



SnapNrack™

Solar Mounting Solutions

Series 200

Residential Ground Mount System
Installation Manual

snapnrack.com



2703 Listed — PV Mounting System

SnapNrack Series 200 PV Mounting System offers a straightforward, visually appealing, photovoltaic (PV) module installation system. This innovative system simplifies the process of installing solar PV modules, shortens installation times, and lowers installation costs.

SnapNrack systems, when installed in accordance with this manual, will be structurally adequate for the specific installation site and will meet the local and International Building Code. Systems will also be bonded to ground, under SnapNrack's UL 2703 Listing.

The SnapNrack installation system is a set of engineered components that can be assembled into a wide variety of solar mounting structures. It is designed to be installed by qualified solar installation technicians. With SnapNrack you will be able to solve virtually any PV module mounting challenge.

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Certification Details

SnapNrack Series 200 system has been evaluated by Underwriters Laboratories (UL) and Listed to UL /ANSI Standard 2703 for Grounding/Bonding and Mechanical Loading.

Grounding/Bonding

The Series 200 system has been designed in compliance with UL Standard 2703 Section 9.1 Exception, which permits accessible components that **are not part of the fault current ground path to not be electrically bonded** to the mounting system. The UL Listing covers bonding for a load rating up to 45 psf. For more details on the integrated grounding functionality see the [Grounding Specifications](#) section.

This racking system may be used to ground and/or mount a PV module complying with UL 1703 only when the specific module has been evaluated for grounding and/or mounting in compliance with the included instructions. See the [Grounding Specifications](#) for the list of modules tested with the Series 200 system for integrated grounding.

Ground Lug has been evaluated to both UL 467 and UL 2703 Listing requirements.

Series 200 has been listed with a number of Module Level Power Electronic (MLPE) devices. A complete list can be found in the [Grounding Specifications](#) section.

The mounting system Bonding Listing is only valid when installed with a Non-Separately Derived PV system. The PV system is required to have a direct electrical connection to another source, such as connecting to the grid via a grid interactive inverter.

SnapNrack recommends that bare copper never come into contact with aluminum.

SnapNrack engineered systems should only be used with SnapNrack components and hardware. Any application outside of those specified in this Installation Manual and the Structural Engineering Report may void the warranty and could become invalid.

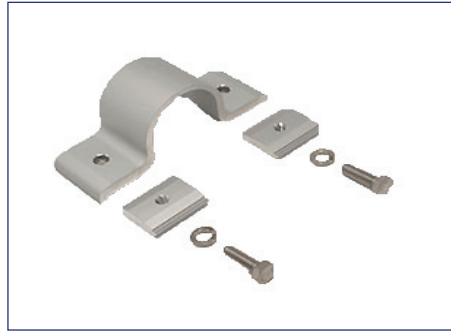
If the module clamps have been engaged and need to be loosened and reengaged, SnapNrack recommends moving the module frame 3mm to engage the bonding pin in a new location.

SnapNrack recommends a periodic re-inspection of the completed installation for loose components, loose fasteners, and any corrosion, such that if found, the affected components are to be immediately replaced.

Structural Components



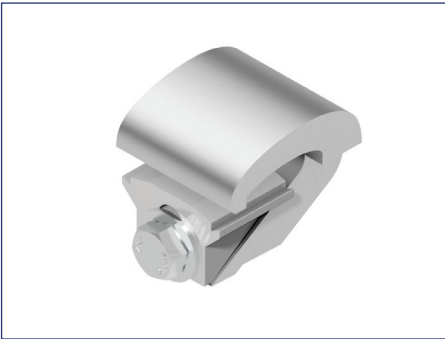
SnapNrack Ground Rail



SnapNrack Pipe Clamp Assembly



SnapNrack Ultra Rail End Clamp



SnapNrack Universal End Clamp



SnapNrack Ultra Rail Mid Clamp



Single Adjustable Socket Tee, Hollaender (17-8), 1-1/2"



Double Adjustable Socket Tee, Hollaender (19E-8), 1-1/2"



Single Socket Tee, Hollaender (5EXT-8), 1 1/2"



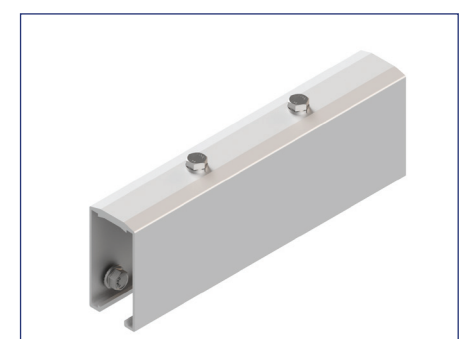
Single Reducing Socket Tee, Hollaender (5-89), 1-1/2" x 2"



Double Adjustable Reducing Socket Tee, Hollaender (19-98), 2" x 1-1/2"



Single Adjustable Reducing Socket Tee, Hollaender (17-98), 2" x 1-1/2"



SnapNrack Ground Rail Splice With Grounding Bolt & Nut

Structural Components



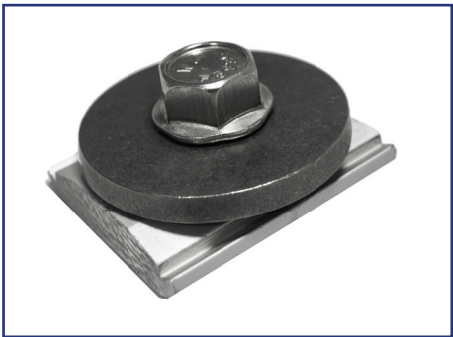
American Ground Screws
Model 3



SnapNrack Wire Clamp



SnapNrack Wire Retention Clip



SnapNrack MLPE Attachment Kit



SnapNrack Ground Lug



IlSCO Lay-In Lug - GBL-4DBT

Aesthetic Components



SnapNrack Ground Rail End Cap



Hollaender Plastic Plug End



Hollaender Aluminum Plug End

Hardware Torque Specifications

Hardware Description	Torque Specification
Grounding Electrode Conductor to SnapNrack Ground Lug (6-12 AWG Solid Copper)	16 ft-lbs (192 in-lbs)
IlSCO Lay-in Lug GBL-4DBT to Rail	5 ft-lbs (60 in-lbs)
Grounding Electrode Conductor to IlSCO Lay-in Lug GBL-4DBT (10-14 AWG Solid Copper)	1.67 ft-lbs (20 in-lbs)
Grounding Electrode Conductor to IlSCO Lay-in Lug GBL-4DBT (8 AWG Stranded Copper)	1.04 ft-lbs (25 in-lbs)
Grounding Electrode Conductor to IlSCO Lay-in Lug GBL-4DBT (4-6 AWG Stranded Copper)	1.46 ft-lbs (35 in-lbs)
Ultra Rail End Clamp, Mid Clamp (Standard Stainless Steel Fasteners)	10+ ft-lbs (120+ in-lbs)
Ultra Rail End Clamp, Mid Clamp (Black Stainless Steel Fasteners)	8 ft-lbs (96 in-lbs)
Universal End Clamp	10 ft-lbs (120 in-lbs)
All Hollaender Pipe Fittings	16 ft-lbs (192 in-lbs)
Pipe Clamp Assembly	12 ft-lbs (144 in-lbs)
SolarEdge Frame Mounted Bracket to Module Frame	7 ft-lbs (84 in-lbs)
MLPE Attachment Kit (Rail Mounted Bracket to Rail)	10 ft-lbs (120 in-lbs)
Enphase Frame Mounted Bracket to Module Frame	13 ft-lbs (156 in-lbs)

Site Survey

- Measure the installation area and develop an accurate drawing identifying any obstacles such as buildings, ditches, and trees.
- Identify any access areas or keep-out areas as required by the local AHJ (i.e. easements).
- If terrain and/or soils conditions do not meet the minimum requirements set in the Series 200 Structural Engineering Report, consult a structural engineer.

Design Guidance

1) Layout the array in the available installation area. Adjacent modules in the same column are spaced 3/4" apart. Adjustable End Clamps require an additional 1" of rail extending past module frame, while Universal End Clamps require no extra rail. When installing multiple columns of modules, a minimum spacing gap of 1/8" should be used between columns.

2) Review the shading pattern across the installation area from nearby structures, trees, etc.

 **Design Note:**
A shade analysis prior to the design as a part of the standard site analysis is recommended.

3) Determine site conditions for calculating the engineering values.

 **Design Note:**
Always confirm that site conditions and code versions comply with local AHJ requirements.

4) Reference site conditions and system specifications in Series 200 Structural Engineering Report to determine maximum

5) To simplify the design process and automatically generate a bill of materials for the mounting system, use the Series 200 Configuration Tool located on the SnapNrack website. Always refer to Approved Module Lists in Installation Manuals to ensure installation complies with UL 2703 Listing.

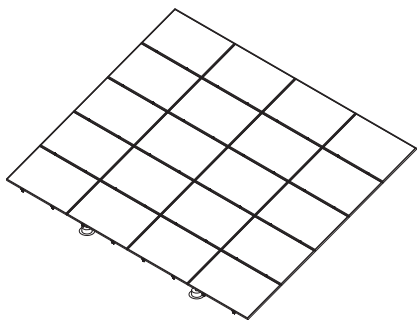
6) Insert SnapNrack installation details in to design set specific to the project requirements.

Design Note:

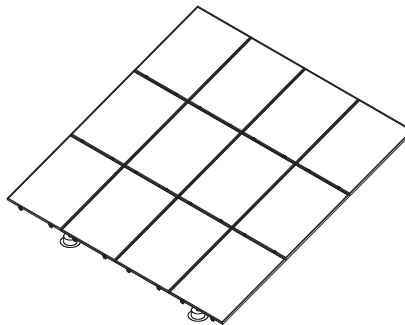
Series 200 allows for multiple mounting configurations. Modules can be mounted in landscape (long side of module perpendicular to slope) or portrait (long side of module parallel to slope) orientations up to a maximum rail length of 214". Landscape orientation is recommended for maximum material efficiency. Standard Series 200 configurations include:

- Five modules in landscape (214" MAX rail length)
- Three modules in portrait (214" MAX rail length)
- Four modules in landscape
- Three modules in landscape
- Two modules in landscape
- Two modules in portrait

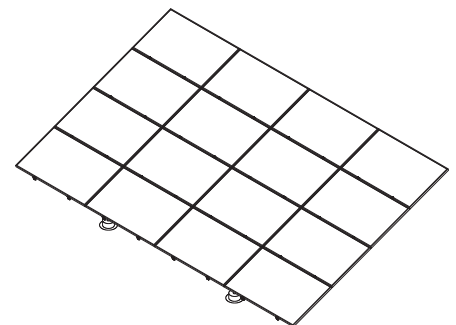
Configuration Examples



Five Modules in Landscape



Three Modules in Portrait



Four Modules in Landscape

Safety Guidance

- Before you dig any holes, contact all utilities in the area to locate any underground lines, pipes, and wiring.
- Always wear appropriate OSHA approved safety equipment when at active construction site
- Appropriate fall protection or prevention gear should be used. Always use extreme caution when near the edge of a roof
- Use appropriate ladder safety equipment when accessing the roof from ground level
- Safety equipment should be checked periodically for wear and quality issues
- Always wear proper eye protection

System Layout

- 1) Stake corners of the array according to the plan layout.
- 2) Stake and mark locations of foundations based on design.

