

# PHOTOVOLTAIC ROOF MOUNT SYSTEM

32 MODULES-ROOF MOUNTED - 11.68 kWDC, 9.28 kWAC  
1507 NW FRONTIER DR, LAKE CITY, FL 32055 USA



UNICITY SOLAR ENERGY  
LICENSE # EC13010036  
ADDRESS: 4612 FLORIDA AVE  
PALM HARBOR, FL 34683 USA  
PHONE: 727-945-6060

SYSTEM SUMMARY:

- (N) 32 - TRINA SOLAR TSM-DE06X.05(II) (365W) MODULES
- (N) 32 - ENPHASE IQ8PLUS-72-2-US MICRO-INVERTERS
- (N) JUNCTION BOX
- (E) 200A MAIN SERVICE PANEL WITH (E) 200A MAIN BREAKER
- (N) 60A FUSED AC DISCONNECT
- (N) ENPHASE IQ COMBINER BOX 4

DESIGN CRITERIA:

ROOF TYPE: - CORRUGATED METAL  
SEAM SPACING: - SEAMS @12" O.C.  
STORY: - ONE STORY  
SNOW LOAD : - 0 PSF  
WIND SPEED :- 117 MPH  
WIND EXPOSURE:- C  
RISK CATEGORY:- II

GOVERNING CODES:

- 2020 7TH EDITION FLORIDA BUILDING CODE : BUILDING
- 2020 7TH EDITION FLORIDA BUILDING CODE : RESIDENTIAL
- 2020 7TH EDITION FLORIDA BUILDING CODE : MECHANICAL
- 2020 7TH EDITION FLORIDA BUILDING CODE : PLUMBING
- 2020 7TH EDITION FLORIDA BUILDING CODE : FUEL GAS
- 2020 7TH EDITION FLORIDA BUILDING CODE : ENERGY CONSERVATION
- 2020 7TH EDITION FLORIDA BUILDING CODE : EXISTING BUILDING
- 2020 7TH EDITION FLORIDA BUILDING CODE : ACCESSIBILITY
- 2020 7TH EDITION FLORIDA FIRE PREVENTION CODE (NFPA)
- 2017 NATIONAL ELECTRIC CODE (NEC)

SHEET INDEX

- PV-0 COVER SHEET
- PV-1 SITE PLAN WITH ROOF PLAN
- PV-2 ROOF PLAN WITH MODULES
- PV-3 ROOF ZONING AND ATTACHMENT PLAN
- PV-3.1 ATTACHMENT DETAILS
- PV-4 ELECTRICAL LINE DIAGRAM & CALCULATION
- PV-4.1 EQUIPMENT PHOTOS
- PV-5 WARNING LABELS
- PV-6+ EQUIPMENT SPEC SHEETS

GENERAL NOTES:

