

Pegasus Rail System Installation Manual



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Overview



The Reggas Rail System is engineered to mechanically attach solar PV modules to residential and commercial sloped roofs. The system may be used to ground and bond solar PV modules complying with UL 2703 when the specific module has been evaluated for grounding and/or bonding in compliance with this manual. A list of evaluated modules is located in Appendix A. The installed mounting system and solar PV array should be inspected periodically for loose components, debris build up (such as under the PV modules), and any corrosion. Any loose components, excessive debris, or corrosion should be remedied immediately by a licensed contractor.



Disclaimer

This manual describes proper installation procedures and provides necessary standards required for product reliability. All installers must thoroughly read this manual and have a clear understanding of the installation procedures prior to installation. Failure to follow these guidelines may result in solar array damage, property damage, bodily injury or even death. Warranty details are available at www.pegasusolar.com

THE INSTALLER IS RESPONSIBLE FOR:

- Ensuring all electrical components are installed by a licensed and bonded electrician or solar contractor.
- Ensuring all work complies with national, state and local installation laws and codes, and all work complies with all applicable local or national building and fire codes, including any that may supersede this document.
- Ensuring all information provided about the jobsite was accurately used in determining the suitability of the system and the rail and mount design.
- Ensuring all components are installed in accordance to this installation manual, and the spacing and use of mounts and rails are in compliance with Pegasus engineering span tables for the specific attributes of the solar array (e.g. wind load, building exposure, etc.).
- Using only Pegasus Solar components – substituting any components will void the Warranty unless explicitly stated by Pegasus in writing.
- Providing an appropriate method of direct-to-earth grounding according to the latest edition of the National Electrical Code, including NEC 250: Grounding and Bonding, and NEC 690: Solar Photovoltaic Systems.
- Ensuring bare copper grounding wire does not contact aluminum components.
- Ensuring PV modules and module level power electronics are installed in compliance with the respective manufacturers' installation manual and warranty terms and conditions.
- Not breaking the bonding path of the array during periodic maintenance.
- Upon maintenance of a Pegasus installed system, checking for loose components, excessive debris, and corrosion. The installer shall re-tighten any loose components immediately; remove any excess debris immediately; and replace any corroded components immediately.
- Ensuring all AC power is disconnected before servicing PV modules, wiring, and any module level power electronics.



Certifications / Code Compliances / Product Identification

Certifications and Code Compliance

BONDING AND GROUNDING

- Conforms to UL 2703, Ed. 1 Standard for Safety First Edition: Mounting Systems, Mounting Devices, Clamping/ Retention Devices, and Ground Lugs for Use with FlatPlate Photovoltaic Modules and Panels.
- Certified to LTRAC001-2012 Photovoltaic Module Racking Systems
- Max Overcurrent Protective Device (OCPD) Rating: 25A
- Max Module Size: 2'4"; Max Frameless Module Size for Canadian LTRAC: 19.5 ft²
- Module Orientation: Portrait or Landscape
- System Level Allowable Design Load Rating: see PE stamped certification letters defining the actual system structural capacity (see Appendix B)
- Ground Lug conforms to UL 467

CLASS A SYSTEM FIRE RATING PER UL2703 & UL1703

- Any roof slope with Module Type 1, Type 2, Type 29, Type 30
- Any module-to-roof gap; no detectors required
- This rating is applicable with any third-party attachment
- Class A rated PV systems can be installed on Class A, B, and C roofs without affecting the roof fire rating



STRUCTURAL CERTIFICATION

- Designed and Certified for Compliance with the International Building Code, ASCE 7-10 & ASCE 7-16
- For Dual Rail installations, up to 2 PV modules per pair of rails are allowed
- See PE Certified Span Tables in Appendix C for load ratings and details

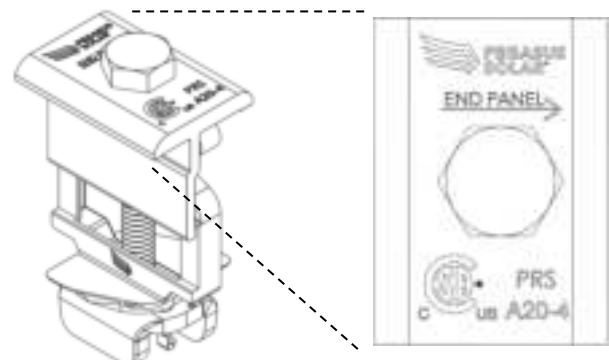
WATER SEAL RATINGS: AC208

- Comp Mount has been tested and evaluated without sealant for roof slopes between 2:12 and 12:12

Product Identification

Product identification can be made by looking at the top of the Multi Clamp.

- Pegasus Logo above bolt head
- Model Name: "PRS"
- Lot Code: ex. "A204"
- UL 2703 listing: CSA Mark



Required Tools



ROOFING CHALK



STRING LINE



MEASURING TAPE



1/2" DEEP SOCKET



TORQUE WRENCH



DRILL DRIVER



DRILL



JOBBER BIT



Components and Installation Torque Requirements

Rails and Splices



Pegasus Rail	Pegasus Max Rail	Splice	Max Splice
6' Spans (w/ 130 mph*)	6' Spans (w/ 130 mph*)	Structural, Non-interfering	Structural, Non-interfering
4' Spans (w/ 130 mph*)	4' Spans (w/ 130 mph*)	No Tools	No Tools
J-2703 Listed	J-2703 Listed	J-2703 Listed	J-2703 Listed

* Not for design use. See Appendix B for design use details.

