RBI Solar Installation Guide
Metal Roof Mount Solution | RS-MS

Trapezoidal Sheet Metal Roof Mounting System for Solar PV Applications

ETL Listed to
UL 2703
for Bonding and Grounding

RBI Solar RS-MS| Installation Guide 2019 v1
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UL 2703 LISTING SUMMARY

The entire RBI Solar Metal Roof Mount Solution (RS-MS) is ETL Listed to UL 2703 Listed 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 liable for any claim resulting from installations that are not in accordance with installation guide instructions and/or applicable building code.
The RBI Solar Metal Roof Mount Solution (RS-MS) is a simple, compact, and cost-effective solution for mounting PV modules to trapezoidal steel sheet metal roofs.

- Fastens directly to sheet metal thereby eliminating the need for long rails and attachments to purlins or rafters.
- EPDM gaskets pre-assembled under all MS Clamp Bases and fasteners for double protection from leaks.
- Third-party waterproof tested for assurance.
- One-size End and Mid Clamps fit all commonly used modules to simplify inventory.
- Pre-assembled Clamps allow for quick installation.
- Self-piercing/self-tapping screws with hardened tips to eliminate drilling.
- All 304 stainless steel and 6000 series aluminum construction ensures reliability and longevity.
- ICC and UL approvals allow for fast permitting.
**APPLICABLE ROOF TYPES**

The RBI Solar RS-MS system is fastened directly to trapezoidal sheet metal panels only, not structural members like rafters or purlins. In order to install the system correctly, the trapezoidal roof must meet the following guidelines:

- Steel ONLY (no aluminum)
- Must be 26 ga. (0.018”) or larger
- Flat peak must be at least ¾” wide
- The roof must be free of rust and structurally sound

*Trapezoidal Roof Profile Examples*

To ensure the proper layout and installation of the RBI Solar RS-MS System, it is important to determine the following dimensions:

- **A** Trapezoidal Pitch: Distance between flat peaks. This dimension will determine the spacing of the MS Bases.
- **B** Sheet Metal Thickness
- **C** Width of Peak
TOOLS & MATERIALS

Tools for RBI Solar RS-MS assembly:

- Socket wrench
- Torque wrench, 0-10 ft-lbs
- 13mm hex socket
- Cordless drill w/torque adjustability
- 1/4" Hex drive (MS-HP/HPF)
- 5/16" Deep 6-point socket (MS-HP/HPF)
- Tape measure
- Chalk line

NOTES:

- Do not use power tools for installing Clamps and Grounding Lugs.
- Always use the correct fasteners supplied by RBI Solar and never use fasteners purchased anywhere else. Contact RBI Solar if additional fasteners are needed.

RBI SOLAR RS-MS LAYOUT

Plan the layout of the components per the dimensions below:

1. Module width + 0.75"
2. Approximately ¼ module length (verify allowable clamping locations in module manufacturer's installation guide)
3. Spacing of RS-MS Bases varies with the peak distance of the trapezoidal roof panels
4. 0.75" minimum
5. Quantity of modules in the vertical direction x (module width + 0.75”)
6. Quantity of modules in the horizontal direction x (module length + )

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. Due to varying trapezoidal peak distances, it may be difficult to fall within the allowable clamping zones and maintain the 0.75" (4) between columns. Adjust this dimension as needed when planning the array layout.
Prior to Installation

- **Torque Setting**: A simple test should be performed to determine the required torque setting for the cordless drill. Start by adjusting the torque to the lowest setting. Next, attempt to fasten a test MS Base to the roof using the provided MS Screws. Slowly increase the torque settings until the MS Screw compresses the sealing washer as shown below.

![Torque Setting Diagram](image)

- **Overlapping Metal Panels**: Some sheet metal panels overlap to connect. For this scenario, the MS Screws must penetrate each layer. Adjustment in torque settings may be required.

- **Chalk Lines**: Start with the southwest corner of the array and place the first MS Base. From that point, use a chalk-line and tape measure to lay out the horizontal lines (front of the MS Base) of the system. The horizontal lines must be perpendicular (90°) to the trapezoidal peaks.

![Chalk Lines Diagram](image)
Step 1. Clamp Base & Screws
Place \( \text{A} \) MS Base on center of trapezoidal peaks. Fasten to the roof using \( \text{B} \) MS Screws.