Layout Note:

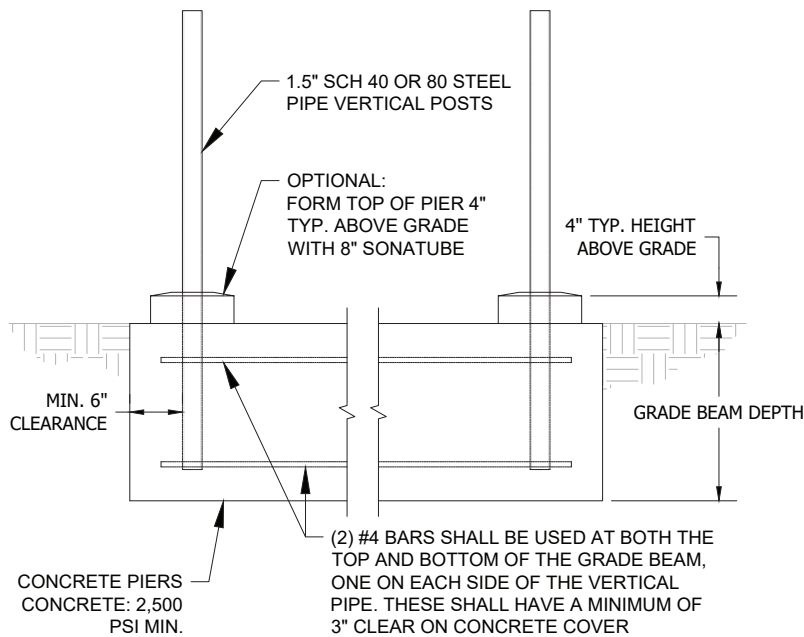
Ensure final foundation locations do not exceed the maximum pipe span and cantilever specified in the design.

Required Tools

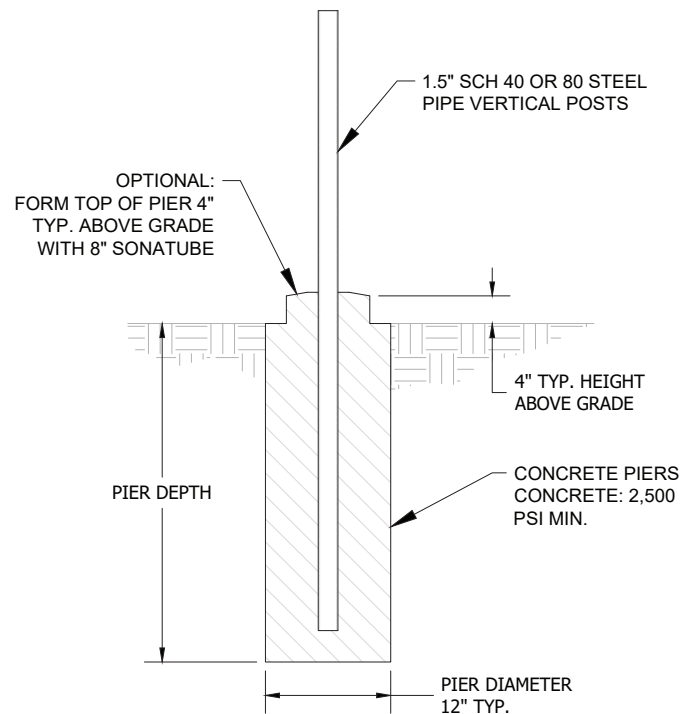
- 12" Diameter Excavation Drill Auger (Pier)
- Backhoe or Excavator with 12" Bucket (Grade Beam)
- Portable Band Saw (18 tpi)
- Concrete Mixer
- String Line
- Surveying Marker Pen or Paint
- Basic Concrete Tools

Materials Needed

- Sched 40 or 80 1-1/2" Pipe w/ 1.9" Outside Diameter (Local Supplier)
- Rebar #4 (Grade Beam Only)
- Concrete/Concrete Mix
- Wood 2x4 for Bracing Pipes



Grade Beam Foundation Detail



Standard Pier Detail

Conversion Chart for Pier to Grade Beam Footings

12" diameter Pier Depth	12" wide Grade Beams Depth (in)	18" wide Grade Beams Depth (in)	24" wide Grade Beams Depth (in)
3 ft	12	12	12
4 ft	17	15	13
5 ft	20	18	17
6 ft	24	22	20
7 ft	29	26	23

INSTALLATION INSTRUCTIONS



1A) **12" Pier Option** - Using a 12-in diameter auger, excavate footings at marked locations to the depth required by the structural engineering.



Install Note:

In areas subject to freezing, pier depths may increase to resist freeze heave. Always consult a structural engineer to confirm.



1B) **Grade Beam Option** - Using a backhoe or excavator, excavate footings at marked locations to the depth required by the structural engineering. Build rebar support structure in excavation, as specified in the Structural Engineering Report.



Install Note:

Jigs can be used to locate and support vertical posts.



2) Pour mixed concrete (minimum 2500 psi) into excavated holes.



Install Note:

Never use a sonotube in the footing and ensure concrete is in contact with soil.



3) Insert posts into wet concrete, ensuring that bottom of posts are not in contact with dirt. Set sonotubes at ground level centered around post and fill with concrete to create a pedestal above pier. Smooth concrete.



4) Use string line grid and post level to place verticals square and plumb. Support vertical posts while concrete cures.



5) Once concrete is cured, determine the proper angle for the module array and calculate the length of the vertical posts, then cut posts to length.



Install Note:

Move posts up and down to ensure concrete fills inside of posts.

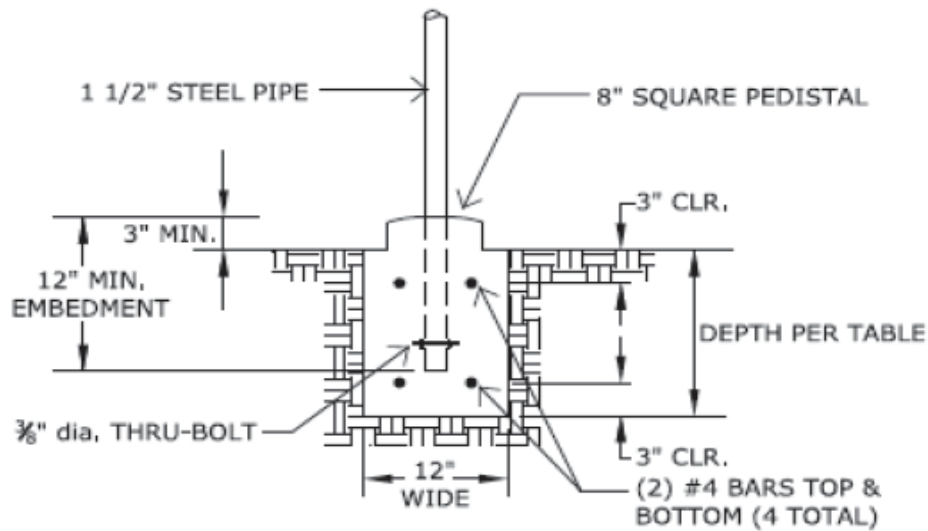


Install Note:

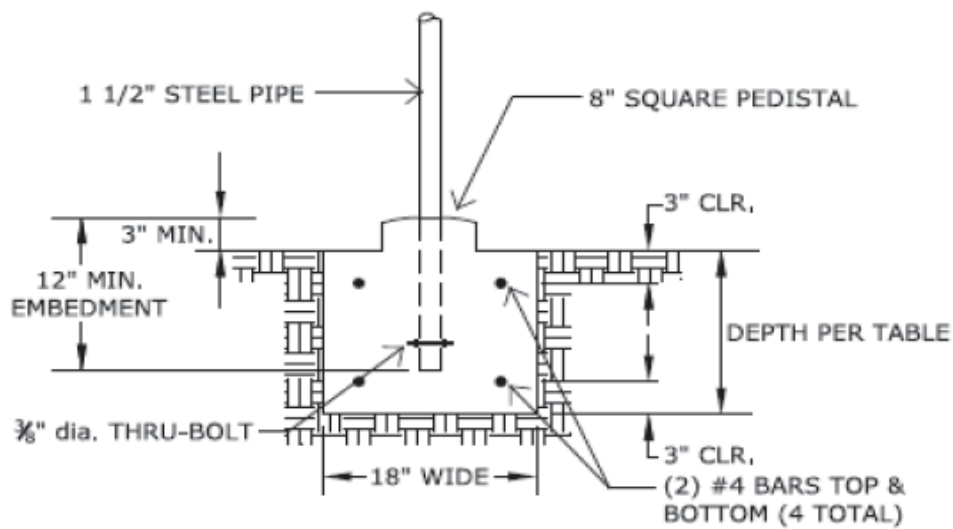
Maximum front post height is limited to 48" and maximum tilt angle is 45 degrees, measured from horizontal.

GRADE BEAM FOOTING OPTIONS

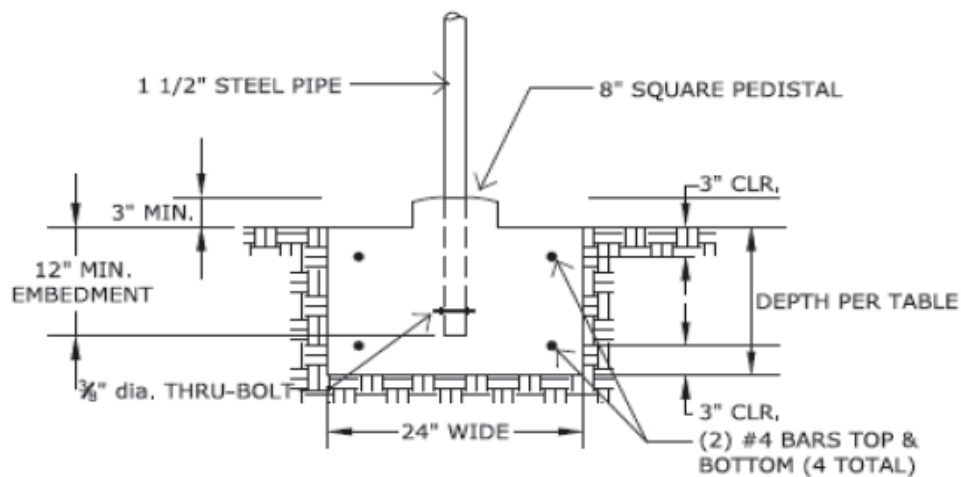
12" Wide Grade Beam Footing Option



18" Wide Grade Beam Footing Option



24" Wide Grade Beam Footing Option





Install Recommendation:

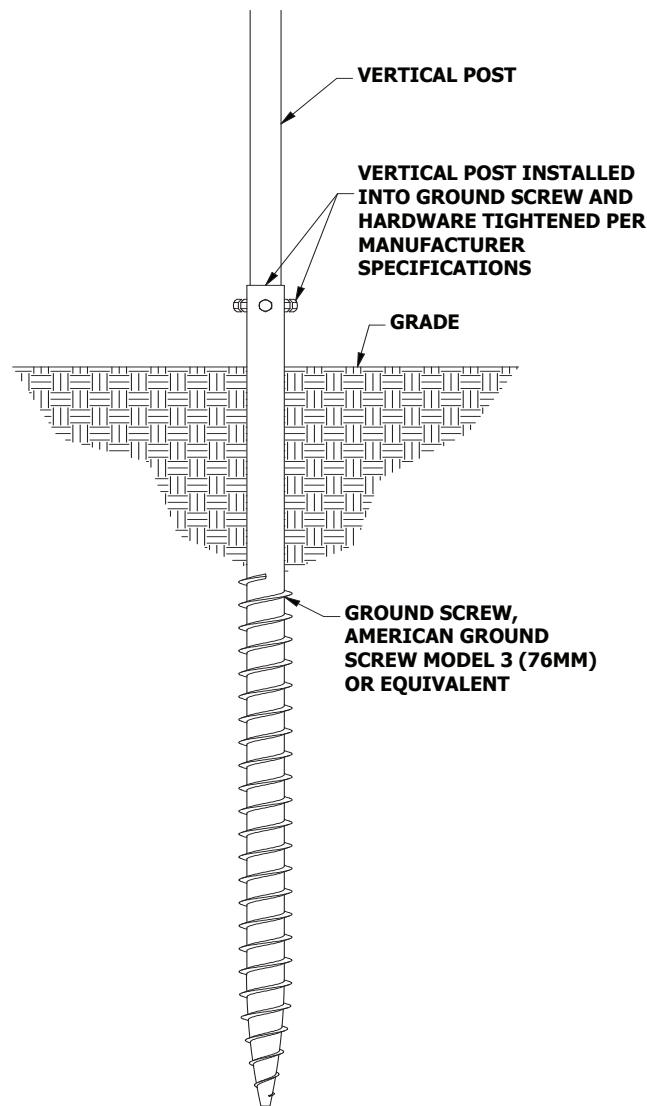
In areas subject to freezing, pier depths may increase to resist freeze heave. Always consult a structural engineer to confirm.

