

QRail[®] System

QClick Technology[®]

Rail Mounting System

Installation Manual



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1. Introduction

1.1 Short Description

The QRail PV mounting system is a strong, versatile system for mounting PV modules on low and steep-sloped roofs. The system consists of aluminum module support rails and includes all necessary components in order to attach the rails to each other, to attach the rails to the roof, and to attach the modules to the rails; it also includes other various accessories, such as module level power electronic (MLPE) attachments. The system allows modules to be mounted in portrait or landscape and can also be configured for Shared Rail design in either orientation. It accommodates most framed modules. Bonding is fully integrated into the QRail system.

1.2 About This Manual

This manual describes the installation of the QRail mounting system and provides necessary information regarding components, system planning, and important safety warnings. Sections 1, 2, and 3 provide an overview as well as detailed information about the QRail system and components. Section 4 provides basic module layout and planning information. Sections 5 and 6 provide detailed system assembly and installation instructions. Section 7 provides maintenance requirements, and the last remaining section provides detailed information on UL 2703 evaluated and approved modules.





It is important that you carefully read these Instructions as well as all applicable documents prior to carrying out any installation, maintenance, or disassembly work. These instructions provide you with the information required for the safe and complete installation, maintenance, and disassembly. Should you have any questions, please contact Quick Mount PV at tech@quickmountpv.com or at 925-478-8269. Please refer to our website for further information and details at www.quickmountpv.com.

1.3 Warnings

The following warnings are used in these Installation Instructions to indicate safety-related information. They include:

- Warning symbols (pictograms)
- Signal words which identify the hazard level
- Information about the type and source of the hazard
- Information about the potential consequences in case of the hazard being disregarded
- Measures for the prevention of hazards and the prevention of injuries or damage to property.

The signal words of the warnings respectively indicate one of the following hazard levels:

			
DANGER	WARNING	CAUTION	ATTENTION
Indicates a potentially mortal danger, disregard for which may result in serious injury or death.	Indicates a potentially dangerous situation which may result in serious injury or damage to property.	Indicates a potentially dangerous situation which may result in minor injuries or damage to the property if ignored.	Indicates potential danger which can result in damage to the property.

Installation Personnel

The QRail system and these instructions are intended for use by qualified personnel. Qualified personnel are those who have skills, knowledge, and training in the installation of photovoltaic mounting systems necessary to follow these instructions in order to safely use the required tools and to carry out the required procedures.

Intended Use

The QRail system is intended for use only as a mounting system for photovoltaic panels and certain associated hardware and components. Any other usage or usage outside the intent or scope of these instructions is considered not as intended and may result in forfeiture of the system warranty. Please contact Quick Mount PV with any questions regarding these requirements.

General Safety Warnings



DANGER

Risk of fatal injury due to falling. Falling from the roof can result in serious injuries or death.

- Please wear and use proper protective equipment
- Secure yourself against falling
- Do not perform any work in strong winds



DANGER

Risk of fatal injury from falling objects. Parts falling from the roof can result in serious injuries or death.

- Before beginning the installation, please ensure that proper safety precautions are observed, only authorized personnel are permitted in and around the construction area and proper protective clothing and equipment are worn.



DANGER

Risk of injury from damage to roof excessive loads can severely damage the roof and cause injury.

- Before mounting and installation, please make sure that the buildings and especially the roof meet the increased structural requirements of the PV system and the installation operations.



CAUTION

Material damage due to incorrect installation. Incorrectly mounted QClick Clamps can slip out. PV modules can fall and be damaged.

- Mount all QClick Clamp connections in accordance with the instructions, the increased structural requirements of the PV system and the installation operations.

1.4 Regulatory Information

ANSI / UL 2703

The QRail system is ETL listed to UL 2703, Edition 1. Listing documents are available from the website: www.quickmountpv.com. For additional information, contact Quick Mount PV.

UL 2703 requires that listed PV systems be labeled to indicate their compliance with UL 2703.

The QRail system includes labels affixed to the QRail as shown in image 1.4.1.



Fire Class Resistance Rating (ANSI / UL 2703)

The QRail system is intended for roof mounting over a fire-resistant roof covering rated for the application. The QRail fire rating is valid for the following:

- Class A for Flush Mounted Steep Slope Applications when using Type 1 or Type 2, Listed Photovoltaic Modules w/o QSkirt
- Class A for Flush Mounted Steep Slope Applications when using Type 1 or Type 2, Listed Photovoltaic Modules w/ QSkirt
- Class A for Flush Mounted Low Slope Applications when using Type 1 or Type 2, Listed Photovoltaic Modules w/o QSkirt
- Class A for Flush Mounted Low Slope Applications when using Type 1 or Type 2, Listed Photovoltaic Modules w/ QSkirt
- Class A for 5° and above Tilt Mounted Low Slope Applications when using Type 1 or Type 2, Listed Photovoltaic Modules w/o QSkirt
- Class A for 5° and above Tilt Mounted Low Slope Applications when using Type 1 or Type 2, Listed Photovoltaic Modules w/ QSkirt

This fire class rating requires installation procedures, which are in compliance with the included instructions. The QRail system is intended for roof mounting over a fire-resistant roof covering rated for the application. The QRail fire rating is valid for all roof slopes for Flush Mounted Systems and roof slopes equal to or less than 7° (1½:12) for Tilt Mounted Systems. The fire class rating is valid for systems installed at any height above the roof deck, with or without optional skirt.

Grounding & Bonding (ANSI / UL 2703)

This racking system may be used to ground and/or mount a PV module complying with UL 1703 only when the specific module has been evaluated for grounding and/or mounting in compliance with the included instructions.

Mechanical Load Rating (ANSI / UL 2703)

The QRail system has been mechanically tested according to UL 2703 Edition 1 to the following load ratings:

- Downward Pressure: 10 PSF
- Upward Pressure: 5 PSF
- Down-Slope Load: 5 PSF

Marking (ANSI / UL 2703)

ANSI/UL 2703 require the presence of a label indicating the system Fire Class Rating or information directing the user to the appropriate information. The QRail Fire Class Rating label is located on each End Clamp as shown in Image 1.4.1.

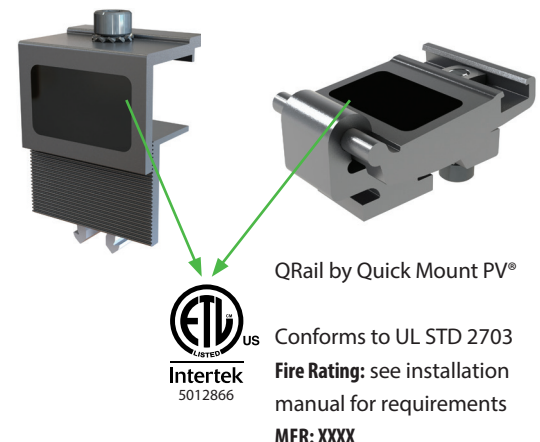


Image 1.4.1
QRail label placement

1.5 Safety

All generally applicable safety regulations for Quick Mount PV products can be viewed in the General Installation Manual. Please read this document carefully and adhere to the instructions and procedures therein – use the system only for its intended purpose and follow both the general and specific safety instructions. In addition, please observe the specific safety instructions which precede the process steps in the present product-specific Mounting Instructions.

Safety Ratings:

- Maximum 300 modules per ground lug
- Maximum size of modules: 22.31ft²
- Maximum system voltage is 1000 VDC
- Maximum Fuse Rating: 20A

2. Technical Description

2.1 System Overview

The following is an overview of the major QRail system components as shown in Image 2.1.1.

Note that the actual configuration of each individual system can vary depending on:

- Type of roof (substructure and roofing)
- Type of module
- Number of modules and configuration
- Local conditions

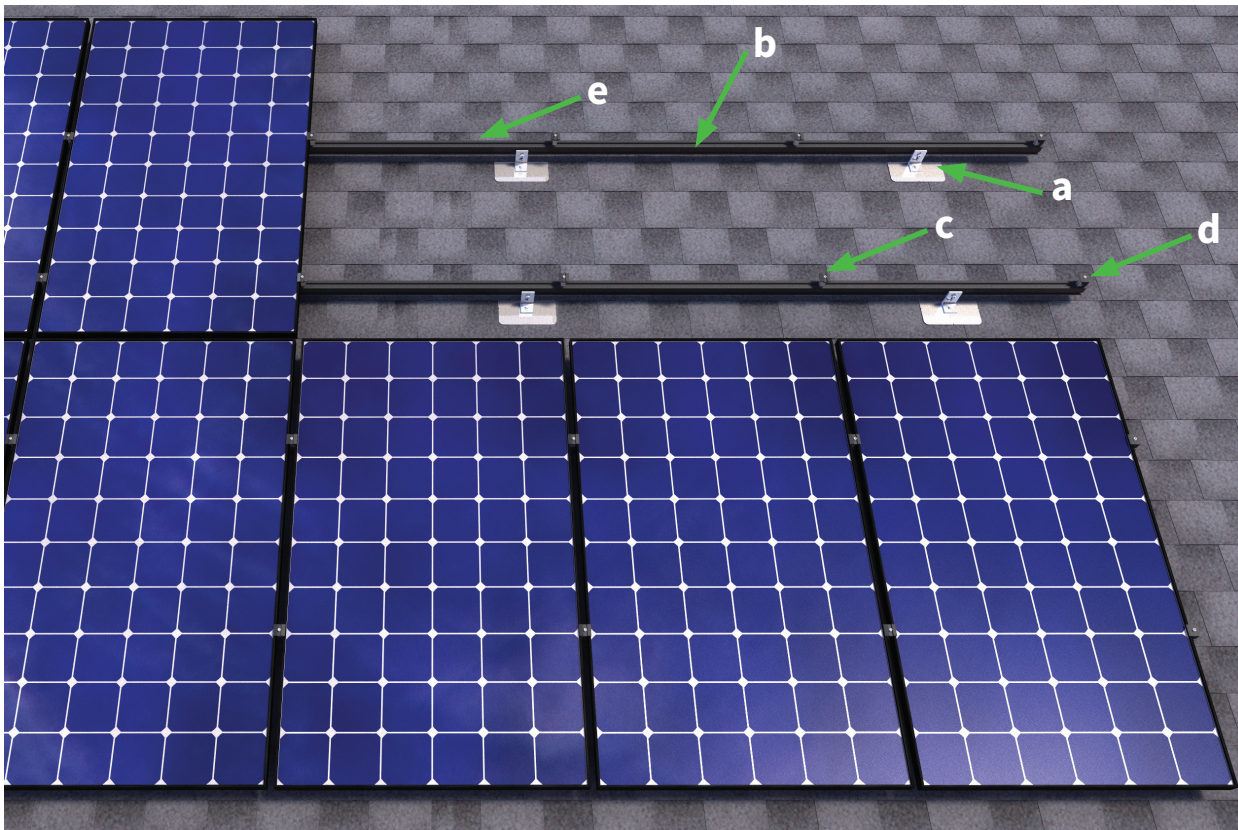
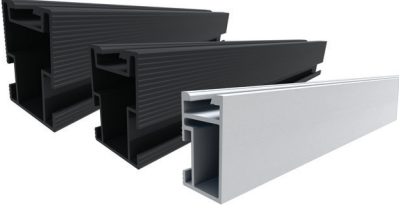

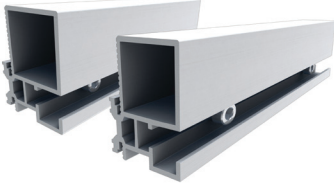





Image 2.1.1

- a** Roof attachment
- b** QRail
- c** Mid clamp
- d** End clamp
- e** Internal QSplice (not visible)

2.2 QRail System Components

Components	Product Rendering	Torque Value
<p>QRail options: Heavy in various lengths Standard in various lengths Light in various lengths Mill or Black finish</p>		
<p>Internal QSplice: For Heavy, Standard & Light QRail sizes</p>		
<p>External QSplice: For Heavy or Standard QRail sizes</p>		10 - 12ft-lbf/ 14-16N-m
<p>Fixed Size End Clamps w/ QClick Technology®: For modules from 31-50mm thick Available with optional WEEB bonding clip Mill or Black finish</p>		8ft-lbf/11N-m
<p>Universal End Clamps w/ QClick Technology®: 2 clamps for modules from 30-45mm or 38-50mm thick Available with optional WEEB bonding clip Mill or Black finish</p>		8ft-lbf/11N-m
<p>Hidden End Clamps</p>		9ft-lbf/12N-m
<p>Universal Bonding Mid Clamps w/ QClick Technology®: 2 clamps for modules from 30-45mm or 38-50mm thick Mill or Black finish</p>		12ft-lbf/16N-m
<p>End Cap options: For Heavy, Standard & Light QRail sizes Black finish</p>		

2.3 Technical Data

Application	Low and Steep Slope Roofs
Roofing type	Suitable for most types of roofing
Roof slope	Up to - 45° ¹ (upto 12:12)
Building height	Up to 60 ft / 18.25 m ¹
PV modules	Framed
Module orientation	Landscape or portrait
Size of module array	Any size possible ³
Position of the module array	No special requirements ²
Distance between roof attachment points	Up to 10 ft / 3 m ¹
Maximum Rail Cantilever	1/3 maximum allowable span for project ¹
Codes & Standards	IBC/IRC 2015 IBC/IRC 2012 ICC-AC428 2012 ASCE 7-05 ASCE 7-10 CBC/CRC 2016 ANSI/ UL 2703 Ed. 1 FBC/FRC 2017 Aluminum Design Manual 2010, 2015 SEAOC PV2
Supporting profiles	Extruded Aluminum
Small parts	Stainless steel
Color	Mill or Black finish
Warranty	25 years ³

¹ Different maximum values may apply, depending on site, building, choice of roof attachment and module type.

² The Quick Mount PV QDesign can be used to verify the structural adequacy of each specific project quickly and easily.

³ Limited product warranty. Download full warranty on www.quickmountpv.com.

2.4 System Electrical Bonding

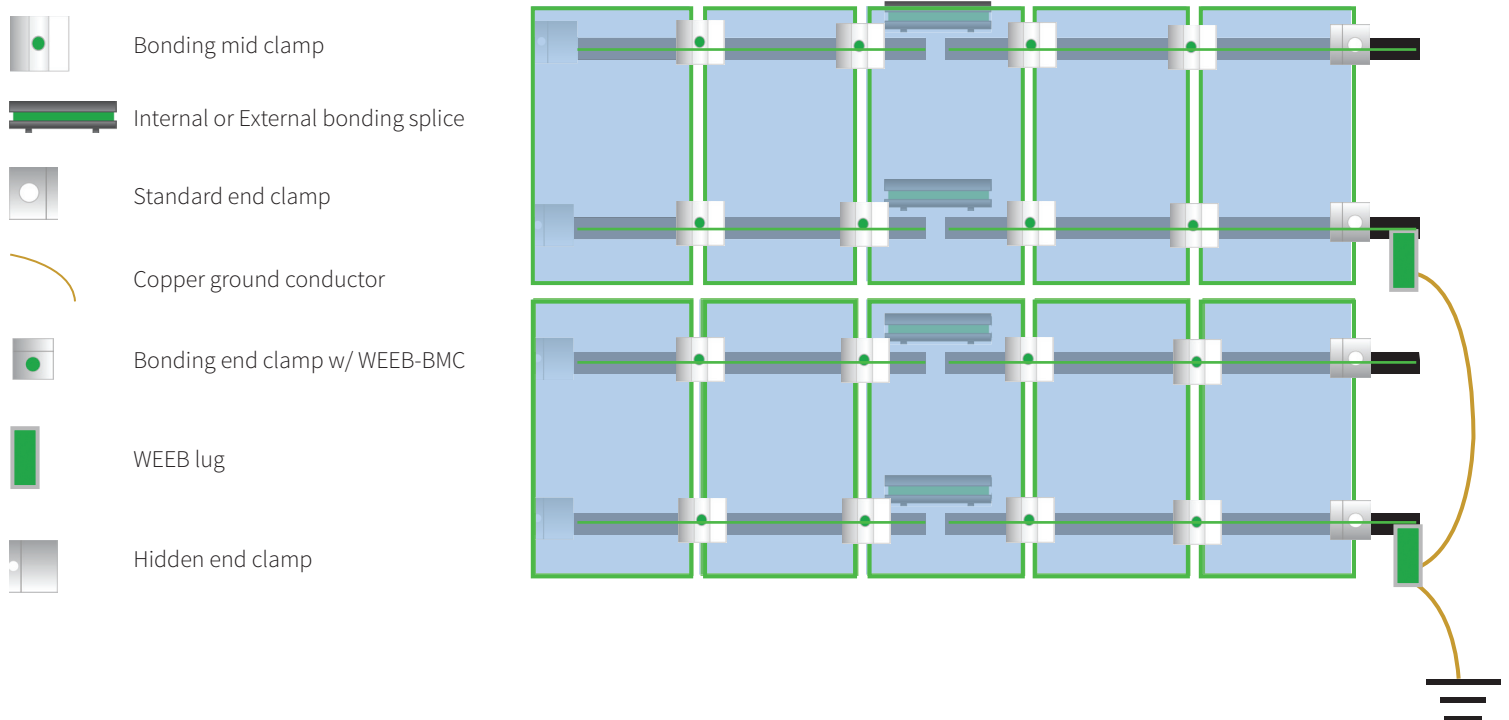
The QRail system, when properly assembled and installed, provides an integrated electrical bonding path, ensuring that all exposed metal parts and the PV module frames are electrically connected. The QRail employs a number of features to ensure reliable electrical connectivity.

