SnapNrack™

Solar Mounting Solutions

Series 200

Residential Ground Mount System
Installation Manual

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2703 Listed — PV Mounting System

An Intro to SnapNrack Series 200

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.

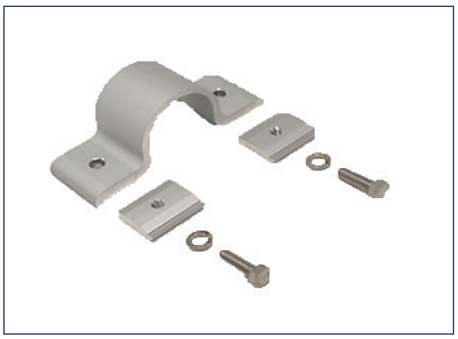
If the module clamps have been engaged and need to be loosened and reengaged, SnapNrack recommends moving the module frame 3mm to engage the bonding pin in a new location.

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.

Component Details

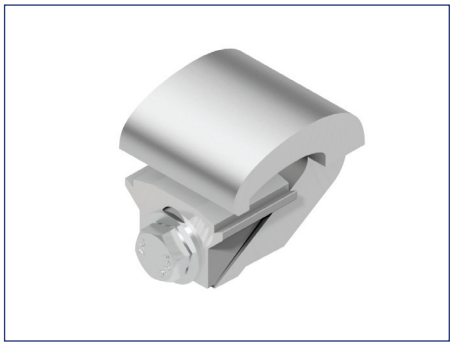
Structural Components

SnapNrack Ground Rail



SnapNrack Pipe Clamp Assembly

SnapNrack Ultra Rail End Clamp



SnapNrack Universal End Clamp

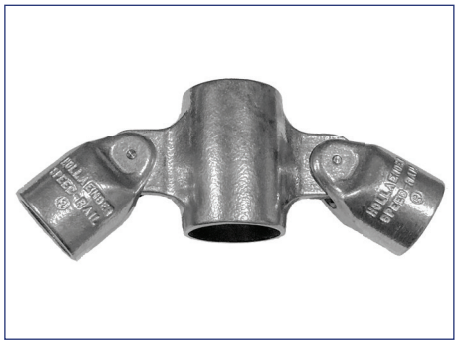
SnapNrack Ultra Rail Mid Clamp

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

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

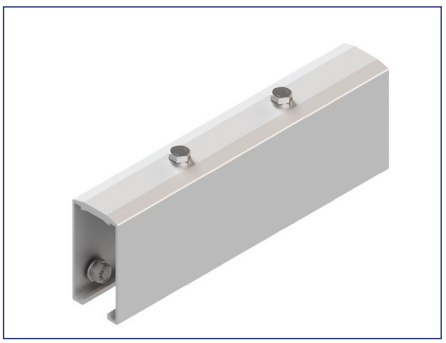
Single Socket Tee, Hollaender (5EXT-8), 1 ½”

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”

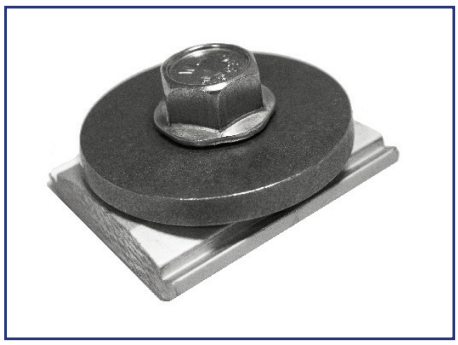


SnapNrack Ground Rail Splice With Grounding Bolt & Nut

Component Details

Structural Components

American Ground Screws
Model 3



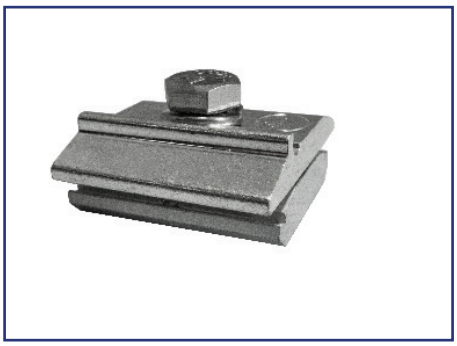
SnapNrack MLPE Attachment Kit

SnapNrack Ground Rail End Cap

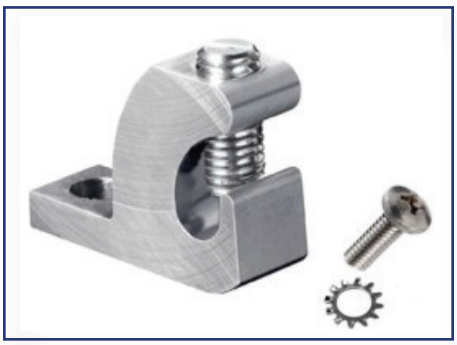
Wire Management/Grounding Components

SnapNrack Wire Clamp

SnapNrack Wire Retention Clip



SnapNrack Ground Lug



Ilsco Lay-In Lug – GBL-4DBT

Aesthetic Components

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)	16 ft-lbs (192 in-lbs)
Ultra Rail End Clamp, Mid Clamp (Black Stainless Steel Fasteners)	16 ft-lbs (192 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)

Pre-Installation Requirements

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.

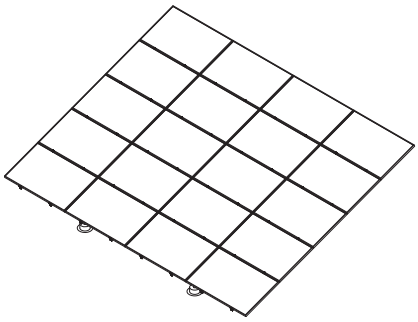
Pre-Installation Requirements

Design Note:

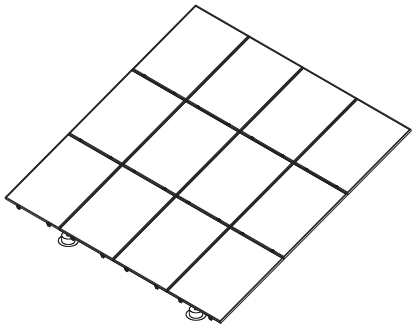
Series 200 allows for multiple mounting configurations. Modules can be mounted in landscape (long side of module perpendicular to slope) or portrait (long side of module parallel to slope) orientations up to a maximum rail length of 214". Landscape orientation is recommended for maximum material efficiency.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

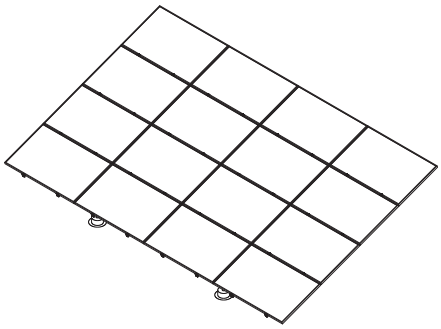
Configuration Examples



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.

Concrete Foundations

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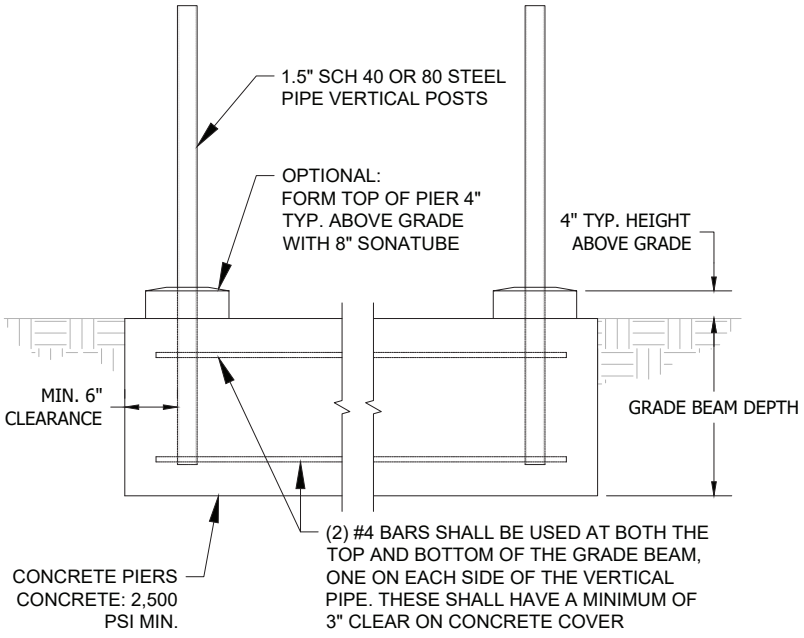
Required Tools

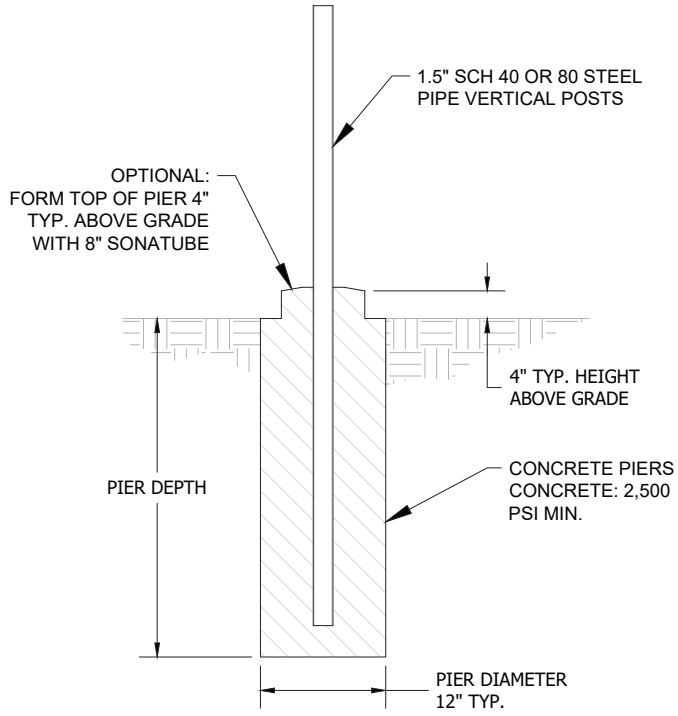
- 12” Diameter Excavation Drill Auger (Pier)
- Backhoe or Excavator with 12” Bucket (Grade Beam)
- Portable Band Saw (18 tpi)
- Concrete Mixer
- Basic Concrete Tools
- String Line
- Surveying Marker Pen or Paint

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

Concrete Foundations

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.

