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
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-Feet 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.

**Component Overview**

- A: L-Foot
- B: VS Rail
- C: IB Splice
- D: End Clamp
- E: IB Mid Clamp
- F: Grounding Lug
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.

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 ASHPhALT 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.
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 cannot exceed 33% of the rated Rail span. Download span charts on our company website to determine spans and cantilevers for your specific application.

**RAIL SUPPORT LOCATIONS**

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 Supports Near Splice Connectors**

Either location can be used (the best application for layout)
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.

### 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!)

#### Landscape Orientation
- Commercial construction
- Standing seam metal (attaching to Purlin)

- Rafters/standing seams run N-S
- Rails run E-W
- Clamp down modules on long side
- Purlins run E-W
- Rails run N-S
- Clamp down modules on long side
Required Tools for Mounting RBI Solar RS-VS Assembly

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

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

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.)

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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, 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 L-Feet to Flashing components.

Step 2. Rails
Attach the Rails to the 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
IB Splice Connectors are required to connect Rails together and electrically bond them. Rails can be flush against each other or be spaced apart up to ¼”.

**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 Splice in the side of the 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 End Clamp onto the 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 IB Mid Clamp onto the 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 IB Mid Clamp. This alignment is required for proper attachment.
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.

- M8-1.25 304SS serrated flange nut (tighten to 10 ft-lbs)
- 8.2mm slot width
- Top Plate (5052-H32 aluminum, 2mm thick) - Common to microinverters power optimizers
- M8-1.25x25mm 304SS serrated T-bolt w/ nylon patch
- VS Rail Mill Finish
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)

VS Rail Mill Finish

M8-1.25x25mm 304SS serrated T-bolt w/ nylon patch

IB Splice

M8-1.25 304 SS serrated flange nut
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.

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

M8-1.25 304SS serrated flange nut (tighten to 10 ft-lbs)

RBI Solar IB Mid Clamp top plate

WEEB-MSNR516

RBI Solar IB Mid Clamp connector

304SS serrated T-bolt w/ nylon patch

VS Rail Mill Finish

Module frame
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

- 0.196” drilled hole in VS Rail
- Tin-coated copper Ilsco GBL-4DBT lug
- No. 10 304 SS split lock washer
- 10-32x0.75 304 SS HH bolt (tighten to 35 in-lbs)
- 10-32 304 SS hex nut
- No. 10 304 SS star washer
- Ilsco DE-OX oxide inhibitor
- Ilsco DE-OX oxide inhibitor
- ¾-28 304 SS set screw (tighten to 35 in-lbs)
- 10-14 AWG, Cu, solid
- 4-8 AWG, Cu, stranded
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.

**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

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REC240-270PE |  |
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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 | YES  
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 |  |
| **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  
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