

# SOLARMOUNT®

## Installation with Top Mounting Clamps

### Installation Manual 201.1

U.S. Des. Patent No. D496,248S. Other patents pending.

This manual details the procedure for flush mounting SolarMount to a pitched roof. If your installation includes tilt legs, see also the instructions shipped with the leg kit.

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#### Table 5. Part quantities

##### SolarMount® Rail Sets

Rail length (inches)	No. of rails	L-feet	3/8" footing bolts	3/8" flange nuts
48-106	2	4	4	4
120-180	2	6	6	6
192-216	2	8	8	8
226-288 (w/ splice)	2	10	10	10
300-336 (w/ splice)	2	12	12	12
348-408 (w/ splice)	2	14	14	14
420-432 (w/ splice)	2	16	16	16

##### Top Mounting Clamp Sets, Sizes A-F, G\*, H†, and J

Modules per row	End clamps	Mid clamps	1/4" module T-bolts	1/4" x 5/8" safety bolts	1/4" flange nuts
2	4	2	6	2	8
3	4	4	8	2	10
4	4	6	10	2	12
5	4	8	12	2	14
6	4	10	14	2	16
7	4	12	16	2	18
8	4	14	18	2	20
9	4	16	20	2	22
10	4	18	22	2	24
11	4	20	24	2	26
12	4	22	26	2	28

\* In size G, end clamps and mid clamps are identical, except that end clamps include spacers. For illustration, see page 14.

† In size H, end clamps and mid clamps are identical. Hexhead bolts replace T-bolts. For illustration, see page 14.

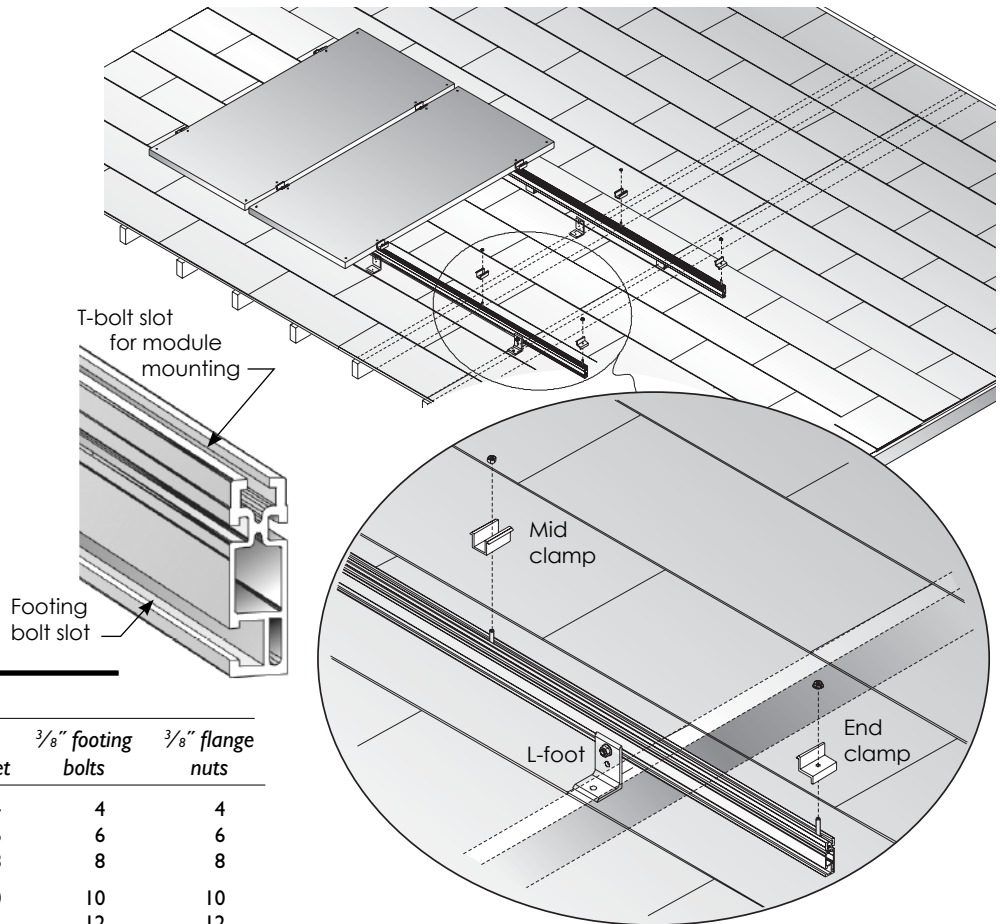


Figure 3. Exploded view of a low-profile installation mounted flush to the roof with L-feet.