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

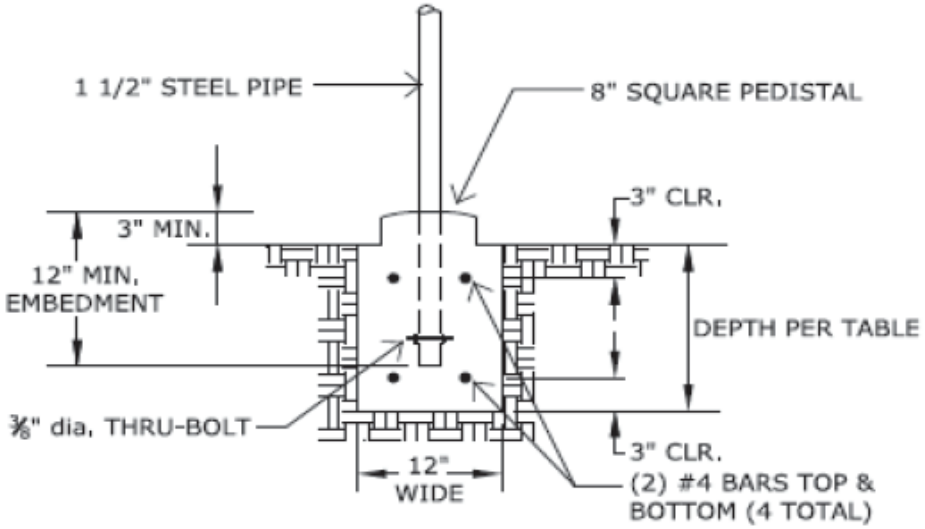
4) Use string line grid and post level to place verticals square and plumb. Support vertical posts while concrete cures.

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.

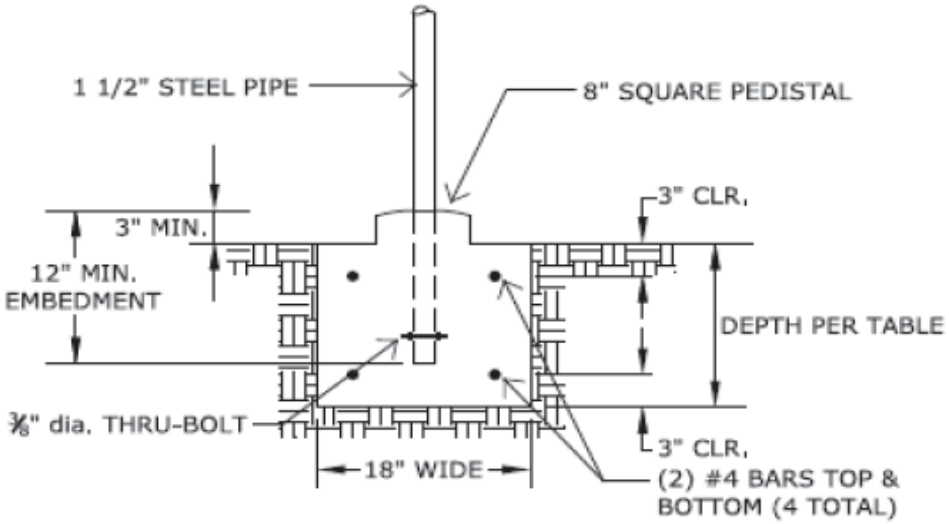
Install Note:
Maximum front post height is limited to 48" and maximum tilt angle is 45 degrees, measured from horizontal.

GRADE BEAM FOOTING OPTIONS

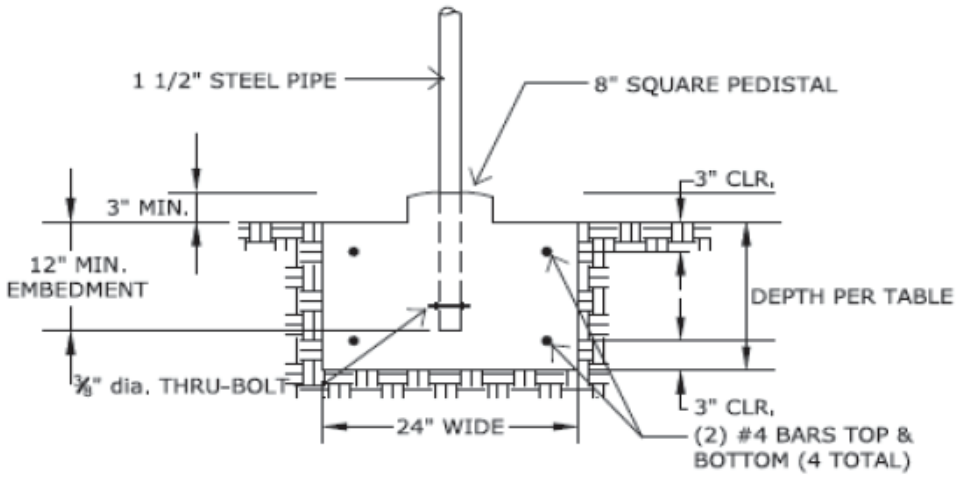
12” Wide Grade Beam Footing Option



18” Wide Grade Beam Footing Option



24” Wide Grade Beam Footing Option



Ground Screw Foundations

Install Recommendation:

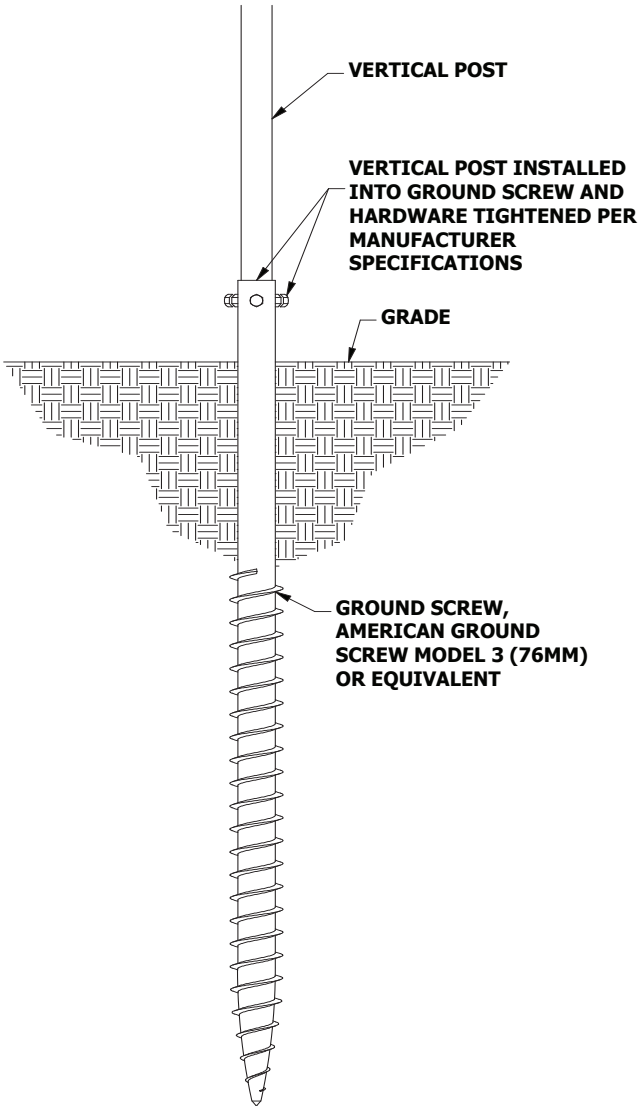
In areas subject to freezing, pier depths may increase to resist freeze heave. Always consult a structural engineer to confirm.

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.

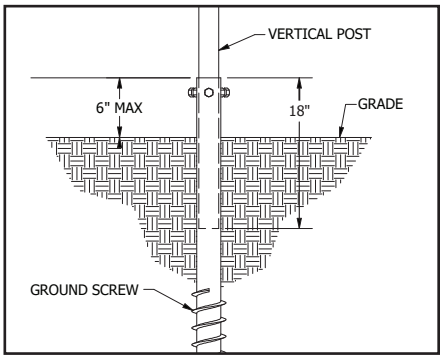
Install Note:

To ensure the ground screw is installed plumb, use two spotters 90° appart 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 posts are inserted 18" 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.

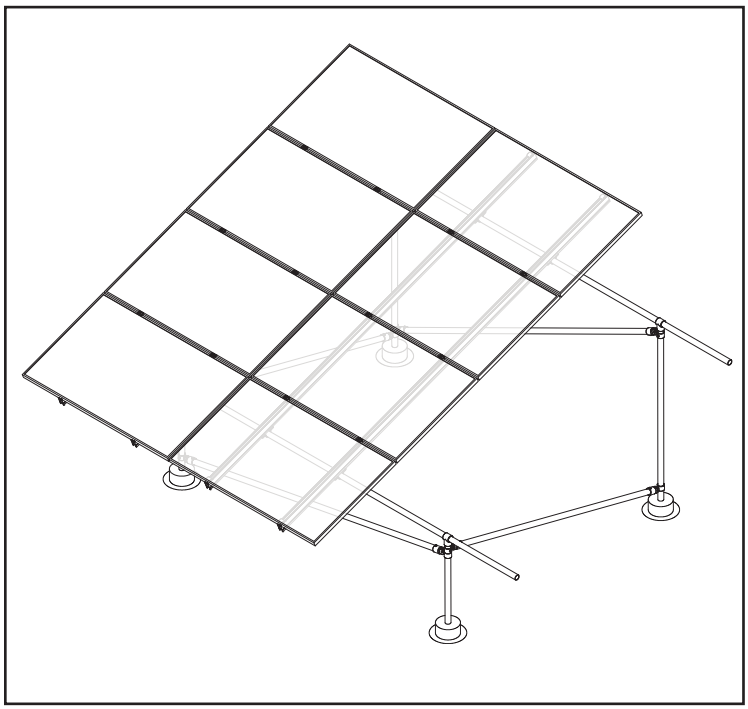
Horizontal Pipe & Bracing Installation

Required Tools

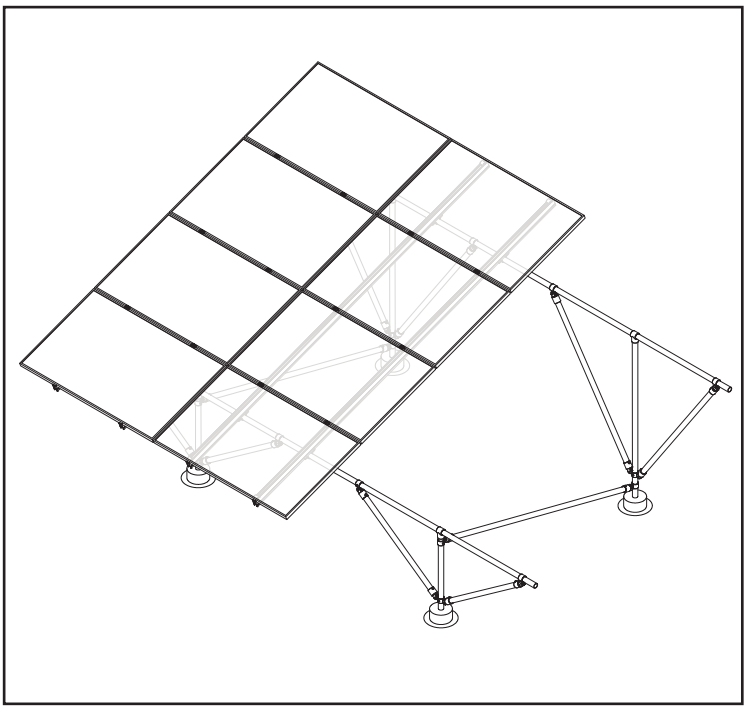
- 3/16” Allen Wrench
- Portable Band Saw
- Measuring Tape
- Cold Galvanizing Spray

