RM5 INSTALLATION GUIDE



UNIRAC Code-Compliant Installation Manual

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RM5 INSTALLATION GUIDE

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GENERAL NOTES:

If provided refer to construction drawings for project specific details. Construction drawings have precedence over these installation guidelines.

RM5

TOOLS & SPECIFICATIONS

INSTALLATION GUIDE | PAGE 1

TECHNICAL SPECIFICATIONS:

Material Types: 16G ASTM A653 GR50 Steel

Coating(s): G235 Galvanization, G180 Galvanization, G40 Galvinization + InterCoat® ChemGuard, G60 Galvinization + InterCoat® ChemGuard or G80 Galvinization + InterCoat® ChemGuard

Hardware: Stainless Steel

Bonding and Grounding: UL2703 Listed Continuous Bonding Path.

TOOLS REQUIRED OR RECOMMENDED FOR LAYOUT, ATTACHMENTS & INSTALLATION:

- Drill **(Do Not Use An Impact Driver)**
- 7/16" Socket
- Torque Wrench
- Tape Measure
- Chalk Reel
- Optional Spacers (See Diagram - Page Right)

GENERAL HARDWARE:

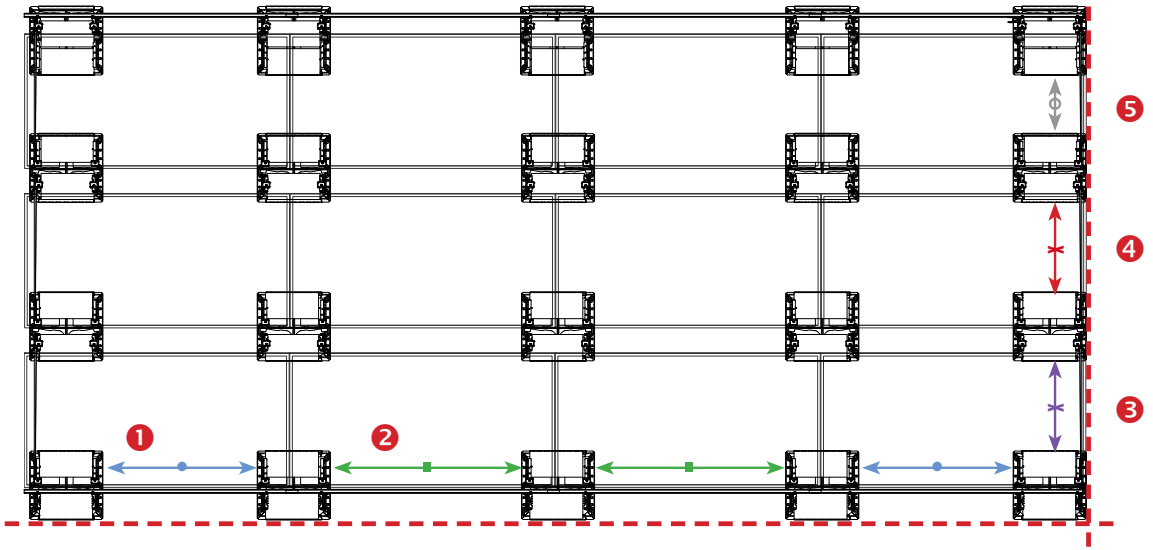
- ¼-20 X 2 ½" Hex Head Bolt - Module Clamps
- ¼-20 X 1" Hex Head Bolt - Wind Deflectors
- ¼-20 Stainless Steel U-Nuts
- ¼" Flat Washer 1 ½" O.D.

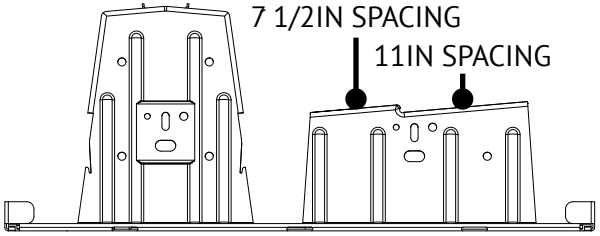
SAFETY:

All applicable OSHA safety guidelines should be observed when working on a PV installation job site. The installation and handling of PV solar modules, electrical installation and PV racking systems involves handling components with potentially sharp metal edges. Rules regarding the use of gloves and other personal protective equipment should be observed.

LAYOUT ASSISTANCE TOOL:

Module Dimensions:		RM5	Module location:	Spacing Equations (in Inches):	
				For 7.5" inter-row option:	For 11" inter-row option:
Module Length (ML) =		1	Perimeter Column Spacing =	ML+(G/2)-32.04"	
Module Width (MW) =		2	Interior Column Spacing =	ML+G-21.36"	
Prefered module gap? (1/4" - 1" is permissible)		3	South Row Spacing =	(MW x 0.996) - 12.79"	(MW x 0.996) - 12.79"
		4	Row Spacing =	(MW x 0.996) - 12.79"	(MW x 0.996) - 9.25"
East/West Module Gap (G) =		5	North Row Spacing =	(MW x 0.996) - 21.97"	(MW x 0.996) - 18.46"

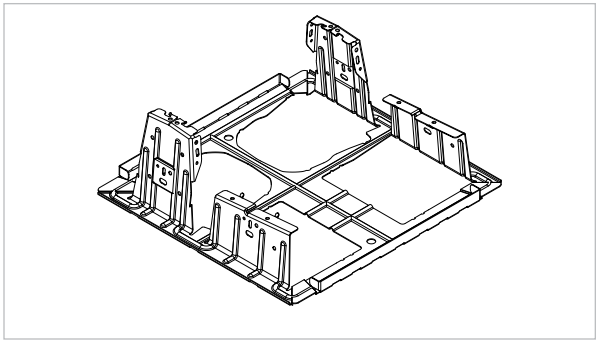




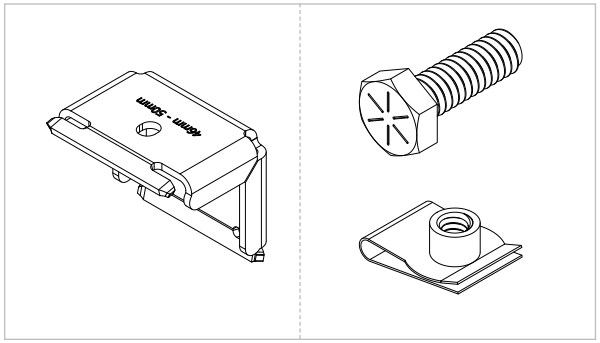
MODULE ROW SPACING OPTIONS

SPACERS - OPTIONAL

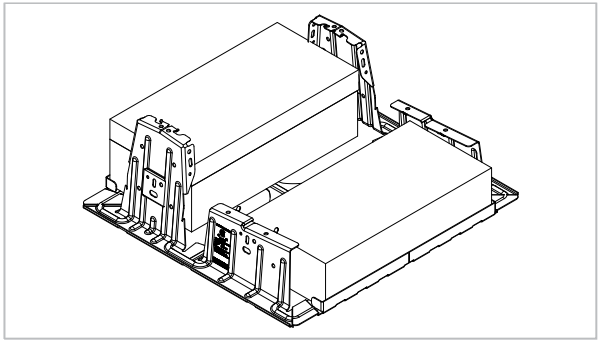
- PERIMETER COLUMN SPACER
- COLUMN SPACER
- SOUTH ROW SPACER
- ROW SPACER
- NORTH ROW SPACER



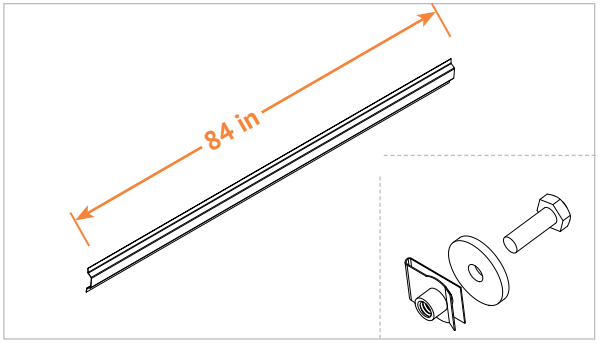
BALLAST BAY: The Ballast Bay is constructed of a high strength low alloy steel with a coating to protect against corrosion. This system has a modular design that allows for easy installation around roof obstructions and accommodates roof undulations. The Ballast Bays are designed to nest within each other to optimize shipping logistics. **NOTE: Systems installed on PVC roofs require ballast bays with pre-installed Santoprene pads.**



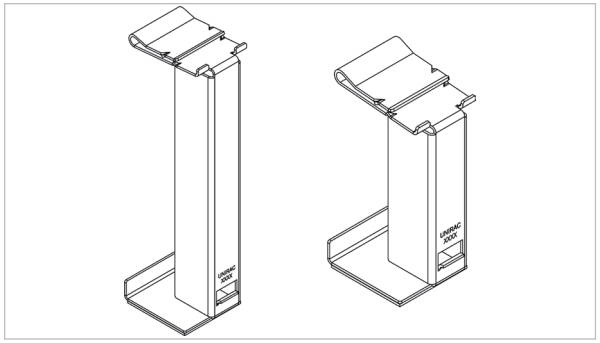
CLAMP & HARDWARE: The Module Clamp is made of Stainless Steel and can be used with module frame heights indicated on the clamp. The clamps are a portion of the UL2703 Listed system when installed according to this installation guide. A ¼-20 stainless steel bolt and u-nut are the associated hardware for installing clamps. **NOTE: U-Nuts come in packages separate from Clamp Kit.**



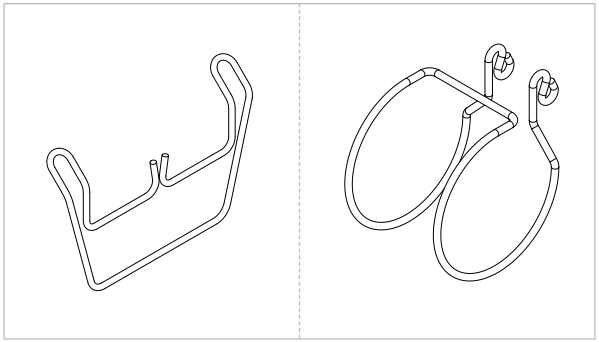
BALLAST BLOCK: The RM ballast bay can fit up to 2 ½ standard 4”x8”x16” solid concrete cap blocks. Block weight can range from 26 – 38 lbs. and shall meet ASTM C1491 requirements for freeze thaw durability. Verify your block weights before using the Unirac U-Builder online design tool.



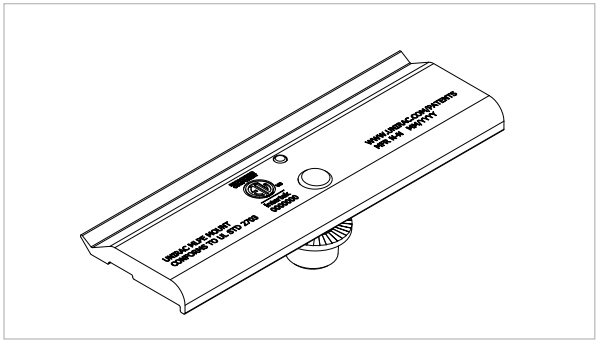
WIND DEFLECTOR: 18G G180 steel wind deflector aids in ballast reduction and provides fire mitigation. A 1/4"- 20 stainless steel bolt and fender washer (1.5" O.D) are associated hardware for wind deflectors. **NOTE: U-Nuts come in packages separate from deflector hardware.**



MID SUPPORTS: Mid Supports are made of Galvalume steel and provide additional downforce support for large modules as well as heavy wind and snow loads.



OPTIONAL WIRE MANAGEMENT: Custom Unirac wire clip along with mounting options for various off the shelf wire management clips.