Required Tools

- Ground Screw Drive Head Adapter
- Skid Steer or Mini Excavator with PTO Auger Attachment
- Portable Band Saw (18 tpi)
- String Line
- Surveying Marker Pen or Paint

Materials Needed

- Sched 40 or 80 1 ½" Galvanized Pipe w/ 1.9" Outside Diameter (Local Supplier)
- Sched 40 or 80 2" Galvanized Pipe w/ 2.4" Outside Diameter (Local Supplier)
- Ground Screw, American Ground Screw Model 3, or equivalent



INSTALLATION INSTRUCTIONS



1) Using a Skid Steer, drive ground screws at marked locations.



Install Note:

To ensure the ground screw is installed plumb, use two spotters 90° apart to direct the driver.

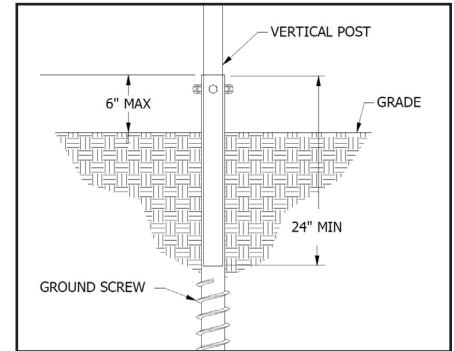


2) Drive Screw until no more than 6" of screw remains above grade.



Install Note:

Drive the two end ground screws first, then use a stringline to make sure the middle ground screws form a straight line.



3) Insert steel pipe vertical posts into ground screws ensuring that bottom of posts are seated 24" MINIMUM into the screw.



4) Use a post level and adjust the ground screw set screws to seat all vertical posts square and plumb. Tighten set screws to manufacturer specified torque.



5) Determine the proper array angle based on the plans and calculate the length of the vertical posts so the horizontal pipes are level, then cut posts to height.



Install Note:

Maximum front post height is limited to 48" and maximum tilt angle is 45 degrees, measured from horizontal.



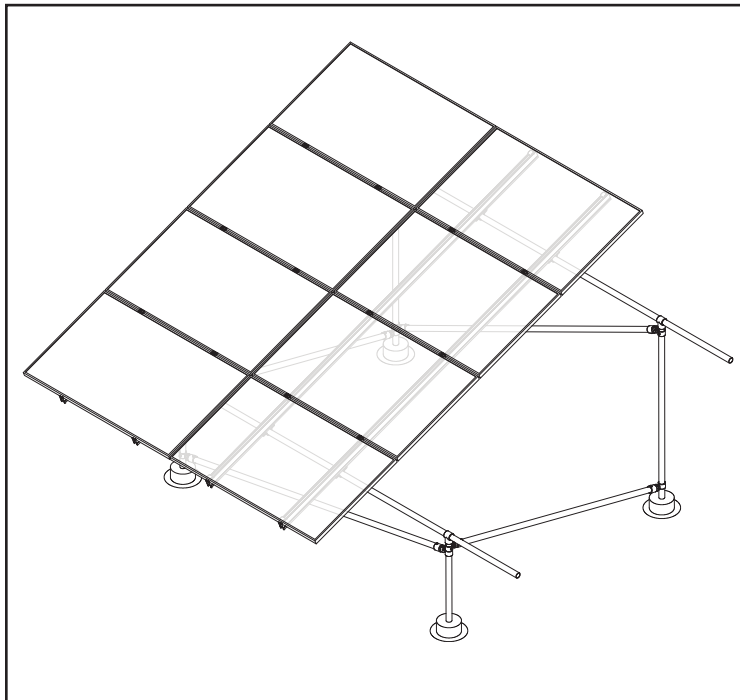
Horizontal Pipe & Bracing Installation

Required Tools

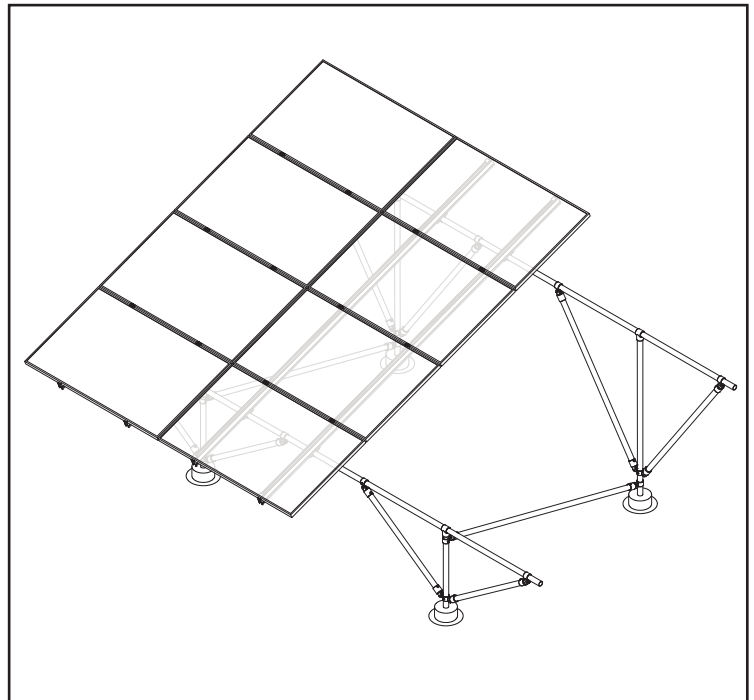
- 3/16" Allen Wrench
- Portable Band Saw
- Measuring Tape
- Cold Galvanizing Spray

Materials Needed

- Sched 40 or 80 1-1/2" Pipe w/ 1.9" Outside Diameter (Local Supplier)
- Single Socket Tee
- Single Adjustable Socket Tee
- Double Adjustable Socket Tee
- Plug Ends



Standard Option



Braced Option

INSTALLATION INSTRUCTIONS



1) Determine the bracing requirements for the racking design and slide all necessary adjustable socket tee fittings onto vertical pipes.



Install Note:

Bracing requirements can be found on Series 200 Configuration Tool output.



2) Slide the required number of single and any adjustable socket tee fittings onto horizontal pipes before installing onto verticals.



Install Note:

Install plug ends in top of vertical pipes to prevent entry of water.

Use existing rigid threaded couplers to connect long sections of pipe together.



3) Install horizontal pipes onto verticals, and then check for array tilt consistency using a section of rail along the entire length of array.



Best Practice:

Leave extra material on each end of horizontal pipes in case of errors.



4) Measure the distances between bracing fittings and cut braces to length, then install and tighten hardware on fittings.



Install Note:

Braces E and F are to be attached to the horizontal pipes at $\frac{1}{3}$ the distance between the two verticals.

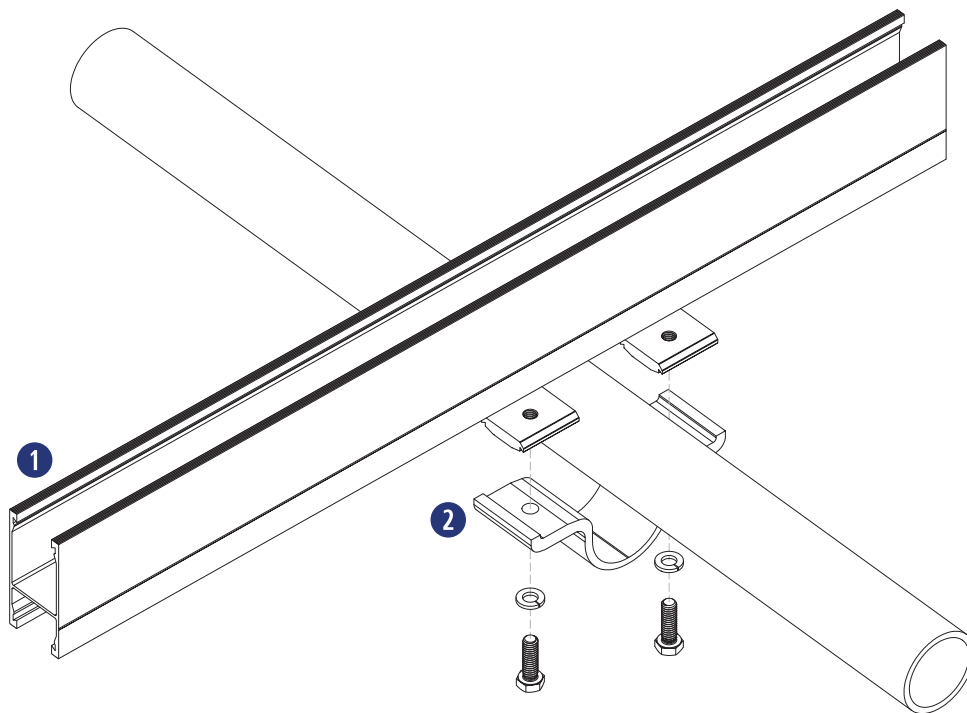
Online Configuration Tool conservatively estimates the brace lengths to ensure you purchase enough pipe, but actual field measurements should be taken and used.

Required Tools

- Level
- String Line or Spare Rail
- Pitch Meter
- Torque Wrench
- Socket Wrench
- 1/2" Socket

Materials Needed - Rail Installation

- ① Ground Rail
- ② Pipe Clamp Assemblies



Pipe Clamp to Rail Assembly

INSTALLATION INSTRUCTIONS



1) Mark rail locations on lower horizontal pipe, using module dimensions as a guideline.



2) Place pipe clamps on horizontal pipes where markings were made for rails.



3) Attach rails with pipe clamps by snapping channel nuts in to bottom rail channel.



Install Note:

Be sure to account for a small gap between module columns when marking rail locations.



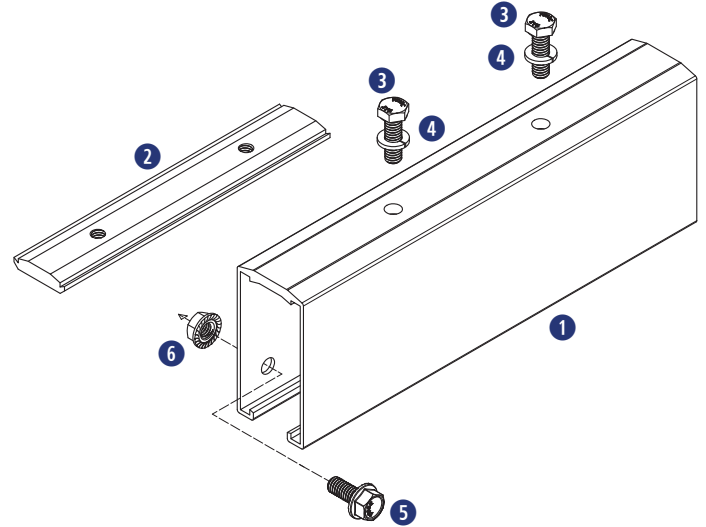
4) Square and center end rails to horizontal pipes and tighten hardware to 12 ft-lbs, then run a string line to align and install remaining rails.