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

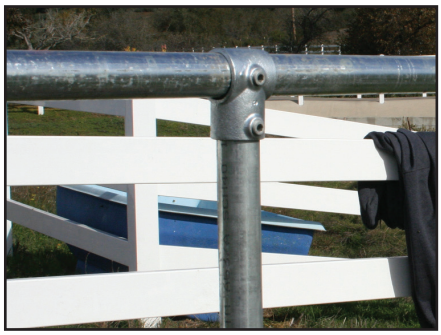
Horizontal Pipe & Bracing Installation

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 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.

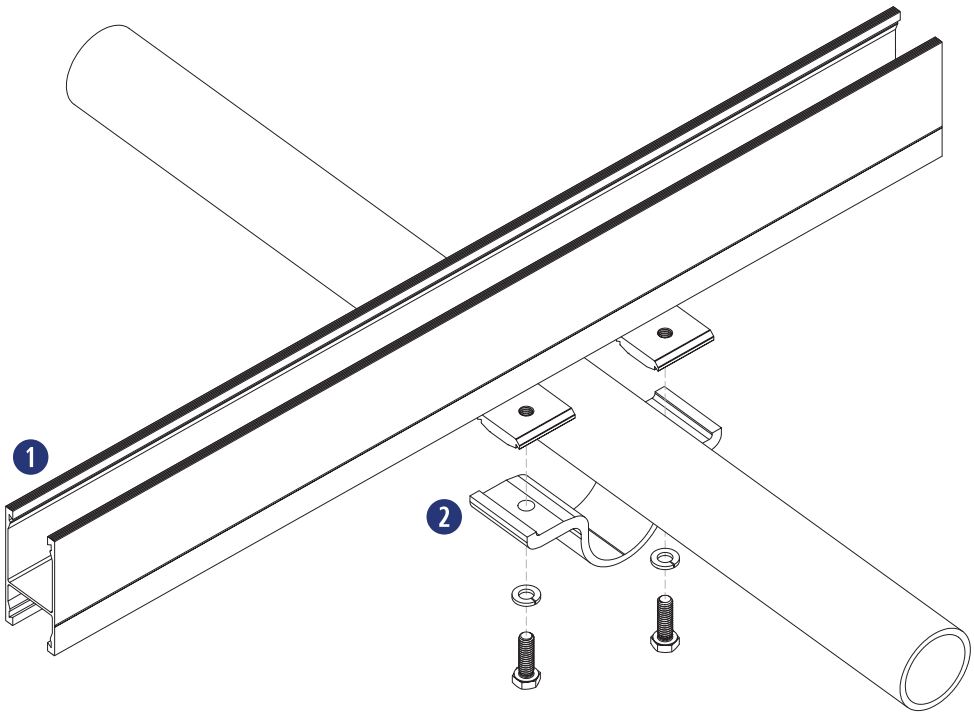
Rail Installation

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.

Install Note:

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

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.

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.

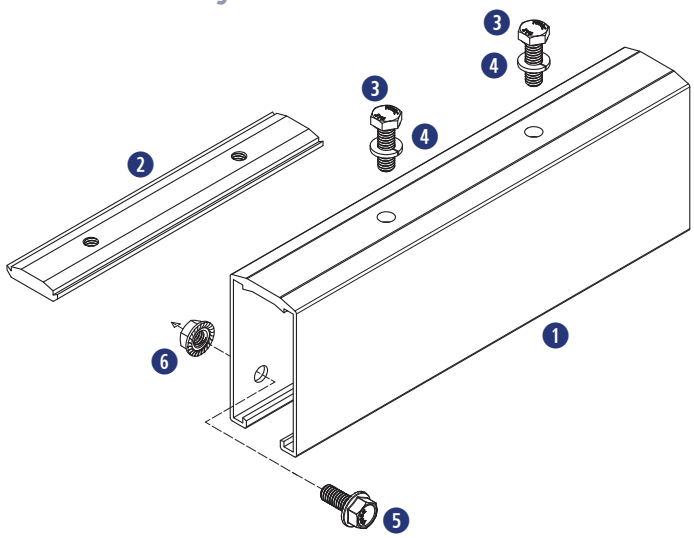
SnapNrack Series 200 Splice

Required Tools

- Drill with 5/16” Pilot Drill Bit
- Torque Wrench with ½” Socket
- Socket Wrench with ½” 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 ¾” SS Serrated Flange Bolt
6. (1) 5/16”-18 SS Serrated Flange Nut



Installation Requirements

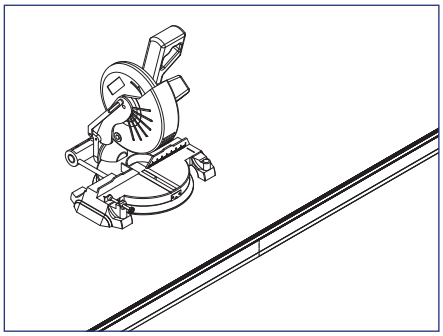
SnapNrack Ground Rail Splice must be installed between horizontal pipes, and located in an area clear of Mid Clamps and module frames.

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.

Series 200 Splice Installation

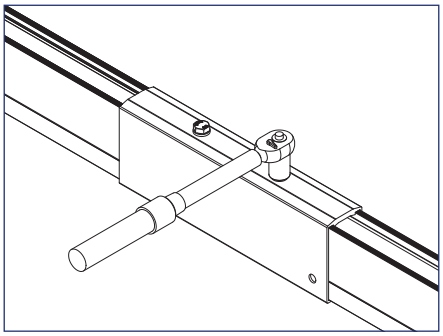
INSTALLATION INSTRUCTIONS



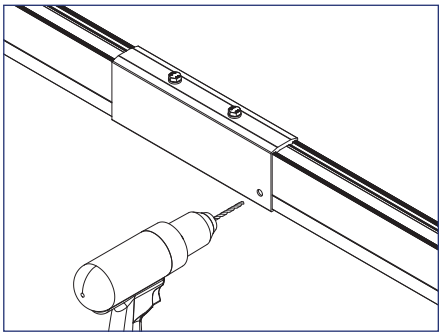
1) Cut one 172” SnapNrack Series 200 ground rail into thirds (roughly 57 inches).

Install Note:

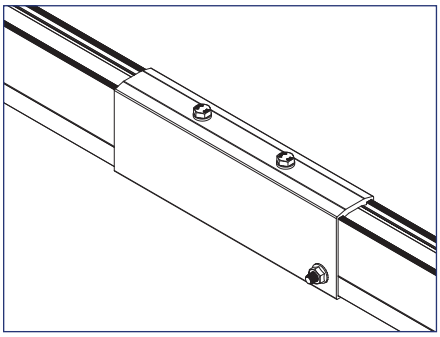
With this method (8) sections of standard 172” rail will make (6) rails for an array with columns of 5 modules.



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.

Module Installation

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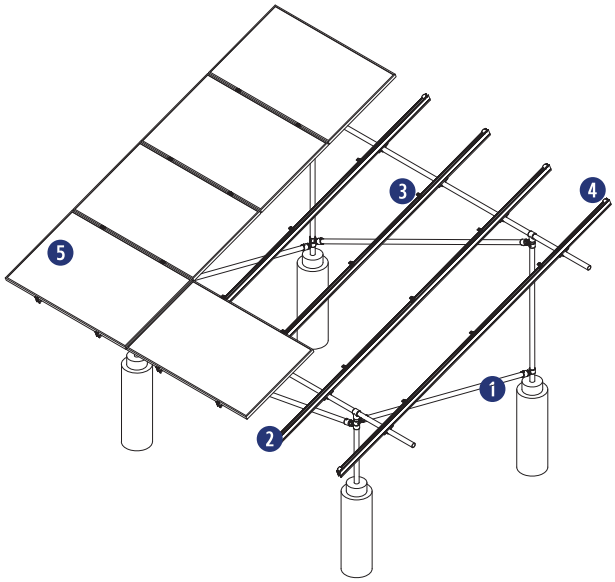
Required Tools

