



Tamarack Flush Mount Solar Roof Mount System



Installation Manual for 4-rail kit

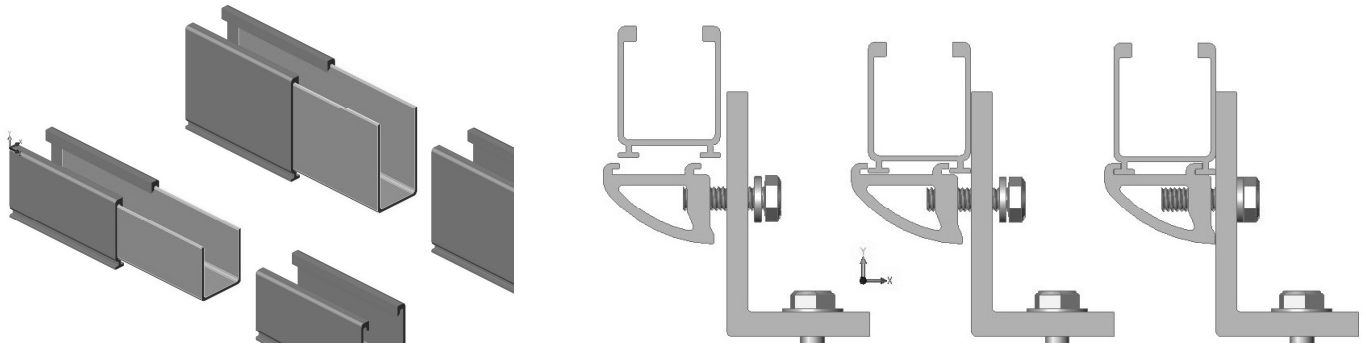
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Technical Support: 707-234-8107 or 800-819-7236 ext.556

Tamarack Flush Mount System Features

- Designed for mounting on most residential roofs
- Can be installed with most available roof attachments for composition shingle, tile and metal roofs
- Only 4 tools required for installation
- Top clamps and rail attachments require the use of a single standard 1/2-inch socket
- One part for both mid-clamp and end-clamp use simplifies ordering and stocking parts
- Module clamps are spring loaded to ease module placement
- Two rail heights and one rail length
- Bonding splice installs easily without tools
- Built-in wire management for module and microinverter cables
- Sleek low-profile design eliminates the need for an array skirt



Tamarack Product Summary

Flush mount is a visually appealing, low profile, photovoltaic (PV) module installation system that significantly lowers PV module installation cost by allowing the installation professional to stock fewer parts and to complete the installation in less time.

Certified to meet local and International Building Codes when installed in accordance with this manual. The design load rating meets the minimum requirements of 10 PSF downward pressure, 5 PSF upward pressure and 5 PSF down-slope load. Module orientation may be portrait or landscape. Designed for use with most third-party roof attachments including Solar Roof Hooks, Quick Mount PV, Ironridge Flashfoot, S-5 Clamps, etc.

Class A Fire Rating per UL 1703 for steep roof slope applications when using Type 1 or Type 2 Listed Photovoltaic Modules. This is per Middleton fire test report 103427989MID-004.

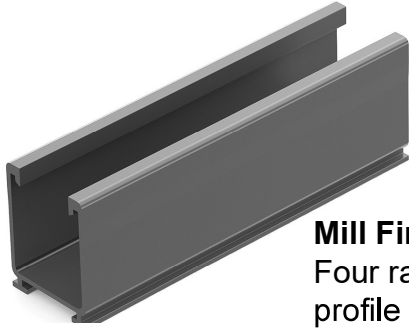
ETL Listed to UL 2307 for bonding and grounding when installed in accordance with this manual.

Rails, clamps, splices and mounting devices are UL2703 Listed for mounting flat-plate Photovoltaic Modules and Panels



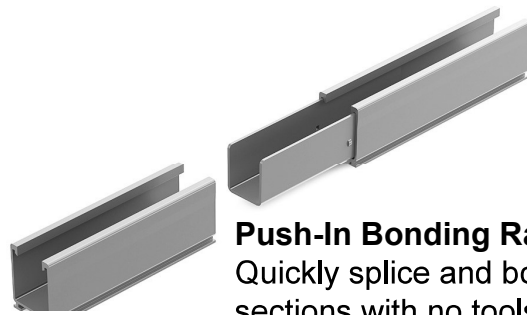
Tamarack Flush Mount 84-inch Rail Kit

Install Four Typical PV modules*



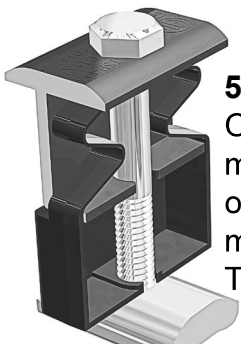
Mill Finish Rails

Four rails for attractive low-profile mounting of up to eight modules with four-foot roof attachment spacing. Certified for up to 180 MPH wind speed and 120 PSF snow load.



Push-In Bonding Rail Splice

Quickly splice and bond rail sections with no tools or fasteners. Top Clamps and Rail Mounts can be co-located with splice. Four splices included.



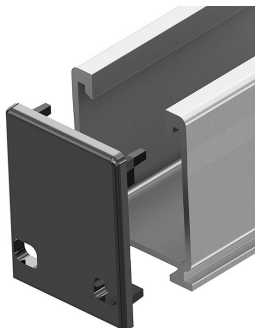
50-50 Clamp

One clamp can be used as a mid-clamp or an end-clamp on modules with 30 mm to 40 mm frame height. Ten clamps are included.