Step 1. Note:
The MS Base must sit in the center of the flat peak so that assembly stands perpendicular to the roof surface.

Step 2. End Clamps
Snap \( \text{C} \) End Clamp onto middle of \( \text{A} \) MS Base. Repeat this step along the entire bottom edge of 1st row.

Step 3. Modules (1st Row)
Slide the first row of modules against the \( \text{C} \) End Clamps and tighten to 10 ft-lbs.

\textbf{IMPORTANT: Do NOT apply additional anti-seize to the Clamps.}

Step 4. WEEB-CCR2 & Mid Clamp
Place the \( \text{D} \) WEEB-CCR2 on \( \text{A} \) MS Base. Snap on the \( \text{E} \) Mid Clamp over \( \text{D} \) WEEB-CCR2 and slide assembly against module. Repeat this step for the top edge of entire row of modules.

Step 5. Modules (2nd Row)
Slide the second row of modules into place and tighten the \( \text{E} \) Mid Clamps to 10 ft-lbs. Repeat steps 4-5 for the rest of the array.

\textbf{IMPORTANT: Do NOT apply additional anti-seize to the Clamps.}

Step 6. End Clamps (top of array)
Snap \( \text{C} \) End Clamp onto the \( \text{A} \) MS Base and tighten to 10 ft-lbs.

\textbf{IMPORTANT: Do NOT apply additional anti-seize to the Clamps.}

Repeat this step across the entire top row of modules

Step 7. Module Jumper (top of array)
Slide the \( \text{F} \) Module Jumper onto the lip of adjacent module flanges to bond the columns together. Be sure to leave slack in the wire for expansion and contraction in the module frame.
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. Some MLPE may have larger vent sinks that can cause fitment issues with MS-HPF Base. Check dimensional fitment or call RBI Solar prior to installation. After installing the provided hardware, tighten to 10 ft-lbs.
Module-to-Module Grounding (within columns)

Install a WEEB-CCR2 at every Mid Clamp location to ground each column of modules.

Column-to-Column Grounding

The Dynobond Module Jumper can bond one column of modules to another column of modules without the need of additional Grounding Lugs and copper wire. The teeth on the Dynobond Module Jumper bite 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.
Clamp Base-to-EGC Grounding

1. **End Clamp & WEEB-CCR2**
   Slide WEEB-CCR2 under module frame. Snap end clamp over clamp base and tighten to 10 ft-lbs on module frame.

2. **WEEB-LUG 8.0**
   Assemble WEEB-LUG assembly and tighten fasteners to 10 ft-lbs. Lay in equipment ground conductor (EGC) and tighten to 7 ft-lbs.

- M8-1.25 304SS serrated flange nut
- 6-14 AWG, Cu, solid or stranded
- WEEB-Lug-8.0
- WEEB-8.0
- M8-1.25x20mm 304SS T-bolt w/ nylon patch
- RS-MS HPF Base
- EGC
RBI SOLAR RS-MS GROUNDING (cont.)

Serrated T-bolt and serrated nut bond the microinverter/power optimizer flat plate to MS Base.

WEEB Clip bonds both modules to the MS Base.

Dynobond Module Jumpers may be used to bond from one column of modules to another column.

WEEB Clip bonds the MS Base to the lug. The solid copper wire provides the ground connection.
Trunk Cables (Optimizers and Microinverters)

Wiley ACC-F2-90 Clips can be used with the RBI Solar RS-MS HPF Base to manage trunk cables. Install near the top of the RS-MS HPF Base.

In order to maintain the listing for bonding, listed wire management device(s) must be assembled according to the manufacturer’s instructions.
WIRE MANAGEMENT SOLUTIONS (cont.)

PV Cable Wire Management

**IMPORTANT:** Complete this step before laying the modules down, either on the roof or prior to carrying the module up.

Using two RBI Solar RS-MS Wire Management Clips (small or large) pressed onto the module frame, loop the PV cables and press into clips as shown.

Conduit Attachment

**IMPORTANT:** This can be completed at either the north or south side of the sub-array, whichever works best for the application.