Bonding and Fault Path

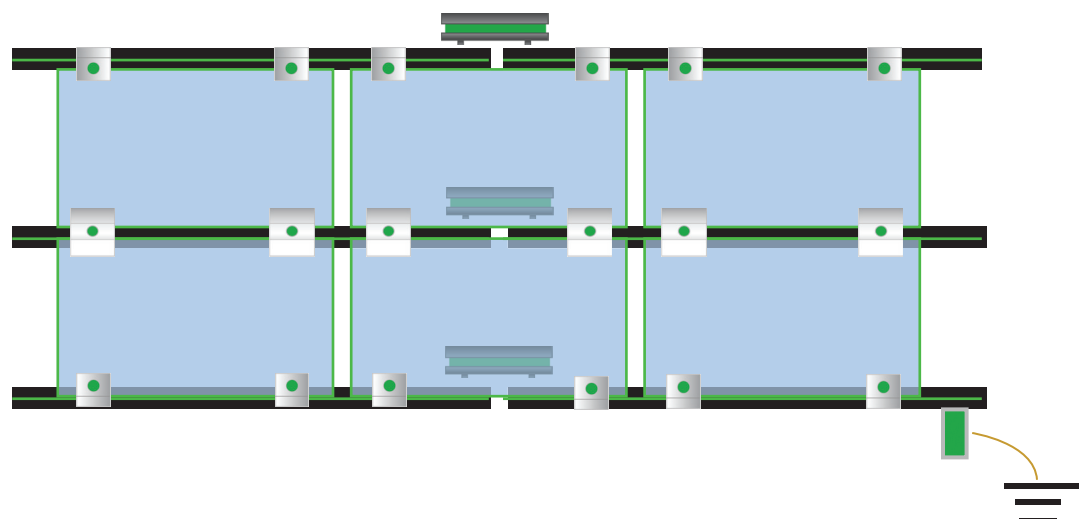
Images 2.4.2 and 2.4.3 show the available current path(s) in the QRail system for standard (2 or more rails per row of modules) and shared rail configurations, respectively.

Images 2.4.4 through 2.4.14 provide detail drawings of the labeled connection points.

2.4.2 Standard configuration bonding path (two rail system shown)



2.4.3 Shared configuration bonding path



Bonding with QClick Technology®

As shown in Image 2.4.4 and 2.4.5, the QRail Clamps with QClick Technology and rails are designed with complementary, sharp hooks. When the clamp is installed in the rail and the bolt is tightened, the bolt forces the hooks into the rail. Then, as the clamp engages the module and the bolt is tightened to the recommended torque specification [12 ft-lbf (16 N-m)], these hooks are pulled into the QClick channel and penetrate the aluminum oxide or painted coating on the rail and electrically bond to the rail, clamp, and bolt. A star washer under the bolt head serves to electrically bond the bolt to the body of the mid or end clamp, thus forming a secure electrical bonding path as shown in Image 2.4.6.

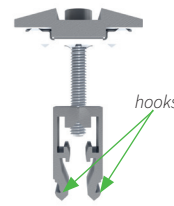


Image 2.4.4
Clamp hooks

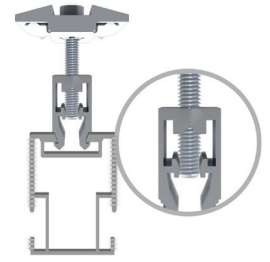


Image 2.4.5
Clamp hooks and rail



Image 2.4.6
Clamp bonding path

PV Module Bonding

PV module frames are electrically bonded to the QRail system by the bonding mid clamps. Bonding plate mid clamps are preassembled with a stainless steel plate below the clamp head. The stainless steel bonding plate is formed with spikes that pierce the oxide of the clamp head and the PV module, forming an electrical bond between the module, the clamp head, and thus to the rest of the QRail system. Bonding mid clamps are available in either mill or black finish.

Universal height end clamps are available with optional bonding clips (WEEB-BMC-1¹). Bonding versions of the end clamps are useful when mounting a single module or in shared rail configuration where bonding mid clamps are not utilized. The WEEB-BMC-1 works in the same way as the bonding plate.

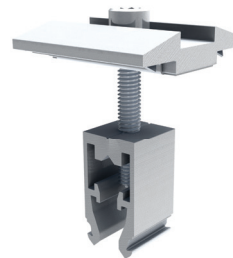


Image 2.4.7
Bonding plate mid clamp

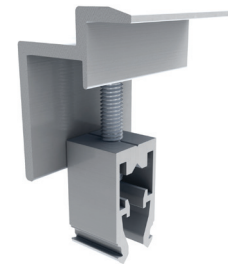


Image 2.4.8
Fixed end clamp

NOTE!

The installer is responsible for and shall 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 and NEC 690: Solar Photovoltaic Systems.

The QRail Hidden End Clamp is NOT a bonding solution and therefore cannot be used on single modules. It must always be installed in conjunction with at least one Bonding Mid Clamp.

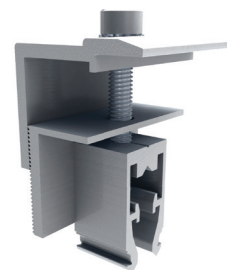


Image 2.4.9
Universal end clamp

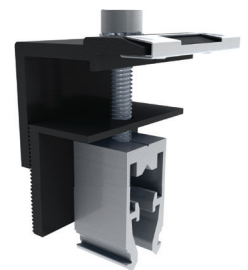


Image 2.4.10-1
Universal end clamp
w/WEEB-BMC

¹WEEB-BMC -1 is evaluated as an alternative component and maybe used interchangeably with a WEEB-BMC Bonding Clip.

Rail Bonding with Internal QSplice

All QRails can be spliced into longer units by means of the QRail Internal QSplice (Image 2.4.11). The bonding splice joins the two rail segments mechanically and electrically for the Heavy, Standard, and Light rails.

The Internal QSplice has a bonding plate that pierces any paint or aluminum oxide layer on the rails. This forms a electrical bind from rail-to-rail through the bonding plate. The splice body is electrically bonded through the bonding plate and the rivet that secures the bonding plate.

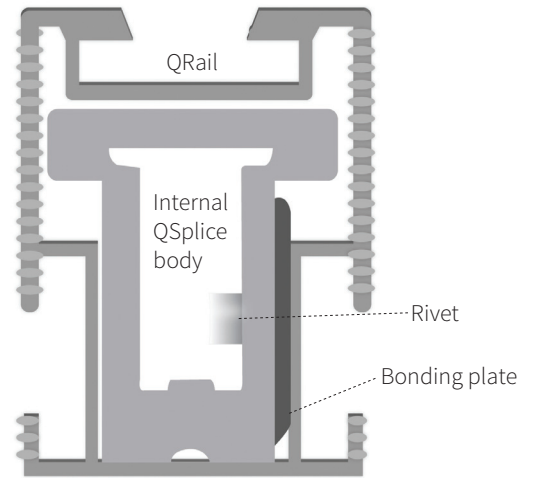


Image 2.4.11-1 QRail Internal QSplice

Rail Bonding with External QSplice

QRail Heavy and Standard rails can be spliced into a longer unit by means of the QRail External QSplice, (Image 2.4.10-2). The bonding splice joins the two rail segments mechanically and electrically.

The External QSplice uses two stainless steel bolts – one for each rail – which, when tightened to the specified torque of 10-12 ft-lbf, pierce any painted coating or aluminum oxide layer on the rails and embed in the rails being joined. This forms a conductive path from the rails through the bolt shafts, captive square nuts, and star washers into the splice body.

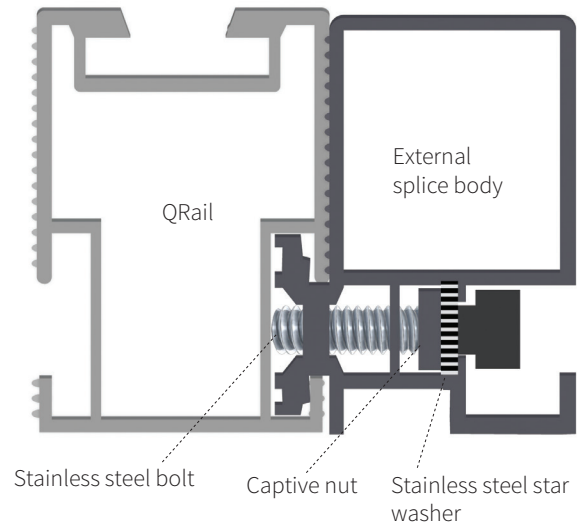


Image 2.4.10-2 QRail External QSplice

Roof Attachment Bonding

The QRail is attached to the roof by roof attachments with L-feet.

The connection from the attachment device to the rail is made via a stainless steel T-bolt and a stainless steel, serrated flange nut (Image 2.4.11-2).



Image 2.4.11-2
T-bolt

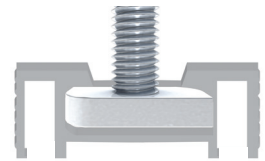
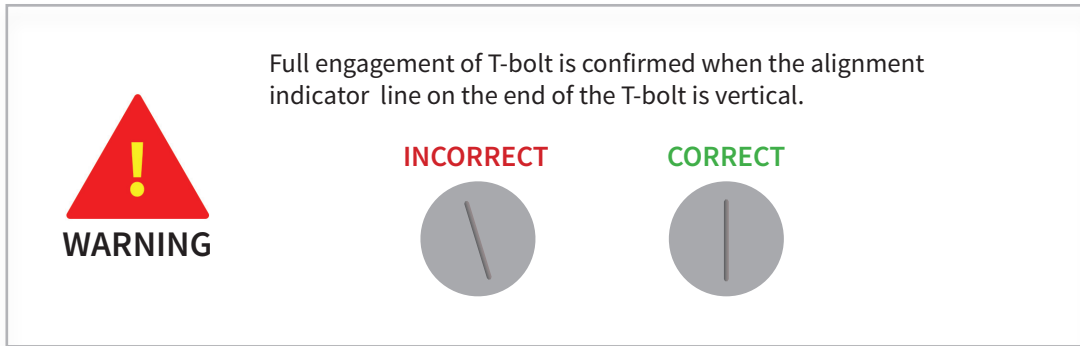


Image 2.4.12
T-bolt in QRail

Module Level Power Electronic (MLPE) or Accessory Bonding

The QRail is attached to a MLPE with the same stainless steel T-Bolt and stainless steel serrated flange nut used for the roof attachment. (Image 2.4.11-2). When secured to the rail [16 ft-lbf (22 N-m)]¹, the T-bolt crushes and pierces the aluminum oxide or paint and forms an electrical bond with the rail. The serrated flange nut pierces the coating on the MLPE bracket and forms an electrical bond that is carried through the T-Bolt to the rail.

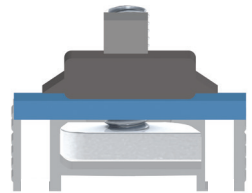
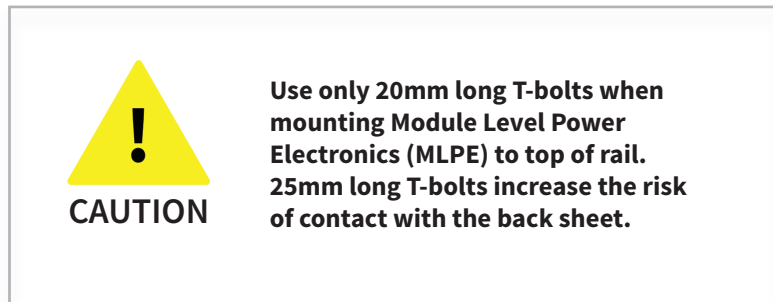


Image 2.4.13
T-bolt in QRail with MLPE installed



¹ If using non-nylon patched t-bolts tighten to 15 ft-lbf (22 N-m)

2.5 System Electrical Grounding

Array Grounding Lug

The QRail system is listed to UL 2703 with the Burndy/Wiley WEEB-Lug 8.0 as the means to connect the QRail array to the system ground electrode. It is the system installer's responsibility to determine the appropriate wire size for grounding the array.

To ease and facilitate the process of bonding and grounding the array, it is recommended that these steps are accomplished after the roof attachments and rails are in place prior to module installation. The Burndy WEEB-Lug 8.0 is a special, preassembled lay-in lug designed specifically for use in bonding the array segments (module rows) electrically and for connecting the bonded array to ground. The WEEB-Lug 8.0 is shown in Image 2.5.2:

- a Lug
- b WEEB 8.0
- c Wire capture bolt
- d M8x20 T-head bolt
- e M8 serrated flange nut

When the PV modules are properly installed, the QRail QClick bonding clamps ensure that all the exposed metal parts and the module frames in each module row or array segment are integrally electrically connected (bonded) with a high-ampacity bond. Each module row must also be connected to ground through the system ground electrode. This is accomplished by using WEEB-Lugs to bond each of the array segments or module rows together and for connecting the entire array to the ground electrode. This arrangement is shown in Image 2.5.3.

It is the installer's responsibility to determine the correct wire type, size, and temperature rating for the particular array. The wire sizes and capacities, which can be accommodated by the WEEB-Lug 8.0, are shown in Table 2.5.1 on the next page.

NOTE!

The QRail QSplices have been evaluated and listed to UL 2703; therefore, a spliced rail can be treated as a single solid rail. Additional WEEB-Lugs or bonding jumpers are not required for spliced rails.