#### Table 6. Wrenches and torque

	Wrench size	Recommended torque (ft-lbs)
1/4" hardware	7/16"	15
3/8" hardware	9/16"	30



Stainless steel hardware can seize up, a process called galling. To significantly reduce its likelihood, (1) apply lubricant to bolts, preferably an anti-seize lubricant, available at auto parts stores, (2) shade hardware prior to installation, and (3) avoid spinning on nuts at high speed. See Installation Supplement 910, *Galling and Its Prevention*, at [www.unirac.com](http://www.unirac.com).

## Installer responsibility



The installer is solely responsible for:

- Complying with all applicable local or national building codes, including any that may supercede this manual;
- Ensuring that UniRac and other products are appropriate for the particular installation and the installation environment;
- Ensuring that the roof, its rafters, connections, and other structural support members can support the array under building live load conditions.
- Using only UniRac parts and installer-supplied parts as specified by UniRac (substitution of parts may void the warranty);
- Ensuring that lag screws have adequate pullout strength and shear capacities as installed;
- Maintaining the waterproof integrity of the roof, including selection of appropriate flashing; and
- Ensuring safe installation of all electrical aspects of the PV array.

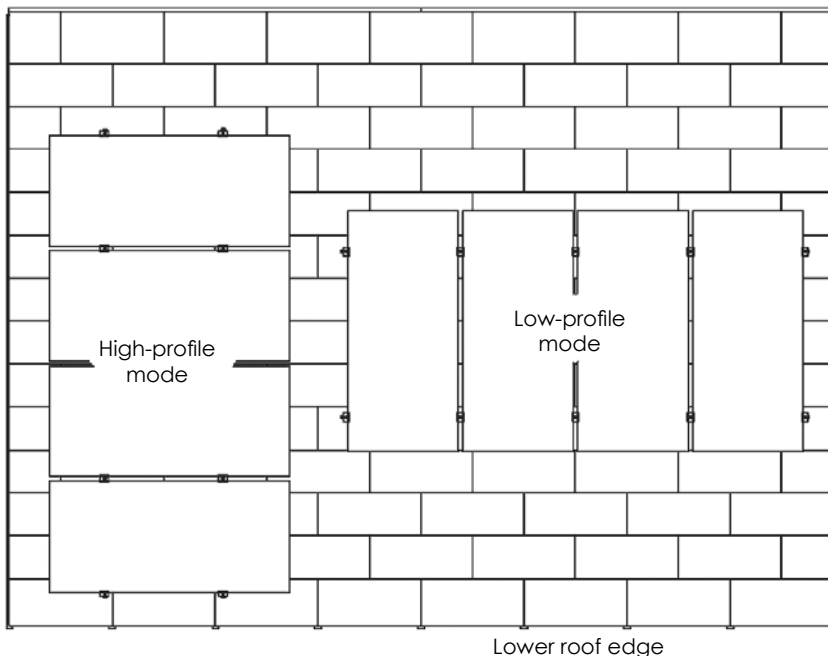


Figure 4. Rails may be placed parallel or perpendicular to rafters.

## Laying out the installation area

The installation can be laid out with rails parallel to the rafters (high-profile mode) or perpendicular to the rafters (low-profile mode). Note that SolarMount rails make excellent straight edges for doing layouts. Center the installation area over the rafters as much as possible.

Leave enough room to safely move around the array during installation.

The width of the installation area is equal to the length of one module.

The length of the installation area is equal to:

- the total width of the modules,
- plus 1 inch for each space between modules (for mid-clamp),
- plus 3 inches (1½ inches for each set of end clamps).