- Torque Wrench
- Socket Wrench
- 1/2” Socket

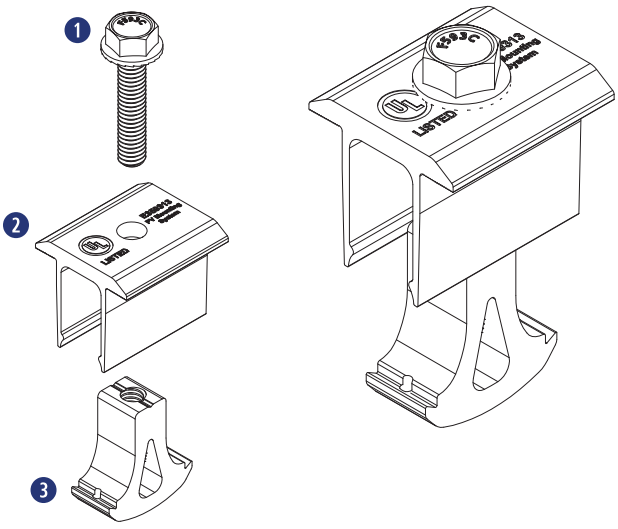


Materials Needed - Module Installation

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

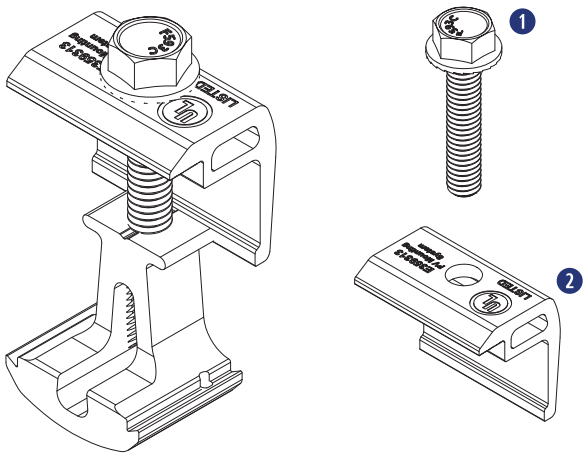
Ultra Rail Mid Clamp Assembly

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



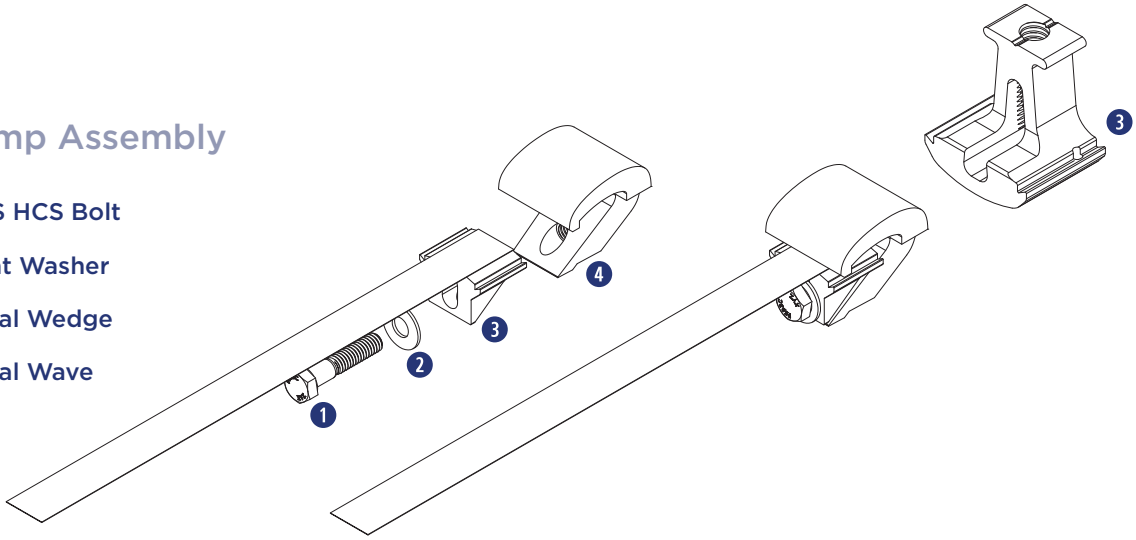
Ultra Rail End Clamp Assembly

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

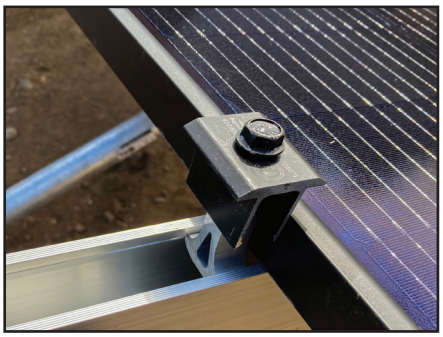
1. (1) 5/16”-18 X 1-1/2” SS HCS Bolt
2. (1) 5/16” X 3/4” SS Flat Washer
3. (1) SnapNrack Universal Wedge
4. (1) SnapNrack Universal Wave



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:

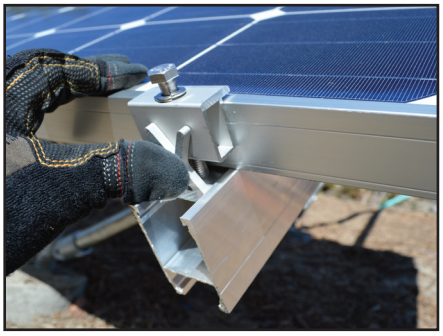
Mid clamps are Listed with and without springs.

SnapNrack Adjustable End Clamp

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

Install Note:

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



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.

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.

Install Note:

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

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:

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

4) **Install rubber end cap to finish.**

Install Note:

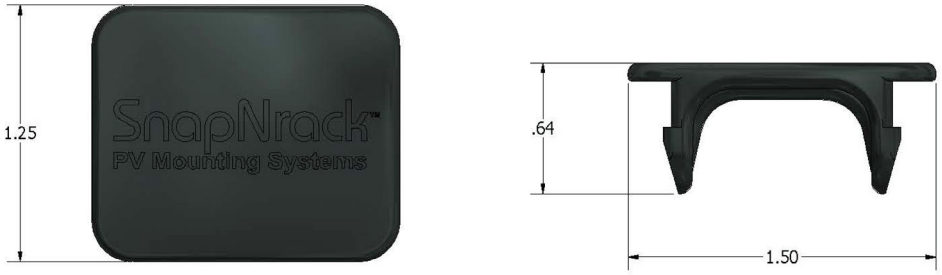
Modules will need to be grounded separately when Universal End Clamps are the only type of clamp attaching a module.

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:

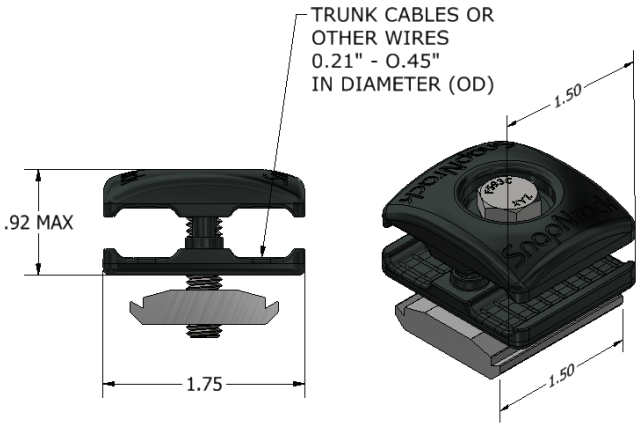
Install as necessary to manage and safely retain conductors within SnapNrack rails.

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.

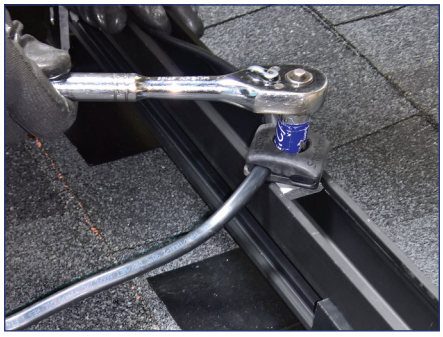
SnapNrack Universal Wire Clamp

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.

MLPE Installation

Required Tools

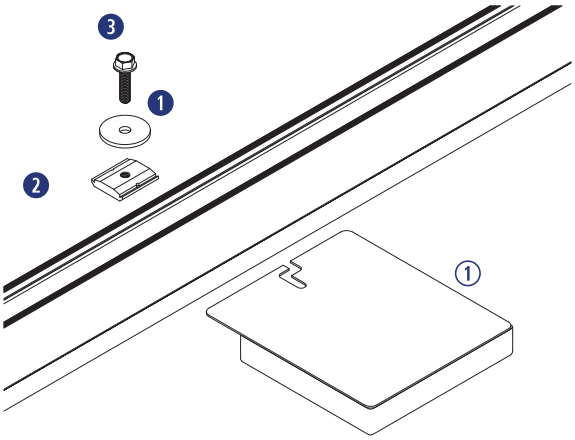
- Torque Wrench
- Socket Wrench
- 1/2” Socket

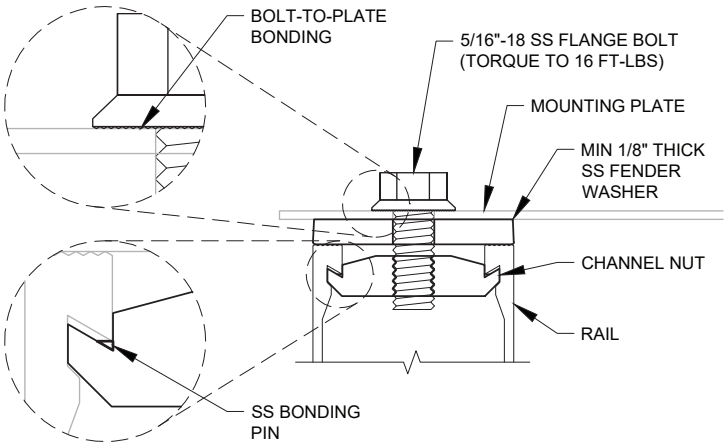
Materials Included - MLPE Rail Attachment Kit

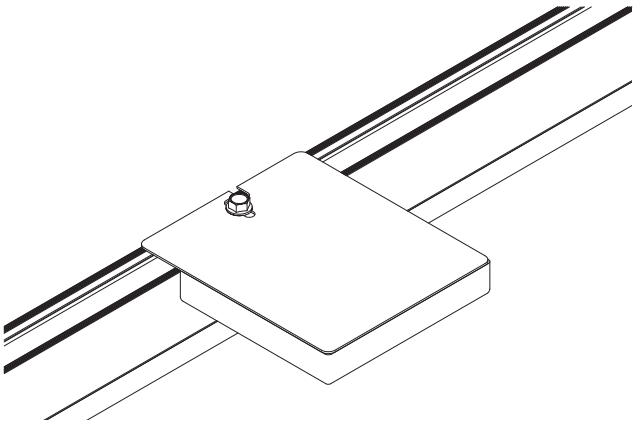
1. (1) 5/16” X 1-1/2” X 0.125” SS Fender Washer
2. (1) SnapNrack Channel Nut
3. (1) 5/16”-18 X 1-1/4” SS Flange Bolt

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.

