

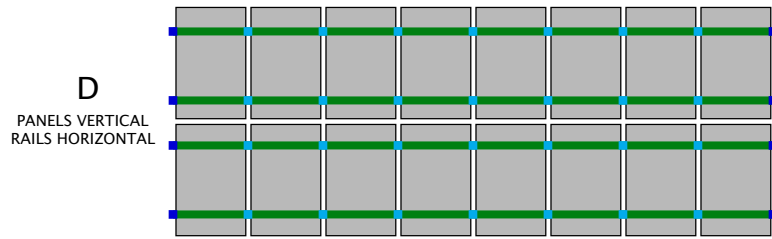


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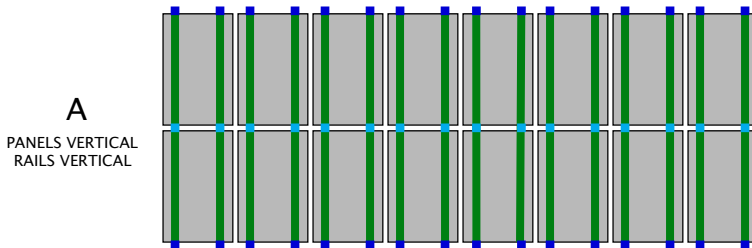
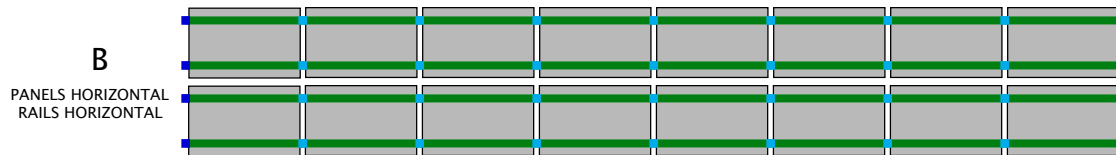
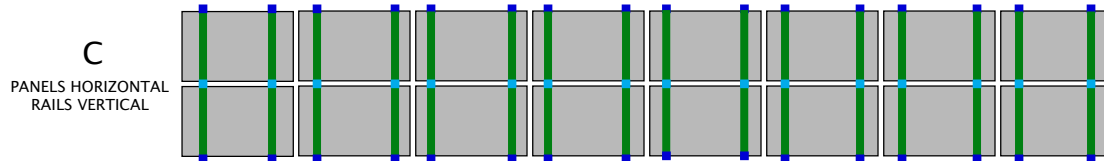
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# RACKING LAYOUT OPTIONS

MID CLAMP   
 END CLAMP   
 RAIL 



UNLESS OTHERWISE NOTED ON YOUR QUOTE, THIS IS THE CONFIGURATION THAT YOUR RACKING HAS BEEN DESIGNED FOR.



RAIL RUNS THAT ARE PARALLEL TO PV MODULES (OPTIONS A & B) MAY VOID PV MODULE WARRANTY. CALL WHOLESALE SOLAR FOR DETAILS.

MODULE MOUNTING RAILS SHOULD CROSS THE LONG SIDE OF THE MODULES WITHIN 2" EITHER SIDE OF THE MANUFACTURER'S PRE-DRILLED MOUNTING HOLES. WITH RAILS, THE MOUNTING HOLES ARE NOT USED BUT DO GIVE THE PROPER LOCATION RECOMMENDED BY THE MANUFACTURERS TO SUPPORT SNOW AND WIND LOADING. THESE HOLES CAN BE SEEN ON THE BACK LONG SIDES OF THE MODULE BETWEEN 7 TO 11 INCHES FROM THE ENDS OF THE MODULE DEPENDING ON THE MODEL.

CLAMPS ATTACH MODULES TO RAILS WITHOUT USING MODULE MOUNTING HOLES

END CLAMPS



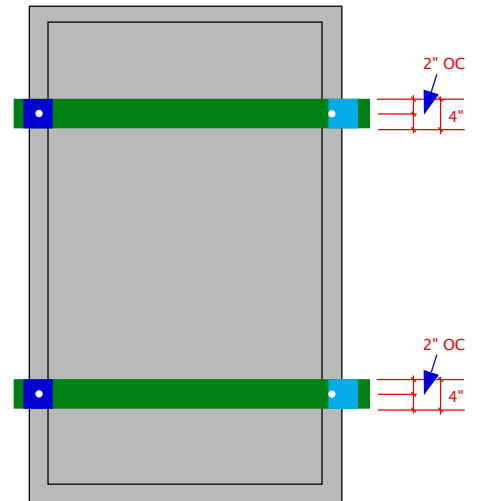
IRONRIDGE

MID CLAMPS



IRONRIDGE

## OPTIONS D & C



WHOLESALE SOLAR  
[www.wholesalesolar.com](http://www.wholesalesolar.com)  
 1-800-472-1142

## MODULE GROUNDING

**MODULE FRAMES MUST BE GROUNDED (EGC) VIA UL APPROVED WEEB CLIPS OR UL APPROVED LAY-IN LUGS.**



**WEEB CLIPS** - "LEGS" IN RAIL GROOVES, ONE PER MODULE FOR MODULE OR MICRO INVERTER GROUNDING (EGC)



DMC (IRONRIDGE)  
6400014



4-LEG 9.5  
6949504



NO-LEG 9.5NL  
2 PER MODULE FOR  
GROUND OR POLE MOUNTS  
6949504

**LAY-IN LUGS** - ONE ONLY AT ONE END OF RAIL LENGTH OR ONE PER MODULE FOR ELECTRICAL GROUNDING (GEC) [N/A FOR ENPHASE]



IRONRIDGE LUG  
W/WEEB CLIP  
6910554  
6400024



MODULE LUG  
9934145

## WIRE MANAGEMENT CLIPS

(2-3 CLIPS PER MODULE)

**RACKING INSTALLATIONS WITHOUT WIRE MANAGEMENT CLIPS MAY LEAVE PV WIRE LOOSE AND IN CONTACT WITH ROOF OR OTHER SURFACES. OVER TIME THE EXTERIOR WIRE INSULATION MAY BE WORN AWAY FROM RUBBING AGAINST SURFACES, EXPOSING LIVE WIRE, THUS BECOMING AN ELECTROCUTION OR FIRE RISK.**

### RAIL CLIPS



ENPHASE  
7500011

### MODULE CLIP



.005 - .125 INCH  
MODULE EDGE  
7500013

### RAIL CLIPS FOR IRONRIDGE XRS/XRL



ENPHASE  
2977175



IRONRIDGE  
6400077

### RAIL L-FEET



IRONRIDGE  
6410004

### RAIL GROUND BONDING JUMPER



IRONRIDGE  
6400343

### RAIL INTERNAL SPLICE CONNECTORS



IRONRIDGE XRS  
6400104



IRONRIDGE XRL  
6500002

## ROOF ATTACHMENT

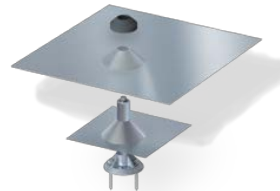
**QUICK MOUNT QMSE - 6963152**



**QUICK MOUNT COMPOSITION FLASHING KIT - 6963150**



**QUICK MOUNT UNIVERSAL TILE FLASHING KIT - 6963287**



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www.wholesalesolar.com  
1-800-472-1142

# Roof Mounting System

**2013 Edition** v1.42

This **Engineering Design Guide** was created to help our engineering partners more easily design and specify PV roof mount applications using IronRidge components. In addition to this document, IronRidge provides a complete system of technical support including installation guides, pre-stamped certification letters for most PV-friendly states, our online Design Assistant software, and live, knowledgeable person-to-person customer service.

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## Introduction

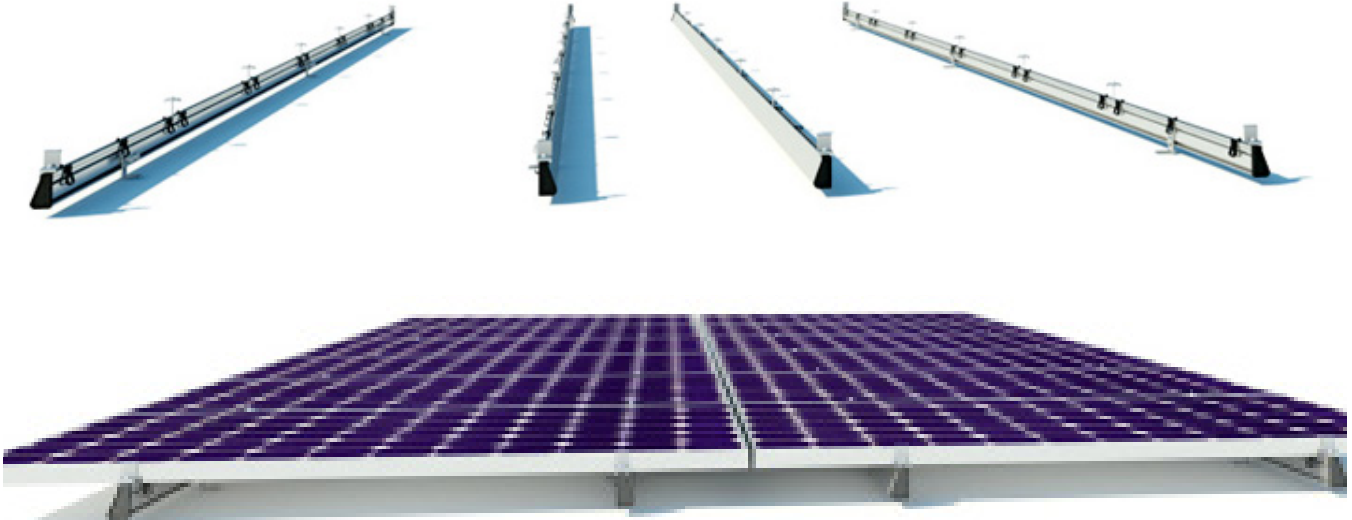
IronRidge provides a comprehensive platform for designing a wide variety of photovoltaic systems for roof mounting applications. Due to its modular architecture, it can handle nearly all commercially available PV modules and layout designs. The IronRidge Roof Mount components are engineered and certified to work with best-in-class 3rd party flashing and roof connecting solutions including Quick Mount PV, Ecofasten, and S5! IronRidge products are engineered to last in the most extreme weather conditions and have been installed in every continent in the world.

## Technical Specifications

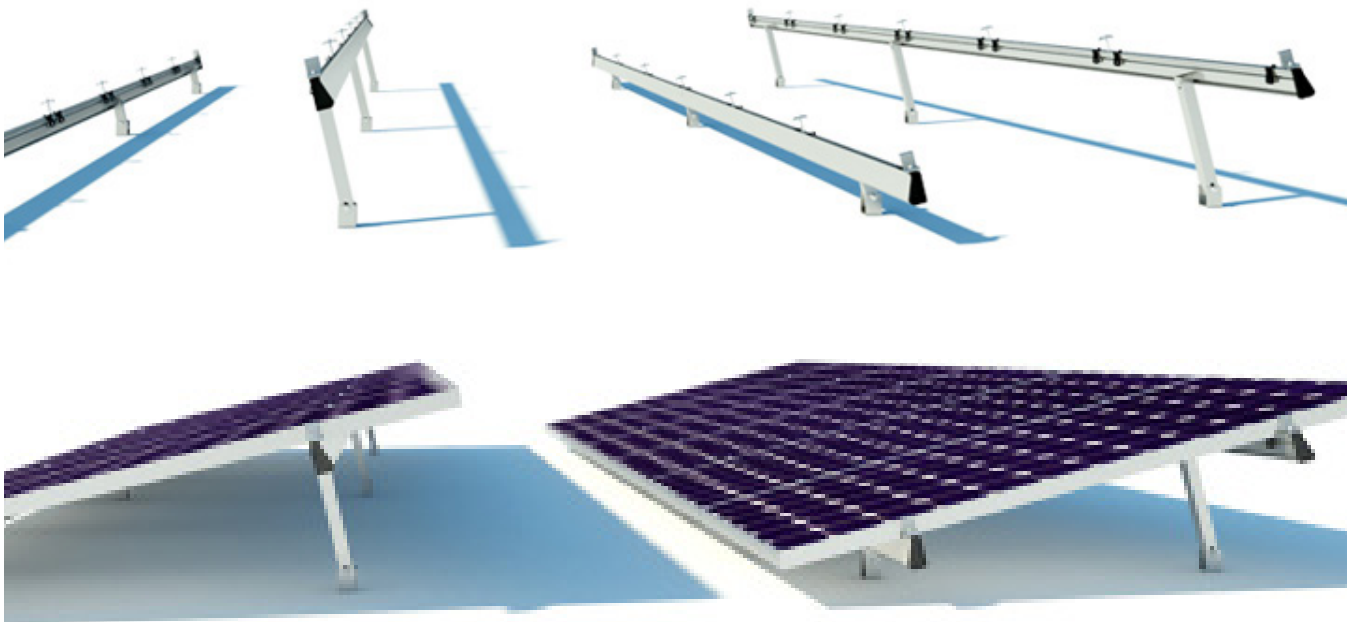
Below is a brief summary of the technical specifications of the IronRidge Roof Mount platform. More detail will be provided in the following pages. If there is additional information you require that is not listed in this Engineering Design Guide, please do not hesitate to contact us at [support@ironridge.com](mailto:support@ironridge.com).

