

FAST- RACK ULTRA INSTALLATION MANUAL V 1.0

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# FR-ULINSTALL MANUAL

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## INTRODUCTION

The Fast-Rack family of racking systems is designed to safely and securely mount solar photovoltaic modules to sloped roofs. Fast-Rack Ultra (FR-UL) is a modified version of our original FR-HD rail profile, designed for residential and smaller scale commercial applications where more traditional 48” maximum spans are preferred and expected. This lighter rail profile saves customers product costs and is easier to handle with small installation teams.

When used with our Drop-In Mid and End Clamps, L-Foot mounting hardware, and various roof attachment options, the Fast-Rack family of racking system can meet even the most demanding sloped roof installation challenge.

This manual includes the details for the safe and correct installation of the Fast-Rack Ultra racking system, and should be used by experienced installers with a working knowledge of the components and tools used in mounting solar Photovoltaic arrays to sloped roofs.

## FEATURES

The entire Fast-Rack family of racking systems provides the following features:

- Top down clamping for ease of assembly
- Integrated bonding for reduced wire and simplified installation
- Sealing elements on all roof penetration options
- Corrosion resistant components and fasteners
- Up to 1” of height adjustment to minimize the need for shims on uneven rooftops and to clear rooftop obstacles

## LIABILITY

The Fast-Rack Ultra racking components are to be used for sloped roof mounting of solar photovoltaic arrays only. Damage or Injury caused by failure to comply with these installation instructions, safety instructions, or misuse of product is the responsibility of others, including the installer and building owner.

## SAFETY

### Personal Safety

Prior to starting installation it is important to identify all potential hazards and implement a safety plan denoting how to deal with these hazards.

Examples of some potential personal hazards which may be encountered during a sloped roof installation are:

- Fall Hazards – Ensure compliance with OSHA regulations for working at height. Use fall protection, or fall prevention equipment and practices as necessary.
- Electrical Hazards – Observe the location of overhead and rooftop conductors/electrical equipment. When possible disconnect/lockout circuits in the work area.
- Lifting Hazards – Use proper lifting techniques to prevent work place injuries when moving components on the ground, on the roof and lifting between the ground and roof.
- Environmental Hazards – Rain, snow, wind, sun and heat. All of these have the potential to injure personnel and property if not properly prepared for.

Once the hazards specific to the installation have been identified, it is critical to devise a plan should a workplace accident occur. Some things to have prepared and discussed prior to start of work are:

- Location of nearest hospital, emergency phone number
- Trained and certified on-site first-aid attendant and location of first-aid kit
- Devise method for extracting injured personnel
- Communication and awareness of potential hazards
- Trained and certified fall protection training for all personnel working at height

HES PV Ltd. offers regular training courses for Fall Protection Awareness, while Occupational First Aid courses can be found in most municipalities often through local fire departments.

### Site Safety

If necessary, obtain a structural analysis of the roof to determine its capacity before installing solar PV modules. Failure to do so may result in overloading the roof and could lead to costly upgrades of the existing structure.

Most municipalities in Canada have recognized that the distributed load of a Solar PV array (typically less than 4 PSF) is a small fraction of most residence's snow load capacity and often do not require a structural analysis for permitting. Familiarize yourself with local municipalities' building permit requirements. Larger

commercial and industrial projects will typically require a structural assessment prior to the issue of a building permit.

In addition to determining the structural suitability of the building it is also important to protect the building when working on the roof. Adhere to best practices when working on different roof membranes to prevent damage to the roof and the potential for water penetration.

If necessary, work with an experienced roofer to install roof penetrations according to roof manufacturer's specifications.

It is the responsibility of the installer/owner to ensure the racking and solar system (including installation) meets local building and electrical codes along with requirements for local power distribution companies.