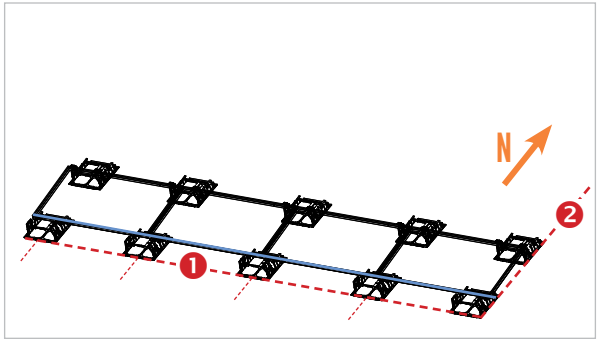
OPTIONAL MICROINVERTER MOUNTING: Microinverter / Power optimizer bracket, see page 11 for additional instructions.

NOTE: All conduit and wire ways should be grounded & bonded per the (NEC) National Electric Code.

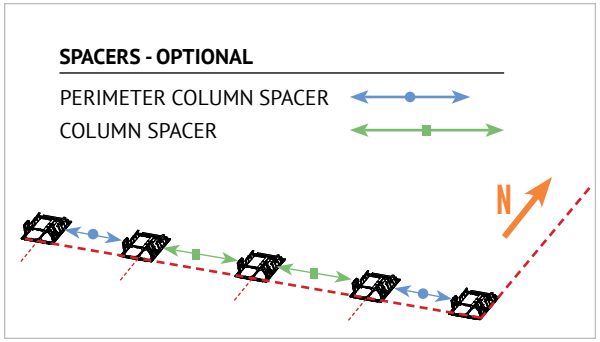
PART NUMBER DATA

S.No.	Part Number	Part Description
1	310800	RM5 BAY
2	310803	RM5 BAY, PVC
3	310810	RM5 WIND DEFLECTOR, 84"
4	310811	RM5 WIND DEFLECTOR, 98"
5	310820	RM5/DT ENDCLAMP 30-40MM
6	310821	RM5/DT ENDCLAMP 41-45MM
7	310822	RM5/DT ENDCLAMP 46-50MM
8	310830	RM5/DT PVC ROOF FRICTION PATCH
9	310850	RM5/DT WIRE MGMT CLIP
10	310851	RM5 WD WIRE MGMT CLIP
11	310860	RM5/DT 1/4-20 CLIP U-NUT SS18-8
12	310861	RM5, WIND DEFLECTOR HDW KIT
13	008114M	MLPE MOUNT ASSY

S.No.	Part Number	Part Description
14	205000S	ENPHASE ENGAGE CABLE CLIP
15	008002S	GROUND WEEBLUG #1
16	008009P	ILSCO LAY IN LUG (GBL4DBT)
17	310999	FLASHLOC RM KIT
18	310835	RM5 MID SUPPORTKIT

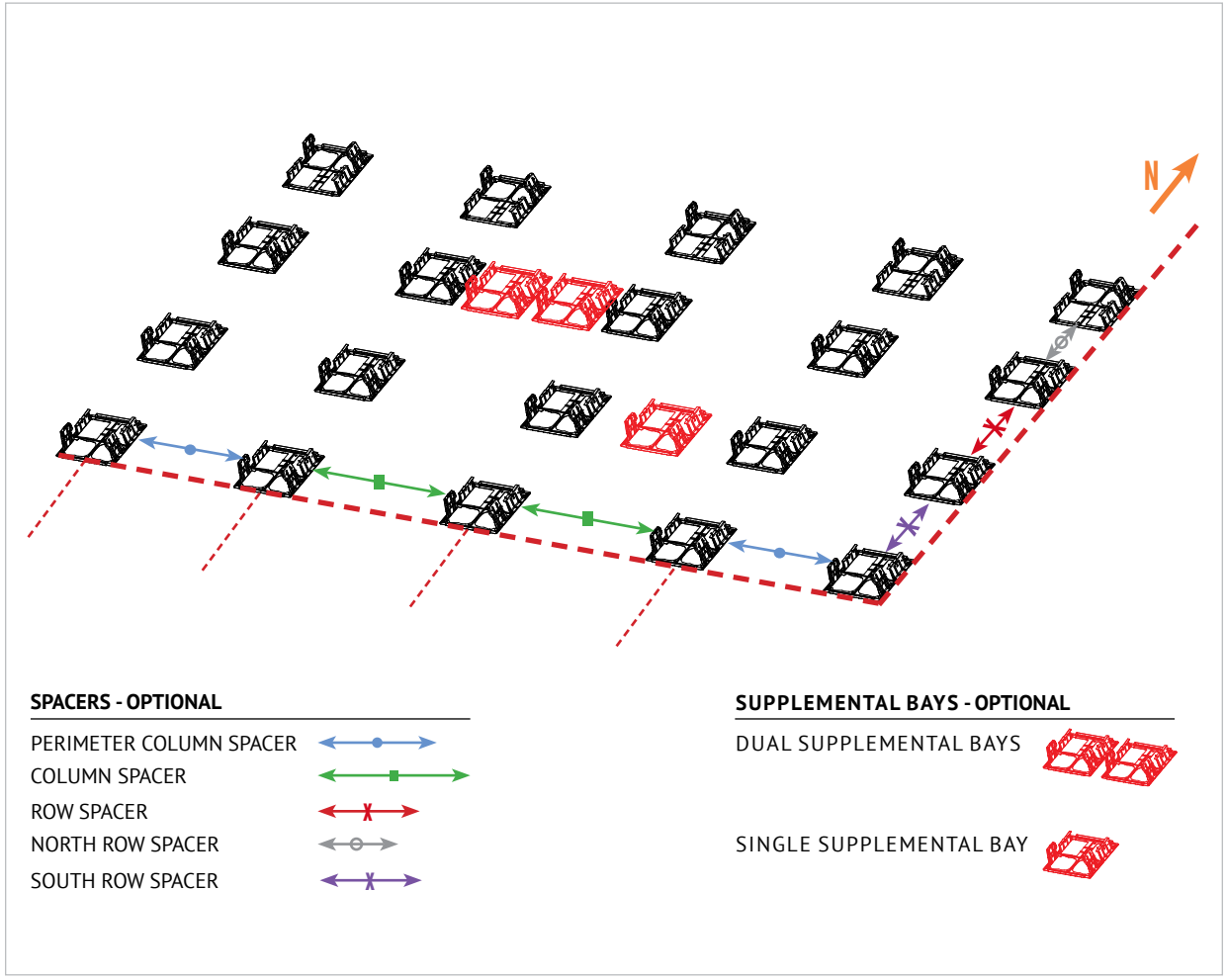


SNAP SOUTH PERIMETER CHALK LINE, THEN EAST OR WEST PERIMETER CHALK LINE. As best practice, on south edge of array mark lines to locate the center of each bay.



PLACE SOUTH PERIMETER BAYS FIRST. If slip sheets are required, place per manufacturers recommendations.

NOTE: Custom spacers can be made to aid in the placement of bays on the roof. See page 1

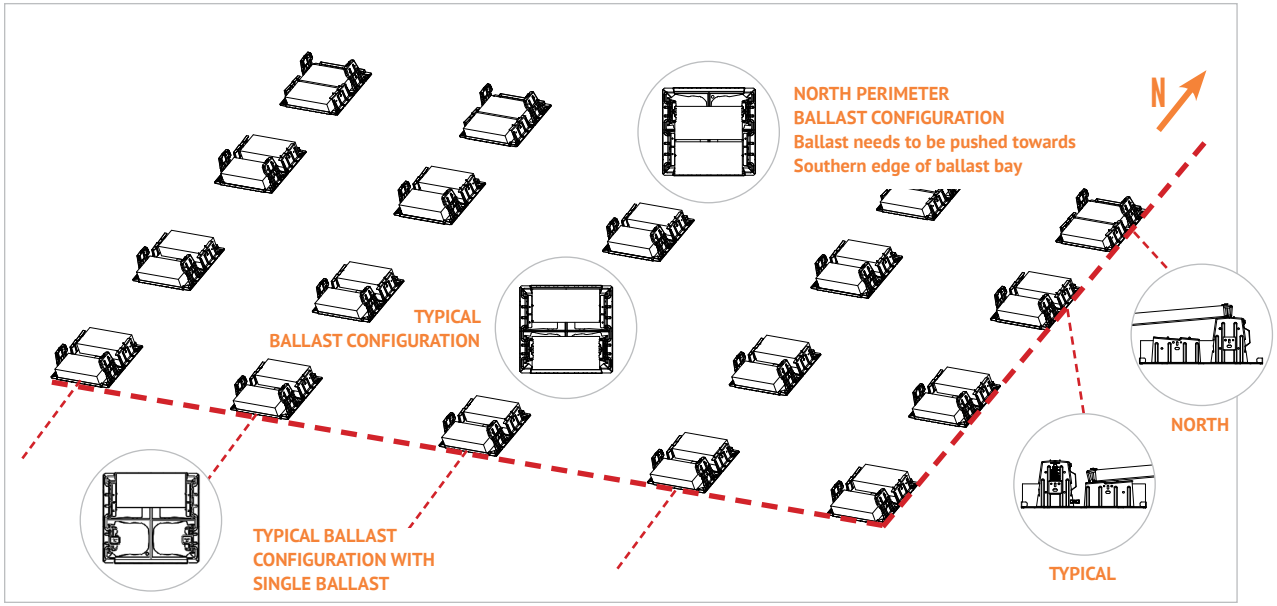


PLACE ALL BAYS.

NOTE: If mechanical attachment is required, place prior to installation of modules.

NOTE: If supplemental bay is required, install after the primary bays are installed. Supplemental bay needs to be centered in between primary bays.

PLACE ALL BALLAST: A maximum of two and half (2 ½) ballast blocks can be placed in each ballast bay, typically pushed into the retention feature on the north or south edge. The North perimeter requires ballast blocks to be pushed towards the southern edge of the ballast bay to accommodate wind deflectors. Site specific ballast calculations should be created for each individual project in accordance with the U-Builder design software. This system has been rated for the mechanical load provisions of UL2703. In addition, it has been designed and tested to comply with the more rigorous requirements of SEAOC PV1, PV2 and ASCE 7.



SOUTHERN EDGE MODULE PLACEMENT: Each bay has two spacing options, select the appropriate tab according to layout requirements.

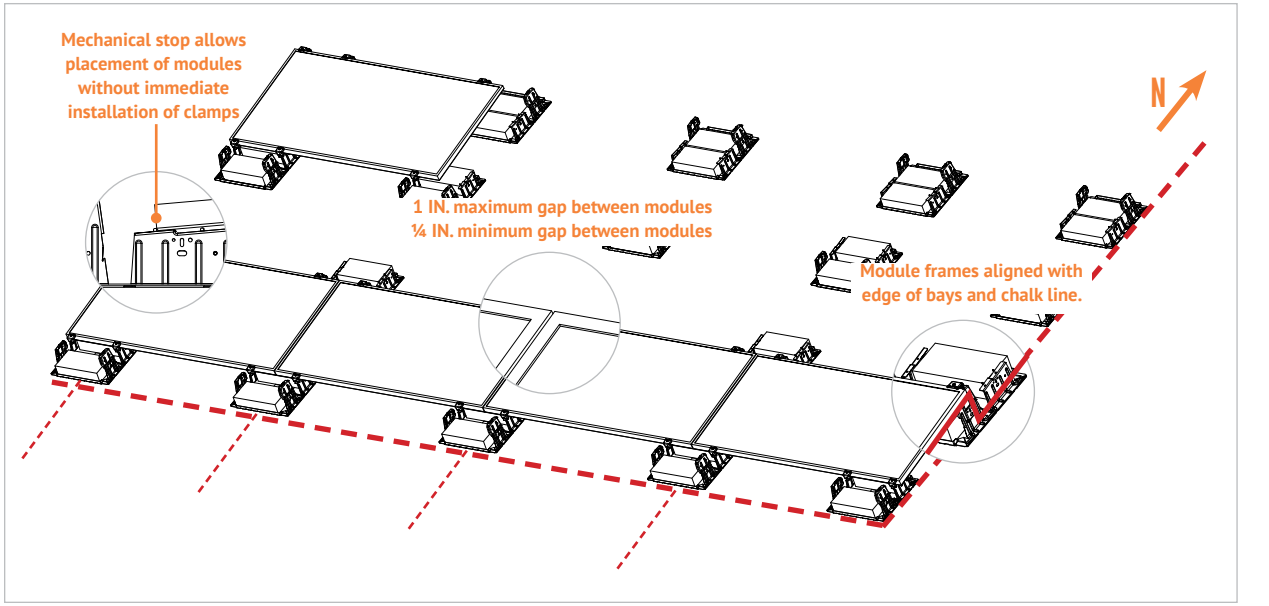
Place southern row of modules on bays. You may adjust second row of bays. Do not adjust southern most row of bays

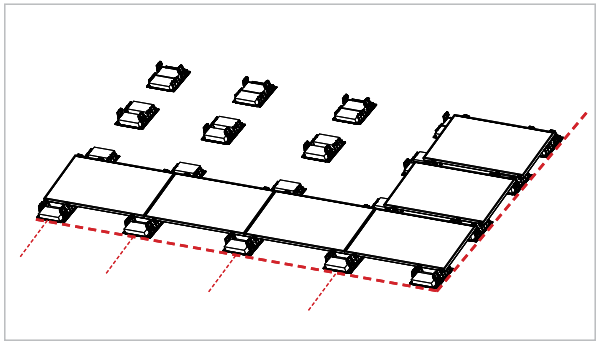
1 IN. Maximum gap between modules

¼ IN. Minimum gap between modules

NOTE: Modules may be placed on bays without immediate installation of clamps.

