

**GENERAL NOTES**

**CODE AND STANDARDS**

1. ALL WORK SHALL COMPLY WITH 2017 NATIONAL ELECTRIC CODE (NEC), 2018 NORTH CAROLINA BUILDING CODE (NCBC), 2018 NORTH CAROLINA RESIDENTIAL CODE (NCRC), PLUMBING CODE (NPC), AND ALL STATE AND LOCAL BUILDING, ELECTRICAL, AND PLUMBING CODES.
2. DRAWINGS HAVE BEEN DETAILED ACCORDING TO UL LISTING REQUIREMENTS.

**SITE NOTES / OSHA REGULATION**

1. A LADDER SHALL BE IN PLACE FOR INSPECTION IN COMPLIANCE WITH OSHA REGULATIONS.
2. THE PV MODULES ARE CONSIDERED NON-COMBUSTIBLE AND THIS SYSTEM IS A UTILITY INTERACTIVE SYSTEM.
3. THE SOLAR PV INSTALLATION SHALL NOT OBSTRUCT ANY PLUMBING, MECHANICAL, OR BUILDING ROOF VENTS.
4. ROOF COVERINGS SHALL BE DESIGNED, INSTALLED, AND MAINTAINED IN ACCORDANCE WITH THIS CODE AND THE APPROVED MANUFACTURER'S INSTRUCTIONS SUCH THAT THE ROOF COVERING SHALL SERVE TO PROTECT THE BUILDING OR STRUCTURE.

**SOLAR CONTRACTOR**

1. MODULE CERTIFICATIONS WILL INCLUDE UL1703, IEC61646, IEC61730.
2. IF APPLICABLE, MODULE GROUNDING LUGS MUST BE INSTALLED AT THE MARKED GROUNDING LUG HOLES PER THE MANUFACTURER'S INSTALLATION REQUIREMENTS.
3. AS INDICATED BY DESIGN, OTHER NRTL LISTED MODULE GROUNDING DEVICES MAY BE USED IN PLACE OF STANDARD GROUNDING LUGS AS SHOWN IN MANUFACTURER DOCUMENTATION AND APPROVED BY THE AHJ.
4. CONDUIT AND WIRE SPECIFICATIONS ARE BASED ON MINIMUM CODE REQUIREMENTS AND ARE NOT MEANT TO LIMIT UP-SIZING AS REQUIRED BY FIELD CONDITIONS.
5. CONDUIT POINT OF PENETRATION FROM EXTERIOR TO INTERIOR TO BE INSTALLED AND SEALED WITH A SUITABLE SEALING COMPOUND.
6. DC WIRING LIMITED TO MODULE FOOTPRINT W/ ENPHASE AC SYSTEM.
7. ENPHASE WIRING SYSTEMS SHALL BE LOCATED AND SECURED UNDER THE ARRAY W/ SUITABLE WIRING CLIPS.
8. MAX DC VOLTAGE CALCULATED USING MANUFACTURER PROVIDED TEMP COEFFICIENT FOR VOC UNLESS NOT AVAILABLE.
9. ALL INVERTERS, MOTOR GENERATORS, PHOTOVOLTAIC MODULES, PHOTOVOLTAIC PANELS, AC PHOTOVOLTAIC MODULES, DC COMBINERS, DC-TO-DC CONVERTERS, SOURCE CIRCUIT COMBINERS, AND CHARGE CONTROLLERS INTENDED FOR USE IN A PHOTOVOLTAIC POWER SYSTEM WILL BE IDENTIFIED AND LISTED FOR THE APPLICATION PER NEC 690.4(B).
10. ALL SIGNAGE TO BE PLACED IN ACCORDANCE WITH LOCAL BUILDING CODE.
11. TERMINALS AND LUGS WILL BE TIGHTENED TO MANUFACTURER TORQUE SPECIFICATIONS (WHEN PROVIDED) IN ACCORDANCE WITH NEC CODE 110.14(D) ON ALL ELECTRICAL CONNECTIONS.

**EQUIPMENT LOCATIONS**

1. PROPER ACCESS AND WORKING CLEARANCE AROUND EXISTING AND PROPOSED ELECTRICAL EQUIPMENT WILL BE PROVIDED AS PER SECTION NEC 110.26.
2. EQUIPMENT INSTALLED IN DIRECT SUNLIGHT MUST BE RATED FOR EXPECTED OPERATING TEMPERATURE AS SPECIFIED BY NEC 690.31(A) AND NEC TABLE 310.15(B).
3. ALL EQUIPMENT SHALL BE INSTALLED ACCESSIBLE TO QUALIFIED PERSONNEL ACCORDING TO NEC APPLICABLE CODES.
4. ALL COMPONENTS ARE LISTED FOR THEIR PURPOSE AND RATED FOR OUTDOOR USAGE WHEN APPROPRIATE.

**PROJECT INFORMATION:**

**NUMBER OF STORIES:** 2  
**CONDUIT RUN:** Interior  
**ECOBEE QTY:** 2  
**LIGHT BULB QTY:** 18  
**PV METER:** Not Required

**ROOF TYPE (1) INFORMATION:**

**ROOF TYPE:** Trapezoidal Metal  
**FRAMING TYPE:** Manufactured Truss  
**SHEATHING TYPE:** OSB  
**ATTACHMENT:** S-5! SolarFoot  
**RACKING:** Unirac Solarmount LT @ 32" OC Portrait / 32" OC Landscape  
**NUMBER OF ATTACHMENTS:** 70

**ROOF TYPE (2) INFORMATION (IF APPLICABLE):**

**\*SEE PV4.2**

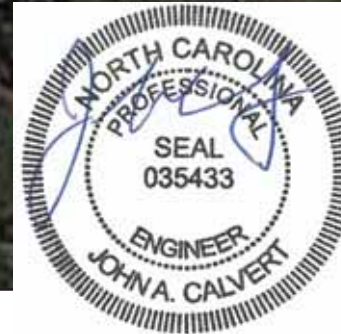
**SYSTEM TO BE INSTALLED INFORMATION:**

**DC SYSTEM SIZE:** 6.075 kW DC  
**AC SYSTEM SIZE:** 4.35 kW AC  
**MODULE TYPE:** (15) Seraphim SEG-405-BMD-TB  
**INVERTER TYPE:** Enphase IQ8PLUS-72-2-US  
**MONITORING:** Enphase IQ Combiner 4 X-IQ-AM1-240-4

**AERIAL VIEW**



Sealed For Existing Roof & Attachment Only



Firm No. : D-0449  
 3/1/2023

**DESIGN CRITERIA**

**WIND SPEED:** 15 mph  
**GROUND SNOW LOAD:** 15 lb/ft<sup>2</sup>  
**WIND EXPOSURE FACTOR:** C  
**SEISMIC DESIGN CATEGORY:** B

**SITE SPECIFICATIONS**

CONSTRUCTION - V-B  
 ZONING: RESIDENTIAL

**SCOPE OF WORK**

INSTALLATION OF UTILITY INTERACTIVE PHOTOVOLTAIC SOLAR SYSTEM AND ANY NECESSARY ADDITIONAL WORK NEEDED FOR INSTALLATION.

**SHEET INDEX**

- PV1 - COVER SHEET
- PV2 - SITE PLAN
- PV3 - ROOF PLAN
- PV4 - STRUCTURAL
- PV5 - ELECTRICAL 3-LINE DIAGRAM
- PV6 - ELECTRICAL CALCULATIONS
- PV7 - WARNING LABELS AND LOCATIONS  
(ALL OTHER SHEETS AS REQUIRED)
- SS - PRODUCT SPEC. SHEETS

**UTILITY COMPANY:**

South River Electric Coop

**PERMIT ISSUER:**

Harnett County

Digitally signed  
 by John A. Calvert  
 Date: 2023.03.01  
 10:34:48 -07'00'



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PV INSTALLATION PROFESSIONAL  
 Scott Gurney  
 #PV-011719-015866

CONTRACTOR:  
 BRS FIELD OPS  
 800-377-4480

**CUSTOMER INFORMATION:**

Lorothy Wilson  
 488 Stone Cross Dr  
 Spring Lake North Carolina 28390  
**AC SYSTEM SIZE:** 4.35 kW AC  
**DC SYSTEM SIZE:** 6.075 kW DC

DRAWING BY:

Colton Livingston

PLOT DATE:

February 28, 2023

PROJECT NUMBER:

709171

SHEET NAME:

COVER SHEET

REVISION:

0

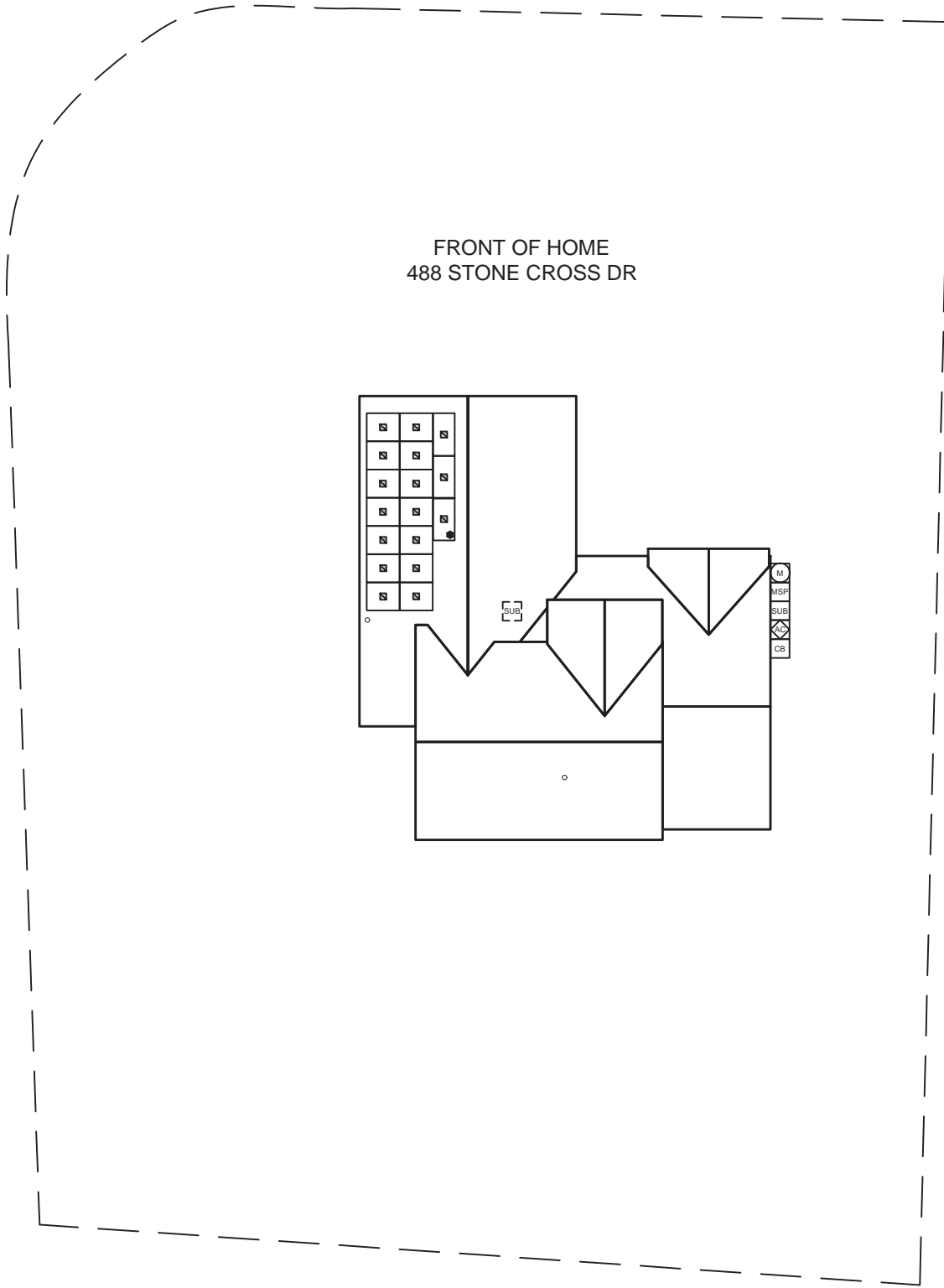
PAGE NUMBER:

PV1

**PV SYSTEM SPECIFICATIONS**
















**TOTAL NUMBER OF MODULES:** 15  
**MODULE MAKE AND MODEL:** Seraphim SEG-405-BMD-TB  
**MODULE WATTAGE:** 405W DC

**INVERTER MAKE AND MODEL:** Enphase IQ8PLUS-72-2-US  
**INVERTER TYPE:** Microinverter (1 Inverter per PV Module)  
**INVERTER CURRENT OUTPUT:** 1.21A AC  
**INVERTER NOMINAL VOLTAGE:** 240V  
**INVERTER WATTAGE:** 290W AC



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Existing Roof &  
Attachment Only

**LEGEND**

-  JUNCTION BOX
-  UTILITY METER
-  MAIN SERVICE PANEL
-  AC DISCONNECT
-  COMBINER BOX
-  LOAD CENTER
-  SUBPANEL
-  PV METER
-  TRANSFER SWITCH
-  SUNPOWER ESS
-  SUNPOWER HUB+
-  REMOTE POWER OFF
-  FIRE SETBACK
-  TRENCHING
-  PROPERTY LINE

SCALE: 3/64" = 1'-0"

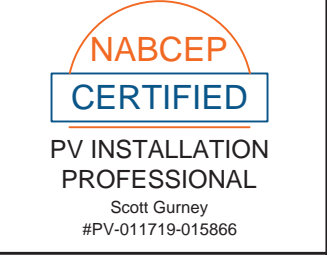


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BRS FIELD OPS  
800-377-4480

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**DC SYSTEM SIZE:** 6.075 kW DC

DRAWING BY:  
Colton Livingston

PLOT DATE:  
February 28, 2023

PROJECT NUMBER:  
709171

SHEET NAME:  
SITE PLAN

REVISION: 0	PAGE NUMBER: PV2
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**PV SYSTEM SPECIFICATIONS**

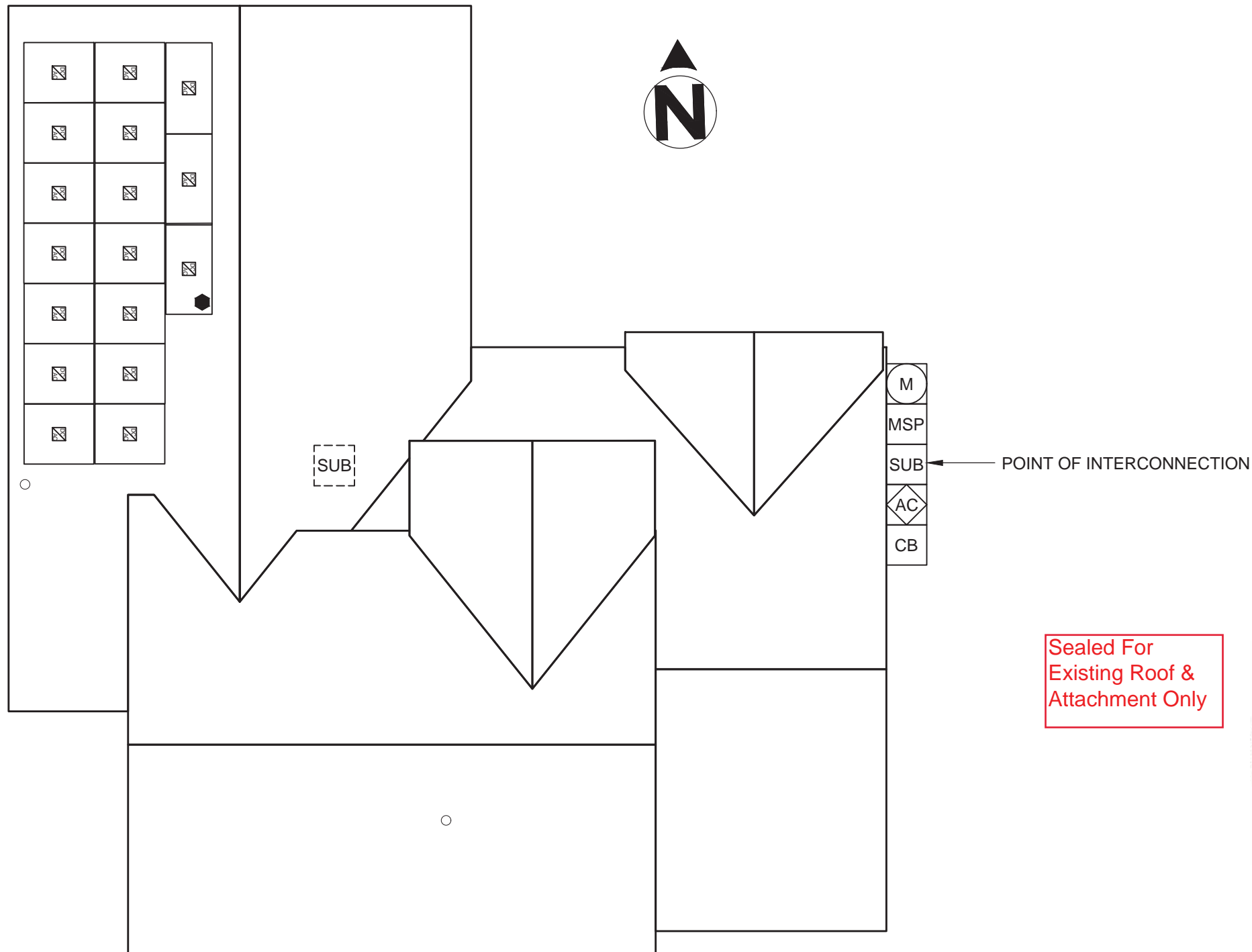
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**INVERTER CURRENT OUTPUT:** 1.21A AC  
**INVERTER NOMINAL VOLTAGE:** 240V  
**INVERTER WATTAGE:** 290W AC

FRONT OF HOME

**MP1**

**# OF MODULES:** 17  
**AZIMUTH:** 272  
**PITCH:** 39  
**TSRF:** 75%  
**AREA:** 720 ft.<sup>2</sup>



**LEGEND**

- JUNCTION BOX
- UTILITY METER
- MAIN SERVICE PANEL
- AC DISCONNECT
- COMBINER BOX
- LOAD CENTER
- SUBPANEL
- PV METER
- TRANSFER SWITCH
- SUNPOWER ESS
- SUNPOWER HUB+
- REMOTE POWER OFF
- FIRE SETBACK
- TRENCHING
- PROPERTY LINE

SCALE: 1/8" = 1'-0"

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 #PV-011719-015866

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DRAWING BY:  
 Colton Livingston

PLOT DATE:  
 February 28, 2023

PROJECT NUMBER:  
 709171

SHEET NAME:  
 ROOF PLAN

REVISION: 0 PAGE NUMBER: PV3

**STRUCTURAL INFORMATION:**

**ROOF TYPE (1):**  
**ROOF TYPE:** Trapezoidal Metal  
**SHEATHING TYPE:** OSB  
**FRAMING TYPE:** Manufactured Truss  
**FRAMING SIZE:** 2x4 @ 24" OC  
**CEILING JOIST SIZE:** 2x4 @ 24" OC

**ATTACHMENT:** S-5! SolarFoot  
**RACKING:** Unirac Solarmount LT  
 @ 32" OC Portrait / 32" OC Landscape  
**NUMBER OF ATTACHMENTS:** 70

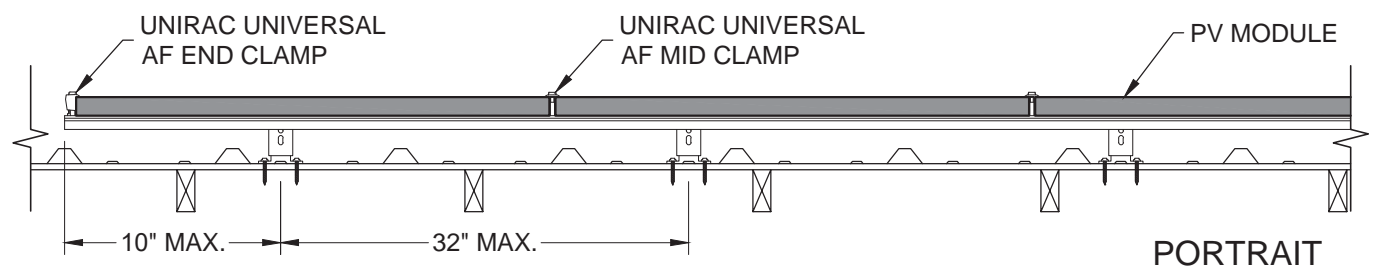
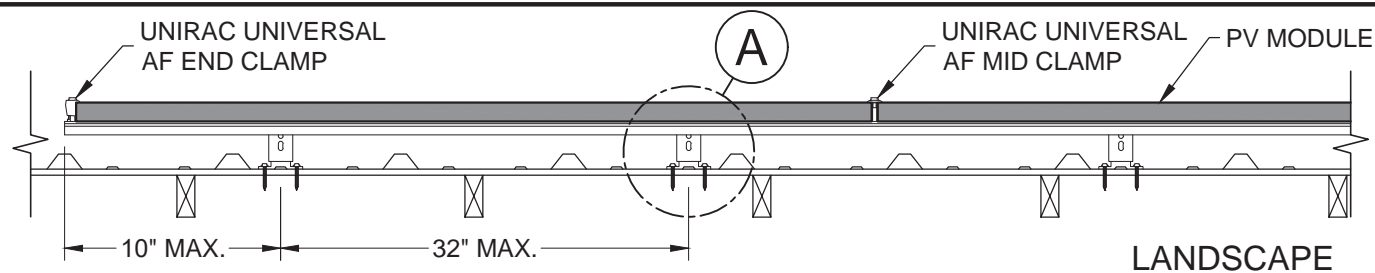
**PV MODULE COUNT:** 15 Modules  
**TOTAL ARRAY AREA:** 306.0 ft<sup>2</sup> (20.4ft<sup>2</sup>/panel)  
**TOTAL ROOF AREA:** 3166 ft<sup>2</sup>  
**ARRAY/ROOF AREA:** 9.7%  
**ARRAY WEIGHT:** 750 lbs (50 lbs/panel)  
**DISTRIBUTED LOAD:** 2.45 lbs/ft<sup>2</sup>  
**POINT LOAD:** 10.71 lbs/attachment

**STRUCTURAL NOTES:**

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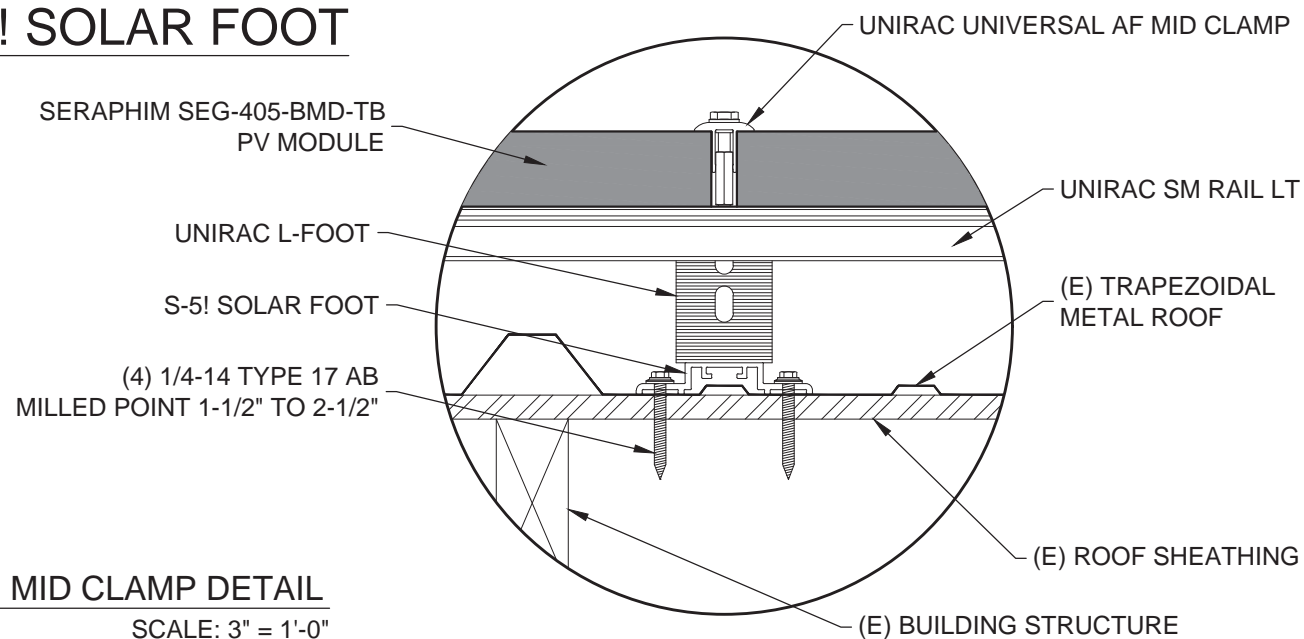
None

\*NOTE: LISTED NUMBER OF ATTACHMENT POINTS ARE AN ESTIMATE ONLY AND MAY VARY BASED ON FIELD CONDITIONS. MAXIMUM ATTACHMENT SPACING TO BE FOLLOWED PER ENGINEER OF RECORD SPECIFICATIONS.