Rail Mount and L-Foot

Quickly and securely mount the rail from either side, to any L-Foot, Tile Hook or specialty flashing with a hole or slot for a 5/16-inch bolt. Eight mounts are included.



Push-On End Cap

Four caps, for two rows give the rail system a finished look while allowing drainage.



Wire Management Clip

Kit includes 12 clips that can be pushed into top of rail to keep cables in place.

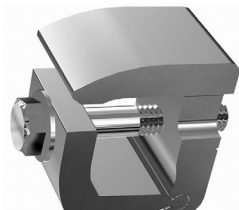


Ground lug

Use one per module row to ground rail with bare 6 to 10 AWG copper wire. Two clamps are included.

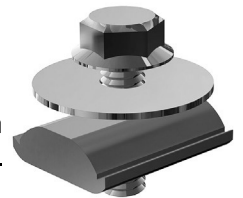
Channel End Clamp

Use this end clamp for mounting modules flush with the end of the rails. This end clamp replaces 50/50 clamps at the end of the row. Four clamps are included in the kit.



MLPE Adapter

Attach microinverters or power optimizers to the rails under the modules. Use one adapter for each device. Four adapters are included.



Tools Required

- Cordless Drill
- Torque Wrench
- Ratchet and 1/2" Socket
- Level

Torque Specifications

Rail Support	12 ft-lbs
MLPE Rail Attachment	12 ft-lbs
Ground Lug	12 ft-lbs
50-50 clamp	12 ft-lbs
Rail Ground Lug	12 ft-lbs
IlSCO SGB-4 Module Frame Ground lug	12 ft-lbs

Prepare for Installation

Plan the PV module layout that fits the roof and confirm that plans comply with local AHJ requirements.

The rails can be installed parallel or perpendicular to the roof rafters. Center the rails over the structural members as much as possible.

Leave enough room to work safely around the array during the installation process. Some building and fire codes require minimum clearances around PV module installations.

The length of the rails for each row in the installation will be equal to the total width of the modules plus 1/2-inch for each 50-50 clamp used between modules plus 2-inches total for end clamping. When using the channel end clamp, rails can be cut to the edge of the array.

Install proper roof mount flashings per the manufacturer's instructions. The maximum allowable spans between roof supports is 6 feet.

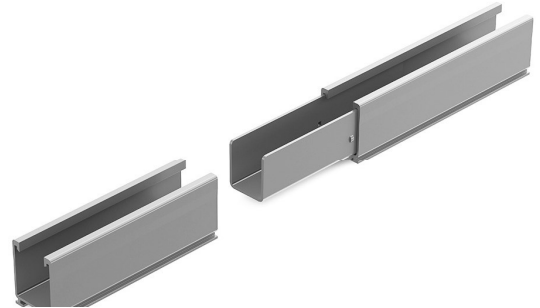
Attach Rail Mounts

Each Rail-Mount consists of two parts, a 5/16 inch bolt and a clamp extrusion. The rail adapters have been designed to interface with off-the-shelf mounting products that have vertical leveling slots. Our Rail Mounts work with most products that have 5/16 inch or 3/8 inch bolt slots. We also offer our own L foot for mounting to products that have a flat mounting surface, such as seam clamps, exposed beams or Quick Mount Q Blocks.



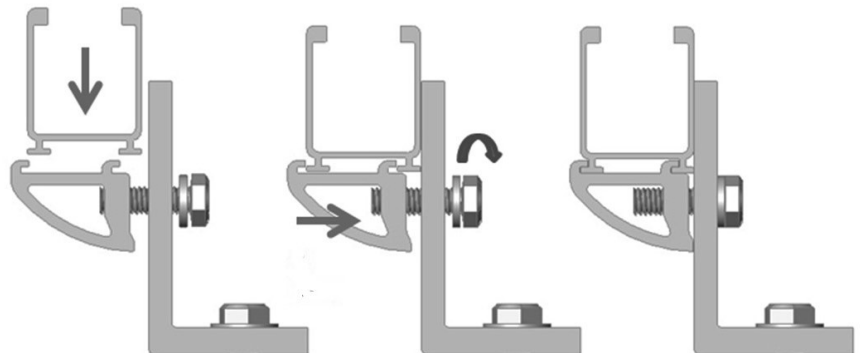
Install Rails

This kit contains eight 84-inch rails. This is enough to mount four 60 cell or 72 cell modules with a width of up to 40.5 inches in portrait orientation. If you are mounting modules in landscape orientation, the amount of modules you can mount with this kit will vary with module length. Use a Tamarack bonding splice to connect each section of rail in a row.



If a cut section of rail is required for the installation, it must not be installed at the end of a row. Each section of rail at the end of a row must be supported by two mounts before being spliced. If a rail section has a splice and 3 roof mounts, the splice should be located within 1/3 rail span of the middle mount.

Rail mounting is simple and easy. The Rail Adapter clamps to the two feet on the bottom of the rail. There is never any drilling, and parts can be brought on the roof fully assembled and ready to be installed. Rail Adapters may be installed anywhere on the rails, including at splices and they will not interfere with module mounting clamps.



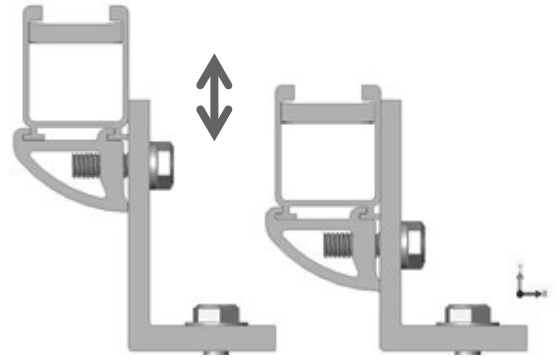
Simply position the adapter into the two feet on the bottom of the rail, and tighten the bolt slightly. Leave the bolt slightly loose to allow leveling of the rails in the next step.