Required Tools

- Drill with 5/16" Pilot Drill Bit
- Torque Wrench with 1/2" Socket
- Socket Wrench with 1/2" Socket

Materials Included - SnapNrack Ground Rail Splice Assembly

- 1 (1) SnapNrack Ground Rail Splice
- 2 (1) SnapNrack Shallow Rail Splice Insert
- 3 (2) 5/16"-18 x 1" SS HCS Bolt
- 4 (2) 5/16" SS Split Lock Washer
- 5 (1) 5/16"-18 x 3/4" SS Serrated Flange Bolt
- 6 (1) 5/16"-18 SS Serrated Flange Nut



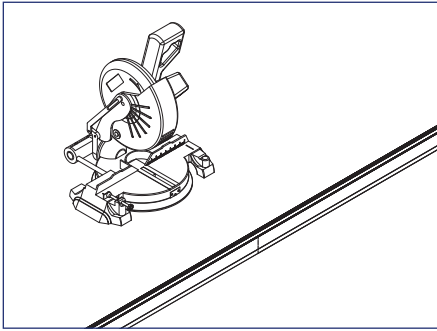
Installation Requirements

SnapNrack Ground Rail Splice must be installed between horizontal pipes, and located in an area clear of Mid Clamps and module frames.

Application Note:

Use the shorter rail section on the low end of each column to ensure the splice is located in the middle of a module. Cut off excess rail from the top of the longer section after modules are installed.

INSTALLATION INSTRUCTIONS

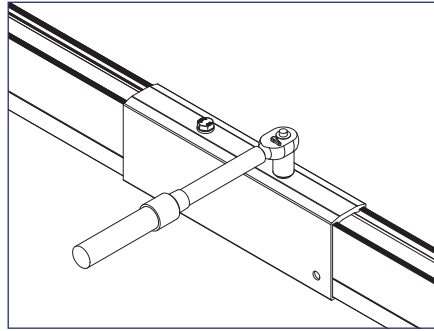


1) Cut one 172" SnapNrack Series 200 ground rail into thirds (roughly 57 inches).

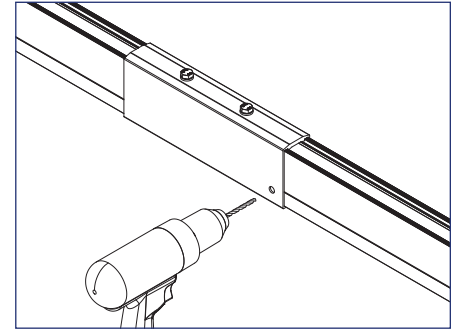


Install Note:

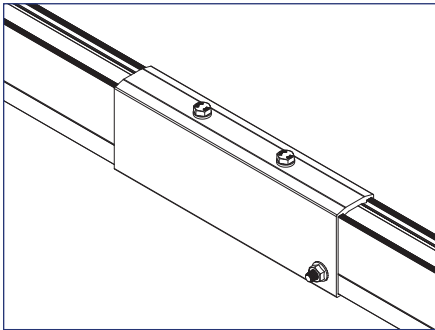
With this method (8) sections of standard 172" rail will make (6) rails for an array with columns of 5 modules.



2) Using one short rail and one 172" rail, slide the rail ends into the SnapNrack Series 200 splice, leaving a gap of no more than 1". Tighten bolts to 16 ft lbs.



3) Drill a 5/16" hole in the Series 200 rail through the existing hole in the Series 200 splice.



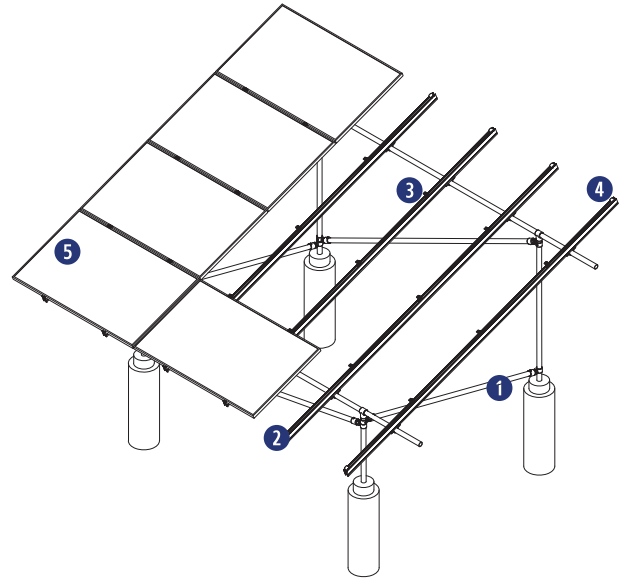
4) Insert 5/16" serrated flange grounding bolt and through rail and splice, thread on serrated flange nut, and tighten to 10 ft lbs. minimum.

Required Tools

- Torque Wrench
- Socket Wrench
- 1/2" Socket

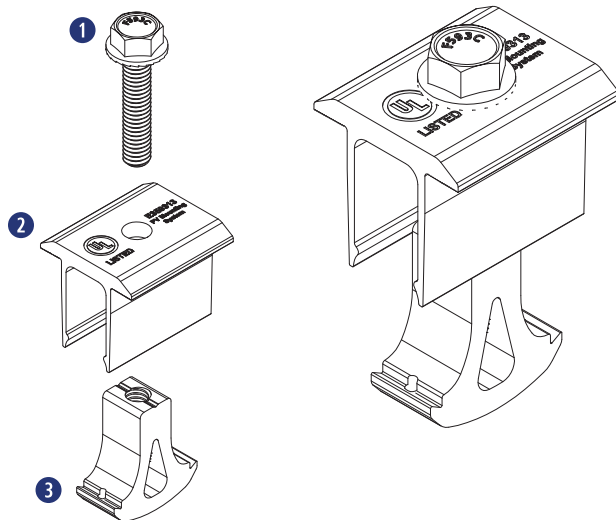
Materials Needed - Module Installation

- ① Pre-Installed SnapNrack Pipe Structure
- ② Pre-Installed SnapNrack Rails
- ③ SnapNrack Mid Clamp Assemblies
- ④ SnapNrack End Clamp Assemblies
- ⑤ PV Modules



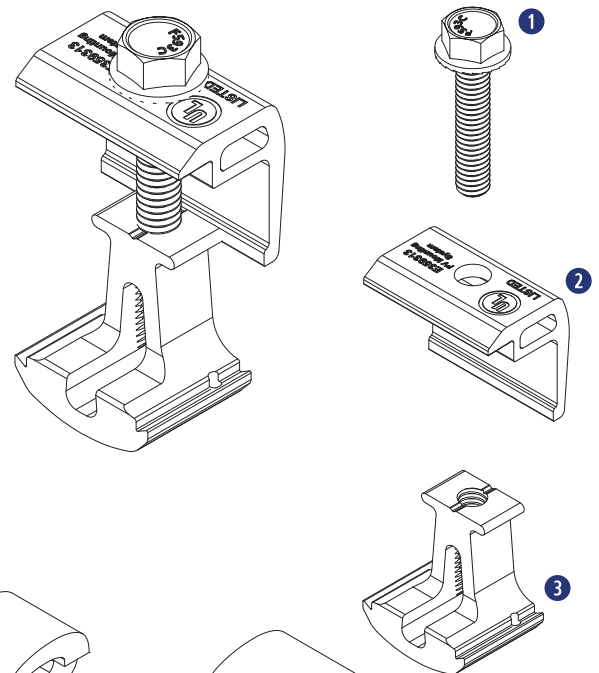
Ultra Rail Mid Clamp Assembly

- ① (1) 5/16"-18 X 1-1/2" SS Flange Bolt
- ② (1) SnapNrack Ultra Rail Mid Clamp Top
- ③ (1) SnapNrack Ultra Rail Mid Clamp Base



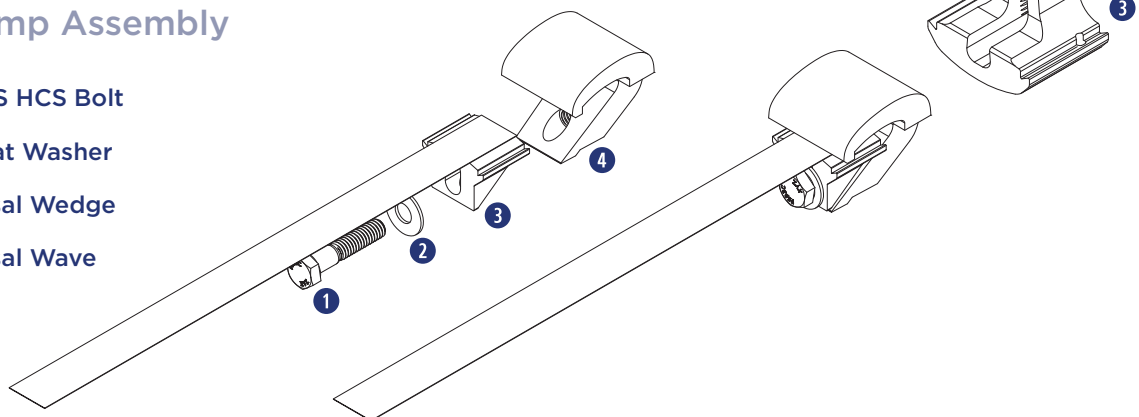
Ultra Rail End Clamp Assembly

- ① (1) 5/16"-18 X 1-1/2" SS Flange Bolt
- ② (1) SnapNrack Ultra Rail End Clamp Top
- ③ (1) SnapNrack Ultra Rail End Clamp Base



Universal End Clamp Assembly

- ① (1) 5/16"-18 X 1-1/2" SS HCS Bolt
- ② (1) 5/16" X 3/4" SS Flat Washer
- ③ (1) SnapNrack Universal Wedge
- ④ (1) SnapNrack Universal Wave

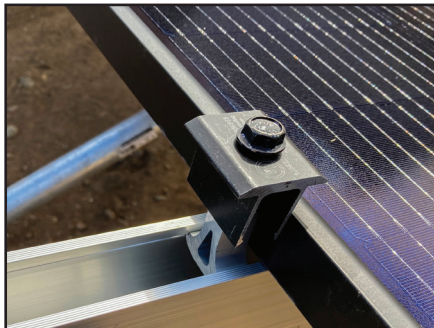


INSTALLATION INSTRUCTIONS

SnapNrack Mid Clamp



1) Snap the channel nut into the top channel of the rail.



2) Slide the mid clamp flush to the module with the top lip of the mid clamp over the top edge of the module frame, then place the next module flush to the other side of the mid clamp.



Install Note:

Take care to avoid having wires pinched between modules and rails, as this can lead to system failure and be dangerous.

Mid clamps create 3/4" gap between modules.



3) Tighten hardware, torque silver hardware to 10+ ft-lbs and black hardware to 8 ft-lbs.



Install Note:

Mid clamps are Listed with and without springs.

SnapNrack Adjustable End Clamp



1) Snap the clamp channel nut into the top channel of the rail.



2) Slide the clamp flush to the module with the top lip of the end clamp over the top edge of the module frame.



Install Note:

Take care to avoid having wires pinched between modules and rails, as this can lead to system failure and be dangerous.



3) Tighten hardware, torque silver hardware to 10+ ft-lbs and black hardware to 8 ft-lbs.



Install Note:

Adjustable End Clamps require 1" of extra rail to extend past the end of the module frame.

INSTALLATION INSTRUCTIONS

SnapNrack Universal End Clamp



1) Slide the Universal End Clamp (UEC) into the end of the rail.



2) Lift the module and slide the clamp far enough under the module to pass the lip of the bottom edge of the module frame.



3) Use the pull tab to hold the UEC taut towards the end of the rail and tighten hardware to 10 ft-lbs.



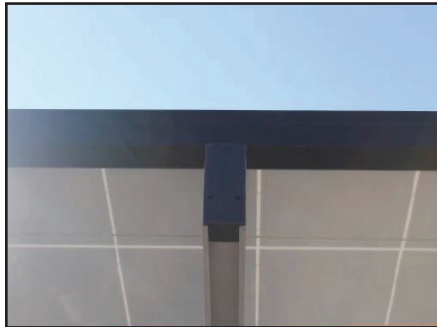
Install Note:

Take care to avoid having wires pinched between modules and rails, as this can lead to system failure and be dangerous.