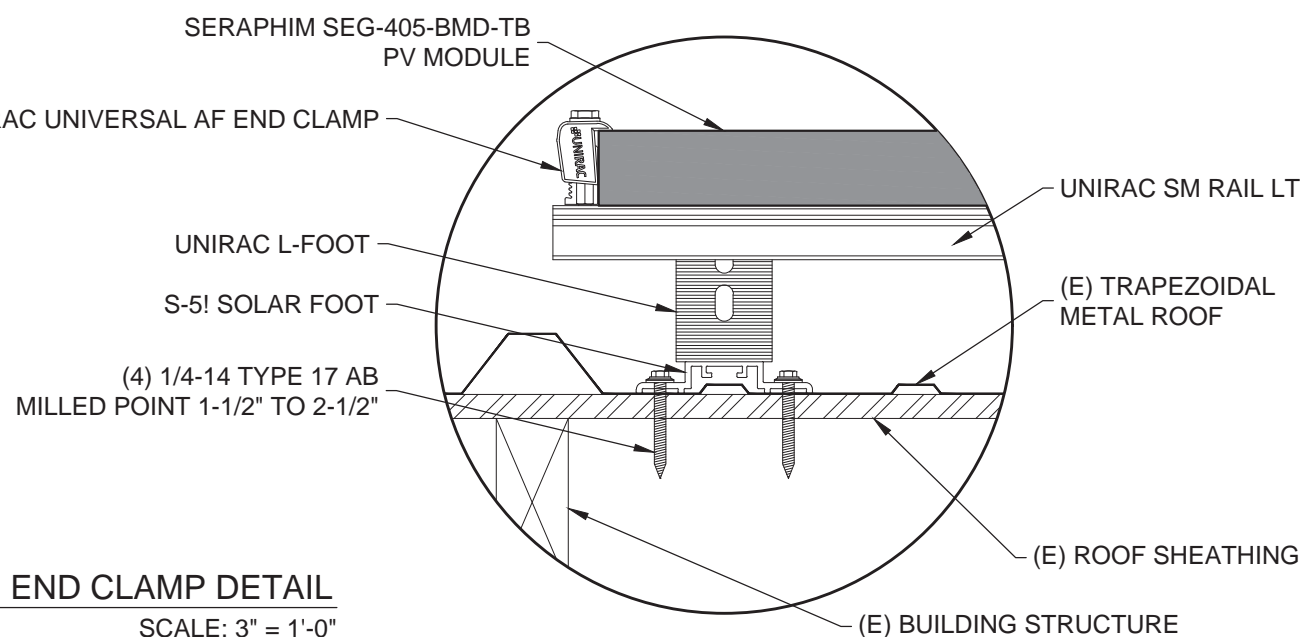


**C ATTACHMENT SPACING- FRONT VIEW**  
 SCALE: 3/4" = 1'-0"  
 -RACKING ATTACHMENTS TO BE STAGGERED

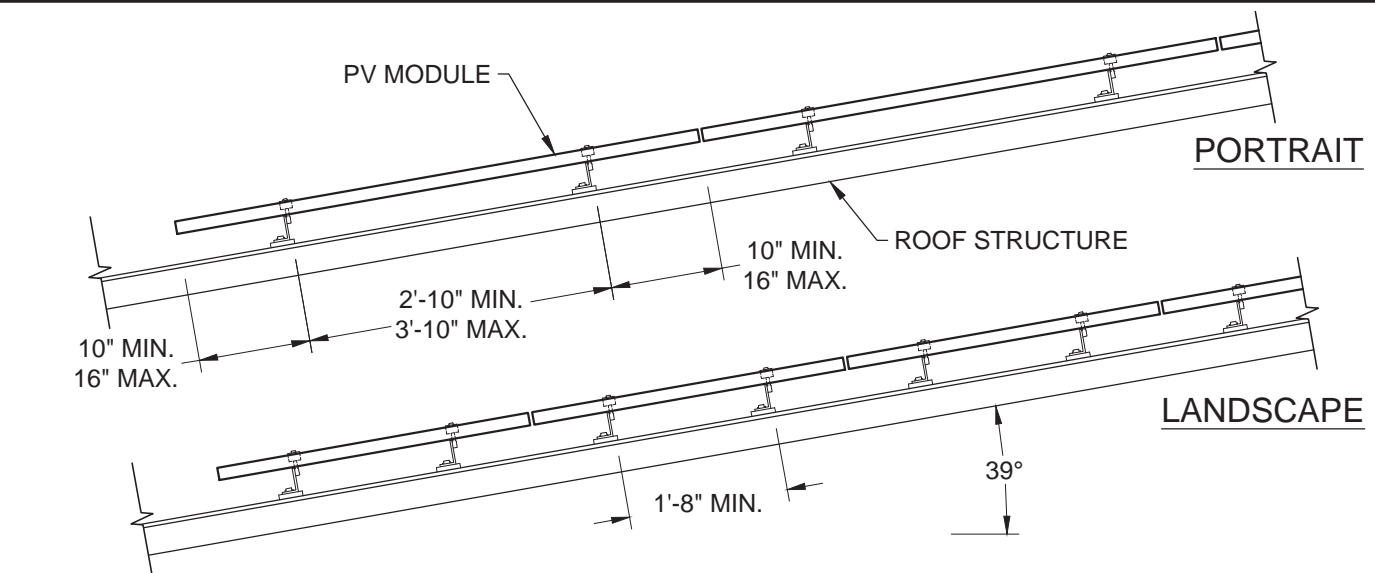
**S-5! SOLAR FOOT**



**A MID CLAMP DETAIL**  
 SCALE: 3" = 1'-0"



**B END CLAMP DETAIL**  
 SCALE: 3" = 1'-0"



**D ATTACHMENT SPACING- SIDE VIEW**  
 SCALE: 1/2" = 1'-0"

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**DC SYSTEM SIZE:** 6.075 kW DC

DRAWING BY:  
 Colton Livingston

PLOT DATE:  
 February 28, 2023

PROJECT NUMBER:  
 709171

SHEET NAME:  
 STRUCTURAL

REVISION: 0 PAGE NUMBER: PV4

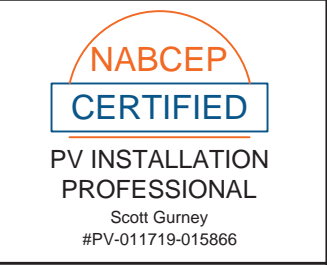
15	(1) 10 AWG THHN/THWN-2, CU., BLACK (L1)	18.2 A AC	3	(2) 10 AWG THHN/THWN-2, CU., BLACK (L1)	MAX 9.7 A AC	2	(1) 10 AWG THHN/THWN-2, CU., BLACK (L1)	MAX 9.7 A AC	1	(1) 12-2 TC-ER, THHN/THWN-2, CU.	MAX 9.7 A AC		
	(1) 10 AWG THHN/THWN-2, CU., RED (L2)	240 V AC		(2) 10 AWG THHN/THWN-2, CU., RED (L2)	240 V AC		(1) 10 AWG THHN/THWN-2, CU., RED (L2)	240 V AC		(1) 10 AWG THHN/THWN-2, CU., RED (L2)	240 V AC	(1) 6 AWG BARE, CU [EGC]	240 V AC
	(1) 10 AWG THHN/THWN-2, CU., WHITE (N)			(1) 10 AWG THHN/THWN-2, CU., GREEN (EGC)			(1) 10 AWG THHN/THWN-2, CU., GREEN (EGC)			(1) 10 AWG THHN/THWN-2, CU., GREEN (EGC)			
	(1) 10 AWG THHN/THWN-2, CU., GREEN (EGC)									OR 10-2 UF-B W/G (OR NM-B), THHN/THWN-2, SOLID CU.			
	(1) 3/4 INCH EMT	EXTERIOR		(1) 3/4 INCH EMT	EXTERIOR		(1) 3/4 INCH EMT (Not Required for UF-B or NM-B Cable)	INTERIOR			EXTERIOR		

16	(1) 6 AWG THHN/THWN-2, CU., BLACK (L1)	(1) 10 AWG THHN/THWN-2, CU., BLACK (L1)
	(1) 6 AWG THHN/THWN-2, CU., RED (L2)	(1) 10 AWG THHN/THWN-2, CU., RED (L2)
	(1) 6 AWG THHN/THWN-2, CU., WHITE (N)	(1) 10 AWG THHN/THWN-2, CU., WHITE (N)
	(1) 10 AWG THHN/THWN-2, CU., GREEN (EGC)	
	(1) 1 INCH RMC	EXTERIOR



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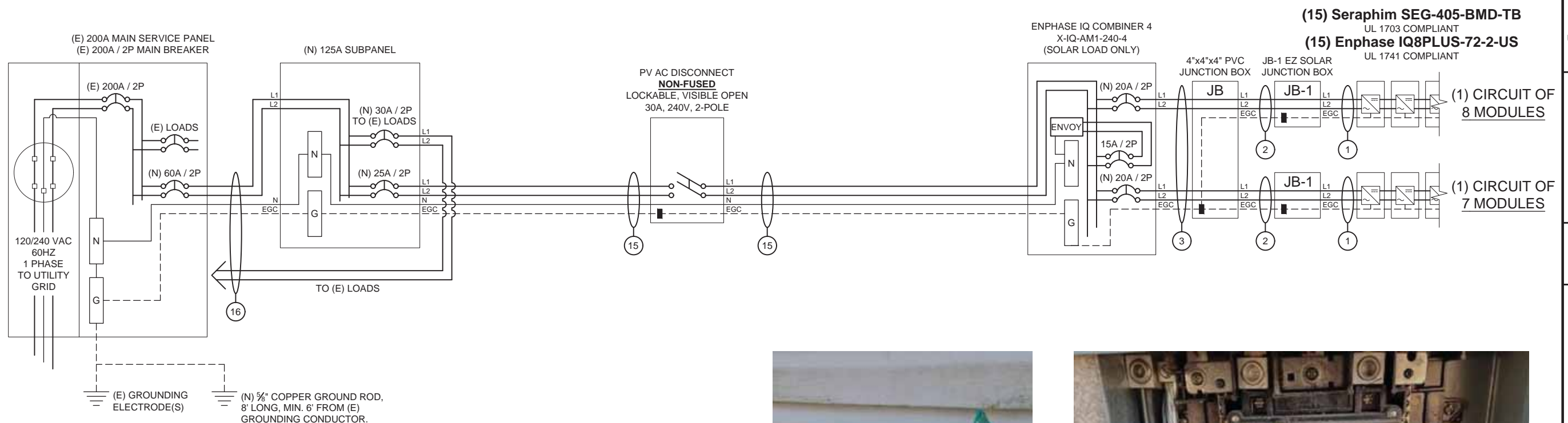
CONTRACTOR:  
BRS FIELD OPS  
800-377-4480

**DESIGNER NOTES:**

LOAD SIDE BREAKER IN SUBPANEL, EXTERIOR POI. SUBPANEL INSERT.

**ELECTRICAL NOTES:**

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IF REQUIRED, VERIFICATION WILL BE DONE TO ENSURE THE GROUNDING ELECTRODE SYSTEM IS CONGRUENT WITH CURRENT REQUIREMENTS. (NEC 250 PART III) IF NOT, A NEW GROUND ROD WILL BE INSTALLED.

(N) 5/8" COPPER GROUND ROD, 8' LONG, MIN. 6" FROM (E) GROUNDING CONDUCTOR.  
GEC INSTALLED PER NEC 250.64: 6 OR 4 AWG SOLID COPPER GEC.

**INTERCONNECTION NOTES**

705.12(B)(3) THE FOLLOWING METHOD(S) SHALL BE USED TO DETERMINE THE RATINGS OF BUSBARS: (2) WHERE TWO SOURCES, ONE A PRIMARY POWER SOURCE AND THE OTHER ANOTHER POWER SOURCE, ARE LOCATED AT OPPOSITE ENDS OF A BUSBAR THAT CONTAINS LOADS, THE SUM OF 125 PERCENT OF THE POWER-SOURCE(S) OUTPUT CIRCUIT CURRENT AND THE RATING OF THE OVERCURRENT DEVICE PROTECTING THE BUS BAR SHALL NOT EXCEED 120 PERCENT OF THE AMPACITY OF THE BUSBAR.



UTILITY COMPANY: South River Electric Coop PERMIT ISSUER: Harnett County

**CUSTOMER INFORMATION:**  
Lorothy Wilson  
488 Stone Cross Dr  
Spring Lake North Carolina 28390

**AC SYSTEM SIZE: 4.35 kW AC**  
**DC SYSTEM SIZE: 6.075 kW DC**

DRAWING BY: Colton Livingston	
PLOT DATE: March 1, 2023	
PROJECT NUMBER: 709171	
SHEET NAME: ELECTRICAL	
REVISION: 0	PAGE NUMBER: PV5





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#PV-011719-015866

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800-377-4480

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**AC SYSTEM SIZE: 4.35 kW AC**  
**DC SYSTEM SIZE: 6.075 kW DC**

DRAWING BY:  
Colton Livingston

PLOT DATE:  
February 28, 2023

PROJECT NUMBER:  
709171

SHEET NAME:  
ELEC CALCS

REVISION: 0 PAGE NUMBER: PV6

MODULE SPECIFICATIONS		Seraphim SEG-405-BMD-TB	
RATED POWER (STC)	405 W		
MODULE VOC	37.22 V DC		
MODULE VMP	30.93 V DC		
MODULE IMP	13.1 A DC		
MODULE ISC	13.7 A DC		
VOC CORRECTION	-0.26 %/°C		
VMP CORRECTION	-0.34 %/°C		
SERIES FUSE RATING	25 A DC		
ADJ. MODULE VOC @ ASHRAE LOW TEMP	40.6 V DC		
ADJ. MODULE VMP @ ASHRAE 2% AVG. HIGH TEMP	26.2 V DC		

MICROINVERTER SPECIFICATIONS		Enphase IQ8+ Microinverters	
POWER POINT TRACKING (MPPT) MIN/MAX	30 - 58 V DC		
MAXIMUM INPUT VOLTAGE	60 V DC		
MAXIMUM DC SHORT CIRCUIT CURRENT	15 A DC		
MAXIMUM USABLE DC INPUT POWER	440 W		
MAXIMUM OUTPUT CURRENT	1.21 A AC		
AC OVERCURRENT PROTECTION	20 A		
MAXIMUM OUTPUT POWER	290 W		
CEC WEIGHTED EFFICIENCY	97 %		

AC PHOTOVOLTAIC MODULE MARKING (NEC 690.52)	
NOMINAL OPERATING AC VOLTAGE	240 V AC
NOMINAL OPERATING AC FREQUENCY	47 - 68 HZ AC
MAXIMUM AC POWER	240 VA AC
MAXIMUM AC CURRENT	1.0 A AC
MAXIMUM OCPD RATING FOR AC MODULE	20 A AC

DESIGN LOCATION AND TEMPERATURES	
TEMPERATURE DATA SOURCE	ASHRAE 2% AVG. HIGH TEMP
STATE	North Carolina
CITY	Spring Lake
WEATHER STATION	SEYMOUR-JOHNSON AFB
ASHRAE EXTREME LOW TEMP (°C)	-10
ASHRAE 2% AVG. HIGH TEMP (°C)	38

SYSTEM ELECTRICAL SPECIFICATIONS	CIR 1	CIR 2	CIR 3	CIR 4	CIR 5	CIR 6
NUMBER OF MODULES PER MPPT	8	7				
DC POWER RATING PER CIRCUIT (STC)	3240	2835				
TOTAL MODULE NUMBER	15					
STC RATING OF ARRAY	6075					
AC CURRENT @ MAX POWER POINT (IMP)	9.7	8.5				
MAX. CURRENT (IMP X 1.25)	12.1	10.5875				
OCPD CURRENT RATING PER CIRCUIT	20	20				
MAX. COMB. ARRAY AC CURRENT (IMP)	18.2					
MAX. ARRAY AC POWER	4350W AC					

AC VOLTAGE RISE CALCULATIONS	DIST (FT)	COND.	VRISE(V)	VEND(V)	%VRISE
VRISE SEC. 1 (MICRO TO JBOX)	28.8	12 Cu.	0.93	240.93	0.39%
VRISE SEC. 2 (JBOX TO COMBINER BOX)	65	10 Cu.	1.60	241.60	0.67%
VRISE SEC. 3 (COMBINER BOX TO POI)	5	10 Cu.	0.23	240.23	0.10%
TOTAL VRISE			2.76	242.76	1.15%

PHOTOVOLTAIC AC DISCONNECT OUTPUT LABEL (NEC 690.54)	
AC OUTPUT CURRENT	18.2 A AC
NOMINAL AC VOLTAGE	240 V AC

CONDUCTOR SIZE CALCULATIONS	
MICROINVERTER TO JUNCTION BOX (1)	MAX. SHORT CIRCUIT CURRENT (ISC) = 9.7 A AC MAX. CURRENT (ISC X1.25) = 12.1 A AC CONDUCTOR (TC-ER, COPPER (90°C)) = 12 AWG CONDUCTOR RATING = 30 A AMB. TEMP. AMP. CORRECTION = 0.91 ADJUSTED AMP. = 27.3 > 12.1
JUNCTION BOX TO JUNCTION BOX (2)	MAX. SHORT CIRCUIT CURRENT (ISC) = 9.7 A AC MAX. CURRENT (ISC X1.25) = 12.1 A AC CONDUCTOR (UF-B, COPPER (60°C)) = 10 AWG CONDUCTOR RATING = 30 A CONDUIT FILL DERATE = 1 AMB. TEMP. AMP. CORRECTION = 0.91 ADJUSTED AMP. = 27.3 > 12.1
JUNCTION BOX TO COMBINER BOX (3)	MAX. SHORT CIRCUIT CURRENT (ISC) = 9.7 A AC MAX. CURRENT (ISC X1.25) = 12.1 A AC CONDUCTOR (UF-B, COPPER (60°C)) = 10 AWG CONDUCTOR RATING = 30 A CONDUIT FILL DERATE = 0.8 AMB. TEMP. AMP. CORRECTION = 0.91 ADJUSTED AMP. = 21.84 > 12.1
COMBINER BOX TO MAIN PV OCPD (15)	INVERTER RATED AMPS = 18.2 A AC MAX. CURRENT (RATED AMPS X1.25) = 22.69 A AC CONDUCTOR (THWN-2, COPPER (75°C TERM.)) = 10 AWG CONDUCTOR RATING = 35 A CONDUIT FILL DERATE = 1 AMB. TEMP. AMP. CORRECTION = 0.91 ADJUSTED AMP. = 31.85 > 22.7