NOTE: Modules shall be mounted in landscape orientation only.



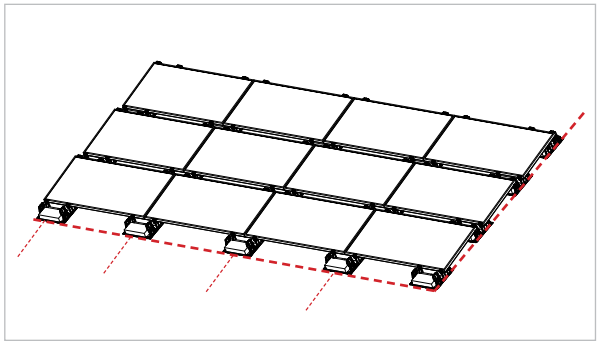


EAST OR WEST EDGE MODULE PLACEMENT

NOTE: Modules may be placed on bays without immediate installation of clamps.

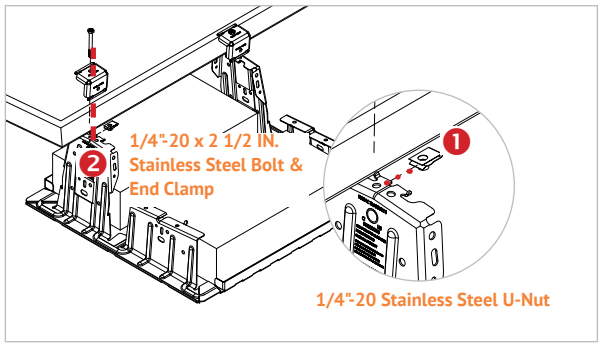
NOTE: Modules shall be mounted in landscape orientation only.

NOTE: Install wind deflector at the time of module installation. See page 9 for installation guide.



COMPLETE MODULE PLACEMENT

NOTE: Wiring, wire management, and electrical QC should be done as each row is built, especially in case of 7.5" row spacing to ensure adequate room for installation.

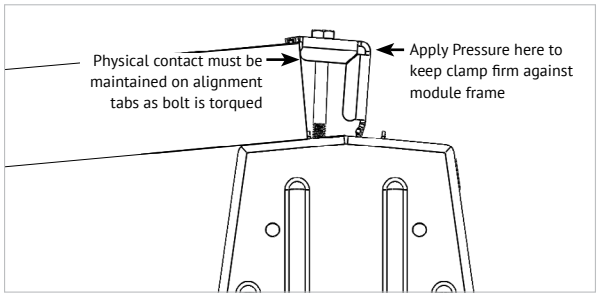


INSTALL U-NUT & INSTALL CLAMPS

NOTE: U-NUT - Single Use Only - Do not re-torque once fully seated

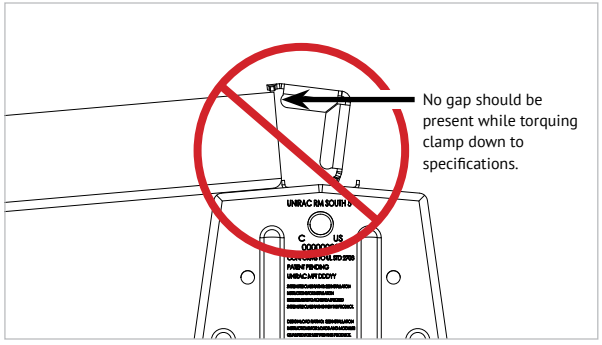
NOTE: CLAMP AND BOLT - Single Use Only - Do not re-torque once fully seated

TORQUE VALUE: 7FT-LBS to achieve UL2703 required clamp load



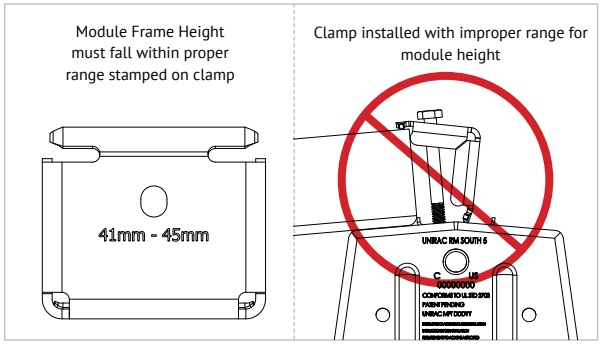
PROPER CLAMP INSTALLATION:

- Clamp is stamped for module frame height on each leg
- Clamp should be firmly held against module frame while being torqued



PROBLEM – CLAMP NOT SEATED AGAINST MODULE DURING TORQUING

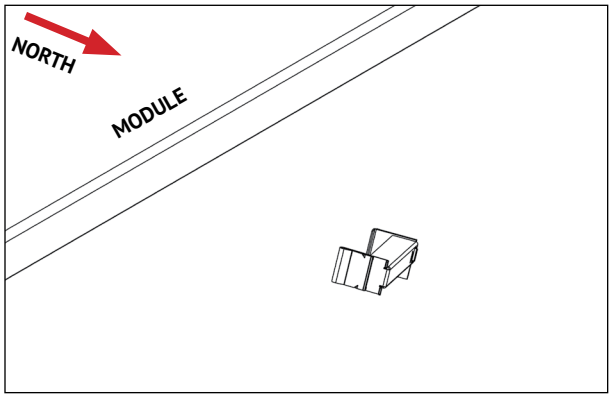
- Clamp needs to be held securely against the module frame during torquing for proper installation



PROBLEM – NOT USING PROPER SIZE OF CLAMP FOR MODULE FRAME HEIGHT

- Double check the stamping on clamp to use the correct leg of clamp for module frame height
- The module height shall fall within the range shown on the top of the clamp
- Excessive angle on clamp will inhibit required clamp load on module

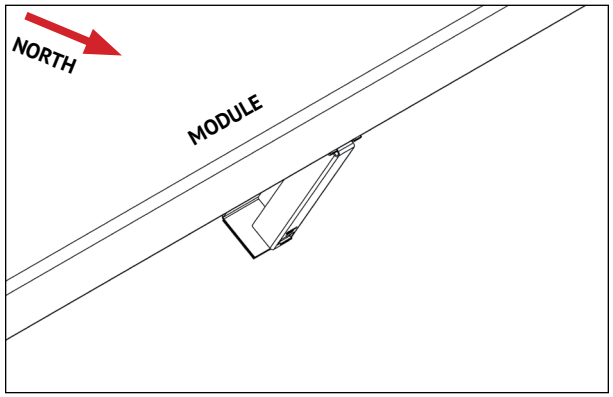
INSTALLING NORTH AND SOUTH MID SUPPORTS



STEP 1: To install the North mid support, tilt it horizontally as shown in the figure and insert it under the module's North side.

CAUTION

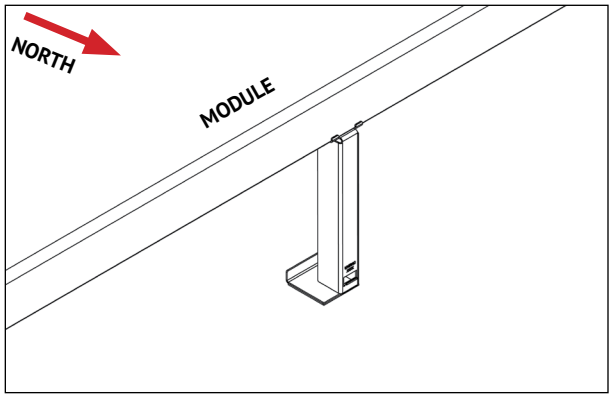
While inserting the midsupport, make sure not to scrape the roof surface with the metal edge.



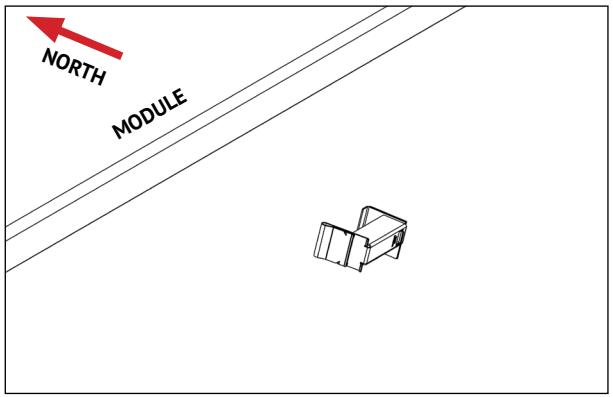
STEP 2: Using the PV module cell lines, locate the module centre point (+/- 1"). Tilt back midsupport to engage it to module flange

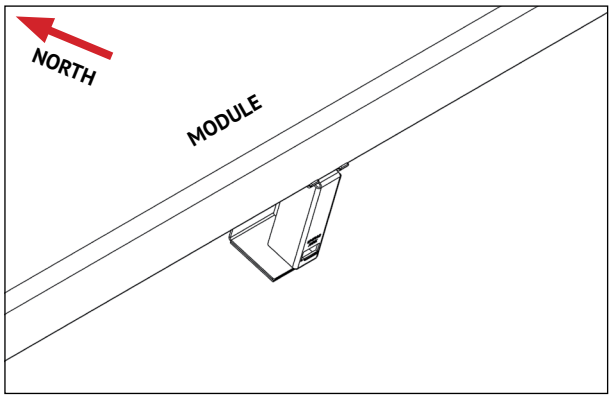
CAUTION

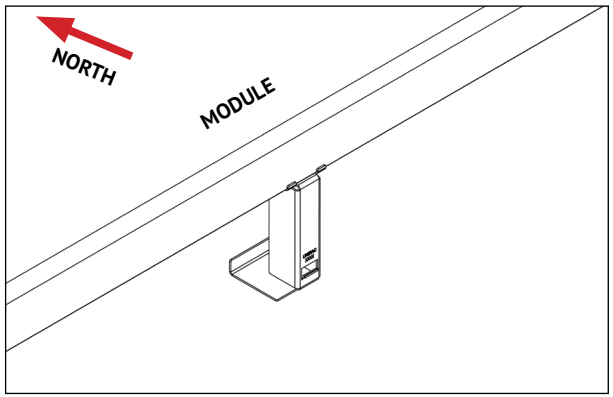
While tilting the south midsupport, make sure not to scrape the roof surface with the metal edge.



STEP 3: Pull the midsupport onto the module flange. Ensure the midsupport is fully engaged.