Using the standard Microinverter Hardware Kit, Pipe Clamps (not provided by RBI Solar) can be attached to the exposed portion of the MS Base along the north (or south) edge of the array.
A Grounding Lug with copper EGC used in accordance with the PV modules UL 1703 or 61730 Installation Guide may be used for grounding. An example below shows a TYCO SolKlip:

The TYCO Lug can be attached to any module frame grounding location within the array. Install the lug in the grounding hole of the module frame and tighten to 15 ft-lbs. Once EGC is placed in Lug, snap into place.
APPENDIX B: MODULE MAINTENANCE

Bonding Path When Removing a Module

During a RBI Solar RS-MS installation, Dynobond Module Jumpers are installed on the top of the array to electrically bond the columns of modules. When maintenance is required, additional Dynobond Module Jumpers may be installed on the bottom of the array. Under this type of installation, any module can be removed and the RS-MS system will stay grounded, and only one grounding lug is required. Additional Dynobond Module Jumpers may be installed during the initial installation of the system or they may be installed only when maintenance is required.

When removing the module where the TYCO Grounding Lug is attached, the Grounding Lug will either need to be moved (see manufacturer for how many times the lug can be re-used) or a new Grounding Lug will need to be installed on the next available module or MS Base that has a module on top of it.

NOTES:

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

The RBI Solar RS-MS 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-MS 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

<table>
<thead>
<tr>
<th>Module Manufacturer</th>
<th>Module Series</th>
<th>Dynobond</th>
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</thead>
<tbody>
<tr>
<td><strong>Astronergy</strong></td>
<td>(Nova) CHSM6612M-315-345</td>
<td>(Violin) CHSM6612P/HV-305-330</td>
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<td>(Nova) CHSM6612M/HV-320-345</td>
<td>(Violin II) CHSM6612P-315-335</td>
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<td>(Nova II) CHSM6612M-325-365</td>
<td>(Violin II) CHSM6612P/HV-315-335</td>
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<td>(Nova II) CHSM6612M/HV-330-365</td>
<td>(Violin II) CHSM6610P-260-290</td>
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<td>(Nova) CHSM6610M-265-290</td>
<td>(Diamond) CHSM6612P-305-325</td>
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<td>(Nova) CHSM6610M/HV-265-290</td>
<td>(Diamond) CHSM6610P/HV-260-290</td>
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<td></td>
<td>(Nova II) CHSM6610M-275-295</td>
<td>(Star II) CHSM6612M-350-365</td>
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<td></td>
<td>CHSM6612P300-330</td>
<td>(Star II) CHSM6612M/HV-350-365</td>
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<td></td>
<td>CHSM6612P/HV-310-330</td>
<td>(Stave) CHSM6612P-310-330</td>
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<td>(Violin) CHSM6610P-255-275</td>
<td>(Stave) CHSM6612P/HV-310-330</td>
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<td>(Violin) CHSM6610P/HV-255-275</td>
<td>(Stave II) CHSM6612P-330-345</td>
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<td>(Violin) CHSM6612P-305-330</td>
<td>(Stave II) CHSM6612P/HV-330-345</td>
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<tr>
<td><strong>BYD</strong></td>
<td>BYD XXXP6C-30</td>
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<td></td>
<td>BYD XXXP6C-36</td>
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<tr>
<td><strong>Canadian Solar</strong></td>
<td>CS6K-260-275P</td>
<td>MAXPOWER2 CS6U-325-335M</td>
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<td></td>
<td>CS6K-275-280M</td>
<td>MAXPOWER2 CS6XA-325-335M</td>
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<td>MAXPOWER CS6U-315-340P</td>
<td>MAXPOWER2 CS6XB-325-335M</td>
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<td>MAXPOWER CS6U-325-345M</td>
<td>SUPERPOWER CS6X-290-300MS</td>
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<td><strong>CSUN</strong></td>
<td>CSUN235-250-60M</td>
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<td>CSUN240-260P</td>
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<td></td>
<td>CSUN265-280-60M QSAR</td>
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[40mm Frame]

[40mm Frame]