**GROUNDING NOTES**

1. A GROUNDING ELECTRODE SYSTEM IN ACCORDANCE WITH [NEC 690.47] AND [NEC 250.50-60] SHALL BE PROVIDED. PER [NEC 690.47], THE GROUNDING ELECTRODE SYSTEM OF AN EXISTING BUILDING MAY BE USED AND BE BONDED AT THE SERVICE ENTRANCE. IF EXISTING SYSTEM IS INACCESSIBLE, OR INADEQUATE, OR IS ONLY METALLIC WATER PIPING, A SUPPLEMENTAL GROUNDING ELECTRODE WILL BE USED AT THE INVERTER LOCATION CONSISTING OF A UL LISTED 8 FT GROUND ROD WITH ACORN CLAMP.
2. THE GROUNDING ELECTRODE CONDUCTOR SHALL BE PROTECTED FROM PHYSICAL DAMAGE BETWEEN THE GROUNDING ELECTRODE AND THE PANEL (OR INVERTER) IF SMALLER THAN #6 AWG COPPER WIRE PER [NEC 250.64(B)]. THE GROUNDING ELECTRODE CONDUCTOR WILL BE CONTINUOUS, EXCEPT FOR SPLICES OR JOINTS AT BUSBARS WITHIN LISTED EQUIPMENT PER [NEC 250.64(C)].
3. GROUNDING ELECTRODE CONDUCTORS SHALL BE NO LESS THAN 8 AWG AND NO GREATER THAN 6 AWG COPPER AND BONDED TO THE EXISTING GROUNDING ELECTRODE TO PROVIDE FOR A COMPLETE SYSTEM.
4. PV SYSTEM SHALL BE GROUNDED IN ACCORDANCE TO [NEC 250.21], [NEC TABLE 250.122], AND ALL METAL PARTS OR MODULE FRAMES ACCORDING TO [NEC 690.46].
5. MODULE SOURCE CIRCUITS SHALL BE GROUNDED IN ACCORDANCE TO [NEC 690.42].
6. THE GROUNDING CONNECTION TO A MODULE SHALL BE ARRANGED SUCH THAT THE REMOVAL OF A MODULE DOES NOT INTERRUPT A GROUNDED CONDUCTOR TO ANOTHER MODULE.
7. EACH MODULE WILL BE GROUNDED USING THE SUPPLIED CONNECTION POINTS IDENTIFIED IN THE MANUFACTURER'S INSTALLATION INSTRUCTIONS.
8. ENCLOSURES SHALL BE PROPERLY PREPARED WITH REMOVAL OF PAINT/FINISH AS APPROPRIATE WHEN GROUNDING EQUIPMENT WITH TERMINATION GROUNDING LUGS.
9. GROUNDING SYSTEM COMPONENTS SHALL BE LISTED FOR THEIR PURPOSE, AND GROUNDING DEVICES EXPOSED TO THE ELEMENTS SHALL BE RATED FOR DIRECT BURIAL.
10. GROUNDING AND BONDING CONDUCTORS SHALL BE COPPER, SOLID OR STRANDED, AND BARE WHEN EXPOSED.
11. EQUIPMENT GROUNDING CONDUCTORS SHALL BE SIZED ACCORDING TO [NEC 690.45] AND BE A MINIMUM OF 10 AWG WHEN NOT EXPOSED TO DAMAGE (6 AWG SHALL BE USED WHEN EXPOSED TO DAMAGE).
12. GROUNDING AND BONDING CONDUCTORS, IF INSULATED, SHALL BE COLOR CODED GREEN (OR MARKED GREEN IF 4 AWG OR LARGER).
13. ALL CONDUIT BETWEEN THE UTILITY AC DISCONNECT AND THE POINT OF CONNECTION SHALL HAVE GROUNDED BUSHINGS AT BOTH ENDS.
14. SYSTEM GEC SIZED ACCORDING TO [NEC 690.47], [NEC TABLE 250.66], DC SYSTEM GEC SIZED ACCORDING TO [NEC 250.166], MINIMUM 8 AWG WHEN INSULATED, 6 AWG WHEN EXPOSED TO DAMAGE.
15. EXPOSED NON-CURRENT CARRYING METAL PARTS OF MODULE FRAMES, EQUIPMENTS, AND CONDUCTOR ENCLOSURES SHALL BE GROUNDED IN ACCORDANCE WITH [NEC 250.134] OR [NEC 250.136(A)] REGARDLESS OF VOLTAGE.

**WIRING & CONDUIT NOTES**

1. ALL CONDUIT SIZES AND TYPES, SHALL BE LISTED FOR ITS PURPOSE AND APPROVED FOR THE SITE APPLICATIONS.
2. BOLTED CONNECTION REQUIRED IN DC DISCONNECTS ON THE WHITE GROUNDED CONDUCTOR (USE POLARIS BLOCK OR NEUTRAL BAR).
3. ANY CONNECTION ABOVE LIVE PARTS MUST BE WATERTIGHT. REDUCING WASHERS DISALLOWED ABOVE LIVE PARTS, MEYERS HUBS RECOMMENDED
4. UV RESISTANT CABLE TIES (NOT ZIP TIES) USED FOR PERMANENT WIRE MANAGEMENT OFF THE ROOF SURFACE IN ACCORDANCE WITH [NEC 110.2, 110.3(A-B)].
5. SOLADECK JUNCTION BOXES MOUNTED FLUSH WITH ROOF SURFACE TO BE USED FOR WIRE MANAGEMENT AND AS FLASHED ROOF PENETRATIONS FOR INTERIOR CONDUIT RUNS.
6. ALL PV CABLES AND HOMERUN WIRES BE TYPE USE-2, AND SINGLE-CONDUCTOR CABLE LISTED AND IDENTIFIED AS PV WIRE, TYPE TC-ER, OR EQUIVALENT; ROUTED TO SOURCE CIRCUIT COMBINER BOXES AS REQUIRED.
7. ALL CONDUCTORS AND OCPD SIZES AND TYPES SPECIFIED ACCORDING TO [NEC 690.8] FOR MULTIPLE CONDUCTORS.
8. ALL PV DC CONDUCTORS IN CONDUIT EXPOSED TO SUNLIGHT SHALL BE INSTALLED AT LEAST 7/8" ABOVE THE ROOF SURFACE AND DERATED ACCORDING TO [NEC TABLE 310.15 (B)(2)(A)], [NEC TABLE 310.15(B)(3)(A)], & [NEC 310.15(B)(3)(C)].
9. EXPOSED ROOF PV DC CONDUCTORS SHALL BE USE-2, 90°C RATED, WET AND UV RESISTANT, AND UL LISTED RATED FOR 600V, UV RATED SPIRAL WRAP SHALL BE USED TO PROTECT WIRE FROM SHARP EDGES.
10. PHASE AND NEUTRAL CONDUCTORS SHALL BE DUAL RATED THHN/THWN-2 INSULATED, 90°C RATED, WET AND UV RESISTANT, RATED FOR 600V
11. 4-WIRE DELTA CONNECTED SYSTEMS HAVE THE PHASE WITH THE HIGHER VOLTAGE TO GROUND MARKED ORANGE OR IDENTIFIED BY OTHER EFFECTIVE MEANS.
12. ALL SOURCE CIRCUITS SHALL HAVE INDIVIDUAL SOURCE CIRCUIT PROTECTION
13. VOLTAGE DROP LIMITED TO 2% FOR DC CIRCUITS AND 3% FOR AC CIRCUITS
14. NEGATIVE GROUNDED SYSTEMS DC CONDUCTORS SHALL BE COLOR CODED AS FOLLOWS: DC POSITIVE- RED (OR MARKED RED), DC NEGATIVE- GREY (OR MARKED GREY)
15. POSITIVE GROUNDED SYSTEMS DC CONDUCTORS COLOR CODED: DC POSITIVE- GREY (OR MARKED GREY), DC NEGATIVE- BLACK (OR MARKED BLACK)
16. AC CONDUCTORS >4AWG COLOR CODED OR MARKED: PHASE A OR L1- BLACK, PHASE B OR L2- RED, PHASE C OR L3- BLUE, NEUTRAL- WHITE/GRAY  
\* USE-2 IS NOT INDOOR RATED BUT PV CABLE IS RATED THWN/THWN-2 AND MAY BE USED INSIDE  
\*\* USE-2 IS AVAILABLE AS UV WHITE
17. RIGID CONDUIT, IF INSTALLED, (AND/OR NIPPLES) MUST HAVE A PULL BUSHING TO PROTECT WIRES.
18. IF CONDUIT DETERMINED TO BE RAN THROUGH ATTIC IN FIELD THEN CONDUIT WILL BE EITHER EMT, FMC, OR MC CABLE IF DC CURRENT COMPLYING WITH [NEC 690.31], [NEC 250.118(10)]. DISCONNECTING MEANS SHALL COMPLY WITH [NEC 690.13] AND [NEC 690.15].
19. CONDUIT RAN THROUGH ATTIC WILL BE AT LEAST 18" BELOW ROOF SURFACE COMPLYING WITH [NEC 230.6(4)] AND SECURED NO GREATER THAN 6' APART PER [NEC 330.30(B)].

# STANDARD LABELS

**⚠ WARNING**  
ELECTRIC SHOCK HAZARD

TERMINALS ON THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

**LABEL 1**  
FOR PV SYSTEM DISCONNECTING MEANS WHERE THE LINE AND LOAD TERMINALS MAY BE ENERGIZED IN THE OPEN POSITION.  
[2017 NEC 690.13(B)]  
[2020 NEC 690.13(B)]

**☀ PHOTOVOLTAIC SYSTEM**  
**⚠ AC DISCONNECT ⚠**

RATED AC OUTPUT CURRENT 18.15 A  
NOMINAL OPERATING AC VOLTAGE 240 V

**LABEL 2**  
SHALL BE MARKED AT AN ACCESSIBLE LOCATION AT THE DISCONNECTING MEANS AS A POWER SOURCE AND WITH THE RATED AC OUTPUT CURRENT AND THE NOMINAL OPERATING AC VOLTAGE.  
[2017 NEC 690.54]  
[2020 NEC 690.54]

**⚠ WARNING**  
DUAL POWER SUPPLY

SOURCES: UTILITY GRID AND PV SOLAR ELECTRIC SYSTEM

**LABEL 3**  
IF INTERCONNECTING LOAD SIDE, INSTALL THIS LABEL ANYWHERE THAT IS POWERED BY BOTH THE UTILITY AND THE SOLAR PV SYSTEM, IE. MAIN SERVICE PANEL AND SUBPANELS.  
[2017 NEC 705.12(B)(3)]  
[2020 NEC 705.12(B)(3)]

**⚠ WARNING**  
POWER SOURCE OUTPUT CONNECTION

DO NOT RELOCATE THIS OVERCURRENT DEVICE

**LABEL 4**  
APPLY TO THE DISTRIBUTION EQUIPMENT ADJACENT TO THE BACK-FED BREAKER FROM THE POWER SOURCE.  
[2017 NEC 705.12(B)(2)(3)(b)]  
[2020 NEC 705.12(B)(3)(2)]

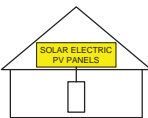
**⚠ WARNING**

THIS EQUIPMENT FED BY MULTIPLE SOURCES. TOTAL RATING OF ALL OVERCURRENT DEVICES, EXCLUDING MAIN SUPPLY OVERCURRENT DEVICE, SHALL NOT EXCEED AMPACITY OF BUSBAR.

**LABEL 5**  
APPLY TO THE PV COMBINER BOX  
[2017 NEC 705.12(B)(2)(3)(c)]  
[2020 NEC 705.12(B)(3)(3)]

**SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN**

TURN RAPID SHUTDOWN SWITCH TO THE "OFF" POSITION TO SHUT DOWN PV SYSTEM AND REDUCE SHOCK HAZARD IN THE ARRAY



**LABEL 6**  
BUILDINGS WITH PV SYSTEMS SHALL HAVE A PERMANENT LABEL LOCATED AT EACH SERVICE EQUIPMENT LOCATION TO WHICH THE PV SYSTEMS ARE CONNECTED OR AT AN APPROVED READILY VISIBLE LOCATION AND SHALL INDICATE THE LOCATION OF RAPID SHUTDOWN INITIATION DEVICES.  
[2017 NEC 690.56(C)(1)(a)]  
[2020 NEC 690.56(C)]

**RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM**

**LABEL 7**  
SIGN LOCATED AT RAPID SHUT DOWN DISCONNECT SWITCH  
[2017 NEC 690.56(C)(3)]  
[2020 NEC 690.56(C)(2)]

## LABELING NOTES

- 1) LABELS CALLED OUT ACCORDING TO ALL COMMON CONFIGURATIONS. ELECTRICIAN TO DETERMINE EXACT REQUIREMENTS IN THE FIELD PER CURRENT NEC AND LOCAL CODES AND MAKE APPROPRIATE ADJUSTMENTS.
- 2) LABELING REQUIREMENTS BASED ON THE 2017 & 2020 NEC CODE, OSHA STANDARD 19010.145, ANSIZ535.
- 3) MATERIAL BASED ON THE REQUIREMENTS OF THE AHJ.
- 4) LABELS TO BE OF SUFFICIENT DURABILITY TO WITHSTAND THE ENVIRONMENT INVOLVED AND SHALL NOT BE HANDWRITTEN [NEC 110.21]

**⚠ WARNING**  
MAIN DISTRIBUTION UTILITY DISCONNECT(S)

POWER TO THIS BUILDING IS ALSO SUPPLIED FROM A ROOF MOUNTED SOLAR ARRAY WITH A RAPID SHUTDOWN DISCONNECTING MEANS GROUPED AND LABELED WITHIN LINE OF SITE AND 10 FT OF THIS LOCATION

**LABEL 8**  
PERMANENT PLAQUE OR DIRECTORY DENOTING THE LOCATION OF ALL ELECTRIC POWER SOURCE DISCONNECTING MEANS ON OR IN THE PREMISES SHALL BE INSTALLED AT EACH SERVICE EQUIPMENT LOCATION AND AT THE LOCATION(S) OF THE SYSTEM DISCONNECT(S) FOR ALL ELECTRIC POWER PRODUCTION SOURCES CAPABLE OF BEING INTERCONNECTED.  
[2017 NEC 705.10]  
[2020 NEC 705.10]

**⚠ WARNING**

POWER TO THIS BUILDING IS ALSO SUPPLIED FROM MAIN DISTRIBUTION UTILITY DISCONNECT LOCATED

**LABEL 9**  
PERMANENT PLAQUE OR DIRECTORY DENOTING THE LOCATION OF ALL ELECTRIC POWER SOURCE DISCONNECTING MEANS ON OR IN THE PREMISES SHALL BE INSTALLED AT EACH SERVICE EQUIPMENT LOCATION AND AT THE LOCATION(S) OF THE SYSTEM DISCONNECT(S) FOR ALL ELECTRIC POWER PRODUCTION SOURCES CAPABLE OF BEING INTERCONNECTED.  
[2017 NEC 705.10]  
[2020 NEC 705.10]

**⚠ WARNING**

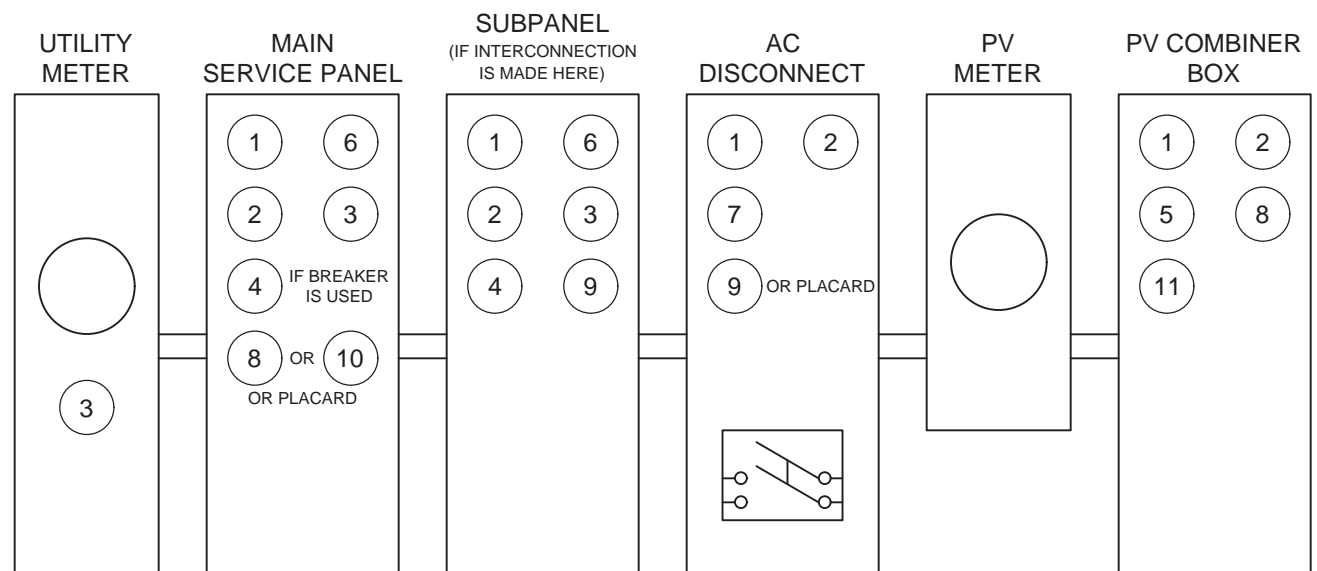
POWER TO THIS BUILDING IS ALSO SUPPLIED FROM A ROOF MOUNTED SOLAR ARRAY. SOLAR ARRAY RAPID SHUTDOWN DISCONNECT IS LOCATED OUTSIDE NEXT TO THE UTILITY METER.

**LABEL 10**  
PERMANENT PLAQUE OR DIRECTORY TO BE LOCATED AT MAIN SERVICE EQUIPMENT DENOTING THE LOCATION OF THE RAPID SHUTDOWN SYSTEM DISCONNECTING MEANS IF SOLAR ARRAY RAPID SHUTDOWN DISCONNECTING SWITCH IS NOT GROUPED AND WITHIN LINE OF SITE OF MAIN SERVICE DISCONNECTING MEANS.  
[2017 NEC 705.10 AND 690.56(C)(1)(a)]  
[2020 NEC 705.10 AND 690.56(C)]

**⚠ WARNING**  
PHOTOVOLTAIC SYSTEM COMBINER PANEL

DO NOT ADD LOADS

**LABEL 11**  
PERMANENT PLAQUE OR DIRECTORY TO BE LOCATED AT AC COMBINER PANEL.  
[2017 NEC 110.21(B)]  
[2020 NEC 110.21(B)]



\*ELECTRICAL DIAGRAM SHOWN ABOVE IS FOR LABELING PURPOSES ONLY. NOT AN ACTUAL REPRESENTATION OF EQUIPMENT AND CONNECTIONS TO BE INSTALLED. LABEL LOCATIONS PRESENTED MAY VARY DEPENDING ON TYPE OF INTERCONNECTION METHOD AND LOCATION PRESENTED ON 3 LINE DIAGRAM. 3 LINE DIAGRAM ON PV5 TO REFLECT ACTUAL REPRESENTATION OF PROPOSED SCOPE OF WORK.

# ADDITIONAL LABELS

**⚠ WARNING**  
DUAL POWER SUPPLY

SOURCES: UTILITY GRID AND PV SOLAR ELECTRIC SYSTEM

**LABEL 3**  
IF INTERCONNECTING LOAD SIDE, INSTALL THIS LABEL ANYWHERE THAT IS POWERED BY BOTH THE UTILITY AND THE SOLAR PV SYSTEM, IE. MAIN SERVICE PANEL AND SUBPANELS. [NEC 705.12(B)(3)]



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PV INSTALLATION PROFESSIONAL  
Scott Gurney  
#PV-011719-015866

CONTRACTOR:  
BRS FIELD OPS  
800-377-4480

**CUSTOMER INFORMATION:**  
Lorothy Wilson  
488 Stone Cross Dr  
Spring Lake North Carolina 28390  
**AC SYSTEM SIZE: 4.35 kW AC**  
**DC SYSTEM SIZE: 6.075 kW DC**

DRAWING BY:  
Colton Livingston

PLOT DATE:  
February 28, 2023

PROJECT NUMBER:  
709171

SHEET NAME:  
LABELS

REVISION: 0  
PAGE NUMBER: PV7



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PV INSTALLATION PROFESSIONAL  
Scott Gurney  
#PV-011719-015866

CONTRACTOR:  
BRS FIELD OPS  
385-498-6700



# SIV SERIES

Small Changes, Big Accomplishments

## 405-420W

### • SIV SERIES

SEG Solar INC. (SEG) redefined the high-efficiency module series by integrating 182mm silicon wafers with multi-busbar and half-cut cell technologies. SEG panel combined creative technology effectively and extremely improved the module efficiency and power output.

### • KEY FEATURES

- The transmittance of 400~1100nm band in the transparent region is ≥90%
- Using POE or EVA package, there is no need to worry about component power attenuation caused by PID
- A transparent backsheet reduces module weight by 30%, resulting in reduced shipping and installation costs
- Through ultraviolet 500kWh/m2 strict test, fully meet the requirements of 25 years of use of the modules
- Timely release of packaging material decomposition of acetic acid, effectively reduce the concentration of acetic acid modules
- Consistent with conventional component production process, no need to modify production equipment

### • PRODUCT CERTIFICATION

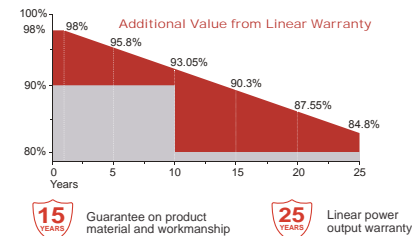
IEC61215:2016; IEC 61730:2016; UL1703; UL61730/CSA/CEC
IEC62804 PID
IEC61701 Salt Mist
IEC62716 Ammonia Resistance
IEC60068 Dust and Sand
IEC61215 Hailstone(25mm)
Fire Type (UL61730):1/29 (Type1-HV Type29-BG)
ISO14001:2015; ISO9001:2015; ISO45001:2018



### • INSURANCE



### • WARRANTY



### Mechanical Specifications

External Dimension	1722 x 1134 x 30 mm
Weight	21.5 kg
Solar Cells	PERC Mono crystalline(108 pcs)
Front Glass	3.2 / mm AR coating semi-tempered glass / low iron
Backsheet	Transparent backsheet
Frame	Black anodized aluminium alloy
Junction Box	IP68 / 3 diodes
Connector Type	MC4
Cable Type / Length	12 AWG PV Wire (UL/IEC) / 1200 mm
Mechanical Load(Front)	5400 Pa / 113 psf*
Mechanical Load(Rear)	3600 Pa / 75 psf*

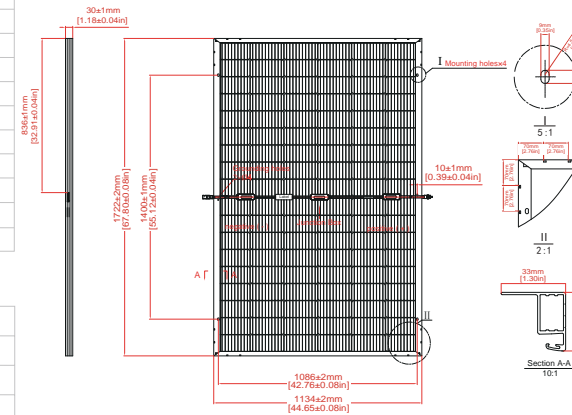
\*Refer to SEG installation Manual for details

### Packing Configuration

Container	20'GP	40'HQ
Pieces per Pallet	40	36
Pallets per Container	6	26
Pieces per Container	240	936

For details, please consult SEG.