Rail Components



Multi-Clamp	Hidden End Clamp	MLPE Mount	Dovetail T-Bolt
Mid and End Clamp 50-40mm PV modules	Any PV module with internal Lange	Compatible with most MLPE devices	For use with any mount or attachment
J-2703 Listed	J-2703 Listed	J-2703 Listed	J-2703 Listed
1/2" Socket Torque: 100-150 in. lbs.	1/2" Socket Torque: 150-160 in. lbs.	1/2" Socket Torque: 150-160 in. lbs.	1/2" Socket Torque: 220-300 in. lbs.



Wire Clip	Cable Grip	Ground Lug	N.E. Bonding Junction	End Cap & Max End
Hold wire to Rail	Hold to secure cables	6 AWG-4/0 Copper Wire	For max PV modules	End of PV array supports
1/2" Socket and finger tight	Hold for PV wires	J-2703 Listed	J-2703 Listed	1/2" Socket and finger tight
No Torque	1/2" Socket Torque: 150-160 in. lbs.	1/2" Socket Torque: 150-160 in. lbs.	No Torque	No Torque



Components and Installation Torque Requirements

SkipRail Clamp



SkipRail Clamp	SkipRail Clamp w/ Kickstand
For SkipRail installation method	For SkipRail installation method
UL 2703 Listed only with Peppas Rail System	UL 2703 Listed only with Peppas Rail System
1/2" Torque: 130-150 in. lbs.	1/2" Torque: 130-150 in. lbs.

UL2703 Listed Roof Attachments



Intentionally Blank

Instaflash	Comp Mount
For Concrete Shingle Roofs	For Concrete Shingle Roofs
UL 2703 Listed with Doweclat Turret	UL 2703 Listed with Doweclat Turret



Tile Scissor Mount	Tilt-Leg Kit with L-foot	Tilt-Leg Kit for Instaflash
For Concrete Tile Roofs	For Flat roof applications	For Flat roof applications
UL 2703 Listed with Doweclat Turret	UL 2703 Listed with Doweclat Turret Torque: see install instructions	UL 2703 Listed with Doweclat Turret Torque: see install instructions



Compatible Mounts

Comp Mounts - Black and Mill



Comp Mount

For use on sloped asphalt or composite shingle roofs.
For installation instructions and training videos please visit
www.pegasusolar.com

Tile Scissor Mounts - Flat, S, and W Tile Roof Profiles



Tile Scissor Mount

For use on sloped concrete and clay tile roofs.
For installation instructions and training videos please visit
www.pegasusolar.com

Third-Party Mounts and Attachments

When using a third-party attachment or mount, refer to the manufacturer's installation manual. In all cases, the Dovetail Turret is required to attach the Rails to any third-party attachment or mount. It is the installer's responsibility to compare the load rating and span tables of the Pegasus Rail to the third-party attachment ratings, and use the lesser of the two ratings when designing the system. For all third-party mounts and attachments, when the Dovetail Turret and rails are installed and tightened to the attachment, the Dovetail Turret must be flush or extend past the last thread on the rail.



Installation Process

Rail and T-Bolt Installation



Place Dovetail T-Bolt in the slot of the rail. Fasten to other attachment. The Dovetail T-Bolt is the only approved attachment bolt for the Rail for any mode of attachment.



- Insert the T-Bolt into the rail slot and hand tighten.
- Rail ends must extend beyond attachment face, or when using a splice.



- Install additional rows of Rails spaced per PV manufacturer's requirements.
- Level Rail rows using leveling tool.
- Tighten the Bolts to each to 280-300 ft. lbs. with a 1/2" socket.

Splice Installation



Splice can be installed anywhere in a span, but must be used between two mounts (not in a cantilevered section of rail).



Insert the Splice into the first Rail up to the bumper stop (the back). Push a second Rail into the Splice up to the bumper stop.



For cantilevered ends of rail:

- Min. cantilever: 4 ft.
- Max. cantilever: 24 ft.

Thermal Break



- Leave a 1" thermal break every 50 ft. of continuous Rail sections.
- Thermal break must be offset 6" minimum from attachment.



PV wires and VEEF trunk cables can be placed into the channel of the rail.



The Langes of the Multi Clamp will protect wires from the rail after tightening.

PV wires spaced 5" to max 6" apart.



Installation Process

MLPE Mount Installation



Position the MLPE Mount perpendicular to the rail opening, place on rail, and turn clockwise 90 degrees.



Install the MLPE Mount to the MLPE Mount and tighten the bolt to 150-160 in lbs with a 1/2" socket.



Route wires before or after installing the MLPE.

Cable Grip



Like the MLPE Mount, twist and lock the Cable Grip in the open channel of the Rail.



Cable Grip can be used to secure up to two trunk cables or four PV wires, and firmly secures and holds them in place.

Wire Clip



Press firmly on top of Wire Clip and push into Rail. Use a screwdriver or similar tool through the hole to pry out the Wire Clip if necessary.

Ground Lug Installation



The Ground Lug comes pre-installed on a MLPE Mount. Determine best position for ground wire (e.g., near L box), install the Ground Lug on to Rail.



Run a 2 or 6 gauge copper ground wire from each Ground Lug to the Junction connection to earth ground, tighten to 150-160 in lbs with a 1/2" socket.



Alternatively, remove the Ground Lug from the MLPE Mount and use a Doweled T-bolt to attach the T to the Rail, tighten to 230-250 in lbs with a 1/2" socket.



Installation Process

Multi-Clamp Installation



Align the Multi-Clamp handle with the rail, then insert into the rail channel.



Push down and turn the Multi-Clamp clockwise 90 degrees.



Multi-Clamp will click when it is engaged. Slide the Multi-Clamp opening to the PV module frame.