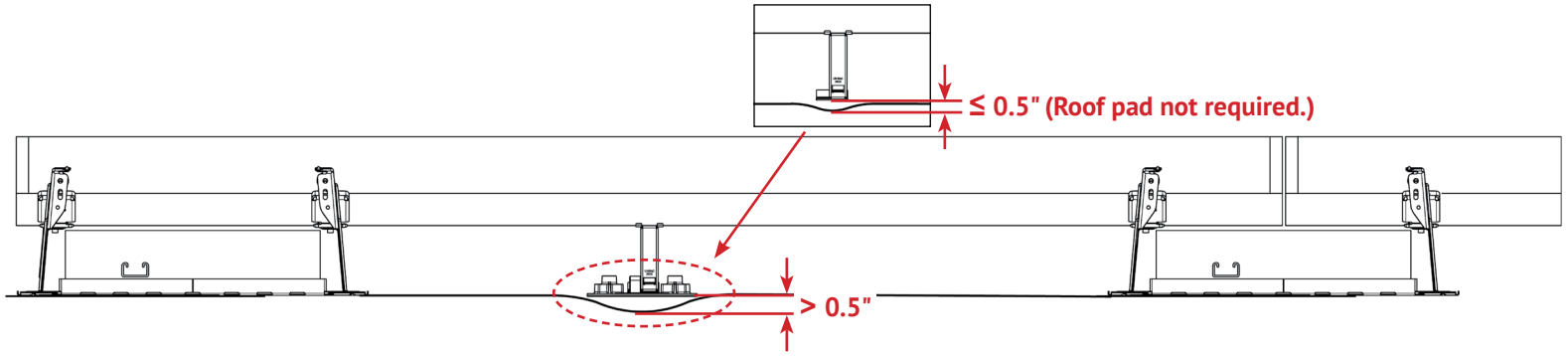






NOTE:
Similarly, we can install the south midsupport by following the STEP 1 to STEP 3

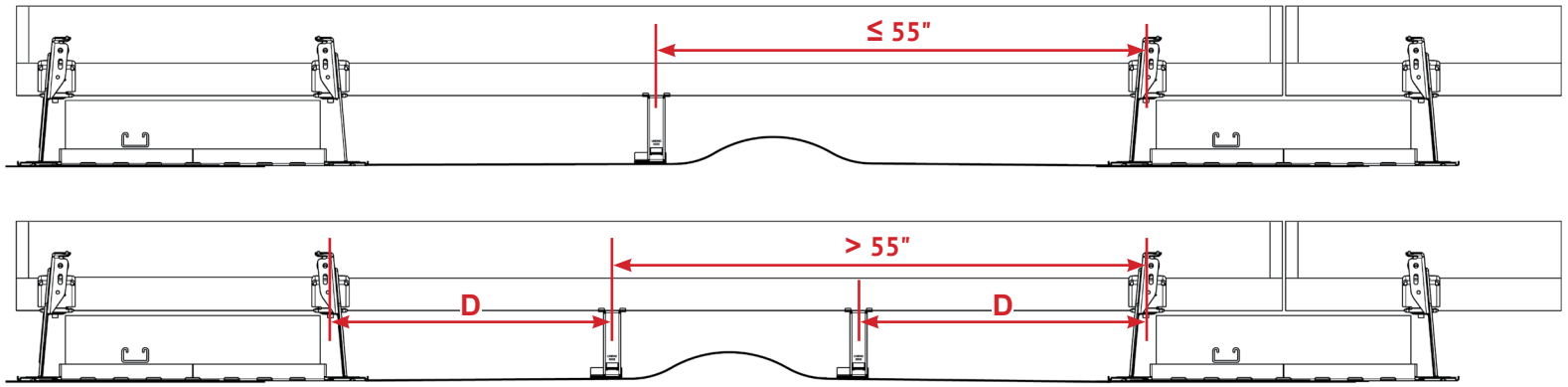
INSTALLING MID SUPPORTS ON ROOF UNDULATIONS



CASE 1: MID SUPPORT AT THE VALLEY OF ROOF UNDULATION

- Place the roof pad *(P/N: 360060)* directly under the mid support at the valley of the roof undulation if the gap is greater than 0.5 inches.
- Stack additional roof pads until the gap between roof pad and mid support is less than or equal to 0.5 inches.
- Ensure the roof pads are aligned properly and provide a stable base for the mid support.

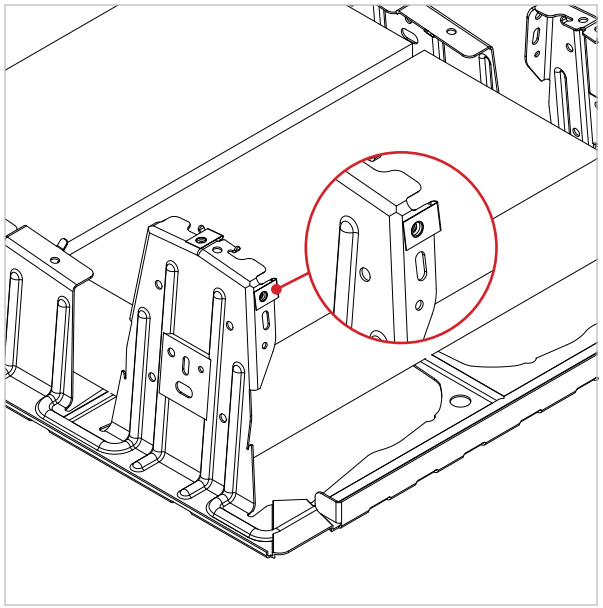
Note: A roof pad is not required if the gap at the roof undulation is 0.5 inch or less.



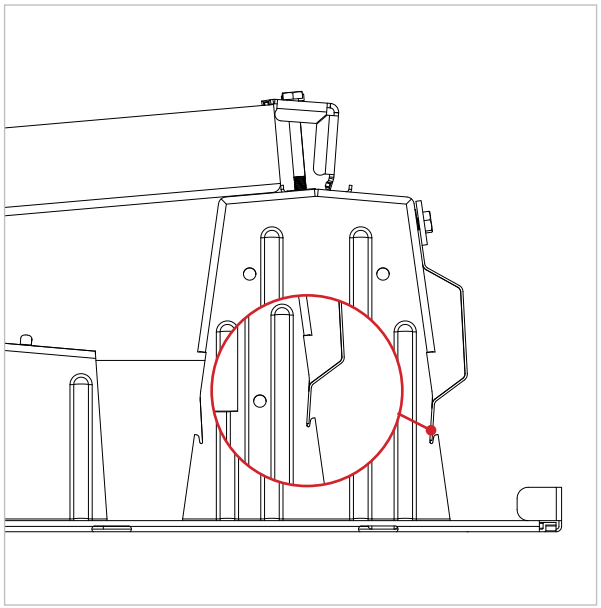
D: Distance between Mid Support and Module Clamp

CASE 2: MID SUPPORT AT THE PEAK OF ROOF UNDULATION

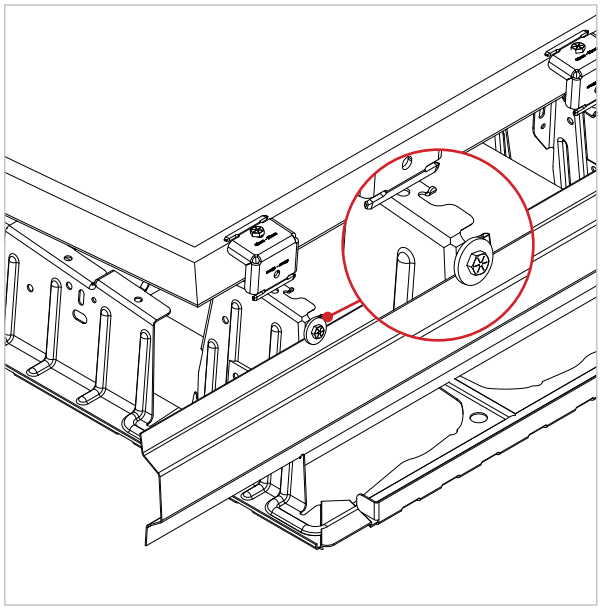
- Slide mid support to either side of undulation so that it lands on flat surface.
- If distance between mid support and farthest module clamp on same module exceeds 55 inches, add another mid support symmetrically to the previous mid support.



STEP 1 - U-NUTS:
Install u-nuts on side flange



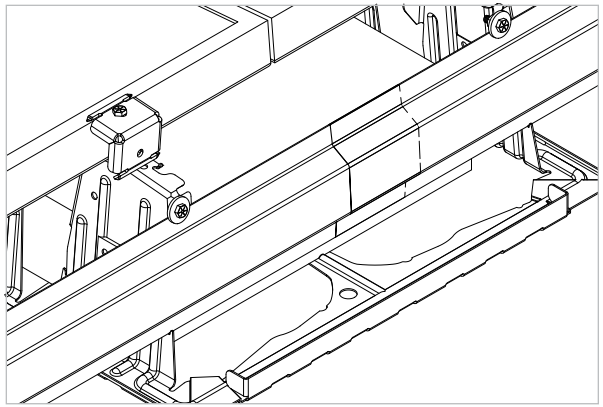
STEP - 2 WIND DEFLECTOR:
Position wind deflector in the slots provided in the bay



STEP 3 - HARDWARE: Secure wind deflector with 1 ½" O.D. flat washer and ¼-20 x 1" Bolt, as shown above

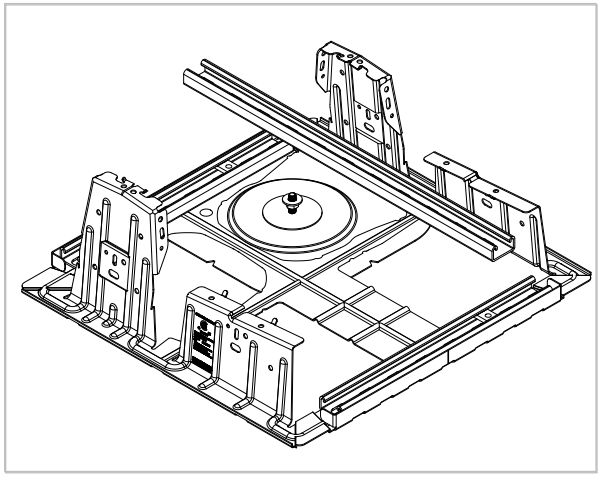
TORQUE VALUE: 10FT-LBS

NOTE: If the system requires wind deflectors do not leave arrays without installing wind deflectors. Wind deflectors are critical aerodynamics components in the case of any wind event.

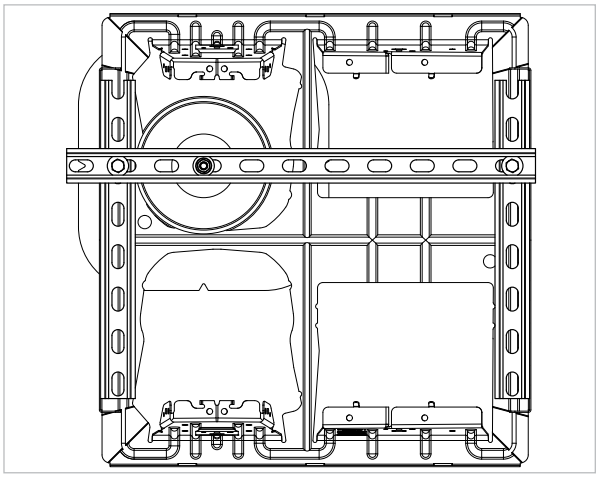


INSTALL BALLAST BAY WIND DEFLECTORS

NOTE: Wind deflectors overlap at splice

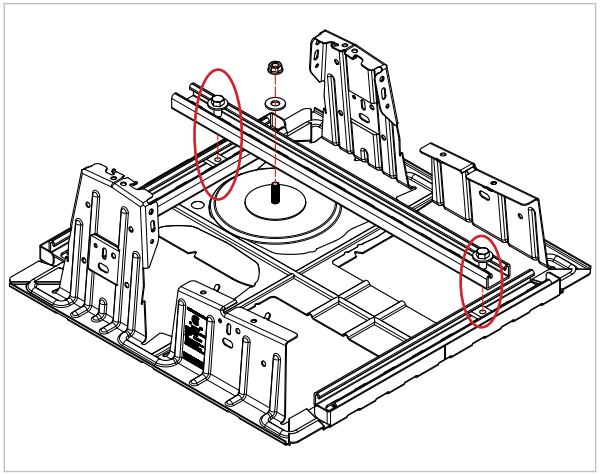


STEP 1 - PLACE NUT AND WASHER:
Include the nut and washer on the anchor stud prior to placing the stud through the strut.