## 10 year limited Product Warranty, 5 year limited Finish Warranty

UniRac, Inc., warrants to the original purchaser (“Purchaser”) of product(s) that it manufactures (“Product”) at the original installation site that the Product shall be free from defects in material and workmanship for a period of ten (10) years, except for the anodized finish, which finish shall be free from visible peeling, or cracking or chalking under normal atmospheric conditions for a period of five (5) years, from the earlier of 1) the date the installation of the Product is completed, or 2) 30 days after the purchase of the Product by the original Purchaser (“Finish Warranty”):

The Finish Warranty does not apply to any foreign residue deposited on the finish. All installations in corrosive atmospheric conditions are excluded. The Finish Warranty is VOID if

the practices specified by AAMA 609 & 610-02 – “Cleaning and Maintenance for Architecturally Finished Aluminum” ([www.aamanet.org](http://www.aamanet.org)) are not followed by Purchaser. This Warranty does not cover damage to the Product that occurs during its shipment, storage, or installation.

This Warranty shall be VOID if installation of the Product is not performed in accordance with UniRac’s written installation instructions, or if the Product has been modified, repaired, or reworked in a manner not previously authorized by UniRac IN WRITING, or if the Product is installed in an environment for which it was not designed. UniRac shall not be liable for consequential, contingent or incidental damages arising out of the use of the Product by Purchaser under any circumstances.

If within the specified Warranty periods the Product shall be reasonably proven to be defective, then UniRac shall repair or replace the defective Product, or any part thereof, in UniRac’s sole discretion. Such repair or replacement shall completely satisfy and discharge all of UniRac’s liability with respect to this limited Warranty. Under no circumstances shall UniRac be liable for special, indirect or consequential damages arising out of or related to use by Purchaser of the Product.

Manufacturers of related items, such as PV modules and flashings, may provide written warranties of their own. UniRac’s limited Warranty covers only its Product, and not any related items.

## Laying out L-feet

L-feet (Fig. 5) are used for installation through existing roofing material, such as asphalt shingles or sheet metal.

Use Figure 6 or Figure 7 below to locate and mark the L-foot lag bolt holes within the installation area.

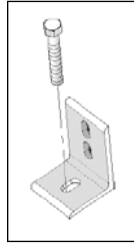


Figure 5



**Consult UniRac's SolarMount Code-Compliant Planning and Assembly to determine foot spacing that will meet code. Download the version for the applicable building code at [www.unirac.com](http://www.unirac.com).**

In low-profile layouts, stagger feet on rafters (Fig. 7) to distribute the load.

If multiple high-profile rows are to be installed adjacent to one another, it will not be possible for each row to be centered above the rafters. Adjust as needed, following the guidelines in Figure 7 as closely as possible.