## TOOLS

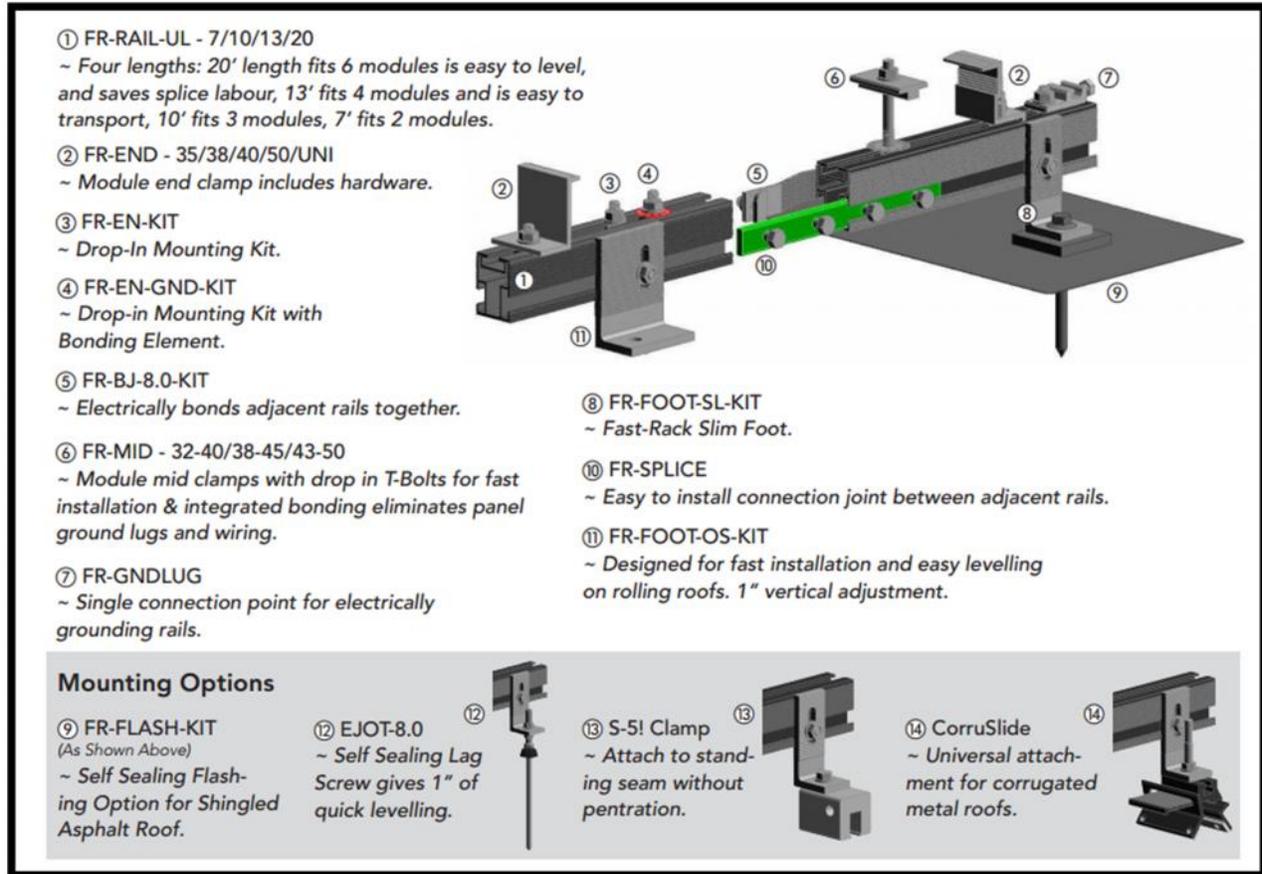
A major goal of the Fast-Rack mounting systems was to standardize the tools needed for installation. In general, the following tools are necessary:

- Drill/driver with various bits, extra battery
- Socket wrench/wrench (various sizes – 1/2" necessary for most Fast-Rack applications)
- Wire snips/Side Cutters
- Waterproof sealant, plus rag/cleaning method
- Chalk/chalk line (for marking array layout)
- Hand-saw or chop saw (to modify rail length for more complex layouts)
- Tape measure
- Carpenter's level
- Electronic stud finder
- Anti-seize Nickel lubricant (for stainless steel fasteners, to reduce galling)

*\*See individual mounting options for a list of mounting-specific extra tools*

## COMPONENTS

The illustration below shows the various components common to the Fast-Rack Mounting System.



## LAYOUT

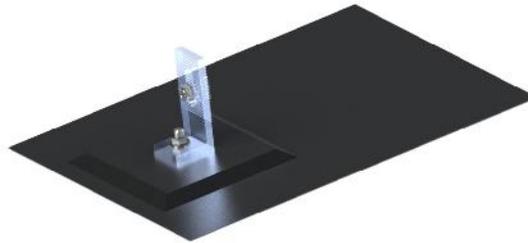
When creating a layout, it is important to keep in mind both aesthetics and available space. In general, HES recommends the following method:

- Measure and mark center line of roof
- Mark footprint of array, moving evenly outwards from either side of centerline, maintaining an 18" minimum spacing from all sides of the roof and a 24" minimum spacing from the roof ridge.
  - To calculate the width of the array, include the correct number of modules and end clamps, plus 2 inches on either side of the array for end clamps.
  - When calculating the height of the array include 1/2" air gap between rows.