When using a WEEB-Lug 8.2 see our Supplemental for info on www.quickmountpv.com



Image 2.5.1
WEEB Lug 8.0

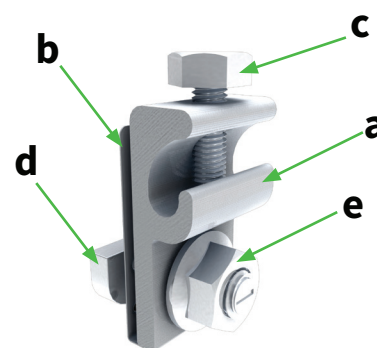


Image 2.5.2
WEEB Lug 8.0 components

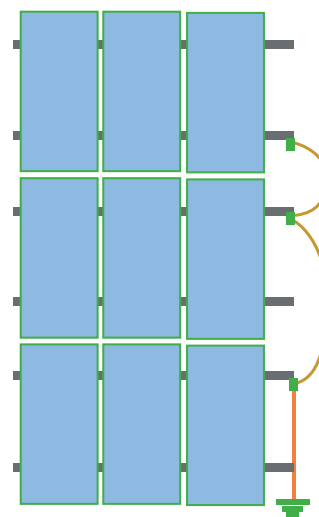


Image 2.5.3
Array bonding connections at each module row

WEEB-Lug Installation

The QRail WEEB-Lug 8.0 is preassembled with a M8-T-bolt, serrated flange nut, and a WEEB bonding plate. The lug is installed in the side channel of the QRail rail.

- Insert T-head bolt head into the rail's side channel. Be sure to allow the bolt head to rotate as far as possible in the T-bolt channel to ensure full engagement of the bolt head with the sides of the channel.
- Ensure WEEB washer is aligned with lug body and that lug body makes full contact with rail. Tighten nut finger tight to hold lug and WEEB in place
- Tighten M8 nut to 16 ft-lbf (22 N-m)¹

Using the above procedure, install a WEEB-Lug on each segment of the array. Once all the WEEB-Lugs are installed, use a continuous length of wire to connect each rail by laying wire in the lug wire channel and secure with the wire capture bolt. Torque to 7 ft-lbf (10 N-m).

Array Grounding

The bonded array segments must be connected to the system ground electrode using a single continuous copper wire. This is achieved by routing the grounding cable through the WEEB Lugs on each array segment. (Image 2.5.6)

AWG Wire Size	WEEB- Lug 8.0 Capacity
14 - 6	1 wire
10	2 wires
12	2 wires

Table 2.5.1
WEEB-Lug 8.0 wire capacity

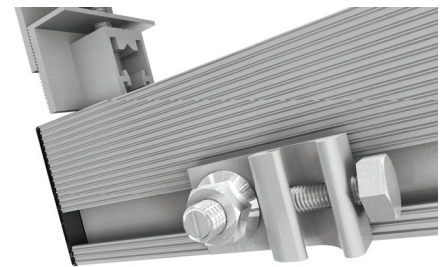


Image 2.5.4
WEEB-Lug 8.0 installed

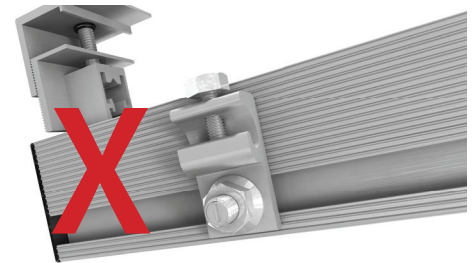


Image 2.5.5
WEEB-Lug 8.0 *incorrectly* installed



ATTENTION

Galvanic Reaction

When dissimilar metals come into contact, it is possible that they will react with each other and cause corrosion in one or both of the metal surfaces. Aluminum and copper are particularly reactive with each other; care must be taken to prevent any contact between aluminum components and bare copper wire (Image 2.5.6).

NOTE!

The WEEB Lug 8.0 can only be reused five times. When uninstalled and reinstalled, it must be moved to a new location.

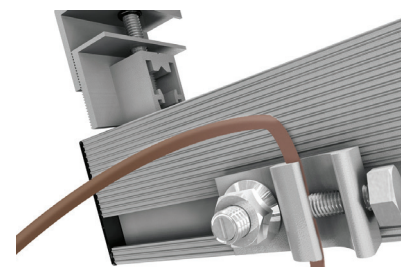


Image 2.5.6
Copper wire in WEEB-Lug

¹ If using non-nylon patched t-bolts tighten to 15 ft-lbf (20 N-m)

3. Important Installation Information

3.1 Conditions of Use

The QRail on-roof system is available with different rail and roof attachment types designed in accordance to and/or compliance with the following codes and standards:

- IBC/IRC 2015
- IBC/IRC 2012
- ICC-AC428 2012
- ASCE 7-05
- ASCE 7-10
- CBC/CRC 2016
- ANSI/ UL 2703 Ed. 1
- FBC/FRC 2017
- Aluminum Design Manual 2010, 2015
- SEAOC PV2



Risk of injury from damage to roof, Excessive loads can severely damage the roof and cause injury.

- Before mounting and installation, please make sure that the building and especially the roofing meet the increased structural requirements of the PV system and the installation operations.



Risk of fatal injury from falling objects. Parts falling from the roof can result in serious injuries or death.

- Before beginning the installation, please ensure that proper safety precautions are observed, that only authorized personnel are permitted in and around the construction area, and that proper protective clothing and equipment are worn.

The design of each system should be verified, e.g. by means of the QDesign tool or an independent Professional Engineer. Please observe the constraints listed in Section 2.3, “Technical Data.”

3.2 Mounting Preparation

Quick Mount PV recommends you ascertain the local conditions and requirements before ordering the QRail. In particular, acquaint yourself with:

- The roof structure and any irregularities
- Dimensions, material, quality, and spacing of the rafters
- Type, quality, and attachment method of the roofing.

3.3 Mounting Aids and Required Tools

In addition to standard hand tools, you will need the following tools:

- 5 mm Allen key / 5 mm Allen key power driver
- 13 mm hex socket / 13 mm box or open-end wrench
- 7/16" (11mm) box end wrench
- Drill driver
- Metric socket set
- Torque wrench
- Reciprocating saw and/or band saw
- Chalk line
- Spirit level
- Tape measure

Please adhere to the mounting steps listed and be sure to follow the safety instructions. DO NOT use an impact gun.



3.4 Fastener Torque Settings

Proper torque is important to a safe and secure installation. Please refer to Section 2.2 QRail Components for recommended torque values for the various fasteners in the QRail system. Unless specifically directed otherwise, these values should be used for all metal-to-metal attachments.

4. Planning the Module Area

For installation, the QRails are fastened to the building structure with roof attachments (e.g. flashed roof attachments). The roof attachments must be mounted at defined distances, depending on the spacing of the supporting structure, the position on the roof, and the site conditions. The layout should be verified using the QDesign tool or a project-related structural analysis by a qualified professional.

a Height of the module field: Number of modules vertically x module length (+ any clearances)

b Width of the module array:
 Using standard end clamps : Number of modules horizontally x (module width + .75in) + 2.4in. /61mm.
 Using hidden end clamp: Number of modules horizontally x (module width + .75in).

c Vertical spacing of the base rails: Refer to module manufacturer’s acceptable clamping zones or mounting point locations.

d Horizontal attachment point spacing: Dependent upon roof attachment method and site-specific parameters.

e Distance between the modules = 0.75 in.

f Distance between module rows = 0.75 in. minimum, no maximum distance provided gap does not result in snow damming

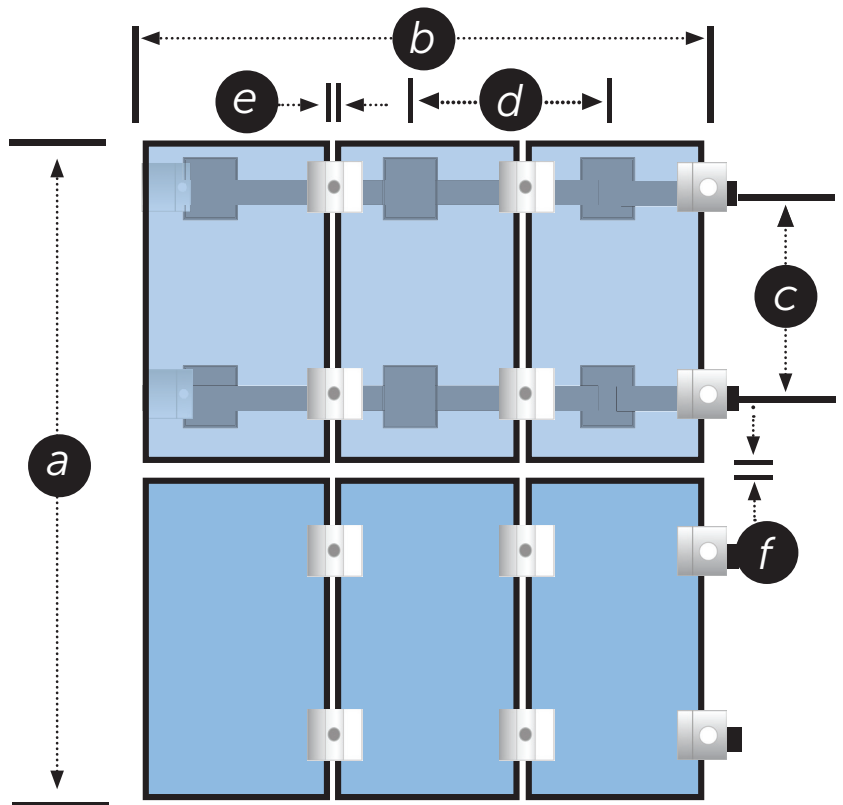


Image 4.1
Module Area



DANGER

Risk of fatal injury due to falling. Falling from the roof can result in serious injuries or death.

- Please wear and use proper protective equipment.
- Secure yourself against falling.
- Do not perform any work in strong winds.

Risk of fatal injury from falling objects. Parts falling from the roof can result in serious injuries or death.

- Block off the hazard area on the ground prior to beginning work to prevent falling objects injuring persons.
- Ensure that no parts can fall off the roof.
- Please wear required protective equipment.
- Do not linger in the hazard area.
- After completion of the installation, re-check area for loose objects and re-check for proper attachment of racking and modules.



DANGER

5. Installation of Roof Attachments and QRails

The roof attachments are attached to the roof structure and support the QRails. The permissible distance between the roof fasteners depends on several factors and must be calculated specifically for each project, e.g. with the QDesign Tool. Roof attachments are available for a wide variety of roof types. In many cases, additional items may be required to accomplish flashing or other weather sealing. Suitable products are available from a number of sources. It is the responsibility of the installer to select the appropriate products and to install them correctly.

5.1 Select QRail Configuration

Standard Rail Configuration

Image 5.1.1 shows a typical standard rail configuration. In this configuration, a row of modules is supported by two rails under each row of modules. In areas with exceptionally high snow loads it may be necessary to support the modules with three rails.

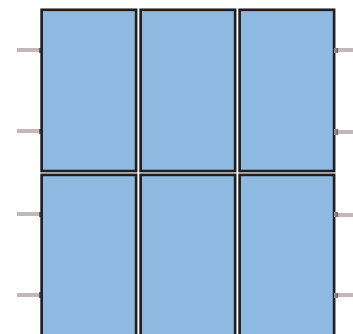


Image 5.1.1
Two-rail configuration

Shared Rail Configuration

The rail design of the QRail system allows the use of shared configurations for the Standard and Heavy rails with standard mid and end clamps. In this configuration, a single rail supports two rows of modules as shown in Image 5.1.2. Shared rails may be used for both landscape and portrait array configurations.

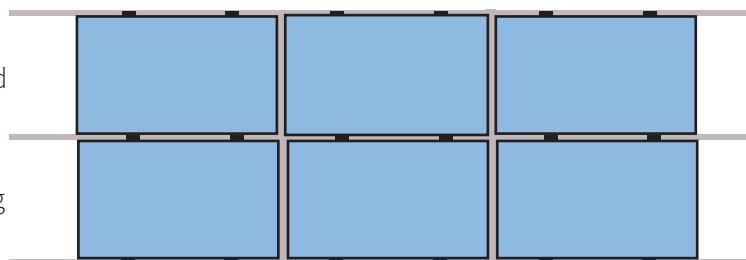


Image 5.1.2
Shared rail configuration

Modified Shared Rail Configuration

Modified shared rail configuration is a hybrid of standard and shared rail configurations. The first and last rail are set back from the end of the modules in standard module clamping zones to provide additional adjustability while the remaining rails are in shared rail configuration. This configuration maintains the benefits of shared rail configuration using the same clamps, 25% less rails, and full array bonding. May be used for both landscape and portrait module orientations.

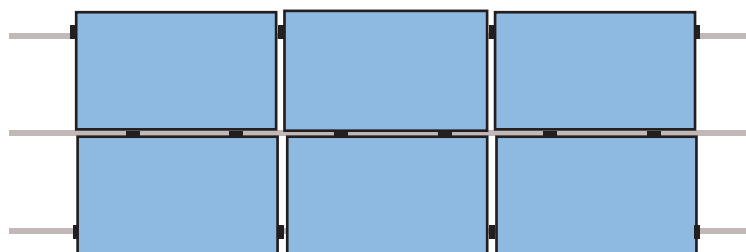


Image 5.1.3
Modified shared rail configuration

NOTE!

When selecting QRail configuration, insure the modules have the appropriate ratings for the project site conditions in the selected configuration. Check the module installation manual to determine if the clamping area falls within the acceptable range for the project design loads.

Precise rail positioning and alignment is critical when installing shared rail systems. Roof attachments which are adjustable in the N-S direction are recommended when installing shared rail systems.

5.2 QRail Preparation

The QRail external and internal QSplices are used to join two rail sections to provide a single rail section of a desired length.

External QSplice Installation

- For the Heavy or Standard rails, join the rail sections together by sliding the QSplice onto the end of the rail, leaving half the length of the splice protruding from the end of the rail.
- Tighten the splice bolt onto the rail end. Tighten to 12 ft-lbf (16 N-m).
- Slide the other rail onto the splice and tighten the splice bolt to 12 ft-lbf 16N-m).

NOTE!

The QRail Internal and External QSplices are a “full-strength” splice. Once it is installed and tightened to the recommended torque specification, it forms an essentially unbroken rail.

It may speed installation to splice rails on the ground and transport them to the roof in one piece for installation on the roof attachments.

To allow for thermal expansion/contraction, spliced rail lengths should not exceed 45 feet without a thermal break of 1/2 in. or more. Do not install modules over this thermal break.



DANGER

The outside edge of the QClick must be installed at least 1/2" from end or rail at a splice location.



CAUTION

Spliced rails must have more than one support on both sides of the splice. Splices cannot be used in cantilever areas.

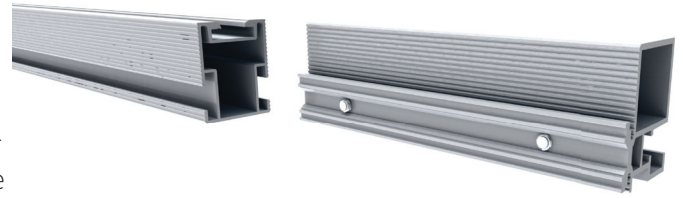


Image 5.2.1



Image 5.2.2

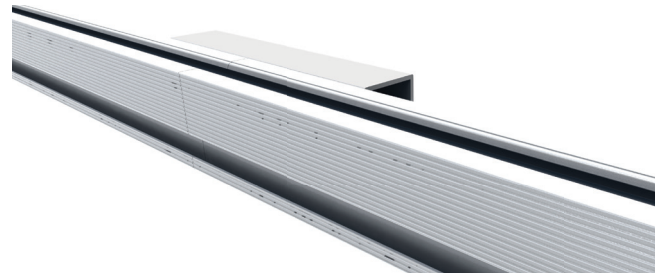


Image 5.2.3

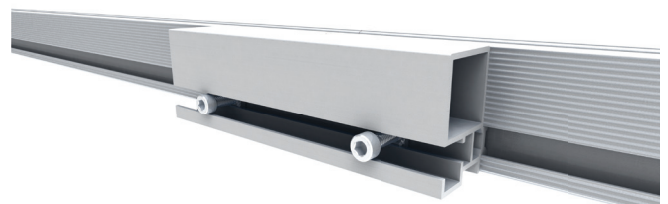


Image 5.2.4

Internal QSplice Installation

- The internal QSplice is a floating splice, no attachments necessary.
- To join any rail using the Internal QSplice, join the rail sections by sliding the splice into the end of the rail until the rivet head comes into contact with the end of the rail.
- Slide the other rail onto the splice until the end of the rail comes into contact with the rivet head.
- When re-installing the QRail Internal QSplices, insert the splice backwards for optimal performance.

