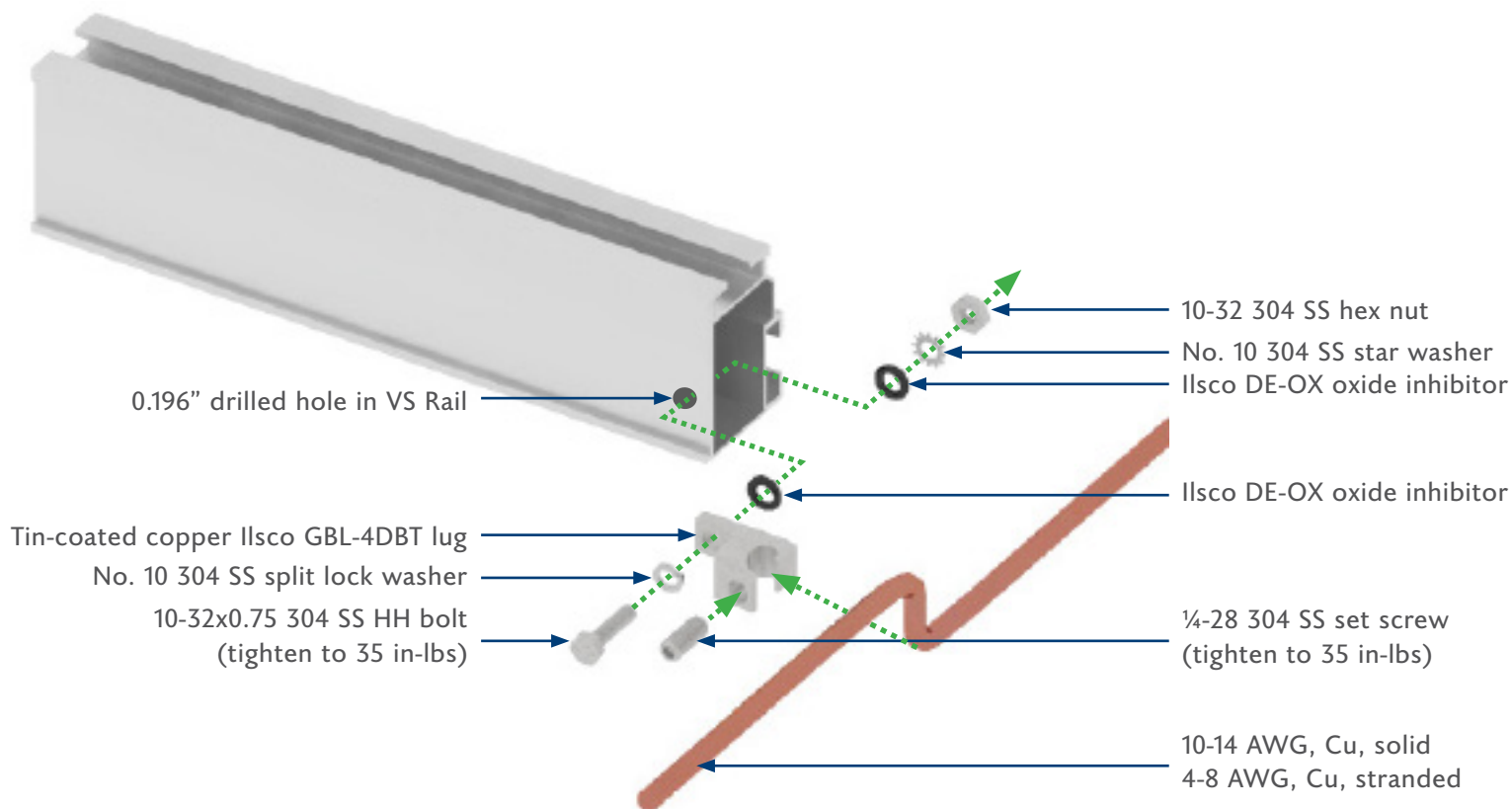
Dynobond Module Jumper Installation

The Dynobond Module Jumper can bond one row of modules to another row of modules without the need of additional Grounding Lugs and copper wire. The teeth on the Dynobond Module Jumper bites into the module frame penetrating the anodized surface. It requires no tools and can slide on either the long or short side of the module frame. For SolarWorld modules, the Dynobond Module Jumper must be installed on the short side of the module frame. For a complete list of PV modules approved for use with Dynobond Module Jumper see the table in Appendix C.