Multi-Clamp as mid clamp
Any orientation acceptable



Multi-Clamp as end clamp
Correct orientation

- Silver Bond Plate is hidden
- Arrow points to end panel



Multi-Clamp as end clamp
Incorrect orientation

- Silver Bond Plate is visible
- Arrow points away from end panel

Hidden End Clamp Installation (optional)



Aligning the Rail to align with the edge of the to be mated PV module, slide the HFC into to the Rail opening, then place the PV module in a position.



Pull the tab until the HFC is fully engaged with the PV module frame, then hook the nearest Full tab to connect to the edge of the Rail.



Tighten the HFC nut with a 1/2" socket to 150-160 in lbs. Then unhook the pull tab and lock it into the Rail opening.



Installation Process

Dual Rail Installation - Setting PV Modules



Place the first PV module at the beginning of the row of Rails.



Insert Multi-Clamp in Rail and slide flush against PV module. Tighten clamp with 1/2" socket to 110-120 ft. lbs. (Note: Multi-Clamp is in the "End Clamp" orientation (see Multi-Clamp install#456).)



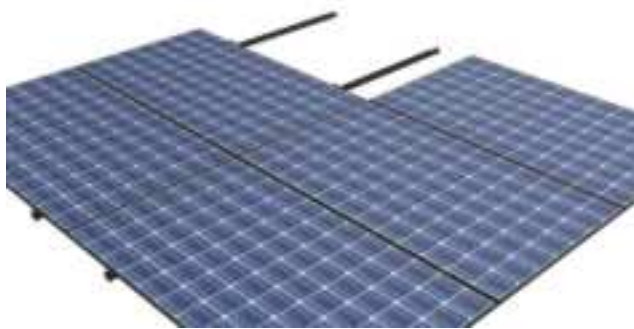
Insert Multi-Clamp into Rail on the opposite side of the PV module. Place next PV module on rail and snug against Multi-Clamp, then tighten Multi-Clamp with 1/2" socket to 110-120 ft. lbs.



Repeat the previous steps until the row is finished.



Start the next row of panels. At least a 1/4" gap shall be between each row of PV modules.

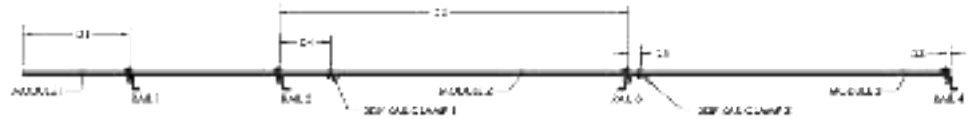


Continue the above steps for every row of modules until array is complete.



Installation Process

SkipRail Installation



Mark the array layout. For the first installed row or partial row of PV modules, install Rail 1 and Rail 2 in the typical method, securing the rails per the PV module manufacturer's mounting location instructions.

For Rails 3 and higher, narrow the Rails as 24" (up to) length of the module plus 12". For example, for a PV module manufacturer that is 66" long, narrow the 3rd, 4th, 5th, and Rail to 24" (66" to 24") from the previous Rail, and PV module manufacturer that is 48" wide, narrow the 3rd, 4th, 5th, and Rail to 24" (48" to 24") from the previous Rail. There shall always be a constant Rail spacing over PV modules.

In all cases, 10" ± 1" (where 24" is the distance from the outer edge of the PV module frame to center of the Rail).



Install the first row of PV modules as normal, ensuring the PV module panel overlaps and 10" meets the PV module manufacturer's requirements.

At the end of each row of PV modules, install a gap between PV modules rows.

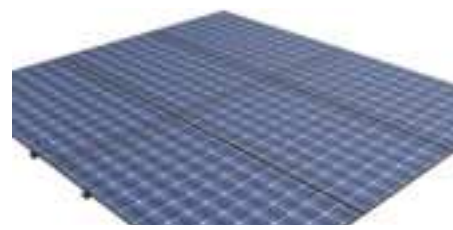
Remove Panels in all SkidRail Clamps (0.05" to 0.07" from the edge of the panel).

Remove Panels in all SkidRail Clamps (0.05" to 0.07" from the edge of the panel).

Tighten the SkidRail Clamp to 2400 ft-lb with a 1/2" hex key.

Within the narrow row of PV modules, install a SkidRail Clamp centered over the end of the panel (aligned above row of PV modules with the plan).

Tighten the SkidRail Clamp bolt to 150 ft-lb with a 1/2" hex key.