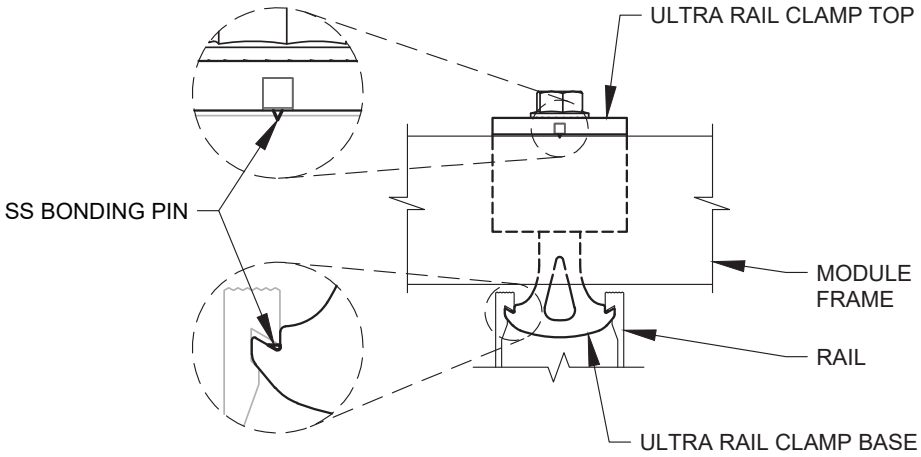
3) Tighten hardware, torque silver hardware to 10 ft-lbs.

Install Note:

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

System Bonding Methods

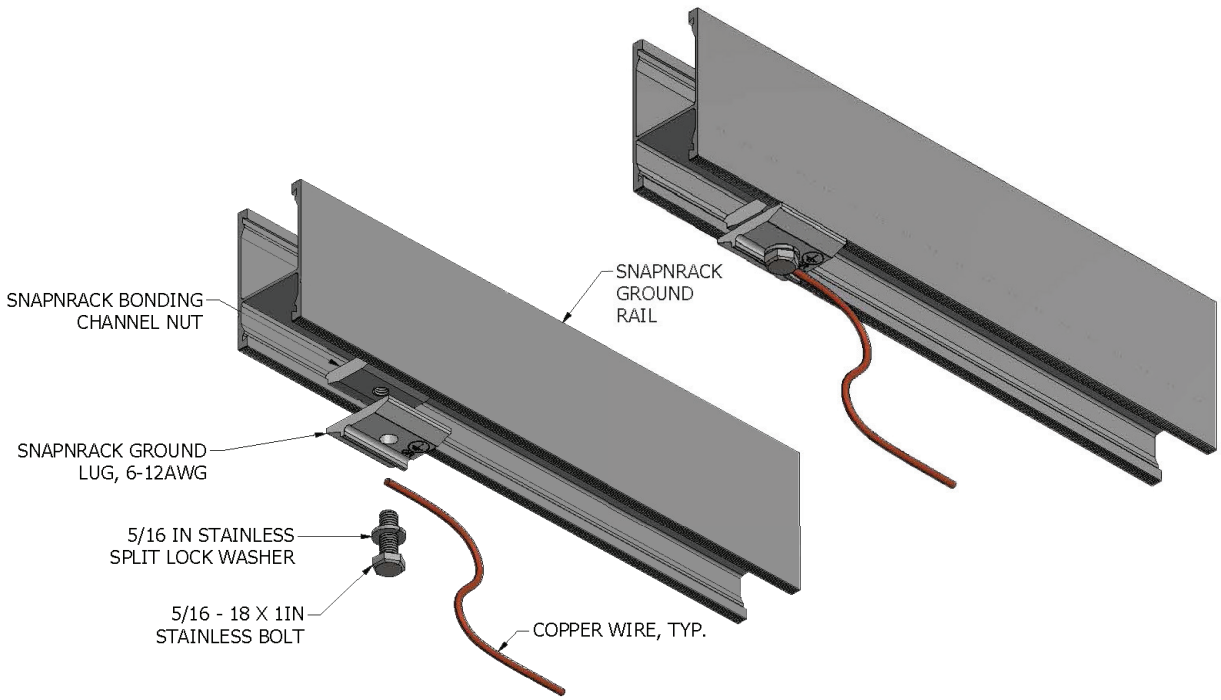
1. SnapNrack Ultra Rail Mid Clamp
2. SnapNrack Ultra Rail End Clamp
3. SnapNrack Pipe Clamp
4. Hollaendar Pipe Fittings



Note:

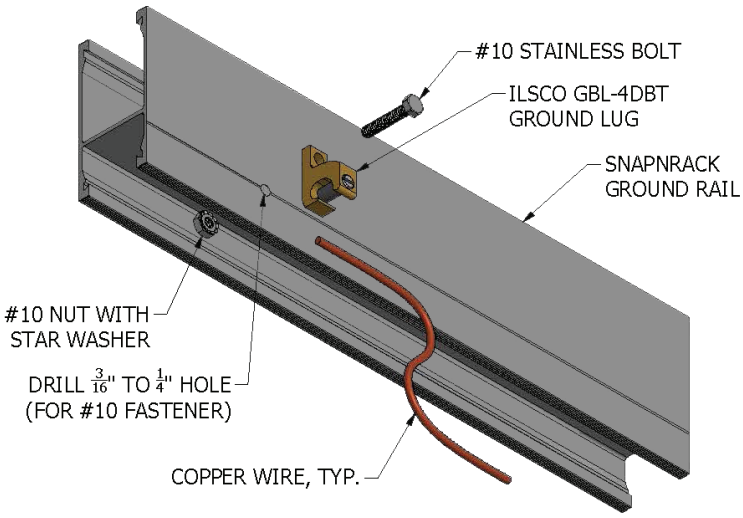
SnapNrack module clamps contain a SnapNrack Channel Nut with integral bonding pins in assembly to properly bond the system (except Universal End Clamps).