Alternate Rail-to-EGC/GEC Grounding at Ends

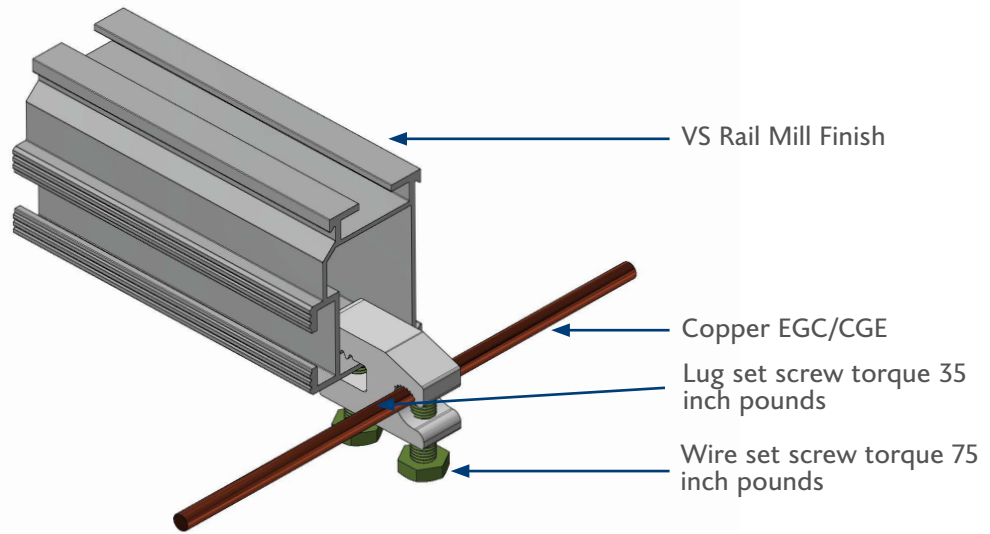
IlSCO GBL-4DBT lug



Alternate Rail-to-EGC/GEC Grounding at Ends

IlSCO SGB 4

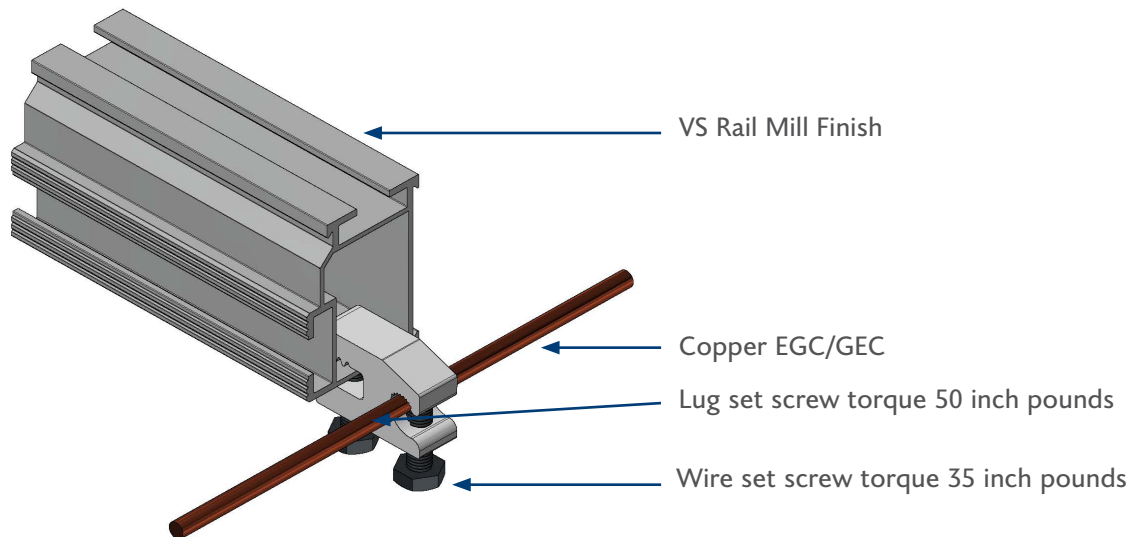
- Connects to VS Rail or VS System to EGC/GEC
- May be fastened as shown or fastened to flat side of VS Rail
- 14 AWG to 4 AWG Copper EGC/GEC
- Fasteners use 7/16" wrench or socket