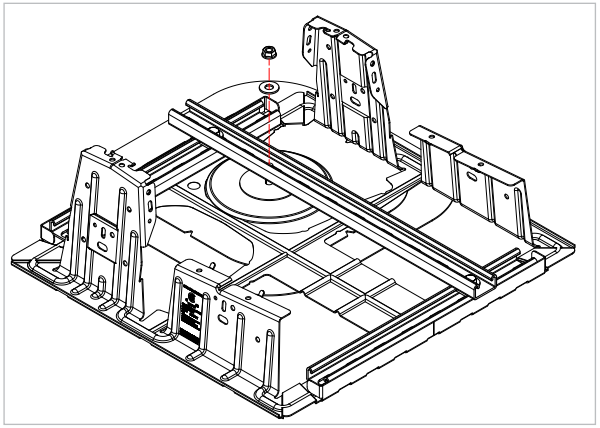
STEP 2 - POSITION ROOF ATTACHMENT:
Position Roof Attachment under bay requiring attachment and install according to manufacturer installation instructions.

NOTE: Position attachment so that it is close to center of the bay as possible.



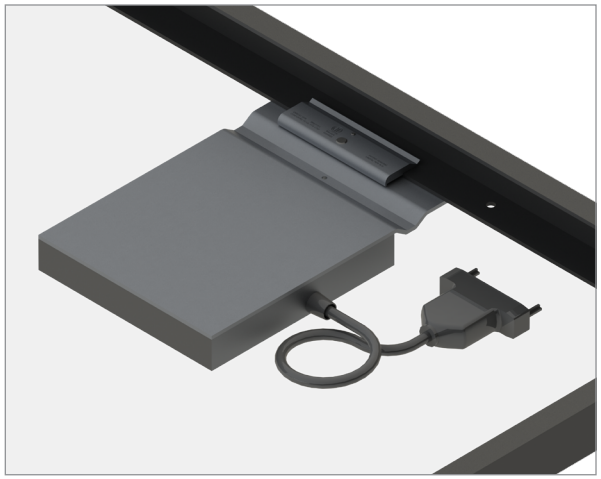
STEP 3 - PLACE UNISTRUT: Position strut sections on bay as pictured above. Align the cross-strut with the anchor's stud. Connect side strut sections to cross strut using a strutnut, bolt, and washer as pictured.

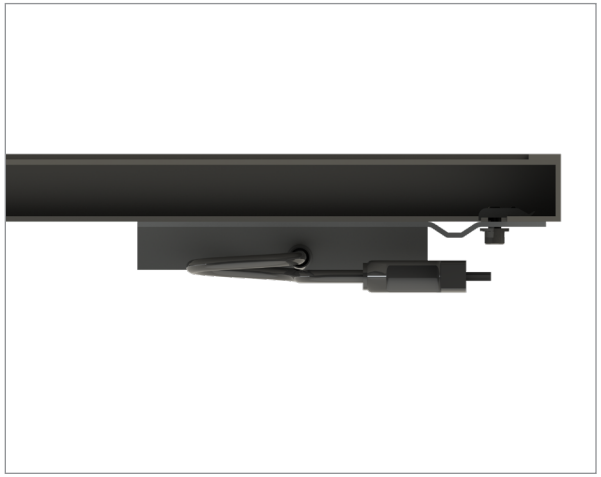
NOTE: Metal base of attachment where stud is located cannot exceed a height of 1/4".



STEP 4 - SECURE UNISTRUT TO ROOF ATTACHMENT: Place 3/8" washer and 3/8-16 serrated flange nut on anchor stud, serrations facing down and tighten to 30 ft-lb.

TORQUE VALUE: 30FT-LBS

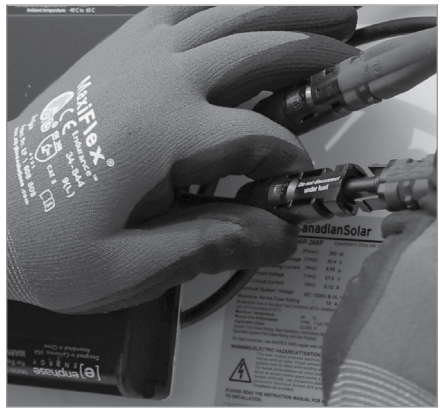




PRE-INSTALL MICROINVERTERS: Install MLPE in a location on the module that will not interfere with ballast bays or grounding lugs. To use trunk cable most efficiently, install MLPE components in the same locations on all modules in the same row.
TORQUE VALUE: 20FT-LBS









GROUNDING LUG MOUNTING DETAILS AS REQUIRED BY CODE & ENGINEER OF RECORD: The Ilsco lug has a green colored set screw for grounding indication purposes. One lug is recommended per continuous array, not to exceed 150ft X 150ft.

Unirac ROOFMOUNT is intended to be used with PV modules that have a system voltage less than or equal to that allowable by the National Electric Code (NEC). It is the installer's responsibility to check adherence to local codes.

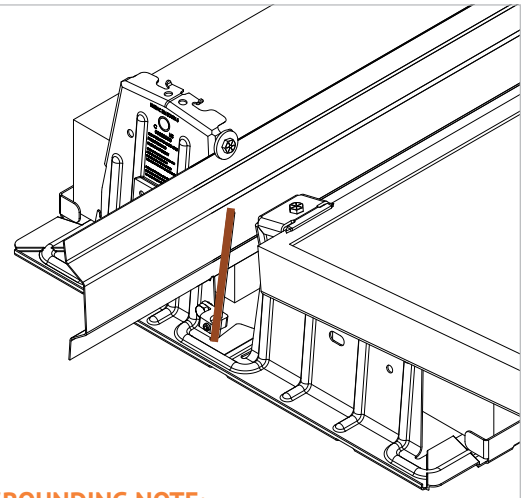
NOTE: The installation must be conducted in accordance with the National Electric Code ANSI / NFPA 70.

Ground Lug	Bolt Size	Torque Value
Ilsco Lug SGB-4	1/4"-20	6.5 ft-lbs (75 in-lbs)
Ilsco Lug GBL-4	#10-32	2.9 ft-lbs (35 in-lbs)
Wiley 6.7	1/4"-20	10 ft-lbs (120 in-lbs)

NOTE: In order to prevent corrosion induced by dissimilar metals, it is important to verify that the bare copper wire does not come into contact with aluminum or galvanized steel. These materials must be kept separate.

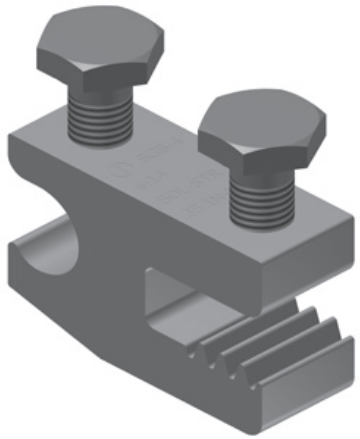
Although conformance with UL2703 was demonstrated without the use of oxide inhibitor material, it is recommended by Ilsco to provide an optimized bonding solution for their lay-in lug.

All Lugs Solar Grounding & Bonding



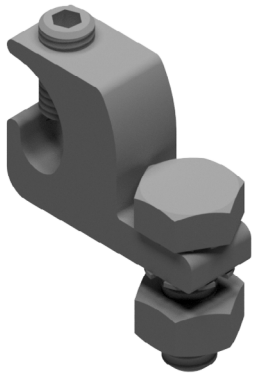
GROUNDING NOTE:
Can be installed on any location with a flat surface on the bay in order to ground the system.

Ilsco SGB-4 Solar Grounding & Bonding



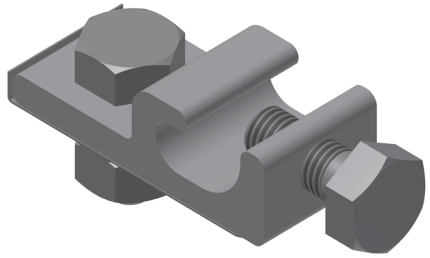
TERMINAL TORQUE:
Install conductor and torque to the following: 4-14 AWG: 35 in-lbs

Ilsco GBL-4 Solar Grounding & Bonding

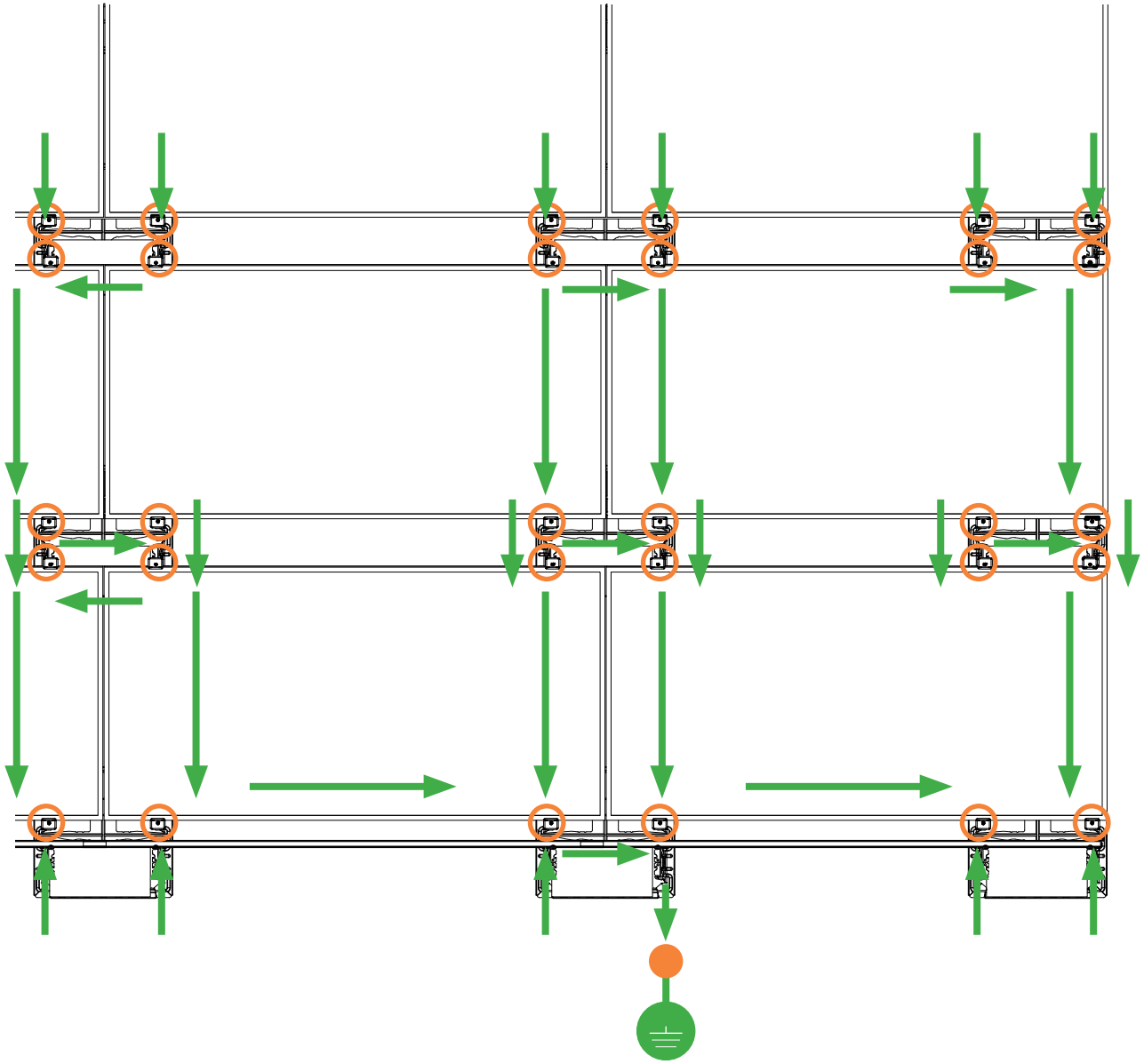


TERMINAL TORQUE:
Install Conductor and torque to the following: 4-6 AWG: 35 in-lbs, 8AWG: 25 in-lbs

Wiley WEEB-Lug 6.7 Solar Grounding & Bonding



TERMINAL TORQUE:
Install Conductor and torque to the following: 4-6 AWG: 10 ft-lbs, 6-14 AWG: 7 ft-lbs