Leveling Rails

Start by leveling the bottom rail of the array first. Set the Rail Adapters near the middle of the leveling range and adjust as necessary to have visually level rails. Tighten the attachment bolts to the specified torque when they are aligned. Level the top rail of the array in the same manner.

If there are multiple rows of rails in the array, use a string level or straight edge to help adjust the remaining rows to be level with the top and bottom rails. It is also possible to visually align rails in the middle of the array.

Tighten all hardware to the specified torque.



Grounding

Tamarack rails and PV modules are bonded by 50-50 Module Clamps and bonding splices. The 50-50 clamps achieve bonding to the module frames by stainless-steel pins in the clamping surface of the clamp tops, which penetrate module frame coating. The rails and channel nuts are bonded because of the conductive surface of the mill finish aluminum used in the rail construction.

SolarEdge Optimizers and Enphase Microinverters are bonded to the rail with the Tamarack MPLE adapters.

Bonding Method 1: Rail Lug

Use a Ground Clamp to bond a ground conductor to a rail.



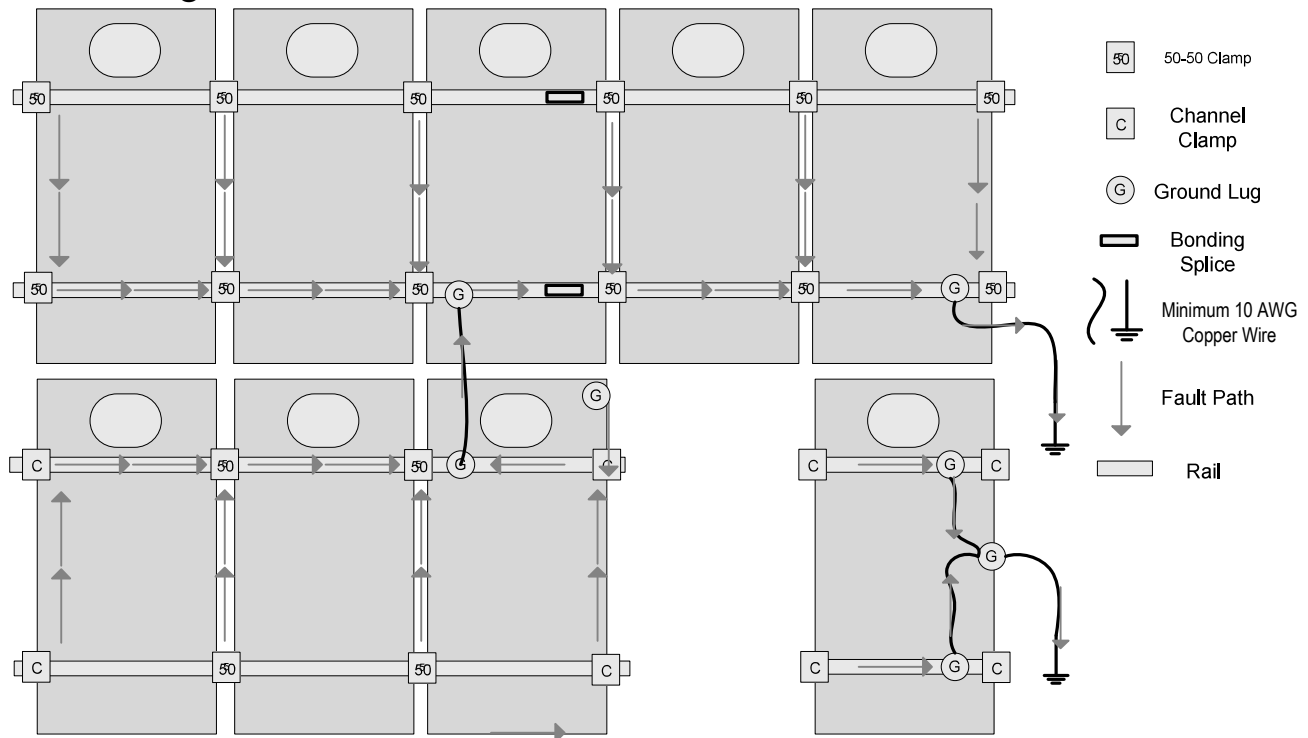
Bonding Method 2 (Optional): Frame Lug

Use a module ground lug to bond a module frame to a ground conductor. The resulting system is bonded primarily through the module frames. This method may not be acceptable to all building inspectors. This lug is not included in the kit.