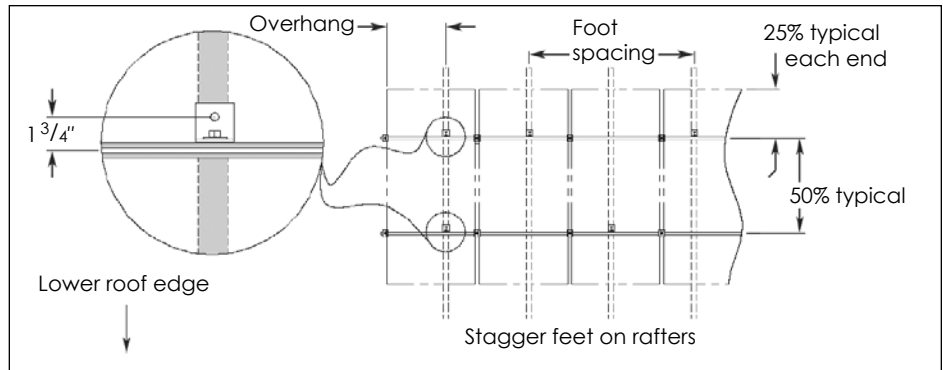


Figure 6. Low-profile layout

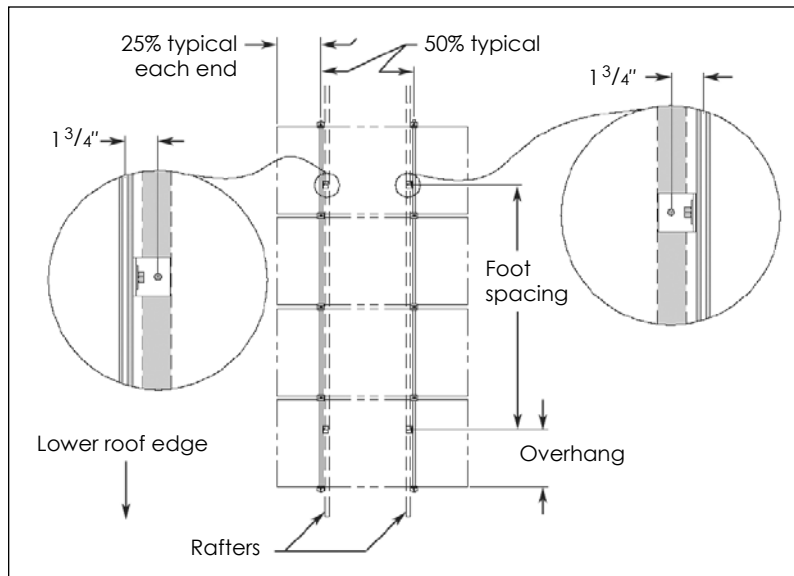


Figure 7. High-profile layout

## Installing L-feet

Drill pilot holes through the roof into the center of the rafter at each L-foot lag bolt hole location.

Consult procedural step 6 and Table 4 (p. 8) in *SolarMount Code Compliant Planning and Assembly* to select the lag bolts that meet building code wind load requirements. Lag bolts are not provided with SolarMount rail sets.

Squirt sealant into the hole, and on the shafts of the lag bolts. Seal the underside of the L-feet with a suitable weatherproof sealant.

Securely fasten the L-feet to the roof with the lag bolts. Ensure that the L-feet face as shown in Figure 6 or Figure 7. The single-slotted square side of the L-foot must always lie against the roof with the double-slotted side perpendicular to the roof.

## Laying out standoffs

Standoffs (Fig. 8) are used for flashed installations, such as those with tile and shake shingles.

Use Figure 9 or Figure 10 to locate and mark the standoff lag bolt holes within the installation area.



**Consult UniRac's SolarMount Code-Compliant Planning and Assembly to determine foot spacing that will meet code. Download the version for the applicable building code at [www.unirac.com](http://www.unirac.com).**

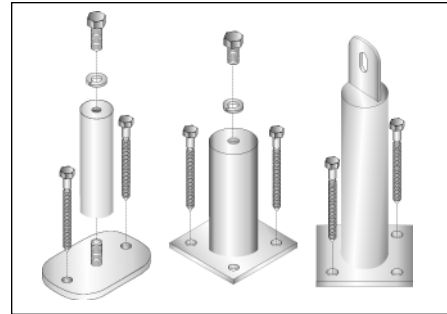
Remove the tile or shake underneath each standoff location, exposing the roofing underlayment. Ensure that the standoff base lies flat on the underlayment, but remove no more material than required for the flashings to be installed properly.

Use the standoff base as a template to mark lag bolt hole locations on underlayment above the center of the rafters (Fig. 9 or Fig. 10).

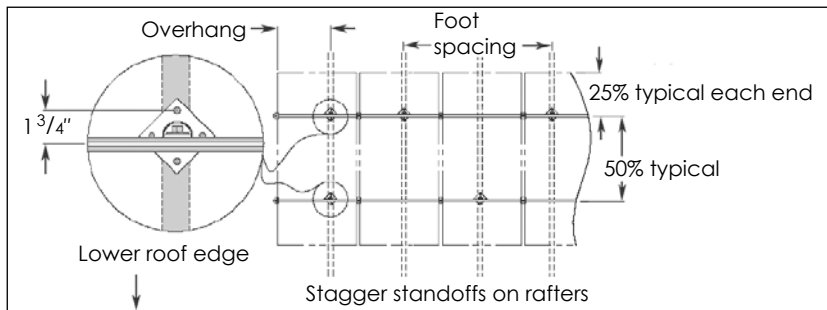
In low-profile layouts, stagger standoffs on rafters (Fig. 9) to distribute the load.

When determining the distance between the rails in high-profile mode, keep in mind that the center of each rail will be offset from the standoff lag bolt holes by  $\frac{7}{16}$  of an inch.