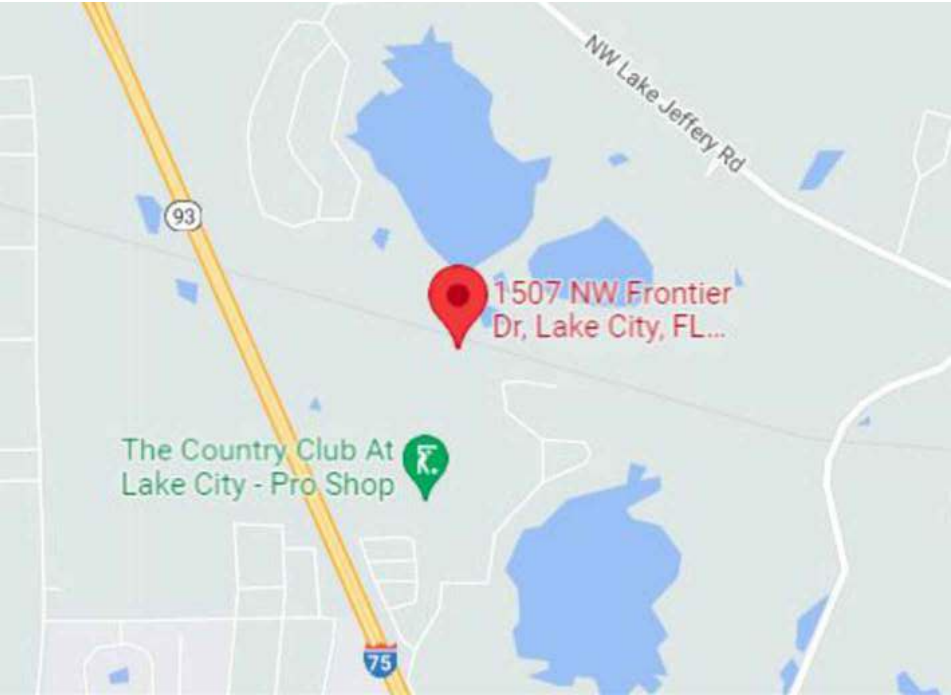
- APPLICABLE CODE: 2020 FLORIDA BUILDING CODE (7TH EDITION) & ASCE 7-16 MINIMUM DESIGN LOADS FOR BUILDING AND OTHER STRUCTURES.
- LAG SCREW DIAMETER AND EMBEDMENT LENGTHS ARE DESIGNED PER 2020 FLORIDA BUILDING CODE (7TH EDITION) REQUIREMENTS. ALL BOLT CAPACITIES ARE BASED ON SOUTHER YELLOW PINE (SYP) RESIDENTIAL WOOD ROOF RAFTERS AS EMBEDMENT MATERIAL.
- ALL WIND DESIGN CRITERIA AND PARAMETERS ARE FOR HIP AND GABLE RESIDENTIAL ROOFS, CONSIDERING FROM A 7° TO A MAXIMUM 23° (5/12 TO A MAXIMUM 7/12 PITCH) ROOF IN SCHEDULE. CONTRACTOR TO FIELD VERIFY THAT MEAN ROOF HEIGHT DOES NOT EXCEED 30'-0".
- ROOF SEALANTS SHALL CONFORM TO ASTM C920 AND ASTM 6511, AND IS THE RESPONSIBILITY OF THE CONTRACTOR TO PILOT DRILL AND FILL ALL HOLES.
- ALL DISSIMILAR MATERIALS SHALL BE SEPARATED WITH NEOPRENE WASHERS, PADS, ETC OR SIMILAR.
- ALL ALUMINUM COMPONENTS SHALL BE ANODIZED ALUMINUM 6105-T5 UNLESS OTHERWISE NOTED.
- ALL LAG SCREW SHALL BE ASTM A276 STAINLESS STEEL UNLESS OTHERWISE NOTED.
- ALL SOLAR RAILING AND MODULES SHALL BE INSTALLED PER MANUFACTURER INSTRUCTIONS.
- CONTRACTOR SHALL ENSURE ALL ROOF PENETRATIONS TO BE INSTALLED AND SEALED PER 2020 FLORIDA BUILDING CODE (7TH EDITION) OR LOCAL GOVERNING CODE

ELECTRICAL NOTES

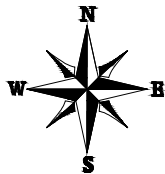
- ALL EQUIPMENT TO BE LISTED BY UL OR OTHER NRTL, AND LABELED FOR ITS APPLICATION.
- ALL CONDUCTORS SHALL BE COPPER, RATED FOR 600 V AND 90 DEGREE C WET ENVIRONMENT.
- WIRING, CONDUIT, AND RACEWAYS MOUNTED ON ROOFTOPS SHALL BE ROUTED DIRECTLY TO, AND LOCATED AS CLOSE AS POSSIBLE TO THE NEAREST RIDGE, HIP, OR VALLEY.
- WORKING CLEARANCES AROUND ALL NEW AND EXISTING ELECTRICAL EQUIPMENT SHALL COMPLY WITH CEC 110.26.
- DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS. CONTRACTOR SHALL FURNISH ALL NECESSARY OUTLETS, SUPPORTS, FITTINGS AND ACCESSORIES TO FULFILL APPLICABLE CODES AND STANDARDS.
- WHERE SIZES OF JUNCTION BOXES, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, THE CONTRACTOR SHALL SIZE THEM ACCORDINGLY.
- ALL WIRE TERMINATIONS SHALL BE APPROPRIATELY LABELED AND READILY VISIBLE.
- MODULE GROUNDING CLIPS TO BE INSTALLED BETWEEN MODULE FRAME AND MODULE SUPPORT RAIL, PER THE GROUNDING CLIP MANUFACTURER'S INSTRUCTION.
- MODULE SUPPORT RAIL TO BE BONDED TO CONTINUOUS COPPER G.E.C. VIA WEEB LUG OR ILSCO GBL-4DBT LAY-IN LUG.
- THE POLARITY OF THE GROUNDED CONDUCTORS IS NEGATIVE