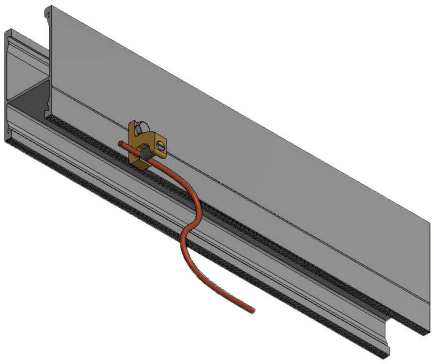
SnapNrack Ground Lug Assembly



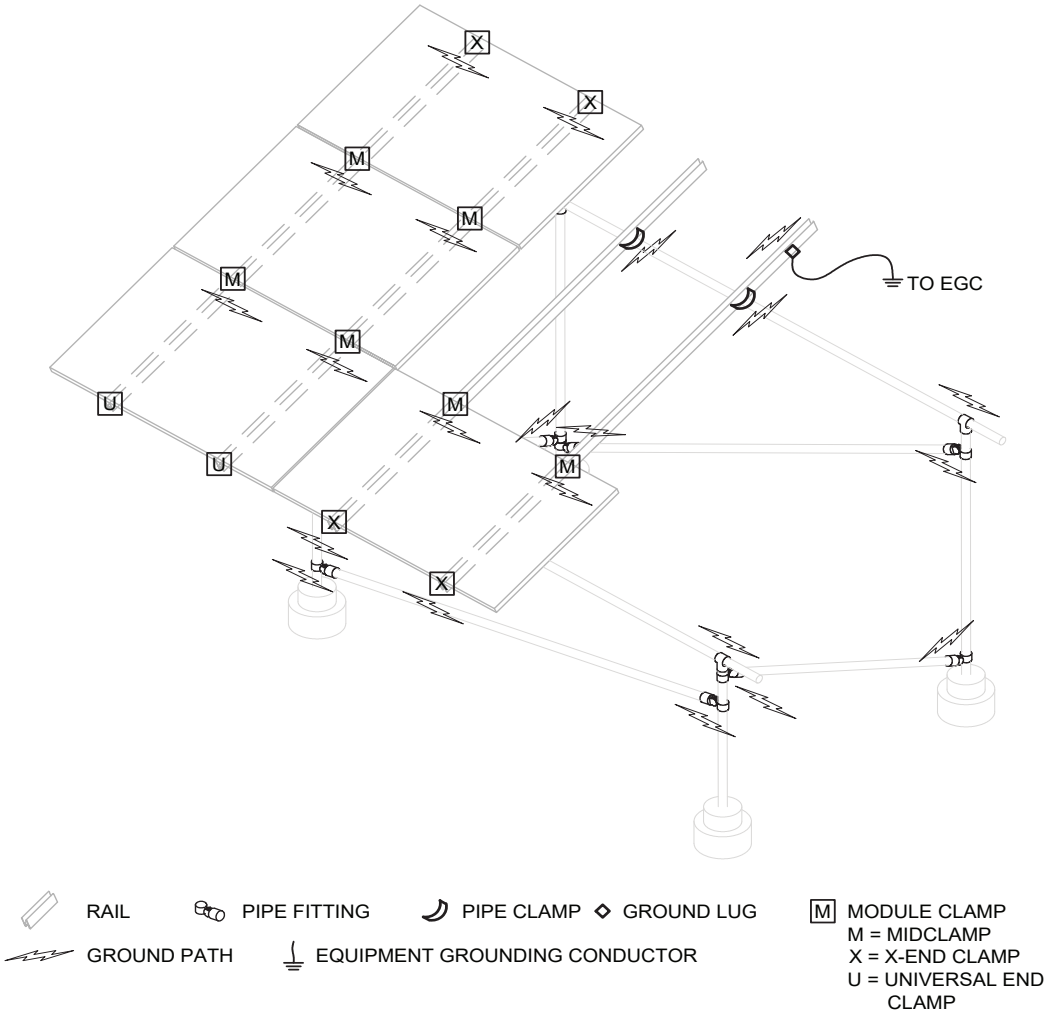
Grounding Specifications

Ilsco Lay-in Lug Assembly

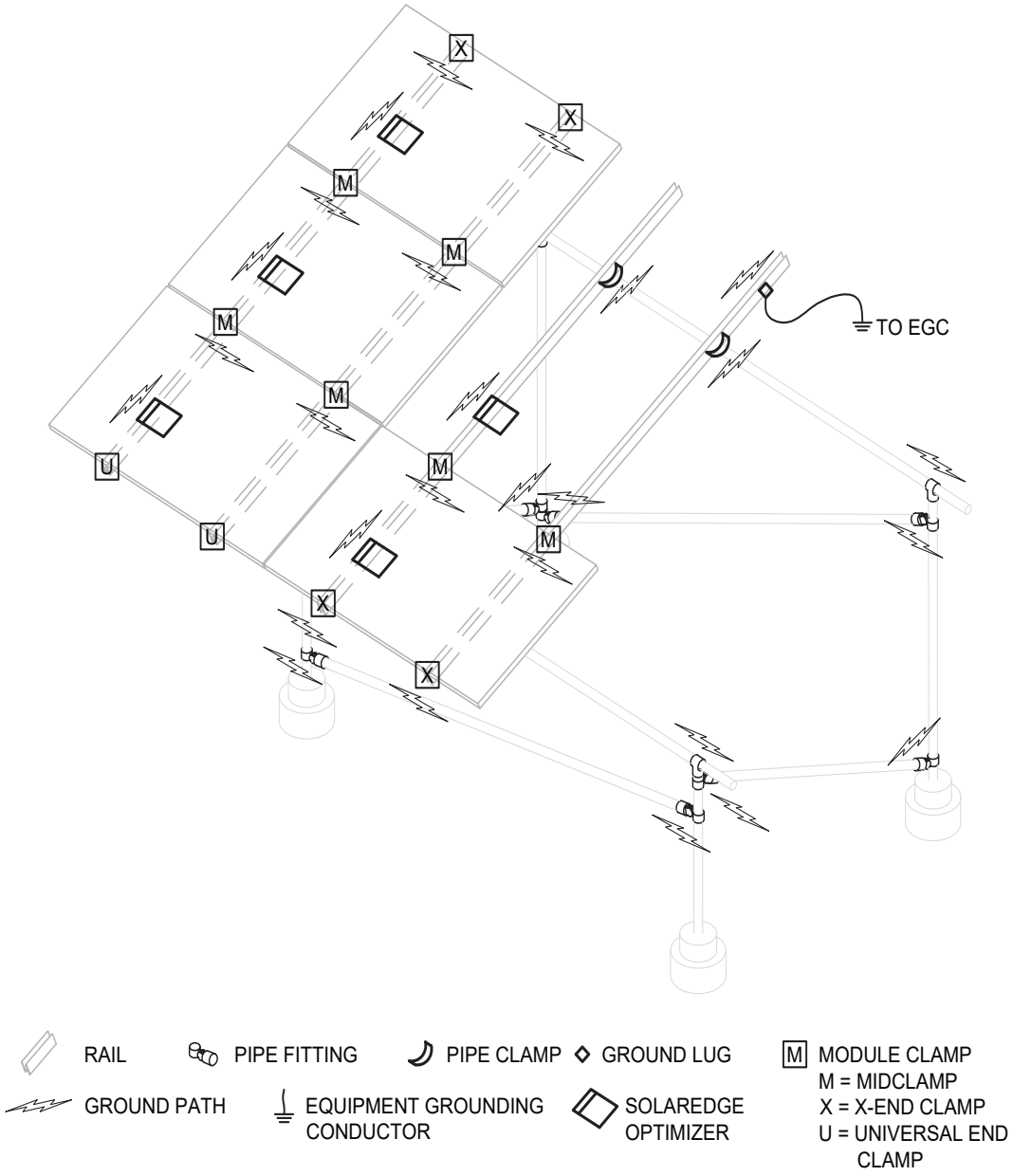




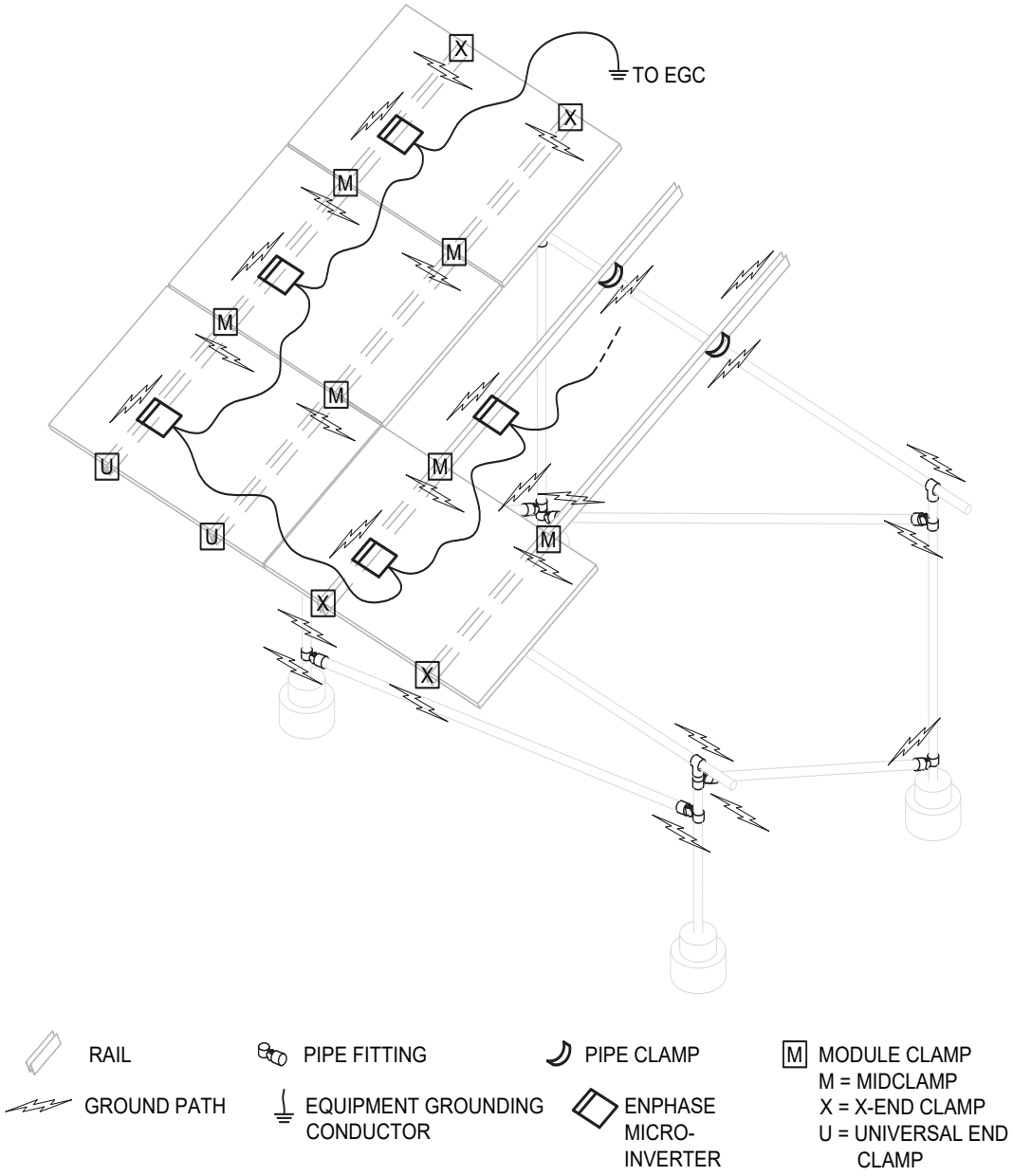
Ground Path Details



Ground Path Details - SolarEdge

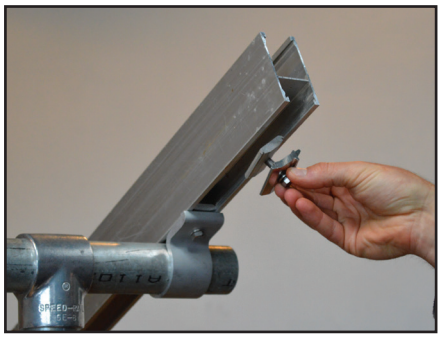


Ground Path Details - Enphase



INSTALLATION INSTRUCTIONS

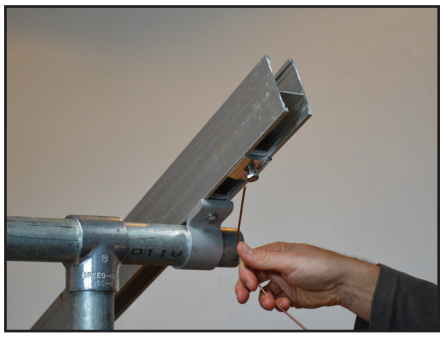
SnapNrack Ground Lug



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

Install Note:

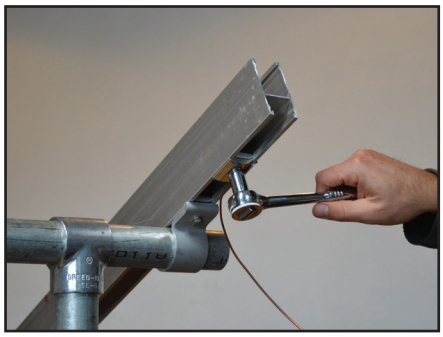
SnapNrack Ground Lug may be used in top or bottom channel, and may be rotated 90 degrees relative to slot to facilitate running copper across top of rails.



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

Install Note:

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



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

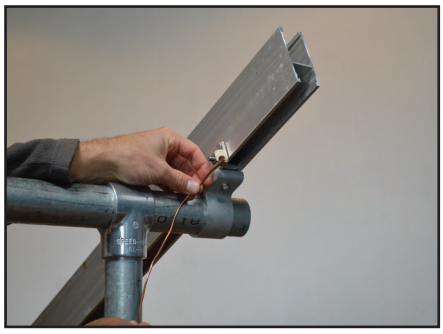
INSTALLATION INSTRUCTIONS

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.**

Install Note:
Torque rail connection to 5 ft-lbs.

2) Place grounding conductor into slot.



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

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.

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.