<b>Allowable Roof Slope</b>	0 to 45 Degrees	<b>Warranty</b>	20 Yr Mfg, 10 Yr Structural
<b>Span Lengths</b>	Up to 12'	<b>Tilt Legs</b>	Yes (10" to 40")
<b>Rail Lengths</b>	Standard & Custom	<b>Adjustable Tilt Legs</b>	Up to 45 Degrees
<b>Rail Finish</b>	Mill, Black	<b>Adjustable L Feet</b>	1-3/8" vertical adjustability
<b>Building Height</b>	Certified to 60'	<b>Splices</b>	Patent-pending internal
<b>Max Wind Speed</b>	150 Mph	<b>Stand-offs</b>	Yes (3", 4", 6", 7")
<b>Module Orientation</b>	Landscape & Portrait	<b>Tilt Stand-offs</b>	Yes (3.75", 6", 9")
<b>Wind Exposure</b>	Category B, C & D	<b>Flashing</b>	Quick Mount Compatible
<b>Cantilever</b>	40% of Adjacent Span	<b>T-bolts</b>	Multiple Sizes
<b>Max Ground Snow Load</b>	90 psf	<b>Wire Clips</b>	Black Polycarbonate
<b>Component Materials</b>	Aluminum	<b>End Caps</b>	Black Polycarbonate
<b>Hardware</b>	Stainless Steel Fasteners	<b>Engineering Support</b>	Yes (P.E. Certified)

## Assembled Views

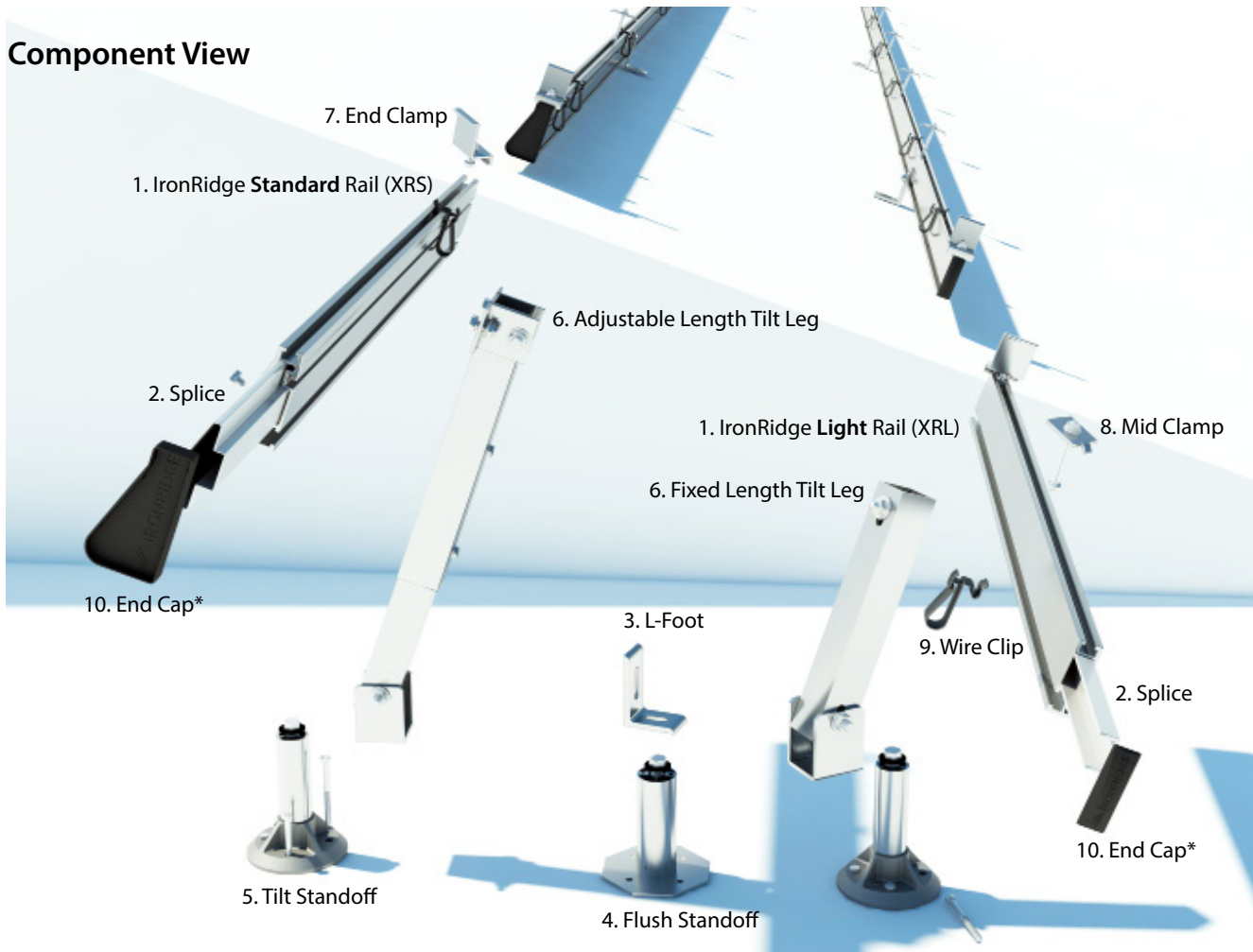


## Flush Mounted



## Tilt Mounted

For a complete 360 degree interactive roof mounting viewing environment, go to: [ironridge.com/products/roofmounting/360view](http://ironridge.com/products/roofmounting/360view).

**Component View**


For a complete 360 degree interactive viewing environment, go to: [ironridge.com/products/roofmounting/360view](http://ironridge.com/products/roofmounting/360view).

**1. Rail:** Supports the PV modules. Use two rails for each row of modules. Available as Standard Rail or Light Rail, depending on project requirements. Multiple lengths available depending on configuration.

**2. Splice:** Joins and aligns rail sections into single, continuous length of rail. A splice can be used either as a rigid, structural connection or as a thermal expansion joint.

**3. L-foot:** Secures the rail directly to the building structure either through roofing material or in conjunction with standoffs. Provides adjustability for roof irregularities with vertical slot.

**4. Flush Standoff:** Flat top two-piece aluminum standoff secures the rail system directly to the building rafter for flush mount applications. Ships pre-assembled.

**5. Tilt Standoff:** Aluminum standoff secures the rail system directly to the building rafter for tilt applications.

**6. Tilt Legs:** Extruded aluminum tubes that attach directly to both Standard and Light rails providing height necessary to cover most tilt angles. Fixed and adjustable length legs available in multiple sizes.

**7. End Clamp:** Secures the PV module to the rail. Use four clamps for each row of modules, one on the end of each rail. Multiple sizes available depending on thickness of PV module.

**8. Mid Clamp:** Secures PV modules to the rail when there are multiple modules in a row. The mid clamp fits between two adjacent modules, providing clamping pressure to both simultaneously.

**9. Wire Clip:** Fits into top slot of rails and accommodate up to ten (10) 5mm wires, or one MC4, one Enphase wire, and one dual Enphase wire. Molded from black polycarbonate with UV protection.

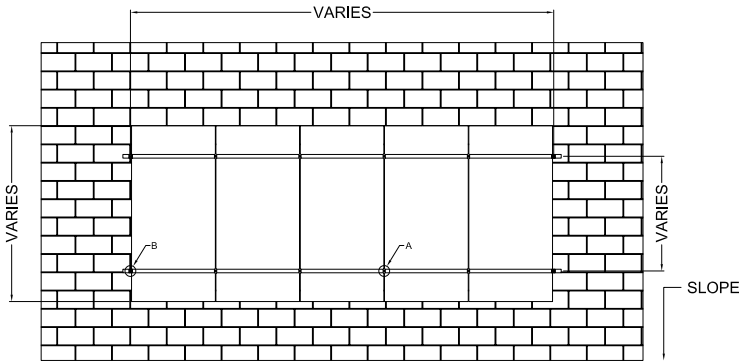
**10. End Cap:** Provides a finished look to the PV system while protecting against the collection of water and debris inside the rails.

\*All Rail Assembly components fit both Standard and Light rails except for the (rail) End Caps. Details for each component begin on the next page.

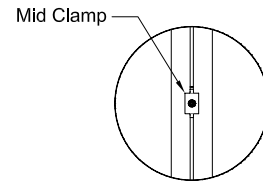


Assembly CAD Details

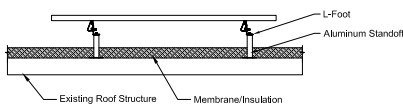
[Download AutoCAD File](#) | [Download PDF](#)



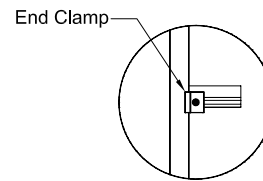
Typical Flush Mount Array - Plan View  
1/2" = 1' -0"



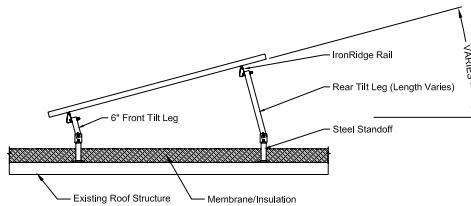
Detail A - Mid Clamp to XRS Rail - Plan  
3" = 1' -0"



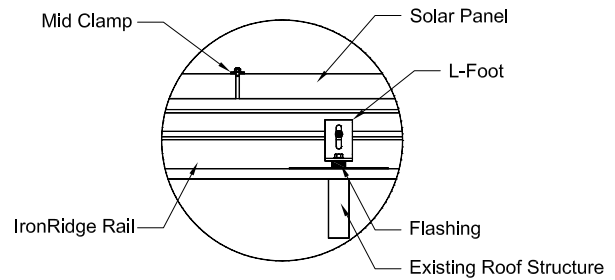
Section - Flush Mount - Flat Roof  
3/4" = 1' -0"



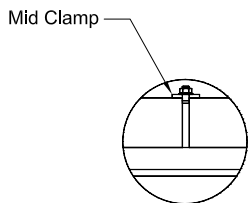
Detail B - End Clamp to Rail - Plan  
3" = 1' -0"



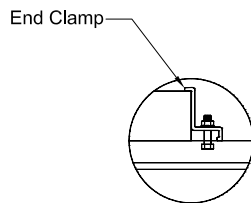
Section - Tilt Mount - Flat Roof  
3/4" = 1' -0"



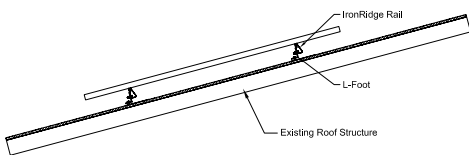
Detail C - Typical Roof Connection  
3" = 1' -0"



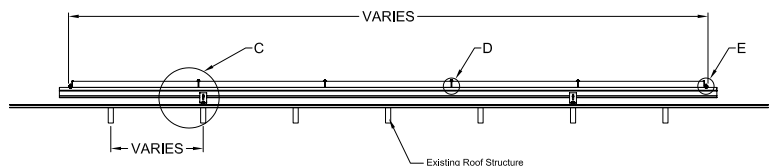
Detail D - Mid Clamp to Rail - Elevation  
6" = 1' -0"



Detail E - End Clamp to Rail - Elev.  
6" = 1' -0"



Section - Flush Mount - Sloped Roof  
3/4" = 1' -0"



Typical Flush Mount Array - Elevation  
3/4" = 1' -0"

## Standard Rail

The IronRidge Standard Rail is a high performance rail that spans over twelve feet under typical load conditions. This rail has slots for both top and bottom PV module mounting and is manufactured using extruded aluminum alloys.



Property	Value
Material	6000 Series Aluminum
Finish	Clear & Black Anodized
Beam Height	3.00"
Weight / Linear Foot	.945 Lbs
Total Cross-Sectional Area	.807 In <sup>2</sup>
Section Modulus (X-axis)	.530 In <sup>3</sup>
Moment of Inertia (X-axis)	.843 In <sup>4</sup>
Moment of Inertia (Y-axis)	.182 In <sup>4</sup>
Torsional Constant	.436 In <sup>3</sup>
Polar Moment of Inertia	0.3299 In <sup>4</sup>

## Light Rail

The IronRidge Light Rail is a super-light, highly cost-effective rail that spans over six feet under typical load conditions. This rail has a top slot for easy top mounting and is manufactured using extruded aluminum alloys.



Property	Value
Material	6000 Series Aluminum
Finish	Clear Anodized
Beam Height	2.055"
Weight / Linear Foot	.561 Lbs
Total Cross-Sectional Area	.456 In <sup>2</sup>
Section Modulus (X-axis)	.192 In <sup>3</sup>
Moment of Inertia (X-axis)	.197 In <sup>4</sup>
Moment of Inertia (Y-axis)	.031 In <sup>4</sup>
Torsional Constant	.100 In <sup>3</sup>
Polar Moment of Inertia	.039 In <sup>4</sup>

## Internal Splice

IronRidge Rails are easy to extend with our patent-pending Internal Splices. The Internal Splice does not interfere with clamping or attachment mounting, and offers a near seamless appearance. The IronRidge Splices come standard with all mounting hardware.



Property	Value
Material	6000 Series Aluminum
Finish	Mill
Standard Rail Splice Length	12"
Light Rail Splice Length	6"
Hardware	2 SS Self-tapping Screws

## End Clamp

IronRidge End Clamps secure PV modules to both Standard and Light Rails using the top slot of these rails. Our Clamps are independent upon the module's mounting holes.



Property	Value
Material	5000 Series Aluminum
Finish	Mill & Black
Height	Varies depending on Module
Width	1.5"
Depth	1.5"
Weight	0.2 Lbs
Hardware	1/4"-20 SS Nut and Bolt

## Mid Clamp

IronRidge Mid Clamps secure PV modules to the rail when there are multiple modules in a row. The mid clamp fits between two adjacent modules, providing clamping pressure to both modules simultaneously. The Mid Clamps are not dependent upon the PV module's mounting holes and fit to the top slots of either our Standard or Light Rails.



Property	Value
Material	5000 Series Aluminum
Finish	Mill & Black
Spacing between Modules	1/4"
Width	1"
Depth	1.5"
Weight	0.2 Lbs
Hardware	1/4"-20 SS Nut and Bolt

## Grounding Mid Clamp

Grounding Mid Clamps are used when top-mounting modules to the top slot of either our Standard (XRS) and/or our Light (XRL) Rails (fits both). Each Grounding Mid Clamp pierces through the anodized coatings of both the module frame and the mounting rail to form secure electrical bonds, which are repeated throughout the array. These clamps are not dependent upon the module's mounting holes. These Mid Clamps may be ordered with T-bolts. Mid Clamps require .25" between modules thus maximizing the total number of modules per set of rails. Available in clear or black finish. Ground Mid Clamps are ETL listed and conforms to UL 2703 for use with IronRidge Rails with Integrated Grounding.



Property	Value
Material	304 Stainless Steel
Finish	Mill & Black
Spacing between Modules	1/4"
Width	1"
Depth	1.2"
Weight	0.3 Lbs
Hardware	1/4"-20 SS Nut and Bolt

## Under Clamp

IronRidge Under Clamps secure PV modules to the Standard Rail using the mounting holes of the PV module and the side slot of the Standard Rail.



Property	Value
Material	5000 Series Aluminum
Finish	Mill
Spacing between Modules	¼"
Width	1.6"
Depth	1.5"
Weight	0.05 Lbs
Hardware	¼"-20 SS Nut and Bolt

## Adjustable L-Foot

Our adjustable L-feet are engineered for most roof mounting applications. Vertical slots provide adjustability to account for roof irregularities. Our L-feet are compatible with Quick Mount PV, Ecofasten, and many other roofing products. This product works with both Standard and Light Rails.



Property	Value
Material	6000 Series Aluminum
Finish	Mill & Black
Height	3"
Width	2"
Depth	2"
Length of Vertical Slot	1.375"
Weight	0.16 Lbs
Hardware	3/8" SS

## Flush Mount Standoff

Our Flush Mount Aluminum Standoffs are sized to integrate easily with Oatey Flashings. IronRidge Flush Mount Standoffs are available in four lengths ranging from 3" to 7". They ship pre-assembled, and include L-Foot mounting hardware. Lag bolts not included.



Property	Value
Material (Post)	6000 Series Aluminum
Material (Base)	5000 Series Aluminum
Finish	Mill
Heights	3", 4", 6", 7"
Post Diameter	1.5"
Depth	4"
Weight	0.84 Lbs
Hardware	5/16", ¼" SS

## Tilt Mount Standoff

Our Tilt Mount Aluminum Standoffs are sized to integrate easily with Oatey Flashings. IronRidge Tilt Mount Standoffs are available in four lengths ranging from 3" to 7". They ship pre-assembled, and include L-Foot Mounting hardware. Lag bolts included.



Property	Value
Material (Post)	6000 Series Aluminum
Material (Base)	A360 (Cast AL)
Finish	Mill
Heights	3.75", 6", 9"
Post Diameter	1.25"
Base Diameter	4"
Weight	0.85 Lbs
Hardware	5/16" SS

## Fixed Tilt Length Leg

Our Fixed Tilt Legs attach directly to IronRidge Standard and Light Rails. This simple design provides adjustability in all 3 axes, and a variety of lengths cover most angles. Each Tilt Leg Kit comes with the shorter front leg, the longer rear leg, mounting brackets and hardware.