1 AERIAL PHOTO  
PV-0 SCALE: NTS



2 VICINITY MAP  
PV-0 SCALE: NTS



Saddam Ahmad  
Digitally signed by Saddam Ahmad  
Date: 2022.10.27 14:09:04 -05'00'



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REVISIONS

DESCRIPTION	DATE	REV
INITIAL RELEASE	10/27/2022	UR

PROJECT NAME

WILLIAM NAILLER  
1507 NW FRONTIER DR,  
LAKE CITY, FL 32055 USA  
AHJ: COLUMBIA COUNTY

SHEET NAME

COVER SHEET

SHEET SIZE

ANSI B  
11" X 17"

SHEET NUMBER

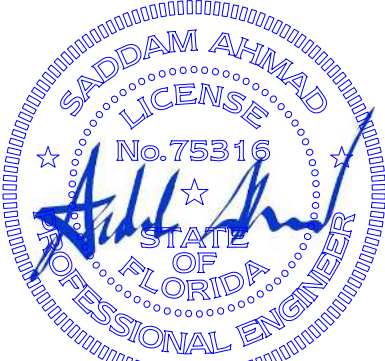
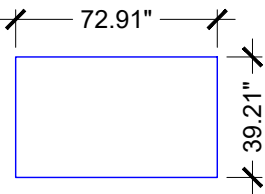
PV-0

● **ROOF ACCESS POINT** SHALL BE LOCATED IN AREAS THAT DO NOT REQUIRE THE PLACEMENT OF GROUND LADDERS OVER OPENINGS SUCH AS WINDOWS OR DOORS, AND LOCATED AT STRONG POINTS OF BUILDING CONSTRUCTION IN LOCATIONS WHERE THE ACCESS POINT DOES NOT CONFLICT WITH OVERHEAD OBSTRUCTIONS SUCH AS TREE LIMBS, WIRES OR SIGNS.

**NOTE: ACTUAL ROOF CONDITIONS AND SEAMS (OR SEAM) LOCATIONS MAY VARY. INSTALL PER MANUFACTURER(S) INSTALLATION GUIDELINES AND ENGINEERED SPANS FOR ATTACHMENTS**