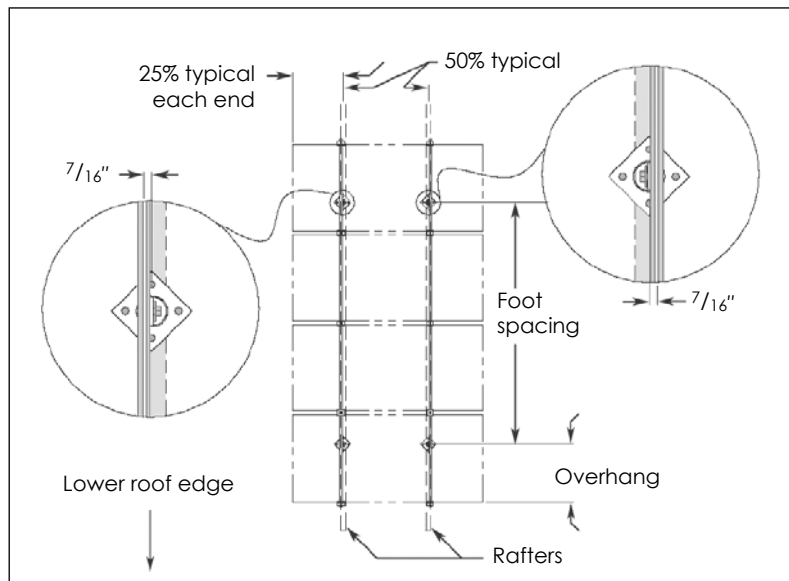
If multiple high-profile rows are to be installed adjacent to each other, it will not be possible for each row to be centered above the rafters. Adjust as needed following the guidelines in Figure 10 as closely as possible.



**Figure 8. SolarMount standoff choices: aluminum 2-piece (left), steel flat-top (center), and steel raised flange. Two-piece standoffs allow flashings to be precisely placed over bases prior to installation of the standoff itself. Raised flange standoffs do not require L-feet.**



**Figure 9. Low-profile layout**



**Figure 10. High-profile layout**

## Installing standoffs

Drill  $\frac{3}{16}$ -inch pilot holes through the underlayment into the center of the rafters at each standoff location. Securely fasten *each* standoff to the rafters with the two  $\frac{5}{16}$ " x  $3\frac{1}{2}$ " lag bolts provided with it.

Verify that the lag bolts you use are adequate for your installation by following procedural steps 4A or 4B (pp. 5, 8) in *SolarMount Code-Compliant Planning and Assembly*.

If you are using raised-flange standoffs, ensure that they face as shown in Figure 9 or Figure 10. Steel flattop standoffs should also be lagged at opposite corners.

SolarMount steel standoffs are designed for installation with collared flashings available from UniRac. Aluminum flashings take all metal flashings, also available from UniRac.

Install and seal flashings and standoffs using standard building practices.

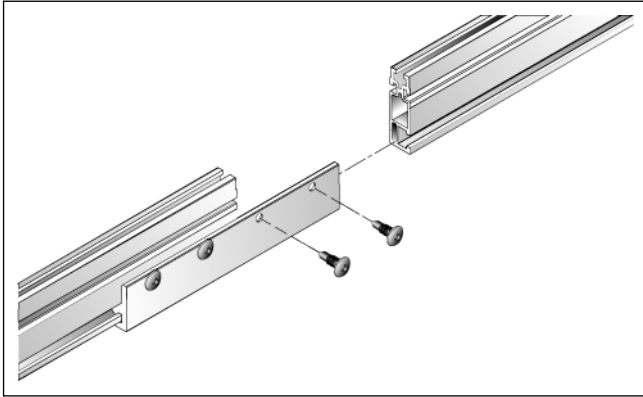


Figure 11. Splice bars slide into the footing bolt slots of SolarMount rail sections.

## Installing SolarMount rails

Keep rail slots free of roofing grit or other debris. Foreign matter will cause bolts to bind as they slide in the slots.

**Installing Splices.** If your installation uses SolarMount splice bars, attach the rails together (Fig. 11) before mounting the rails to the footings. Use splice bars only with flush installations or those that use low-profile tilt legs.