Alternate Rail-to-EGC/GEC Grounding at Ends

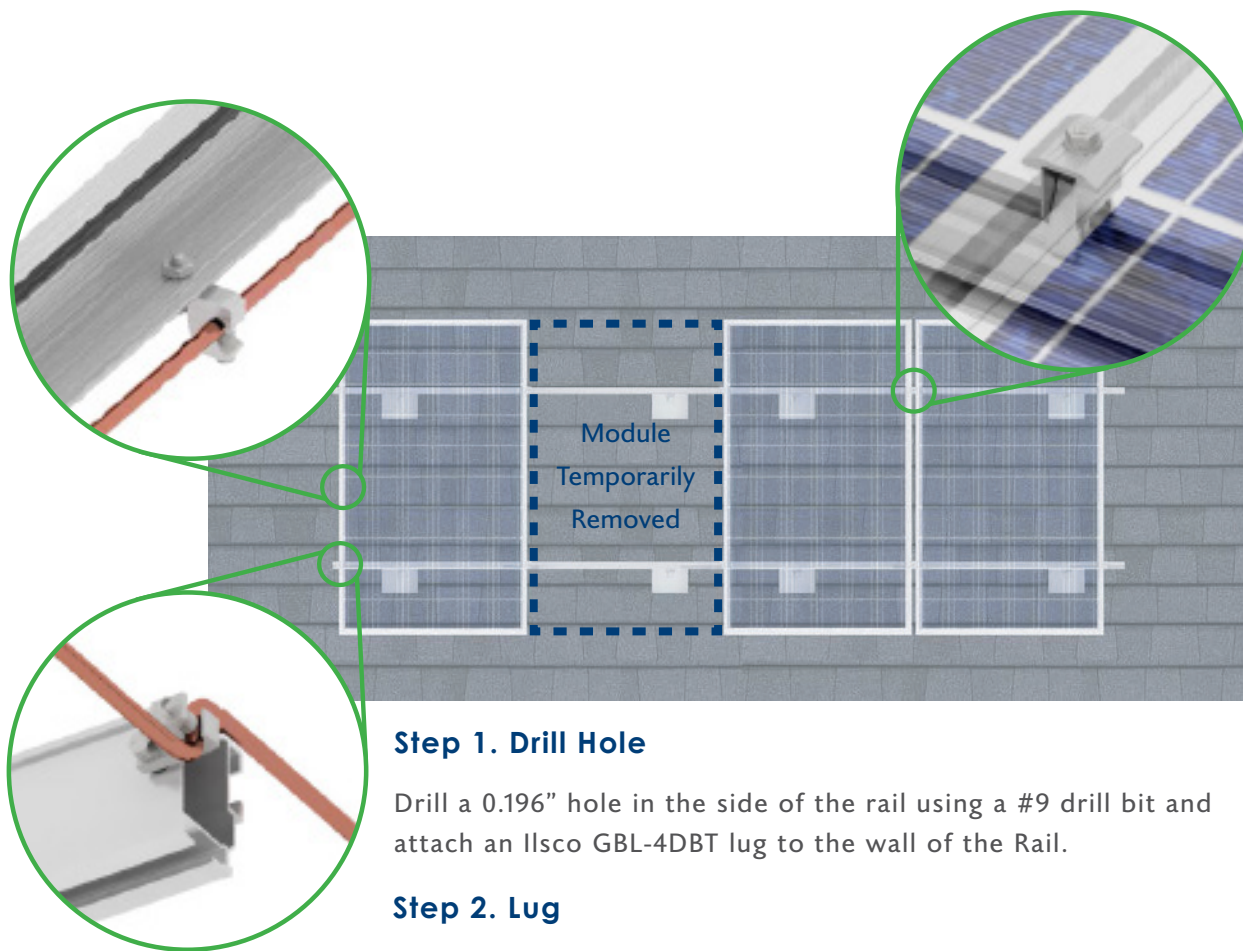
Burdy BGBS4

- Connects to VS Rail or VS System to EGC/GEC
- Accepts 14 AWG to 6 AWG Copper EGC/GEC
- May be fastened as shown or fastened to flat side of VS Rail
- Fasteners use 7/16" wrench or socket



Bonding Path When Removing a Module

When removing a solar module for maintenance, the system must stay properly grounded. If the module has an IB Mid Clamp securing it to the rail, the IB Mid Clamp will keep the module bonded to the ground path. If the module does not have a IB Mid Clamp securing it to the Rail, then Grounding Lugs and copper wire will need to be used in order to ensure all modules are properly grounded.



Step 1. Drill Hole

Drill a 0.196" hole in the side of the rail using a #9 drill bit and attach an IlSCO GBL-4DBT lug to the wall of the Rail.

Step 2. Lug

Attach an IlSCO GBL-4DBT lug to the grounding hole of the module frame. Tighten to 35 in-lbs.

Step 3. Copper Wire

Connect a copper wire from the Lug in the Rail to the Lug in the module frame. Tighten to 35 in-lbs.

NOTES:

1. It is important to periodically inspect the installed system for loose components, loose fasteners, and corrosion. If any corroded parts are discovered, the effected parts must immediately be replaced.

APPENDIX C: ADDITIONAL GROUNDING NOTES

The RBI Solar RS-VS mounting system may be used to ground and/or mount a PV module complying with UL 1703 or 61730 when the specific module has been evaluated for grounding and/or mounting in compliance with the included instructions.