### Technical Drawing



### Electrical Characteristics

Module Type	SEG-405-BMD-TB			SEG-410-BMD-TB			SEG-415-BMD-TB			SEG-420-BMD-TB		
	Front STC	Front NOCT	Back STC	Front STC	Front NOCT	Back STC	Front STC	Front NOCT	Back STC	Front STC	Front NOCT	Back STC
Maximum Power -P <sub>mp</sub> (W)	405	304	284	410	308	287	415	311	291	420	314	294
Open Circuit Voltage -V <sub>oc</sub> (V)	37.22	34.73	37.20	37.32	34.81	37.30	37.42	34.90	37.40	37.52	34.99	37.50
Short Circuit Current -I <sub>sc</sub> (A)	13.70	11.07	9.66	13.80	11.15	9.73	13.90	11.23	9.80	14.00	11.31	9.87
Maximum Power Voltage -V <sub>mp</sub> (V)	30.93	28.91	30.98	31.05	29.05	31.03	31.16	29.19	31.17	31.28	29.33	31.29
Maximum Power Current -I <sub>mp</sub> (A)	13.10	10.51	9.17	13.21	10.59	9.25	13.32	10.66	9.34	13.43	10.73	9.42
Module Efficiency STC-η <sub>m</sub> (%)	20.74			21.00			21.25			21.51		
Power Tolerance (W)	(0, +4.99)											
Pmax Temperature Coefficient	-0.34 %/°C											
Voc Temperature Coefficient	-0.26 %/°C											
Isc Temperature Coefficient	+0.05 %/°C											

STC: Irradiance 1000 W/m<sup>2</sup> module temperature 25°C AM=1.5  
NOCT: Irradiance 800W/m<sup>2</sup> ambient temperature 20°C module temperature 45°C wind speed: 1m/s  
Power measurement tolerance: +/-3%

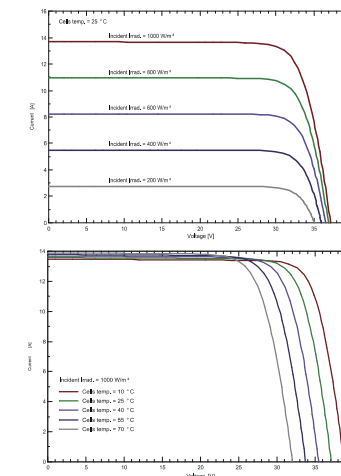
### Rear Side Power Gain(SEG-410-BMD-TB)

Power Gain	10%	15%	20%	25%	30%
Maximum Power -P <sub>mp</sub> (W)	451	472	492	513	533
Open Circuit Voltage -V <sub>oc</sub> (V)	37.22	37.22	37.22	37.22	37.22
Short Circuit Current -I <sub>sc</sub> (A)	15.18	15.87	16.56	17.25	17.94
Maximum Power Voltage -V <sub>mp</sub> (V)	31.05	31.05	31.05	31.05	31.05
Maximum Power Current -I <sub>mp</sub> (A)	14.53	15.19	15.85	16.51	17.17

### Application Conditions

Maximum System Voltage	1500V DC
Maximum Series Fuse Rating	25 A
Operating Temperature	-40~+85 °C
Nominal Operating Cell Temperature	45±2 °C
Bifaciality	70%±10%

### I-V Curve



Specifications are subject to change without further notification SEG-DS-EN-2022V1.0 © Copyright 2022 SEG

### SEG SOLAR INC. (SEG)

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# IQ8 and IQ8+ Microinverters

Our newest IQ8 Microinverters are the industry's first microgrid-forming, software-defined microinverters with split-phase power conversion capability to convert DC power to AC power efficiently. The brain of the semiconductor-based microinverter is our proprietary application-specific integrated circuit (ASIC) which enables the microinverter to operate in grid-tied or off-grid modes. This chip is built in advanced 55nm technology with high speed digital logic and has super-fast response times to changing loads and grid events, alleviating constraints on battery sizing for home energy systems.



Part of the Enphase Energy System, IQ8 Series Microinverters integrate with the Enphase IQ Battery, Enphase IQ Gateway, and the Enphase App monitoring and analysis software.



IQ8 Series Microinverters redefine reliability standards with more than one million cumulative hours of power-on testing, enabling an industry-leading limited warranty of up to 25 years.



Connect PV modules quickly and easily to IQ8 Series Microinverters using the included Q-DCC-2 adapter cable with plug-n-play MC4 connectors.



IQ8 Series Microinverters are UL Listed as PV Rapid Shut Down Equipment and conform with various regulations, when installed according to manufacturer's instructions.

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IQ8SP-DS-0002-01-EN-US-2022-03-17

### Easy to install

- Lightweight and compact with plug-n-play connectors
- Power Line Communication (PLC) between components
- Faster installation with simple two-wire cabling

### High productivity and reliability

- Produce power even when the grid is down\*
- More than one million cumulative hours of testing
- Class II double-insulated enclosure
- Optimized for the latest high-powered PV modules

### Microgrid-forming

- Complies with the latest advanced grid support\*\*
- Remote automatic updates for the latest grid requirements
- Configurable to support a wide range of grid profiles
- Meets CA Rule 21 (UL 1741-SA) requirements

\* Only when installed with IQ System Controller 2, meets UL 1741.

\*\* IQ8 and IQ8Plus supports split phase, 240V installations only.

# IQ8 and IQ8+ Microinverters

INPUT DATA (DC)		IQ8-60-2-US	IQ8PLUS-72-2-US
Commonly used module pairings <sup>1</sup>	W	235 – 350	235 – 440
Module compatibility		60-cell/120 half-cell	60-cell/120 half-cell, 66-cell/132 half-cell and 72-cell/144 half-cell
MPPT voltage range	V	27 – 37	29 – 45
Operating range	V	25 – 48	25 – 58
Min/max start voltage	V	30 / 48	30 / 58
Max input DC voltage	V	50	60
Max DC current <sup>2</sup> [module Isc]	A		15
Overvoltage class DC port			II
DC port backfeed current	mA		0
PV array configuration		1x1 Ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit	
OUTPUT DATA (AC)		IQ8-60-2-US	IQ8PLUS-72-2-US
Peak output power	VA	245	300
Max continuous output power	VA	240	290
Nominal (L-L) voltage/range <sup>3</sup>	V	240 / 211 – 264	
Max continuous output current	A	1.0	1.21
Nominal frequency	Hz	60	
Extended frequency range	Hz	50 – 68	
AC short circuit fault current over 3 cycles	Arms	2	
Max units per 20 A (L-L) branch circuit <sup>4</sup>		16	13
Total harmonic distortion		<5%	
Overvoltage class AC port		III	
AC port backfeed current	mA	30	
Power factor setting		1.0	
Grid-tied power factor (adjustable)		0.85 leading – 0.85 lagging	
Peak efficiency	%	97.5	97.6
CEC weighted efficiency	%	97	97
Night-time power consumption	mW	60	
MECHANICAL DATA			
Ambient temperature range		-40°C to +60°C (-40°F to +140°F)	
Relative humidity range		4% to 100% (condensing)	
DC Connector type		MC4	
Dimensions (HxWxD)		212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")	
Weight		1.08 kg (2.38 lbs)	
Cooling		Natural convection – no fans	
Approved for wet locations		Yes	
Pollution degree		PD3	
Enclosure		Class II double-insulated, corrosion resistant polymeric enclosure	
Environ. category / UV exposure rating		NEMA Type 6 / outdoor	
COMPLIANCE			
Certifications		CA Rule 21 (UL 1741-SA), UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 1071-01	
		This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020 section 690.12 and C22.1-2018 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to manufacturer's instructions.	

(1) No enforced DC/AC ratio. See the compatibility calculator at <https://link.enphase.com/module-compatibility>  
 (2) Maximum continuous input DC current is 10.6A (3) Nominal voltage range can be extended beyond nominal if required by the utility. (4) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

IQ8SP-DS-0002-01-EN-US-2022-03-17

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PV INSTALLATION PROFESSIONAL

Scott Gurney  
#PV-011719-015866

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385-498-6700

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# Enphase IQ Combiner 4/4C

X-IQ-AM1-240-4  
X-IQ-AM1-240-4C



X-IQ-AM1-240-4C

X-IQ-AM1-240-4

The **Enphase IQ Combiner 4/4C** with IQ Gateway and integrated LTE-M1 cell modem (included only with IQ Combiner 4C) consolidates interconnection equipment into a single enclosure and streamlines IQ microinverters and storage installations by providing a consistent, pre-wired solution for residential applications. It offers up to four 2-pole input circuits and Eaton BR series busbar assembly.

### Smart

- Includes IQ Gateway for communication and control
- Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), included only with IQ Combiner 4C
- Includes solar shield to match Enphase IQ Battery aesthetics and deflect heat
- Flexible networking supports Wi-Fi, Ethernet, or cellular
- Optional AC receptacle available for PLC bridge
- Provides production metering and consumption monitoring

### Simple

- Centered mounting brackets support single stud mounting
- Supports bottom, back and side conduit entry
- Up to four 2-pole branch circuits for 240 VAC plug-in breakers (not included)
- 80A total PV or storage branch circuits

### Reliable

- Durable NRTL-certified NEMA type 3R enclosure
- Five-year limited warranty
- Two years labor reimbursement program coverage included for both the IQ Combiner SKU's
- UL listed

## Enphase IQ Combiner 4/4C

### MODEL NUMBER

IQ Combiner 4 (X-IQ-AM1-240-4)	IQ Combiner 4 with Enphase IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes a silver solar shield to match the IQ Battery system and IQ System Controller 2 and to deflect heat.
IQ Combiner 4C (X-IQ-AM1-240-4C)	IQ Combiner 4C with Enphase IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), a plug-and-play industrial-grade cell modem for systems up to 60 microinverters. (Available in the US, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.) Includes a silver solar shield to match the IQ Battery and IQ System Controller and to deflect heat.

### MICROINVERTERS, ACCESSORIES AND REPLACEMENT PARTS (not included, order separately)

Supported Microinverters	IQ6, IQ7, IQ8. Do not mix IQ6/7 Micro-inverters with IQ8
Ensemble Communications Kit COMMS-CELLMODEM-M1-06 CELLMODEM-M1-06-SP-05 CELLMODEM-M1-06-AT-05	- Includes COMMS-KIT-01 and CELLMODEM-M1-06-SP-05 with 5-year Sprint data plan for Ensemble sites - 4G based LTE-M1 cellular modem with 5-year Sprint data plan - 4G based LTE-M1 cellular modem with 5-year AT&T data plan
Circuit Breakers BRK-10A-2-240V BRK-15A-2-240V BRK-20A-2P-240V BRK-15A-2P-240V-B BRK-20A-2P-240V-B	Supports Eaton BR210, BR215, BR220, BR230, BR240, BR250, and BR260 circuit breakers. Circuit breaker, 2 pole, 10A, Eaton BR210 Circuit breaker, 2 pole, 15A, Eaton BR215 Circuit breaker, 2 pole, 20A, Eaton BR220 Circuit breaker, 2 pole, 15A, Eaton BR215B with hold down kit support Circuit breaker, 2 pole, 20A, Eaton BR220B with hold down kit support
EPLC-01	Power line carrier (communication bridge pair), quantity - one pair
XA-SOLARSHIELD-ES	Replacement solar shield for IQ Combiner 4/4C
XA-PLUG-120-3	Accessory receptacle for Power Line Carrier in IQ Combiner 4/4C (required for EPLC-01)
XA-ENV-PCBA-3	Replacement IQ Gateway printed circuit board (PCB) for Combiner 4/4C
X-IQ-NA-HD-125A	Hold down kit for Eaton circuit breaker with screws.

### ELECTRICAL SPECIFICATIONS

Rating	Continuous duty
System voltage	120/240 VAC, 60 Hz
Eaton BR series busbar rating	125 A
Max. continuous current rating	65 A
Max. continuous current rating (input from PV/storage)	64 A
Max. fuse/circuit rating (output)	90 A
Branch circuits (solar and/or storage)	Up to four 2-pole Eaton BR series Distributed Generation (DG) breakers only (not included)
Max. total branch circuit breaker rating (input)	80A of distributed generation / 95A with IQ Gateway breaker included
IQ Gateway breaker	10A or 15A rating GE/Siemens/Eaton included
Production metering CT	200 A solid core pre-installed and wired to IQ Gateway
Consumption monitoring CT (CT-200-SPLIT)	A pair of 200 A split core current transformers

### MECHANICAL DATA

Dimensions (WxHxD)	37.5 x 49.5 x 16.8 cm (14.75" x 19.5" x 6.63"). Height is 21.06" (53.5 cm) with mounting brackets.
Weight	7.5 kg (16.5 lbs)
Ambient temperature range	-40° C to +46° C (-40° to 115° F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction
Wire sizes	• 20 A to 50 A breaker inputs: 14 to 4 AWG copper conductors • 60 A breaker branch input: 4 to 1/0 AWG copper conductors • Main lug combined output: 10 to 2/0 AWG copper conductors • Neutral and ground: 14 to 1/0 copper conductors Always follow local code requirements for conductor sizing.
Altitude	Up to 3000 meters (9,842 feet)

### INTERNET CONNECTION OPTIONS

Integrated Wi-Fi	802.11b/g/n
Cellular	CELLMODEM-M1-06-SP-05, CELLMODEM-M1-06-AT-05 (4G based LTE-M1 cellular modem). Note that an Enphase Mobile Connect cellular modem is required for all Ensemble installations.
Ethernet	Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included)

### COMPLIANCE

Compliance, IQ Combiner	UL 1741, CAN/CSA C22.2 No. 107.1, 47 CFR, Part 15, Class B, ICES 003 Production metering: ANSI C12.20 accuracy class 0.5 (PV production) Consumption metering: accuracy class 2.5
Compliance, IQ Gateway	UL 60601-1/CANCSA 22.2 No. 61010-1

To learn more about Enphase offerings, visit [enphase.com](http://enphase.com)

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PROFESSIONAL

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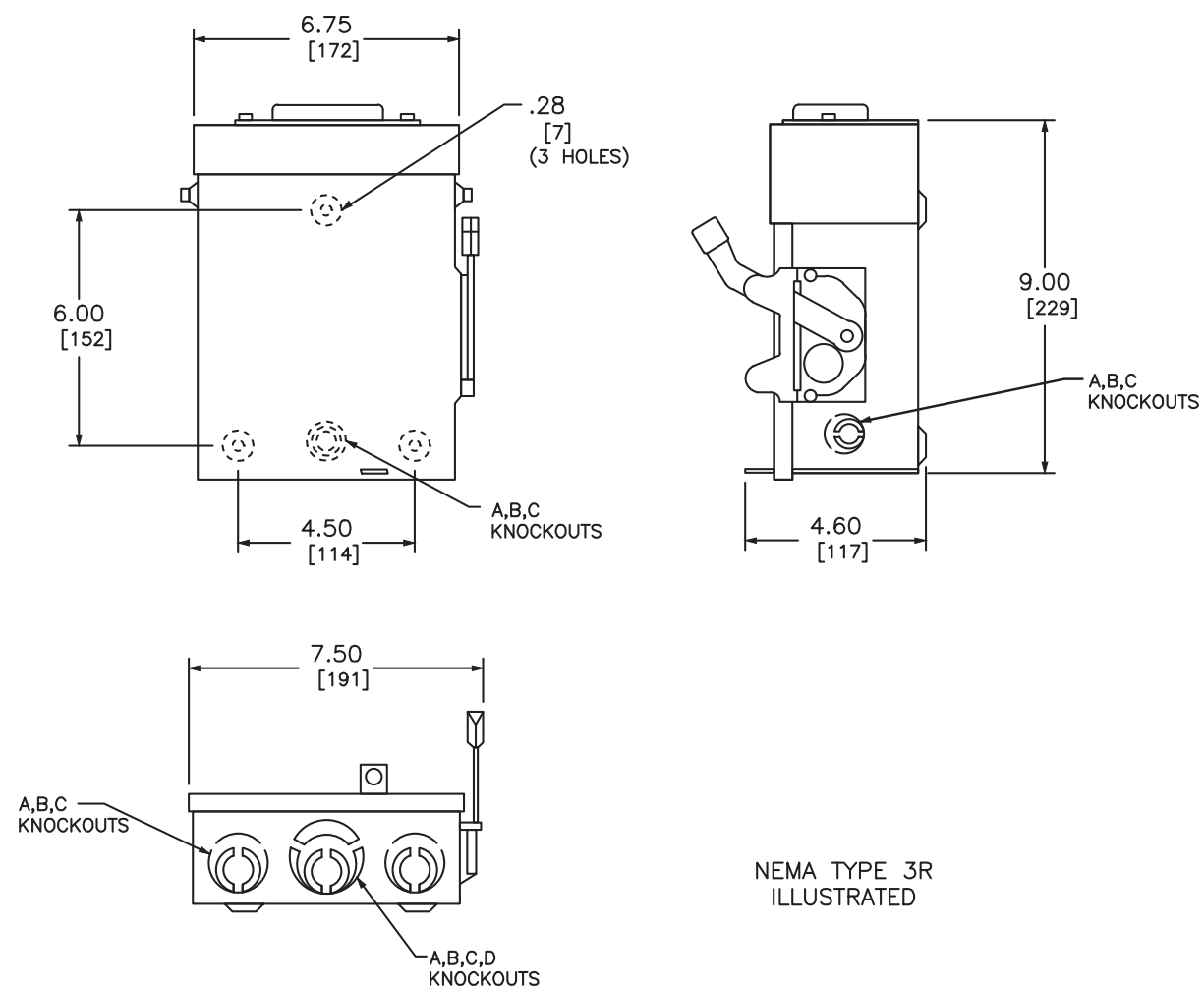
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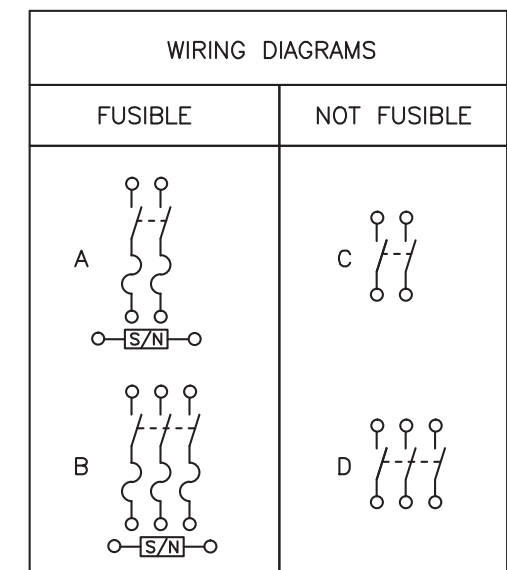
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NEMA TYPE 3R ILLUSTRATED



TERMINAL LUGS ‡			
AMPERES	MAX. WIRE	MIN. WIRE	TYPE
30	# 6 AWG	# 12 AWG	AL
	# 6 AWG	# 14 AWG	CU


KNOCKOUTS				
SYMBOL	A	B	C	D
CONDUIT SIZE	.50	.75	1	1.25

DUAL DIMENSIONS: INCHES  
MILLIMETERS

CATALOG NUMBER	VOTAGE RATINGS	WIRING DIAG.	HORSEPOWER RATINGS					
			120VAC		240VAC			
			STD.	MAX.	STD.		MAX.	
			1 Ø	1 Ø	1 Ø	3 Ø	1 Ø	3 Ø
D211NRB●■	240VAC	A	1/2	2	1 1/2	-	3	-
D221NRB	240VAC	A	-	-	1 1/2	3*	3	7 1/2*
D321NRB	240VAC	B	-	-	1 1/2	3	3	7 1/2
DU221RB	240VAC	C	-	-	-	-	3	-
DU321RB	240VAC	D	-	-	-	-	3	7 1/2

NOTES:  
FINISH - GRAY BAKED ENAMEL ELECTRODEPOSITED OVER CLEANED PHOSPHATIZED STEEL.  
UL LISTED - FILE E-2875  
ALL NEUTRALS - INSULATED GROUNDABLE  
SUITABLE FOR USE AS SERVICE EQUIPMENT  
TOP OF NEMA TYPE 3R SWITCHES HAVE PROVISIONS FOR MAXIMUM 2 1/2" BOLT-ON HUB.  
SHORT CIRCUIT CURRENT RATINGS:  
● 10,000 AMPERES.  
■ 10,000 AMPERES WHEN USED WITH OR PROTECTED BY CLASS H OR K FUSES.  
■ 100,000 AMPERES WITH CLASS R FUSES.  
\* FOR CORNER GROUNDED DELTA SYSTEMS.  
■ PLUG FUSES  
‡ LUGS SUITABLE FOR 60°C OR 75° CONDUCTORS.

GENERAL DUTY SAFETY SWITCHES  
VISIBLE BLADE TYPE  
30 AMPERE  
ENCLOSURE - NEMA TYPE 3R RAINPROOF



by Schneider Electric

DWG# 1852  
NO.

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## Carlton® Non-Metallic Junction Boxes

### Molded Non-Metallic Junction Boxes — 6P Rated

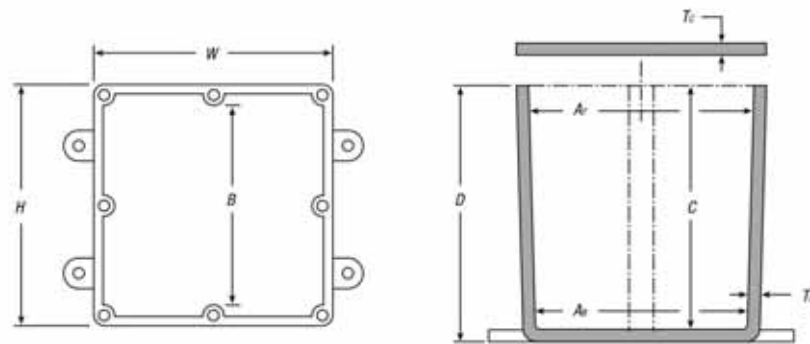
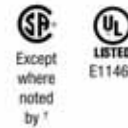
Non-metallic junction boxes are UL® Listed with a NEMA 6P rating per Section 314.28 of the National Electrical Code® and CSA Certified per Section 12 of the Canadian Electrical Code. Manufactured from PVC or PPO thermoplastic molding compound and featuring foam-in-place gasketed lids attached with stainless steel screws, these rugged enclosures offer all the corrosion resistance and physical properties you need for direct burial applications.