Install Note:

Rail can be cut flush to the module using the UEC Rail Cutting Tool.



4) Install rubber end cap to finish.



Install Note:

Modules will need to be grounded separately when Universal End Clamps are the only type of clamp attaching a module.

Required Tools

- Socket Wrench (Wire Clamp)
- 1/2" Socket (Wire Clamp)

Materials Included - Wire Retention Clip

- 1 SnapNrack Wire Retention Clip



Dimensioned Wire Retention Clip

Application Note:

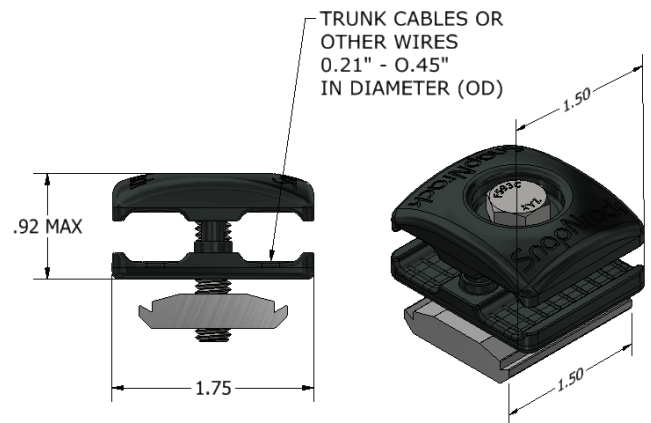
Install as necessary to manage and safely retain conductors within SnapNrack rails.

Materials Included - Wire Clamp

- 1 (1) SnapNrack 4-Wire Clamp, Trunk Cable Clamp, or Universal Wire Clamp

Application Note:

Install as necessary to secure cables and conductors running from rail to rail, or transitioning out/in from a rail channel



Dimensioned Universal Wire Clamp Assembly

INSTALLATION INSTRUCTIONS

SnapNrack Wire Retention Clip



1) Place all electrical conductors in the bottom of the rail channel, and snap the Wire Retention clip into the rail.

SnapNrack Universal Wire Clamp

Install Note:

Universal Wire Clamps are intended for both PV wire conductors and AC trunk cables.

Conductors of different types should be placed under separate Universal Wire Clamps.



1) Snap Universal Wire Clamp into top or side rail channel.



2) With Wire Clamp loose, place conductors or cables in slots.



3) Tighten Wire Clamp with 1/2" socket, ensure cables and conductors are aligned in the clamp slots.

Install Note:

Universal Wire Clamps can be rotated and oriented in any direction.

Required Tools

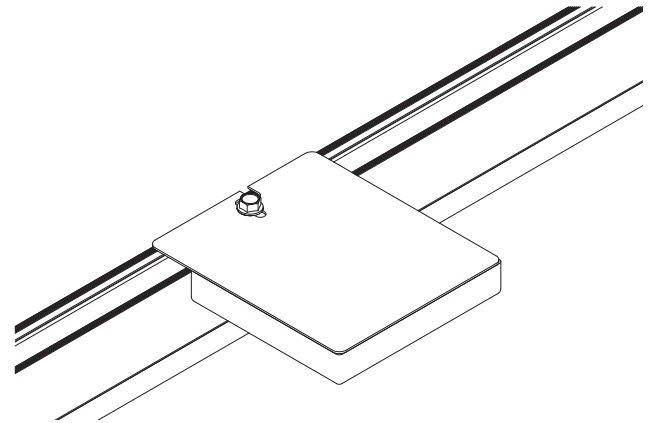
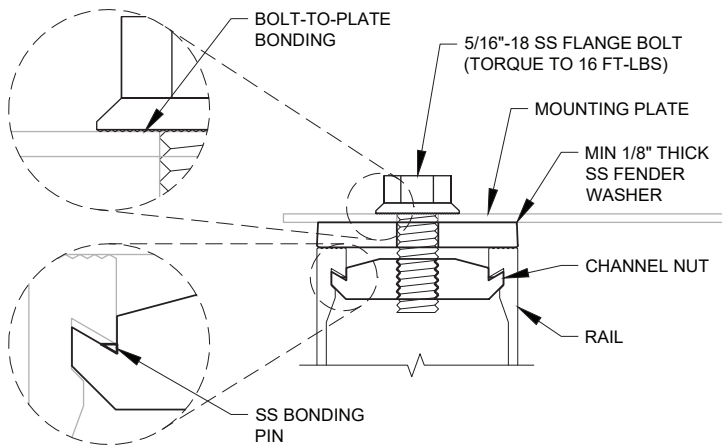
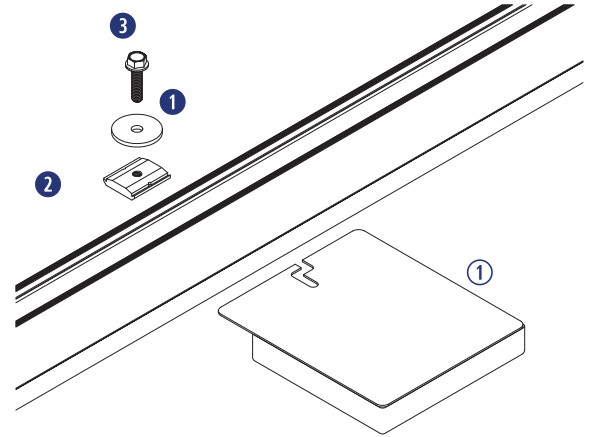
- Torque Wrench
- Socket Wrench
- 1/2" Socket

Materials Included - MLPE Rail Attachment Kit

- ① (1) 5/16" X 1-1/2" X 0.125" SS Fender Washer
- ② (1) SnapNrack Channel Nut
- ③ (1) 5/16"-18 X 1-1/4" SS Flange Bolt

Other Materials Required

- ① (1) MLPE Unit



INSTALLATION INSTRUCTIONS - MLPE RAIL ATTACHMENT



1) Snap the SnapNrack MLPE Rail Attachment Kit channel nut into the desired location on the rail where the microinverter will be installed.



2) Install the microinverter mounting plate onto the bolt of the MLPE Rail Attachment Kit, ensuring that the large fender washer is between the rail and mounting plate.

Install Note:

Bolt and washers may need to be removed and then replaced.



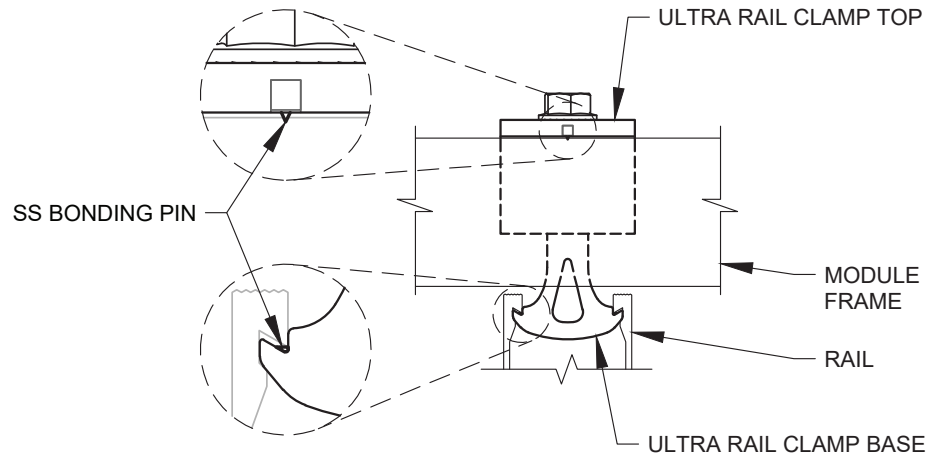
3) Tighten hardware, torque silver hardware to 10 ft-lbs.

Install Note:

MLPE Attachment Kits are approved for bolt lengths between 1" and 1.5" long.

System Bonding Methods

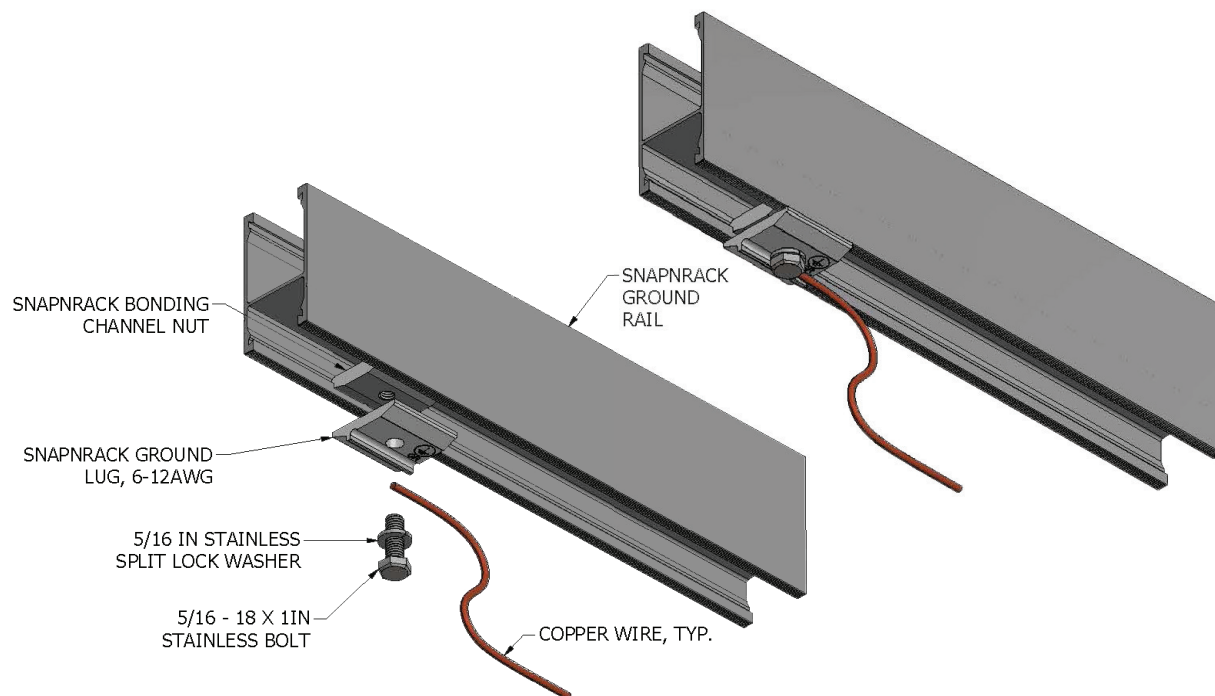
- 1 SnapNrack Ultra Rail Mid Clamp
- 2 SnapNrack Ultra Rail End Clamp
- 3 SnapNrack Pipe Clamp
- 4 Hollaendar Pipe Fittings



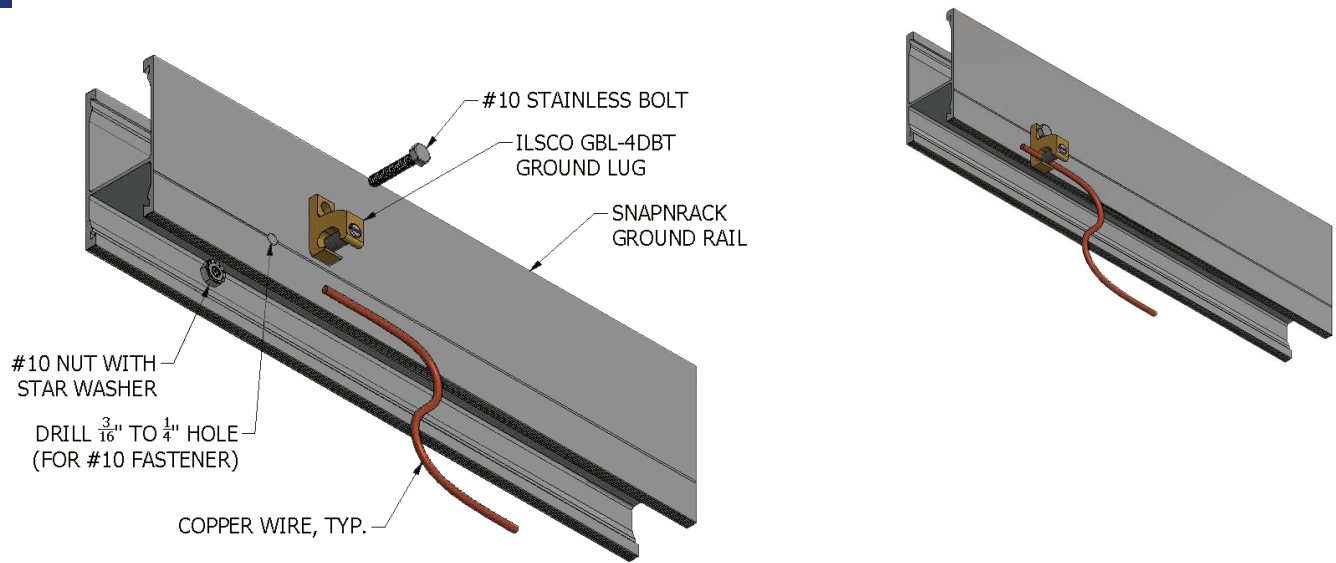
Note:

SnapNrack module clamps contain a SnapNrack Channel Nut with integral bonding pins in assembly to properly bond the system (except Universal End Clamps).