[40mm Frame]
# APPENDIX C: ADDITIONAL GROUNDING NOTES

<table>
<thead>
<tr>
<th>Module Manufacturer</th>
<th>Module Series</th>
<th>Dynobond</th>
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<tr>
<td><strong>ET</strong>&lt;br&gt;[60-cell Silver 35mm Frame]</td>
<td>ET-M660270-290WWAC&lt;br&gt;ET-P660260-270WWAC&lt;br&gt;ET-M660270-290WWCO&lt;br&gt;ET-P660260-270WWCO</td>
<td>YES</td>
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<tr>
<td><strong>ET</strong>&lt;br&gt;[72-cell Black 40mm Frame]</td>
<td>ET-P672305-320WB&lt;br&gt;Elite Poly ET-P672300-325WB&lt;br&gt;ET-P672300-315BB</td>
<td>YES</td>
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<tr>
<td><strong>Flex Energy</strong>&lt;br&gt;[35mm &amp; 50mm Frame]</td>
<td>FXS-310-335BB-SA1W4</td>
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<td><strong>Hansol</strong>&lt;br&gt;[35mm Silver Frame]</td>
<td>60 Cell Mono TB-AN3 270-300W&lt;br&gt;60 Cell Poly PB-AN1 260-290W&lt;br&gt;72 Cell Mono UD-AN1 340-370W&lt;br&gt;120 Cell Mono UD-JH2 310-325W</td>
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<tr>
<td><strong>Hansol</strong>&lt;br&gt;[40mm Silver Frame]</td>
<td>72 Cell Mono TD-AN3 320-360W&lt;br&gt;72 Cell Mono UD-AN1 340-370W&lt;br&gt;78 Cell Mono UE-AN1 380-420W&lt;br&gt;144 Cell Mono UD-JH2 370-400W</td>
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<tr>
<td><strong>Hanwha Q Cells</strong></td>
<td>Hanwha Q Cells Q.Pro L-G2</td>
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<tr>
<td><strong>Hyundai</strong></td>
<td>HiS-MxxxRG where xxx is 250 to 260&lt;br&gt;HiS-SxxxRG where xxx is 260 to 270&lt;br&gt;HiS-SxxxRW where xxx is 255 to 265&lt;br&gt;HiS-MxxxMG where xxx is 230 to 250</td>
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<td><strong>Kyocera</strong></td>
<td>KD235-245GX-LPB&lt;br&gt;KD235-250GX-LFB&lt;br&gt;KD135-140GX-LFBS&lt;br&gt;KD135-140GXLPU</td>
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<tr>
<td><strong>LG</strong></td>
<td>LG325-335NIC-A5&lt;br&gt;LG315-320N1K-A5&lt;br&gt;LG290-300S1C-A5</td>
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<tr>
<td><strong>LG</strong></td>
<td>LG350-360S2W-A5&lt;br&gt;LG380N2T-A5&lt;br&gt;LG395-410N2W-A5</td>
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### APPENDIX C: ADDITIONAL GROUNDING NOTES

<table>
<thead>
<tr>
<th>Module Manufacturer</th>
<th>Module Series</th>
<th>Dynobond</th>
</tr>
</thead>
</table>
| **REC** | REC275-290TP2S  
REC335-355TP2S 72  
REC360-380TP2SM72 | | |
| [30mm Silver Frame] | | |
| **REC** | REC265-285TP BLK  
REC275-295TP2 BLK  
REC240-270PE BLK  
REC285-300TP2M BLK2 | | |
| [38mm Black Frame] | | |
| **REC** | REC265-285TP  
REC275-295TP2  
REC240-270PE | | |
| [38mm Silver Frame] | | |
| **REC** | Twin Peak REC330-340TP72  
Peak Energy REC300-325PE72 | | |
| [45mm Silver Frame] | | |
| **Recom** | Amur Leopard RCM-300-340-6PA  
Black Panther RCM-310-330-6MA  
Black Panther RCM-335-355-6MA | | |
| [40mm Frame] | | |
| **Seraphim** | SRP-340-360-6MA  
SRP-315-330-6PA | | |
| [50mm Frame] | | |
| **SolarWorld** | 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 | |
| [31mm Frame] | | |
| **SolarWorld** | 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 | |
| [33mm Frame] | | |
| **Suniva** | OPT 250-260-4-100 | | |
| [46mm Silver Frame] | | |
| **SunPower** | 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 | |
| [46mm Frame] | | |
| **Trina** | TSM-225-245 PC05  
TSM-225-245 PA05 | | |
| [60-Cell  
40mm Frame] | | |