Property	Value
Material (Legs)	6000 Series Aluminum
Material (Brackets)	5000 Series Aluminum
Finish	Mill
Length (Short Leg)	6"
Length (Long Legs)	10", 15", 20", 25", 30", 40"
Leg Diameter	1.5" Square Tube
Tube Weight / Linear Foot	0.80 Lbs
Height (Brackets)	2.6"
Width (Brackets)	1.85"
Depth (Brackets)	2"
Hardware	3/8" SS

## Wire Clips

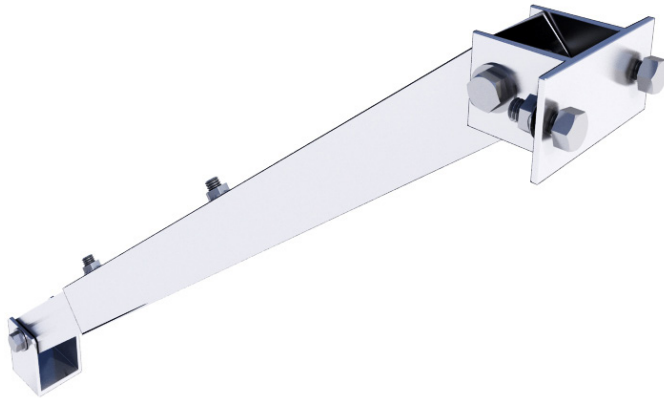
IronRidge Wire Clips fit our Standard (XRS) and Light (XRL) Rails, and accommodate up to ten 5mm panel wires, or one MC4, one Enphase wire and one dual Enphase wire. The Wire Clips are molded from black polycarbonate with UV protection.



Property	Value
Material	Polycarbonate
Color	Black
UV Protection	Yes
Weight	0.01 Lbs

## Adjustable Tilt Length Leg

As with our Fixed Tilt Legs, the Adjustable Tilt Legs attach directly to the IronRidge Standard and the Light Rails. Each Tilt Leg Assembly kit comes with the shorter fixed front leg, the longer adjustable rear leg, and all the necessary hardware.



Property	Value
Material (Legs)	6000 Series Aluminum
Material (Brackets)	5000 Series Aluminum
Finish	Mill
Length (Short Leg)	6"
16" Range (Long Leg)	18" – 22"
28" Range (Long Leg)	30" – 46"
56" Range (Long Leg)	58" – 94"
Outer Tube Diameter	1.8" Square Tube
Inner Tube Diameter	1.5" Square Tube
Upper Bracket	2.2"x4.25"x2"
Lower Bracket	2.6"x1.85"x2"
Hardware	3/8" SS

## Grounding Strap

Grounding Straps are used to bond rail-to-rail connections. They are only required on the rail with the grounding lug. Grounding Strap Expansion Joint also available.



Property	Value
Material	Tin-plated Copper Flat Braid
Weight	0.054 Lbs
Wire Gauge	9 AWG

## End Caps

Available for both Standard (XRS) and Light (XRL) Rails, end caps provide a finished look while protecting against the collection of water and debris inside the rail. End caps are molded from black polycarbonate with UV protection.



Property	Value
Material	Polycarbonate
Color	Black
UV Protection	Yes
Weight	0.01 Lbs (XRL), 0.02 Lbs (XRS)

## Grounding Lug

Manufactured from high strength copper alloy with stainless steel screw, UL listed and CSA certified.



Property	Value
Material	Tin-plated Copper
Weight	0.154 Lbs
Conductor Size	4-14 AWG
Listing	UL 467 Compliant
Hardware	#10 SS

## Third-Party Grounding Components

Wiley grounding clips (WEEB DMC) are used in conjunction with the IronRidge Mid Clamps for grounding PV modules to the Standard or Light rails. Order one grounding clip for every two Mid Clamps used.



Property	Value
Material	304 Stainless Steel
ETL Listed	ANSI/UL 467 Compliant
Maximum Conductor Size	6 AWG (with two WEEBs contacting each module)
Hardware	None

Wiley grounding lugs are used in conjunction with copper wire to provide a continuous ground for every row of rails.



Property	Value
WEEB Material	304 Stainless Steel
Lug Material	Tin-plated Copper
ETL Listed	ANSI/UL 467 Compliant
Ground Conductor	One 14 AWG to 6 AWG or two 10 AWG, two 12 AWG
Hardware	1/4"-20 & 1/4"-28 SS

Wiley bonding jumpers are used to provide a continuous ground between spliced rail sections. Order one bonding jumper for every splice.



Property	Value
WEEB Material	304 Stainless Steel
Braid Material	Tin-plated Copper
ETL Listed	ANSI/UL 467 Compliant
Hardware	1/4"-20 SS

## Summary

With the IronRidge Design Assistant™ our customers move from laboriously designing systems across the span of weeks, to intuitively designing while pricing, a bill of materials and engineering calculations all updates in real-time.

If you choose to register for an online account, you will then be able to save your work and prevent losing your project's configuration settings.

The application is so quick and easy to use, multiple what-if scenarios can be evaluated through immediate engineering and pricing feedback. Engineered calculations comply with ASCE 7-05 building codes for expedited P.E. approval.

The IronRidge Design Assistant™ is provided free of charge to IronRidge customers.

## Design, engineer and quote, online, in just minutes.

[ironridge.com/support/designassistant](http://ironridge.com/support/designassistant)





## Code Compliance

IronRidge Roof Mount components, when installed in accordance with the IronRidge Standard Rail Installation Manual and the IronRidge Light Rail Installation Manual, will be structurally adequate and will meet the structural requirements of:

- ASCE/SEI 7-05 Minimum Design Loads for Buildings & Other Structures
- California Building Code, 2007 & 2010 Editions
- AC428, Acceptance Criteria for Modular Framing Systems Used to Support PV Modules, effective 3/1/2011 y ICC-ES
- Aluminum Design Manual, 2005 Edition
- ASCE/SEI 7-10 Minimum Design Loads for Building & Other Structures
- Florida Building Code 2010 Edition
- Florida Residential Building Code 2010 Edition
- International Building Code 2012 Edition
- International Residential Building Code 2012 Edition

### **IronRidge Rails with Integrated Grounding conforms to:**

- UL Subject 2703 Outline of Investigation for Rack Mounting Systems and Clamping Devices for Flat-Plate Photovoltaic Modules and Panels
- ETL Listed requirements and certification

## Thermal Expansion (Expansion Joints)

For continuous rows of panels exceeding 50 feet in length, the use of Expansion Joints is required to allow for thermal expansion and reduce the risk of buckling. To create a thermal expansion joint, secure the IronRidge Internal Splice into one of the rails with attachment hardware. Then slide the other rail over the splice bar, and leave the splice bar secured on one side only. Leave a 1/2" gap between the ends of the rails to allow for thermal expansion. The Internal Splice bar does not interfere with clamping or attachment mounting.

## Engineering Assumptions

The procedures for calculating the engineering values in Tables 1-4 are based on the following assumptions:

1. The building height is 30 feet
2. The building must be enclosed, not an open or partially enclosed structure like a carport
3. The building has a flat or gable roof with a pitch between 7 and 27 degrees
4. The long dimension of the solar module is 67.5 inches
5. There are 2 inches of clearance between the roof and the bottom of the rail
6. There are no rail splices in the end spans or middle 1/3 of interior spans
7. Calculated spans assume single simple spans; tabulated values may be increased for multiple continuous spans

For conditions outside these assumptions, please use the IronRidge Design Assistant or contact IronRidge customer service.

**Maximum Allowable Spans for Standard Rail (Flush)**

Exposure Category	Roof Zone	Wind mph	Snow 0 psf	Snow 10 psf	Snow 20 psf	Snow 30 psf	Snow 40 psf	Snow 50 psf	Snow 60 psf	Snow 70 psf	
B	1	85	147	123	103	94	83	75	69	64	
		90	147	123	103	94	83	75	69	64	
		100	147	123	103	94	83	75	69	64	
		110	147	123	103	94	83	75	69	64	
		120	147	123	103	94	83	75	69	64	
		130	138	123	103	94	83	75	69	64	
		140	129	120	101	94	83	75	69	64	
	150	120	117	99	93	83	75	69	64		
	2	85	137	123	103	94	83	75	69	64	
		90	130	123	103	94	83	75	69	64	
		100	118	118	103	94	83	75	69	64	
		110	114	114	103	94	83	75	69	64	
		120	105	105	103	94	83	75	69	64	
		130	97	97	97	94	83	75	69	64	
		140	91	91	91	91	83	75	69	64	
	150	85	85	85	85	83	75	69	64		
	3	85	112	112	103	94	83	75	69	64	
		90	106	106	103	94	83	75	69	64	
		100	96	96	96	94	83	75	69	64	
		110	93	93	93	93	83	75	69	64	
		120	86	86	86	86	83	75	69	64	
		130	79	79	79	79	79	75	69	64	
		140	74	74	74	74	74	74	69	64	
	150	69	69	69	69	69	69	69	64		
	C	1	85	147	123	103	94	83	75	69	64
			90	147	123	103	94	83	75	69	64
			100	143	123	103	94	83	75	69	64
110			138	123	103	94	83	75	69	64	
120			127	119	101	94	83	75	69	64	
130			117	115	99	92	83	75	69	64	
140			109	109	96	90	82	75	69	64	
150		102	102	94	88	81	75	69	64		
2		85	117	117	103	94	83	75	69	64	
		90	111	111	103	94	83	75	69	64	
		100	100	100	100	94	83	75	69	64	
		110	97	97	97	94	83	75	69	64	
		120	89	89	89	89	83	75	69	64	
		130	83	83	83	83	83	75	69	64	
		140	77	77	77	77	77	75	69	64	
150		72	72	72	72	72	72	69	64		
3		85	96	96	96	94	83	75	69	64	
		90	91	91	91	91	83	75	69	64	
		100	82	82	82	82	82	75	69	64	
		110	79	79	79	79	79	75	69	64	
		120	73	73	73	73	73	73	69	64	
		130	68	68	68	68	68	68	68	64	
		140	63	63	63	63	63	63	63	63	
		150	59	59	59	59	59	59	59	59	

**Maximum Allowable Spans for Standard Rail (Tilt 5-27°)**

Exposure Category	Roof Zone	Wind mph	Snow 0 psf	Snow 10 psf	Snow 20 psf	Snow 30 psf	Snow 40 psf	Snow 50 psf	Snow 60 psf	Snow 70 psf
B	1	85	122	110	96	90	82	76	70	65
		90	117	107	94	88	81	76	70	65
		100	108	102	90	85	79	74	69	65
		110	105	100	89	84	78	73	69	65
		120	98	95	85	81	75	71	67	64
		130	91	91	82	78	73	69	65	62
		140	86	86	79	75	71	67	64	61
	150	80	80	76	73	68	65	62	59	
	2	85	122	110	96	90	82	76	70	65
		90	116	107	94	88	81	76	70	65
		100	105	102	90	85	79	74	69	65
		110	102	100	89	84	78	73	69	65
		120	94	94	85	81	75	71	67	64
		130	87	87	82	78	73	69	65	62
		140	81	81	79	75	71	67	64	61
150	76	76	76	73	68	65	62	59		
3	85	100	100	96	90	82	76	70	65	
	90	95	95	94	88	81	76	70	65	
	100	86	86	86	85	79	74	69	65	
	110	83	83	83	83	78	73	69	65	
	120	76	76	76	76	75	71	67	64	
	130	71	71	71	71	71	69	65	62	
	140	66	66	66	66	66	66	64	61	
150	62	62	62	62	62	62	62	59		
C	1	85	107	102	90	85	79	73	69	65
		90	102	98	87	83	77	72	68	65
		100	94	92	83	79	74	70	66	63
		110	91	90	82	78	73	69	65	62
		120	85	85	78	75	70	66	63	60
		130	79	79	74	72	68	64	61	59
		140	74	74	71	69	65	62	59	57
	150	69	69	68	66	63	60	57	55	
	2	85	104	102	90	85	79	73	69	65
		90	99	98	87	83	77	72	68	65
		100	90	90	83	79	74	70	66	63
		110	87	87	82	78	73	69	65	62
		120	80	80	78	75	70	66	63	60
		130	74	74	74	72	68	64	61	59
		140	69	69	69	69	65	62	59	57
	150	64	64	64	64	63	60	57	55	
	3	85	85	85	85	85	79	73	69	65
		90	81	81	81	81	77	72	68	65
		100	73	73	73	73	73	70	66	63
		110	71	71	71	71	71	69	65	62
		120	65	65	65	65	65	65	63	60
130		60	60	60	60	60	60	60	59	
140		56	56	56	56	56	56	56	56	
150	52	52	52	52	52	52	52	52		

**Maximum Allowable Spans for Standard Rail (Tilt 28-45°)**

Exposure Category	Roof Zone	Wind mph	Snow 0 psf	Snow 10 psf	Snow 20 psf	Snow 30 psf	Snow 40 psf	Snow 50 psf	Snow 60 psf	Snow 70 psf
B	1-3	85	111	108	95	90	83	77	72	67
		90	107	105	93	88	81	76	72	67
		100	99	99	89	84	78	74	70	66
		110	96	96	87	83	77	73	69	66
		120	90	90	83	80	75	71	67	64
		130	83	83	80	77	72	68	65	62
		140	78	78	77	74	70	66	63	61
		150	73	73	73	71	67	64	61	59
C	1-3	85	98	98	88	84	78	74	70	66
		90	94	94	86	82	77	72	68	65
		100	86	86	81	78	73	69	66	63
		110	83	83	80	77	72	68	65	62
		120	77	77	76	73	69	66	63	60
		130	71	71	71	70	66	63	61	58
		140	67	67	67	67	64	61	59	57
		150	62	62	62	62	61	59	57	55

**Maximum Allowable Spans for Light Rail (Flush)**

Exposure Category	Roof Zone	Wind mph	Snow 0 psf	Snow 10 psf	Snow 20 psf	Snow 30 psf	Snow 40 psf	Snow 50 psf	Snow 60 psf	Snow 70 psf
B	1	85	88	75	63	59	52	47	43	40
		90	88	75	63	59	52	47	43	40
		100	88	75	63	59	52	47	43	40
		110	88	75	63	59	52	47	43	40
		120	88	75	63	59	52	47	43	40
		130	81	75	63	59	52	47	43	40
		140	75	73	62	58	52	47	43	40
	150	70	70	61	57	52	47	43	40	
	2	85	85	75	63	59	52	47	43	40
		90	80	75	63	59	52	47	43	40
		100	72	72	63	59	52	47	43	40
		110	70	70	63	59	52	47	43	40
		120	64	64	63	59	52	47	43	40
		130	59	59	59	59	52	47	43	40
		140	54	54	54	54	52	47	43	40
	150	51	51	51	51	51	47	43	40	
	3	85	68	68	63	59	52	47	43	40
		90	65	65	63	59	52	47	43	40
		100	58	58	58	58	52	47	43	40
		110	56	56	56	56	52	47	43	40
		120	51	51	51	51	51	47	43	40
130		47	47	47	47	47	47	43	40	
140		44	44	44	44	44	44	43	40	
150	41	41	41	41	41	41	41	40		
C	1	85	88	75	63	59	52	47	43	40
		90	88	75	63	59	52	47	43	40
		100	84	75	63	59	52	47	43	40
		110	81	75	63	59	52	47	43	40
		120	74	73	62	58	52	47	43	40
		130	68	68	60	56	51	47	43	40
		140	63	63	59	55	50	47	43	40
	150	59	59	57	54	49	46	43	40	
	2	85	72	72	63	59	52	47	43	40
		90	68	68	63	59	52	47	43	40
		100	61	61	61	59	52	47	43	40
		110	59	59	59	59	52	47	43	40
		120	54	54	54	54	52	47	43	40
		130	49	49	49	49	49	47	43	40
		140	46	46	46	46	46	46	43	40
	150	43	43	43	43	43	43	43	40	
	3	85	58	58	58	58	52	47	43	40
		90	54	54	54	54	52	47	43	40
		100	49	49	49	49	49	47	43	40
		110	47	47	47	47	47	47	43	40
		120	43	43	43	43	43	43	43	40
		130	40	40	40	40	40	40	40	40
		140	37	37	37	37	37	37	37	37
		150	34	34	34	34	34	34	34	34