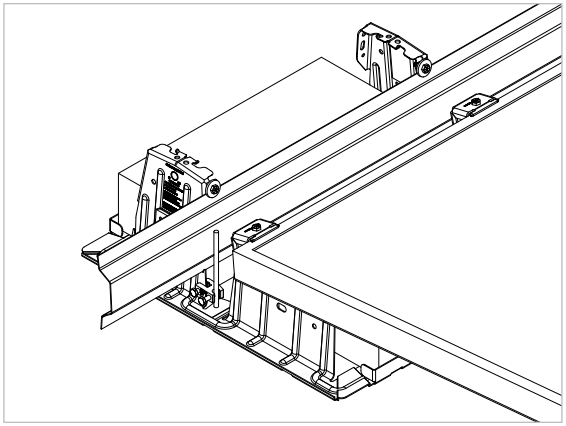
Fault Current Ground Path

Ground Lug

Grounding Clip & Bolt

Min. 10 AWG Copper Wire

Module Frame
Module Bay w/ Grounding Clips

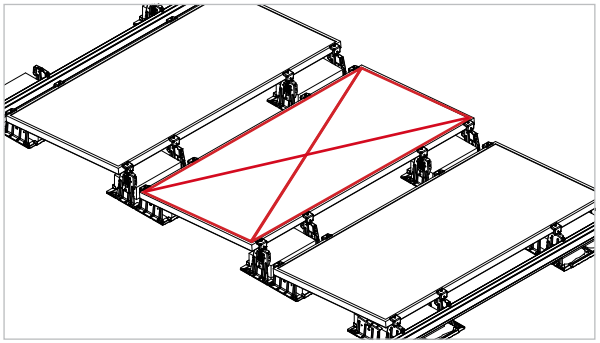


TEMPORARY GROUNDING & BONDING PROCEDURE: Periodic inspections should be conducted on the PV array to ensure there are not loose components, loose fasteners or corrosion. If any of the above items are found, the affected components are to be immediately replaced.

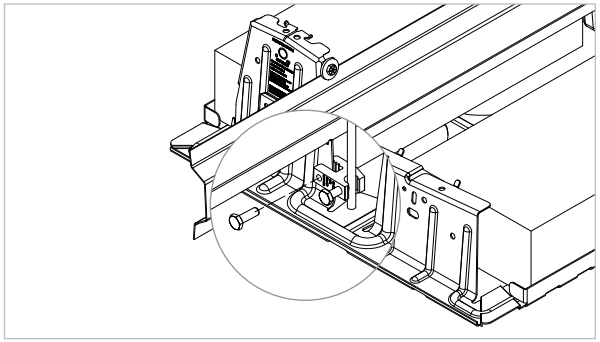
Note

- **If a module must be removed or replaced, a temporary bonding jumper must be used to ensure safety of the personnel and PV system.**
- **Removing a PV module from a system is not considered to be routine maintenance. This type of activity should only be performed by trained and qualified installers.**
- **In order to prevent corrosion induced by dissimilar metals, it is important to verify that the bare copper wire does not come into contact with aluminum or galvanized steel. These materials must be kept separate.**

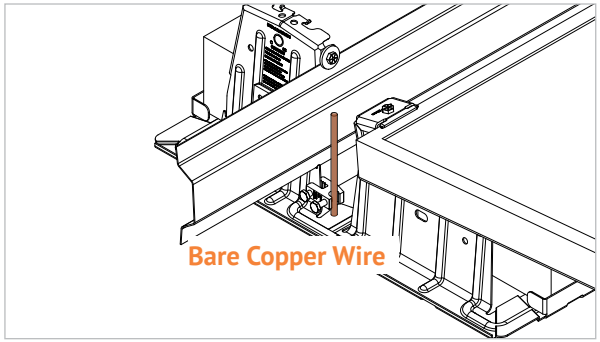
APPROVED LUGS and Terminal Torque see page 12



BONDING JUMPER REQUIRED: One example of a module removal that will require the use of a bonding jumper

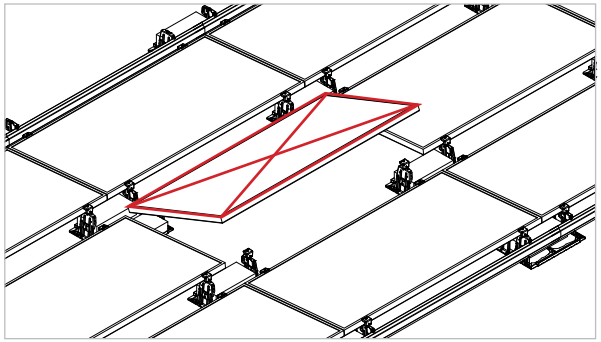


ATTACH LUGS: Use approved lug(s) to install on adjacent bays where the module is being removed.



INSERT COPPER WIRE: Insert bare copper wire into each lug, providing a bonding jumper across the missing module location.

Remove module & reverse the operation after maintenance is complete



BONDING JUMPER NOT REQUIRED, due to integrated bonding/grounding path throughout module frames/ bays around this location.

NOTE: CLAMP AND BOLT - Single Use Only - Use new clamps after any module replacements or system maintenance.

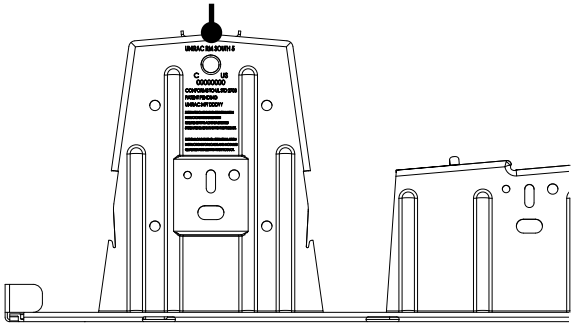
SYSTEM LEVEL FIRE CLASSIFICATION: The system fire class rating is only valid when the installation is conducted in accordance with the assembly instructions contained in this manual over a fire resistant roof covering rated for the application. RM ROOFMOUNT has been classified to the system level fire portion of UL2703. It has achieved Class A performance for low sloped roofs when used in conjunction with type 1, 2, 29, and 30 module constructions. Please see the specific conditions below for mounting details required to maintain the Class A fire rating. Minimum and maximum roof slopes are restricted through the system design and layout rules. The fire classification rating is only valid on roof pitches less than 2:12 (slopes < 2 inches per foot, or 9.5 degrees).

Refer to page right for proper installation of wind deflectors for required fire mitigation.

NOTE: Fire Type information is generally located on back of modules or through manufacturer's documentation. Some building codes and fire codes require minimum clearances around such installations, and the installer should check local building code requirements for compliance.

Unirac RM

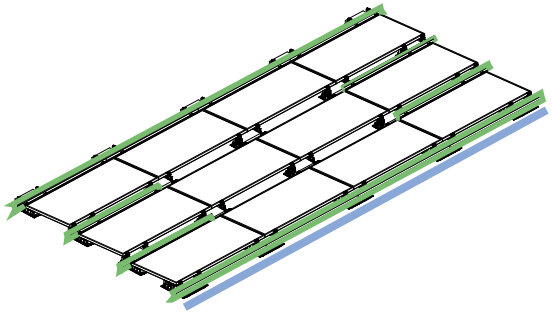
CONFORMS TO UL STD2703



Module Type	System level Fire Rating	Mitigation
Type 1, 29, & 30	Class A	Prescriptive. See notes & Illustration Below
Type 2	Class A	Prescriptive. See notes & Illustration Below

TYPE 1 / TYPE 2 CLASS A FIRE RATING MOUNTING ORIENTATION

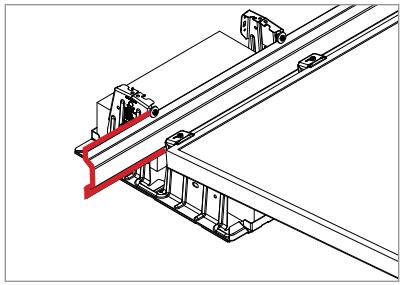
Unirac RM has achieved Class A system level fire performance for type 1, 2, 29, and 30 module constructions. In order to maintain the fire rating for type 1, 29, & 30 modules wind deflectors must be installed on the north edge of the array. Type 2 modules require wind deflectors to be installed on the north and south edges of the array and at all perimeter modules. **NOTE: See page 9 for installation of wind deflectors.**



Please use the U-builder tool to optimize the usage of wind deflectors for fire mitigation.

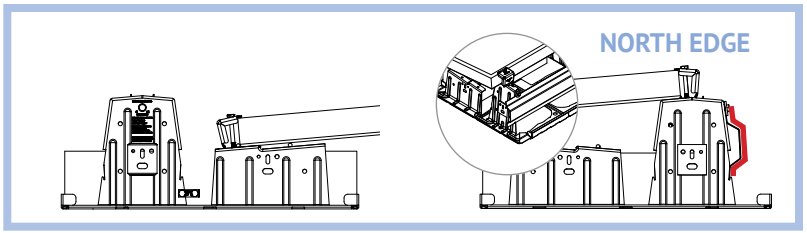
Type 1, 29, & 30 Requires fire mitigation on North Edge when there are no additional wind deflectors throughout the array

Type 2 Requires fire mitigation on all perimeter modules within array.

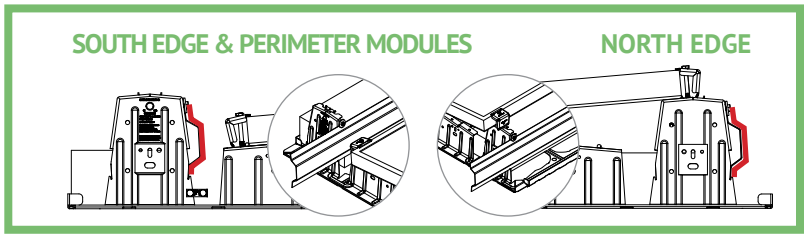


TYPE 2 EAST/WEST EDGES ONLY: Install wind deflectors in each row with 6" overhang on east and west edges. This applies for any deflector installed on east and west edges throughout the array.

TORQUE VALUE: 10FT-LBS
All Wind Deflector Hardware (¼-20 x 1inch bolt, ¼-20 u-nut & 1/4inch flat washer 1 1/2in O.D.)



TYPE 1, 29, & 30: Install wind deflectors on North edge of array.



TYPE 2: Install wind deflectors on all perimeter modules within array

NOTE: Wind deflector should be secured to supplemental bay by two hardware kits.

MECHANICAL LOAD TEST

The Unirac RM system has been tested to the mechanical load provisions of UL2703 and covers the following basic parameter(s):

- Test Loads = 1.5 x Design Loads
- PV modules may have a reduced load rating, independent of the RM5 load rating. Please consult the PV module manufacturer's installation guide for more information.

TESTED MODULES

Module Manufacturer	Model / Series	Area (sq ft)	Standard Installation Configuration - No Mid Bay		Installed with Additional Bay at Modules East/West Center	
			Up Design Load (psf)	Down Design Load (psf)	Up Design Load (psf)	Down Design Load (psf)
Jinko	JKMxxxM-72HL4-V	27.8	17.24	36.20	Not Tested	Not Tested
Canadian Solar	CS7N-xxxMB-AG	33.4	15.67	14.85	23.52	33.33

NOTE:
All installation configurations have achieved a minimum of 5psf design load in the downslope direction.

ELECTRICAL BONDING & GROUNDING TEST MODULES: This racking system may be used to ground and/or mount a PV module complying with UL1703 or UL61730 only when the specific module has been evaluated for grounding and/or mounting in compliance with the included instructions.