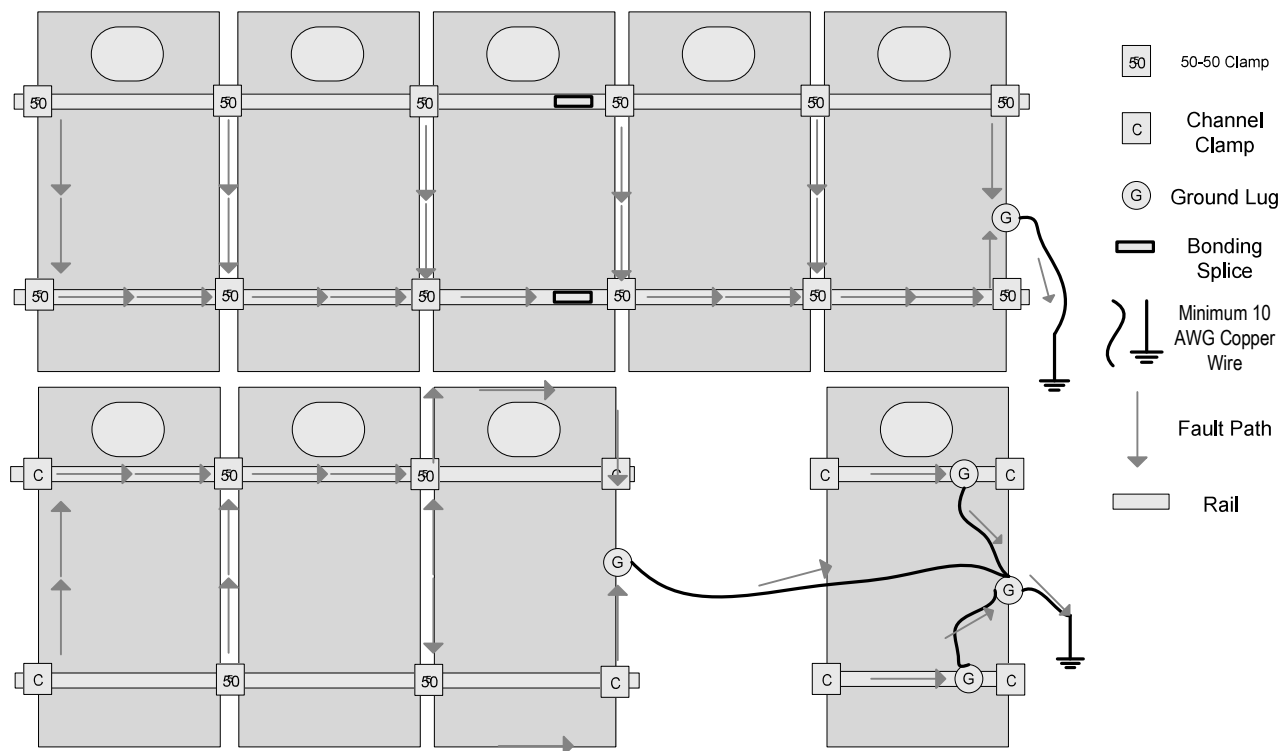


Grounding Diagrams

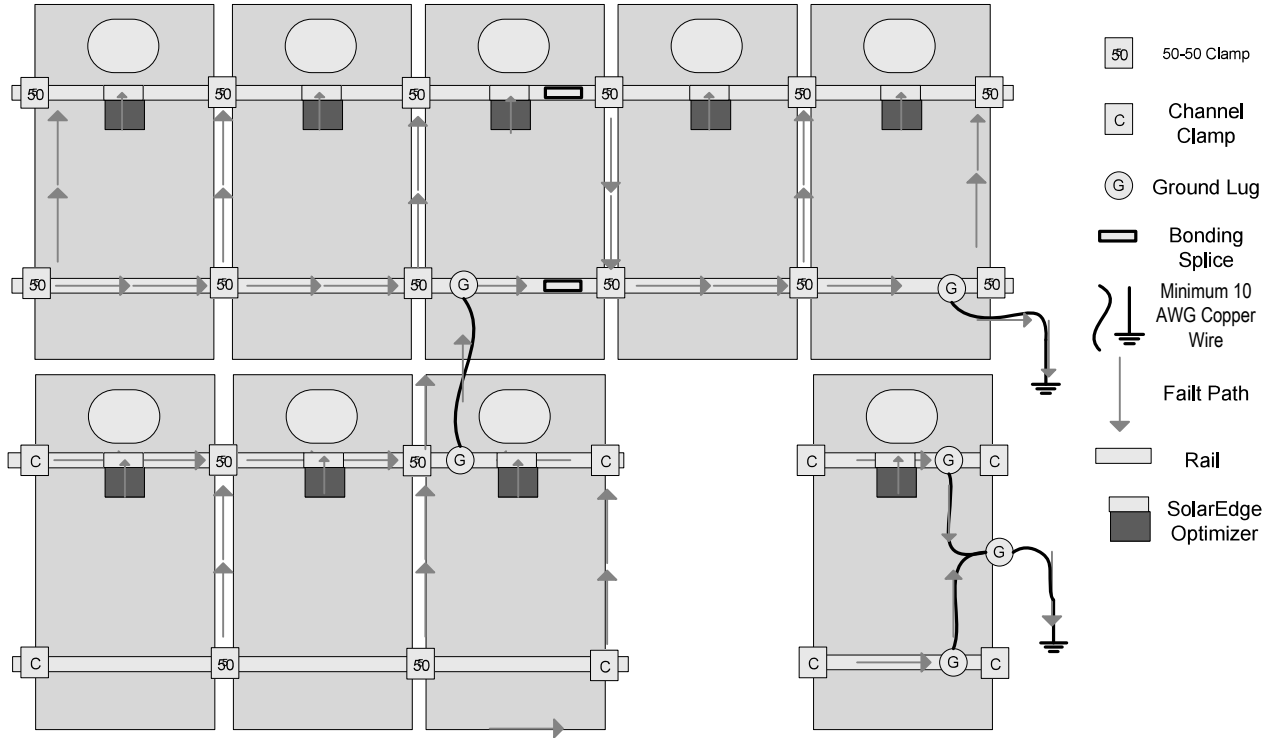
Rail Grounding method



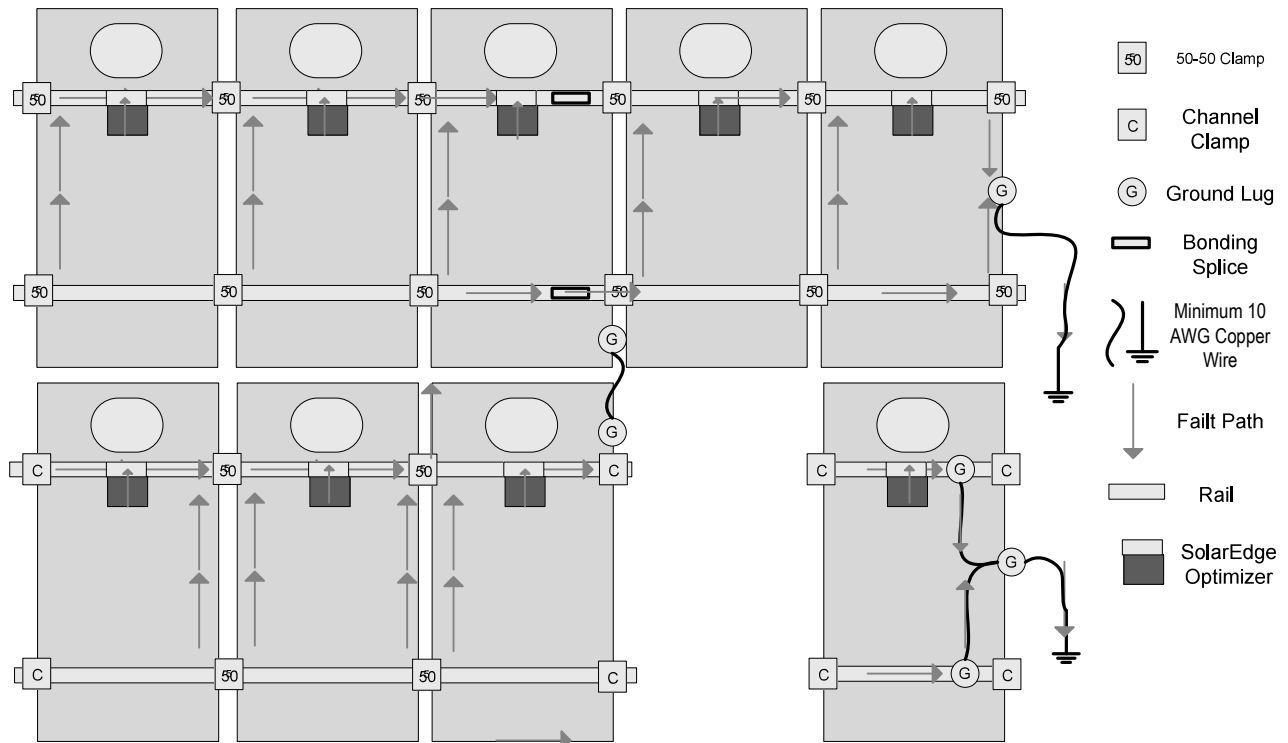
Frame Grounding Method



Rail Grounding method with SolarEdge Optimizers



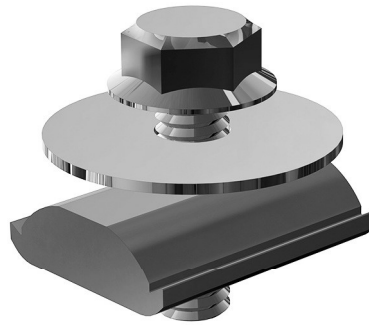
Frame Grounding method with SolarEdge Optimizers



Module Level Power Electronics

Use the Tamarack MLPE Rail Adapter to attach Enphase microinverters or SolarEdge Optimizers to the rails.

The large flat washer is installed between the mounting plate of the MLPE and the top of the rail. Tighten the bolt with a 1/2" socket to the 12 ft-lbs.



Wire Management

Place electrical conductors and connectors at the bottom of the rail channels.