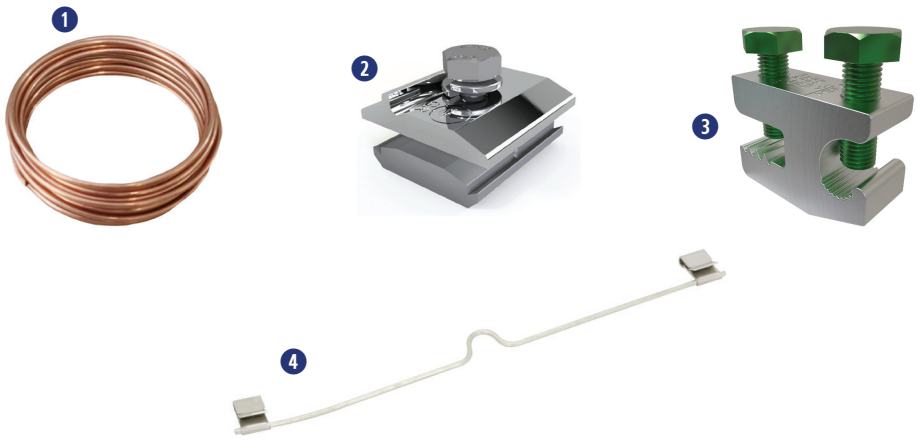
In most cases, the removal of a module for servicing will not disturb or break grounding continuity because SnapNrack Series 200 Ground Mount Systems are bonded through the rail. If a module is to be removed that will break continuity, these are the steps that must be taken to maintain a continuously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

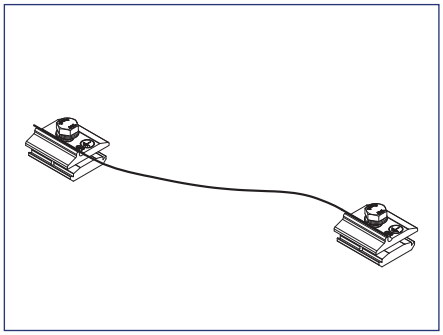


Maintaining the Grounding Bonding When Removing a Module

JUMPER ASSEMBLY INSTRUCTION & INSTALLATION

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

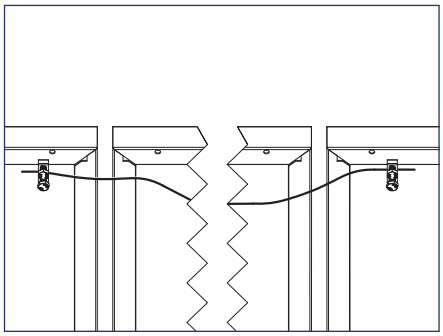
1) Identify the existing ground path at the location of module removal and choose an appropriate length of #10 bare copper to bridge the soon to be broken ground path.



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.

Grounding Specifications

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-BF26-XXXW
	DNA-120-BF23-XXX	DNA-144-BF26-XXXW
	DNA-144-MF23-XXX	DNA-108-BF10-xxxW
	DNA-144-BF23-XXX	DNA-120-BF10-xxxW
	DNA-120-MF26-XXXW	DNA-108-MF10-xxxW
	DNA-144-MF26-XXXW	
Boviet Solar	BVM6610P-XXX	BVM6612P-XXX
	BVM6610M-XXX	BVM6612M-XXX
Canadian Solar	CS6K-XXX-M	CS3U-XXX-MS
	CS6K-XXX-M-SD	CS3U-XXX-P
	CS6K-XXX-P	CS1K-XXX-MS
	CS6K-XXX-P-SD	CS1H-XXX-MS
	CS6K-XXX-MS	CS1H-XXX-MS-AB
	CS6P-XXX-M	CS3W-XXX-P
	CS6P-XXX-P	CS3N-XXX-MS
	CS6P-XXX-P-SD	CS1Y-XXX-MS
	CS6V-XXX-M	CS3W-XXXMB-AG
	CS6V-XXX-P	CS3Y-XXXMB-AG
	CS6X-XXX-P	CS6W-XXXMB-AG
	CS3K-XXX-P	CS6R-XXXMS-HL
	CS3K-XXX-MS	CS3W-XXX-MS
CertainTeed	CTXXXHC11-06	
Chint Solar	CHSM6612M-XXX	CHSM72M-HC-XXX* (Astro 4)
	CHSM6612M(BL)-XXX	CHSM72M-HC-XXX* (Astro 5)
	CHSM6612M/HV-XXX	
Dehui Solar	DH-M760B-XXXW	DH-M760F-XXXW*
	DH-M760W-XXXW	DH-M772F-XXXW*
	DH-M772W-XXXW	
ET Solar	ET-P660XXXBB	P660XXXWB/WW
	ET-P660XXXWB	P660XXXWWG
	ET-P660XXXWW	M660XXXBB
	ET-P660XXXWWG	M660XXXWW
Freedom Forever	FF-MP-BBB-xxx	
Hanwha Q Cells	Q.PEAK BLK-G3.1-XXX	Q.PEAK DUO-L-G7.2-XXX
	Q.PEAK G3.1-XXX	Q.PEAK DUO-L-G7.3-XXX
	Q.PLUS BFR-G3.1-XXX	Q.PEAK DUO-L-G6-XXX

Grounding Specifications

Manufacturer	Model	
Hanwha Q Cells	B.LINE PLUS BFR-G4.1-XXX	Q.PEAK DUO-L-G6.2-XXX
	B.LINE PRO BFR-G4.1-XXX	Q.PEAK DUO-L-G6.3-XXX
	Q.BASE GY-XXX	Q.PEAK DUO-L-G8-XXX
	Q.PEAK BFR-G4-XXX	Q.PEAK DUO-L-G8.1-XXX
	Q.PEAK BFR-G4.1-XXX	Q.PEAK DUO-L-G8.2-XXX
	Q.PEAK BLK-G4.1-XXX	Q.PEAK DUO-L-G8.3-XXX
	Q.PEAK BLK-G4.1/TAA-XXX	Q.PEAK DUO-G5/SC-XXX
	Q.PEAK G4-XXX	Q.PEAK DUO-BLK-G5/SC-XXX
	Q.PEAK G4.1-XXX	Q.PEAK DUO-G6+/SC-XXX
	Q.PEAK G4.1/MAX-XXX	Q.PEAK DUO-BLK-G6+/SC-XXX
	Q.PEAK G4.1/TAA-XXX	Q.PEAK DUO BLK-G6+/AC-XXX
	Q.PLUS BFR-G4-XXX	Q.PEAK DUO-ML-G9-XXX
	Q.PLUS BFR-G4.1-XXX	Q.PEAK DUO-BLK-ML-G9-XXX
	Q.PLUS BFR-G4.1/TAA-XXX	Q.PEAK DUO-BLK-G9-XXX
	Q.PLUS G4-XXX	Q.PEAK DUO-BLK-G9+-XXX
	Q.PLUS GY-XXX	Q.PEAK DUO-ML-G9+-XXX
	Q.PLUS BFR-GY-XXX	Q.PEAK DUO-BLK-ML-G9+-XXX
	Q.PRO BFR-G4-XXX	Q.PEAK DUO-G5/TS-XXX
	Q.PRO BFR-G4.1-XXX	Q.PEAK DUO BLK-G5/TS-XXX
	Q.PRO BFR-G4.3-XXX	Q.PEAK DUO-G6/TS-XXX
	Q.PRO BFR-GY-XXX	Q.PEAK DUO BLK-G6/TS-XXX
	Q.PRO BLK-GY-XXX	Q.PEAK DUO-G6+/TS-XXX
	Q.PRO G4-XXX	Q.PEAK DUO BLK-G6+/TS-XXX
	Q.PRO GY-XXX	Q.PEAK DUO XL-G9.2-XXX
	Q.PRO GY/SC-XXX	Q.PEAK DUO XL-G9.3-XXX
	Q.PEAK DUO-G5-XXX	Q.PEAK DUO XL-G9.3/BFG-XXX
	Q.PEAK DUO-BLK-G5-XXX	Q.PEAK DUO XL-G10.2-XXX
	Q.PLUS DUO-G5-XXX	Q.PEAK DUO XL-G10.3/BFG-XXX
	Q.PEAK DUO-G7-XXX	Q.PEAK DUO XL-G10.3-XXX
	Q.PEAK DUO-BLK-G7-XXX	Q.PEAK DUO XL-G10.c-XXX
	Q.PEAK DUO-G7.2-XXX	Q.PEAK DUO XL-G10.d-XXX
	Q.PEAK DUO-G6+-XXX	Q.PEAK DUO L-G8.3/BFG-XXX
	Q.PEAK DUO-BLK-G6+-XXX	Q.PEAK DUO L-G8.3/BGT-XXX
	Q.PEAK DUO-G6-XXX	Q.PEAK DUO ML-G10-XXX
	Q.PEAK DUO-BLK-G6-XXX	Q.PEAK DUO BLK ML-G10+-XXX
	Q.PEAK DUO-G8+-XXX	Q.PEAK DUO ML-G10+-XXX
	Q.PEAK DUO-BLK-G8+-XXX	Q.PEAK DUO BLK ML-G10-XXX
	Q.PEAK DUO-G8-XXX	Q.PEAK DUO ML-G10.a+-XXX
	Q.PEAK DUO-BLK-G8-XXX	Q.PEAK DUO BLK ML-G10.a+-XXX
	Q.PLUS L-G4-XXX	Q.PEAK DUO ML-G10.a-XXX
	Q.PLUS L-G4.1-XXX	Q.PEAK DUO BLK ML-G10.a-XXX
	Q.PLUS L-G4.2-XXX	Q.PEAK DUO BLK ML-G10.a+/TS-XXX
	Q.PEAK L-G4.1-XXX	Q.PEAK DUO G10-XXX
	Q.PEAK L-G4.2-XXX	Q.PEAK DUO BLK G10-XXX
	Q.PLUS DUO-L-G5-XXX	Q.PEAK DUO G10+-XXX