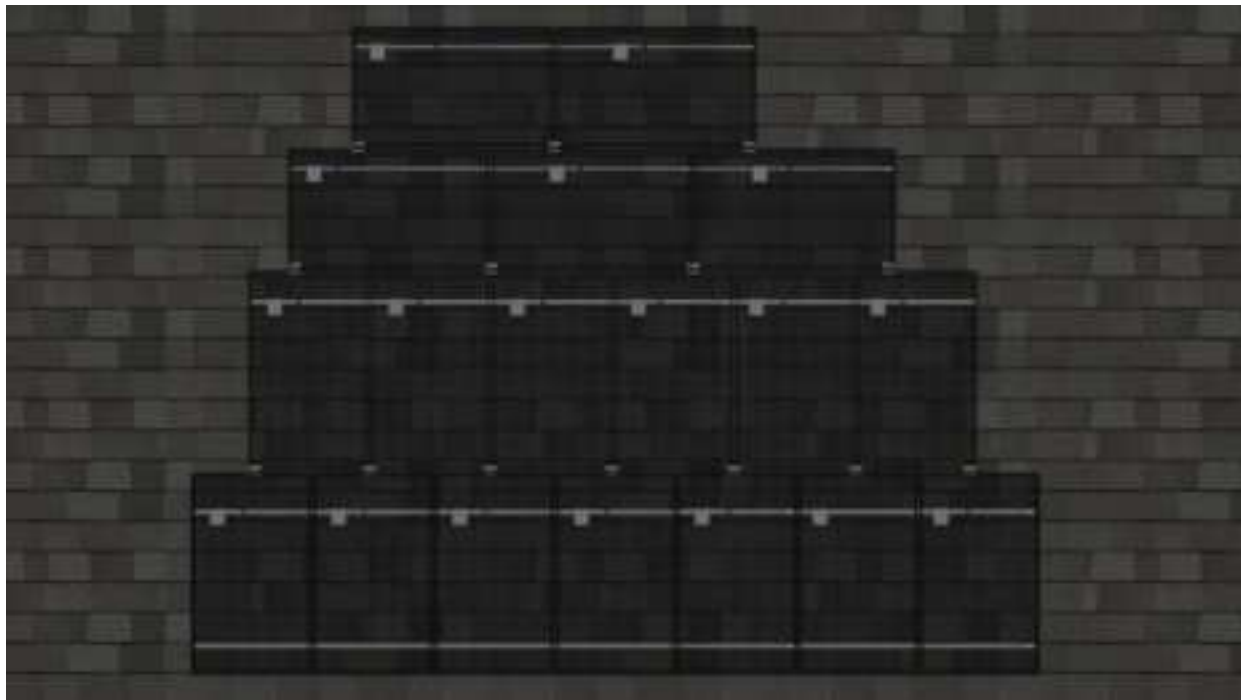
Install the next row of PV modules into the open side of the SkidRail Clamp, then lower on to the Rail. Tighten Mult-Clamps as previously described.

Finish installing all PV modules.

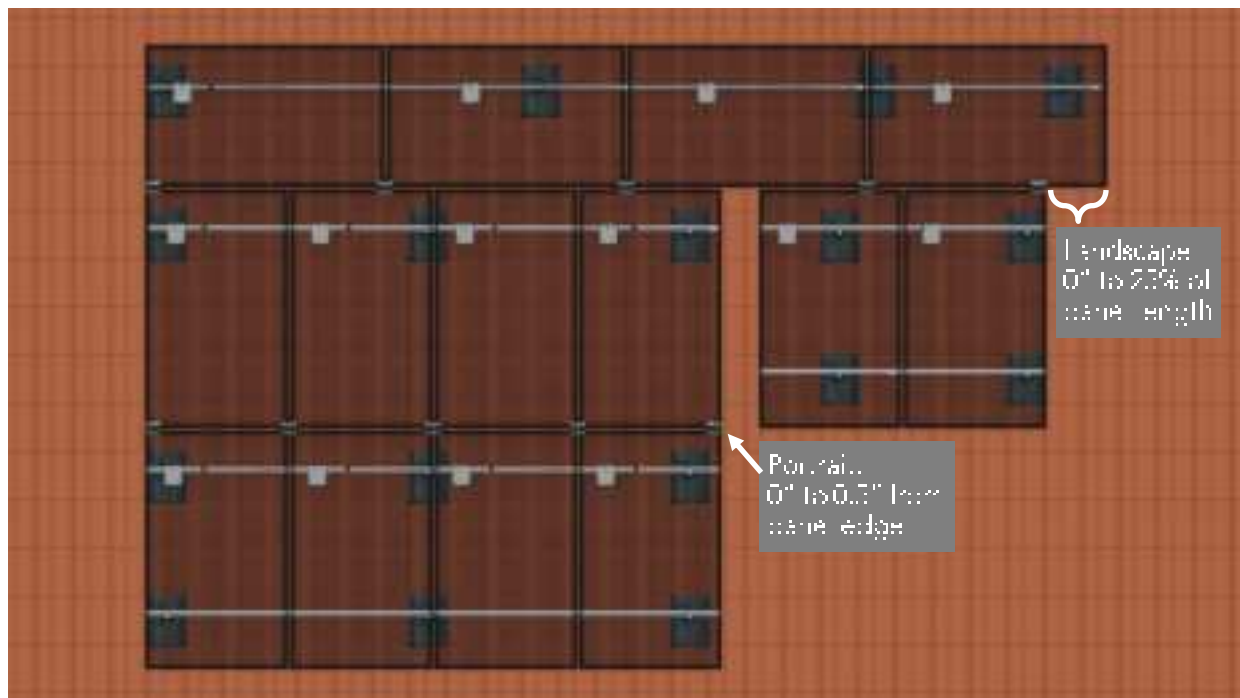


Installation Process

SkipRail Installation



Example mixed orientation array on a Gables Shingle roof. Any set of panels that are the first row in their column



Example mixed orientation array with pipe vent clearance on a Tile roof. Any set of panels that are the first row in their column should be installed using the standard Dual Rail method as shown on the right hand side of this array.



Installation Process

N-S Bonding Jumper Installation *(optional)*



Attach Bonding Jumpers on the underside of PV modules in adjacent rows.



From under the PV module, align the jumper with the numbered terminals on each PV module.



Firmly press each side of the Jumper onto each PV module frame until fully seated.

End Cap Installation *(optional)*



Line the tabs on the end cap up with the hole on part of the rail.



Press firmly until the End Cap is fully seated against the Rail.

Alternative Ground Lug *(optional)*



A WFFB LUG 5.0 or equivalent can be inserted into the MLEF Mount in the Rail. Tighten MLEF bolt with a 1/2" socket or 150-160 in. lbs. install ground wire and tighten lug bolt to 54 in. lbs.