Install the wire protection clips where necessary to keep wires in the channels.

When using 1.6 inch rail, it is possible to damage connectors or large bundles of wire when 50-50 bolts are tightened. Position connectors and bundles appropriately to prevent risk of ground faults.



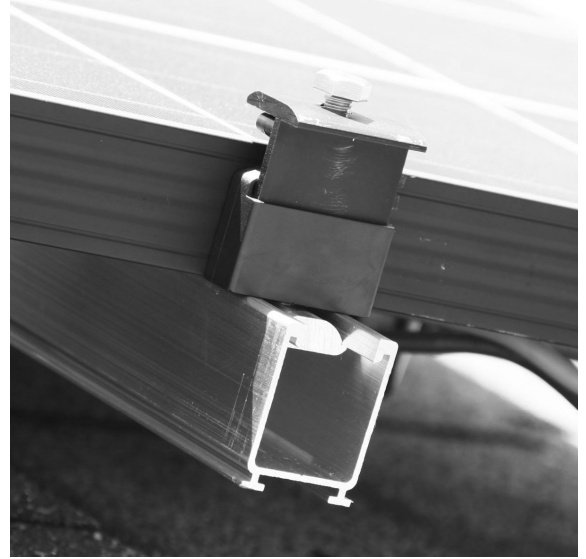
NOTE

These kits may have extra parts that will not be needed in some situations

Module Installation

Start module installation at one end of the rails. If there are multiple rows, start on the bottom row.

Install a 50-50 clamp at the end of each rail with the side of the clamp with 2 bonding pins on the module frame. Push the channel nut into the rail. The integrated spring assembly will hold the clamp in place.