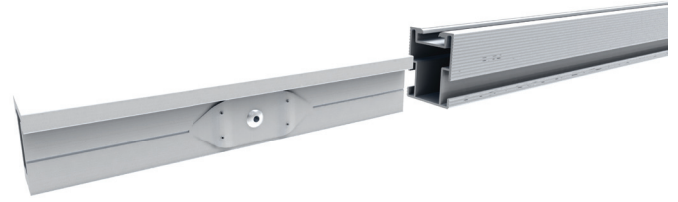


Image 5.2.6

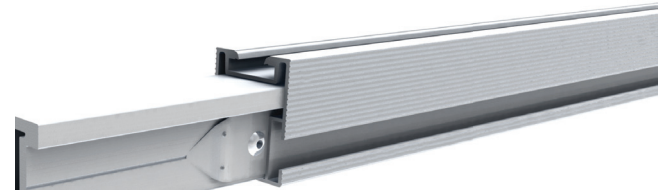


Image 5.2.7

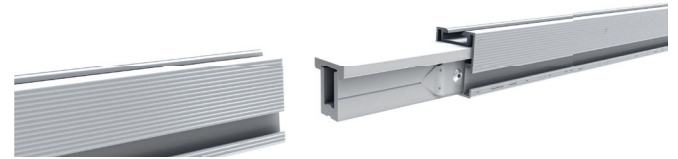


Image 5.2.8

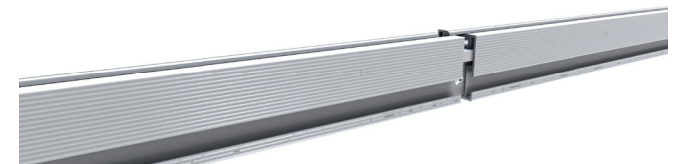


Image 5.2.9

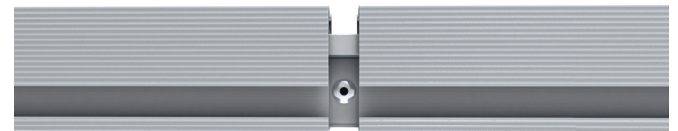


Image 5.2.10

NOTE!

To allow for thermal expansion/contraction, spliced rail lengths should not exceed 45 feet without a thermal break of 1/2 in. or more. Do not install modules over this thermal break.



DANGER

The outside edge of the QClick must be installed at least 1/2" from end or rail at a splice location.



CAUTION

Spliced rails must have more than one support on both sides of the splice. Splices cannot be used in cantilever areas.

Thermal Break

In cases where a thermal break is necessary it is recommended to use the splices in conjunction with the Wiley WEEB-BNDJMP8.0 to insure continuous bonding across the thermal break.

Internal Splice:

- Install the internal splice 1" of gap between the rails.
- After installing the rails install the WEEB-BNDJMP8.0 across the gap with T-bolts. Insure a loop is left to allow for thermal expansion and contraction and torque T-bolts to 16 ft-lbs¹.

External Splice:

- Install the external splice while leaving a gap of 1" between rails. Tighten only ONE bolt on the splice to allow for thermal expansion and contraction.
- After installing the rails install the WEEB-BNDJMP8.0 on the opposite side across the gap with T-bolts. Insure a loop is left to allow for thermal expansion and contraction and torque T-bolts to 16 ft-lbs¹.

NOTE!

Align module a minimum of 1.2" from the end of the rail.



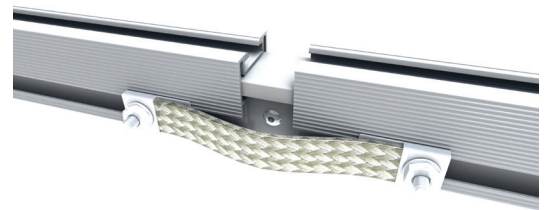
CAUTION

Modules cannot be installed over thermal break. The row of continuous modules must end before the break and a new row must start after the thermal break.

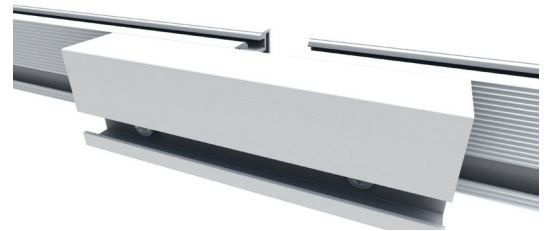
¹ If using non-nylon patched t-bolts tighten to 15 ft-lbf (20 N-m)



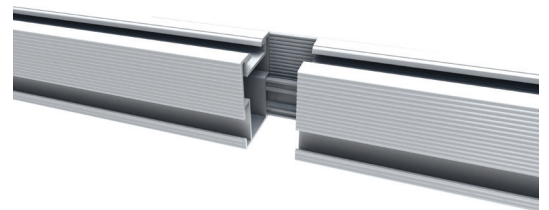
Images 5.2.11
1" thermal break with Internal QSplice



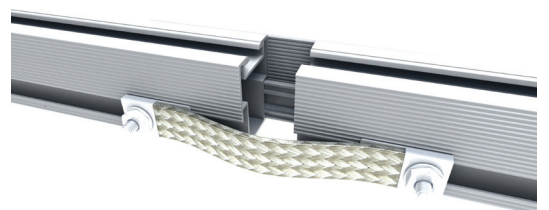
Images 5.2.12
WEEB-BNDJMP8.0 installed with Internal QSplice



Images 5.2.13
1" thermal break with External QSplice



Images 5.2.14
Tighten only ONE bolt on the splice



Images 5.2.15
WEEB-BNDJMP8.0 installed with External QSplice

5.3 QRail Installation on Roof-top

Installation of the QRail system on most roof-types requires that any penetrations of the roof surface be flashed in accordance with the appropriate local codes and roofing best practices.

Installing Two-Rail Configuration

- After determining the location of the array on the roof, mark the rail locations with chalk lines or other suitable method.
- Determine the rafter locations and mark them on the E-W chalk lines.
- For standard rail configuration installations, install roof attachments per the mount manufacturer's instructions.
- Install the roof attachments along the chalk line per the manufacturer's instructions taking care to align the L-foot mounting point (mount bolt) as closely as possible to the intersection of the rafter and the chalk line.
- Loosely install the T-bolts on the L-foot with the T-bolt facing the ridge of the roof. The L-feet may be aligned with the base of the "L" facing north or south.
- Position the rail in place E-W and hold each end of the rail against the end L-feet. Insert the preassembled T-bolt rail fasteners in the end L-feet into the slot on the side of the QRail. Using a spirit level or other suitable device, set and hold the rail level at the desired height by moving the T-bolt up or down in the L-foot.
- Using a 13 mm socket, tighten the rail fastener nuts to 16 ft-lbf (22 N-m)¹. Be sure to allow the bolt head to rotate as far as possible in the T-bolt channel to ensure full engagement of the bolt head with the sides of the channel. **Full engagement is confirmed when the alignment line on the end of the T-bolt is vertical.**
- Proceed along the line of L-feet, inserting the T-bolts and tightening as above.
- Position the rail and L-feet N-S and secure the L-feet to the mount according to the mount manufacturer's instructions.
- Repeat the above steps for each rail in the array.

INCORRECT



CORRECT



NOTE!

Where site conditions and safety considerations allow, it may speed and simplify the installation to splice rails on the ground then transport them to the roof.

If rails are to be spliced, the splice should be installed prior to installing the rails onto the L-feet or other roof attachments. See Section 5.2 for rail splicing instructions.



DANGER

Rail must be installed so the mount is fully engaged (edge of rail line to line with edge of mount) and maintain a minimum of 3/4" from the end of the rail to center of T-bolt.

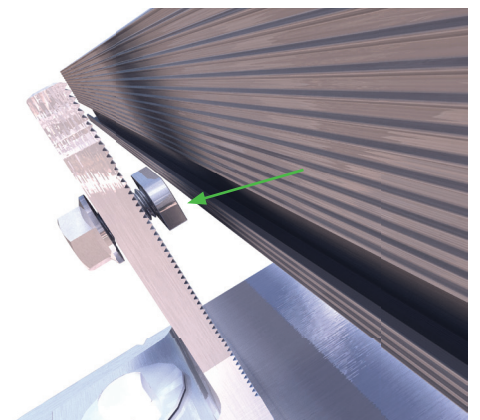


Image 5.3.2

T-bolt correctly positioned for insertion

¹ If using non-nylon patched t-bolts tighten to 15 ft-lbf (20 N-m)

Installing Shared QRail Configuration

Optional gauge fabrication:

- Fabricate an installation gauge by laying two rails on a flat surface. Lay one of the modules on the rails as shown. Be sure the rails are parallel with the edges of the module and with each other.
- Carefully measure distance “a” as shown in Image 5.3.3. This is the critical N-S distance between L-foot rail attachment points for shared rails. Carefully cut a dowel, PVC pipe, or other rigid length of material to distance “a.”

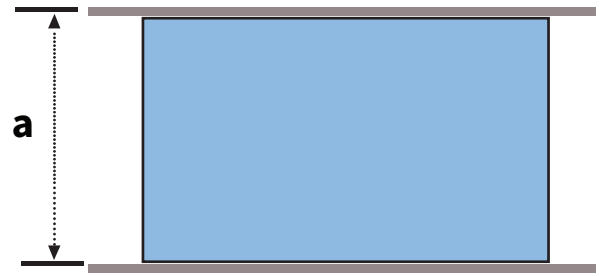


Image 5.3.3
Shared rail distance gauge

Array Installation:

- After determining the location of the array on the roof, mark the location of the lower rail with a chalk line or other suitable method.
- Determine the rafter locations and mark them on the E-W chalk lines.
- Install the roof attachments along the chalk line per the manufacturers’ instructions taking care to align the L-foot mounting point (mount bolt) as closely as possible to the intersection of the rafter and the chalk line.
- Install and tighten the L-feet on the two end mounting/ flashings taking care to place the upright stays of the L-feet as closely aligned with the marked line as possible with the faces of the stays as closely parallel to the line as possible.
- Stretch a reference string between the end L-feet and attach the remaining L-feet with the upright stays just touching the reference string and secure them in position.
- Using the gauge fabricated earlier or using a measuring tape or other suitable method, locate and mark the positions of the remaining rows of the array.
- Install the remaining mounting/ flashings and L-feet and check frequently to ensure proper N-S spacing of the upright surfaces of the L-foot stays with the distance gauge.
- Position the rail in place E-W and hold each end of the rail against the end L-feet. Insert the preassembled T-head rail fasteners in the end L-feet into the slot on the side of the QRail rail. Using a spirit level or other suitable device, set and hold the rail level at the desired height by moving the T-head bolt up or down in the L-foot. See Image 5.3.4.
- Using a 13 mm socket, tighten the rail fastener nuts to 16 ft-lbf (22 N-m)¹. (Be sure to allow the bolt head to rotate as far as possible in the T-head channel to ensure full engagement of the bolt head with the sides of the channel). **Full engagement is confirmed when the alignment line on the end of the T-bolt is vertical.** See Image 5.3.5.

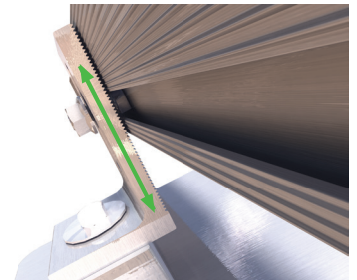
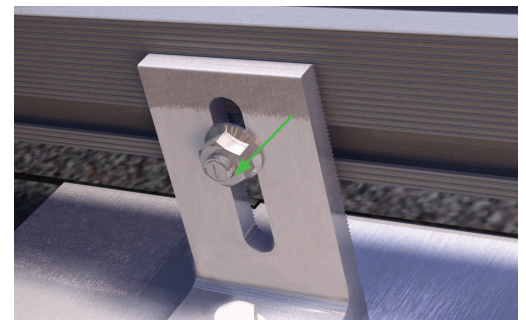


Image 5.3.4



INCORRECT

CORRECT



Image 5.3.5

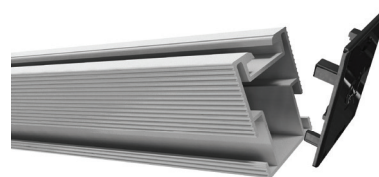
- With each end of the rail secured and the rail level, proceed along the line of L-feet, inserting the T-head bolts into the rail side channel and tightening as above.

¹ If using non-nylon patched t-bolts tighten to 15 ft-lbf (20 N-m)

- At this point, it is recommended to install the rail at the opposite side of the array and level it at both ends with respect to the first rail. That is, if the lower-most rail was installed first, the uppermost rail should be installed second and leveled N-S with the first rail and E-W.
- Stretch strings from each corner of the upper and lower rails.
- Position the next rail and attach it as described above, leveling it both E-W and N-S using the strings installed above as reference.
- Repeat the above steps for each rail in the array.

5.4 End Caps

End caps are installed either by simply inserting them into the ends of the rails. See Images 5.6.1-1 & 2.



1



2

Images 5.6.1-1 & 2
End cap installation

6. Module Installation

6.1 Module Level Power Electronic Installation

If module level power electronics (MLPE) are to be used with the array and mounted on the rails, they should be installed prior to installing the PV modules. There are two methods for attaching these components, either the Rail / MLPE Attachment or the Rail/ Low Mount MLPE Attachment. The two options should be selected by the installer based on site conditions, panel clearance, and system configuration.

Rail / MLPE Attachment Installation:

- Insert the T-bolt and flanged nut through the mounting flange of the device to be mounted to the QRail with the T-bolt below the mounting flange.
- Insert T-head into the top channel of the QRail rail and, using a 13 mm wrench or socket, tighten the nut to 15 ft-lbf (20 N-m).

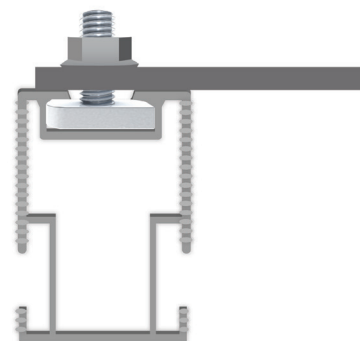


Image 6.1.1
Rail/MLPE Attachment

Rail/ Low Mount MLPE Attachment Installation:

- Insert the T-bolt on the base of the L-Foot into the downslope channel of the QRail Rail and tighten nut to a torque of 16 ft-lbf (22 N-m)
- Install the provided hex bolt into the mounting flange of the device and slot in the L-Foot, Bolt facing downward, then install the provided flange nut and torque to 16 ft-lbf (22 N-m)

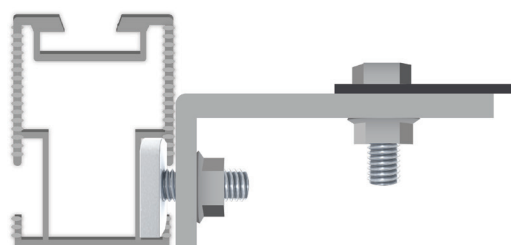


Image 6.1.2
Rail/Low MLPE Adapter



CAUTION

Use only 20mm long T-bolts when mounting Module Level Power Electronics (MLPE) to top of rail. 25mm long T-bolts increase the risk of contact with the back sheet.

¹ If using non-nylon patched t-bolts tighten to 15 ft-lbf (20 N-m)

6.2 Installing Clamps w/ QClick Technology®

Quick Mount PV's patented QClick Technology is a special clip with which the module clamps are fastened in the QRail. You need only a 5mm Allen key for the installation. The QClick is inserted from above into the top channel of the QRail.