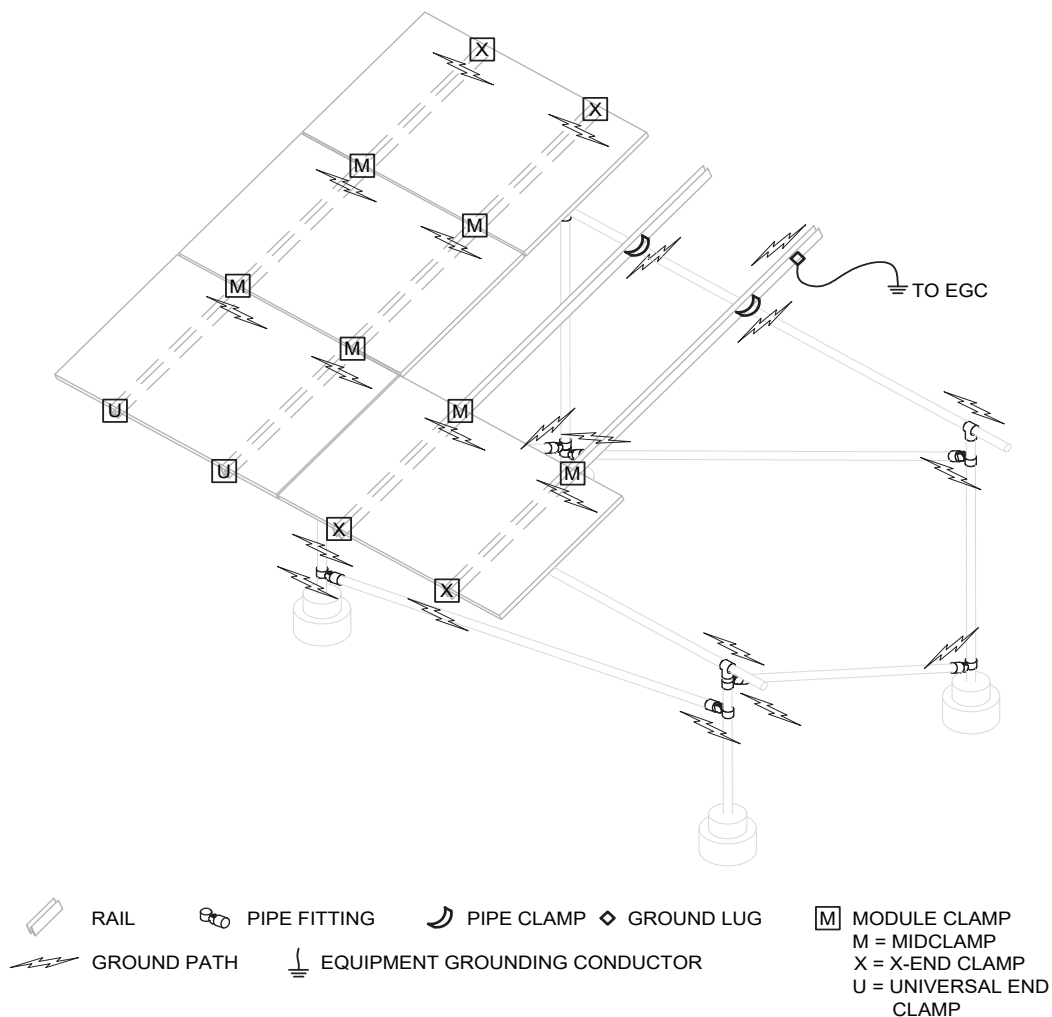
SnapNrack Ground Lug Assembly



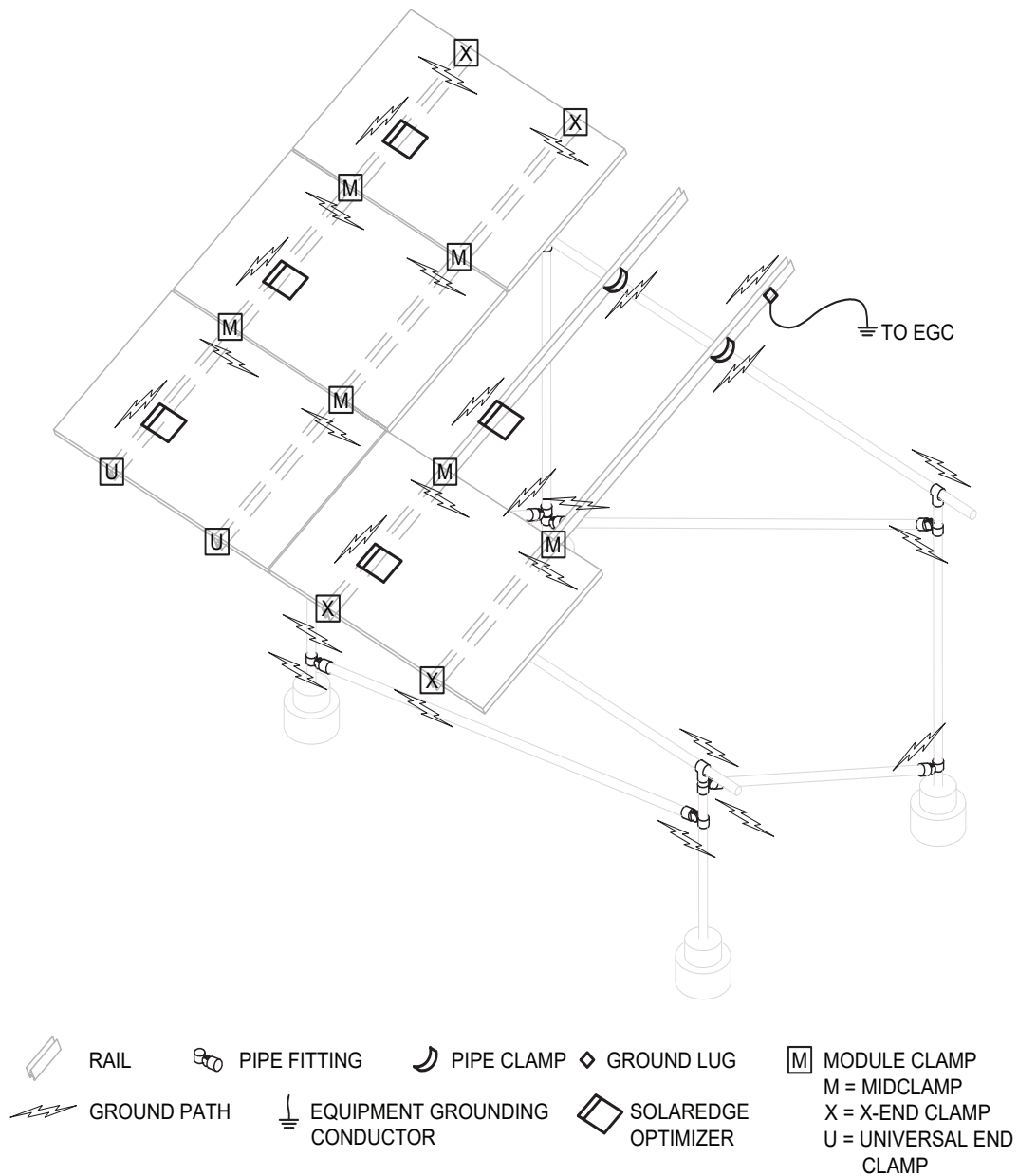
IlSCO Lay-in Lug Assembly



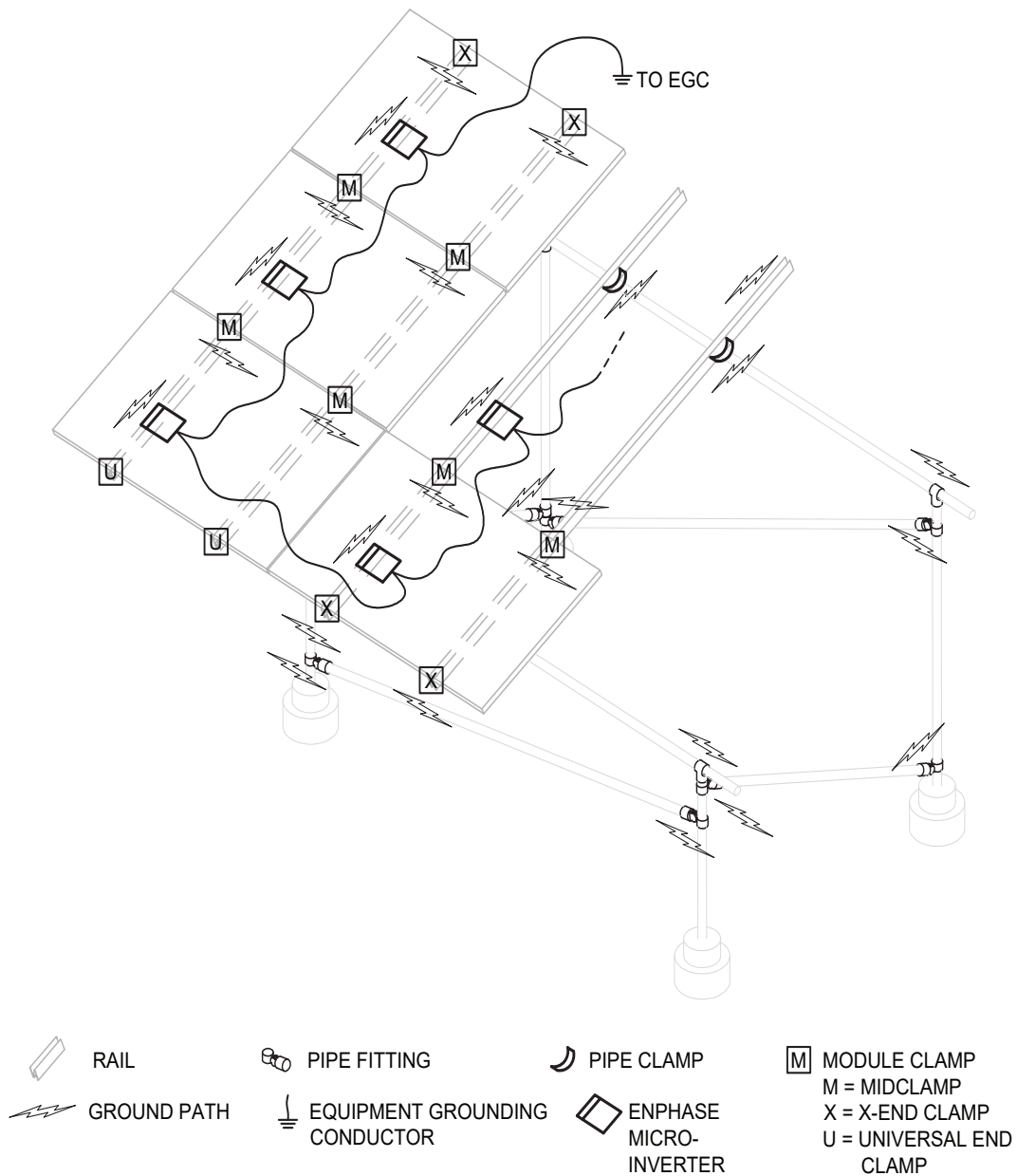
Ground Path Details



Ground Path Details - SolarEdge

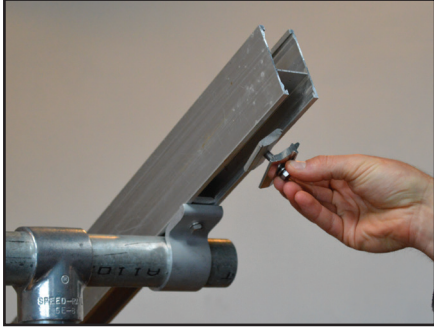


Ground Path Details - Enphase

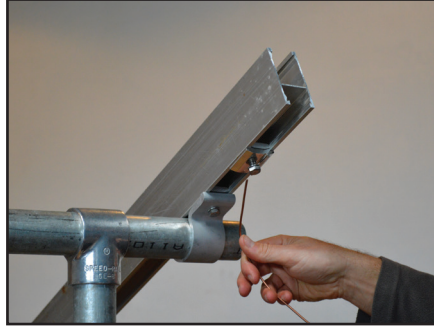


INSTALLATION INSTRUCTIONS

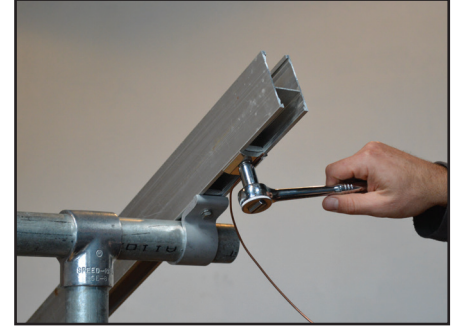
SnapNrack Ground Lug



1) Snap the SnapNrack Ground Lug into the rail channel on **one rail per array**.



2) Place grounding conductor into slot underneath split ring washer.



3) Tighten hardware to a minimum of 16 ft-lbs.



Install Note:

SnapNrack Ground Lug may be used in top or bottom channel, and may be rotated 90 degrees relative to slot to facilitate running copper across top of rails.



Install Note:

SnapNrack Ground Lug only Listed for use with 6-12 AWG solid copper conductor.

INSTALLATION INSTRUCTIONS

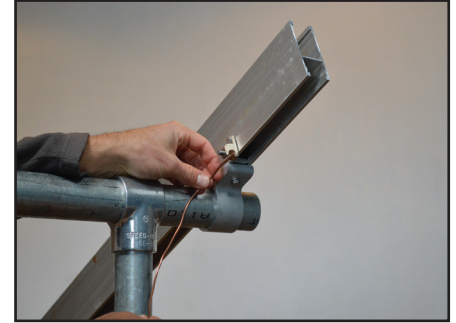
IlSCO Lay-In Lug



1) Drill and deburr a 3/8" hole in either side of the rail for the IlSCO lug to attach to, place the bolt through the hole, and attach the lug assembly on **one rail per array**.



2) Place grounding conductor into slot.



3) Tighten set screw per IlSCO's recommendation (see below).



Install Note:

Torque rail connection to 5 ft-lbs.



Install Note:

Torque set screw to 20 in-lbs for #10-#14 solid and stranded copper, 25 in-lbs for #8 stranded copper, and 35 in-lbs for #4-#6 stranded copper.



Note:

- System has been evaluated to a maximum overcurrent device (OCD) protection level of 20 Amps.
- Universal End Clamp (UEC) does not bond module to rail. Be sure to separately ground any modules that are only secured by UECs, especially during servicing.
- SnapNrack Ground Lug: torque bolt to 16 ft-lbs. The Ground Lug may be used in top or bottom channel. It may be rotated 90 degrees relative to slot to facilitate running copper across top of rails.
- Grounding with a standard IlSCO GBL-4DBT Lug is a listed alternate and requires drilling of a hole in the rail.
- IlSCO hardware connection to rail: 5 ft-lbs. Torque for lug set screw: #10-#14 solid and stranded copper- 20 in-lbs, #8 stranded copper- 25 in-lbs, #4-#6 stranded copper- 35 in-lbs.

DynoBond

R/C (QIMS2), DynoRaxx (E357716) photovoltaic bonding jumper cat. no. DynoBond is an optional component that may be used with this system. The DynoBond jumper has been evaluated to provide module to module bonding. The DynoBond device attaches to the frame flange of adjacent modules.

Maintaining the Grounding Bonding When Removing a Module

INSTRUCTION FOR MAINTAINING THE GROUNDING BONDING WHEN REMOVING A MODULE FOR SERVICING

CAUTION: Module removal may disrupt the bonding path and could introduce the risk of electric shock. Additional steps may be required to maintain the bonding path. Modules should only be removed by qualified persons in compliance with the instructions in this manual.

Module removal is not presented as a frequently expected occurrence and will not be required as part of routine maintenance.

Scenarios that could result in a disruption of the bonding path are, for example irregularly-shaped arrays, arrays consisting of individual rows, and any other scenario where module removal could disrupt the bonding path.

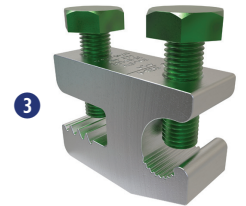
In most cases, the removal of a module for servicing will not disturb or break grounding continuity because SnapNrack Series 200 Ground Mount Systems are bonded through the rail. If a module is to be removed that will break continuity, these are the steps that must be taken to maintain a continuously bonded SnapNrack Series 200 Ground Mount System.