Place the first module onto the rails so that it is centered over the rails. Make sure the module is touching the inside edge of the clamps and tighten the clamps with a 1/2" socket.



Install 50-50 Clamps in each rail on the other side of the first module. The springs will hold the clamps in place prior to tightening. Place the second module on the rails, align it with the first module, and push in against the clamps. Tighten the clamps to fully secure the module.

Install the remaining modules and clamps on the rails in the same manner, aligning the corners of the modules.



On the outside edge of the last module, install the clamps so that the side with the two stainless-steel pins is on the module frame. Tighten all bolts to 12 ft-lbs.

Do a final check to be sure that all installation hardware on the array is properly tightened to 12 ft-lbs.



Channel End Clamps

Channel End Clamps may be used in place of the 50-50 clamps at the ends of rails. Channel Clamps secure the module frame from below and allow the rails to be cut flush to the edge of the array for a clean look.

Insert channel end clamp in the rail. The module must be lifted slightly to slide the clamp under the frame. Allow the module to rest on the rail again and slide the clamp back toward the end of the module until it is flush with the outside end of the module frame and tighten lightly. Feel under the array to check that the clamp is clamping the module flange securely, then tighten to 12 ft-lbs.



End Caps

Place an end cap at the end of each rail to improve the look of the system. Drain holes on the bottom of the end caps ensure that water does not accumulate in the rails.



Disclaimer

This manual describes proper installation procedures and provides necessary standards required for product reliability. Warranty details are available on our website. www.tamaracksolar.com

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 property damage, bodily injury or even death.

Installers Responsibilities

- Follow all applicable local or national building and fire codes, including any that may supersede this manual.
- Electrical installation should be conducted by a licensed and bonded electrician or solar contractor.
- Module maintenance or removal must not break the bonding path of the system.
- Ensure all products used are appropriate for the installation and array under the site's loading conditions.
- Use only Tamarack parts or parts approved by Tamarack; substituting parts may void any applicable warranty.
- Comply with all applicable fire codes including, but not limited to, keeping walkways clear.
- Ensure bare copper grounding wire does not contact aluminum and zinc-plated steel components, to prevent risk of galvanic corrosion.
- If loose components or loose fasteners are found during periodic inspection, retighten immediately. If corrosion is found, replace affected components immediately.
- Provide an appropriate method of direct-to-earth grounding according to the latest edition of the National Electrical Code, including NEC 250: Grounding and Bonding, NEC 690: Solar Photovoltaic Systems, and CSA C22.1, Safety Standard for Electrical Installations, Canadian Electrical Code, Part 1
- Disconnect AC power before servicing or removing microinverters and power optimizers.
- Review module manufacturer's documentation to ensure compatibility and compliance with warranty terms and conditions.
- Maximum Series Fuse Rating of 20 Amps.