*If using more than one splice per rail, contact UniRac concerning thermal expansion issues.*

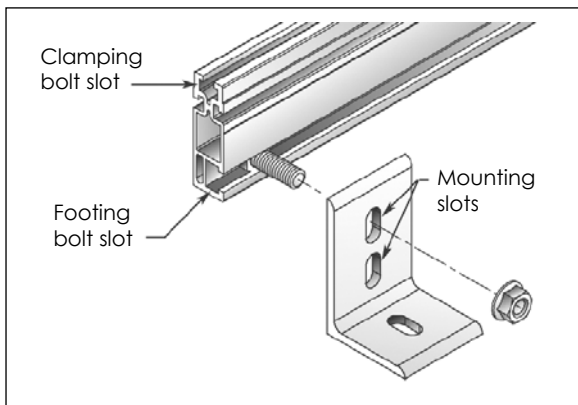


Figure 12. Foot-to-rail splice attachment

**Mounting Rails on Footings.** Rails may be attached to either of two mounting holes in the footings (Fig. 12). Mount in the lower hole for a low profile, more aesthetically pleasing installation. Mount in the upper hole for a higher profile, which will maximize airflow under the modules. This will cool them more and may enhance performance in hotter climates.

Slide the 3/8-inch mounting bolts into the footing bolt slots. Loosely attach the rails to the footings with the flange nuts.

Ensure that the rails are oriented to the footings as shown in Figure 6, 7, 9, or 10, whichever is appropriate.

### Aligning the Rail Ends.

Align one pair of rail ends to the edge of the installation area (Fig. 13 or Fig. 14).

The opposite pair of rail ends will overhang the side of the installation area. Do not trim them off until the installation is complete.

In low-profile mode (Fig. 13), either end of the rails can be aligned, but the first module must be installed at the aligned end.

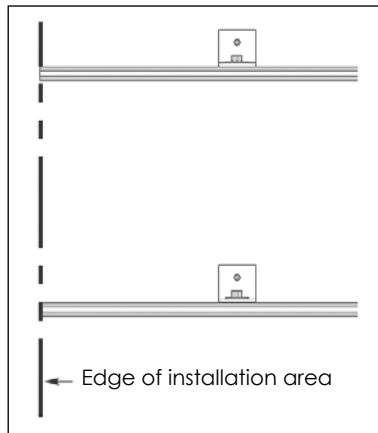


Figure 13. Low-profile mode

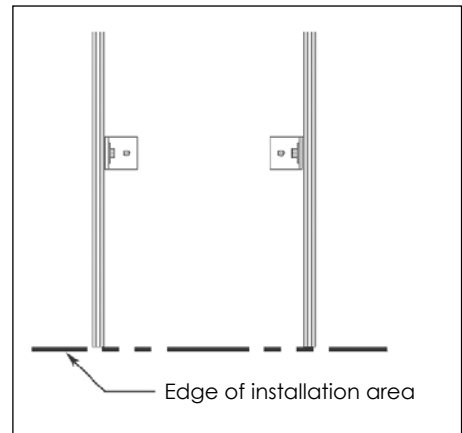


Figure 14. High-profile mode

For the safest high-profile installation (Fig. 14), the aligned end of the rails must face the lower edge of the roof. Securely tighten the flange nuts on the mounting bolts after alignment is complete (28–32 ft lbs).



**Mount modules to the rails as soon as possible. Temperature changes may bow the rails within a few hours if module placement is delayed.**

## Installing the modules

**Prewiring Modules.** If modules are the Plug and Play type, no prewiring is required, and you can proceed directly to “Installing the First Module” below.

If modules have standard J-boxes, each module should be prewired with one end of the intermodule cable for ease of installation. For safety reasons, module prewiring should not be performed on the roof.

Leave covers off J-boxes. They will be installed when the modules are installed on the rails.

**Installing the First Module.** In high-profile installations, the safety bolt and flange nut must be fastened to the module bolt slot at the aligned (lower) end of each rail. It will prevent the lower end clamps and clamping bolts from sliding out of the rail slot during installation.

If there is a return cable to the inverter, connect it to the first module. Close the J-box cover. Secure the first module with T-bolts and end clamps at the aligned end of each rail. Allow half an inch between the rail ends and the end clamps (Fig. 15). Finger tighten flange nuts, center and align the module as needed, and securely tighten the flange nuts (15 ft lbs).