A WFFB LUG 5.0 or equivalent can be inserted into the Drive-IT Mount. Tighten the T-bolt with a 1/2" socket or 250-260 in. lbs. install ground wire and tighten lug bolt to 84 in. lbs.



Installation Process

Tilt Leg Kit

1
Mark array and
feet
location and
install lower
legs and Upper
legs for desired
spacing and tilt
angle.



2
Flash each L-foot
with 3rd party
flashing system.



3
Using Pegasus
Rail or Pegasus
Max Rail, cut leg
sections to desired
length, and install
onto Upper Leg
L-foot and Upper
Leg Bracket.
Torque to
250in-lbs.



4
Install Pegasus Rail
or Pegasus Max
Rail onto Lower
and Upper Tilt
Legs. Torque to
250in-lbs.



5
Install MLPE and
manage wires in
the Pegasus Rail
channel.

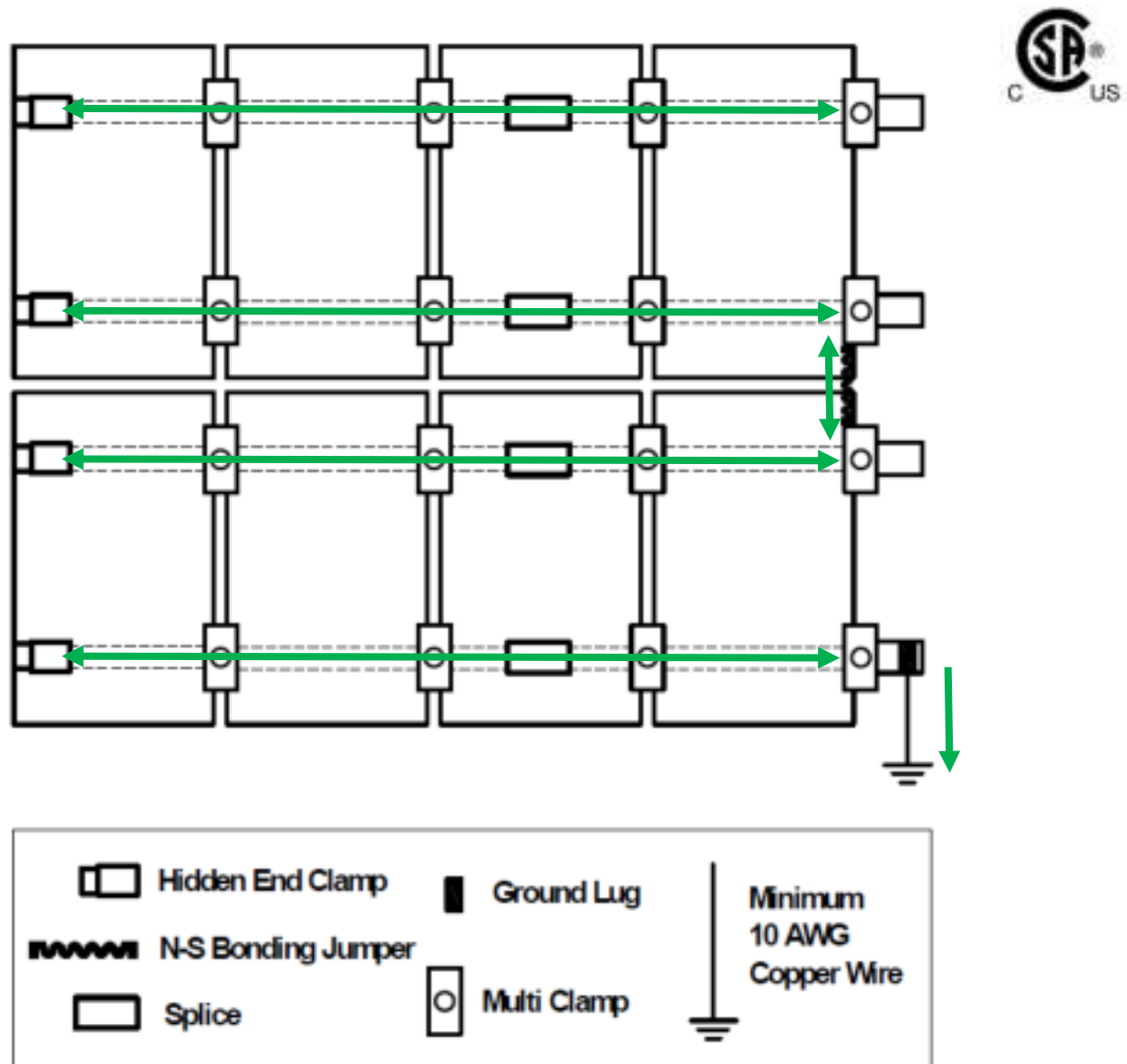


6
Install
PV Modules
using the
Pegasus Rail
System
components.



Pegasus Rail System - Bond Path to Ground

Ground Lug & N-S Bonding Jumper



Multi Clamps bond adjacent PV modules to one another and to the Rail. The Splice provides a bond connection between two Rail sections, including when a 1" thermal gap is utilized. The N-S Bonding Jumper will provide a bonding path between rows of PV modules, so that one Ground Lug per array is necessary for each ground. If a Thermal break is left between two sections of Rail, the Multi Clamps will provide a bond path across the two Rails through the PV module frame.