Required Tools

- Socket Wrench
- Torque Wrench
- 1/2" Socket
- 7/16" Socket

Required Materials

- 1 #10 Or Larger Bare Copper Conductor
- 2 SnapNrack SKU 242-02101
- 3 IlSCO Part No. SGB-4
- 4 DnoRaxx Dynobond™

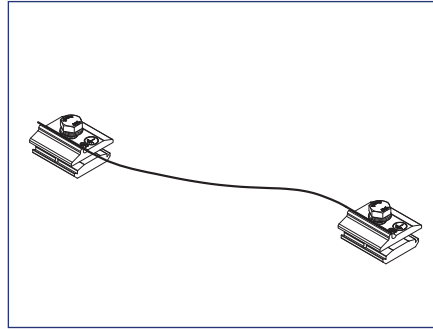


Maintaining the Grounding Bonding When Removing a Module

JUMPER ASSEMBLY INSTRUCTION & INSTALLATION

CAUTION: Do Not Remove the Module until the Jumper is installed

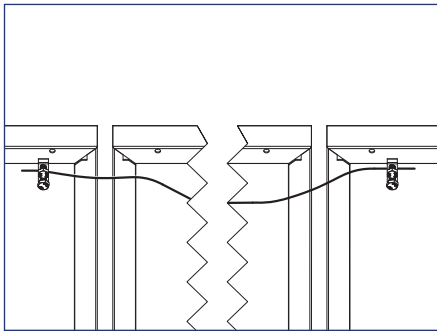
1) Identify the existing ground path at the location of module removal and choose an appropriate length of #10 bare copper to bridge the soon to be broken ground path.



Example of assembled bonding jumper using (2) SnapNrack Ground Lugs

2) Attach one ground lug to each end of #10 bare copper wire. See recommended options below:

1. (2) SnapNrack SKU: 242-02101
2. (2) IlSCO part no. SGB-4
3. (1) SnapNrack part no. 242-02101 & (1) IlSCO part no. SGB-4
4. (1) DroRaxx DynoBond™



3) Before the module is removed, attach the assembled bonding jumper. Depending on where the module will be removed and choice of ground lug, jumper attachment locations will vary.

- IlSCO SGB-4 lugs can be attached to SnapNrack S200 Ground Rail, or module frames
- SnapNrack Ground Lug can only be attached to SnapNrack S200 Ground Rail
- DynoRaxx DynoBond™ is approved and appropriate when a short bonding jumper is needed from module to module, or module to rail

4) Service the array. With the bonding jumper installed, it is now safe to remove the module for service or maintenance.

5) After Servicing the array reinstall the module and original ground path. Only then remove the bonding jumper.

Caution: Do not remove the bonding jumper until original ground path is established.

Series 200 has been tested with the following UL Listed modules:

The Series 200 System employs top-down clamps which have been evaluated for frame-to-system bonding, at specific mounting torques and with the specific modules listed below.

Manufacturer	Model
Aptos Solar	DNA-120-MF23-XXX
	DNA-120-BF23-XXX
	DNA-144-MF23-XXX
	DNA-144-BF23-XXX
Boviet Solar	BVM6610P-XXX
	BVM6610M-XXX
	BVM6612P-XXX
	BVM6612M-XXX
Canadian Solar	CS6K-XXX-M
	CS6K-XXX-M-SD
	CS6K-XXX-P
	CS6K-XXX-P-SD
	CS6K-XXX-MS
	CS6P-XXX-M
	CS6P-XXX-P
	CS6P-XXX-P-SD
	CS6V-XXX-M
	CS6V-XXX-P
	CS6X-XXX-P
	CS3K-XXX-P
	CS3K-XXX-MS
	CS3U-XXX-MS
	CS3U-XXX-P
	CS1K-XXX-MS
	CS1H-XXX-MS
	CS1H-XXX-MS-AB
	CS3W-XXX-P
	CS3N-XXX-MS
	CS1Y-XXX-MS
ET Solar	ET-P660XXXBB
	ET-P660XXXWB
	ET-P660XXXWW
	ET-P660XXXWWG
	P660XXXWB/WW
	P660XXXWWG
	M660XXXBB
	M660XXXWW

Manufacturer	Model
Hanwha Q Cells	Q.PEAK BLK-G3.1-XXX
	Q.PEAK G3.1-XXX
	Q.PLUS BFR-G3.1-XXX
	B.LINE PLUS BFR-G4.1-XXX
	B.LINE PRO BFR-G4.1-XXX
	Q.BASE GY-XXX
	Q.PEAK BFR-G4-XXX
	Q.PEAK BFR-G4.1-XXX
	Q.PEAK BLK-G4.1-XXX
	Q.PEAK BLK-G4.1/TAA-XXX
	Q.PEAK G4-XXX
	Q.PEAK G4.1-XXX
	Q.PEAK G4.1/MAX-XXX
	Q.PEAK G4.1/TAA-XXX
	Q.PLUS BFR-G4-XXX
	Q.PLUS BFR-G4.1-XXX
	Q.PLUS BFR-G4.1/TAA-XXX
	Q.PLUS G4-XXX
	Q.PLUS GY-XXX
	Q.PLUS BFR-GY-XXX
	Q.PRO BFR-G4-XXX
	Q.PRO BFR-G4.1-XXX
	Q.PRO BFR-G4.3-XXX
	Q.PRO BFR-GY-XXX
	Q.PRO BLK-GY-XXX
	Q.PRO G4-XXX
	Q.PRO GY-XXX
	Q.PRO GY/SC-XXX
	Q.PEAK DUO-G5-XXX
	Q.PEAK DUO-BLK-G5-XXX
	Q.PLUS DUO-G5-XXX
	Q.PEAK DUO-G7-XXX
	Q.PEAK DUO-BLK-G7-XXX
	Q.PEAK DUO-G7.2-XXX
	Q.PEAK DUO-G6+-XXX
	Q.PEAK DUO-BLK-G6+-XXX
	Q.PEAK DUO-G6-XXX
	Q.PEAK DUO-BLK-G6-XXX
	Q.PEAK DUO-G8+-XXX
	Q.PEAK DUO-BLK-G8+-XXX
	Q.PEAK DUO-G8-XXX
	Q.PEAK DUO-BLK-G8-XXX