**Maximum Allowable Spans for Light Rail (Tilt 5-27°)**

Exposure Category	Roof Zone	Wind mph	Snow 0 psf	Snow 10 psf	Snow 20 psf	Snow 30 psf	Snow 40 psf	Snow 50 psf	Snow 60 psf	Snow 70 psf
B	1	85	72	67	59	55	51	48	45	42
		90	69	65	57	54	50	47	44	42
		100	63	61	55	52	48	45	43	41
		110	61	60	54	51	48	45	42	40
		120	57	57	52	49	46	43	41	39
		130	53	53	49	47	44	42	40	38
		140	50	50	47	45	43	41	39	37
	150	47	47	45	44	41	39	38	36	
	2	85	72	67	59	55	51	48	45	42
		90	68	65	57	54	50	47	44	42
		100	62	61	55	52	48	45	43	41
		110	60	60	54	51	48	45	42	40
		120	55	55	52	49	46	43	41	39
		130	51	51	49	47	44	42	40	38
		140	47	47	47	45	43	41	39	37
150	44	44	44	44	41	39	38	36		
3	85	59	59	59	55	51	48	45	42	
	90	56	56	56	54	50	47	44	42	
	100	50	50	50	50	48	45	43	41	
	110	49	49	49	49	48	45	42	40	
	120	45	45	45	45	45	43	41	39	
	130	42	42	42	42	42	42	40	38	
	140	39	39	39	39	39	39	39	37	
150	36	36	36	36	36	36	36	36		
C	1	85	63	61	55	52	48	45	43	41
		90	60	59	53	51	47	44	42	40
		100	55	55	50	48	45	43	41	39
		110	53	53	49	47	44	42	40	38
		120	49	49	47	45	43	40	39	37
		130	46	46	44	43	41	39	37	36
		140	42	42	42	41	39	37	36	35
	150	40	40	40	39	37	36	35	34	
	2	85	62	61	55	52	48	45	43	41
		90	58	58	53	51	47	44	42	40
		100	53	53	50	48	45	43	41	39
		110	51	51	49	47	44	42	40	38
		120	47	47	47	45	43	40	39	37
		130	43	43	43	43	41	39	37	36
		140	40	40	40	40	39	37	36	35
	150	38	38	38	38	37	36	35	34	
	3	85	50	50	50	50	48	45	43	41
		90	47	47	47	47	47	44	42	40
		100	43	43	43	43	43	43	41	39
		110	41	41	41	41	41	41	40	38
		120	38	38	38	38	38	38	38	37
130		35	35	35	35	35	35	35	35	
140		33	33	33	33	33	33	33	33	
150	30	30	30	30	30	30	30	30		

**Maximum Allowable Spans for Light Rail (Tilt 28-45°)**

Exposure Category	Roof Zone	Wind mph	Snow 0 psf	Snow 10 psf	Snow 20 psf	Snow 30 psf	Snow 40 psf	Snow 50 psf	Snow 60 psf	Snow 70 psf
B	1-3	85	66	66	58	55	52	48	46	43
		90	64	64	57	54	50	47	45	43
		100	58	58	54	52	48	46	43	41
		110	57	57	53	51	48	45	43	41
		120	53	53	51	49	46	43	41	40
		130	49	49	48	46	44	42	40	38
		140	46	46	46	44	42	40	39	37
		150	43	43	43	43	41	39	37	36
C	1-3	85	58	58	54	52	48	46	43	41
		90	55	55	52	50	47	45	42	40
		100	50	50	49	47	45	43	41	39
		110	49	49	48	46	44	42	40	38
		120	45	45	45	44	42	40	38	37
		130	42	42	42	42	40	38	37	36
		140	39	39	39	39	38	37	36	34
		150	37	37	37	37	37	35	34	33

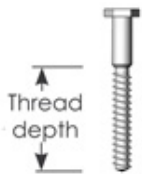
## AWC Lag Pull-out Chart

Lag pull-out (withdrawal) capacities (lbs) in typical roof lumber (ASD)

Material	Specific Gravity	Lag Screw Specifications*
Douglas Fir, Larch	0.50	266
Douglas Fir, South	0.46	235
Engelmann Spruce, Lodgepole Pine (MSR 1650 f & higher)	0.46	235
Hem, Fir, Redwood (close grain)	0.43	212
Hem, Fir (North)	0.46	235
Southern Pine	0.55	307
Spruce, Pine, Fir	0.42	205
Spruce Pine Fir (E of 2 million psi and higher grades of MSR and MEL)	0.50	266

Sources: American Wood Council, NDS 2005, Table 11.2A, 11.3.2A.

- Notes: (1) Thread must be embedded in the side grain of a rafter or other structural member integral with the building structure.  
 (2) Lag bolts must be located in the middle third of the structural member.  
 (3) These values are not valid for wet services.  
 (4) This table does not include shear capacities. If necessary, contact a local engineer to specify lag bolt size with regard to shear forces.  
 (5) Install lag bolts with head and washer flush to surface (no gap). Do not over-torque.  
 (6) Withdrawal design values for lag screw connections shall be multiplied by applicable adjustment factors if necessary. See Table 10.3.1 in the American Wood Council NDS for Wood Construction.



\*5/16" shaft, per inch thread depth (Use flat washers with lag screws).



## Rails & Splices

When top mounting panels, the lengths of Standard or Light rails required for each row may be determined by multiplying the quantity of modules in a row by the module's width. Add to this ¼ inch space between each module and 1.5 inches to each end for the total length of rail required for that row.

### Standard (XRS) Rails

Part Number	Description	Weight	Packaging
51-7000-144A	XRS, Rail 144" (12 Feet), Clear	11.34 Lbs	Sub-bundles of 4; Bundles of 80
51-7000-168A	XRS, Rail 168" (14 Feet), Clear	13.23 Lbs	Sub-bundles of 4; Bundles of 80
51-7000-192A	XRS, Rail 192" (16 Feet), Clear	15.12 Lbs	Sub-bundles of 4; Bundles of 80
51-7000-216A	XRS, Rail 216" (18 Feet), Clear	17.01 Lbs	Sub-bundles of 4; Bundles of 80
51-7000-144B	XRS, Rail 144" (12 Feet), Black	11.34 Lbs	Sub-bundles of 4; Bundles of 80
51-7000-168B	XRS, Rail 168" (14 Feet), Black	13.23 Lbs	Sub-bundles of 4; Bundles of 80
51-7000-192B	XRS, Rail 192" (16 Feet), Black	15.12 Lbs	Sub-bundles of 4; Bundles of 80
51-7000-216B	XRS, Rail 216" (18 Feet), Black	17.01 Lbs	Sub-bundles of 4; Bundles of 80

### Light (XRL) Rails

Part Number	Description	Weight	Packaging
51-6000-144A	XRL, Rail 144" (12 Feet), Clear	6.73 Lbs	Sub-bundles of 8; Bundles of 80
51-6000-168A	XRL, Rail 168" (14 Feet), Clear	7.85 Lbs	Sub-bundles of 8; Bundles of 80
51-6000-192A	XRL, Rail 192" (16 Feet), Clear	8.98 Lbs	Sub-bundles of 8; Bundles of 80
51-6000-216A	XRL, Rail 216" (18 Feet), Clear	10.10 Lbs	Sub-bundles of 8; Bundles of 80

### Internal Splices

Part Number	Description	Weight	Packaging
29-7000-010	XRS Splice, (Fits Standard Rail)	0.44 Lbs	1 Splice/Kit; 20 Splices/Box
29-7000-000	XRL Splice, (Fits Light Rail)	0.15 Lbs	1 Splice/Kit; 20 Splices/Box

## Clamps

Module Clamp size depends on the module thickness. Use the table below to determine which Module Clamp will fit your projects module thickness. Reminder: Our Mid and End Clamps fit both Standard (XRS) and Light (XRL) Rails.

Module Thickness		Clamp Info		Part Numbers			
Mm	Inches	Type	Bolt Height	End Clamp	Hex Mid Clamp	T-bolt Mid Clamp	Grounding Mid Clamp
31.0 - 32.5	1.22 - 1.28	I	2.00"	29-7000-125	29-7000-105	29-70TB-105	RS-GD-MCL-200
33.3 - 34.8	1.31 - 1.37	A	2.00"	29-7000-134	29-7000-105	29-70TB-105	RS-GD-MCL-200
34.8 - 36.8	1.37 - 1.45	B	2.00"	29-7000-224	29-7000-105	29-70TB-105	RS-GD-MCL-225
39.0 - 41.0	1.53 - 1.61	C	2.25"	29-7000-157	29-7000-101	29-70TB-101	RS-GD-MCL-225
41.1 - 42.7	1.62 - 1.68	J	2.25"	29-7000-165	29-7000-101	29-70TB-101	RS-GD-MCL-250
42.7 - 44.2	1.68 - 1.74	E	2.25"	29-7000-171	29-7000-101	29-70TB-101	RS-GD-MCL-250
45.0 - 47.0	1.77 - 1.85	F	2.50"	29-7000-214	29-7000-108	29-70TB-108	RS-GD-MCL-250
46.7 - 48.3	1.84 - 1.90	K	2.50"	29-7000-187	29-7000-108	29-70TB-108	RS-GD-MCL-275
49.0 - 51.1	1.93 - 2.01	G	2.50"	29-7000-204	29-7000-108	29-70TB-108	RS-GD-MCL-275
57.4 - 58.9	2.26 - 2.32	H	2.75"	29-7000-230	29-7000-104	29-70TB-104	Unsupported

**End Clamps**

Part Number	Description	Weight	Packaging
29-7000-125	Kit, 4pcs, End Clamp I, 1.25", Mill	0.3 Lbs	Kits of 4; Boxes of 25
29-7000-134	Kit, 4pcs, End Clamp A, 1.34", Mill	0.3 Lbs	Kits of 4; Boxes of 25
29-7000-224	Kit, 4pcs, End Clamp B, 1.41", Mill	0.3 Lbs	Kits of 4; Boxes of 25
29-7000-157	Kit, 4pcs, End Clamp C, 1.57", Mill	0.3 Lbs	Kits of 4; Boxes of 25
29-7000-165	Kit, 4pcs, End Clamp J, 1.65", Mill	0.3 Lbs	Kits of 4; Boxes of 25
29-7000-171	Kit, 4pcs, End Clamp E, 1.71", Mill	0.3 Lbs	Kits of 4; Boxes of 25
29-7000-214	Kit, 4pcs, End Clamp F, 1.81", Mill	0.3 Lbs	Kits of 4; Boxes of 25
29-7000-187	Kit, 4pcs, End Clamp K, 1.87", Mill	0.3 Lbs	Kits of 4; Boxes of 25
29-7000-204	Kit, 4pcs, End Clamp G, 1.97", Mill	0.3 Lbs	Kits of 4; Boxes of 25
29-7000-230	Kit, 4pcs, End Clamp H, 2.30", Mill	0.3 Lbs	Kits of 4; Boxes of 25
29-7000-125B	Kit, 4pcs, End Clamp I, 1.25" Black	0.3 Lbs	Kits of 4; Boxes of 25
29-7000-134B	Kit, 4pcs, End Clamp A, 1.34" Black	0.3 Lbs	Kits of 4; Boxes of 25
29-7000-224B	Kit, 4pcs, End Clamp B, 1.41" Black	0.3 Lbs	Kits of 4; Boxes of 25
29-7000-157B	Kit, 4pcs, End Clamp C, 1.57" Black	0.3 Lbs	Kits of 4; Boxes of 25
29-7000-165B	Kit, 4pcs, End Clamp J, 1.65" Black	0.3 Lbs	Kits of 4; Boxes of 25
29-7000-171B	Kit, 4pcs, End Clamp E, 1.71" Black	0.3 Lbs	Kits of 4; Boxes of 25
29-7000-214B	Kit, 4pcs, End Clamp F, 1.81" Black	0.3 Lbs	Kits of 4; Boxes of 25
29-7000-187B	Kit, 4pcs, End Clamp K, 1.87" Black	0.3 Lbs	Kits of 4; Boxes of 25
29-7000-204B	Kit, 4pcs, End Clamp G, 1.97" Black	0.3 Lbs	Kits of 4; Boxes of 25

**Mid Clamps**

Part Number	Description	Weight	Packaging
29-7000-105	Kit, 4pcs, Mid Clamp A/B/I, 2.00", Mill (Hex)	0.3 Lbs	Kits of 4; Boxes of 50
29-7000-101	Kit, 4pcs, Mid Clamp C/D/J/E, 2.25", Mill (Hex)	0.3 Lbs	Kits of 4; Boxes of 50
29-7000-108	Kit, 4pcs, Mid Clamp F/K/G, 2.50", Mill (Hex)	0.3 Lbs	Kits of 4; Boxes of 50
29-7000-104	Kit, 4pcs, Mid Clamp H 2.75", Mill (Hex)	0.3 Lbs	Kits of 4; Boxes of 50
29-70TB-105	Kit, 4pcs, Mid Clamp A/B/I, 2.00", Mill (T-bolt)	0.3 Lbs	Kits of 4; Boxes of 50
29-70TB-101	Kit, 4pcs, Mid Clamp C/D/J/E, 2.25", Mill (T-bolt)	0.3 Lbs	Kits of 4; Boxes of 50
29-70TB-108	Kit, 4pcs, Mid Clamp F/K/G, 2.50", Mill (T-bolt)	0.3 Lbs	Kits of 4; Boxes of 50
29-70TB-104	Kit, 4pcs, Mid Clamp H, 2.75", Mill (T-bolt)	0.3 Lbs	Kits of 4; Boxes of 50
29-7000-105B	Kit, 4pcs, Mid Clamp A/B/I, 2.0", Black (Hex)	0.3 Lbs	Kits of 4; Boxes of 50
29-7000-101B	Kit, 4pcs, Mid Clamp C/D/J/E, 2.25", Black (Hex)	0.3 Lbs	Kits of 4; Boxes of 50
29-7000-108B	Kit, 4pcs, Mid Clamp F/K/G, 2.5", Black (Hex)	0.3 Lbs	Kits of 4; Boxes of 50
29-7000-104B	Kit, 4pcs, Mid Clamp H, 2.75", Black (Hex)	0.3 Lbs	Kits of 4; Boxes of 50
29-70TB-105B	Kit, 4pcs, Mid Clamp A/B/I, 2.00", lack (T-bolt)	0.3 Lbs	Kits of 4; Boxes of 50
29-70TB-101B	Kit, 4pcs, Mid Clamp C/D/J/E, 2.25", Black (T-bolt)	0.3 Lbs	Kits of 4; Boxes of 50
29-70TB-108B	Kit, 4pcs, Mid Clamp F/K/G, 2.50", Black (T-bolt)	0.3 Lbs	Kits of 4; Boxes of 50
29-70TB-104B	Kit, 4pcs, Mid Clamp H, 2.75", Black (T-bolt)	0.3 Lbs	Kits of 4; Boxes of 50