Manufacture	Module Model / Series
Aionrise	AION60G1, AION72G1
Aleo	P18 & P19 S18, S19, S59, & S79
AMPS	AMPS-xxxN-108BB AMPS-xxxP-54BB
Aptos Solar	DNA-108-(MF/BF)10-xxxW DNA-108-MFN10-xxxW DNA-120-(MF/BF)10-xxxW DNA-120-(MF/BF)26 DNA-120-MF10 DNA-144-(MF/BF)26 DNA-144-BF10-xxxW-DG
Astronergy	ASM6612P Series CHSM6610(P/M)/HV CHSM6612(P/M)/HV CHSM66M(DG)/F-BH CHSM72(P/M)-HC CHSM72M(DG)/F-BH CHSM72N(DG)/F-BH (Fire Type 29 only) CHSM72M(DG)/F-BH (Fire Type 29 only)
AU Optronics	PM Series
Auxin	AXN10Mxxx AXN6M610T AXN6M612T AXN6P610T AXN6P612T AXNG1M SERIES
Axitec	AC-xxx(M/P)/(60/72)(S/V) AC-xxxMBT/144V AC-xxxP/156-60S AC-xxxTGB/144TS

Manufacture	Module Model / Series
Axitec(Cont.)	AXIblackpremium X HC: AC-xxxMH/(120/144)(SB/VB) AXIblackpremium XL HC: AC-xxxMH/120(SB/VB) AC-xxxTGB/96BB AC-xxxTGB/144WS-US AC-xxxTGB/108BB AXIpremium X HC: AC-xxxMH/(120/144)(S/V) AXIpremium XL HC: AC-xxxMH/120(S/V)
Bila Solar	AA550US-6x24GG
Bluesun Solar	BSMxxxM10-72HBD
Boviet Solar	BVM6610 & BVM6612 BVM6610M-xxxS-H-HC BVM6610M-xxxS-H-HC-BF BVM6612M-XXXS-H-HC-BF-DG BVM7612M-H-HC-BF-DG
BYD	P6K Series, MHK
Canadian Solar	CS1(K/H/U/Y)-MS, CS3(U/K)-MB-AG CS3K-(MB/MS/P/PB), CS3L-(P/MS) CS3N-MS, CS3U-(MB/MS/P/PB/PB-AG) CS3W-(MB-AG/MS/P/P-PB-AG) CS3Y-MB-AG, CS5A-M CS6.1-54TM-H, CS6.1-60TM-H CS6.1-72TB-H, CS7N-xxxTB-AG CS6.2-48TM-xxxH CS6.2-66TB-xxxH CS6.2-66TB-xxxHR CS6K-(M/MS/P), CS6P-(M/P) CS6R-MS, CS6U-(M/P) CS6R-xxxMS-HL, CS7N-xxxMB-AG CS6V-M, CS6W-(MB-AG/MS) CS6W-xxx-TB-AG CS6X-P, CS7L-MB-AG, ELPS CS6(P/A)-MM CS7L-MB-AG, CS7L-TB-AG , CS7N-xxx MS

Manufacture	Module Model / Series
Canadian Solar (Cont.)	CS7L-xxxMB-AG
Centrosolar America	C-Series & E-Series
CertainTeed	CT54M10XXX-N07 CT72M10XXX-N07 CTM10400HC11-06, CTxxxHC11-06 CTM10400HC11-08, CTM10400HC11-09 CTTCxxxHC12-08 CTxxxMxx-(01/02/03/04) CTxxxPxx-01
Eco Solargy	Orion 1000 & Apollo 1000
EMMVEE	Titanium Clear ExxxHCBT144-T
Energy America	ZLK-xxx
Es Foundry	ES-DN8-H54B-xxx ES-DN8-H72-xxx ES-DP8-H54B-xxx ES-DP8-H72-xxx
ET Solar	ETAC & ET Modules ET-M672BHxxxTW ET-M772BH520-550WW/WB ET-M772BHxxxTW/TB ET-N772TBHxxxGL
Fellow Energy	FE72-18X(ND)
Flextronics	FXS
Freedom Forever	FF-MP-BBB-xxx FF-MP1-BBB-xxx
FreeVolt	PVGraf
GCL	GCL-P6 & GCL-M6 Series
Gstar Solar	GSD7S54T-xxxBT

- Unless otherwise noted, all modules listed above include all wattages and specific models within that series. Variable wattages are represented as "xxx"
- Items in parenthesis are those that may or may not be present in a compatible module's model ID
- Slashes "/" between one or more items indicates that either of those items may be the one that is present in a module's model ID

ELECTRICAL BONDING & GROUNDING TEST MODULES: This racking system may be used to ground and/or mount a PV module complying with UL1703 or UL61730 only when the specific module has been evaluated for grounding and/or mounting in compliance with the included instructions.

Manufacture	Module Model / Series
Gstar Solar (Cont.)	GSP7G54M(H)
Hansol	TD-AN3, TD-AN4, UD-AN1 & UB-AN1
Hanwha SolarOne	HSL 60 & HSL 72
Heliene	132HC M10 SL Monofacial 144HC M10 NTYP SL Bifacial Module 144HC M10 SL Bifacial 144HC M6 156HC M10 NTYP SL Bifacial Module 156HC M10 SL Bifacial 36M, 60M, 60P, 72M & 72P Series
HT-SAAE	HT60-156M(V)-C HT60-156M-C HT72-156(M/P) HT72-156P(V)-C HT72-156P-C HT72-166M HT72-18X HT72-18X(ND)-F
Hyperion Solar	HY-DH108N8B HY-DH108P8(B) HY-DH144P8 HY-DH156N8 HY-DH156P8
Hyundai	HiN-SxxxXG(BK) HiN-TxxxNF(BK) HiN-TxxxNI HiN-TxxxNJ HiN-TxxxOJ HiS-SxxxOJ HiS-SxxxXG(BK) HiS-SxxxYH(BK) HiS-TxxxNJ

Manufacture	Module Model / Series
Hyundai Heavy Industries	MG, TG, RG, KG, MI, RI, KI, HI & TI Series HiA-SxxxHG, HiD-SxxxRG(BK), HiS-S400PI
Illuminate USA	IL5-72HBD-xxx M IL8-66HGD-xxx M
Imperial Star	ISM7-SHDD108-400/M
INDEPWR Solar	iPWR-M10-54BX2S-xxxW iPWR-M10-60BX2S-xxxW
ITEK	iT, iT-HE & iT-SE Series
Japan Solar	JPS-60 & JPS-72 Series
JA Solar	JAM54S30 xxx/MR JAM54S31 xxx/MR JAM66D45 LB JAM72D10 xxx/MB JAM72D30MB JAM72D40 xxx/MB JAM72S30 /MR JAM72S30 /MR JAM78D10MB JAP6(k)-60-xxx/4BB JAP6-60, JAM6-60 JAP6-72, JAM6-72 JAP60S##-xxx/** JAM6(k)-60-xxx/**, JAM60S##-xxx/** JAP6(k)-72-xxx/4BB, JAP72S##-xxx/** JAM6(k)-72-xxx/**, JAM72S##-xxx/** i. ##: 01, 02, 03, 09, 10 ii. **: SC, PR, BP, HiT, IB, MW, MR ** = Backsheet, ## Cell technology
Jinko	JK07(A/B) JKMSxxx(P/PP)-60 JKMSxxx(P/PP)-72 JKMSxxx-72 JKMSxxxM-60 JKMSxxxPP-60B-J4

Manufacture	Module Model / Series
Jinko(Cont.)	JKMxxx(M/PP)-72-V JKMxxx(M/P/PP)-72 JKMxxx(P/PP)-60, JKMxxxPP-60(Plus) JKMxxx(P/PP)-72B JKMxxx-72L-V JKMxxxM-60 JKMxxxM-60(B/L/HL/BL/LV) JKMxxxM-60-V JKMxxxM-6RL3-B JKMxxxM-72HBL-V JKMxxxM-72HL(4)-V JKMxxxM-72HL4-TV JKMxxxM-72HLM-TV JKMxxxM-72L-V JKMxxxM-7RL3-TV JKMxxxM-7RL3-V JKMxxxN-54HL4-B JKMxxxN-72HL4-BDV(30mm & 35mm Frame Height) JKMxxxN-72HL4-BDX JKMxxxN-72HL4-TV JKMxxxPP-60B JKMxxxPP-60B-J4 JKMxxxPP-72(Plus)
Kyocera	KD-F Series
LA Solar	BLA Model LSxxxBF LSxxxBL LSxxxBL (410 watt) LSxxxHC LSxxxHC (430-450 watt range)
LG Electronics	LGxxx(E1C/E1K/N1C/N1K/N2T/N2W/S1C/S2W/Q1C/Q1K)-A5 LGxxx(A1C/M1C/M1K/N1C/N1K/Q1C/Q1K/QAC/QAK)-A6 LGxxxN2T-B5

- Unless otherwise noted, all modules listed above include all wattages and specific models within that series. Variable wattages are represented as "xxx"
- Items in parenthesis are those that may or may not be present in a compatible module's model ID
- Slashes "/" between one or more items indicates that either of those items may be the one that is present in a module's model ID

ELECTRICAL BONDING & GROUNDING TEST MODULES: This racking system may be used to ground and/or mount a PV module complying with UL1703 or UL61730 only when the specific module has been evaluated for grounding and/or mounting in compliance with the included instructions.

Manufacture	Module Model / Series
LG Electronics (Cont.)	LGxxxN1K-B6 LGxxx(N1C/N1K/N2T/N2W)-E6 LGxxxN2T-J5 LGxxx(N1K/N1W/N2T/N2W)-L5 LGxxx(M1C/N1C/Q1C/Q1K)-N5 LGxxx(N1C/N1K/N2W/Q1C/Q1K)-V5 LGxxxN3K-V6
LONGi	LR4-60(HPB/HIB/HPH/HIH) LR4-72(HPH/HIH) LR4-72HBD xxxM LR5-54HABB-xxx M (fire type 29 only) LR5-54HPB-xxx M LR5-54HTB xxxM LR5-72HBD xxx M LR6-60, LR6-60(BK/PE/PB/PH/HPB/HIB/HPH/HIH) LR6-72, LR6-72(BK/HV/PE/PB/PH/HPH/HIH) LR7-72HGD-xxx M LR8-54HGBB LR8-66HGD-xxx M
Maxeon	SPR-MAX3-xxx-BLK-R SPR-MAX3-xxx-COM SPR-MAX3-xxx-R SPR-MAX6-xxx SPR-MAX6-xxx-BLK
Meyer Burger	Meyer Burger Black Meyer Burger Glass Meyer Burger White
Mission Solar Energy	MSExxxSX5K MSExxxSX5T MSH10-xxxHN4G-DC11 MSE MONO & MSE PERC MSExxx(SR8T/SR8K/SR9S/SX5T/SX5K/SX6W) MSExxxHT0B

Manufacture	Module Model / Series
Mission Solar Energy (Cont.)	MSExxxSX6Z MSExxxSX9R MSExxxSX9Z MSH10-xxxHN4G MSH10-xxxHT4T MSI10-xxxHN4G MSI10-xxxHT4G MSI10-xxxHT4T MSN10xxxHT4T MSX10-xxxHN0B
Mitrex	Mxxx-L3H, Mxxx-I3H
Mitsubishi	MJE & MLE Series
mSolar	108BB HC Series (TXI10-xxx108BB) 144BB HC Series (TXS6-xxx144BB)
Neo Solar Power Co.	D6M Series
NE Solar	NESE xxx-60MH-M6 NESE xxx 66MHB-G12 NESE xxx-66THB-G12R NESE xxx-72MHB-M10 NESE xxx 72MHT-M10 NESE xxx 72THB-M10 NESE xxx 72MHB-M10
Optivolt	OPT10MxxxB
Panasonic	EVPVxxx EVPVxxx(H/K/PK/HK/HK2) VBHNxxxKA(01/02) VBHNxxxKA(03/04) VBHNxxxSA(15/16) VBHNxxxSA17(G/E) & SA18(E)
Peimar	SGxxxM (FB/BF), SMxxxM
Philadelphia Solar	PS-M108(HCBF)-400W (30 & 35mm frames) PS-M144(HCBF)-xxxW PS-MNB108(HCBF)-xxxW