Manufacturer	Model
Hanwha Q Cells	Q.PLUS L-G4-XXX
	Q.PLUS L-G4.1-XXX
	Q.PLUS L-G4.2-XXX
	Q.PEAK L-G4.1-XXX
	Q.PEAK L-G4.2-XXX
	Q.PLUS DUO-L-G5-XXX
	Q.PLUS DUO-L-G5.1-XXX
	Q.PLUS DUO-L-G5.2-XXX
	Q.PLUS DUO-L-G5.3-XXX
	Q.PEAK DUO-L-G5.2-XXX
	Q.PEAK DUO-L-G5.3-XXX
	Q.PEAK DUO-L-G7-XXX
	Q.PEAK DUO-L-G7.1-XXX
	Q.PEAK DUO-L-G7.2-XXX
	Q.PEAK DUO-L-G7.3-XXX
	Q.PEAK DUO-L-G6-XXX
	Q.PEAK DUO-L-G6.2-XXX
	Q.PEAK DUO-L-G6.3-XXX
	Q.PEAK DUO-L-G8-XXX
	Q.PEAK DUO-L-G8.1-XXX
	Q.PEAK DUO-L-G8.2-XXX
	Q.PEAK DUO-L-G8.3-XXX
	Q.PEAK DUO-G5/SC-XXX
	Q.PEAK DUO-BLK-G5/SC-XXX
	Q.PEAK DUO-G6+/SC-XXX
	Q.PEAK DUO-BLK-G6+/SC-XXX
	Q.PEAK DUO BLK-G6+/AC-XXX
	Q.PEAK DUO-ML-G9-XXX
	Q.PEAK DUO-BLK-ML-G9-XXX
	Q.PEAK DUO-G5/TS-XXX
	Q.PEAK DUO BLK-G5/TS-XXX
	Q.PEAK DUO-G6/TS-XXX
	Q.PEAK DUO BLK-G6/TS-XXX
	Q.PEAK DUO-G6+/TS-XXX
	Q.PEAK DUO BLK-G6+/TS-XXX
Hanwha SolarOne	HSL60P6-PB-2-XXXQ
	HSL60P6-PB-4-XXXQ
Heliene	60M-XXX
	60P-XXX
	72M-XXX
	72P-XXX

Manufacturer	Model
Hyundai	HiS-MXXXRG
	HiS-SXXXRG
	HiS-SXXXRW
	HiS-MXXXMG
	HiS-SXXXMG
	HiD-SXXXRG
	HiA-SXXXMS
	HiS-SXXXXY
	HiS-SXXXXI
JA Solar	JAM6-60-XXX/SI
	JAP6-60-XXX/3BB
	JAM60S09-XXX/PR
	JAM60S10-XXX/MR
	JAM60S10-XXX/PR
	JAM60S12-XXX/PR
	JAP72S01-XXX/SC
	JAM72S09-XXX/PR
	JAM72S10-XXX/MR
	JAM72S10-XXX/PR
	JAM72S12-XXX/PR
	JAP6(k)-72-XXX/4BB
	JAM60S17-XXX/MR
Jinko Solar	JKMXXXM-60
	JKMXXXM-60L
	JKMXXXM-60HL
	JKMXXXM-60HBL
	JKMXXXP-60
	JKMXXXP-60-J4
	JKMXXXP-60-V
	JKMXXXP-60B-J4
	JKMXXXPP-60
	JKMXXXPP-60-V
	JKMXXXM-72
	JKMXXXM-72L-V
	JKMXXXP-72
	JKMXXXP-72-V
	JKMXXXPP-72
	JKMXXXPP-72-V
	JKMSXXXP-72
	JKMXXXM-72HL-V
	JKMXXXM-72HL-TV
	JKMXXXM-72HBL

Manufacturer	Model
Jinko Solar	JKMXXXM-6TL3-B
	JKMXXXM-6RL3-B
Kyocera	KUXXX-6YYY
	KUXXX-8YYY
LG	LGXXN1C-A5
	LGXXN1K-A5
	LGXXQ1C-A5
	LGXXQ1K-A5
	LGXXS1C-A5
	LGXXN2C-B3
	LGXXN2W-B3
	LGXXN1C-G4
	LGXXN1K-G4
	LGXXS1C-G4
	LGXXN2C-G4
	LGXXN2K-G4
	LGXXN2W-G4
	LGXXS2C-G4
	LGXXS2W-G4
	LGXXN1C-V5
	LGXXN1W-V5
	LGXXN2T-V5
	LGXXN2T-J5
	LGXXN1T-V5
	LGXXA1C-V5
	LGXXM1C-L5
	LGXXM1K-L5
	LGXXN1C-N5
	LGXXN1K-L5
	LGXXN1K-A6
	LGXXN1C-A6
	LGXXN1W-A6
	LGXXQ1C-A6
	LGXXQ1K-A6
	LGXXM1K-A6
	LGXXM1C-A6
	LGXXA1C-A6
Longi	LR6-60-XXXM
	LR6-60BK-XXXM
	LR6-60HV-XXXM
	LR6-60PB-XXXM
	LR6-60PE-XXXM

Manufacturer	Model
Longi	LR6-60PH-XXXM
	LR6-60HPB-XXXM
	LR6-60HPH-XXXM
	LR4-60HPB-XXXM
	LR4-60HIB-XXXM
	LR4-60HPH-XXXM
	LR4-60HIH-XXXM
	LR6-60HIH-XXXM
	LR6-60HIB-XXXM
	LR4-72HPH-XXXM
Mission Solar	MSEXXXSO5T
	MSEXXXSO5K
	MSEXXXSQ5T
	MSEXXXSQ5K
	MSEXXXMM4J
	MSEXXXMM6J
	MSEXXXSO6W
	MSEXXXSO4J
	MSEXXXSO6J
	MSEXXXSQ6S
	MSEXXXSQ4S
	MSEXXXSR8K
	MSEXXXSR8T
	MSEXXXSR9S
	MSE60AXXX
	MSEXXXTS60
	MSEXXXSX5K
	MSEXXXSX5T
	MSEXXXSX6S
	MSEXXXSX6W
Next Energy Alliance	USNEA-XXXM3-60
	USNEA-XXXM3B-60
	USNEA-XXXM3-72
	USNEA-XXXM3B-72
Panasonic	VBHNXXXKA01
	VBHNXXXKA02
	VBHNXXXSA16
	VBHNXXXKA03
	VBHNXXXKA04
	VBHNXXXSA17
	VBHNXXXSA18
	VBHN325SA17E

Manufacturer	Model
Panasonic	VBHXXXRA18N
	VBHXXXRA03K
	EVPVXXX(K)
Phono Solar	PSXXXM-20/U
	PSXXXMH-20/U
REC	RECXXXPE
	RECXXXPE-BLK
	RECXXXTP
	RECXXXTP-BLK
	RECXXXTP IQ
	RECXXXTP2
	RECXXXTP2-BLK
	RECXXXNP
	RECXXXTP2M
	RECXXXTP72
	RECXXXPE72
	RECXXXPE72XV
	RECXXXTP2M 72
	RECXXXTP2M 72 BLK
	RECXXXTP2M 72 BLK2
	RECXXXTP2SM 72
	RECXXXTP2SM 72 BLK
	RECXXXTP2SM 72 BLK2
	RECXXXAA
	RECXXXTP3M
Renesola	JCXXXM-24/Bb
	JCXXXM-24/BBh
Silfab	SLAXXX-M
	SLAXXX-P
	SSAXXX-M
	SSAXXX-P
	SILXXXBL
	SILXXXML
	SILXXXNL
	SLGXXX-M
	SLGXXX-P
	SSGXXX-M
	SSGXXX-P
	SILXXXNT
	SILXXXHL

Grounding Specifications

Manufacturer	Model
Solaria	Solaria PowerXT-XXXXR-PX
	Solaria PowerXT-XXXXR-BX
	Solaria PowerXT-XXXXR-AC
	Solaria PowerXT-XXXXR-PM
	Solaria PowerXT-XXXXR-PM-AC
SolarWorld	SWXXX-Mono
	SWXXX-Mono XL
Suniva	MVX-XXX-60-5-701
	MVX-XXX-60-5-7B1
	OPT-XXX-60-4-100
	OPT-XXX-60-4-1B0
	OPT-XXX-60-4-800
	OPT-XXX-60-4-8B0
Sunpower	SPR-EYY-###
	SPR-XY-###
	SPR-EYY-###
	SPR-XY-###
	SPR-P17-XXX-COM
	SPR-P19-XXX-COM
SunSpark	SST-XXXM3-60
	SST-XXXM3B-60
	SST-XXXM3-72
	SST-XXXM3B-72
Talesun	TP660M-XXX
	TP660P-XXX
	TP672M-XXX
	TP672P-XXX
Trina	TSM-XXXDD05(II)
	TSM-XXXDD05A.05(II)
	TSM-XXXDD05A.08(II)
	TSM-XXXDD05A.082(II)
	TSM-XXXPA05
	TSM-XXXPA05.05
	TSM-XXXPA05.08
	TSM-XXXPD05
	TSM-XXXPD05.002
	TSM-XXXPD05.05
	TSM-XXXPD05.05S
	TSM-XXXPD05.08
	TSM-XXXPD05.082
	TSM-XXXPD05.08D
	TSM-XXXPD05.08S
	TSM-XXXDD06M.05(II)

Manufacturer	Model
Trina	TSM-XXXDE15H(II)
	TSM-XXXDE15M(II)
	TSMXXXDD05H.05(II)
Yingli	YLXXXA-29b
	YLXXXP-29b
Znshine	ZM6-60-XXX/M

Series 200 has been tested with the following Module Level Power Electronic (MLPE) devices:

The Series 200 System has been tested with the following UL/NRTL Listed Module Level Power Electronic (MLPE) Devices. The back plates of the MLPEs have been evaluated for bonding to Series 200 Ground Rail through the MLPE Attachment Kit.

AP Smart	RSD-S-PLC	
Celestica International	DG-006-F001201x	DG-006-F001401x
Delta Electronics	GPI00010105	
Enphase	C250	IQ7-60-2-US
	M215	IQ7-60-B-US
	M250	IQ7PLUS-72-2-US
	IQ6-60-2-US	IQ7PLUS-72-B-US
	IQ6PLUS-72-2-US	
Ginlong Technologies	Solis-RSD-1G	Solis-MLRSD-R2-1G
	Solis-MLRSD-R1-1G	
SolarEdge	P300-5NC4ARS	P405
	P320-5NC4ARS	P485
	P370-5NC4AFS	P505
	P400-5NC4AFS	P730
	P320	P800p
	P340	P850
	P370	P860
	P400	P950
	P401	
SMA	RSB-2S-US-10	
Tigo	TS4-R-F	TS4-R-S-DUO
	TS4-R-M	TS4-A-F
	TS4-R-O	TS4-A-2F
	TS4-R-S	TS4-A-O
	TS4-R-M-DUO	TS4-A-S
	TS4-R-O-DUO	

Notes:

AP Smart RSD-S-PLC, Ginlong Solis-MLRSD-R1-1G and Solis-MLRSD-R2-1G, and all Tigo models have not been investigated for bonding since the enclosures are constructed entirely of polymeric materials.

The SolarEdge P320 and P370 models are both frame mount and rail mount. All other PXXX series models are rail mount.

Functionality of these devices was not evaluated.