Installation Steps:

- Insert the QClick at a slight angle into the rail channel.
- While holding it firmly in place, rock the QClick upright until it clicks into place.

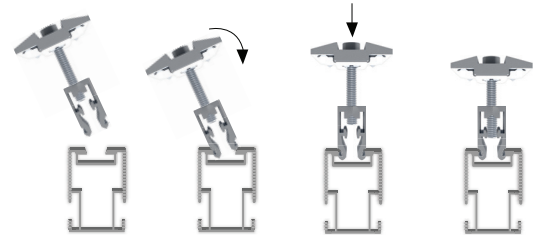


Image 6.2.1
Installation of clamps w/ QClick Technology

Removing the Clamps w/ QClick:

Spreaders on the inside of the QClick are designed so that once the bolt of the clamp has been tightened, the QClick cannot unlatch from the rail.

To remove a QClick, first unscrew the bolt so that it is clear of the spreaders then, with pressure on the QClick "legs," rock the QClick to unlatch it from the rail and lift it out.

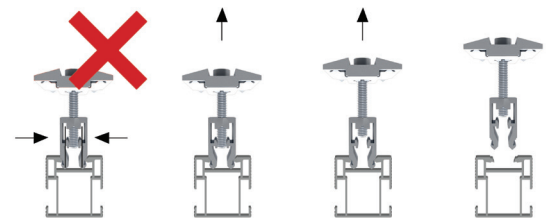


Image 6.2.2
Removing clamps w/ QClick Technology

Moving the Clamps w/ QClick:

The shape of the QClick corresponds exactly to the profile of the rail channel. It's been deliberately designed not to slide easily in order to prevent unintentional slipping in vertical rail installations. To move the QClick, loosen the bolt of the clamp so that it is not contacting the spreaders in the QClick body. Then, while pressing lightly on the bolt, squeeze the QClick legs together and slide the QClick along the channel.

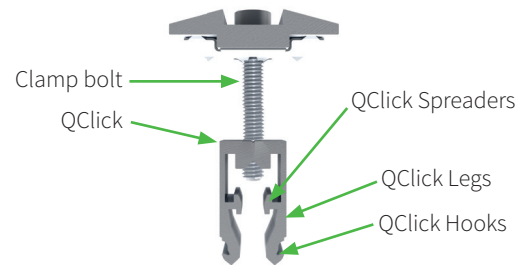


Image 6.2.3
QClick Components



DANGER

The outside edge of the QClick must be installed at least ½" from end or rail at a splice location.



CAUTION

Material damage caused by deformed QClicks

If clearly deformed QClicks are used, the safety of the module attachment is not assured. PV modules can fall and be damaged. Use only QClick where the legs are parallel to each other and you can clearly hear them clicking into the rail channel. Replace the deformed QClick prior to installation.

6.3 Installing the End Modules

The end modules of the PV system are fastened on the outer side with two module end clamps each. Three types of module end clamps are available from Quick Mount PV. Fixed end clamps are sized to fit a particular module thickness and will not work on modules of other thicknesses. Hidden end clamps will work on any module with a flange in the acceptable clamping zone. Universal end clamps are designed to fit 2 ranges of module thicknesses. Universal end clamps are available in the following size ranges:

- 30-45mm
- 38-50mm

Mounting Steps, Fixed Height End Clamps:

- Place and align an outside module. The QRail must extend beyond the module frame by a minimum of 1.2 in.
- Insert the QClick of the end clamp into the channel of the QRail.
- Push the module end clamp flush to the module frame.
- Tighten the bolt to 8 ft-Lb (11 Nm), thus clamping the module.

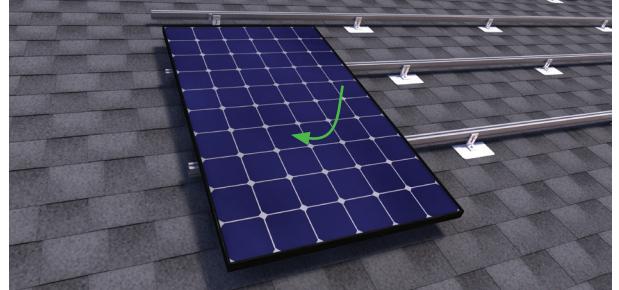


Image 6.3.1

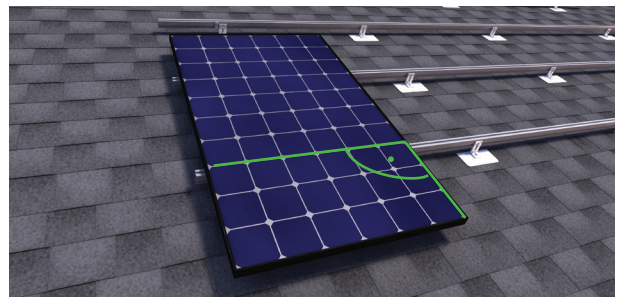
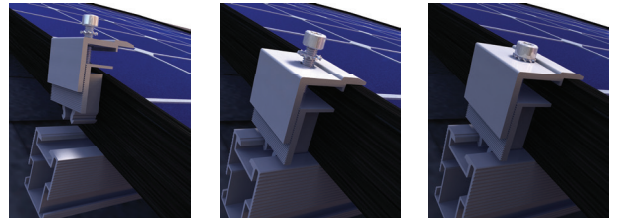


Image 6.3.2

Mounting steps, Universal End Clamps:

- Place and align an outside module. The QRail must extend beyond the module frame by 1.2 in. (30 mm).
- Insert the QClick of the end clamp flush against the module frame. The lip of the upper clamp body should be flush against the edge of the module.
- Ensure that the lower section of the clamp body sits squarely on the top of the rail.
- While holding the upper clamp body against the module and the lower clamp body, tighten the clamp bolt to 8 ft-lbf (11 N-m).



1 2 3

Image 6.3.3
End Clamp installation



DANGER

Material damage due to incorrect installation

Incorrectly mounted clamps with QClick Technology can slip out. PV modules can fall and be damaged. Mount all clamp connections in accordance with the instructions.

- Make sure the clamps are installed correctly.
- Ensure the module is installed flush and tight against the side of the end clamp.
- Ensure proper torque of the end clamp mounting bolt 8 ft-lbf (11 N-m) or 9ft-lbf for hidden end clamps.

Mounting Steps, Hidden End Clamps:

- After installation of rails and prior to installation of the modules slide the Hidden End Clamp into both sides approximately 4 inches from the end of the rail. See Image 6.3.4
- Install first module insuring the module frame is flush with the end of the rails. See Image 6.3.5
- Slide Hidden End Clamp over until it fully engages with the module flange. See Image 6.3.6
- Tighten Hidden End Clamp bolt to 9 ft-lbs (Using Ratchet or right angel tool). See Image 6.3.7
- At end of module row place final module in place (Do not tighten mid clamps) and mark the edge of the module on the rail and pick up module.
- Cut Rail at the marked location
- Replace module and tighten Mid Clamps
- Slide final Hidden End Clamp over to fully engage flange of the module
- Tighten Hidden End Clamp Bolt to 9 ft-lbs (Using ratchet or right angle tool)
- Place End Caps onto rails

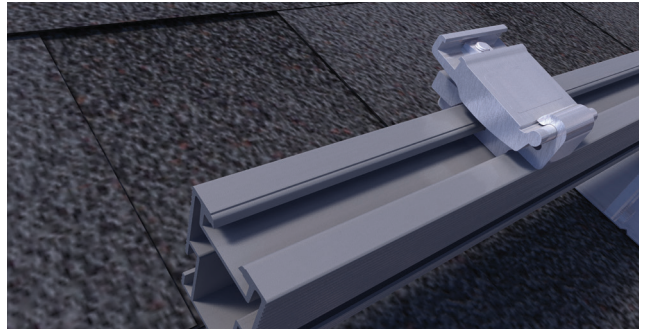


Image 6.3.4

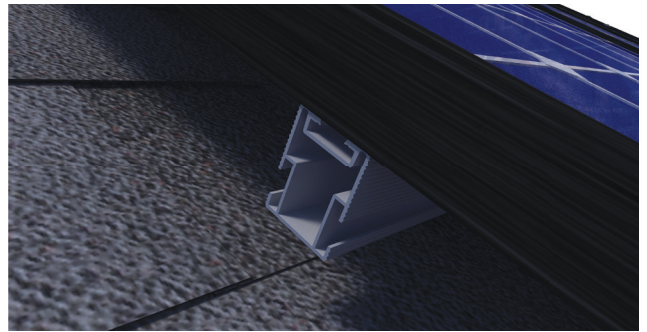


Image 6.3.5

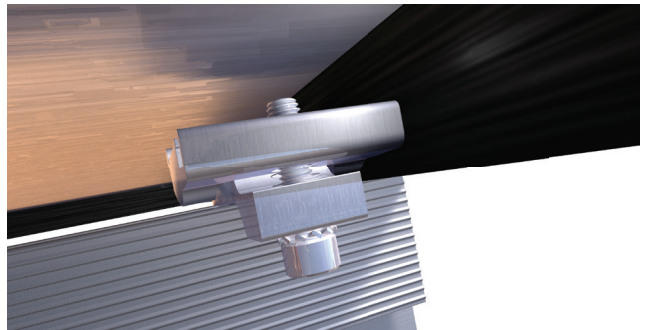


Image 6.3.6

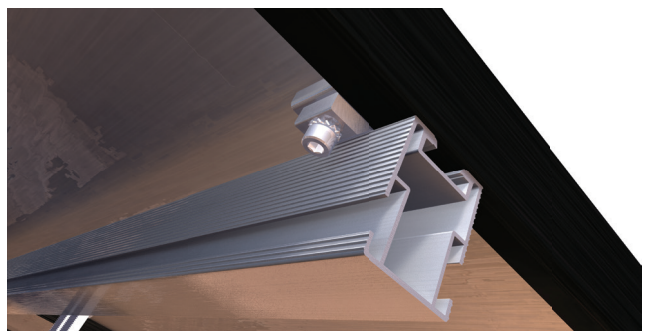


Image 6.3.7

NOTE!

The QRail Hidden End Clamp is NOT a bonding solution and therefore cannot be used on single modules. It must always be installed in conjunction with at least one Bonding Mid Clamp.

6.4 Installing the Inner Modules

Inner modules of the array are secured with mid clamps. All mid clamps are provided with integral bonding plates. Mid clamps are designed to fit modules within a particular range. Mid clamps are available in either mill finish or black in the following size ranges:

Part Number		Finish	Clamping Range (mm)	Clamping Range (inches)
bonding plate	2-pin			
872	900	mill	30-45	1.30-1.77
877	902	black	30-45	1.30-1.77
873	901	mill	38-50	1.50-1.97
878	903	black	38-50	1.50-1.97

Table 6.4.1

Mounting steps:

- Insert the QClick of the mid clamp into the QClick channel of the rail. The flat sides of the QClick make it possible to install the QClick flush against the module side.
- Slide the module clamp flush against the side of the module by squeezing the QClick legs and pushing the clamp against the side of the module. Ensure the bonding plate is above the module frame.
- Slide the next module under the clamp head and flush against the QClick body.
- Using a 5 mm Allen key, tighten the clamp bolt onto the modules. Tighten the clamp bolt to 12 ft-lbf (16 N-m).



DANGER

Material damage due to incorrect mounting

Incorrectly mounted modules can fall and become damaged

- Make sure the clamps are installed correctly.
- Ensure the module is installed flush and tight against the side of the mid clamp.
- Ensure proper torque of the mid clamp mounting bolt 12 ft-lbf (16 N-m).

6.5 Installing Additional Module Rows

Mounting steps:

- Additional module rows are by repeating steps in sections 6.1-6.4.

NOTE!

Use of a spare module clamp QClick or other item as a spacing gauge between the top of one row of modules and the bottom of another can help provide a neat, aesthetically pleasing array.

NOTE!

The bonding mid clamps with bonding plates are supplied with the bonding plates preassembled under the clamp head

If not already so positioned, slide the bonding plate and clamp head to the bolt head. This will hold the bonding plate above the module frames until you are ready to tighten the clamp into place.

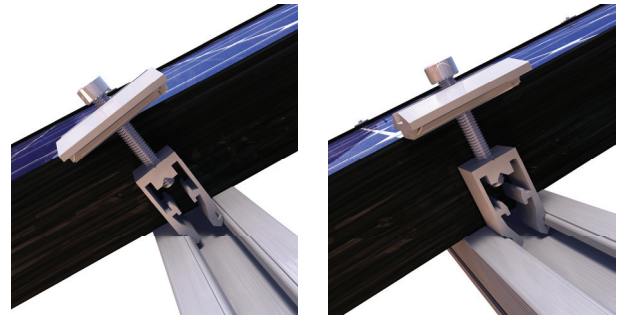


Image 6.4.1
Inner module installation step 1



DANGER

Material damage due to incorrect mounting

Incorrectly fastened modules can fall and become damaged.

- Make sure the QClicks click in securely
- Ensure the modules are flush against both sides of the clamp.
- Observe and adhere to the recommended torque specifications

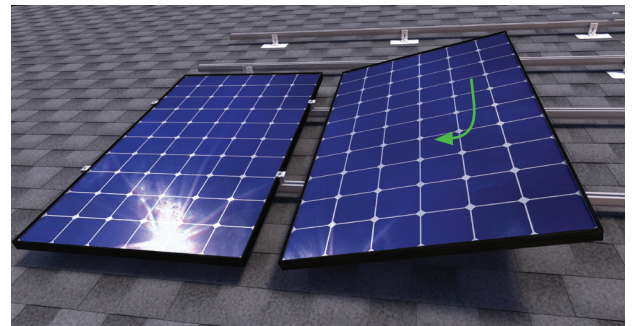


Image 6.4.2
Inner module installation step 2

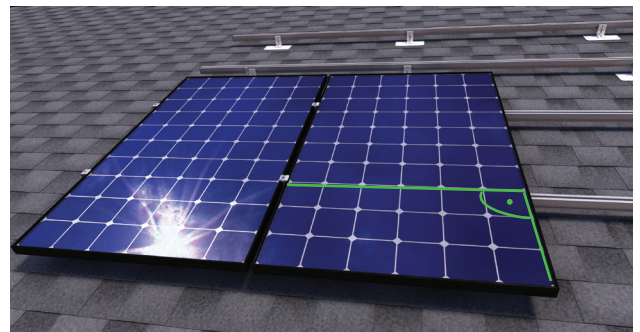


Image 6.4.3
Inner module installation step 3

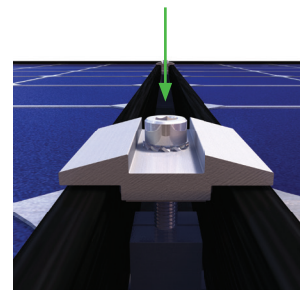


Image 6.4.4
Tighten clamp bolt

7. Maintenance

When properly assembled, the QRail is a reliable and trouble-free system and should require little in the way of ongoing maintenance or repair. Nevertheless, Quick Mount PV recommends maintaining a regular inspection and maintenance schedule. Such a program can detect and address potential problems before they become serious and help ensure the system's excellent long-term durability and reliability.

The following procedure pertains only to the QRail mounting system structure. Maintenance and repair of other PV system components should be carried out in accordance with the respective manufacturers' recommendations.

7.1 Inspection

The system should be visually inspected periodically for loose components, loose fasteners, and any corrosion. If any of these conditions are found, the affected components should be immediately adjusted, repaired, or replaced.

7.2 Testing

After one year in service, it is a good practice to check the torque settings of a representative sample of system connections, including module clamps and rail clamps. If a disproportionate number of loose connections (more than 10% of connections) are found, it may be an indication of improper assembly and it may be necessary to take comprehensive corrective action.