Type 6P enclosures are intended for indoor or outdoor use, primarily to provide a degree of protection against contact with enclosed equipment, falling dirt, hose-directed water, entry of water during prolonged submersion at a limited depth and external ice formation.

- All Carlton® Junction Boxes are UL® Listed/CSA Certified and maintain a minimum of a NEMA Type 4/4X Rating
- Part numbers with an asterisk (\*) are UL® Listed and maintain a NEMA Type 6P Rating and Type 4/4X Rating



Boxes & Covers — Carlton® Enclosures & Junction Boxes



CAT. NO.	SIZE (IN.) H x W x D	STD. CTN.	DIMENSIONS (IN.)						MATERIAL		STD. WT. (LBS.)
			MIN A <sub>i</sub>	MIN A <sub>o</sub>	MIN B	MIN C	T <sub>a</sub>	T <sub>c</sub>	PVC	THERMO- PLASTIC	
E989NNJ*	4 x 4 x 2	10	3 3/8	3 3/8	N/A	2	.160	.155	X		3
E987N*	4 x 4 x 4	10	3 3/8	3 3/8	N/A	4	.160	.155	X		4
E989NNR*	4 x 4 x 6	10	3 3/8	3 3/8	N/A	6	.160	.200	X		5
E989PPJ*	5 x 5 x 2	10	4 1/8	4 1/8	N/A	2	.110	.150		X	3
E987R-CAR*	6 x 6 x 4	2	6	5 1/8	N/A	4	.190	.190		X	3
E989RRR-UPC*	6 x 6 x 6	8	5 1/8	5 1/8	N/A	6	.160	.150		X	14
E989N-CAR	8 x 8 x 4	1	8	8	N/A	4	.185	.190		X	2
E989SSX-UPC	8 x 8 x 7	2	7 7/8	7 7/8	N/A	7	.160	.150		X	6
E989UUN	12 x 12 x 4	3	11 1/8	11 1/8	11 1/8	4	.160	.150		X	12
E989R-UPC	12 x 12 x 6	2	11 1/8	11 1/8	11 1/8	6	.265	.185		X	10

\* UL Listed

† Not CSA Certified

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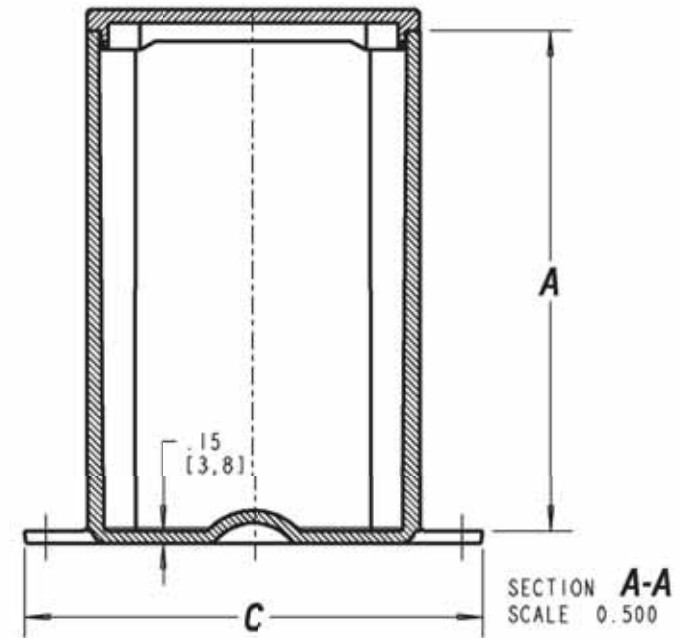
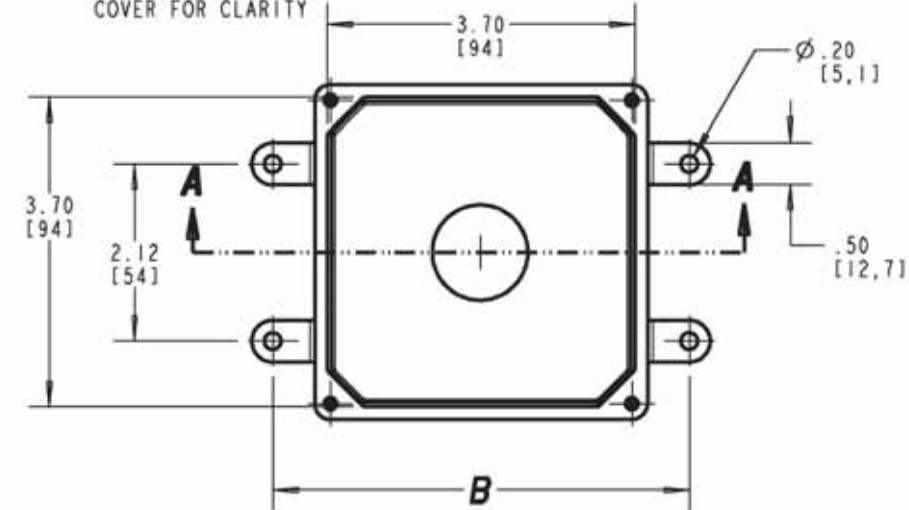
United States  
Tel: 901.252.8000  
800.816.7809  
Fax: 901.252.1354

Technical Services  
Tel: 888.862.3289

Thomas & Betts

A-269

VIEW SHOWN LESS COVER FOR CLARITY



SIZE	A	B	C
E989NNJ E989NNJB E989NNJ-CAR E989NNJCL E989NNJL (4X4X2)	2.00 (50,8)	4.63 (117,8)	5.13 (130,2)
E989NNR E989NNR-CAR (4X4X6)	6.00 (152,4)	5.00 (127,0)	5.50 (139,7)

- NOTES:  
1. MATERIAL: PVC  
2. NEMA TYPES: 4/4X, 6P

#### GENERAL NOTES

- ALL DIMENSIONS ARE FOR REFERENCE ONLY.
- DIMENSIONS IN BRACKETS [ ] ARE IN METRIC UNITS.

#### REVISIONS

F SEE ERN 2016195 FOR APPROVAL SIGNATURES & RELEASE DATE.  
PROJECT NO: 5AM000006

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DESCRIPTION: MOLDED NON-METALLIC ENCLOSURE

ORIGINAL PROJECT NO / ( ERN NO ) SHEET NO: REV. NO: DRAWING NO:  
/ ( ) 2 OF 2 F WSD-AC01977

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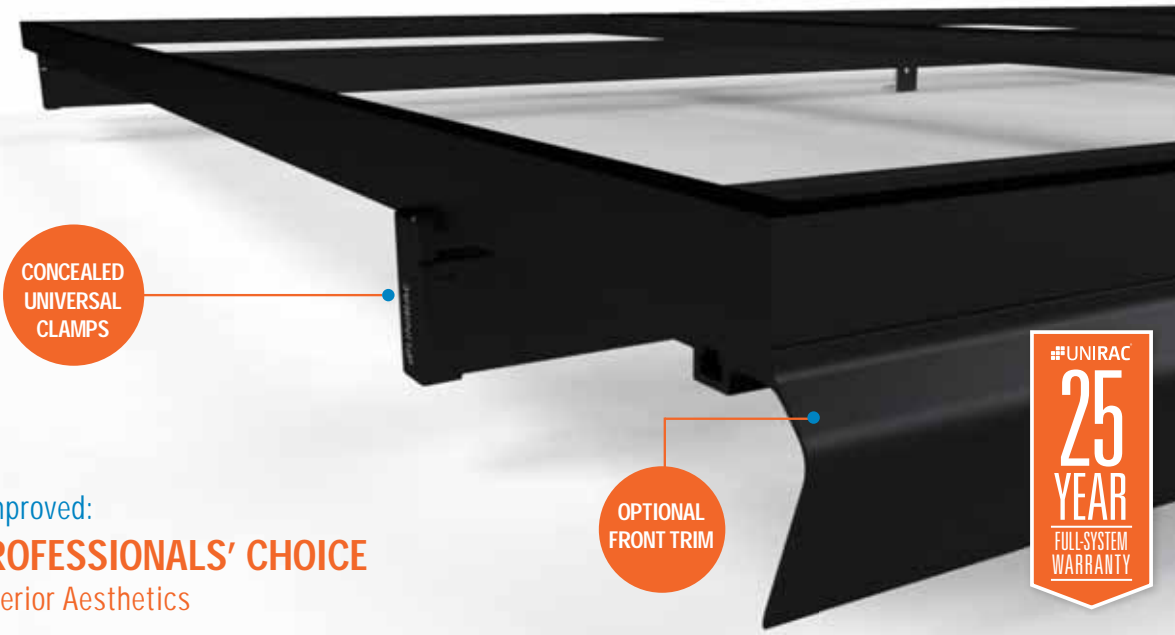
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With Superior Aesthetics



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UNMATCHED EXPERIENCE	CERTIFIED QUALITY	ENGINEERING EXCELLENCE	BANKABLE WARRANTY	DESIGN TOOLS	PERMIT DOCUMENTATION
----------------------	-------------------	------------------------	-------------------	--------------	----------------------

### TECHNICAL SUPPORT

Unirac's technical support team is dedicated to answering questions & addressing issues in real time. An online library of documents including engineering reports, stamped letters and technical data sheets greatly simplifies your permitting and project planning process.

### CERTIFIED QUALITY PROVIDER

Unirac is the only PV mounting vendor with ISO certifications for 9001:2008, 14001:2004 and OHSAS 18001:2007, which means we deliver the highest standards for fit, form, and function. These certifications demonstrate our excellence and commitment to first class business practices.

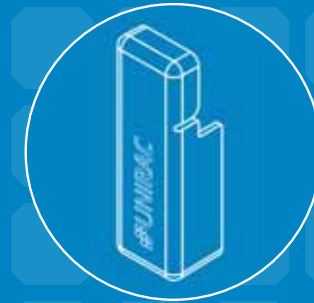
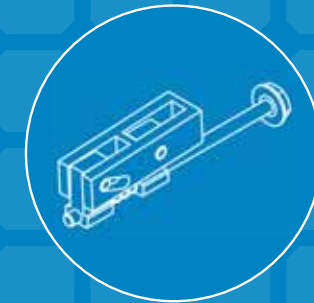
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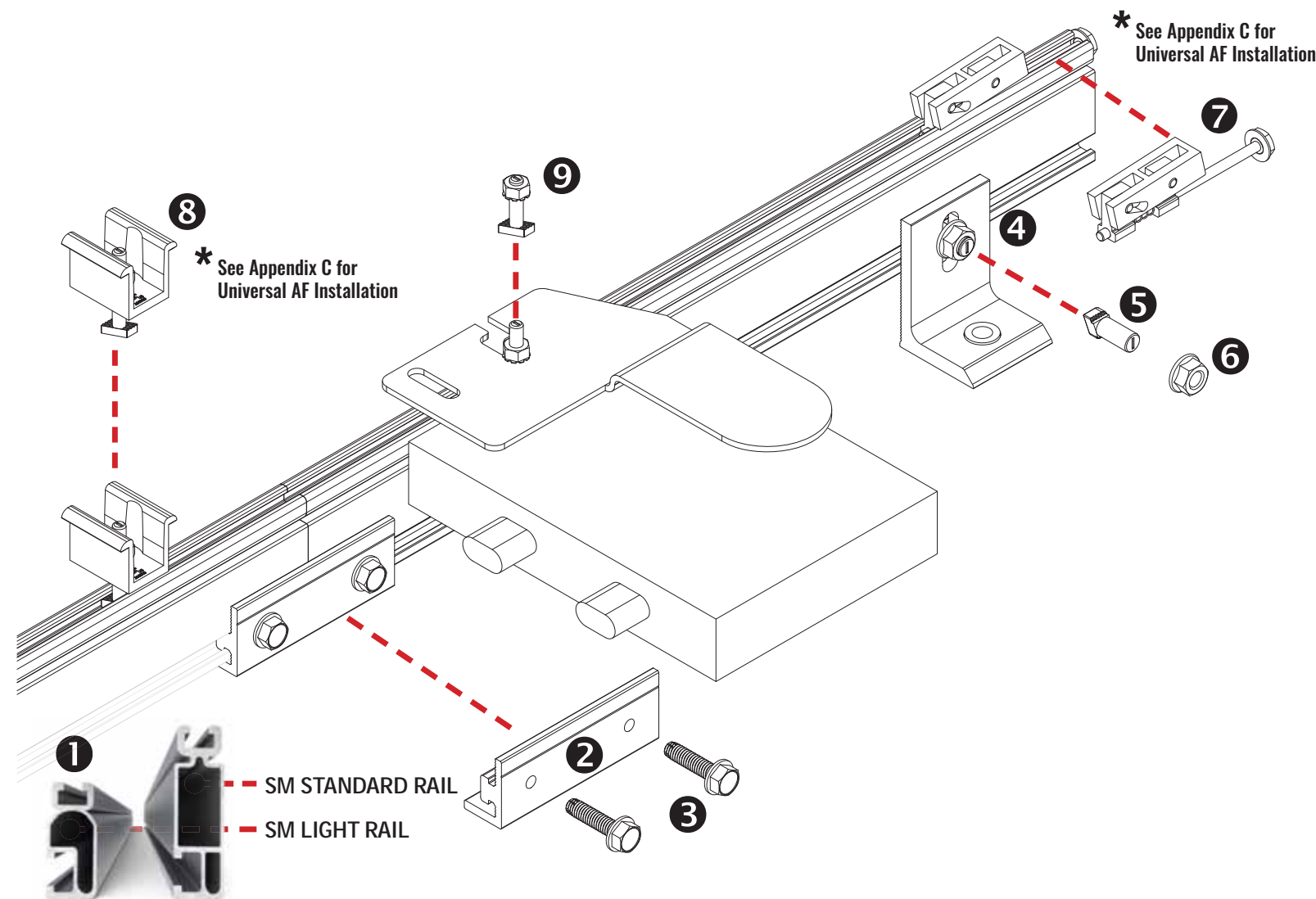
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**1 RAIL:** Supports PV modules. Use at least two per row of modules. Aluminum extrusion, available in mill, clear anodized, or dark anodized.

**2 3 RAIL SPLICE:** Non structural splice joins, aligns, and electrically bonds rail sections into single length of rail. Forms a rigid splice joint, 4 inches long, preassembled with bonding hardware. Available in dark anodized or mill finish.

**4 L-FOOT:** Use to secure rails through roofing material to building structure. Refer to loading tables or U-Builder for spacing.

**5 L-FOOT T- BOLT:** (3/8" x 3/4" or 1") – Use one per L-foot to secure rail to L-foot. Stainless steel. Supplied with L-foot in combination with flange nut, provides electrical bond between L-foot and rail.

**6 SERRATED FLANGE NUT :** Use one per L-foot to secure and bond rail to Lfoot. Stainless steel. Supplied with L-foot.

**7 MODULE ENDCLAMP:** Pre-assembled universal clamp that secures module to rail at module flange by tightening 1/2" hex head bolt.

**8 MODULE MIDCLAMP:** Pre-assembled clamp provides module to module and module to rail bond. Aluminum clamp with stainless steel bonding pins and T-bolt. Available in clear or dark finish.

**9 MICROINVERTER MOUNTING BOLT:** Preassembled bolt, nut, and captive star washer attaches and bonds microinverter to rail.

**NOTE - POSITION INDICATOR:** T-bolts have a slot in the hardware end corresponding to the direction of the T-Head.

**NOTE - Pro Series Mid and End Clamps are single use only**

Wrenches and Torque		
	Wrench or Socket Size	Recommended Torque (ft-lbs)
Mid Clamp 8	1/2"	11
MLPE Mount 9	1/2"	10
End Clamp 7	1/2"	5
L-Foot to Rail 6	1/2"	30
Rail Splice 3	1/2"	10

Anti-Seize 6 9	
Stainless steel hardware can seize up, a process called galling. To significantly reduce its likelihood:	
1. Apply minimal lubricant to bolts only where indicated in installation process, preferably Anti-Seize commonly found at auto parts stores (Anti-seize has been factory applied to mid clamp bolts)	
2. Shade hardware prior to installation, and	
3. Avoid spinning stainless nuts onto bolts at high speed.	

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# CODE COMPLIANCE NOTES

## INSTALLATION GUIDE



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PV INSTALLATION PROFESSIONAL  
Scott Gurney  
#PV-011719-015866

CONTRACTOR:  
BRS FIELD OPS  
385-498-6700

### SYSTEM LEVEL FIRE CLASSIFICATION

The system fire class rating requires installation in the manner specified in the SOLARMOUNT Installation Guide. SOLARMOUNT has been classified to the system level fire portion of UL2703. SOLARMOUNT has achieved system level performance for steep sloped roofs. The fire classification rating is only valid on roof pitches greater than 2:12 (slopes  $\geq$  2 inches per foot, or 9.5 degrees). The system is to be mounted over fire resistant roof covering rated for the application. There is no required minimum or maximum height limitation above the roof deck to maintain the system fire rating for SOLARMOUNT. Module Types, System Level Fire Ratings, and Mitigation Requirements are listed below:

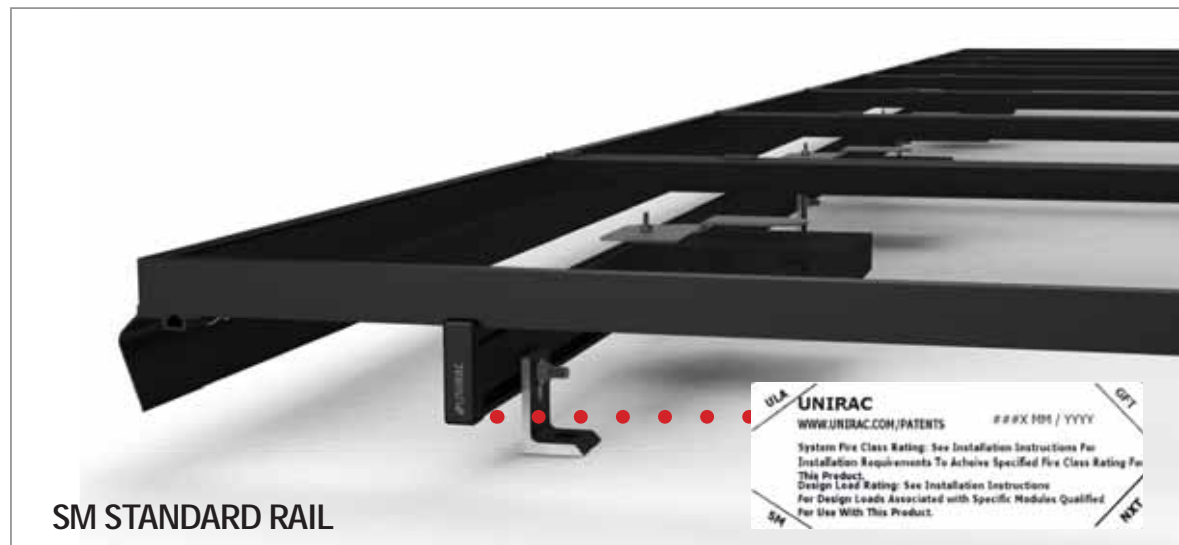
Rail Type	Module Fire Types	System Level Fire Rating	Rail Direction	Module Orientation	Mitigation Required
Standard & HD Rails	1, 2, 3 with Metal Frame, 10 with Metal Frame, 19, 22, 25, 29, & 30	Class A, Class B & Class C	East-West	Landscape OR Portrait	None Required
			North-South	Landscape OR Portrait	None Required
Light Rail	1 & 2	Class A, Class B & Class C	East-West	Landscape OR Portrait	None Required
			North-South	Landscape OR Portrait	None Required
Standard, Light, & HD Rails	4 & 5	Class A, Class B & Class C	East-West	Landscape OR Portrait	Trim installation per Solar Mount Installation Guide
			North-South	Landscape OR Portrait	

**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.**

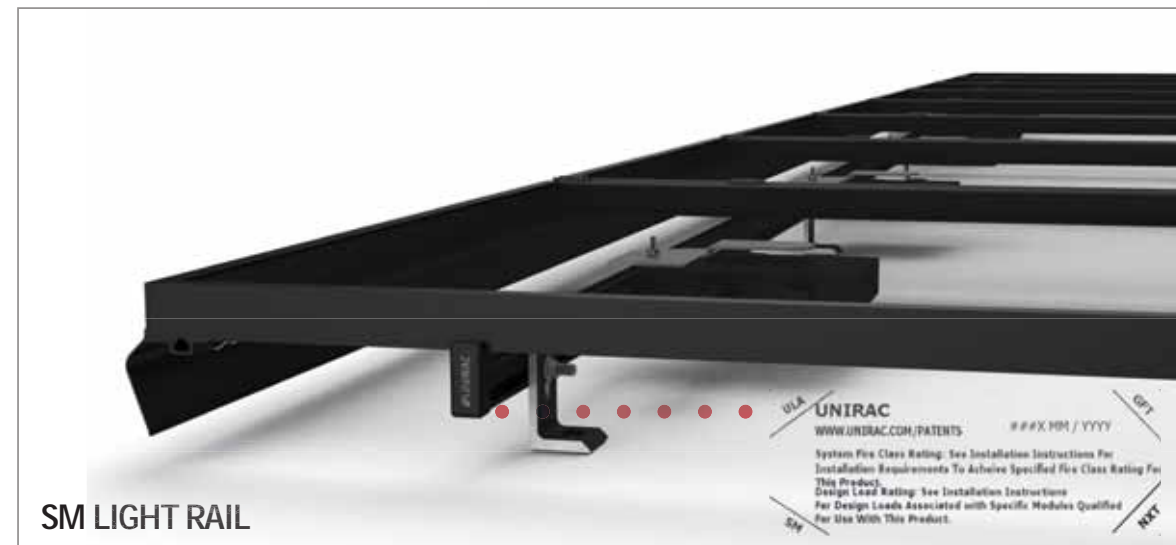
### UL2703 CERTIFICATION MARKING LABEL

Unirac SOLARMOUNT is listed to UL 2703. Certification marking is embossed on all mid clamps as shown. Labels with additional information will be provided. After the racking system is fully assembled, a single label should be applied to the SOLARMOUNT rail at the edge of the array. **Before applying the label, the corners of the label that do not pertain to the system being installed must be removed so that only the installed system type is showing.**