Grounding Specifications

Manufacturer	Model	
Hanwha Q Cells	Q.PLUS DUO-L-G5.1-XXX	Q.PEAK DUO BLK G10+-XXX
	Q.PLUS DUO-L-G5.2-XXX	Q.PEAK DUO BLK G10+/AC XXX
	Q.PLUS DUO-L-G5.3-XXX	Q.PEAK DUO BLK G10+/HL XXX
	Q.PEAK DUO-L-G5.2-XXX	Q.PEAK DUO XL-G11.3 XXX
	Q.PEAK DUO-L-G5.3-XXX	Q.PEAK DUO XL-G11.3 BFG XXX
	Q.PEAK DUO-L-G7-XXX	Q.TRON-G1+ XXX
	Q.PEAK DUO-L-G7.1-XXX	Q.TRON BLK-G1+ XXX
Hanwha SolarOne	HSL60P6-PB-2-XXXQ	HSL60P6-PB-4-XXXQ
Heliene	60M-XXX	72M-XXX
	60P-XXX	72P-XXX
HT-SAAE	HT60-166M-XXX	HT60-182M-XXX
Hyundai	HiS-MXXXRG	HiA-SXXXMS
	HiS-SXXXRG	HiS-SXXXXY
	HiS-SXXXRW	HiS-SXXXYI
	HiS-MXXXMG	HiS-SxxxYH(BK)
	HiS-SXXXMG	All may be followed by (BK)
	HiD-SXXXRG	
Hyperion/Runergy	HY-DH108P8-XXX(Y)	
JA Solar	JAM6-60-XXX/SI	JAM72S10-XXX/MR
	JAP6-60-XXX/3BB	JAM72S10-XXX/PR
	JAM60S09-XXX/PR	JAM72S12-XXX/PR
	JAM60S10-XXX/MR	JAP6(k)-72-XXX/4BB
	JAM60S10-XXX/PR	JAM60S17-XXX/MR
	JAM60S12-XXX/PR	JAM54S30-XXX/MR
	JAP72S01-XXX/SC	JAM54S31-XXX/MR
	JAM72S09-XXX/PR	JAM72D30-XXX/MB
Jinko Solar	JKMXXXM-60	JKMXXXP-72-V
	JKMXXXM-60L	JKMXXXPP-72
	JKMXXXM-60HL	JKMXXXPP-72-V
	JKMXXXM-60HBL	JKMSXXXP-72
	JKMXXXP-60	JKMXXXM-72HL-V
	JKMXXXP-60-J4	JKMXXXM-72HL-TV
	JKMXXXP-60-V	JKMXXXM-72HBL
	JKMXXXP-60B-J4	JKMXXXM-6TL3-B
	JKMXXXPP-60	JKMXXXM-6RL3-B
	JKMXXXPP-60-V	JKMXXXM-7RL3-V
	JKMXXXM-72	JKMXXXM-7RL3-TV
	JKMXXXM-72L-V	JKMXXXM-72HL4-V
	JKMXXXP-72	JKMXXXM-72HL4-TV
Kyocera	KUXXX-6YYY	KUXXX-8YYY
LG	LGXXXN1C-A5	LGXXXA1C-V5
	LGXXXN1K-A5	LGXXXM1C-L5
	LGXXXQ1C-A5	LGXXXM1K-L5
	LGXXXQ1K-A5	LGXXXN1C-N5

Grounding Specifications

Manufacturer	Model	
LG	LGXXXS1C-A5	LGXXXN1K-L5
	LGXXXN2C-B3	LGXXXN1K-A6
	LGXXXN2W-B3	LGXXXN1C-A6
	LGXXXN1C-G4	LGXXXN1W-A6
	LGXXXN1K-G4	LGXXXQ1C-A6
	LGXXXS1C-G4	LGXXXQ1K-A6
	LGXXXN2C-G4	LGXXXM1K-A6
	LGXXXN2K-G4	LGXXXM1C-A6
	LGXXXN2W-G4	LGXXXA1C-A6
	LGXXXS2C-G4	LGXXXQAC-A6
	LGXXXS2W-G4	LGXXXQAK-A6
	LGXXXN1C-V5	LGXXXN1K-B6
	LGXXXN1W-V5	LGXXXN2W-E6
	LGXXXN2T-V5	LGXXXN2T-E6
	LGXXXN2T-J5	LGXXXN1K-E6
	LGXXXN1T-V5	LGXXXN3K-V6
Longi	LR6-60-XXXM	LR4-60HPB-XXXM
	LR6-60BK-XXXM	LR4-60HIB-XXXM
	LR6-60HV-XXXM	LR4-60HPH-XXXM
	LR6-60PB-XXXM	LR4-60HIH-XXXM
	LR6-60PE-XXXM	LR6-60HIH-XXXM
	LR6-60PH-XXXM	LR6-60HIB-XXXM
	LR6-60HPB-XXXM	LR4-72HPH-XXXM
	LR6-60HPH-XXXM	
Meyer Burger	Meyer Burger Black*	Meyer Burger White*
mSolar	TX16-XXX120BB	
Mission Solar	MSEXXXSO5T	MSEXXXSR8K
	MSEXXXSO5K	MSEXXXSR8T
	MSEXXXSQ5T	MSEXXXSR9S
	MSEXXXSQ5K	MSE60AXXX
	MSEXXXMM4J	MSEXXXTS60
	MSEXXXMM6J	MSEXXXSX5K
	MSEXXXSO6W	MSEXXXSX5T
	MSEXXXSO4J	MSEXXXSX6S
	MSEXXXSO6J	MSEXXXSX6W
	MSEXXXSQ6S	MSExxxSX5R
	MSEXXXSQ4S	
Next Energy Alliance	USNEA-XXXM3-60	USNEA-XXXM3-72
	USNEA-XXXM3B-60	USNEA-XXXM3B-72
Panasonic	VBHNXXXKA01	VBHN325SA17E
	VBHNXXXKA02	VBHXXXRA18N
	VBHNXXXSA16	VBHXXXRA03K
	VBHNXXXKA03	EVPVXXX(K)

Grounding Specifications

Manufacturer	Model	
Panasonic	VBHNXXXKA04	EVPVXXXH
	VBHNXXXSA17	EVPVXXXPK
	VBHNXXXSA18	
Phono Solar	PSXXXM-20/U	PSxxxM8GF-18/VH
	PSXXXMH-20/U	PSxxxM8GFH-18/VH
	PSxxxM8GF-24/TH	PSxxxM6-24/TH
	PSxxxM8GFH-24/TH	
REC	RECXXXPE	RECXXXTP2M 72 BLK2
	RECXXXPE-BLK	RECXXXTP2SM 72
	RECXXXTP	RECXXXTP2SM 72 BLK
	RECXXXTP-BLK	RECXXXTP2SM 72 BLK2
	RECXXXTP IQ	RECXXXAA
	RECXXXTP2	RECXXXTP3
	RECXXXTP2-BLK	RECXXXTP3M
	RECXXXNP	RECXXXTP4
	RECXXXTP2M	RECXXXAA Pure
	RECXXXTP72	RECxxxAA Pure-R
	RECXXXPE72	RECXXXNP2
	RECXXXPE72XV	RECxxxNP3
	RECXXXTP2M 72	All may be followed by BLK or BLACK
	RECXXXTP2M 72 BLK	
Renesola	JCXXXM-24/Bb	JCXXXM-24/BBh
SEG Solar	SEG-400-BMB-HV	SEG-xxx-BMD-HV
	SEG-400-BMB-TB	SEG-xxx-BMD-TB
Silfab	SLAXXX-M	SILXXXNT
	SLAXXX-P	SILXXXHL
	SSAXXX-M	SILXXXBK
	SSAXXX-P	SILXXXHC
	SILXXXBL	SILXXXNU
	SILXXXML	SILXXXNX
	SILXXXNL	SILXXXHN
	SLGXXX-M	SILXXXBG
	SLGXXX-P	SIL-xxxHC+
	SSGXXX-M	SIL-xxxHM
	SSGXXX-P	

Grounding Specifications

Manufacturer	Model	
Solaria	Solaria PowerXT-XXXR-PX	Solaria PowerXT-XXXR-PM
	Solaria PowerXT-XXXR-BX	Solaria PowerXT-XXXR-PM-AC
	Solaria PowerXT-XXXR-AC	
SolarWorld	SWXXX-Mono	SWXXX-Mono XL
Suniva	MVX-XXX-60-5-701	OPT-XXX-60-4-1B0
	MVX-XXX-60-5-7B1	OPT-XXX-60-4-800
	OPT-XXX-60-4-100	OPT-XXX-60-4-8B0
Sunpower	SPR-EYY-XXX	SPR-AXXX
	SPR-XYY-XXX	SPR-AXXX-BLK-G-AC
	SPR-EYY-XXX	SPR-AXXX-BLK
	SPR-XYY-XXX	SPR-MXXX-H-AC
	SPR-P17-XXX-COM	SPR-MXXX
	SPR-P19-XXX-COM	SPR-MXXX-BLK-H-AC
	SPR-AXXX-G-AC	SPR-MXXX-BLK
SunSpark	SST-XXXM3-60	SST-XXXM3-72
	SST-XXXM3B-60	SST-XXXM3B-72
Talesun	TP660M-XXX	TP672M-XXX
	TP660P-XXX	TP672P-XXX
Tesla	TXXXS	TXXXH
Trina	TSM-XXXDD05(II)	TSM-XXXDD06M.05(II)
	TSM-XXXDD05A.05(II)	TSM-XXXDE15H(II)
	TSM-XXXDD05A.08(II)	TSM-XXXDE15M(II)
	TSM-XXXDD05A.082(II)	TSMXXXDD05H.05(II)
	TSM-XXXPA05	TSMXXXDE06X.05(II)
	TSM-XXXPA05.05	TSMXXXDE09.05
	TSM-XXXPA05.08	TSMXXXDE15V(II)
	TSM-XXXPD05	TSMXXXDEG15VC.20(II)
	TSM-XXXPD05.002	TSMXXXDEG18MC.20(II)
	TSM-XXXPD05.05	TSM-XXXDE19
	TSM-XXXPD05.05S	TSMXXXDEG19C.20
	TSM-XXXPD05.08	TSMXXXDEG21C.20
	TSM-XXXPD05.082	TSMXXXDE09C.05
	TSM-XXXPD05.08D	TSMXXXDE09C.07
	TSM-XXXPD05.08S	TSM-xxxNE09RC.05
Vikram Solar	SOMERA VSMHBB.60.XXX.05	PREXOS VSMDHT.60.XXX.05
	SOMERA VSMH.72.XXX.05	PREXOS VSMDHT.72.XXX.05

Grounding Specifications

Manufacturer	Model	
VSUN	VSUNXXX-144BMH-DG VSUNXXX-120BMH	VSUNXXX-108BMH
Yingli	YLXXXA-29b	YLXXXP-29b
ZNShine	ZXM6-60-XXX/M ZXM6-NH120-XXXM	ZXM6-NH144-XXXM ZXM7-SH108-XXXM

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 Se-ries 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	IQ7PLUS-72-2-US
	M215	IQ7PLUS-72-B-US
	M250	IQ8-60
	IQ6-60-2-US	IQ8PLUS-72
	IQ6PLUS-72-2-US	IQ8A-72
	IQ7-60-2-US	IQ8H-208-72
	IQ7-60-B-US	IQ8H-240-72
Generac	Optimizer model S2502	
Ginlong Technologies	Solis-RSD-1G	Solis-MLRSD-R2-1G
	Solis-MLRSD-R1-1G	
SolarEdge	P300-5NC4ARS	P505
	P320-5NC4ARS	P730
	P370-5NC4AFS	P800p
	P400-5NC4AFS	P850
	P320	P860
	P340	P950
	P370	P1100
	P400	P1101
	P401	S440
	P405	S500
	P485	
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.