**Grounding Mid Clamps**

Part Number	Description	Weight	Packaging
RS-GD-MCL-200	Kit, 4pcs, Mid Clamp A/B/I, 2.00", Mill (T-bolt)	0.3 Lbs	Kits of 4; Boxes of 50
RS-GD-MCL-225	Kit, 4pcs, Mid Clamp C/D/J/E, 2.25", Mill (T-bolt)	0.3 Lbs	Kits of 4; Boxes of 50
RS-GD-MCL-250	Kit, 4pcs, Mid Clamp F/K/G, 2.50", Mill (T-bolt)	0.3 Lbs	Kits of 4; Boxes of 50
RS-GD-MCL-275	Kit, 4pcs, Mid Clamp H 2.75", Mill (T-bolt)	0.3 Lbs	Kits of 4; Boxes of 50
RS-GD-MCL-200B	Kit, 4pcs, Mid Clamp A/B/I, 2.00", Black (T-bolt)	0.3 Lbs	Kits of 4; Boxes of 50
RS-GD-MCL-225B	Kit, 4pcs, Mid Clamp C/D/J/E, 2.25", Black (T-bolt)	0.3 Lbs	Kits of 4; Boxes of 50
RS-GD-MCL-250B	Kit, 4pcs, Mid Clamp F/K/G, 2.50", Black (T-bolt)	0.3 Lbs	Kits of 4; Boxes of 50
RS-GD-MCL-275B	Kit, 4pcs, Mid Clamp H, 2.75", Black (T-bolt)	0.3 Lbs	Kits of 4; Boxes of 50

**Under Clamps**

Part Number	Description	Weight	Packaging
29-7000-117	Kit, 4pcs, Under Clamp	0.4 Lbs	Kits of 4; Boxes of 25

**Attachments**
**Adjustable L-Feet**

Part Number	Description	Weight	Packaging
29-7000-017	4-pack, Adjustable L-Foot, Mill	0.87 Lbs	4 L-feet/Pack; 25 L-feet/Box
29-7000-017B	4-pack, Adjustable L-Foot, Black	0.87 Lbs	4 L-feet/Pack; 25 L-feet/Box

**Flush Mount Standoffs**

Part Number	Description	Weight	Packaging
51-6003-500L	Kit, 3" Standoff, Flush Mount, Mill	0.51 Lbs	20 Standoffs / Box
51-6004-500L	Kit, 4" Standoff, Flush Mount, Mill	0.56 Lbs	20 Standoffs / Box
51-6006-500L	Kit, 6" Standoff, Flush Mount, Mill	0.75 Lbs	20 Standoffs / Box
51-6007-500L	Kit, 7" Standoff, Flush Mount, Mill	0.84 Lbs	20 Standoffs / Box

**Tilt Mount Standoffs**

Part Number	Description	Weight	Packaging
RF-TLT-SO-375	Kit, Quick Mount PV, Low Slope Mount 3.75"	1.34 Lbs	12 Standoffs / Box
RF-TLT-SO-700	Kit, Quick Mount PV, Low Slope Mount 7.00"	1.63 Lbs	12 Standoffs / Box
RF-TLT-SO-900	Kit, Quick Mount PV, Low Slope Mount 9.00"	2.10 Lbs	12 Standoffs / Box

**Adjustable Tilt Legs**

Part Number	Description	Weight	Packaging
51-7516-016H	Adjustable Tilt Leg, 16 inches (18-22")	4.29 Lbs	12 Adjustable Tilt Legs/Box
51-7528-028H	Adjustable Tilt Leg, 28 inches (30-46")	6.34 Lbs	12 Adjustable Tilt Legs/Box
51-7556-056H	Adjustable Tilt Leg, 56 inches (58-94")	10.39 Lbs	12 Adjustable Tilt Legs/Box

**Fixed Tilt Legs**

Part Number	Description	Weight	Packaging
51-7210-010	Tilt Leg Kit, 10", Mill	1.87 Lbs	20 Fixed Tilt Legs/Box
51-7215-015	Tilt Leg Kit, 15", Mill	2.20 Lbs	20 Fixed Tilt Legs/Box
51-7220-020	Tilt Leg Kit, 20", Mill	2.56 Lbs	20 Fixed Tilt Legs/Box
51-7225-025	Tilt Leg Kit, 25", Mill	2.85 Lbs	20 Fixed Tilt Legs/Box
51-7230-030	Tilt Leg Kit, 30", Mill	3.20 Lbs	20 Fixed Tilt Legs/Box
51-7240-040	Tilt Leg Kit, 40", Mill	3.85 Lbs	20 Fixed Tilt Legs/Box

**Accessories**

Part Number	Description	Weight	Packaging
29-4000-099	Standard Rail (XRS) End Cap (Polybag, 20)	11.40 Lbs/Box	20 End Caps/ Bag; 500 Caps / Box
29-4000-088	Light Rail (XRL) End Cap (Polybag, 20)	4.10 Lbs/Box	20 End Caps/ Bag; 500 Caps / Box
29-4000-077	Wire Clip (Polybag, 20)	6.70 Lbs/Box	20 Clips / Bag; 500 Clips / Box
29-5003-005	Kit, ¼ x ¾ Microinverter Mounting	10.65 Lbs/Box	150 Kits / Box

**Grounding**

Part Number	Description	Weight	Packaging
RS-GDST-001	Grounding Strap	2.7 Lbs/Box	50 Kits / Box
RS-GDXP-001	Grounding Strap Expansion Joint	2.0 Lbs / Box	25 Kits / Box
RS-GDLG-001	Grounding Lug	7.7 Lbs / Box	50 Kits / Box
29-4000-001	WEEB DMC Compression Clip	.50 Lbs/Box	100 Clips / Box
29-4000-002	WEEB Grounding Lug	12.45 Lbs/Box	100 Lugs / Box
29-4000-003	WEEB Bonding Jumper	17.55 Lbs/Box	100 Jumpers / Box

**Ontario FIT-Compliant Products**

Part Number	Description	Weight	Packaging
51-70CR-108A	XRS, Rail 108" (9 Feet), Clear, FIT-compliant	8.51 Lbs	Sub-bundles of 4; Bundles of 80
51-70CR-144A	XRS, Rail 144" (12 Feet), Clear, FIT-compliant	11.34 Lbs	Sub-bundles of 4; Bundles of 80
51-70CR-168A	XRS, Rail 168" (14 Feet), Clear, FIT-compliant	13.23 Lbs	Sub-bundles of 4; Bundles of 80
51-70CR-192A	XRS, Rail 192" (16 Feet), Clear, FIT-compliant	15.12 Lbs	Sub-bundles of 4; Bundles of 80
51-70CR-216A	XRS, Rail 216" (18 Feet), Clear, FIT-compliant	17.01 Lbs	Sub-bundles of 4; Bundles of 80
29-70CS-010	XRS Splice, (Fits Standard Rail), FIT-compliant	0.44 Lbs	1 Splice/Kit; 20 Splices/Box
29-70CF-017	4-pack, Adjustable L-Foot, Mill, FIT-compliant	0.87 Lbs	4 L-feet/Pack; 200 L-feet/Box

## System Support

IronRidge provides a complete system of technical support including installation guides, pre-stamped certification letters for most PV-friendly states, our online Design Assistant software, and live, knowledgeable person-to-person customer service.

## Downloadable Support Documents

Our website at [www.ironridge.com/products/roofmounting/systemsupport](http://www.ironridge.com/products/roofmounting/systemsupport) contains all of the technical support information necessary to design, quote, certify, and install an IronRidge Roof Mount system. The specific documents that can be found here include:

- CAD files (AutoCAD format)
- Engineering Design Guide
- Pre-stamped Certification Letters
- Installation Guides
- Parts Catalog

## 3rd Party Partners

We've engineered best-of-class 3rd party solutions with our Roof Mount platform to further improve the quality we offer customers. Where appropriate, pre-stamped certification letters are included to simplify and expedite the design, quoting, and permitting processes. At this time, we work with roofing products from the following companies:

- Ecofasten
- Enphase
- Quick Mount PV
- S5!
- Wiley

## Design Assistant

The IronRidge Design Assistant automates much of the Design and Engineering phases of a project. Easily accessible from our website, the Design Assistant provides a highly intuitive layout interface, automatically calculates critical engineering information based on your project's specific load conditions, provides the ability to add optional components and 3rd party products, and determines an accurate bill of materials and quotations.

The Roof Mount Design Assistant can be accessed at: [www.ironridge.com/rm](http://www.ironridge.com/rm)

## Engineering Services

IronRidge provides expedited site specific certification letters for many standard load conditions. These letters are available in most PV-friendly states, including:

Arizona	North Carolina
California	New Hampshire
Colorado	New Jersey
Connecticut	New Mexico
D.C.	Nevada
Delaware	New York
Florida	Ohio
Georgia	Oklahoma
Hawaii	Oregon
Iowa	Pennsylvania
Illinois	Rhode Island
Indiana	South Carolina
Louisiana	Tennessee
Massachusetts	Texas
Maryland	Utah
Michigan	Virginia
Maine	Vermont
Minnesota	Washington
Missouri	

In addition, we provide pre-stamped certification letters for:

Ontario  
New Zealand  
Puerto Rico

We can also provide non-standard certifications, wet-stamped letters, or specialized engineering requests. Our preferred engineering firm is Starling Madison Lofquist, Inc. Their contact information is:

Starling Madison Lofquist, Inc.  
5224 South 39th Street  
Phoenix, Arizona 85040  
Phone: 602-438-2500

## Customer Service

The IronRidge support staff is knowledgeable, experienced, friendly, and responsive. We would be happy to provide assistance on any questions you may have. Please feel free to contact us through your preferred method at:

Email: [support@ironridge.com](mailto:support@ironridge.com)  
Phone: 800-227-9523

## Warranty Information

Effective for IronRidge, Inc. ("IronRidge") mounting structure components ("Products") manufactured after April 1st, 2012, IronRidge provides the following warranties, for Products installed properly and used for the purpose for which the Products are designed:

- finishes shall be free of visible defects, peeling, or cracking, under normal atmospheric conditions, for a period of three (3) years from the earlier of (i) the date of complete installation of the Product or (ii) thirty days after the original purchaser's date of purchase of the Product ("Finish Warranty");
- components shall be free of structurally-related defects in materials for a period of ten (10) years from the earlier of (i) the date of complete installation of the Product or (ii) thirty days after the original purchaser's date of purchase of the Product;
- components shall be free of functionally-related manufacturing defects for a period of twenty (20) years from date of manufacture.

The Finish Warranty does not apply to: (a) surface oxidation of the galvanized steel components or any foreign residue deposited on Product finish; and (b) Products installed in corrosive atmospheric conditions, as defined solely by IronRidge; corrosive atmospheric conditions include, but are not limited to, conditions where Product is exposed to corrosive chemicals, fumes, cement dust, salt water marine environments or to continual spraying of either salt or fresh water. The Finish Warranty is VOID if (c) the practices specified by AAMA 609 & 610-02 – "Cleaning and Maintenance for Architecturally Finished Aluminum" ([www.aamanet.org](http://www.aamanet.org)) are not followed by Purchaser for IronRidge's aluminum based components; and (d) if the practices specified by ASTM A780 / A780M - 09 "Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings" are not followed by Purchaser for IronRidge's galvanized steel-based components.

The warranties above do not cover any parts or materials not manufactured by IronRidge, and exclude non-functionally-related defects, as defined solely by IronRidge. The warranties do not cover any defect that has not been reported to IronRidge in writing within twenty (20) days after discovery of such defect.

In the event of breach of or non-compliance with the warranties set forth above, IronRidge's sole obligation and liability, and the sole and exclusive remedy for such breach or non-compliance, shall be correction of defects by repair, replacement, or credit, at IronRidge's sole discretion. Such repair, replacement or credit shall completely satisfy and discharge all of IronRidge's liability with respect to these warranties.

Refurbished Product may be used to repair or replace the defective components. Transportation, installation, labor, or any other costs associated with Product replacement are not covered by these warranties and are not reimbursable. These warranties additionally do not cover (a) normal wear, or damage resulting from misuse, overloading, abuse, improper installation (including failure to follow professional instruction and certification), negligence, or accident, or from force majeure acts including any natural disasters, war or criminal acts; and (b) Products that have been altered, modified or repaired without written authorization from IronRidge or its authorized representative; and (c) Products used in a manner or for a purpose other than that specified by IronRidge. A formal document proving the purchase and the purchase date of the Product is required with any warranty claim.

Except as set forth above, IronRidge sells the Products on an "AS IS" basis, which may not be free of errors or defects, and ALL EXPRESS OR IMPLIED REPRESENTATIONS AND WARRANTIES, INCLUDING ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, QUALITY, WORKMANLIKE EFFORT, CORRESPONDENCE TO DESCRIPTION, DESIGN, TITLE OR NON-INFRINGEMENT, OR ARISING FROM COURSE OF DEALING, COURSE OF PERFORMANCE OR TRADE PRACTICE, ARE HEREBY DISCLAIMED.

# Wiley Electronics LLC

## Washer, Electrical Equipment Bond

# WEEB

Patent Pending

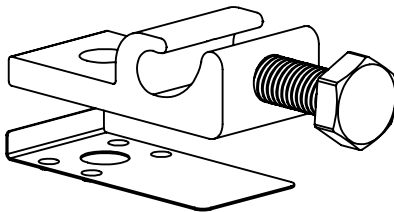
## INSTALLATION INSTRUCTIONS

### *For IronRidge*

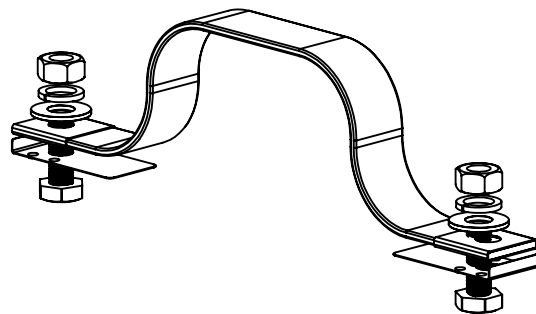
Please read carefully before installing.