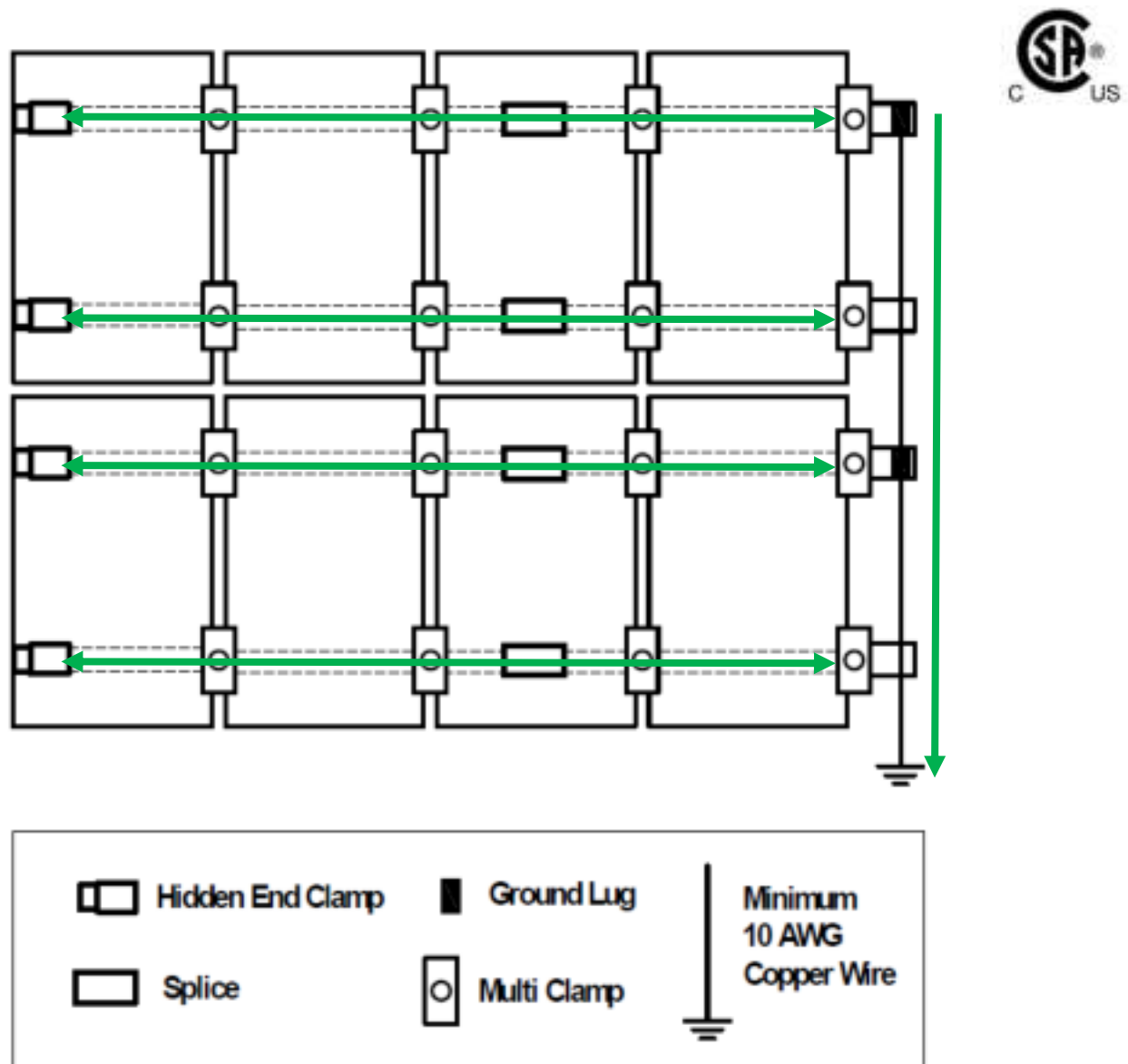
The N-S Bonding jumper may only be used with the Pegasus Rail System, and is not certified for use with any other mounting system.

If the N-S Bonding jumper needs to be removed during maintenance, a second N-S Bonding jumper shall first be installed on the opposite end of the row of PV modules, or the array should be disconnected from A/C power.