Manufacture	Module Model / Series
Philadelphia Solar (Cont.)	PS-MNB144(HCBF)-xxxW PS-MNB156(HCBF)-xxxW
Phono Solar	PSxxxM4(H)-24/TH PSxxxM8GFH-24TNH
Phono Solar Tech.	Standard Modules
Prism Solar	P72 Series P72X-xxx
Q Cells	B.LINE (PLUS/PRO) BFR G4.1 B.LINE PEAK DUO (G7/G7.2) B.LINE PEAK DUO L-(G5/G5.1/G5.2/G5.3) B.LINE PEAK DUO L-(G7/G7.1/G7.2/G7.3) B.LINE PLUS/PRO - L G4.x Q.PEAK DUO (BLK) G5 Q.PEAK DUO (BLK)-G6+ Q.PEAK DUO (BLK)-G7 Q.PEAK DUO (BLK) G8(+) Q.PEAK DUO (BLK) ML-G10(.a)(+) Q.PEAK DUO (BLK) ML G9(+) Q.PEAK DUO (G7/G7.2) Q.PEAK DUO BLK-G10(+) Q.PEAK DUO BLK G10+ /AC Q.PEAK DUO BLK-G6+/TS Q.PEAK DUO BLK ML-G10.B+ Q.PEAK DUO BLK ML-G10.a+ Q.PEAK DUO BLK ML-G10+/AC Q.PEAK DUO BLK ML-G10.C+ Q.PEAK DUO BLK ML-G10.C1+/AC Q.PEAK DUO BLK ML-G10+ / t Q.PEAK DUO BLK ML-G10+ / TS Q.PEAK DUO BLK ML-G10.XY+/AC Q.PEAK DUO G10+ Q.TRON BLK M-G2+ SERIES Q.TRON M-G2+ SERIES

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Manufacture	Module Model / Series
Q Cells(Cont.)	Q.TRON XL-G2.3 / BFG Q.TRON BLK M-G2(.H1)(.F1)(.C1)+/AC (where "X" = any letter between A to W, where "Y" = any number between 1 to 9.) QPEAK DUO G10.C1+ AC Q.PEAK DUO L-(G5/G5.1/G5.2/G5.3) Q.PEAK DUO L-(G6/6.2/6.3) Q.PEAK DUO L-(G7/G7.1/G7.2/G7.3/G7.7) Q.PEAK DUO L-(G8/G8.1/G8.2/G8.3/G8.3 BFG) Q.PEAK DUO L-G6.3 / BFG Q.PEAK DUO ML-G12S.3 / BFG Q.PEAK DUO ML-G12S.3/BFG Q.PEAK DUO ML-G12S.d / BFG Q.PEAK DUO XL-(G10/G10.2/G10.3/G10.c/G10.d) Q.PEAK DUO XL-G10.3/BFG Q.PEAK DUO XL-(G11.2/G11.3) Q.PEAK DUO XL (G9/G9.2/G9.3) Q.PEAK DUO XL-G10.d/BFG Q.PEAK DUO XL-G11.3/BFG Q.PEAK DUO XL-G11S Q.PEAK DUO ML-G12S.7/BFG Q.PEAK DUO XL-G11S.3 / BFG Q.PEAK DUO XL-G9.3/BFG Q.PLUS BFR G4.1(TAA/MAX) Q.PLUS L-G4.2/TAA Q.PLUS/PEAK/PRO - L G4.x Q. PLUS/PRO G3, Q.PLUS BFR G3.1, Q.PRO/PLUS G4 Q.PRO BFR G4x, Q.PEAK (BLK) G4.1 (TAA/MAX) Q.PRO EC-G4.4 Q.PRO L-G2, Q.PEAK (BLK) (G3/G3.1) Q.TRON BLK M-G2+ Q.TRON BLK M-G2+ AC Q.TRON BLK M-G2.C+ Q.TRON BLK M-G2.F+

Manufacture	Module Model / Series
Q Cells (cont.)	Q.PEAK DUO BLK ML-G10.D+ Q.PEAK DUO BLK ML-G10.D1+/AC Q.PEAK DUO ML-G12S.P3 / BFG Q.PEAK DUO XL-G11S.B3 / BFG Q.PEAK DUO XL-G11S.L3 / BFG Q.TRON BLK M-G2+/AC Q.TRON BLK M-G2.C1+/AC Q.TRON BLK M-G2.C3+/AC Q.TRON BLK M-G2.C4+/AC Q.TRON BLK M-G2.D+ Q.TRON BLK M-G2.D1+/AC Q.TRON BLK M-G2.D2+/AC Q.TRON BLK M-G2.F1+/AC Q.TRON BLK M-G2.H+ Q.TRON BLK M-G2.H1+/AC Q.TRON BLK M-G2.Y+ Q.TRON ML-G3.3/BFG
REC	PEAK & ECO RECxxxAA (BLK/Pure/Pure-R/ Pure-RX/ Pure 2/ Pro M) RECxxxAA Pure-RX RECxxxAA PURE-RX-DC RECxxxNP (N-PEAK) RECxxxNP2 (Black) RECxxxNP3 Black RECxxxPE, RECxxxPE72 RECxxxTP RECxxxTP2(BLK2) RECxxxTP2S(B)(XV) RECxxxTP3M (Black) RECxxxTP4 (Black)
Regitec Solar	RMHT54/xxxAB2
Renesola	60 Cell Modules & Vitrus2 RS6-xxxNBG-E3

Manufacture	Module Model / Series
Risen	RSM110-8-xxxBMDG RSM144-6 RSM60-6 RSM72-6
Runergy	HY-DH132N11 HY-DH96N11B
SEG Solar	SEG-xxx-BMD-HV SEG-xxx-BMD-TB SEG-XXX-BMB-TB SEG-xxx-BMA-HV SEG-xxx-BMA-TB SEG-xxx-BMB-HV SEG-xxx-BMA-BG SEG-xxx-BMB-BG SEG-xxx-BTA-BG SEG-xxx-BTB-BG SEG-xxx-BMD-BG SEG-xxx-BTD-BG
S-Energy	SL40-60MAI/MBI/MCI-xxxV SL45-60BGI/BHI SL45-60MBI-xxxZ SN72, SN60 Series
Seraphim	SEG-(6PA/6PB/6MA/6MA-HV/6MB/E01/E11) SRP-(6QA/6QB) SRP-320-375-BMB-HV SRP-390-405-BMD-HV SRP-390-415-BMA-HV SRP-xxx-6MB-HV, SRP-xxx-BMC-HV SRP-xxx-BMD-HV SRP-xxx-BTA-BG

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Manufacture	Module Model / Series
Seraphim (Cont.)	SRP-xxx-BTB-BG SRP-xxx-BTC-BG SRP-xxx-BTD-BG SRP-xxx-BTE-BG
Sharp	ND-24CQCJ ND-25CQCS ND-F4Q300 ND-Q235F4 NU-SA NU-SC
Silfab	SLA-M/P, SLG-M/P SILxxx(BG/BK/BL/HC/HC+/HL/HM/HN/ML/NL/NT/NX/NU/QD/QM) SIL-xxx XL SIL-xxx XM SIL-xxx XM+
Sirius PV	ELNSM54M-HC-BF Series ELNSM54M-HC-N ELNSM54M-HC Series
Solar4America	S4Axxx-108MH10BB S4Axxx-108MH10xxx S4Axxx-108TH10xxx S4Axxx-144MH10xxx S4Axxx-144TH10xxx S4Axxx-144TH16xxx S4Axxx-72MH5BB
SolarEver USA	SE-166*83-xxxM-120N SE-182*91-xxxM-108N SE-182*105-xxxM-96-BD
Solaria	PowerXTxxxR-PD/BD/AC PowerXTxxxC PowerXT-xxxR-PM (AC) PowerX-400R

Manufacture	Module Model / Series
Solar Space	SS8-54HDB-xxx-N SS8-54HD-xxx-N SS8-72HD-xxx-M SS8-72HD-xxx-N SS8-78HD-xxx-M SS9-66HD-xxx-N SSA-48HDB-xxx-N SSA-48HD-xxx-N SSA-54HDB-xxx-N SSA-54HD-xxx-N SSA-66HD-xxx-N
SolarTech	STU HJT & STU PERC
SolarWorld	Sunmodule Protect/Plus
Sonali	SS-M-360 to 390 Series SS-M-390 to 400 Series SS-M-440 to 460 Series SS-M-430 to 460 BiFacial Series
Sun Edison/ Flextronics	F-Series / FLEX FXS, R-Series / FLEX FXS
Suniva	Optimus Series, MV Series
Sunket Solar	SKT580M10-144S2
Sunmac Solar	M754SH-BB Series
SunPlus Optimum	SR4-54HTB-xxxM
SunPower	X-Series 72 & E-Series 72 X-Series 96 & E-Series 96 P-Series, Sig Black SPR E20 435 COM (G4 Frame) Axxx-BLK-G-AC, SPR-Mxxx-H-AC SPR-Mxxx-BLK-H-AC
Sunpro Power	SPDGxxx-120M12 SPDGxxx-N108M10 SPDGxxx-N144M10

Manufacture	Module Model / Series
SunTech	STP XXX, STPXXXS - B60/Wnhb
Talesun	TP572, TP596, TP654, TP660 TP672, Hipor M, Smart TD6I72M TD7G72M TM3G48M TM3G54M TM3G66M TM7G54M TM7G60M TM7G72M TP6F72M TP6F72M(H) TP7G54M(H)
Tesla	Tesla Solar Panel TSP-415/TSP-420 TxxxS, TxxxH
Thornova	TS-BBT54(xxx) TS-BG54 TS-BG72 TS-BGT72(xxx)
Trina Solar	DE06, DE09.05, DE09C.07 DE18M(II), DEG18MC.20(II) DE19, DEG19C.20, TSM-NE09RC.05 DEG15HC.20(II), DEG15MC.20(II), DEG15VC.20(II) PA05, PD05, DD05, DD06 PD14, PE14, DD14, DE14, DE15, DE15V(II) TSM-DE06X.05(II) TSM-DE09.05 TSM-DE09.08 TSM-DE09C.07 TSM-DE15H(II) TSM-DEG21C.20 TSM-NE09RH.05

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Manufacture	Module Model / Series
Trina Solar (Cont.)	TSM-NE19RC TSM-NEG19RC.20 TSM-NEG21C.20
Universal Solar	UNI4xx-144BMH-DG UNI5xx-144BMH-DG UNIxxx-108M-BB UNIxxx-120M-BB UNIxxx-120MH
Upsolar	UP-Mxxx
URE	D7K_H8A, D7M_(H7A/H8A) FAKxxx(C8G/E8G), FAMxxxE7G-BB FAMxxxE8G(-BB), FBKxxxM8G
URECO	F6MxxxE7G-BB FBMxxxM7G-BB FBMxxxMFG-BB
Vikram Solar	Eldorado, Solivo & Somera PREXOS VSMDHT.60.AAA.05 PREXOS VSMDHT.72.AAA.05 Paradea VSMDH.72.AAA.05 Paradea VSMDH.66.AAA.05
VSUN	VSUN400-415-144BMH VSUN4xx-144BMH-DG VSUN5xx-144BMH-DG VSUNxxx-108BMH VSUNxxx-108M-BB VSUNxxx-108MH VSUNxxx-120BMH VSUNxxx-120M-BB VSUNxxx-132BMH VSUNxxx-144M-BB VSUNxxx-60M-BB VSUNxxx-72MH VSUNxxxN-108BMH-BB VSUNxxxN-108BMH-BB (SoftPaw) VSUNxxxN-108BMH-DG-BB

Manufacture	Module Model / Series
VSUN (Cont.)	VSUNxxxN-120BMH-BB (SoftPaw) VSUNxxxN-132BMHR VSUNxxxN-144BMH VSUNxxxN-144MH VSUNxxx-144BMH VSUNxxx-144MH VSUNxxx-144M-BW
Waaree	Arka Series WSMDi Bi-55-xxx BiN-08-xxx
Winaico	WST & WSP Series
Yingli	YGE 60 Cell YGE 60 Cell Series 2 YLM 60 YLM 72 YLM-VG
Yotta Energy	YSM-B450-1
ZNShine Solar	ZXM6-72 Series, ZXM6-NH144 ZXM6-NH120 Series ZXM6-NHLDD144-XXX/M ZXM7-SH108 Series ZXM7-SHDB144 ZXM7-SHLDD144 ZXM7-UHLDD108 ZXM7-UHLDD144 ZXM8-GPLDD132 Series ZXM8-TPLDD132

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