WEEB-DMC



WEEBL-6.7



WEEB Bonding Jumper-6.7



Intertek  
3098177

Products are tested to UL 467  
UL standard for safety grounding and bonding equipment

Document Number 104-0404-000039-000

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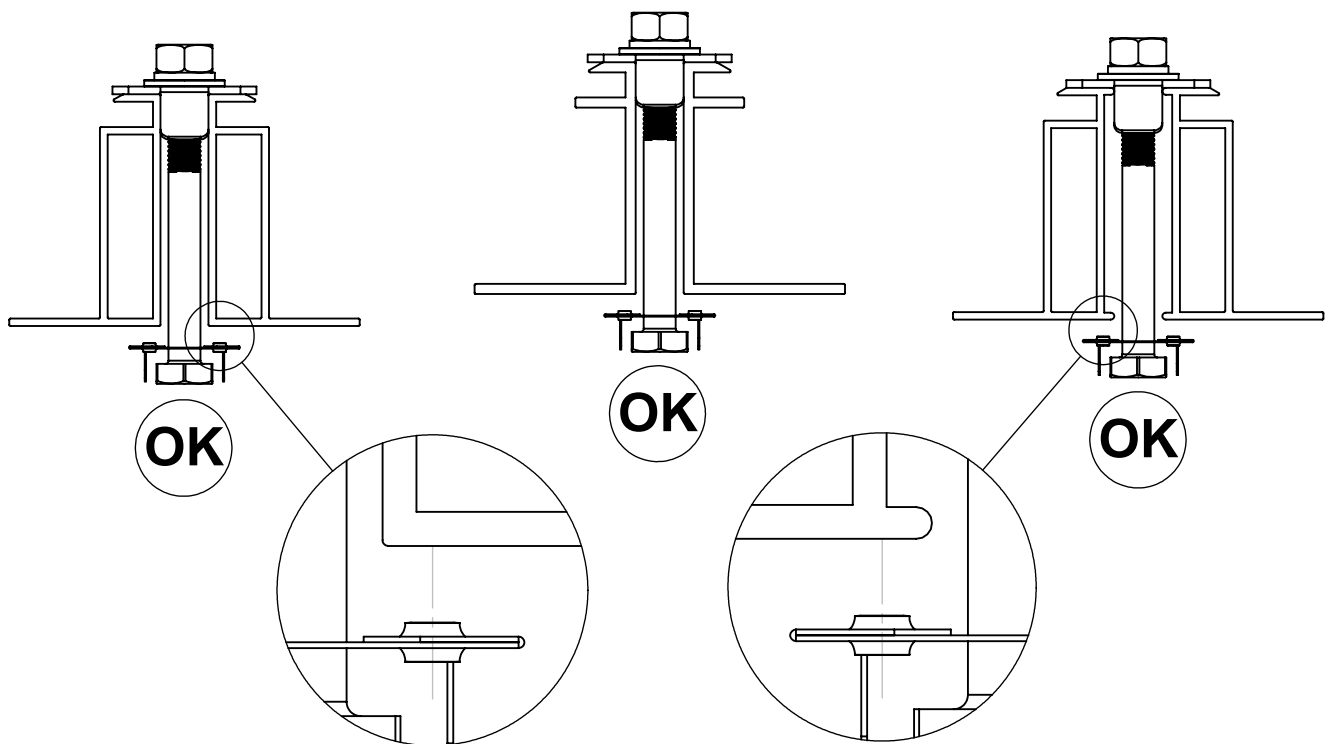


# WEEB COMPATIBILITY

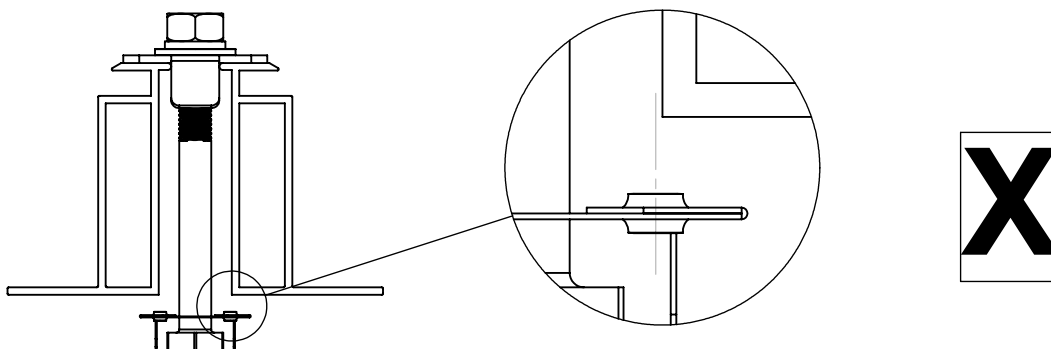
The WEEB family of products can be used to bond anodized aluminum, galvanized steel, steel and other electrically conductive metal structures.

## Standard Top Down Clamps

The WEEBs used for bonding the PV modules to the mounting rails are compatible with various cross-sections of module frames. The following are examples of module frames that are compatible. Notice that the WEEB teeth are positioned completely under the edge of the module frame.

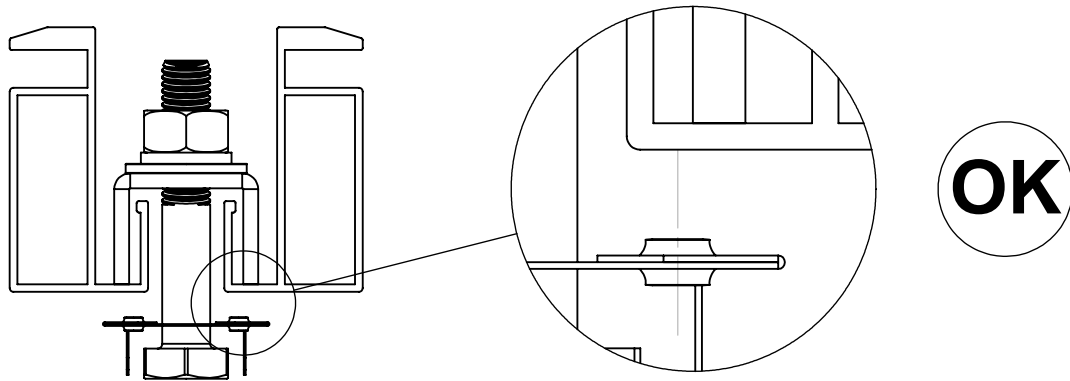


The following is an example of a module frame that is incompatible with the WEEB. The WEEB teeth are positioned only partially under the edge of the module due to the lip on the top edge of the module frame.



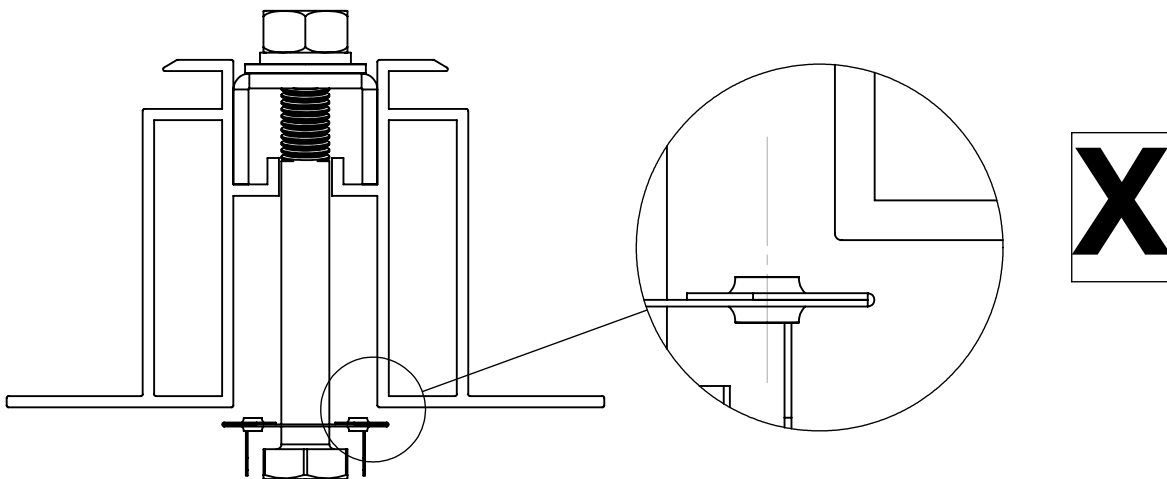
## Top Down Clamps for Lipped Modules

The following are a few variations of lipped solar modules mounted with inverted U-shaped clamps. Notice that the force which the inverted U-shaped clamp exerts is in line with the WEEB teeth.



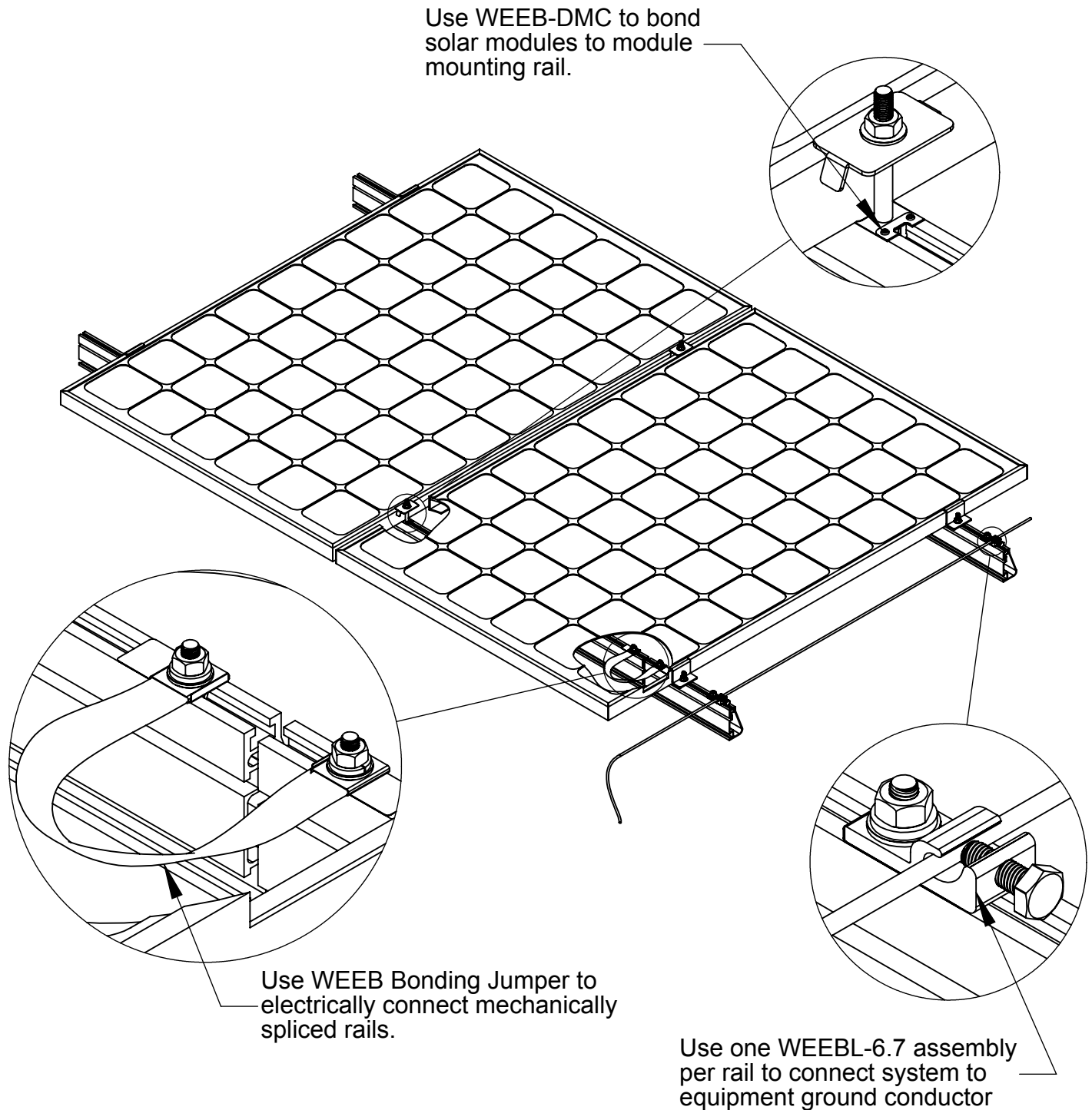
**Low-Lipped Module**

WEEB-DMC is not compatible with high lipped modules. The WEEB teeth do not intersect with the solar module frame.



**High-Lipped Module**

# SYSTEM OVERVIEW

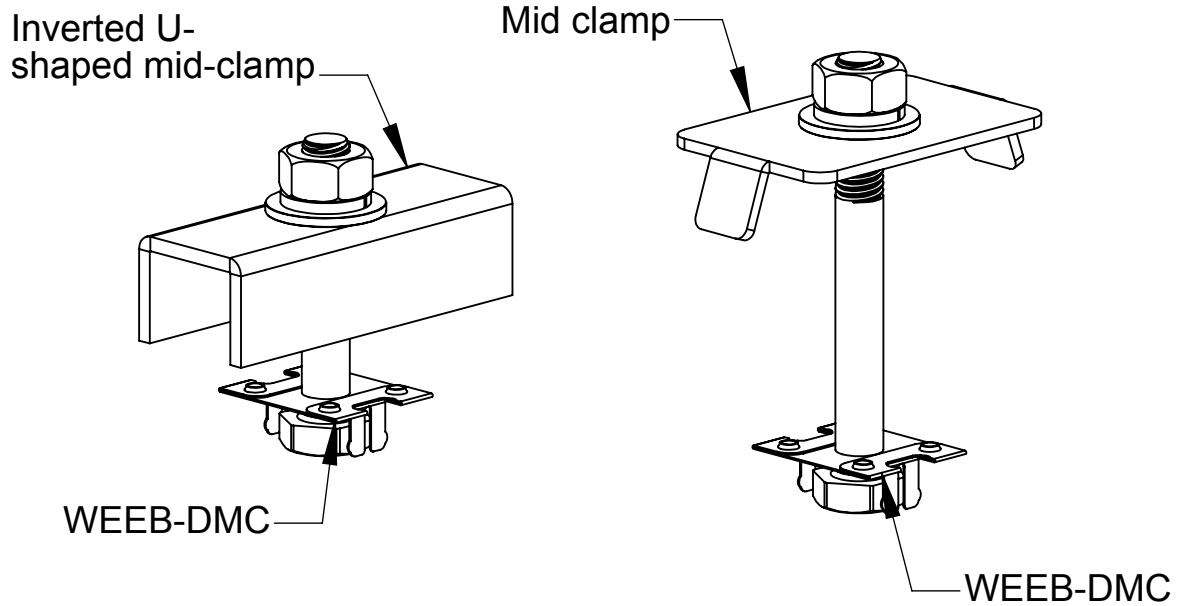


## Important notes:

1. Use general purpose anti-seize compound on fastener threads when installing WEEBs.
2. WEEBs are intended for **SINGLE USE ONLY**. Functionality will not be guaranteed if reused.