Pegasus Rail System - Bond Path to Ground

Ground Lug for each PV Module Row

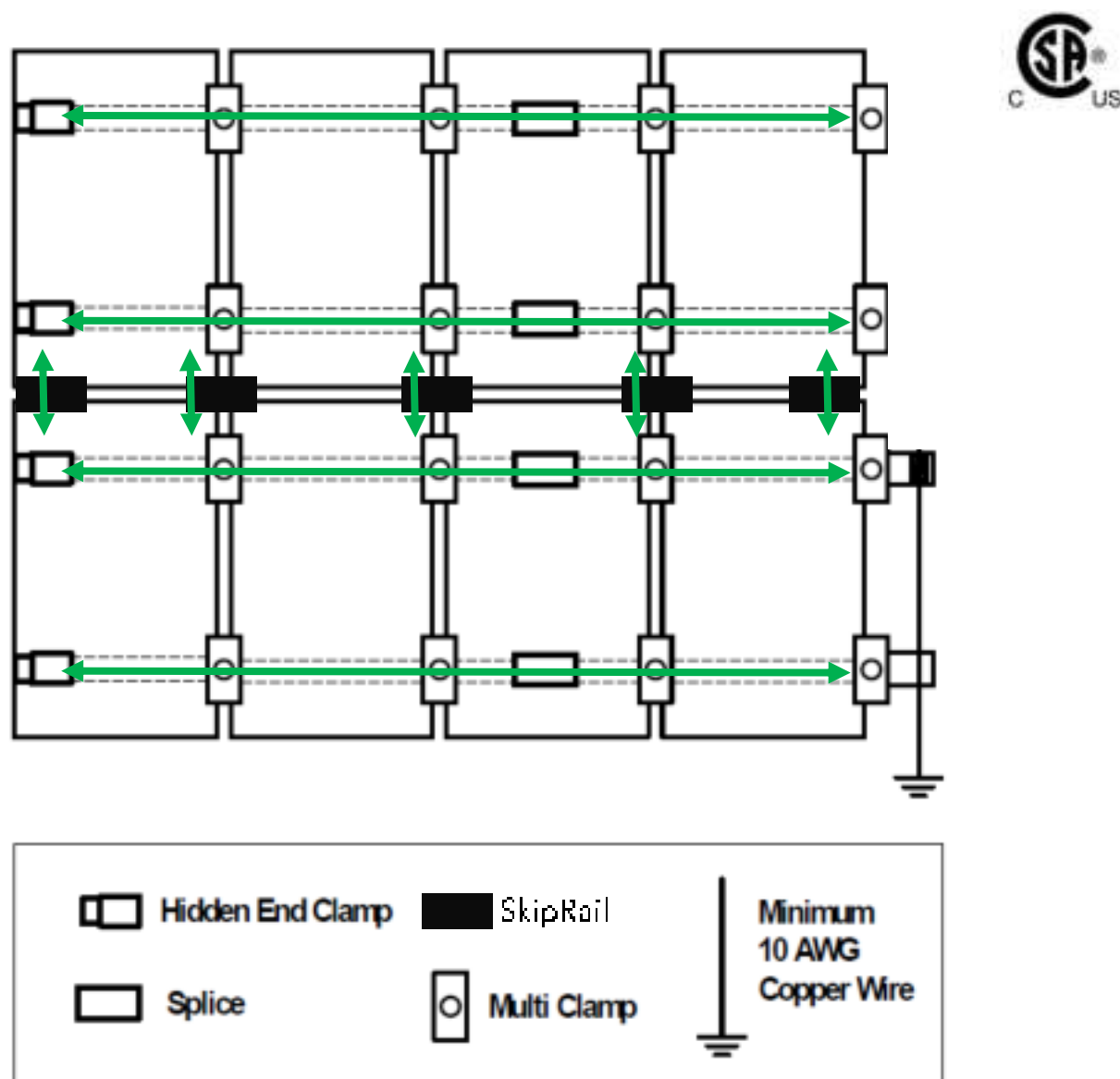


Multi Clamps bond adjacent PV modules to one and then attach to the Rail. The Splice provides a bond connection between two Rail sections, including when a 1" thermal gap is utilized. One Ground Lug is required per row of PV Modules, with a final earth ground connection at the terminal end of the ground wire. The terminal break is left between two sections of Rail. The Multi Clamps will provide a bond path across the two Rails through the PV module frame.



Pegasus Rail System - Bond Path to Ground

SkipRail System

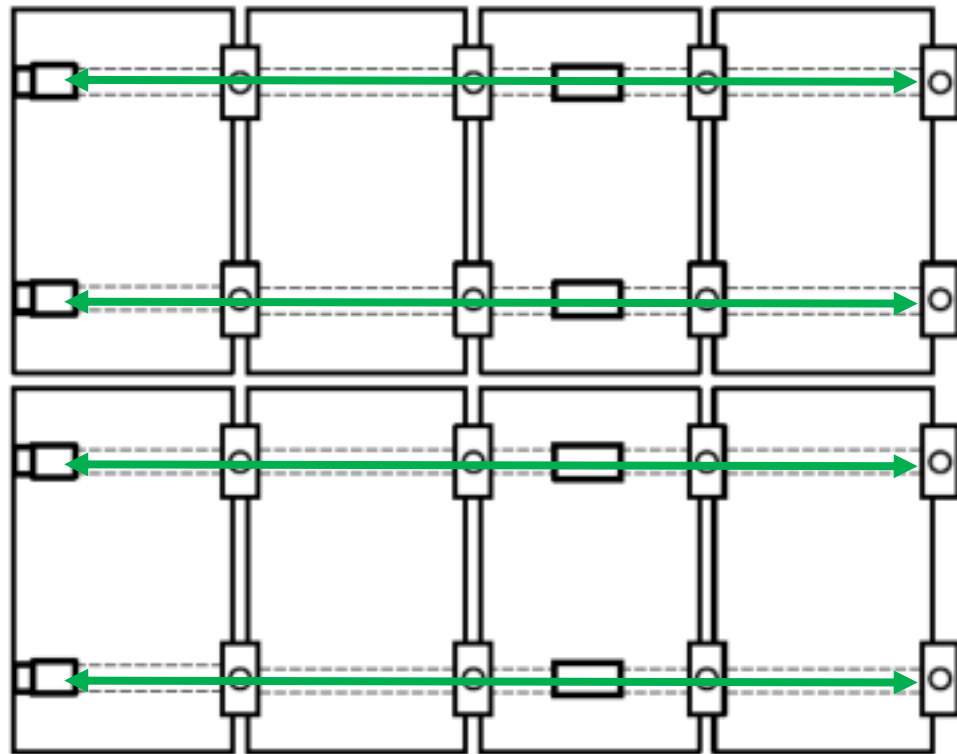


Multi Clamps bond adjacent PV modules to one another and to the Rail. The Splice provides a bond connection between two Rail sections, including when a 1" thermal gap is utilized. The SkipRail Splices will provide a bonding path between rows of PV modules, so that one Grounding path may be necessary for each ground. If a thermal break is utilized between two sections of Rail, the Multi Clamps will provide a bond path across the two Rails through the PV module frame.



Pegasus Rail System - Bond Path to Ground

Using Enphase Products



 Hidden End Clamp

 Splice

 Multi Clamp

Multi Clamps bond adjacent PV modules to one another and to the Rail. The Splice provides a bond connection between two Rail sections, including when a 1" thermal gap is utilized. The MPPE Mount area also provides a bond connection to the MPPE. When using Enphase products, Ground Lugs, N.E. Bonding Jumpers, or other equivalent ground conductors (EGC) are not required, and the use of the Enphase products satisfies the UL 2703 bonding and grounding requirements.