A smaller sampling of connections can be tested annually thereafter. Quick Mount PV recommends keeping records of the connections sampled each year and testing and, if necessary, adjusting previously untested connections in succeeding years. After all connections have been tested, sample sizes and test frequency can be reduced.

8. List of UL2703 Approved Modules

NOTE: Please reference the module list on the most up to date version of the QRail Installation guide for the latest approved module list.

Manufacturer	Model Number
Axitec	AC-xxxA/60B(S), AC-xxxA/72B, AC-xxxMH/120S, AC-xxxMH/144S, AC-xxxMH/120V, AC-xxxMH/144V Note: A = P, M; B = X, V, XV, MX
Boviet	BVM6610P-xxx, BVM6610M-xxx, BVM6612P-xxx, BVM6612M-xxx
Canadian Solar	CS6P-xxx, CS3U-P, CS3U-MS, CS3K-P, CS3K-MS, CS3K-MS, CS6K-xxxMS, All-BLACK CS6K-xxxMS, CS6U-xxxM, 1500V CS6U-xxxM, CS6U-xxxP, 1500V CS6U-xxxP, CS6X-xxxP, ALL-BLACK CS6K-xxxM, CS6K-xxxM, 1500V CS6K-xxxM, CS6K-xxxP, 1500V CS6K-xxxP, CS6P-xxxP, CS3K-XXX-P, CS3K-XXX-MS, CS1K-XXX-MS, CS3U-XXX-P, CS3U-XXX-MS, CS3U-XXX-AG, CS6K-XXX-AG, CS6U-XXX-AG, CS1H-MS, CS3W-xxxMS, CS3W-xxxP, CS3L-xxxP, CS3L-xxxMS, CS3U-xxxPB-AG, CS3U-xxxMB-AG, CS3W-xxxPB-AG, CS3W-xxxMB-AG, CS1U-xxxMS
Certainteed	CTxxxMXX-02, CTxxxMXX-03
Conergy	PowerPlus xxx
ET Solar	ET-M660xxxBB, ET-M660xxxWW/WB, ET-P660xxxBB, ET-P660xxxWW/WB, ET-M672xxxBB, ET-M672xxxWW/WB, ET-P672xxxBB, ET-P672xxxWW/WB
Gigawatt Inc.	GW-xxxPB, GW-xxxMB
Hanwha Q Cell	60 Cell: Q.PEAK DUO-G5 xxx, Q.PEAK DUO BLK-G5 xxx, Q.PEAK G4.1 xxx, Q.PEAK BLK-G4.1 xxx, Q.PEAK-G4.1/MAX xxx, Q.PEAK-G4.1/TAA xxx, Q.PEAK BLK G4.1/TAA xxx, Q.PLUS G4 xxx, Q.PLUS BFR G4.1 xxx, Q.PLUS BFR G4.1/MAX xxx, Q.PLUS BFR G4.1/TAA xxx, Q.PRO G4 xxx, Q.PRO BFR G4 xxx, Q.PRO BFR 4.1 xxx, Q.PRO BFR 4.3 xxx, Q.PRO EC-G4.4 xxx, B.LINE PLUS BFR G4.1 xxx, B.LINE PRO BFR G4.1 xxx Q.PLUS DUO-G5 xxx, Q.PEAK DUO BLK-G6 xxx, Q.PEAK DUO-G6 xxx, Q.PEAK DUO BLK-G6+ xxx, Q.PEAK DUO-G6+ xxx, Q.PEAK DUO G7.2 xxx, Q.PEAK DUO BLK-G7 xxx, Q.PEAK DUO-G7 xxx, Q.PEAK DUO BLK-G8 xxx, Q.PEAK DUO-G8 xxx, Q.PEAK DUO BLK-G8+ xxx, Q.PEAK DUO-G8+ xxx, "
	72 Cell: Q.PEAK DUO L-G5.2, Q.PEAK L G4.2 xxx, Q.PLUS L G4.2 xxx, Q.PLUS L G4.1 xxx, Q.PLUS L G4 xxx, Q.PRO L G4 xxx, Q.PRO L G4.1 xxx, Q.PRO L G4.2 xxx, B.LINE PLUS L G4.2 xxx, B.LINE PRO L G4.1 xxx, B.LINE PRO L G4.2 xxx, Q.PLUS L G4.2 xxx Q.PLUS L-G4.2/TZZ xxx, Q.PEAK L G4.1 xxx, Q.PEAK DUO L-G5.3 xxx, Q.PEAK DUO L-G5.2 xxx, Q.PLUS DUO L-G5.3 xxx, Q.PLUS DUO L-G5.2 xxx, Q.PLUS DUO L-G5.1 xxx, Q.PLUS DUO L-G5 xxx, Q.PEAK DUO L-G6.3 xxx, Q.PEAK DUO L-G6.2 xxx, Q.PEAK DUO L-G6 xxx, Q.PEAK DUO L-G5.3/BF xxx, Q.PEAK DUO L-G7 xxx, Q.PEAK DUO L-G7.1 xxx, Q.PEAK DUO L-G7.2 xxx, Q.PEAK DUO L-G7.3 xxx, Q.PEAK DUO L-G8 xxx, Q.PEAK DUO L-G8.1 xxx, Q.PEAK DUO L-G8.2 xxx, Q.PEAK DUO L-G8.3 xxx"
Heliene	60P, 60M(-BLK), 72P, 72M
Hyundai	HiS-AxxxB, HiS-AxxxB (BK), HiS-AxxxC, HiA-xxxxRG/TG/KG (silver or black), HiA-xxxx-RI/TI/KI (silver), HiA-SxxxHI (silver) Note: A = S, M; B = RG, TG, KG; C = RI, TI, KI "
Itek	IT-xxx-SE, IT-xxx-SE-72

Manufacturer

Model Number

JA Solar	JAM6(K)-60-xxx/4BB, JAP6(K)-60-xxx/4BB, JAM6(K)-60-xxx/PR, JAM6(L)-60-xxx/PR, JAP6-60-xxx/4BB/RE, JAP6(K)-60-xxx/4BB(1500), JAP60S01-xxx/SC, JAMP6(K)-60/PR(1500), JAMP60201-xxx/PR, JAM6(K)-72-xxx/4BB, JAM6(L)-72-xxx/4BB, JAP6(K)-72-xxx/4BB, JAM6(K)-72-xxx/PR, JAM6(L)-72-xxx/PR, JAP6-72-xxx/4BB/RE, JAM60S09-xxx/PR, JAP60S09-xxx/SC, JAM72S09-xxx/PR, JAP72S09-xxx/SC, JAM60S10-xxx/PR, JAP60S10-xxx/PR, JAM72S10-xxx/PR, JAP72S10-xxx/PR
Jinko	JKMxxxP-60, 60 JKMxxx-P-60, 60 JKMxxx-P-60B, 60 JKMxxxPP-60, 60 JKMxxxPP-60B, PERC 60 JKMxxxM-60, Plus JKMxxxPP-60(Plus), JKMxxxP-60-J4, JKMxxxP60B-J4, Black JKMxxxPP-60-J4, JKMxxxPP60B-J4, 1500V 60 JKMxxxPP-60-V, 1500V 60 JKMxxxM-60-V, Jinko MX60 JKMSxxxP, MX JKMSxxxPP-60, JKMxxxM-60B, JK-MxxxM-60-J4, JKMxxxM60B-J4, JKMSxxxP-60, JKMSxxxP-60-J4, JKMSxxxM-60, JKMSxxxM-60-J4, JKMSxxxPP-60-J4, JKMSxxxPP-60, JKMSxxxM-60B-EP, 72 cell modules model: JKMxxxP-72, JKMxxxP-72B, JKMxxxP-72-J4, JKMxxxP-72B-J4, JK-MxxPP-72, JKMxxxPP-72B, JKMxxxPP-72-J4, JKMxxxPP-72B-J4, JKMxxxPP-72(Plus), JKMxxxPP-72-V, JK-MxxxM-72, JKMxxxM-72B, JKMxxxM-72B-J4, JKMxxxM-72-J4, JKMxxxM-72-V, MX JKMSxxxPP-72, JKMxxxM - 60BL, JKMxxxM - 60HBL, JKMxxxM - 72L - V, JKMxxxM - 72HL - V, JKMxxxM-72HL-TV, JKMSxxxM-72HL-V-MX3, JKMSxxxM-60HBL-EP (AC Module) WHERE B = null or B; L = null or L; H = null or H; V= null or V"
LG	LGxxxF1G-A5, LGxxxF2G-A5, LGxxxQ1G-A5, LGxxxF1G-V5, LGxxxF2G-V5, LGxxxQ1G-V5, LGxxxN2T-J5, LGxxxA1C-V5 Note: F = E, N, S; G = any letter in the alphabet "
LONGi	LR6-60A-XXXM, LR6-72A-XXXM, LR4-60A-XXXM, LR4-72A-XXXM Note: A = BK, HV, PB, PE, PH, BP, HPB, HIB, HPH, HIH, HBD, HIBD"
Mission Solar	MSEXxxSO5K, MSExxSO5T, MSExxSO6J, MSExxSO4J, MSExxMM6J, MSExxSQ5K, MSExxSQ5T, MSExxSQ6S, MSExxSQ4S
Panasonic	VBHNxxxSA17, VBHNxxxSA11, VBHNxxxSA16(B), VBHNxxxSA15, VBHNxxxSA15B, VBHNxxxKA01, VBHNxxxKA03, VBHNxxxSA17, VBHNxxxKA03/04, VBHNxxxSA17/18, VBHNxxxSA17E, VBHNxxxSA16, VBHxxxRA18N, VBHxxxRA03K, VBHxxxRA18E, VBHxxxRA03F, VBHxxxRA18G
Piemar	SGXXXA-B Note: A = P or M; B = (BF) or (FB);"
REC	60 cell module: REC TwinPeak 2 Series (BLK), RC TwinPeak 2 BLK2 Series, REC N-Peak, 72 cell module: REC TwinPeak 2S 72 Series, REC TwinPeak 2S 72XV Series, REC TwinPeak 2S 72 BXV Series, REC N-PEAK"
RECOM	RCMxxx6MA-5, RCMxxx6MB-5, RCMxxx6ME-5, RCMxxx6MF-5, 60Mxxx, 72Mxxx
Risen Energy	RSM144-6-xxxM, RSM144-6-xxxP, RSM132-6-xxxM, RSM120-6-xxxM, RSM120-6-xxxP, RSM72-6-xxxM, RSM72-6-xxxP, RSM60-6xxxM, RSM60-6xxxP
S-Energy	SNXXXA-B Note: A = P or M; B = 10 or 10(B)"

Manufacturer**Model Number**

Seraphim Solar	SRP-xxx-6MA, SRP-xxx-6PA, SRP-xxx-6MB, SRP-xxx-6MB-BB, SRP-xxx-6PB, SRP-xxx-6PB-HV, SRP-xxx-6MB-HV, SRP-xxx-6PA-HV, SRP-xxx-6MA-HV, SEG-6MB-xxxWW/WB, SEG-6MB-xxxBB, SEG-6PB-xxxWW/WB, SEG-6PB-xxxBB, SEG-6PA-xxxWW, SEG-6MA-xxxWW, SEG-6MA-xxxBB, SEG-xxx-6MA, SEG-xxx-6MB-BB, SEG-xxx-6MB, SEG-xxx-6PA, SEG-xxx-6PB, SEG-xxx-BMA, SEG-xxx-BMA-BG
Silfab	SLA X, SLA-M-xxx, SLA-P-xxx, SLG-P-xxx, SLG-M-xxx/SLG-X-xxx, SSA-M-xxx/SSA-P-xxx, SSG-M-xxx/SSG-P-xxx; All silver frame, All black frames: SLA-M-xxx, SLG-M-xxx, SLA-X-xxx, SLG-X-xxx, SLA-P-xxx, SLG-P-xxx, SSA-M-xxx, SSG-M-xxx, SSA-P-xxx, SSG-P-xxx
Solar Tech Universal	STU-xxx-PERC, STU-xxx-HJT, PERCB-C-xxx, HJTB-C-xxx (C = W, B),EPIQ xxx f40, EPIQ BLACK xxx f40, EPIQ xxx H f40, EPIQ BLACK xxx H f40"
Solar World	Sunmodule Plus SWxxx, Sunmodule Plus SWA xxx poly (black/clear), Sunmodule Plus SWA xxx SolarWorld mono (black/clear), Sunmodule SWA xxx XL mono (black/clear), Sunmodule SWA xxx XL poly (black/clear), Sunmodule Bisun SWA xxx XL duo (black/clear), Protect SWA mono xxx (black), Bisun SWA xxx duo (black/clear)
Solaria	PowerXT-xxxR-A Note: A = AC, PD, BD, PX, BX "
Sonali Solar	SS 230W to 265W-280W to 320W
Suniva	OPTxxx-60-4-1B0
SunPower	SPR-X21-xxx (BLK), SPR-E20-xxx, SPR-E19-xxx, SPR-X21-xxx, SPR-E20-xxx(BLK), SPR-P17-xxx-COM, SPR-X21-xxx, SPR-E20-xxx(BLK), SPR-X22-xxx-D-AC, SPR-Axxx-G-AC
SunSpark Technology	SMX-xxxw, SST-xxxw
Tesla	SCxxx, SCxxxB, SCxxxB1, SCxxxB2
Trina	60 cell module: TSM-PD05.08-xxx, 72 cell module: TSM-PD14-xxx, ALLMAX-PD05.05, ALLMAX M Plus-DD05A.05 (II)-, ALL- MAX-PD05A.08, TSM-DD14A(II)-, TSM-DE14A(II)-, TSM-DE15H(II)-xxx, TSM-DE15M(II) -xxx, TSM-DD06M.05(II)-xxx, TSM-DD06H.08(II)-xxx, TSM-DD06H.05(II)-xxx, TSM-DEG15MC.20(II)-xxx, TSM-DEG15HC.20(II)-xxx
Yingli	YL-xxx-35B, YL-xxx-29B, YLxxxP29b, YLxxxP-35b, YLxxxD-35B, YLxxxD-36B, YLxxxD-30B

9. CAD Part Drawings

ITEM NO.	DESCRIPTION	QTY.
1	QRAIL, HEAVY, AL, MILL	1

2.047
1.470

NOTES:
 1. AVAILABLE IN 14' AND 17' - 4" LENGTHS
 2. AVAILABLE IN MILL FINISH AND BLACK FINISH

Quick Mount PV[®]

TITLE:
QMR-RH: QRAIL HEAVY

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± 1/8 TWO PLACE DECIMAL ±.19 THREE PLACE DECIMAL ±.094	SIZE	DRAWN BY: DFM	REV
	A	DATE: 4/26/2018	2
SCALE: 1:1		WEIGHT: 0.69	SHEET 1 OF 1

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DO NOT SCALE DRAWING

ITEM NO.	DESCRIPTION	QTY.
1	QRAIL, STANDARD, AL, MILL	1

1.890
1.470

NOTES:
 1. AVAILABLE IN MILL FINISH AND BLACK FINISH

Quick Mount PV[®]

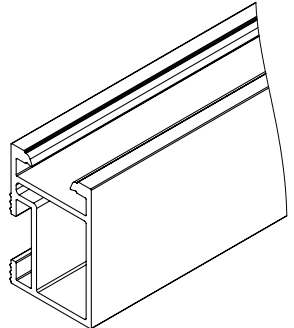
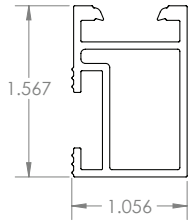
TITLE:
QMR-RS: QRAIL STANDARD

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± 1/8 TWO PLACE DECIMAL ±.19 THREE PLACE DECIMAL ±.094	SIZE	DRAWN BY: RAD	REV
	A	DATE: 8/13/2018	3
SCALE: 1:1		WEIGHT: 0.65	SHEET 1 OF 1