In order to maintain the Listing for bonding, Listed wire management device(s) must be assembled according to the manufacturer's instructions.

The RBI Solar RS-VS is a non-separately derived system that is listed under UL 2703 and was evaluated with the modules listed in the table below as well as any other models that have the same frame. The max fuse rating of the racking system is 30A.

PV Modules evaluated for use with Dynobond bonding jumpers noted in Table 1.

Table 1. UL 2703 Approved Modules

Module Manufacturer	Module Series		Dynobond
Astronergy [40mm Frame]	(Nova) CHSM6612M-315-345 (Nova) CHSM6612M/HV-320-345 (Nova II) CHSM6612M-325-365 (Nova II) CHSM6612M/HV-330-365 (Nova) CHSM6610M-265-290 (Nova) CHSM6610M/HV-265-290 (Nova II) CHSM6610M-275-295 (Nova II) CHSM6610M/HV-275-295 CHSM6612P300-330 CHSM6612P/HV-310-330 (Violin) CHSM6610P-255-275 (Violin) CHSM6610P/HV-255-275 (Violin) CHSM6612P-305-330	(Violin) CHSM6612P/HV-305-330 (Violin II) CHSM6612P-315-335 (Violin II) CHSM6612P/HV-315-335 (Violin II) CHSM6610P-260-290 (Violin II) CHSM6610P/HV-260-290 (Diamond) CHSM6612P-305-325 (Diamond) CHSM6612P/HV-305-325 (Star II) CHSM6612M-350-365 (Star II) CHSM6612M/HV-350-365 (Stave) CHSM6612P-310-330 (Stave) CHSM6612P/HV-310-330 (Stave II) CHSM6612P-330-345 (Stave II) CHSM6612P/HV-330-345	
BYD [40mm Frame]	BYD XXXP6C-30 BYD XXXP6C-36		
CSUN [40mm Frame]	CSUN235-250-60M CSUN240-260P CSUN265-280-60M QSAR		

APPENDIX C: ADDITIONAL GROUNDING NOTES (cont.)