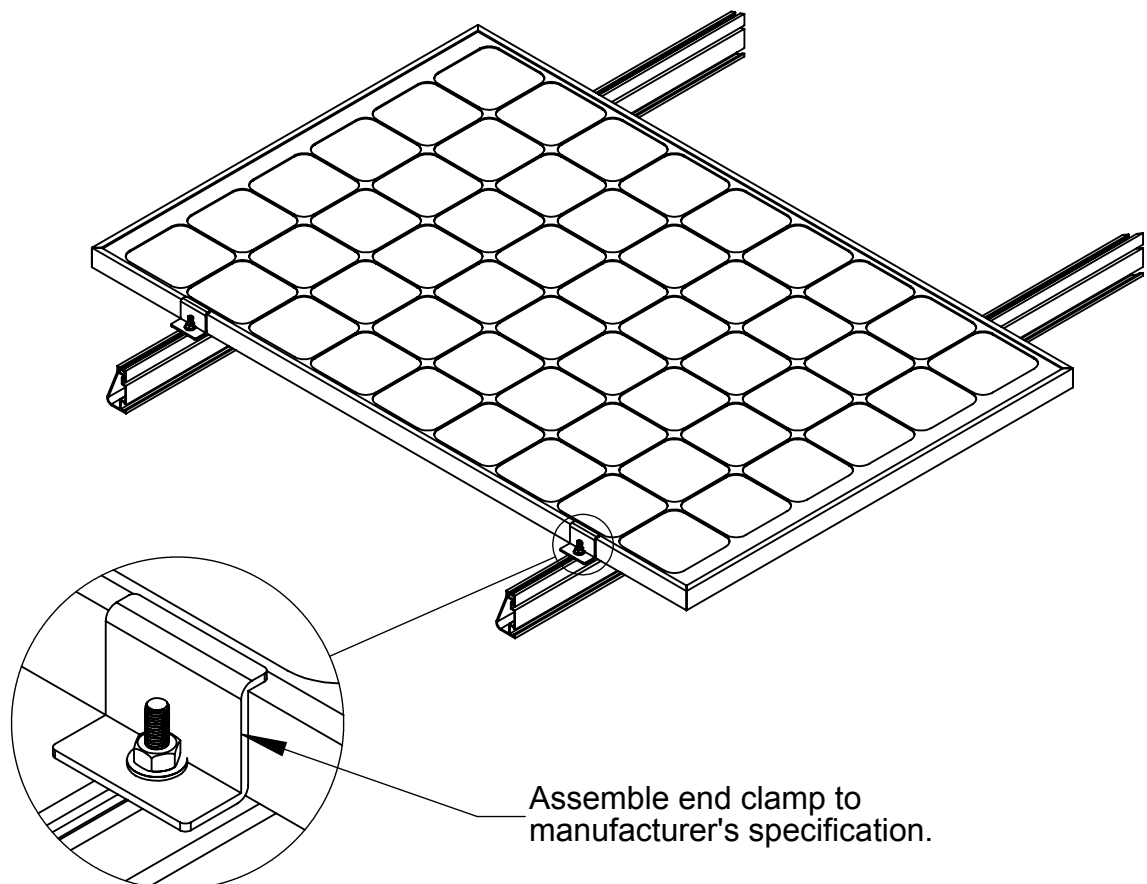
# WEEB-DMC ASSEMBLY

①



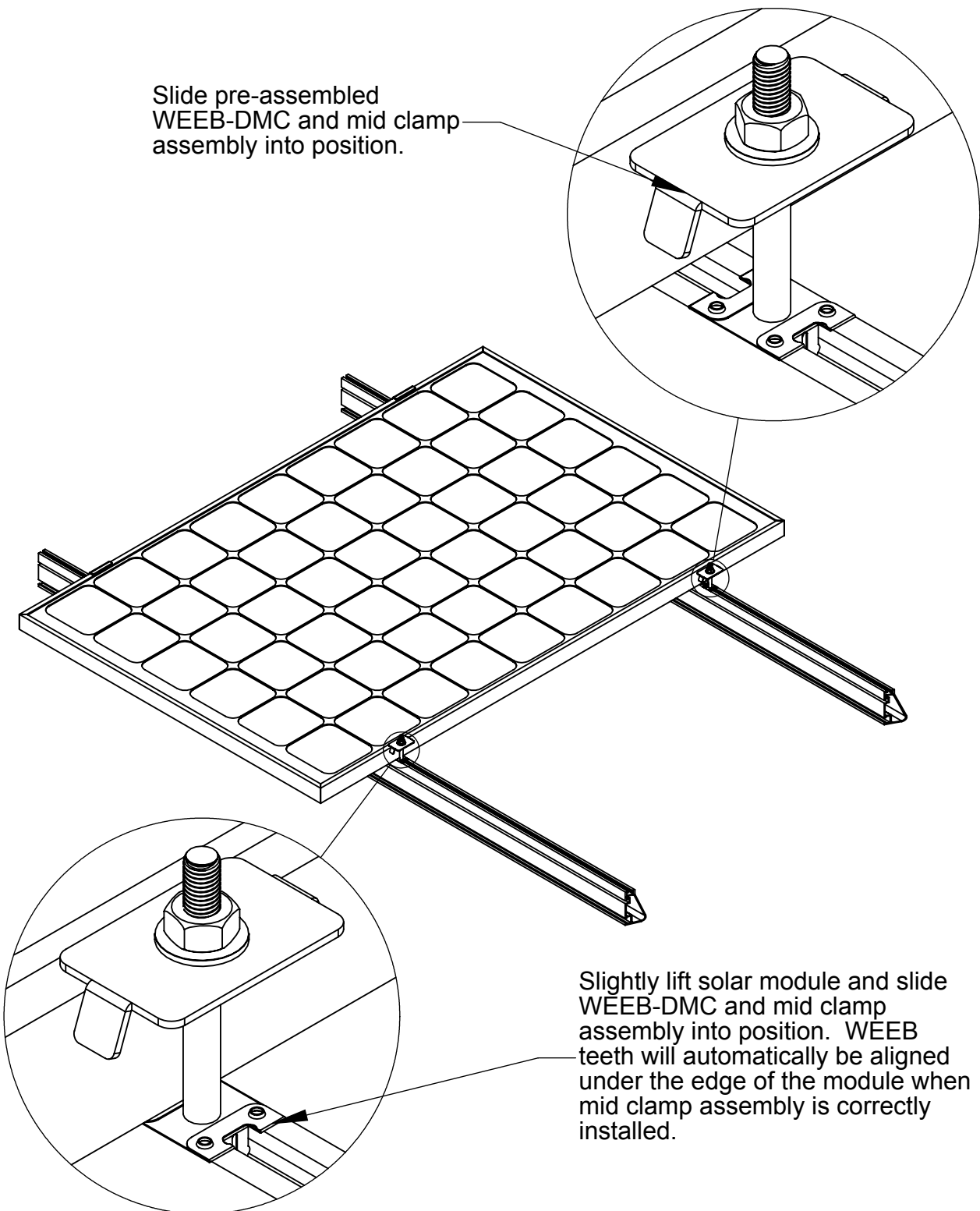
Pre-assemble WEEB-DMC to mid clamp assembly as shown. Pre-assembling WEEB-DMC to mid clamp assembly will contain the small individual parts, reducing the possibility of losing parts during installation.

②



3

Slide pre-assembled WEEB-DMC and mid clamp assembly into position.



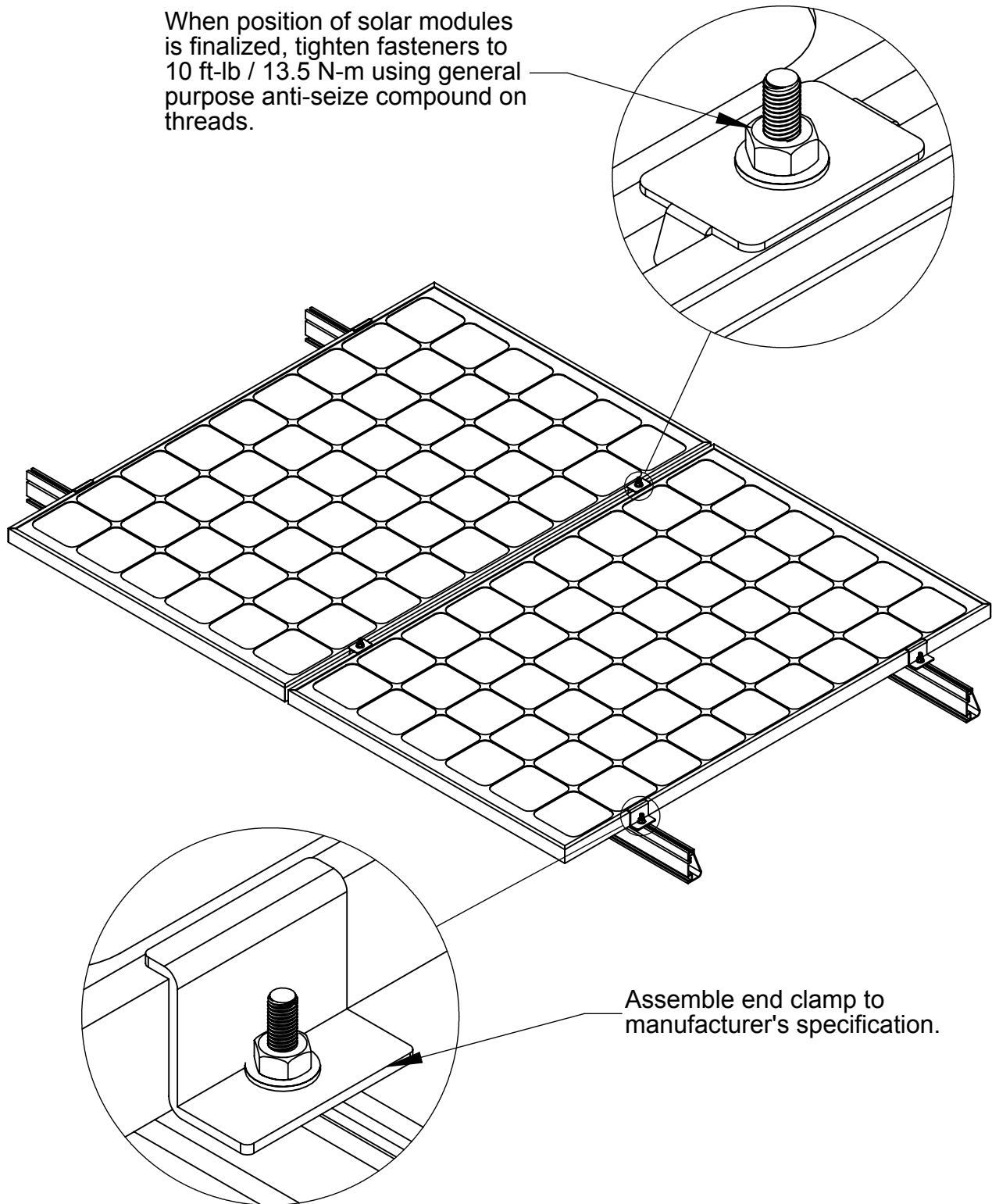
Slightly lift solar module and slide WEEB-DMC and mid clamp assembly into position. WEEB teeth will automatically be aligned under the edge of the module when mid clamp assembly is correctly installed.

**Important note:**

To correctly install mid clamp assembly, ensure that the bolt is perpendicular to the mounting rail and both sides of the solar modules are completely positioned against the mid clamp. Refer to WEEB compatibility page for illustrations.

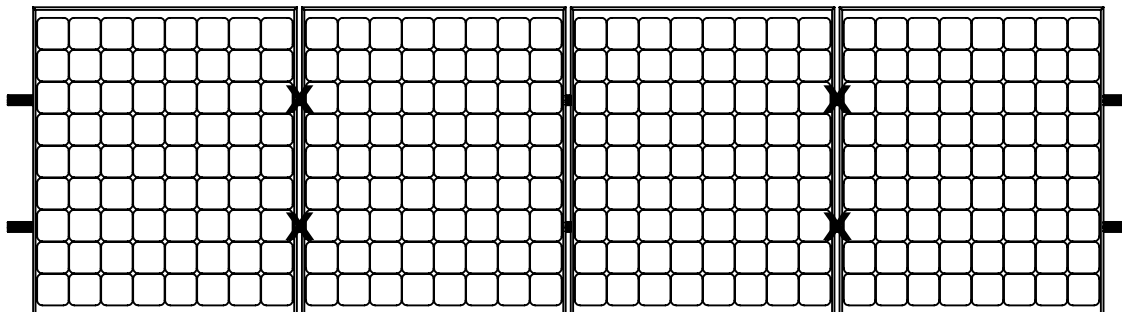
- ④ **Important note:**  
**WEEBs are for SINGLE USE ONLY! Do not torque fasteners down if position of solar modules is not finalized. Only slightly tighten fasteners to keep modules in place.**

When position of solar modules is finalized, tighten fasteners to 10 ft-lb / 13.5 N-m using general purpose anti-seize compound on threads.