**Note: The sticker label should be placed such that it is visible, but not outward facing.**



SM STANDARD RAIL



SM LIGHT RAIL

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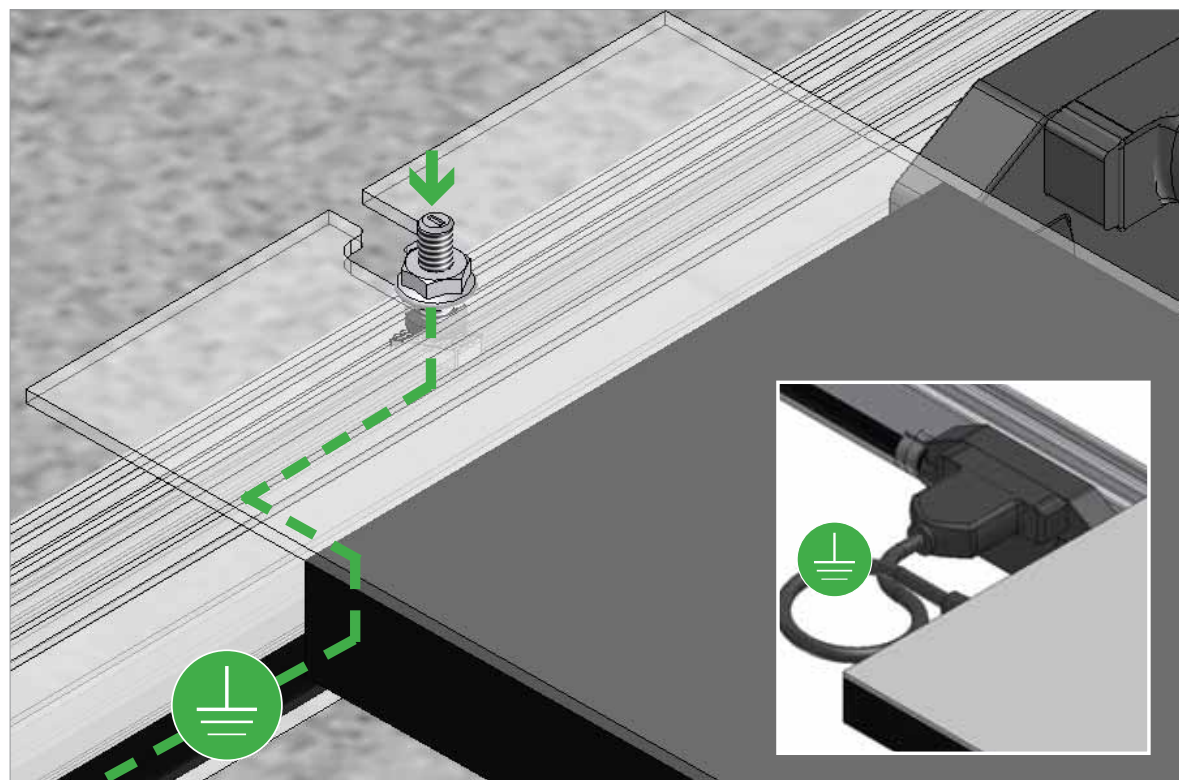
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### SM EQUIPMENT GROUNDING THROUGH ENPHASE MICROINVERTERS

The Enphase M215 and M250 microinverters have integrated grounding capabilities built in. In this case, the DC circuit is isolated from the AC circuit, and the AC equipment grounding conductor (EGC) is built into the Enphase Engage integrated grounding (IG) cabling.

In order to ground the SOLARMOUNT racking system through the Enphase microinverter and Engage cable assembly, there must be a minimum of three PV modules connected to the same trunk cable within a continuous row. Continuous row is defined as a grouping of modules installed and bonded per the requirements of this installation guide sharing the same two rails. The microinverters are bonded to the SOLARMOUNT rail via the mounting hardware. Complete equipment grounding is achieved through the Enphase Engage cabling with integrated grounding (IG). No additional EGC grounding cables are required, as all fault current is carried to ground through the Engage cable.



**SOLARMOUNT INTEGRATED BONDING ADVANTAGE**  
WITH SYSTEM GROUNDING THROUGH ENPHASE MICROINVERTERS AND TRUNK CABLES  
**LOSE ALL THE COPPER & LUGS**

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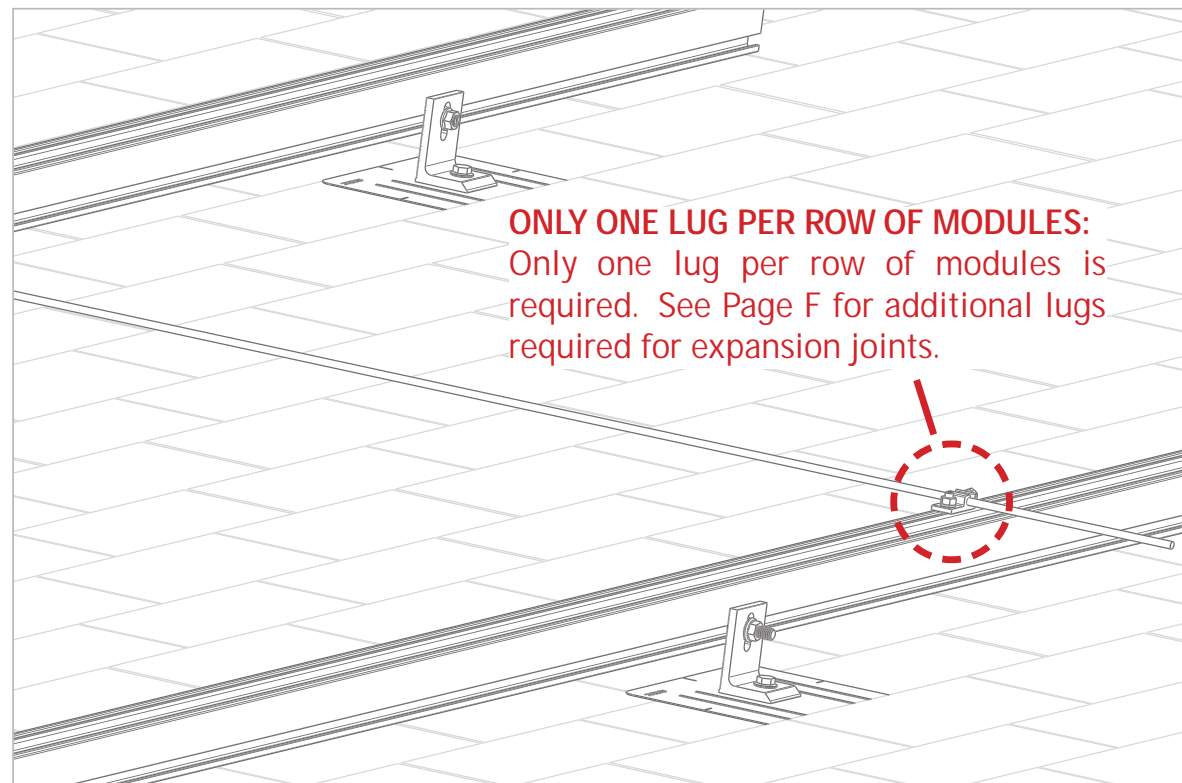
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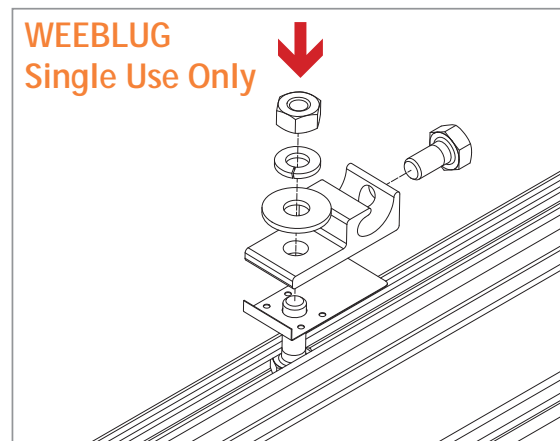
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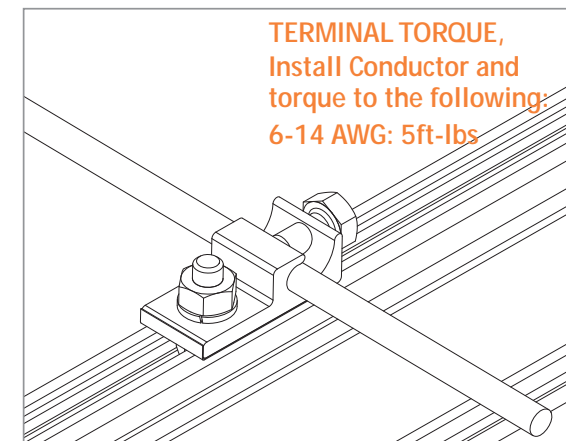




**ONLY ONE LUG PER ROW OF MODULES:**  
Only one lug per row of modules is required. See Page F for additional lugs required for expansion joints.



**WEEBLUG**  
Single Use Only



**TERMINAL TORQUE,**  
Install Conductor and torque to the following:  
6-14 AWG: 5ft-lbs

**WEEBLUG CONDUCTOR - UNIRAC P/N 008002S:**

Apply Anti Seize and insert a bolt in the aluminum rail and through the clearance hole in the stainless steel flat washer. Place the stainless steel flat washer on the bolt, oriented so the dimples will contact the aluminum rail. Place the lug portion on the bolt and stainless steel flat washer. Install stainless steel flat washer, lock washer and nut. Tighten the nut until the dimples are completely embedded into the rail and lug.

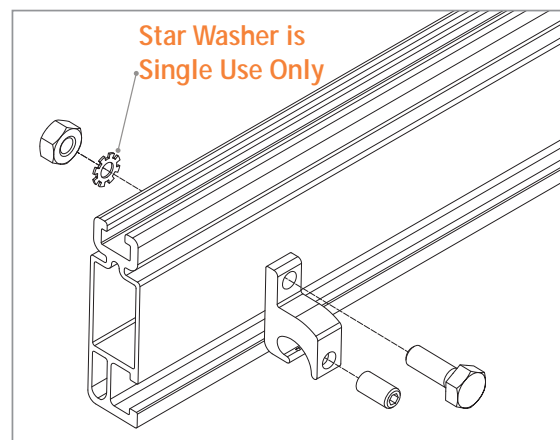
**TORQUE VALUE 10 ft lbs. (See Note on PG. A)**

See product data sheet for more details, Model No. WEEB-LUG-6.7

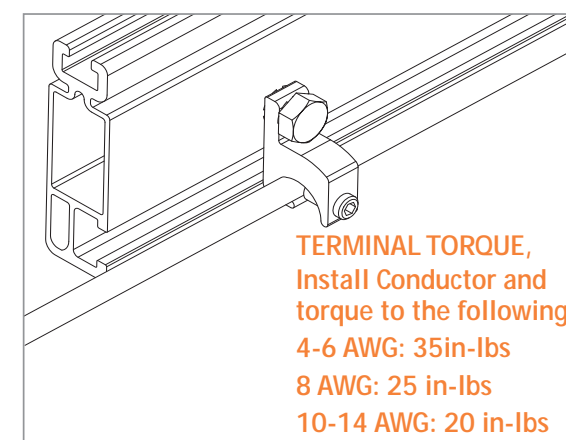
**GROUNDING LUG MOUNTING DETAILS:**

Details are provided for both the WEEB and IlSCO products. The WEEBLug has a grounding symbol located on the lug assembly. The IlSCO lug has a green colored set screw for grounding indication purposes. Installation must be in accordance with NFPA NEC 70, however the electrical designer of record should refer to the latest revision of NEC for actual grounding conductor cable size.

Required if not using approved integrated grounding microinverters



Star Washer is  
Single Use Only



**TERMINAL TORQUE,**  
Install Conductor and torque to the following:  
4-6 AWG: 35in-lbs  
8 AWG: 25 in-lbs  
10-14 AWG: 20 in-lbs

**ILSCO LAY-IN LUG CONDUCTOR - UNIRAC P/N 008009P:** Alternate Grounding Lug - Drill, deburr hole and bolt thru both rail walls per table.

**TORQUE VALUE 5 ft lbs. (See Note on PG. A)**

See ILSCO product data sheet for more details, Model No. GBL-4DBT.

**NOTE: ISOLATE COPPER FROM ALUMINUM CONTACT TO PREVENT CORROSION**

GROUNDING LUG - BOLT SIZE & DRILL SIZE		
GROUND LUG	BOLT SIZE	DRILL SIZE
WEEBLug	1/4"	N/A - Place in Top SM Rail Slot
IISCO Lug	#10-32	7/32"

- Torque value depends on conductor size.
- See product data sheet for torque value.

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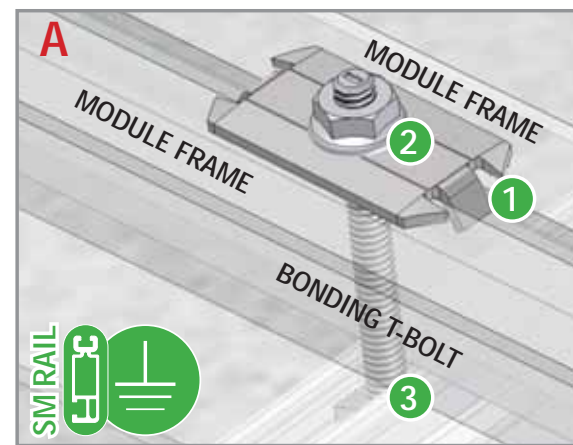
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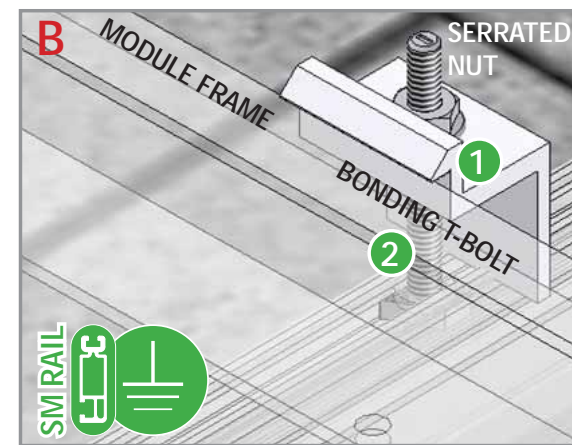
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### BONDING MIDCLAMP ASSEMBLY

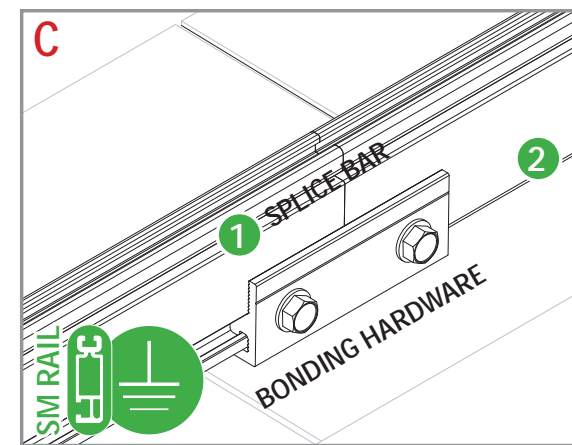
- 1 Stainless steel Midclamp points, 2 per module, pierce module frame anodization to bond module to module through clamp.
- 2 Serrated flange nut bonds stainless steel clamp to stainless steel T-bolt
- 3 Serrated T-bolt head penetrates rail anodization to bond T-bolt, nut, clamp, and modules to grounded SM rail.



### ENDCLAMP ASSEMBLY

- 1 Serrated flange nut bonds aluminum Endclamp to stainless steel T-bolt
- 2 Serrated T-bolt head penetrates rail anodization to bond T-bolt, nut, and Endclamp to grounded SM rail

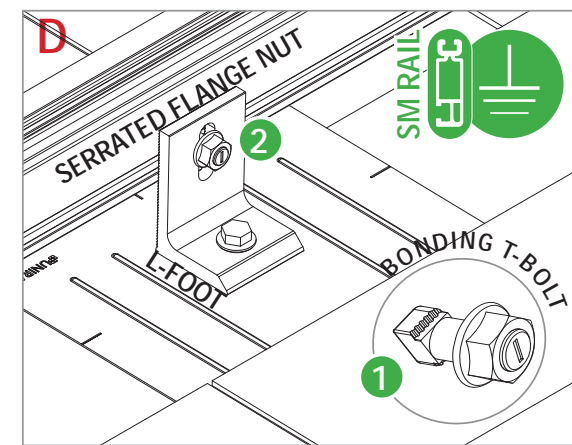
Note: End clamp does not bond to module frame.



### BONDING RAIL SPLICE BAR

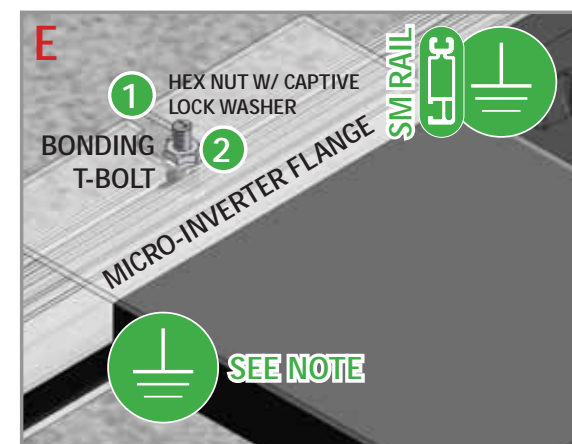
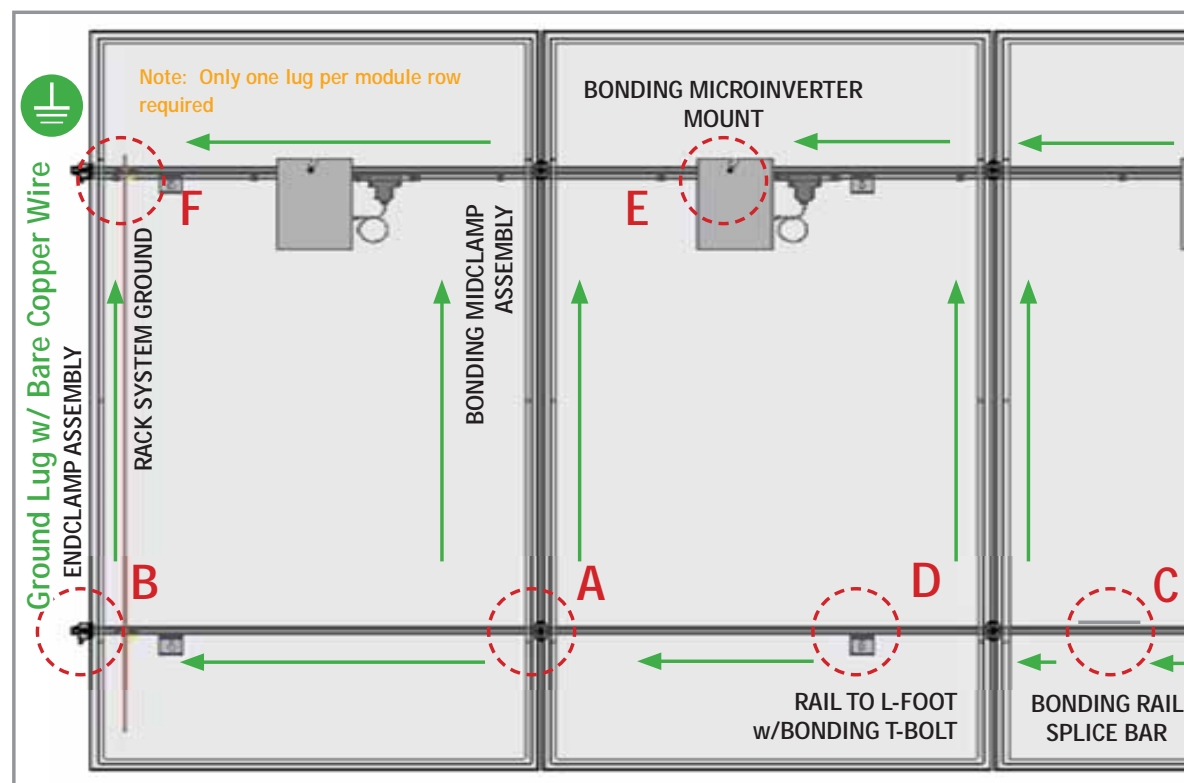
- 1 Bonding Hardware creates bond between splice bar and each rail section
- 2 Aluminum splice bar spans across rail gap to create rail to rail bond. Rail on at least one side of splice will be grounded.

Note: Splice bar and bolted connection are non-structural. The splice bar function is rail alignment and bonding.



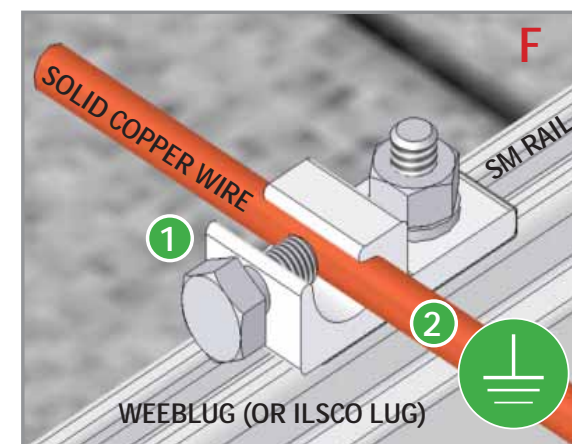
### RAIL TO L-FOOT w/BONDING T-BOLT

- 1 Serrated flange nut removes L-foot anodization to bond L-Foot to stainless steel T-bolt
- 2 Serrated T-bolt head penetrates rail anodization to bond T-bolt, nut, and L-foot to grounded SM rail



### BONDING MICROINVERTER MOUNT

- 1 Hex nut with captive lock washer bonds metal microinverter flange to stainless steel T-bolt
  - 2 Serrated T-bolt head penetrates rail anodization to bond T-bolt, nut, and L-foot to grounded SM rail
- System ground including racking and modules may be achieved through the trunk cable of approved microinverter systems. See page J for details



### RACK SYSTEM GROUND

- 1 Weeb washer dimples pierce anodized rail to create bond between rail and lug
- 2 Solid copper wire connected to lug is routed to provide final system ground connection.