Module Manufacturer	Module Series		Dynobond
ET [60-cell Silver 35mm Frame]	ET-M660270-290WWAC ET-P660260-270WWAC ET-M660270-290WWCO ET-P660260-270WWCO	Elite Mono ET-M660280-295WW Elite Poly ET-P648205-215WW Elite Poly ET-P660250-270WW Elite Poly Anti-Glare ET-P660255-265WWG	YES
Flex Energy [35mm & 50mm Frame]	FXS-310-335BB-SAZ1W4		
Hansol [35mm Frame]	60 Cell Mono TB-AN3 270-300W 60 Cell Poly PB-AN1 260-290W 72 Cell Mono UD-AN1 340-370W 120 Cell Mono UD-JH2 310-325W		
Hansol [40mm Frame]	72 Cell Mono TD-AN3 320-360W 72 Cell Mono UD-AN1 340-370W 78 Cell Mono UE-AN1 380-420W 144 Cell Mono UD-JH2 370-400W		
Hanwha Q Cells	Hanwha Q Cells Q.Pro L-G2		
Hyundai	HiS-MxxxRG where xxx is 250 to 260 HiS-SxxxRG where xxx is 260 to 270 HiS-SxxxRW where xxx is 255 to 265 HiS-MxxxMG where xxx is 230 to 250	HiS-SxxxMG where xxx is 245 to 265 HiS-M290-300MI HiS-S305-315MI	YES
Kyocera	KD235-245GX-LPB KD235-250GX-LFB KD135-140GX-LFBS KD135-140GXLPU	KD185GX-LPU KD135-140SX-UPU KD215-220GX-LFU KD215-220GX-LPU	
LG	LG325-335N1C-A5 LG315-320N1K-A5 LG290-300S1C-A5		
Mission Solar [Silver Frame]	MSE330-3404J MSE330-340SO6J MSE355-365SQ4S	MSE450-360SQ6S MSE320-330MM4J MSE320-330MM6J	
REC [30mm Silver Frame]	REC275-290TP2S REC335-355TP2S 72 REC360-380TP2SM72		
REC [38mm Black Frame]	REC265-285TP BLK REC275-295TP2 BLK REC240-270PE BLK REC285-300TP2M BLK2		

APPENDIX C: ADDITIONAL GROUNDING NOTES (cont.)

Module Manufacturer	Module Series	Dynobond
REC [38mm Silver Frame]	REC265-285TP REC275-295TP2 REC240-270PE	
REC [45mm Silver Frame]	Twin Peak REC330-340TP72 Peak Energy REC300-325PE72	
Recom [40mm Frame]	Amur Leopard RCM-300-340-6PA Black Panther RCM-310-330-6MA Black Panther RCM-335-355-6MA	
Seraphim [50mm Frame]	SRP-340-360-6MA SRP-315-330-6PA	
SolarWorld [31mm Frame]	Sunmodule SW 220 mono & poly SW 225-235 poly SW 240-245 mono & poly SW 245-255 poly Pro	SW 250-270 mono Plus SW 250-285 mono Protect SW 265-275 mono
SolarWorld [33mm Frame]	Sunmodule Plus, SW xxx Mono where xxx is 275 - 300 Sunmodule SW xxx XL Mono where xxx is 320 - 350 Sunmodule Pro-Series, SW xxx Poly where xxx is 250 - 260 Sunmodule Protect, SW xxx Mono where xxx is 275 - 280	YES
Suniva [46mm Silver Frame]	OPT 250-260-4-100	
SunPower [46mm Frame]	SPR-305-WHT-I SPR-E20-440-COM SPR-E20-435-COM SPR-E19-410-COM SPR-E20-327-COM SPR-E19-310 COM SPR-E18-295-COM	SPRP17-335-355-COM SPR-435NW-WHT-D SPR-X22-470-COM SPR-X21-460-COM SPR-X21-445-COM SPR-X22-360-COM
Trina [60-Cell 40mm Frame]	TSM-225-245 PC05 TSM-225-245 PA05	