# WEEB-DMC LAYOUT

## EVEN NUMBER OF MODULES IN ROW

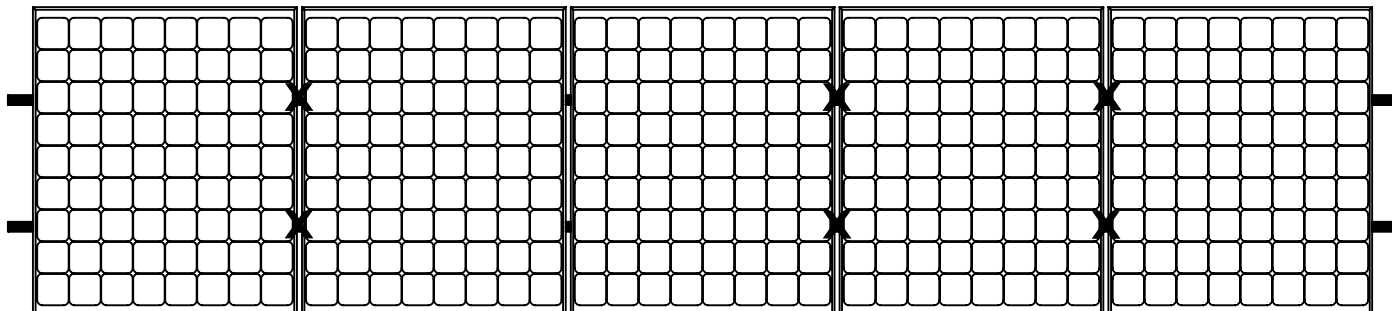


X DENOTES PLACES TO INSTALL WEEB-DMC

$$C \times R = 4 \times 1$$

$$\text{WEEB-DMC NEEDED} = C \times R = 4 \times 1 = 4$$

## ODD NUMBER OF MODULES IN ROW



X DENOTES PLACES TO INSTALL WEEB-DMC

$$C \times R = 5 \times 1$$

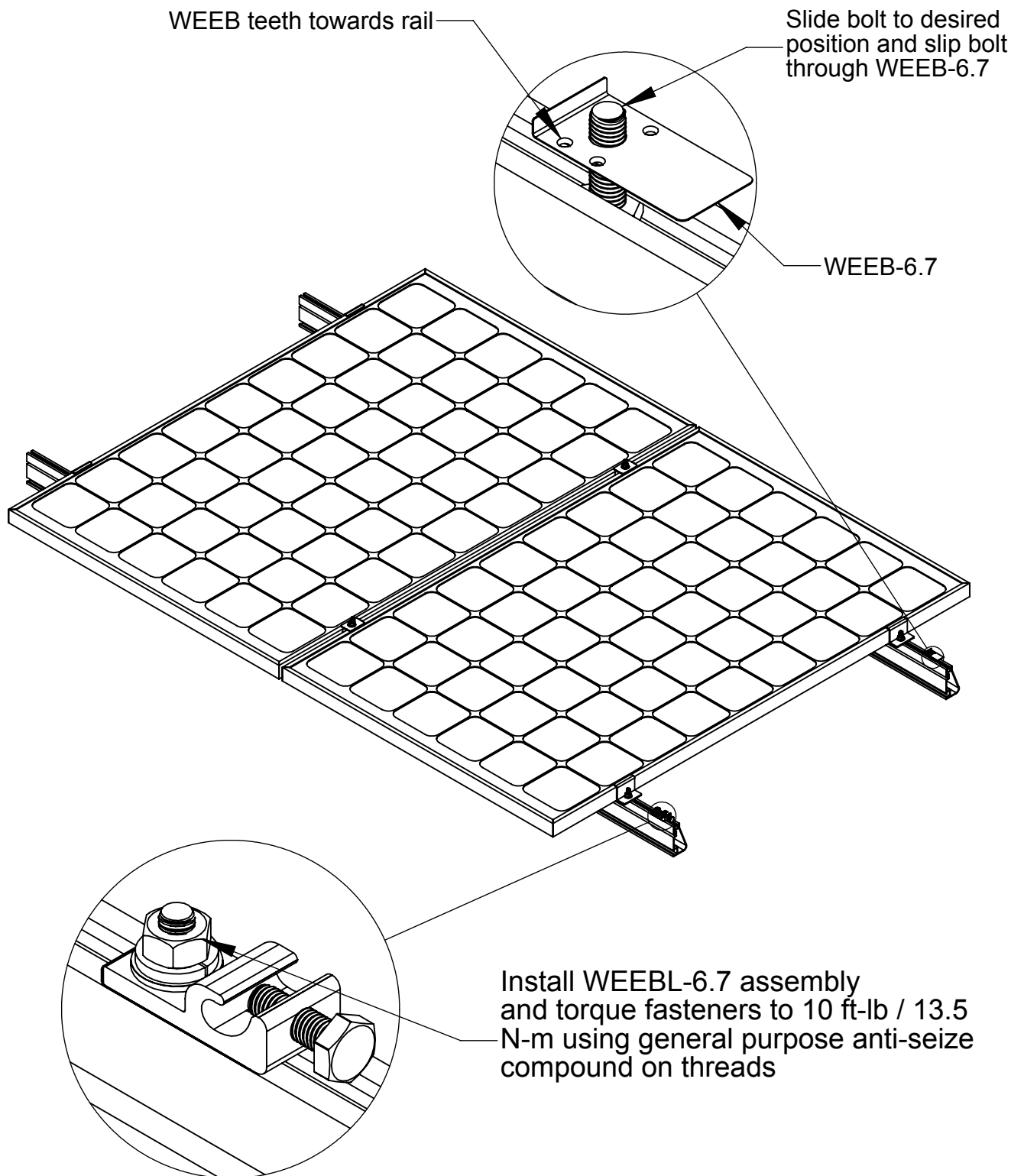
$$\text{WEEB-DMC NEEDED} = [C+1] \times R = [5+1] \times 1 = 6$$

### Note:

When replacing a single faulty module, also remove the adjacent module which contacts the same WEEBs as the faulty module. This will ensure that there are never ungrounded modules in the array.

# WEEBLUG ASSEMBLY

5

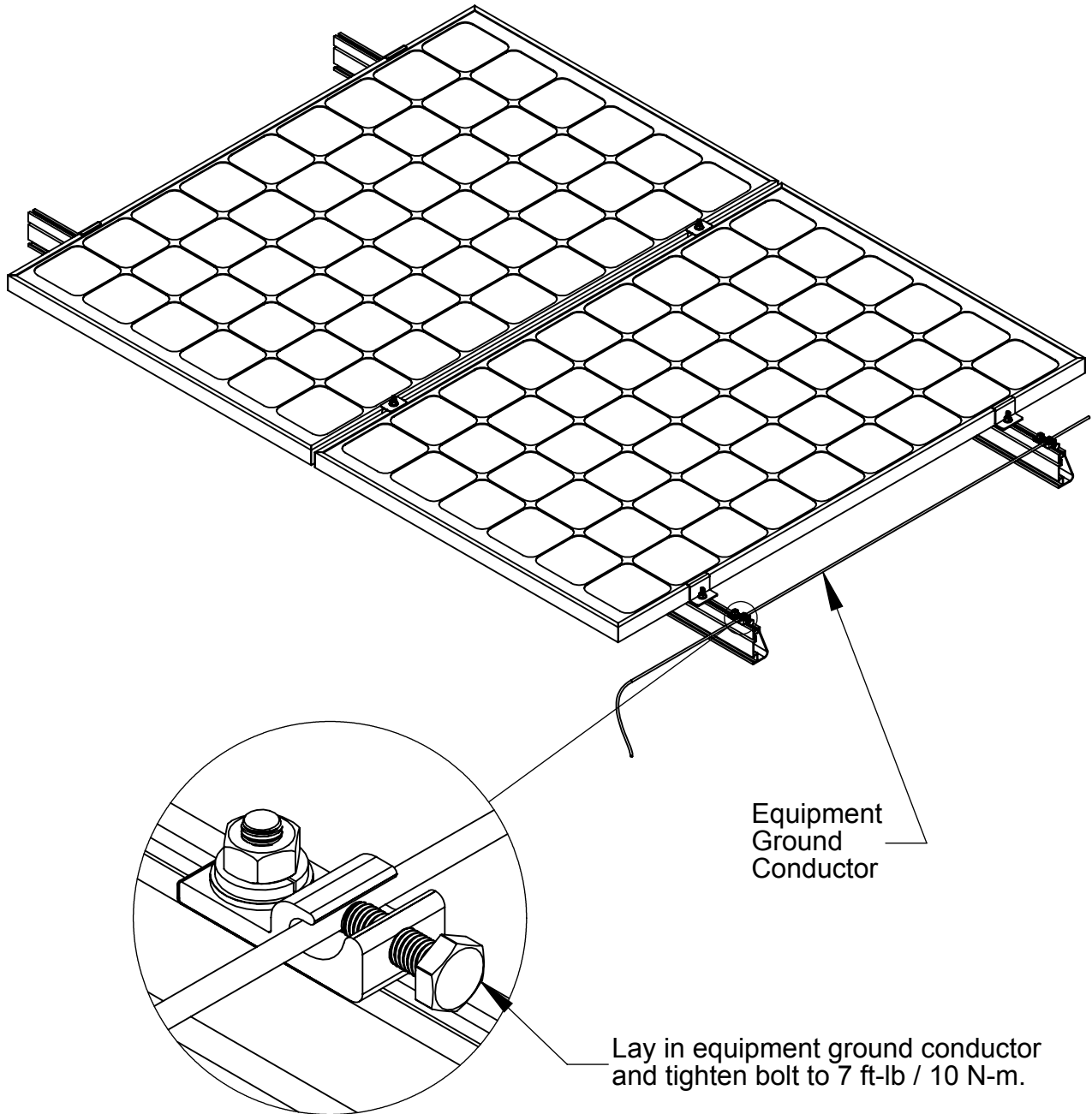


## Important note:

**WEEEB-6.7 that sits under the WEEBLug is for single use only. Ensure position is correct before tightening down.**

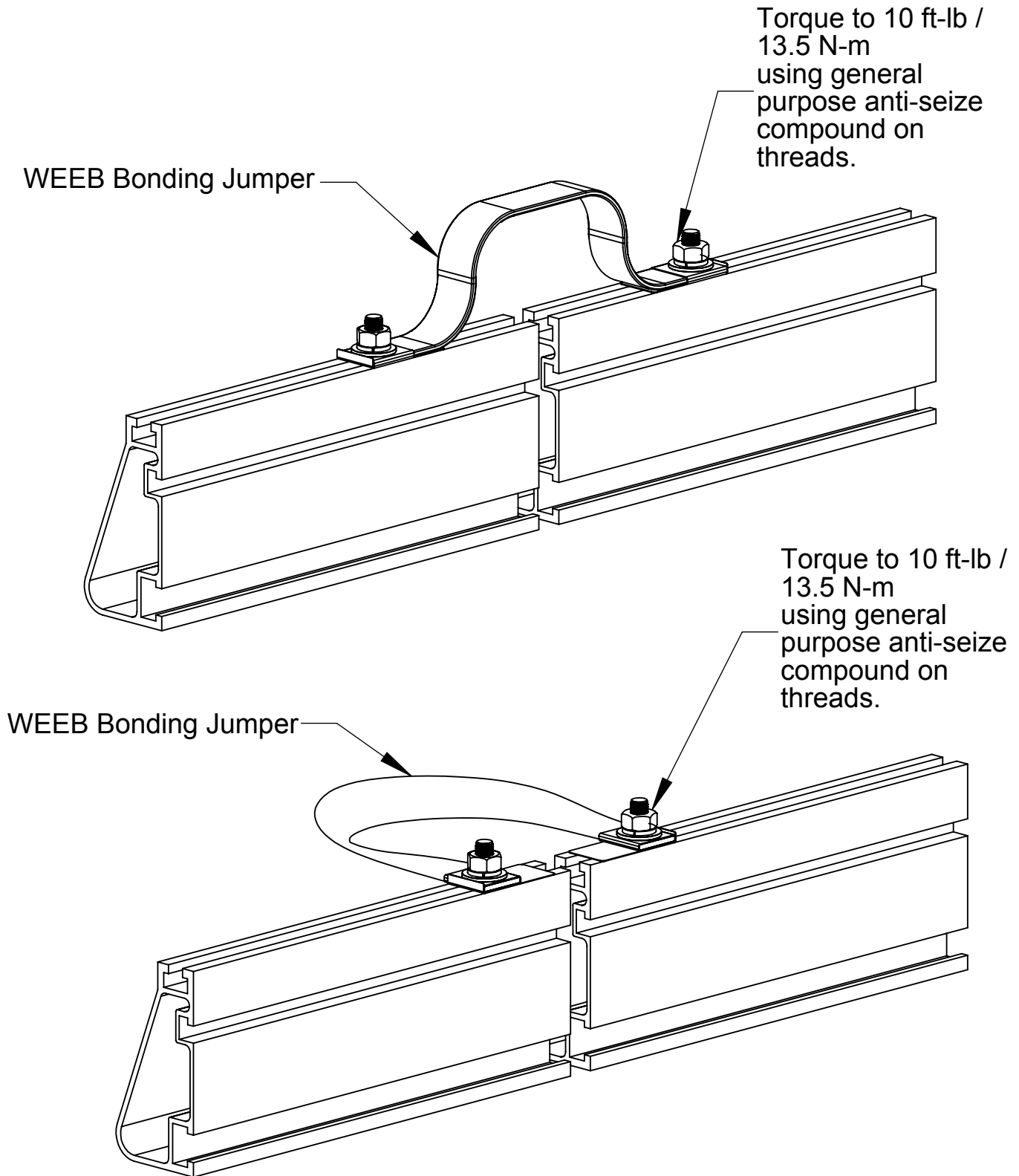


6



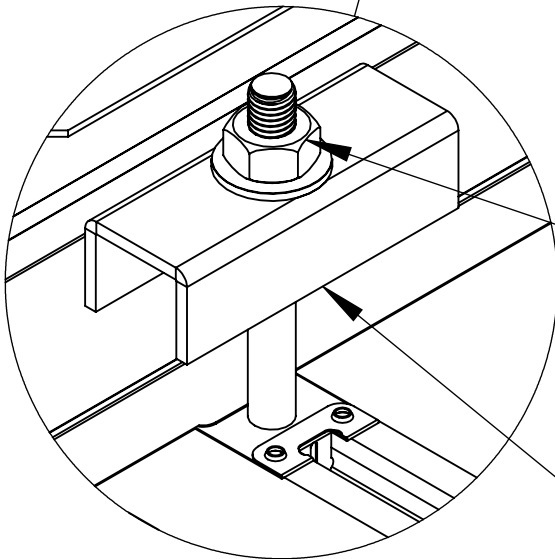
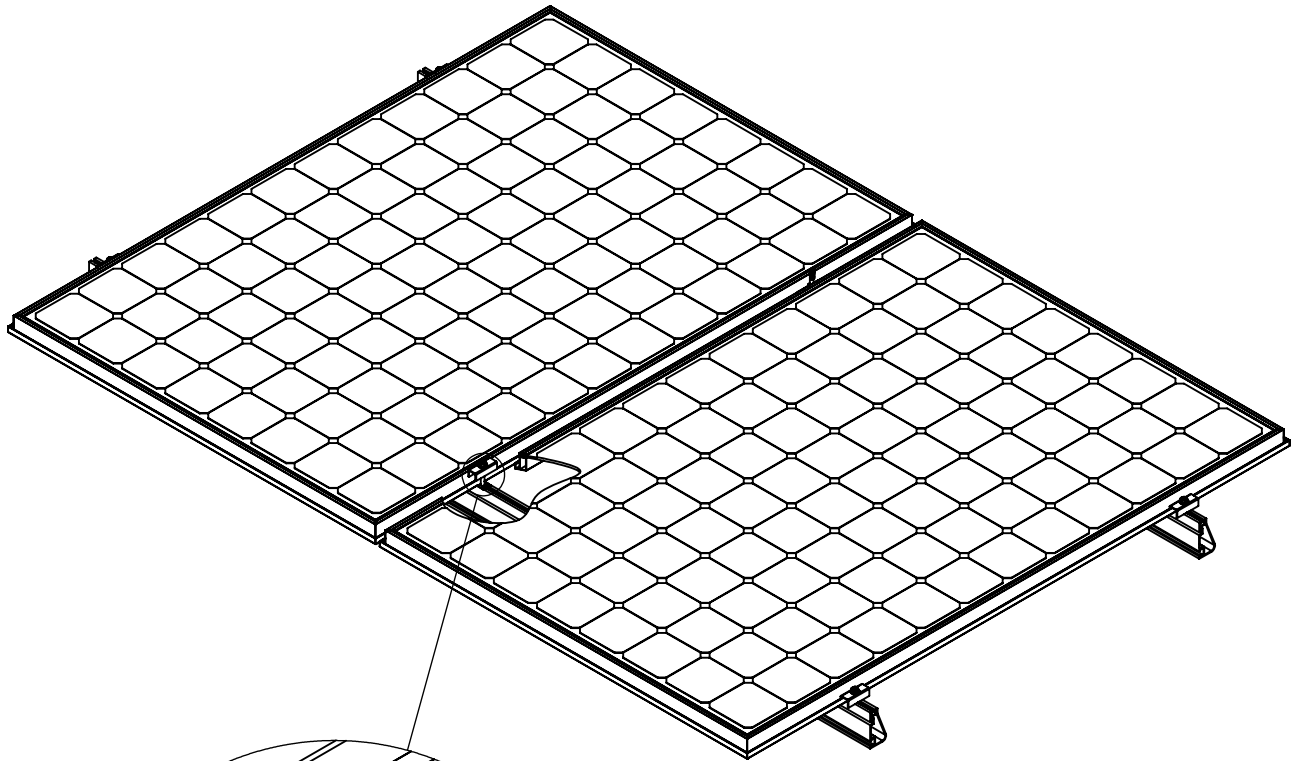
# IRONRIDGE SPLICE KIT ASSEMBLY

- ⑦ The flexible WEEB Bonding Jumper can be mounted in different ways shown below.



Route WEEB Bonding Jumper as shown above if edge of solar module lands between two splice rails.

# LOW-LIPPED MODULE INSTALLATION



Tighten to 10 ft-lb / 13.5 N-m using general purpose anti-seize compound on threads.

Inverted U-shaped mid clamp