**Installing the Other Modules.** Lay the second module face down (glass to glass) on the first module. Connect intermodule cable to the second module and close the J-box cover. Turn the second module face up (Fig. 16). With T-bolts, mid clamps, and flange nuts, secure the adjacent sides of the first and second modules. Align the second module and securely tighten the flange nuts (Fig. 17).

For a neat installation, fasten cable clamps to rails with self-tapping screws.

Repeat the procedure until all modules are installed. Attach the outside edge of the last module to the rail with end clamps.

Trim off any excess rail, being careful not to cut into the roof. Allow half an inch between the end clamp and the end of the rail (Fig. 15).

Check that all flange nuts on T-bolts are securely fastened.

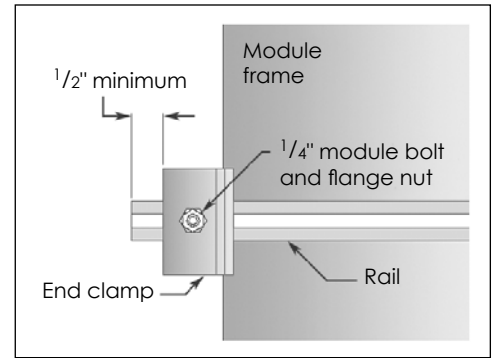


Figure 15

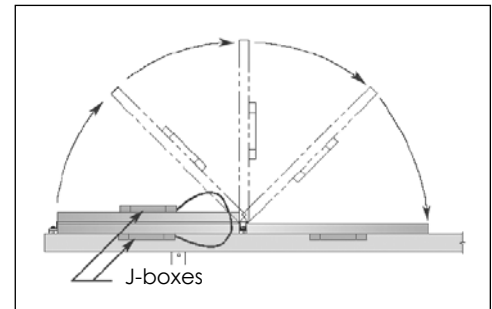


Figure 16

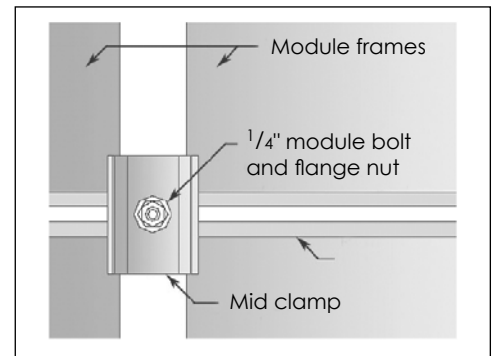


Figure 17

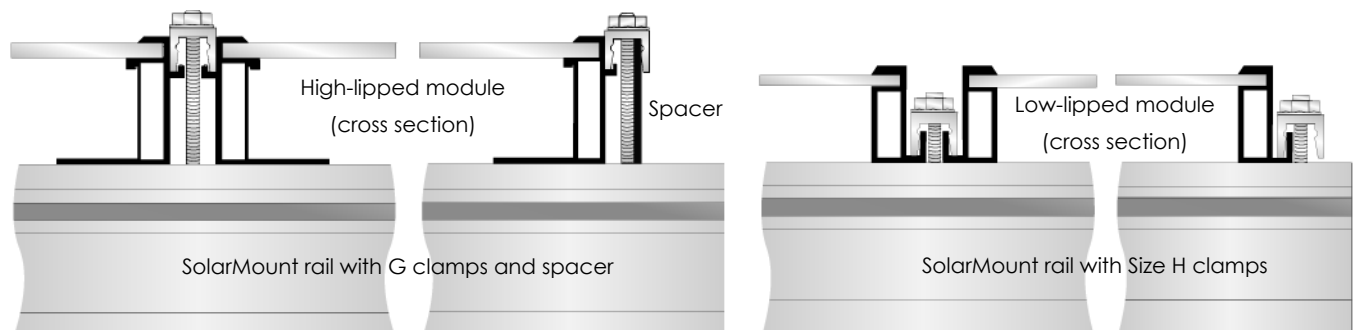


Figure 18. Size G clamps (for modules with high lips) include a spacer for the end clamps but are otherwise identical. Size H mid clamps and end clamps (for mod-

ules with low lips) are identical and employ hexhead bolts in place of T-bolts; their heads slide into SolarMount® rails.