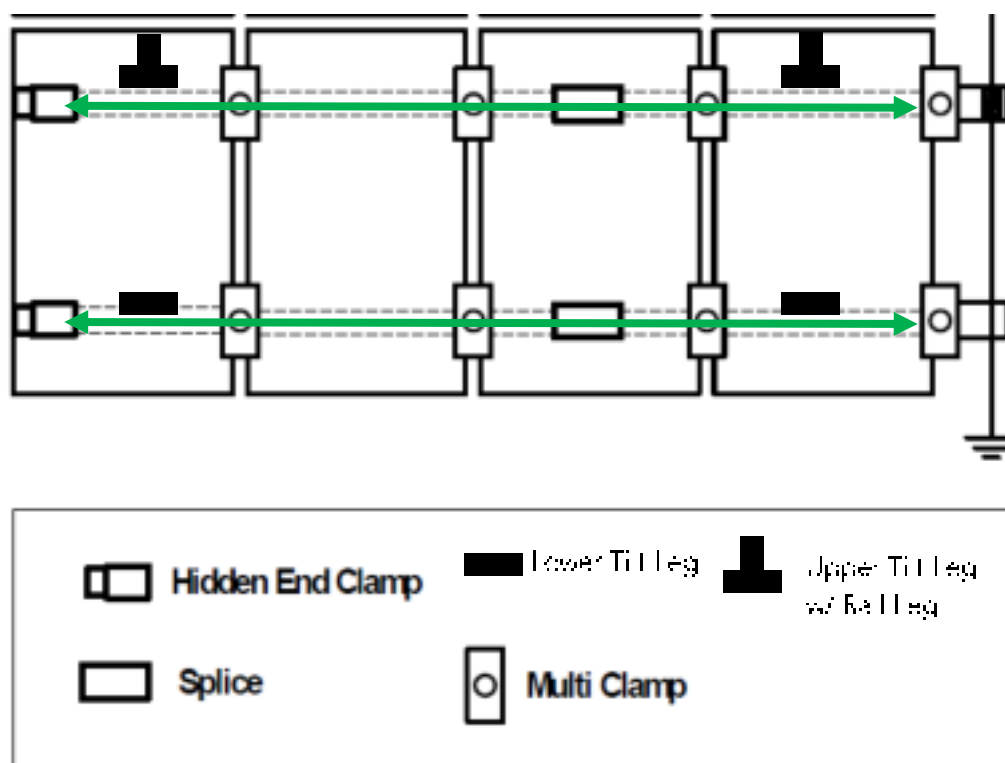
Compatible Enphase products:

- Microinverters: M230-72, M250-60, M275-60, C250-72, with Enphase cables: FXX 210, FXX 205, FXX 211



Pegasus Rail System - Bond Path to Ground

Tilt Leg Kit



Multi Clamps bond adjacent PV modules to one another and to the Rail. The Splice provides a bond connection between two Rail sections, including when a 4" thermal gap is utilized. One Ground Leg is required per row of PV Modules, which is final earth ground connection at the terminal end of the ground wire. A thermal break is left between two sections of Rail; the Multi Clamps will provide a bond path across the two Rails through the PV module frame.

Lower Tilt Leg Bracket bonds to the lower Rail. Upper Tilt Leg Bracket bonds the upper Rail to the Tilt Leg.



Appendix A - Compatible PV Mod-

Sequester Soil System may be used to ground a PV module complying with UL 2703 only when the specific module has been evaluated for grounding protection in accordance with the installation manual. Unless otherwise specified, field wiring to the power rating of the PV module listed and analyzed for use are included in the UL 2703 listing.

[illegible]

Appendix A - Compatible PV Modules (cont.)

Stagnant Soil System may be used to ground a Pyromet. complying with a 2403 only when the specific manufacturer has been listed for grounding application in compliance with the installation requirements. Unless otherwise specified, "lead" refers to the power rating of the Pyromet. (c) lists lead & silver fractions included in the a 2403 listing.

[illegible]

Appendix B - SkipRail Compatible PV Modules

It is for having a PV model, or structure, compatible with the field of application method.

[illegible]

Appendix B - SkipRail Compatible PV Modules (cont.)

The following PC need, as a structurally compatible with the 3.5" half-height slot on method.

Manufacturer	Model
Brand	BSX025W-M60-M70
U.S. Gov.	3Miles/M70; 10Miles/M70-30
Weight	VSU, KccfM-B03-M11; VSUK, ccN-B03-M11-W; VSU, Nccck, B03-M11-30; VSU, Nccck, B03-M11-3; VSUK, ccN-B03-M11-W; VSUK, ccN-B03-M11; VSU, Nccck, B03-M11-W; VSU, Nccck, B03-M11-30; VSU, Nccck, B03-M11-3; VSU, KccfM-B03-M11-W; VSUK, ccN-B03-M11; VSUK, ccN-B03-M11-W; VSU, Nccck, B03-M11-30; VSU, Nccck, B03-M11-3; VSU, KccfM-B03-M11-W
Warranty	W03M17-cc
ZN5-cc	ZXN7-cc-11-00144-cc/N-ZXN7-cc-11-00144-cc/M-ZXN7-cc-11-00144-cc/M



Warranty and External Links

PE Certifications and Span Tables

www.megatecusa.com/certifications

Warranty

www.megatecusa.com/warranty

Comp Conduit Mounts and other Accessories

www.megatecusa.com/accessories