Technical Support: 707-234-8107 or 800-819-7236 ext.556

Certified Module List for UL2703 Listing Program

Manufacturer	Model
Aleo	P18/P19/S18/S19/S59/S79.
AU Optronics	PM Series
Astronergy	CHSM6612M, CHSM6612M/HV, CHSM6612P, CHSM6612P/HV, CHSM6610M (BL) (BF)/(HF), CHSM6610M/HV, ASM3310P
Auxin	AXN6M610Txxx, AXN6P610Txxx, AXN6M612Txxx, AXN6P612Txxx.
Axitec	AXIblackpremium 60 (35mm), AXIpower 60 (35mm), AXIpower 72 (40mm), AXIpremium 60 (35mm), AXIpremium 72 (40mm).
Boviet	BVM6610, BVM6612, BNM6612
BYD	P6K Series (35mm), MHK-36
Canadian Solar	CS6V-xxxM, CS6P-xxxP, CS6K-xxxM, CS5A-xxxM, CS6K-xxxMS CS6U-P, CS6U-M, CS6X-P, CS6K-MS, CS6K-M, CS6K-P, CS6P-P, CS6P-M, CS3U-P, CS3U-MS, CS3K-P, CS3K-MS, CS1K-MS, CS3K, CS3K, CS3K, CS3U, CS3U-MB-AG, CS3K-MB-AG, CS3K-MB-AG, CS6K, CS6U, CS3L, CS3W, CS1H-MS, and CS1U-MS
CentrosoSolar America	C and E series.
Certainteed	CTxxxMxx-01, CTxxxPxx-01, CTxxxMxx-02 Where "xx" denotes frame and backsheet color. CT-03 Series
Dehui	DH-60M xxx-xxxW
Eco Solargy	ORION 1000 ECOXXXH156P-60, APOLLO 1000 ECOXXXT156M-60, and APOLLO 1000 ECOXXXA156M-60.
ET Solar	ETAC Module, ET Module.
GCL	40mm frame: GCL-P6/72 35mm frame: GCL-P6/72, GCL-P6/72H, GCL-M6/72, GCL-M6/72H 35mm frame (Black frame): GCL-P6/60, GCL-M6/60
Hansol	TD-AN3 (40mm), TD-AN4, UB-AN1 (35mm), UD-AN1 (40mm), UB-AN1, UD-AN1
Heliene	36M, 60M, 72M, 60P, and 72P.
HT Solar	HT60-156(M) (NDV) (-F), HT 72-156(M/P)
Hyundai	HI, KG, MG, TG, RI, RG, TI, MI, KI series (35mm and 40mm).
ITEK	iT-xxx, iT-xxx-HE, iT-xxx-SE, iT-xxx-SE-72 (40mm).
JA Solar	JAP6 60-xxx, JAM6-60-xxx/SI, JAM6(K)-60/xxx, JAP6(k)-72-xxx/4BB, JAP72SYY-xxx/ZZ, JAP6(k)-60-xxx/4BB, JAP60SYY-xxx/ZZ, JAM6(k)-72-xxx/ZZ, JAM72SYY-xxx/ZZ, JAM6(k)-60-xxx/ZZ, JAM60SYY-xxx/ZZ, JAM 72S09, JAM72S10, JAP72S10, JAM60S10, JAP60S10 i. YY: 01 white backsheet, 02 black backsheet, 03 half-cell and white backsheet, 09 M4 cell, 10 M4 1/2 cell ii. ZZ: SC standard cell, PR = perc, BP = bifacial, HiT = HIT, IB = IBC, MW = MWT
Japan Solar	JPS-xxxP-60 (35mm), JPS-xxxM-60 (35mm), JPS-xxxP-72 (40mm), JPS-xxxM-60-BB (35mm), JPS-xxxP-72-BB (40mm)
Jinko	JKM xxx P-60, JKM xxx PP-60, JKM xxx M-60, JKM xxx M-60B, JKMS xxx PP-60 JKMS xxx P-60, JKMSxxx-72, JKMxxxP-72, JKMSxxxP-72, JKMxxxM-72, JK07A (JKMSxxxPP-60 & JKMSxxxPP-72), JK07B (JKMSxxxPP-60), JKM xxx PP-60(Plus), JKM xxx PP-60B, JKM xxx M-60B, JKMSxxxM-60, JKMSxxxM-60-EP, JKM xxx P-72B, JKMxxxPP-72, JKMxxxPP-72B, JKMxxxPP-72(Plus), JKMSxxxPP-72, JKMxxxM-72-V, JKMxxxPP-72-V, JKMxxx-72L-V, JKMxxx-72HL-V, JKMxxxM-60L, JKMxxxM-60BL, JKMxxxM-60HL, JKMxxxM-72HL-V, JKMxxxM-72L-V
Hanwha Q-Cells	G3, L-G4 and L-G2, Q.PLUS G4 xxx, Q.PLUS BFR G4.1/TAA xxx, Q.PLUS BFR, G4.1/MAX xxx, Q.PLUS BFR G4.1 xxx, Q.PRO-G4 xxx, Q.PRO EC-G4.4 xxx, Q.PRO BFR G4 xxx, Q.PRO BFR G4.1 xxx, Q.PRO BFR G4.3 xxx, Q.PEAK-G4.1 xxx Q.PEAK- G4.1/MAX xxx, Q.PEAK BLK G4.1 xxx, Q.PEAK-G4.1/TAA xxx Q.PEAK BLK G4.1/TAA xxx, B.LINE PRO BFR G4.1 xxx, B.LINE PLUS BFR G4.1 xxx, B.LINE PRO BFR G4.1 xxx, Q.PEAK DUO-G5-xxx, Q.PEAK DUO-G5.X-xxx and Q.PEAK DUO BLK-G5-xxx Q.PEAK L G4.2, Q.PLUS L G4.2, Q.PLUS L G4.1 -35mm, Q.PLUS L G4 - 35mm, Q.PRO L G4 -35mm, Q.PRO L G4.1 - 35mm, Q.PRO L G4.2 - 35mm, B.LINE PLUS L G4.2 - 35mm, B.LINE PRO L G4.1 - 35mm, B.LINE PRO L G4.2 - 35mm, Q.PLUS L-G4.2/TAA -35mm, Q.PEAK DUO L-G5.2, Q.PEAK DUO L-G5.3 (380-395), Q.Peak Duo L-G6 xxx, Q.Peak Duo L-G6.2 xxx, Q.Peak Duo L-G6.3 xxx, Q.Peak Duo G6 xxx, Q.Peak Duo BLK-G6 xxx 32mm high frame profile: Q.PEAK DUO-G7, B.LINE PEAK DUO-G7, Q.PEAK DUO-G7.2, B.LINE PEAK DUO-G7.2, Q.PEAK DUO L-G7, Q.PEAK DUO L-G7.1, Q.PEAK DUO L-G7.2, Q.PEAK DUO L-G7.3, B.LINE PEAK DUO L-G7, B.LINE PEAK DUO L-G7.1, B.LINE PEAK DUO L-G7.2, B.LINE PEAK DUO L-G7.3, Q.PEAK DUO-G8, Q.PEAK DUO BLK-G8
Kyocera	KU26x-6MCA where x is 0 or 5.
LG	MONO X, MONO X 2, Mono X Plus, Mono Neon 2, Mono Neon 2 LG xxx S1C-L4, LG xxx N1C-G4 LG xxx S1C-A5, LG xxx N1C-A5, LGxxxQ1C(Q1K)-A5, LGxxxN1C(N1K)-A5, LGxxxS1C-A5, LGxxxA1C-A5, LGxxxN2T-A4, LGxxxN2T-A5, LGxxxN2W-A5 LGxxxS2W-A5, LGxxxE1C-A5, LGxxxN1C(N1K)-G4, LGxxxN2W-G4, LGxxxS2W-G4 LGxxxS1C-G4, LGxxxE1K-A5, LGxxxN1K-V5, LGxxxN1C-V5, LGxxxQ1C-V5, LGxxxN2W-V5
LONGi	LR6-60 (40mm), LR6-72 (40mm), LR6-60 HV (40mm), LR6-72 HV (40mm), LR6-60 PH (40mm), LR6-72 PH (40mm), LR6-60 PE (40mm), LR6-72 PE (45mm), LR6-60 BK (40mm Black frame), LR6-72 BK (40mm Black frame), LR6-60 PB (40mm Black frame), LR6-72 PB (45mm Black frame) Number in paranthesis signifies frame profile height.