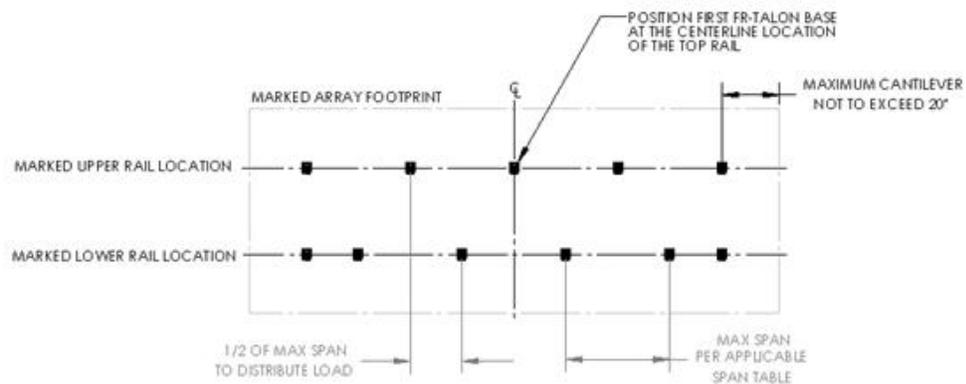
- Mark rail locations using a chalk line (following the ‘20%, 60%, 20%’ rule of thumb – roughly 60% of your panel should be between your two rails, leaving 20% overhang on either side)
  - Otherwise, confirm the module manufacturer’s recommended rail locations for their specific modules.

## ROOF ATTACHMENTS

- When using FR-Talon: position first FR-Talon Base on the centerline of the array at location of top rail.



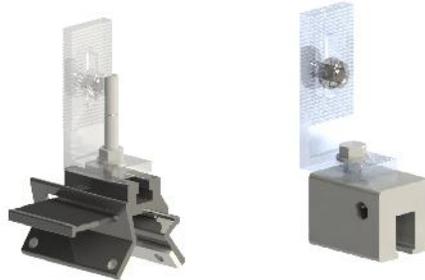
- A sample *Fast-Rack Talon* fastener layout can be seen below:



- For FR-Flashing: Locate studs and mark fastener locations, using an electronic stud finder.



- For Corrugated and Standing Seam roofs: use appropriate mounting hardware on seam or rib nearest to the centerline of array.



- Position remaining roof attachment based on Fast-Rack span table and local environmental conditions.
- Install Fast-Rack L-Foot brackets on each roof penetration using the supplied roof attachment drawings.

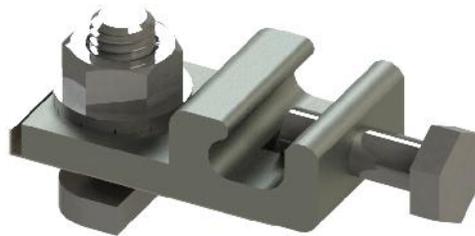
## RAIL INSTALLATION

- Align one end of the Fast-Rack rail with one of edge of marked array foot print. Along the top row of roof penetrations and Fast-Rack L-Foot brackets.
- Position rail so that the T-Bolts (attached to L-Foot Brackets) align with the appropriate slot in the rail.

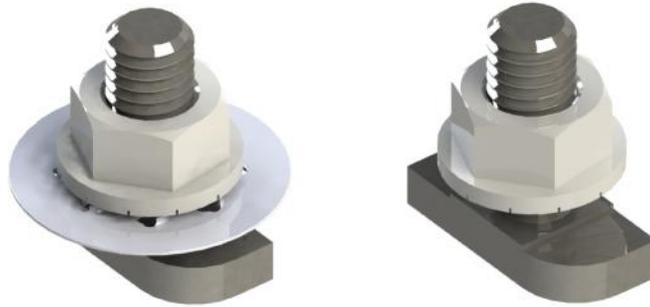
- Join additional rails using the FR-Splice as shown in the ‘Components’ section at the start of this manual.
  - Do not use FR-Splice within 60” of end of rail.
  - Reposition rails if necessary
- Using the corrugations on both the side of the rail and the L-Foot Brackets, as well as a carpenter’s level, ensure the rails are level before tightening the T-Bolts (attached to L-Foot Brackets).
  - Recommended Torque settings are: 188in-lbs (dry), 169in-lbs (lubricated)
- Leave excess rail ends uncut until modules are installed.
- Repeat the above steps for each row of rails installed.