NOTE: IlSCO lug can also be used when secured to the side of the rail. See page K for details

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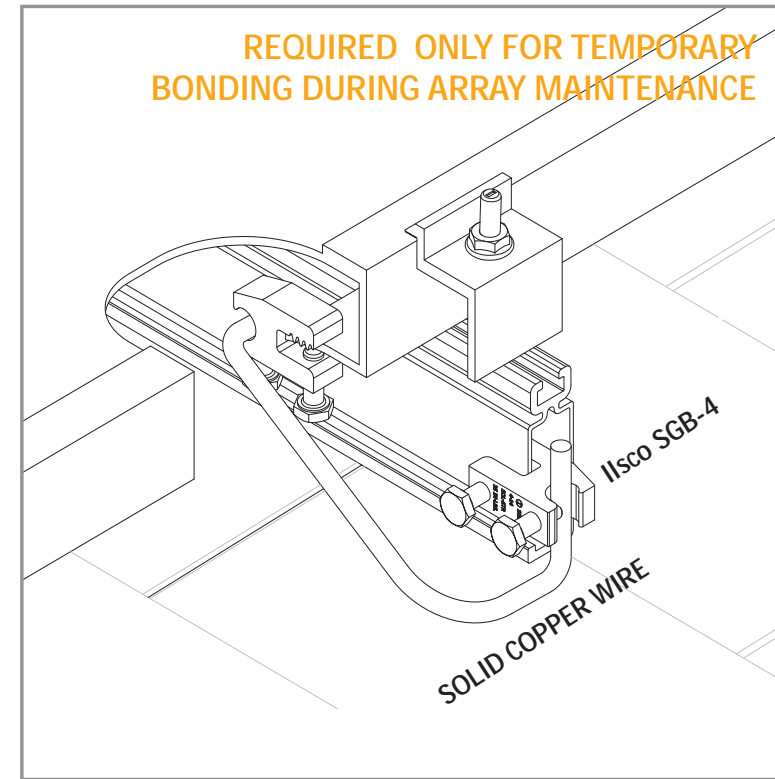
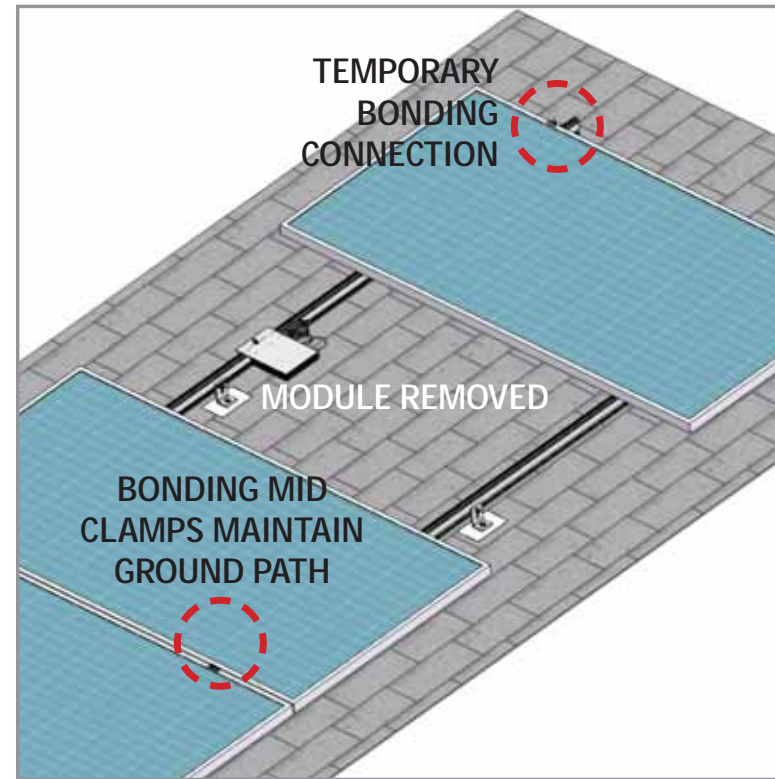
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### TEMPORARY BONDING CONNECTION DURING ARRAY MAINTENANCE

When removing modules for replacement or system maintenance, any module left in place that is secured with a bonding Midclamp will be properly grounded. If a module adjacent to the end module of a row is removed or if any other maintenance condition leaves a module without a bonding mid clamp, a temporary bonding connection must be installed as shown

- Attach IIsco SGB4 to wall of rail
- Attach IIsco SGB4 to module frame
- Install solid copper wire jumper to IIsco lugs

### ELECTRICAL CONSIDERATIONS

SOLARMOUNT is intended to be used with PV modules that have a system voltage less than or equal to that allowable by the NEC. For standard system grounding a minimum 10AWG, 105°C copper grounding conductor should be used to ground a 1000 VDC system, according to the National Electric Code (NEC). It is the installer's responsibility to check local codes, which may vary. See below for interconnection information.

### INTERCONNECTION INFORMATION

There is no size limit on how many SOLARMOUNT & PV modules can be mechanically interconnected for any given configuration, provided that the installation meets the requirements of applicable building and fire codes.

### GROUNDING NOTES

The installation must be conducted in accordance with the National Electric Code (NEC) and the authority having jurisdiction. Please refer to these resources in your location for required grounding lug quantities specific to your project.

The grounding / bonding components may overhang parts of the array so care must be made when walking around the array to avoid damage.

Conductor fastener torque values depend on conductor size. See product data sheets for correct torque values.

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#PV-011719-015866

CONTRACTOR:  
BRS FIELD OPS  
385-498-6700

### Electrical Bonding and Grounding Test Modules

The list below is not exhaustive of compliant modules but shows those that have been evaluated and found to be electrically compatible with the SOLARMOUNT system.

Manufacture	Module Model / Series
Aionrise	AION60G1, AION72G1
Aleo	P-Series & S-Series
Aptos Solar	DNA-120-MF10 DNA-120-(MF/BF)23 DNA-144-(MF/BF)23 DNA-120-(MF/BF)26 DNA-144-(MF/BF)26
Astronergy	CHSM6612 M, M/HV CHSM6612P Series CHSM6612P/HV Series CHSM72M-HC CHSM72M(DG)/F-BH
Auxin	AXN6M610T AXN6P610T AXN6M612T AXN6P612T
Axitec	AC-xxx(M/P)/60S, AC-xxx(M/P)/72S AC-xxxP/156-60S AC-xxxMH/120(S/V/SB/VB) AC-xxxMH/144(S/V/SB/VB)
Boviet	BVM6610, BVM6612
BYD	P6K & MHK-36 Series
Canadian Solar	CS1(H/K/U/Y)-MS CS3K-(MB/MB-AG/MS/P/P HE/PB-AG) CS3L-(MS/P) CS3N-MS CS3U-(MB/MB-AG/MS/P/P HE/PB/PB-AG) CS3W-(MS/MB-AG/P/P-PB-AG) CS3Y-MB-AG

Manufacture	Module Model / Series
Canadian Solar (cont.)	CS5A-M CS6K-(M/MS/MS AIBlack/P/P HE) CS6P-(M/P) CS6R-MS CS6U-(M/P/P HE) CS6W-(MS/MB-AG) CS6X-P, CSX-P ELPS CS6(A/P)-MM
Centrosolar America	C-Series & E-Series
CertainTeed	CT2xxMxx-01, CT2xxPxx-01, CTxxxMxx-01 CTxxxPxx-01, CTxxxMxx-02, CTxxxMxx-03 CTxxxMxx-04, CTxxxHC11-04
Eco Solargy	Orion 1000 & Apollo 1000
ET Solar	ET AC Module, ET Module ET-M772BH520-550WW/WB
First Solar	FS-6XXX(A) FS-6XXX(A)-P, FS-6XXX(A)-P-I
Flextronics	FXS-xxxBB
FreeVolt	PVGraf
GCL	GCL-P6 & GCL-M6 Series
Hanwha SolarOne	HSL 60
Hansol	TD-AN3, TD-AN4 UB-AN1, UD-AN1
Heliene	36M, 36P 60M, 60P, 72M & 72P Series 144HC M6

Manufacture	Module Model / Series
HT-SAAE	HT60-156M-C HT60-156M(V)-C HT72-156(M/P) HT72-156P-C, HT72-156P(V)-C HT72-156M(PDV)-BF, HT72-156M(PD)-BF HT72-166M, HT72-18X
Hyundai	KG, MG, RW, TG, RI, RG, TI, KI, HI Series HiA-SxxxHG, HiD-SxxxRG(BK), HiS-S400PI
ITEK	iT-SE Series
Japan Solar	JPS-60 & JPS-72 Series
JA Solar	JAM72D30MB, JAM78D10MB JAM72S30 /MR JAP6 60-xxx JAM6(K)-60/xxx, JAP6(k)-72-xxx/4BB JAP72S##-xxx/** JAP6(k)-60-xxx/4BB, JAP60S##-xxx/** JAM6(k)-72-xxx/**, JAM72S##-xxx/** JAM6(k)-60-xxx/**, JAM60S##-xxx/** i. ##: 01, 02, 03, 09, 10 ii. **: SC, PR, BP, HiT, IB, MW, MR ** = Backsheet, ## Cell technology
Jinko	JKM & JKMS Series JKMxxxM-72HL-V JKMxxxM-72HL4-(T)V JKMxxxM-72HLM-TV JKMxxxM-7RL3-V
Kyocera	KD-F & KU Series
LA Solar	LSxxxHC(166)

- 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
- The frame profile must not have any feature that might interfere with the bonding devices that are integrated into the racking system
- Use with a maximum over current protection device OCPD of 30A
- **Listed models can be used to achieve a Class A fire system rating for steep slope applications. See Appendix A, page A**

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### Electrical Bonding and Grounding Test Modules

The list below is not exhaustive of compliant modules but shows those that have been evaluated and found to be electrically compatible with the SOLARMOUNT system.

Manufacture	Module Model / Series	Manufacture	Module Model / Series	Manufacture	Module Model / Series
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 LGxxxN2W-B3 LGxxxN2T-B5 LGxxxN1K-B6 LGxxx(N1C/N1K/N2T/N2W)-E6 LGxxx(N1C/N1K/N2W/S1C/S2W)-G4 LGxxxN2T-J5 LGxxx(N1K/N1W/N2T/N2W)-L5 LGxxx(M1C/N1C/Q1C/Q1K)-N5 LGxxx(N1C/N1K/N2W/Q1C/Q1K)-V5 LGxxxN3K-V6	Panasonic	VBHNxxxSA06/SA06B/SA11/SA11B VBHNxxxSA15/SA15B/SA16/SA16B, VBHNxxxKA, VBHNxxxKA03/04, VBHNxxxSA17/SA17G/SA17E/SA18/SA18E, VBHNxxxZA01/ZA02/ZA03/VBHNxxxZA04 EVPVxxx EVPVxxx(H/K/PK)	Q.Cells (cont.)	Q.PEAK DUO L-G8.3 (BFF/BFG/BGT) Q.PEAK DUO (BLK) ML-G9(+) Q.PEAK DUO XL-(G9/G9.2/G9.3) Q.PEAK DUO XL-G9.3/BFG Q.PEAK DUO-G10+ Q.PEAK DUO BLK G10(+) Q.PEAK DUO BLK G10+ /AC Q.PEAK DUO (BLK) ML-G10(a(+)) Q.PEAK DUO XL-(G10/G10.2/G10.3/G10.c/G10.d) Q.PEAK DUO XL-G10.3/BFG Q.PEAK DUO XL-G10.d/BFG Q.PEAK DUO XL-(G11.2/G11.3) Q.PEAK DUO XL-G11.3/BFG
LONGi	LR4-60(HPB/HPH) LR4-72(HPH) LR6-60 LR6-60(BK/HPB/HPH/HV/PB/PE/PH) LR6-72 LR6-72(BK/HV/PB/PE/PH) RealBlack LR4-60HPB RealBlack LR6-60HPB	Phono Solar	PSxxxM1-20/U PSxxxM1H-20/U PSxxxM1-20UH PSxxxM1H-20UH	REC	RECxxxAA (BLK/Pure) RECxxxNP (N-PEAK) RECxxxNP2 (Black) RECxxxPE, RECxxxPE72 RECxxxTP, RECxxxTP72 RECxxxTP2(M/BLK2) RECxxxTP2S(M)72 RECxxxTP3M (Black) RECxxxTP4 (Black)
Meyer Burger	Meyer Burger Black, Meyer Burger White	Phono Solar (cont.)	PSxxxM1-20/UH PSxxxM1H-20/UH PSxxxM-24/T PSxxxMH-24/T PSxxxM-24/TH PSxxxMH-24/TH	Renosola	All 60-cell modules
Mission Solar Energy	MSE Mono, MSE Perc MSExxx(SR8T/SR8K/SR9S/SX5T) MSExxx(SX5K/SX6W)	Prism Solar	P72 Series	Risen	RSM Series, RSM110-8-xxxBMDG
Mitsubishi	MJE & MLE Series	Q.Cells	Plus, Pro, Peak, G3, G4, Peak G5(SC) , G6(+)(SC)(AC), G7, G8(+), Plus, Pro, Peak L-G2, L-G4, L-G5 Peak L-G5, L-G6, L-G7, L-G8(BFF) Q.PEAK DUO( BLK)-G6+ Q.PEAK DUO BLK-G6+/TS Q.PEAK DUO (BLK)-G7 Q.PEAK DUO L-(G7/G7.1/G7.2/G7.3/G7.7) Q.PEAK DUO (BLK) G8(+) Q.PEAK DUO L-(G8/G8.1/G8.2/G8.3)	S-Energy	SN72 & SN60 Series
NE Solar	NESE xxx-72MHB-M10			SEG Solar	SEG-xxx-BMD-HV
Neo Solar Power Co.	D6M Series				

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- 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
- The frame profile must not have any feature that might interfere with the bonding devices that are integrated into the racking system
- Use with a maximum over current protection device OCPD of 30A
- **Listed models can be used to achieve a Class A fire system rating for steep slope applications. See Appendix A, page A**

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Seraphim	SEG-(6PA/6PB/6MA/6MA-HV/6MB/E01/E11) SRP-(6QA/6QB) SRP-xxx-6MB-HV, SRP-320-375-BMB-HV, SRP-xxx-BMC-HV, SRP-390-450-BMA-HV, SRP-xxx-BMZ-HV, SRP-390-405-BMD-HV
Sharp	NU-SA & NU-SC Series
Silfab	SLA-M, SLA-P, SLG-M, SLG-P & BC Series SILxxx(BK/BL/HC/HL/HN/ML/NL/NT/NX/NU)
SolarEver USA	SE-166*83-xxxM-120N
Solaria	PowerXT-xxxR-(AC/PD/BD) PowerXT-xxxC-PD PowerXT-xxxR-PM (AC)
Solartech	STU HJT, STU PERC & Quantum PERC
SolarWorld	Sunmodule Protect, Sunmodule Plus/Pro
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
Suniva	MV Series & Optimus Series (35mm)
SunPower	AC, X-Series, E-Series & P-Series SPR E20 435 COM (G4 Frame) Axxx-BLK-G-AC, SPR-Mxxx-H-AC SPR-Mxxx-H-AC
SunTech	STP, STPXXXS - B60/Wnhb
Sun Edison	F-Series, R-Series

Manufacture	Module Model / Series
Talesun	TP572, TP596, TP654, TP660 TP672, Hipor M, Smart
Tesla	SC, SC B, SC B1, SC B2, TxxxS, TxxxH
Waaree	Ahnay Series Bi-33
Trina	PA05, PD05, DD05, DD06, DE06, DE09.05 PD14, PE14, DD14, DE14, DE15, DE15V(II) DEG15HC.20(II), DEG15MC.20(II) DEG15VC.20(II), DE18M(II), DEG18MC.20(II) DE19, DEG19C.20
TSMC	TS-150C2 CIGSw
Upsolar	UP-MxxxP, UP-MxxxM(-B)
URECO	D7Kxxx(H7A/H8A), D7Mxxx(H7A/H8A) FAKxxx(C8G/E8G), FAMxxxE7G-BB FAMxxxE8G(-BB), FBKxxxM8G
Vikram	Eldora, Somera, Ultima PREXOS VSMDHT.60.AAA.05 PREXOS VSMDHT.72.AAA.05
VSUN	VSUNxxx-60M-BB, VSUNxxx-72MH VSUN4xx-144BMH
Vina	VNS-72M1-5-xxxW-1.5, VNS-72M3-5-xxxW-1.5, VNS-144M1-5-xxxW-1.5, VNS-144M3-5-xxxW-1.5, VNS-120M3-5-xxxW-1.0
Winaico	WST & WSP Series
Yingli	YGE & YLM Series

Manufacture	Module Model / Series
ZNShine Solar	ZXM6-72 Series, ZXM6-NH144 ZXM6-NHLDD144

- 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
- The frame profile must not have any feature that might interfere with the bonding devices that are integrated into the racking system
- Use with a maximum over current protection device OCPD of 30A
- **Listed models can be used to achieve a Class A fire system rating for steep slope applications. See Appendix A, page A**

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## Descriptive Report and Test Results

**MASTER CONTRACT:** 266909  
**REPORT:** 70131735  
**PROJECT:** 80136577

**MASTER CONTRACT:** 266909  
**REPORT:** 70131735  
**PROJECT:** 80136577

**Page No:** 2  
**Date Issued:** August 12, 2022

Models:	SM	-	<b>SOLARMOUNT</b> Flush-to-Roof is an extruded aluminum rail PV racking system that is installed parallel to the roof in landscape or portrait orientations.
	ULA	-	Unirac Large Array is a ground mount system using the SolarMount (SM) platform for the bonding and grounding of PV modules.

### Solarmount

The system listed is designed to provide bonding/grounding, and mechanical stability for photovoltaic modules. The system is secured to the roof with the L-Foot components through the roofing material to building structure. Modules are secured to the racking system with stainless steel or aluminum mid clamps and Aluminum end clamps. The modules are bonded to the racking system with the stainless-steel bonding mid clamps with piercing points. The system is grounded with 10 AWG copper wire to bonding/grounding lugs. Fire ratings of Class A with Type 1, 2, 3 (with metallic frame), 4 (with trim), 5 (with trim), 10(with metallic frame), 19, 22, 25, 29, or 30 for steep slope. Tested at 5" interstitial gap which allows installation at any stand-off height.

The grounding of the system is intended to comply with the latest edition of the National Electrical Code, to include NEC 250 & 690. Local codes compliance is required, in addition to national codes. All grounding/bonding connections are to be torqued in accordance with the Installation Manual and the settings used during the certification testing for the current edition of the project report.

The system may employ optimizers/micro-inverters and used for grounding when installed per installation instructions.

### UL 2703 Mechanical Load ratings:

Module Area up to 22.2 sq ft	
Downward Design Load (lb/ft <sup>2</sup> )	113.5
Upward Design Load (lb/ft <sup>2</sup> )	50.7
Down-Slope Load (lb/ft <sup>2</sup> )	16.13

Module Area up to 27.12 sq ft	
Downward Design Load (lb/ft <sup>2</sup> )	33.9
Upward Design Load (lb/ft <sup>2</sup> )	33.9
Down-Slope Load (lb/ft <sup>2</sup> )	16.5

### Test Loads:

Module Area up to 22.2 sq ft	
Downward Load (lb/ft <sup>2</sup> )	170.20
Upward Load (lb/ft <sup>2</sup> )	76.07
Down-Slope Load (lb/ft <sup>2</sup> )	24.2

Module Area up to 27.12 sq ft	
Downward Design Load (lb/ft <sup>2</sup> )	50.85
Upward Design Load (lb/ft <sup>2</sup> )	50.85
Down-Slope Load (lb/ft <sup>2</sup> )	24.75

**Edition 1:** September 20, 2017; Project 70131735 - Irvine  
Prepared By: Michael Hoffnagle  
Authorized By: Michael Hoffnagle

**Edition 19:** July 29, 2022; Project 80129816 - Irvine  
Prepared By: Michael Hoffnagle  
Authorized By: Michael Hoffnagle

**Edition 20:** August 12, 2022; Project 80136577 - Irvine  
Prepared By: Michael Hoffnagle  
Authorized By: Michael Hoffnagle

Report pages reissued

Contents: Certificate of Compliance - Pages 1 to 6  
Supplement to Certificate of Compliance - Pages 1 to 3  
Description and Tests - Pages 1 to 27  
Att1 Installation Manual SM- Pages 1 to 38  
Att2 Schematics SM/ULA- Pages 1 to 72  
Att3 Installation Manual ULA- Pages 1 to 22  
Att4 RM5\_Installation Guide - 1 to 19  
Att5 RMDT\_Installation Guide - 1 to 20  
Att6 RM series schematics - 1 to 32  
Att7 Installation Manual, GFT Shared Rail - Pages 1 to 41  
Att8 Installation Manual, GFT 4-Rail - Pages 1 to 40  
Att9 GFT Schematics - Pages 1 to 45  
Att10 NXT Horizon Installation Manual - Pages 1 to 23  
Att11 Schematics NXT Horizon - Pages 1 to 27

### PRODUCTS

CLASS - C531302 - POWER SUPPLIES - PHOTOVOLTAICS-PV Racking and clamping systems  
CLASS - C531382 - POWER SUPPLIES - PHOTOVOLTAICS-PV Racking and clamping systems -  
Certified to US Standards

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PV INSTALLATION  
PROFESSIONAL

Scott Gurney  
#PV-011719-015866

**CONTRACTOR:**  
BRS FIELD OPS  
385-498-6700

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**SM and ULA markings**

The following markings appear on the rail by adhesive label:

1. Submitter's name and/or CSA Master Contract number "266909";
2. Model designation;
3. Manufacturing date;
4. System fire class rating/designation of information location in Installation Manual;
5. Design load rating/designation of information location in Installation Manual;

The following markings appear on the Mid clamp by stamping:

1. Submitter's name and/or CSA Master Contract number "266909";
2. CSA mark
3. Mil ID for factory location

**Nameplate adhesive label material approval information:**

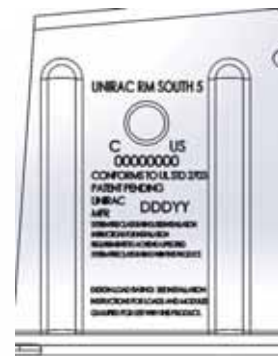
SATO AMERICA INC, SF401 DuraMark Polyester, MH48415 - Printing Materials – Component, UL 969-Marking and Labeling Systems

**RM 5 South and RM DT markings**

The following markings appear on the ballast bay by permanent stamping:

1. Submitter's name and/or CSA Master Contract number "266909";
2. Model designation;
3. Manufacturing date;
4. System fire class rating/designation of information location in Installation Manual;
5. Design load rating/designation of information location in Installation Manual;

UNIRAC RM SOUTH 5  
 CONFORMS TO UL STD 2703  
 PATENT PENDING  
 UNIRAC MFR DDDYY



SYSTEM FIRE CLASS RATING: SEE INSTALLATION INSTRUCTIONS FOR INSTALLATION REQUIREMENTS TO ACHIEVE A SPECIFIED SYSTEM FIRE CLASS RATING WITH THIS PRODUCT.  
 DESIGN LOAD RATING: SEE INSTALLATION INSTRUCTIONS FOR LOADS AND MODULES QUALIFIED FOR USE WITH THIS PRODUCT.