Certified Module List for UL2703 Listing Program

Manufacturer	Model
Mission Solar	MSE series
Mitsubishi	MJE, MLE
NSP	D6M and D6P
Panasonic	VBHNxxxSA16/VBHNxxxSA16B, VBHNxxxSA15/VBHNxxxSA15B, VBHNxxxKA01, VBHN SA17/18/KA03/04, VBHNxxxSA17G, VBHNxxxSA17E/18E, VBHNxxxZA01, VBHNxxxZA02, VBHNxxxZA03, VBHNxxxZA04.
Peimar	SGXXXM (FB), SGXXXM (BF), SGXXXM
Phono Solar	PS-xxx-60, PS-xxx-72
Risen	RSM72-6 (MDG) (M), RSM60-6
REC Solar	PEAK Energy Series, PEAK Energy BLK2 Series, PEAK Energy 72 Series, TWINPEAK 2 SERIES TWINPEAK 2 BLK2 SERIES, TWINPEAK SERIES, alpha Series
Renesola	Virtus II with module ratings of 250-260 in increments of 5. 156 series with module ratings of 270-275.
S-Energy	SN3xxM-10/SN3xxP-10 (40mm), SNxxxM-10/SN2xxP-10 (40mm), SNxxxP-15 (40mm)
Seraphim	SEG-6PA-XXXWB (XXX=280 to 335), SEG-6PA-XXXBB (XXX=280 to 335), SEG-6PB-XXXWW (XXX=240 to 275), SEG-6PB-XXXWB (XXX=240 to 275), SEG-6PB-XXXBB (XXX=240 to 275), SEG-6MA-XXXWW (XXX=290 to 370), SEG-6MA-XXXWB (XXX=290 to 370), SEG-6MA-XXXBB (XXX=290 to 370), SEG-6MB-XXXWW (XXX=250 to 305) SEG-6MB-XXXWB (XXX=250 to 305), SEG-6MB-XXXBB (XXX=250 to 305) SEG-E01A-XXX (XXX=325 to 400), SEG-E01B-XXX (XXX=275 to 330) SEG-E11A-XXX(XXX=325 to 385), SEG-E11B-XXX(XXX=275 to 320) SRP-XXX-6QA-WX-XX (XXX=345 to 370) (XX=40 or 50 mm) (X=B or S for Black or Silver frame), SRP-XXX-6QA- BX-XX (XXX=345 to 370) (XX=40 or 50 mm) (X=B or S for Black or Silver frame), SRP-XXX-6QB-WX-XX (XXX=280 to 300) (XX=40 or 50 mm) (X=B or S for Black or Silver frame), SRP-XXX-6QB-BX-XX (XXX=280 to 300) (XX=40 or 50 mm) (X=B or S for Black or Silver frame)
Sharp	60 and 72 NUSA-xxx/NUSC-xxx
Silfab	SLA-M and SLG-M
SolarWorld	Sunmodule Protect, Sunmodule Plus
Solaria	PowerXT-xxxy-zz, PowerXT-xxxR-PD/BD, PowerXT-xxxR-AC, PowerXT-xxxC where: xxx is power in watts y is module size (R for residential, C for commercial), zz is other PowerXT-xxxy-zz all share the same rail profiles
Sonali	SS 230 - 265
SunEdison/ Flextronics	F-Series / FXS, R-Series / FXS
Suniva	MVX xxx-60, OPT xxx-60-4-100
Sunpower	E20-xxx-COM, X21-xxx, X22-360-C-AC. **Evaluated with both the G3 and G5 frame** SPR-P17-xxx-COM (xxx: module power rating)
SunSpark	40mm high frame profile: Mono module 60P (xxxW), Mono Module 72P (xxxW)
Suntech	STP 35/40
Talesun	TP572, TP596, TP654, TP660 (35mm/40mm), TP672, Hipor M350+ (40mm) Talesun Smart (35mm) M = Mono, P = Poly, B = Black, T = Transparent (H) = 1500V, without (H) is 1000V
Tesla/ZEP/SolarCity	SCxxx, SCxxxB, SCxxxB1, SCxxxB2
Trina Solar	TSM-xxx PA05.08, TSM-xxx PD05.10, TSM-xxx PD05.08, TSM-xxx DD05.08 TSM-xxx DD05A.05(II), TSM-xxx DD05A.05(II), TSM-DD14/PE14/PD14, TSM- DE14
Upsolar	UP-MxxxP, UP-MxxxP-B, UP-MxxxM, UP-MxxxM-B
URE	D7MxxxH8A, D7KxxxH8A, D7MxxxH7A
Vikram	Eldora Grand Ultima, Eldora Grand, Eldora Prime, Eldora Ultima, Solivo, Somera Grand, Ultima, Somera Grand, Somera Half (VSMH.72), Somera Prime, Somera Ultima
Yingli	YL xxx P-29b, YLM 60, YLM 72, YGE, YGE-VG, YLM, YL xxx P-35b, YL xxx D-30b, YL xxx D-36b
Waaree	AC, Adiya 60/72 Mono/Poly Black, Adiya 60/72 Multi
Winaico	WST (35mm), WSP (40mm)

Certified Power Optimizer List for UL2703 Listing Program

Manufacturer	Model Numbers
SolarEdge	P400J, P600, P700, P730, P800p, P800s
Enphase	M250-72, 250-60, M215-60, C250-72, S230, S280, IQ 6, IQ 6+, IQ 7, IQ 7+, IQ 7X, Q Aggregator