## BONDING AND ATTACHMENT COMPONENTS

### FR-GNDLUG



- Locate the FR-GNDLUG approximately 6” from the end of the rail nearest to junction or combiner box to ensure they are completely hidden under the outermost module.
- Align the T-bolt with the channel on the top of the rail and tighten to form bond between the rail and the #6 Cu wire.
  - Recommended Torque settings are: 188in-lbs (dry), 169in-lbs (lubricated)
- Repeat above step for each row of modules (or rails, dependent on local inspectors interpretation of bonding method)
- Run continuous #6 Cu wire through all FR-GNDLUG’s and connect to ground lug in Junction/Combiner Box.

**FR-EN-KIT/FR-END-GND-KIT**

These kits are used to mount components to the rail such as optimizers and micro-inverters. GND-KIT includes washer for bonding component to rail when necessary.

- Position FR-EN-KIT/FR-EN-GND-KIT as close to module frame as possible to prevent interference with junction boxes located on underside of modules, and to prevent possible contact between module glass and T-Bolt when snow/wind load applied to module glass.
- Align the T-bolt with the channel on the top of the rail, install component to be mounted and tighten fastener.
  - Recommended Torque settings are: 188in-lbs (dry), 169in-lbs (lubricated)
- Repeat above step for each component to be mounted.
- Install trunk cable or connect adjacent components prior to installation of modules.
  - Use 'P-clips', zip-ties, or other cable management system to prevent cable from contacting roof surface as this may cause unexpected wear on the cables and roofing material.

**FR-SPLICE**

The Fast-Rack Splice is used to mechanically connect adjacent rails together when necessary. Each splice includes splice bar, and 4 fasteners.

- Place splice bar into the appropriate slot on the Fast-Rack Rail with the two fasteners overlapping the rail, then tighten.
  - Typically 3-4 inches into the rails slot.
  - Recommended Torque settings are: 188in-lbs (dry), 169in-lbs (lubricated)
- Repeat above step for adjacent rail.
  - Be sure to leave a small gap (1/4"-3/8") between adjacent rails to allow for thermal expansion.
- Repeat for all splices in the system.

**FR-BJ-8.0-KIT**

The Fast-Rack Bonding Jumper Kit is used to electrically bond adjacent rails together when necessary. Each kit includes bonding strap, 2 bonding plates and 2 T-Bolts with flange nuts.

- Place T-Bolt located on one end of the kit into the appropriate slot on the Fast-Rack Rail with the bonding washer/plate between the bonding strap and the rail, then tighten.
  - Typically within 2-3 inches from the end of the rail
  - Recommended Torque settings are: 188in-lbs (dry), 169in-lbs (lubricated)
- Repeat above step for adjacent rail.
  - Be sure to leave some slack on the bonding jumper to prevent straining the bonding strap.
- Repeat for all splices in the system.

## MODULE INSTALLATION

- Starting at the center of the array and working outwards, place one FR-SMID on the top row of rails and one FR-SMID on the bottom row rails rest one module on the rail, with the top of the FR-SMID extending over the module frame.
  - Ensure the bonding component of the mid clamp is seated properly.
  - Ensure the module is parallel to the rail.
  - Ensure the module is located such that the clamps contact the rail in the correct mounting 'zone' as specified by the module manufacturers.
  - Ensure electrical connections are complete.
- Loosely tighten the Flange nut on the FR-SMID to hold the module in place.
- Place second pair of FR-SMIDs on unsecured side of module as per directions above.
- Secure second module with second pair of FR-SMIDs, tighten completely.
  - Recommended Torque settings are: 188in-lbs (dry), 169in-lbs (lubricated)
- Continue until the end of the row, and secure outermost edge of last module using FR-END clamps.
- Repeat above steps for all rows of modules.

***\*Ensure each module is secured in four places\****

Should you have any questions with the content of this manual, please contact HES PV Limited Monday – Friday between 8:30AM and 5:00PM local time.