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DO NOT SCALE DRAWING

ITEM NO.	DESCRIPTION	QTY.
1	QRAIL, LIGHT, AL, MILL	1



NOTES:
1. AVAILABLE IN MILL FINISH AND BLACK FINISH

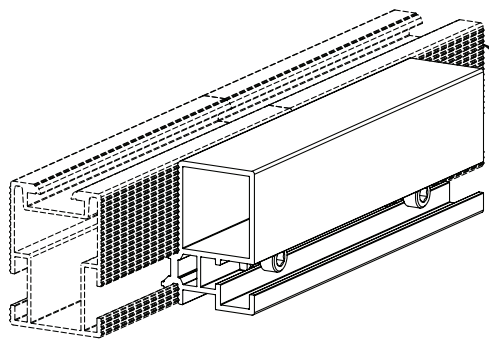
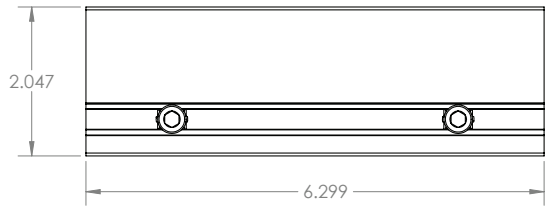
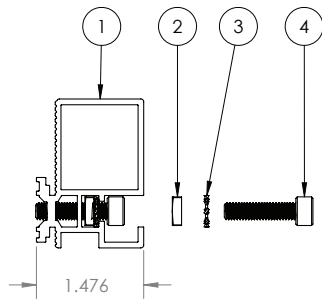
Quick Mount PV®			
TITLE: QMR-RL: QRAIL LIGHT			
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± 1/8 TWO PLACE DECIMAL ±.19 THREE PLACE DECIMAL ±.094	SIZE A	DRAWN BY: DFM	REV 3
		DATE: 8/13/2018	
	SCALE: 1:1	WEIGHT: 0.50	SHEET 1 OF 1

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DO NOT SCALE DRAWING

5 4 3 2 1

ITEM NO.	DESCRIPTION	QTY.
1	QSPUCE EXTERNAL, QRAIL, HEAVY, 6.3", AL, MILL	1
2	NUT, SQUARE, THIN, M6 X 1.0, DIN 562, 18-8 SS	2
3	WASHER, STAR, M6, 18-8 SS	2
4	CAP SCREW, SOCKET HEAD, M6 X 1.0 X 25MM, DIN 912, A2-70 SS	2



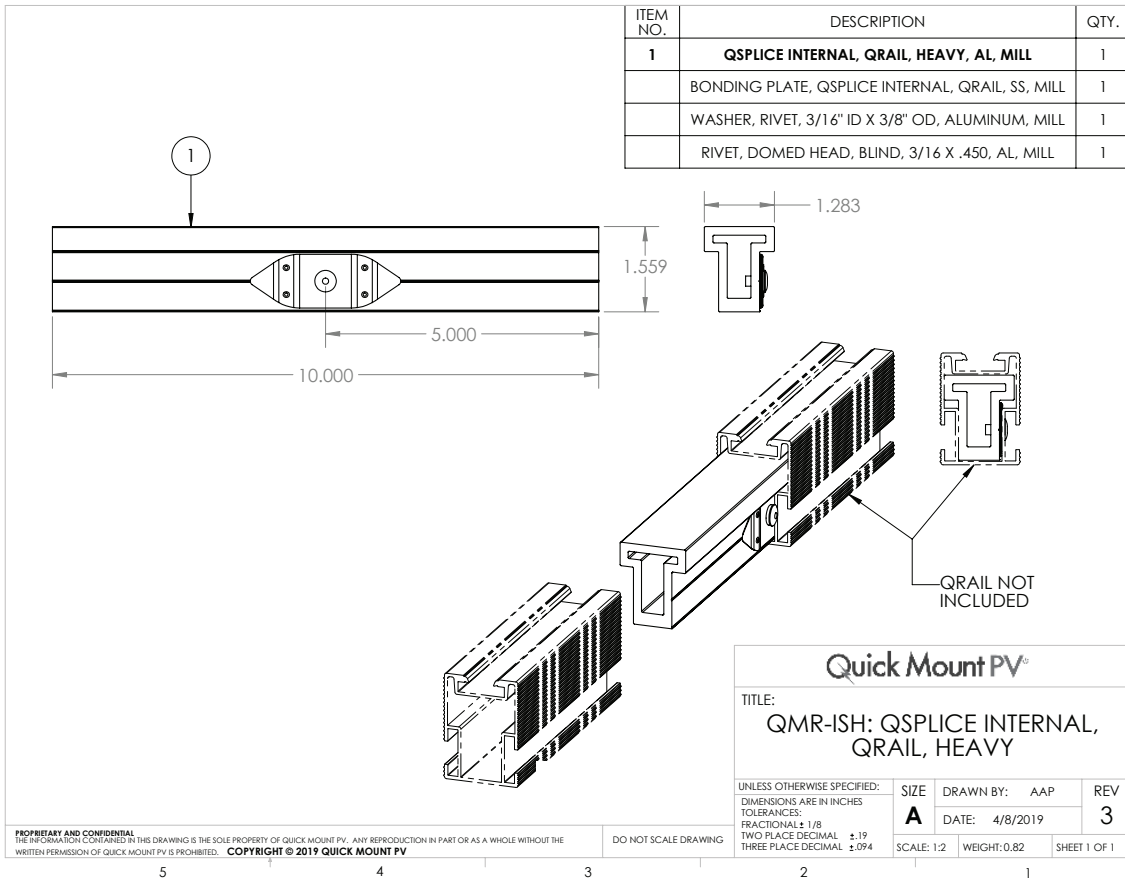
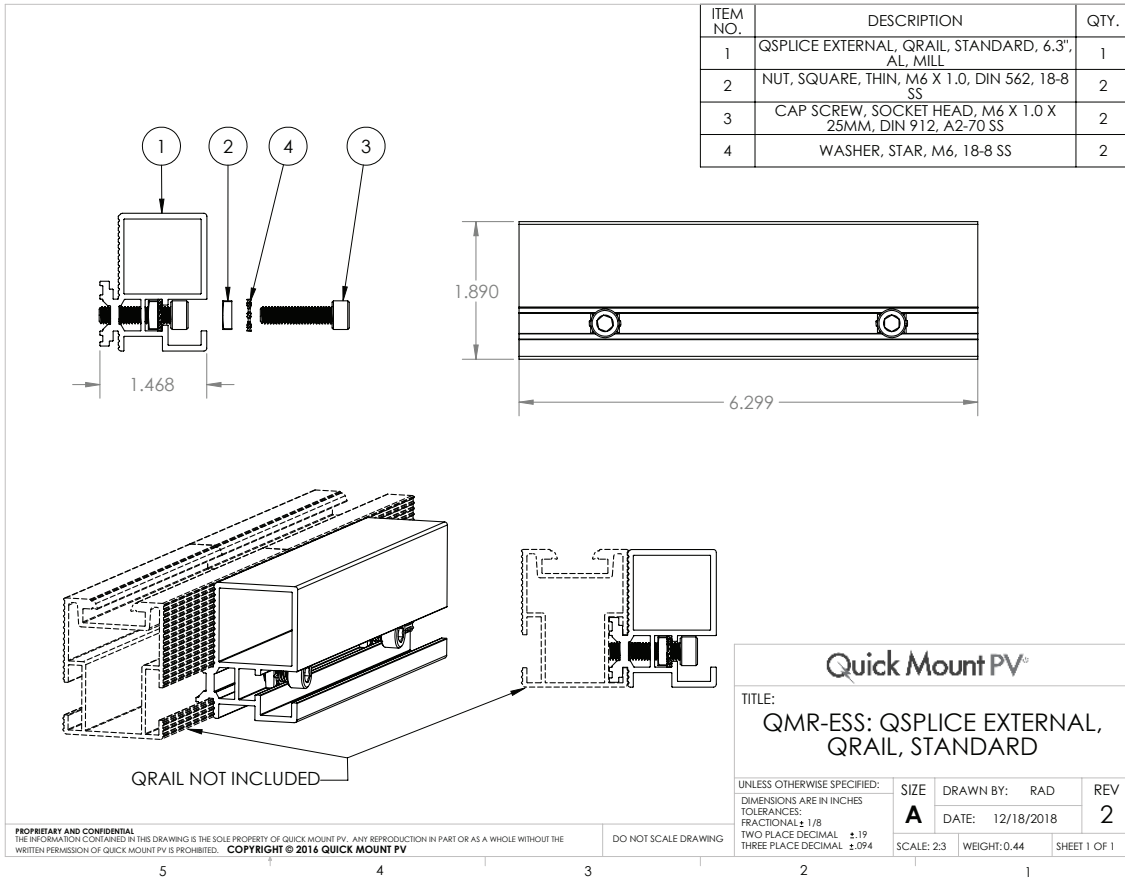
QRAIL NOT INCLUDED

Quick Mount PV®			
TITLE: QMR-ESH: QSPUCE EXTERNAL, QRAIL, HEAVY			
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± 1/8 TWO PLACE DECIMAL ±.19 THREE PLACE DECIMAL ±.094	SIZE A	DRAWN BY: RAD	REV 2
		DATE: 12/18/2018	
	SCALE: 2:3	WEIGHT: 0.46	SHEET 1 OF 1

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DO NOT SCALE DRAWING

5 4 3 2 1



ITEM NO.	DESCRIPTION	QTY.
1	QSPLICE INTERNAL, QRAIL, STANDARD, 8", AL, MILL	1
	BONDING PLATE, QSPLICE INTERNAL, QRAIL, SS, MILL	1
	RIVET, DOMED HEAD, BLIND, 3/16 X .450, AL, MILL	1
	WASHER, RIVET, 3/16" ID X 3/8" OD, ALUMINUM, MILL	1

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DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED:
 DIMENSIONS ARE IN INCHES
 TOLERANCES:
 FRACTIONAL ± 1/8
 TWO PLACE DECIMAL ±.19
 THREE PLACE DECIMAL ±.094

A	SIZE	DRAWN BY: AAP	REV
	DATE: 4/8/2019		5
SCALE: 2:3	WEIGHT: 0.66	SHEET 1 OF 1	

ITEM NO.	DESCRIPTION	QTY.
1	QSPLICE INTERNAL, QRAIL, LIGHT, 6", AL, MILL	1
	BONDING PLATE, QSPLICE INTERNAL, QRAIL, SS, MILL	1
	RIVET, DOMED HEAD, BLIND, 3/16 X .450, AL, MILL	1
	WASHER, RIVET, 3/16" ID X 3/8" OD, ALUMINUM, MILL	1

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DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED:
 DIMENSIONS ARE IN INCHES
 TOLERANCES:
 FRACTIONAL ± 1/8
 TWO PLACE DECIMAL ±.19
 THREE PLACE DECIMAL ±.094

A	SIZE	DRAWN BY: RAD	REV
	DATE: 4/8/2019		4
SCALE: 2:3	WEIGHT: 0.32	SHEET 1 OF 1	

ITEM NO.	DESCRIPTION	QTY.
1	QCLICK, 17MM, AL, MILL	1
2	UNIVERSAL END CLAMP, QRAIL, LOWER, 40MM, AL, MILL	1
3	RUBBER O-RING, 5MM ID X 2MM THK, BUNA-N	1
4	STICKER, ETL, QRAIL, END CLAMP	1
5	UNIVERSAL END CLAMP, QRAIL, UPPER, 40MM, AL, MILL	1
6	WASHER, STAR, M6, 18-8 SS	1
7	CAP SCREW, SOCKET HEAD, M6 X 1.0 X 45MM, DIN 912, A2-70 SS	1
8	WEEB BMC, 304 SS	1

NOTES:
 [1] AVAILABLE IN TWO SIZE RANGES: 30-45MM and 38-50MM
 [2] AVAILABLE IN BONDING AND NON-BONDING VERSIONS (PART #8 INCLUDED WITH BONDING VERSION ONLY)
 3. ALL VERSIONS AVAILABLE IN MILL FINISH, AND BLACK FINISH

Quick Mount PV[®]
 TITLE: QMR-UEC: UNIVERSAL END CLAMP, QRAIL
 UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES
 TOLERANCES: FRACTIONAL ± 1/8 TWO PLACE DECIMAL ±.19 THREE PLACE DECIMAL ±.094
 SIZE: A DRAWN BY: RAD DATE: 12/18/2018 REV: 3
 SCALE: 1:2 WEIGHT: 0.12 SHEET 1 OF 1

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ITEM NO.	DESCRIPTION	QTY.
1	QCLICK, 17MM, AL, MILL	1
2	FIXED END CLAMP, QRAIL, 40MM, X 40MM, AL, MILL	1
3	CAP SCREW, SOCKET HEAD, M6 X 1.0 X 40MM, DIN 912, A2-70 SS	1
4	WASHER, STAR, M6, 18-8 SS	1
5	STICKER, ETL, QRAIL, END CLAMP	1

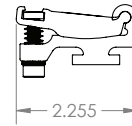
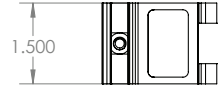
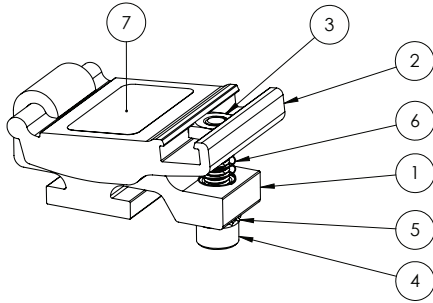
NOTES:
 [1] SEE TABLE A FOR AVAILABLE SIZES
 2. ALL VERSIONS AVAILABLE IN MILL FINISH, AND BLACK FINISH

MILL PART #	BLACK PART #	MODULE SIZE
QMR-FEC31	QMR-FEC31 B	31MM
QMR-FEC32	QMR-FEC32 B	32MM
QMR-FEC33	QMR-FEC33 B	33MM
QMR-FEC35	QMR-FEC35 B	35MM
QMR-FEC38	QMR-FEC38 B	38MM
QMR-FEC40	QMR-FEC40 B	40MM
QMR-FEC42	QMR-FEC42 B	42MM
QMR-FEC45	QMR-FEC45 B	45MM
QMR-FEC46	QMR-FEC46 B	46MM
QMR-FEC50	QMR-FEC50 B	50MM

Quick Mount PV[®]
 TITLE: QMR-FEC: FIXED END CLAMP, QRAIL
 UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES
 TOLERANCES: FRACTIONAL ± 1/8 TWO PLACE DECIMAL ±.19 THREE PLACE DECIMAL ±.094
 SIZE: A DRAWN BY: RAD DATE: 12/18/2018 REV: 3
 SCALE: 2:3 WEIGHT: 0.10 SHEET 1 OF 1

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ITEM NO.	DESCRIPTION	QTY.
1	HIDDEN END CLAMP, QRAIL, LOWER, 0.75", AL, MILL	1
2	HIDDEN END CLAMP, QRAIL, UPPER, 1.5", AL, MILL	1
3	NUT, SQUARE, THIN, M6 X 1.0, DIN 562, 18-8 SS	1
4	CAP SCREW, SOCKET HEAD, M6 X 1.0 X 25MM, DIN 912, A2-70 SS, NYLON PATCH	1
5	WASHER, STAR, M6, 18-8 SS	1
6	SPRING, QRAIL, HIDDEN END CLAMP, SS, MILL	1
7	STICKER, ETL, QRAIL, END CLAMP	1



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TITLE:
QMR-HEC: HIDDEN END CLAMP, QRAIL