**Nameplate adhesive label material approval information:**

Markings applied via permanent stamping to bay.

1. The system does not employ a maximum number of modules that can be installed per system.
2. Module Orientation:
  - a. SM & ULA - Portrait or Landscape
  - b. RM5 & DT – Landscape
  - c. GFT – Portrait
  - d. NXT Horizon - Portrait or Landscape
3. The system was evaluated for use with modules up to:
  - a. SM & ULA – 27.12 sq ft
  - b. RM5 & DT – 27.76 sq ft
  - c. GFT - Portrait - 27.12 sq ft
  - d. NXT Horizon – 27.76 sq ft
4. See Table 1 for customer supplied information for SM
5. See Table 2 for customer supplied information for ULA
6. See Table 3 for customer supplied information for RM
7. See Table 4 for customer supplied information for GFT
8. See Table 5 for customer supplied information for NXT Horizon
9. See the attached installation manual for each model installation instructions, and system drawings.

The critical components identified below may be formed at other locations and shipped directly to the construction site provided they are made with the material/coatings identified and conform to the physical dimensions described and shown in their respective illustrations. Physical specimens may not be present at the location where the CSA mark is applied. Location of markings can be found in the Marking section of this report.

Table 1

MODULE RACKING SYSTEM TYPE/S	
Model	SM
Module Fire Type .....	Class A with Type 1, 2, 3 (with metallic frame), 4 (with trim), 5 (with trim), 10 (with metallic frame), 19, 22, 25, 29, or 30 for steep slope. Tested at 5” interstitial gap, the rating obtained for a 5-inch (127 mm) gap can be used for any other gaps allowed by the mounting instructions, per section 15 of UL 2703
Max branch circuit overcurrent-protection device (A)	30
IDENTIFICATION OF COMPONENTS AND MATERIALS	
End Clamp .....	M101XX Rev. H Extruded Aluminum : 6005A-T61, 6351-T5, 6061-T6, 6005-T5, 6105-T5
End Clamp Assembly .....	M500XX Rev. C, (M50060 – M50071) Extruded Aluminum : 6005A-T61, 6351-T5, 6061-T6, 6005-T5, 6105-T5
Bonding Mid Clamp .....	M6065X, Rev A and M6065X, Rev F 300 Series Stainless Steel



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Mid-Clamp Assembly.....	M500XX Rev. E, (M50077 –M50082) Extruded Aluminum: 6005A-T61, 6351-T5, 6061-T6, 6005-T5, 6105-T5																								
End-Clamp Assembly.....	M60630 Rev. F Extruded Aluminum per ASTM B221-08: 6005A-T61, 6061-T6 and 18-8 Stainless Steel or 316 Stainless Steel																								
Mid-Clamp Assembly.....	M60640 Rev. B – Mill finish or SKU 302030M M60645 Rev. B – Anodized finish or SKU 302030D Extruded Aluminum per ASTM B221-08: 6005A-T6, 6061-T6, or 6351-T5 and 300 Series Stainless Steel and 316 Stainless Steel																								
End-Clamp Assembly.....	P30602125 Rev. D, Rev. E  Extruded Aluminum per ASTM B221-08: 6005A-T61 or 6061-T6, 6063-T6 and 300 Series Stainless Steel.																								
Mid-Clamp Assembly.....	P30601225 Rev. C, Rev. D  Extruded Aluminum per ASTM B221-08: 6063-T6 and 300 Series Stainless Steel.																								
T-Bolt Serrated .....	M3020X Rev. A, Rev. D, Rev. D3, Rev. E 300 Series Stainless Steel																								
T-Bolt Non-Serrated.....	M3018X, Rev. G 300 Series Stainless Steel Suitable for use ONLY on mil-finish rails, such as: <ul style="list-style-type: none"> <li>• M10001 (SM1 rail, item 008A)</li> <li>• M10154-1 (SM2 rail, item 008B)</li> </ul>																								
SM Rail.....	M10001, Rev D Extruded Aluminum: 6005A-T61, 6351-T5, 6061-T6, 6005-T5, 6105-T5; Mil-Finish																								
SM Rail.....	M10154, Rev D Extruded Aluminum: 6005A-T61, 6351-T5, 6061-T6, 6005-T5, 6105-T5; Finish per table: -1 = Mil; as fabricated M12 -2 = Clear; Anodize Type II A-21 clear -3 = Black, Anodize Type II A-24 black																								
SM Heavy Duty Rail .....	M10XXX, Rev D Extruded Aluminum per ASTM B221-08: 6005A-T61, 6351-T5, 6061-T6, 6005-T5 and 6105-T5; Finish per table: <table border="1"> <thead> <tr> <th colspan="3">PART TABLE</th> </tr> <tr> <th>Part Number</th> <th>LENGTH</th> <th>FINISH</th> </tr> </thead> <tbody> <tr> <td>M10098</td> <td>144 in</td> <td>AA-M12</td> </tr> <tr> <td>M10099</td> <td>168 in</td> <td>AA-M12</td> </tr> <tr> <td>M10100</td> <td>204 in</td> <td>AA-M12</td> </tr> <tr> <td>M10106</td> <td>240 in</td> <td>AA-M12</td> </tr> <tr> <td>M10011</td> <td>360 in</td> <td>AA-M12</td> </tr> <tr> <td>M10015</td> <td>336 in</td> <td>MINIMUM AA-M12C22A21</td> </tr> </tbody> </table>	PART TABLE			Part Number	LENGTH	FINISH	M10098	144 in	AA-M12	M10099	168 in	AA-M12	M10100	204 in	AA-M12	M10106	240 in	AA-M12	M10011	360 in	AA-M12	M10015	336 in	MINIMUM AA-M12C22A21
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M10015	336 in	MINIMUM AA-M12C22A21																							

SM Light Rail.....	M101XX, Rev A Extruded Aluminum per ASTM B221-08: 6005A-T61 and 6061-T6; Finish per table: <table border="1"> <thead> <tr> <th colspan="6">PART TABLE</th> </tr> <tr> <th>PART NUMBER</th> <th>LEN</th> <th>LENGTH #-125</th> <th>WIDTH</th> <th>HEIGHT</th> <th>FINISH</th> </tr> </thead> <tbody> <tr> <td>M10101</td> <td>6.50</td> <td>108 in</td> <td>7.75</td> <td>1.250</td> <td>AAMA M12 AS FABRICATED</td> </tr> <tr> <td>M10102</td> <td>6.50</td> <td>108 in</td> <td>7.75</td> <td>1.250</td> <td>AAMA M12C22A21 BLACK 0.1 MIL MIN</td> </tr> <tr> <td>M10103</td> <td>6.50</td> <td>144 in</td> <td>7.75</td> <td>1.250</td> <td>AAMA M12 AS FABRICATED</td> </tr> <tr> <td>M10104</td> <td>6.50</td> <td>144 in</td> <td>7.75</td> <td>1.250</td> <td>AAMA M12C22A21 BLACK 0.1 MIL MIN</td> </tr> </tbody> </table>	PART TABLE						PART NUMBER	LEN	LENGTH #-125	WIDTH	HEIGHT	FINISH	M10101	6.50	108 in	7.75	1.250	AAMA M12 AS FABRICATED	M10102	6.50	108 in	7.75	1.250	AAMA M12C22A21 BLACK 0.1 MIL MIN	M10103	6.50	144 in	7.75	1.250	AAMA M12 AS FABRICATED	M10104	6.50	144 in	7.75	1.250	AAMA M12C22A21 BLACK 0.1 MIL MIN
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M10104	6.50	144 in	7.75	1.250	AAMA M12C22A21 BLACK 0.1 MIL MIN																																
Splice Bar, 4".....	M103XX, Rev. B Extruded Aluminum : 6005A-T61, 6351-T5, 6061-T6, 6005-T5, 6105-T5																																				
BND Splice Bar Pro Series SM.....	P28205001, Rev. B Material is extruded aluminum per ASTM B221-08:6005A-T61, 6351-T5, 6061-T6, 6005-T5 and 6105-T5; Finish per table: <table border="1"> <thead> <tr> <th colspan="6">ASSEMBLY TABLE</th> </tr> <tr> <th>FINISH</th> <th>SKU #</th> <th>ASSY NUMBER</th> <th>ITEM 1 - SPLICE</th> <th>ITEM 2 - SCREW</th> <th>WEIGHT</th> </tr> </thead> <tbody> <tr> <td>MILL</td> <td>30319M</td> <td>P28205005M</td> <td>P28205001M</td> <td>M30009</td> <td>.223 LB</td> </tr> <tr> <td>DARK</td> <td>30319D</td> <td>P28205005D</td> <td>P28205001D</td> <td>M30010</td> <td>.223 LB</td> </tr> </tbody> </table>	ASSEMBLY TABLE						FINISH	SKU #	ASSY NUMBER	ITEM 1 - SPLICE	ITEM 2 - SCREW	WEIGHT	MILL	30319M	P28205005M	P28205001M	M30009	.223 LB	DARK	30319D	P28205005D	P28205001D	M30010	.223 LB												
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DARK	30319D	P28205005D	P28205001D	M30010	.223 LB																																
Serrated L-Foot.....	M10175, Rev G Extruded Aluminum : 6005A-T61, 6351-T5, 6061-T6  P28405002-002, Rev. C Finish per table: <table border="1"> <thead> <tr> <th colspan="4">PART TABLE</th> </tr> <tr> <th>Part Number</th> <th>LENGTH</th> <th>FINISH</th> <th>WEIGHT</th> </tr> </thead> <tbody> <tr> <td>P28405002-002M</td> <td>2.000 in</td> <td>AA M12 AS FABRICATED</td> <td>.215 LB</td> </tr> <tr> <td>P28405002-002D</td> <td>2.000 in</td> <td>AA M12C22A21 BLACK 0.1 MIL MIN</td> <td>.215 LB</td> </tr> <tr> <td>P28405002-002C</td> <td>2.000 in</td> <td>MAKE FROM P28405002-288D, REV-A; ANODIZE NOT REQUIRED ON FABRICATION EDGES</td> <td>.215 LB</td> </tr> </tbody> </table>	PART TABLE				Part Number	LENGTH	FINISH	WEIGHT	P28405002-002M	2.000 in	AA M12 AS FABRICATED	.215 LB	P28405002-002D	2.000 in	AA M12C22A21 BLACK 0.1 MIL MIN	.215 LB	P28405002-002C	2.000 in	MAKE FROM P28405002-288D, REV-A; ANODIZE NOT REQUIRED ON FABRICATION EDGES	.215 LB																
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	EcoFasten Solar 004050X Aluminum: 6000 Series, Finish: X= M – Mill Finish Aluminum D – Anodize Black Type 2, Class 2 per AAMA 611-12																																				
	P28503006, Rev. E COMP ASSEMBLY FLASHLOC Cast Aluminum, A380 Mill or Black finish, see drawings																																				
	P28503025, Rev. B ASSEMBLY FLASHLOC DTD Cast Aluminum, A380 Mill or Black finish, see drawings																																				



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Serrated nut.....	EcoFasten Solar, N-FL 375-16X335 UNI 18-8 Stainless Steel or 304 Stainless Steel										
Nut, Flange Serrated.....	M30211 Stainless Steel, Black Oxide										
Nut, Flange Serrated.....	M30380 300 Series Stainless Steel										
T-bolt, Serrated.....	M31156 300 Series Stainless Steel										
Washer, Flat, RET.....	M31160 PVC Plastic										
Washer NEOP.....	M31161 Neoprene										
Screw, Self Drill.....	M31162 300 Series Stainless Steel										
Nut, Keps 0.25.....	M31163 300 Series Stainless Steel										
Nylon-Insert Lock Nut, 0.25-20.....	M30360 316 Stainless Steel										
K-Lock Nut, 0.25-20.....	M31159 18-8 Stainless Steel										
Nut, Flange Serrated.....	M31184 300 Series Stainless Steel										
Tri Drive Nut serrated	M38018 18-8 Stainless Steel										
Micro-inverter T-Bolt.....	M50085 300 Series Stainless Steel										
MLPE Mount.....	M51538 Rev. C Extruded Aluminum with Stainless Steel Bond Pin & Serrated Flange Nut ETL file 5003705										
SM Trim.....	M110XX Rev. C Extruded Aluminum per ASTM B221-08: 6005A-T61, 6351-T5, 6061-T6, 6005-T5 and 6105-T5; Finish per table :										
	<table border="1"> <thead> <tr> <th colspan="2">PART TABLE</th> </tr> <tr> <th>PART NUMBER</th> <th>FINISH</th> </tr> </thead> <tbody> <tr> <td>M11029</td> <td>AA-M12C22A21 0.1 MIL MIN</td> </tr> <tr> <td>M11030</td> <td>AA-M12C22A24 BLACK 0.1 MIL MIN</td> </tr> <tr> <td>M11031</td> <td>AA-M12</td> </tr> </tbody> </table>	PART TABLE		PART NUMBER	FINISH	M11029	AA-M12C22A21 0.1 MIL MIN	M11030	AA-M12C22A24 BLACK 0.1 MIL MIN	M11031	AA-M12
PART TABLE											
PART NUMBER	FINISH										
M11029	AA-M12C22A21 0.1 MIL MIN										
M11030	AA-M12C22A24 BLACK 0.1 MIL MIN										
M11031	AA-M12										
Micro-Inverter.....	Enphase, M215, M250, IQ6 or IQ6+ Aluminum mounting bracket attached to electronics enclosure										

Optimizer.....	Solar Edge, P300, P320, P400, or P405, P600, P700, P730, P800p or P800s Aluminum mounting bracket attached to electronics enclosure.
N-S Clip.....	M60013 8AWG or Equivalent solid copper wire, 300 stainless steel spring force clips
Ground lug.....	Burndy WEEB-LUG-6.7 Tin Plated Copper, Stainless Steel Bonding Insert UL467 Listed Intertek 3098177
Ground lug.....	IlSCO Lay in Lug GBL-4DBT Tin-plated copper with stainless steel torque screw; Ground wire 4-14 AWG UL467 Listed UL File E34440
Ground lug.....	IlSCO SGB-4 lug 6061 Aluminum, Tin Plated UL467 Listed UL File E34440
Label.....	SATO AMERICA INC, SF401 DuraMark Polyester, MH48415 - Printing Materials – Component, UL 969- Marking and Labeling Systems
Installation Manual.....	2022JUL21 SM Installation Guide

Table 2

MODULE RACKING SYSTEM TYPE/S			
Model	ULA using SM Platform		
ULA Front Cap.....	M50400 (Assembly of Doghouse and Slider) 6105-T5 Aluminum		
ULA Rear Cap.....	M50420 (Assembly of Doghouse and Slider) 6105-T5 Aluminum		
ULA Aluminum 2 Inch Doghouse ...	M10920, Rev. C Material is extruded aluminum per ASTM B221-08:6005A-T61, 6351-T5, 6061-T6, 6005-T5 and 6105-T5;		

TABLE			
Part Number	LENGTH	LENGTH_TOL	3/8-16 HOLES
M40400	4.125 in	+/-0.063	YES
M10920	288	+/-0.125	NONE



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PV INSTALLATION  
 PROFESSIONAL  
 Scott Gurney  
 #PV-011719-015866

CONTRACTOR:  
 BRS FIELD OPS  
 385-498-6700

DRAWING BY:

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# S-5!<sup>®</sup>

## The Right Way!

NEW PRODUCT  
SolarFoot™

Introducing the new SolarFoot™ for exposed fastener metal roofing with the strength, testing, quality, and time-proven integrity you expect from S-5!. The SolarFoot provides an ideal mounting platform to attach the L-Foot (not included) of a rail-mounted PV system to the roof. This solution is The Right Way to secure rail-mounted solar systems to exposed fastener metal such as AG-Panel or R-Panel.

The right way to attach almost anything to metal roofs!



### SolarFoot Features:

Manufactured in the U.S.A. from certified raw material

Fabricated in our own ISO 9001:2015 certified factory

All aluminum and stainless components

25yr limited warranty

Compatible with all commercial L-Foot products on the market

Factory applied 40-year isobutylene/isoprene crosslink polymer sealant for reliable weathertightness

Sealant reservoir to prevent over-compression of sealant

Load-to-failure tested Normal to Seam by a nationally accredited laboratory on numerous metal roof materials and substrates

Four points of attachment into structure or deck with tested holding strength for engineered applications

Integrated M8-1.25x17mm stud and M8-1.25 stainless steel hex flange nut included



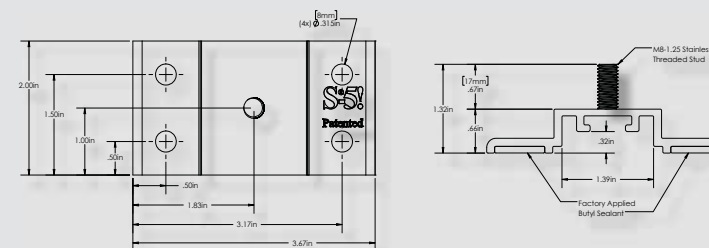
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S-5!<sup>®</sup>  
The Right Way!



## SolarFoot™ Mounting for Exposed Fastener Roofing

The SolarFoot is a simple, cost-effective pedestal for L-Foot (not included) attachment of rail-mounted solar PV. The unique design is compatible with all rail producer L-Foot components. The new SolarFoot assembly ensures a durable weathertight solution for the life of the roof. Special factory applied butyl co-polymeric sealant contained in a reservoir is The Right Way, allowing a water-tested seal. Stainless integrated stud and hex flange lock-nut secure the L-Foot into position. A low center of gravity reduces the moment arm commonly associated with L-Foot attachments. Direct attachment of the SolarFoot to the structural member or deck provides unparalleled holding strength.



\*Fasteners sold separately. Fastener type varies with substrate. Contact S-5! on how to purchase fasteners and obtain our test results. L-Foot also sold separately.

### Fastener Selection



**Metal to Metal:**  
1/4-14 Self Drilling Screw  
1-1/2" to 2-1/2"



**Metal to Wood:**  
1/4-14 Type 17 AB Milled Point  
1-1/2" to 2-1/2"

To source fasteners for your projects, contact S-5!

When other brands claim to be "just as good as S-5!", tell them to PROVE IT.

### SolarFoot Advantages:

Exposed fastener mounting platform for solar arrays attached via L-Foot and Rails

Weatherproof attachment to exposed fastener roofing

Butyl sealant reservoir provides long-term waterproof seal

M8-1.25x17mm stud with M8 hex flange nut for attachment of all popular L-Foot/rail combinations

Tool: 13 mm Hex Socket or 1/2" Hex Socket

Tool Required: Electric screw gun with hex drive socket for self-tapping screws.

Low Center of Gravity reduces moment arm commonly associated with L-Foot/Rail solar mounting scenarios

Attaches directly to structure or deck for optimal holding strength

S-5! Recommended substrate-specific (e.g. steel purlin, wood 2x4, OSB, etc.) fasteners provide excellent waterproofing and pull-out strength

Fastener through-hole locations comply with NDS (National Design Specification) for Wood Construction

### S-5!® Warning! Please use this product responsibly!

The independent lab test data found at www.S-5.com can be used for load-critical designs and applications.

Products are protected by multiple U.S. and foreign patents. For published data regarding holding strength, fastener torque, patents, and trademarks, visit the S-5! website at www.S-5.com. Copyright 2017, Metal Roof Innovations, Ltd. S-5! products are patent protected.

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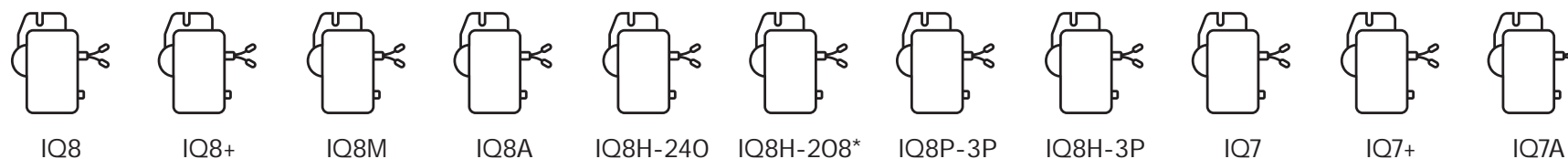
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Temperature range

RECORD LOW    RECORD HIGH  
-27            -    34            °C



\* IQ8H-208 support split phase, 208V only.

SEG-400-BMD-HV



✓ Compatible    (✗) Not compatible

Notice

Modules paired with Enphase microinverters with Integrated Ground must use PV Wire or PV Cable that is compliant with NEC 690.35(D) for Ungrounded PV Power Systems. When using this solar panel calculator, do not connect an Enphase microinverter to a module that the calculator indicates is incompatible. Doing so may void the warranty. This calculator only shows the compatibility of the modules with Enphase microinverters and doesn't provide any information on clipping that may occur due to sizing and other DC parameters of the PV module. Enphase IQ Series microinverters are compatible with bi-facial PV modules if the temperature adjusted electrical parameters (maximum power, voltage and current) of the modules, considering the electrical parameters including the Bifacial gain, are within the allowable microinverter input parameters range. In evaluating the amount of Bifaciality gain, follow the recommendations of the module manufacturers.

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