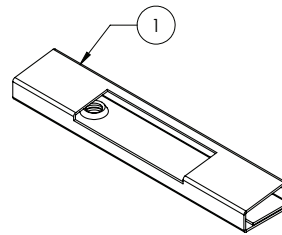
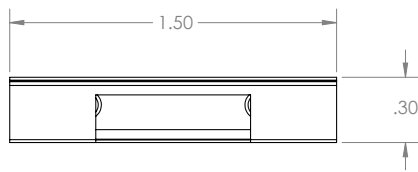
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL $\pm 1/8$ TWO PLACE DECIMAL $\pm .19$ THREE PLACE DECIMAL $\pm .094$	SIZE	DRAWN BY:	REV
	A	DATE: 9/11/2018	1
	SCALE: 1:2	WEIGHT: 0.16	SHEET 1 OF 1

FOR USE WITH QRAIL STANDARD AND LIGHT

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5 4 3 2 1

ITEM NO.	DESCRIPTION	QTY.
1	WEEB BMC, 304 SS	1



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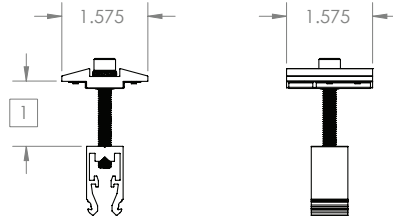
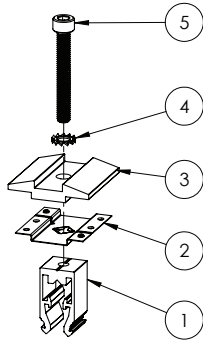
TITLE:
QMR-ECW: WEEB, BMC, END CLAMP, QRAIL

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL $\pm 1/8$ TWO PLACE DECIMAL $\pm .19$ THREE PLACE DECIMAL $\pm .094$	SIZE	DRAWN BY: RAD	REV
	A	DATE: 12/22/2017	1
	SCALE: 2:1	WEIGHT: 0.00	SHEET 1 OF 1

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5 4 3 2 1

ITEM NO.	DESCRIPTION	QTY.
1	QCLICK, 17MM, AL, MILL	1
2	BONDING PLATE, MID CLAMP, V1.2, QRAIL, SS	1
3	UNIVERSAL MID CLAMP, QRAIL, 40MM, AL, MILL	1
4	WASHER, STAR, TIGHT-GRIP, M6, 18-8 SS	1
5	CAP SCREW, SOCKET HEAD, M6 X 1.0 X 45MM, DIN 912, A2-70 SS	1



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TITLE:
QMR-UMC: UNIVERSAL MID CLAMP, V1.2, QRAIL

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± 1/8 TWO PLACE DECIMAL ±.19 THREE PLACE DECIMAL ±.094	SIZE	DRAWN BY: RAD	REV
	A	DATE: 5/10/2018	2
	SCALE: 1:2	WEIGHT: 0.10	SHEET 1 OF 1

NOTES:

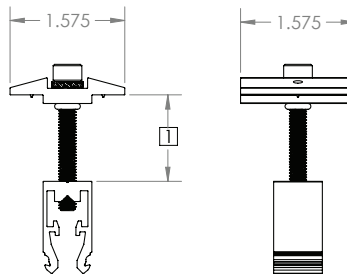
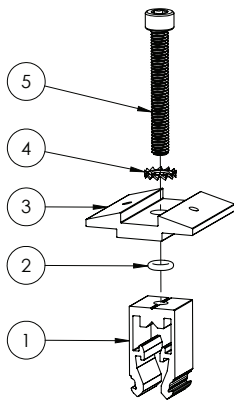
- 1 AVAILABLE IN TWO SIZE RANGES: 30-45MM AND 38-50MM
2. ALL VERSIONS AVAILABLE IN MILL FINISH AND BLACK FINISH

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5 4 3 2 1

ITEM NO.	DESCRIPTION	QTY.
1	QCLICK, 17MM, AL, MILL	1
2	RUBBER O-RING, 5MM ID X 2MM THK, BUNA-N	1
3	UNIVERSAL MID CLAMP, QRAIL, 40MM, 2 PINS, AL, MILL	1
4	WASHER, STAR, TIGHT-GRIP, M6, 18-8 SS	1
5	CAP SCREW, SOCKET HEAD, M6 X 1.0 X 45MM, DIN 912, A2-70 SS	1



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TITLE:
QMR-UMC-P2: UNIVERSAL MID CLAMP, 2 PIN, QRAIL, W/ BONDING

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± 1/8 TWO PLACE DECIMAL ±.19 THREE PLACE DECIMAL ±.094	SIZE	DRAWN BY: RAD	REV
	A	DATE: 4/26/2018	1
	SCALE: 1:1.5	WEIGHT: 0.09	SHEET 1 OF 1

NOTES:

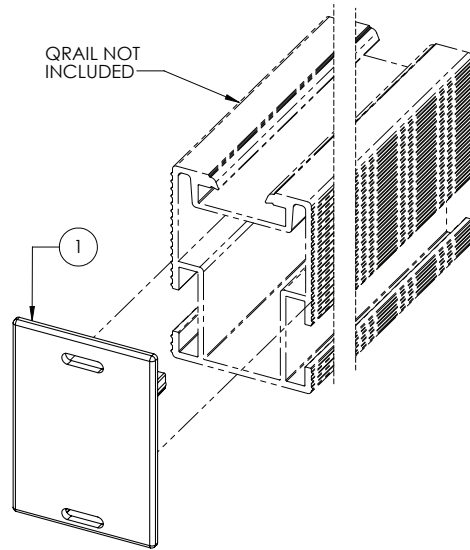
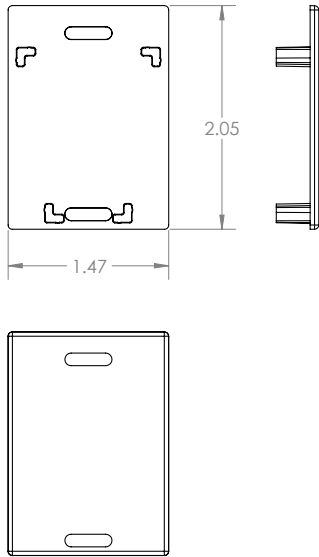
- 1 AVAILABLE IN TWO SIZE RANGES: 30-45 MM AND 38-50 MM
2. ALL VERSIONS AVAILABLE IN MILL FINISH AND BLACK FINISH

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5 4 3 2 1

ITEM NO.	DESCRIPTION	QTY.
1	END CAP, QRAIL, HEAVY, BLACK	1



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TITLE:
QMR-CPH: END CAP, QRAIL,
HEAVY

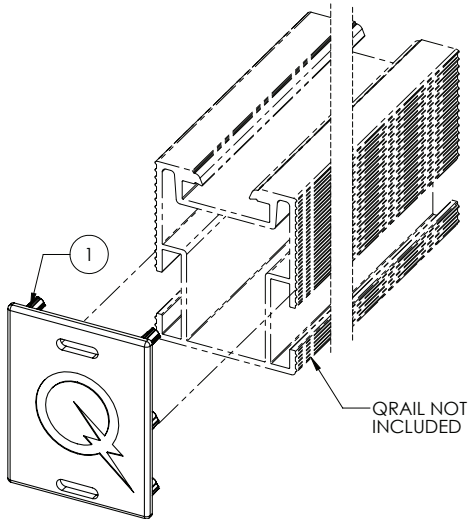
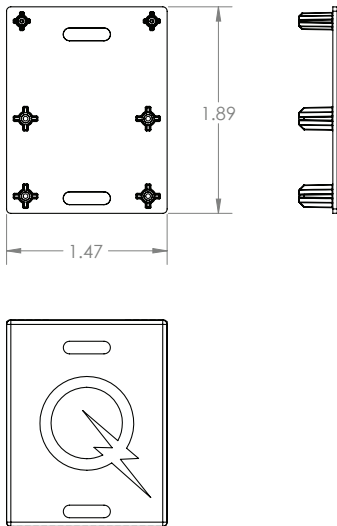
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± 1/8 TWO PLACE DECIMAL ±.19 THREE PLACE DECIMAL ±.094	SIZE	DRAWN BY: AAP	REV
	A	DATE: 4/5/2019	2
	SCALE: 1:1	WEIGHT: 0.0093	SHEET 1 OF 1

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5 4 3 2 1

ITEM NO.	DESCRIPTION	QTY.
1	END CAP, QRAIL, STANDARD, BLACK	1



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TITLE:
QMR-CPS: END CAP, QRAIL,
STANDARD

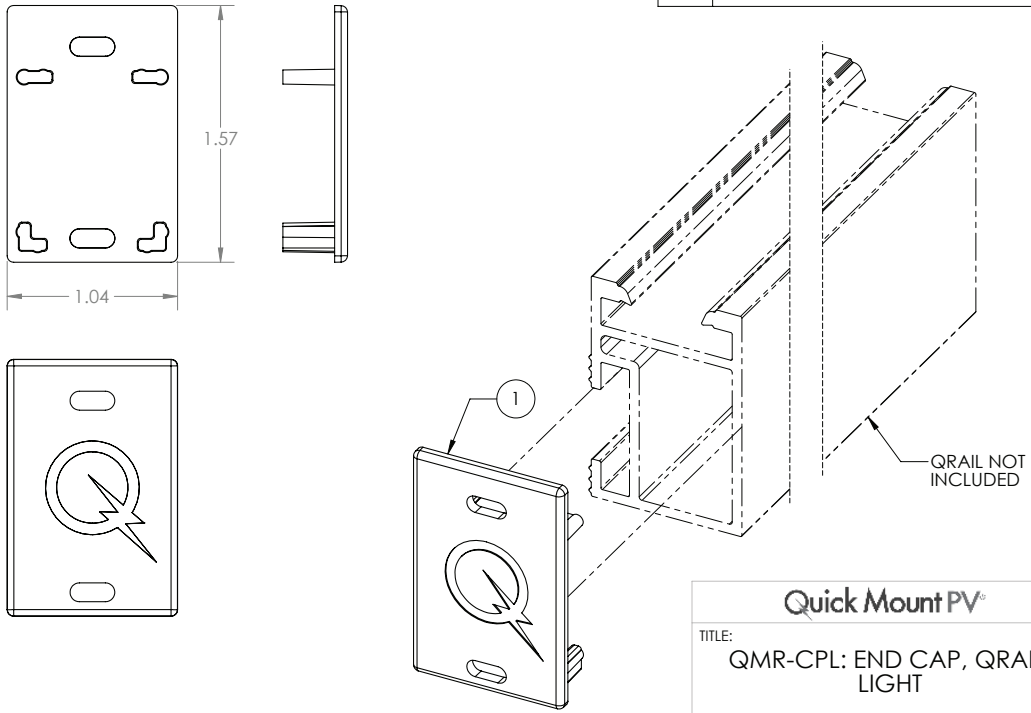
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± 1/8 TWO PLACE DECIMAL ±.19 THREE PLACE DECIMAL ±.094	SIZE	DRAWN BY: AAP	REV
	A	DATE: 4/8/2019	3
	SCALE: 1:1	WEIGHT: 0.01	SHEET 1 OF 1

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5 4 3 2 1

ITEM NO.	DESCRIPTION	QTY.
1	END CAP, QRAIL, LIGHT, BLACK	1



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TITLE:
QMR-CPL: END CAP, QRAIL, LIGHT

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ± 1/8
TWO PLACE DECIMAL ±.19
THREE PLACE DECIMAL ±.094

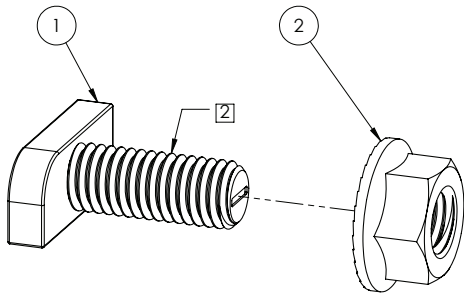
SIZE	DRAWN BY: AAP	REV
A	DATE: 4/8/2019	3

SCALE: 3:2 WEIGHT: 0.0053 SHEET 1 OF 1

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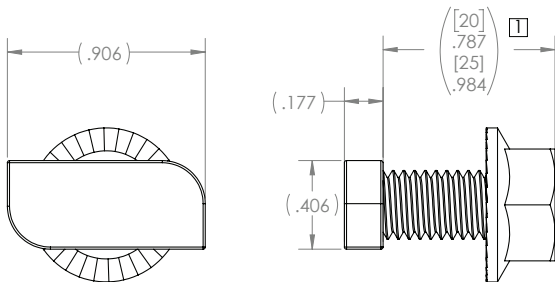
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ITEM NO.	DESCRIPTION	QTY.
1	T-BOLT, M8 X 1.25 X 20MM, A2-70 SS	1
2	NUT, SERRATED FLANGE, M8 X 1.25, DIN 6923, A2-70 SS	1



NOTES:
 [1] AVAILABLE IN 20MM and 25MM LENGTHS
 [2] 20MM LENGTH AVAILABLE WITH PLAIN OR NYLON PATCH THREADS

QMR-TB20	20MM PLAIN THREADS
QMR-TB20P	20MM NYLON PATCH THREADS
QMR-TB25	25MM PLAIN THREADS



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TITLE:
QMR-TB: T-BOLT W/NUT, QRAIL

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ± 1/8
TWO PLACE DECIMAL ±.19
THREE PLACE DECIMAL ±.094

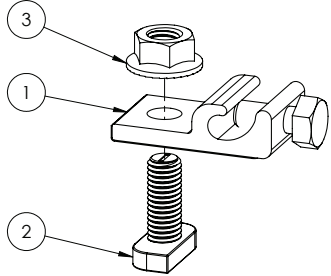
SIZE	DRAWN BY: RAD	REV
A	DATE: 1/9/2019	4

SCALE: 2:1 WEIGHT: 0.05 SHEET 1 OF 1

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ITEM NO.	DESCRIPTION	QTY.
1	GROUNDING LUG, WEEB 8.0, COPPER, TIN PLATED, ASSY.	1
2	T-BOLT, M8 X 1.25 X 20MM, A2-70 SS, NYLON PATCH	1
3	NUT, SERRATED FLANGE, M8 X 1.25, DIN 6923, A2-70 SS	1



RAIL NOT INCLUDED

QMR-GL MUST BE INSTALLED PARALLEL TO RAIL

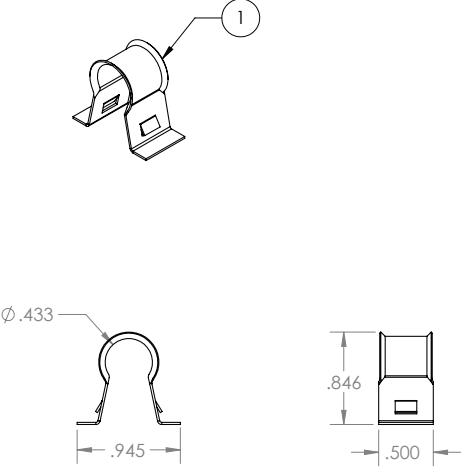
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TITLE:
QMR-GL: WEEB LUG, QRAIL, W/T-BOLT

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES	SIZE	DRAWN BY: AAP	REV
TOLERANCES: FRACTIONAL ± 1/8	A	DATE: 4/8/2019	4
TWO PLACE DECIMAL ±.19	SCALE: 1:1	WEIGHT: 0.06	SHEET 1 OF 1
THREE PLACE DECIMAL ±.094			

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ITEM NO.	DESCRIPTION	QTY.
1	TRUNK / PV CABLE CLIP, QRAIL, SS, MILL	1



QRAIL NOT INCLUDED

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TITLE:
QMR-WC: TRUNK / PV CABLE CLIP, QRAIL

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES	SIZE	DRAWN BY: RAD	REV
TOLERANCES: FRACTIONAL ± 1/8	A	DATE: 9/14/2018	2
TWO PLACE DECIMAL ±.19	SCALE: 1:1	WEIGHT: 0.66	SHEET 1 OF 1
THREE PLACE DECIMAL ±.094			

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