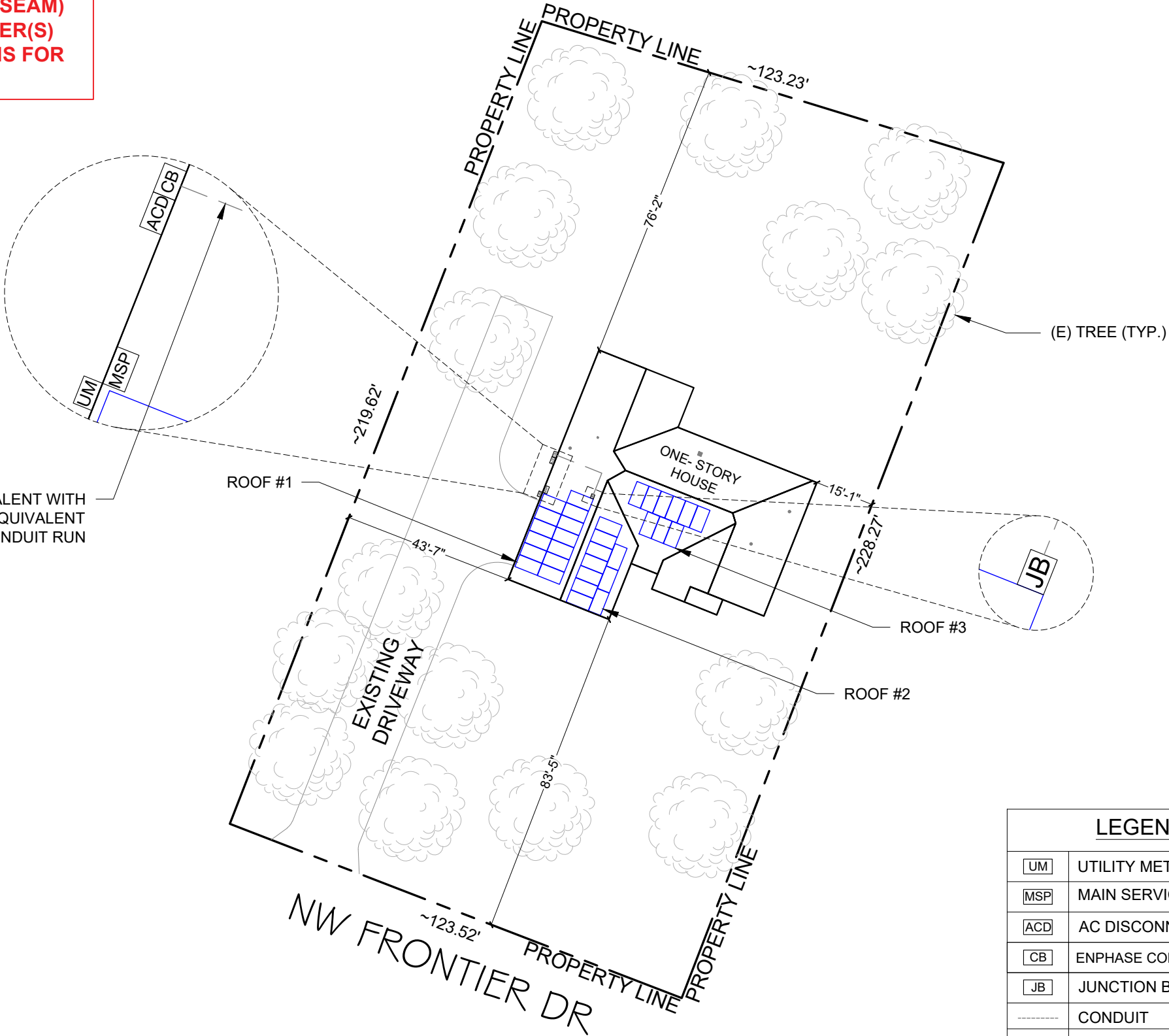
**NOTE TO INSTALLER: FIELD ADJUSTMENTS CAN BE MADE TO LAYOUT OF THE ARRAY**

PHOTOVOLTAIC MODULES  
TRINA SOLAR TSM-DE06X.05(II) (365W)



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LEGEND	
UM	UTILITY METER
MSP	MAIN SERVICE PANEL
ACD	AC DISCONNECT
CB	ENPHASE COMBINER BOX 4
JB	JUNCTION BOX
---	CONDUIT
---	PROPERTY LINE
○ □	VENT, ATTIC FAN (ROOFOBSTRUCTION)
⊠	CHIMNEY

**NOTE: NO FENCE/GATE SURROUND THE PROPERTY**

**NOTE:**

- ALL ELECTRICAL EQUIPMENT, INVERTERS, DISCONNECTS, MAIN SERVICE PANELS, ETC. SHALL NOT BE INSTALLED WITHIN 3' OF THE GAS METERS' SUPPLY OR DEMAND PIPING.



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SHEET NAME

SITE PLAN WITH  
ROOF PLAN

SHEET SIZE

ANSI B  
11" X 17"

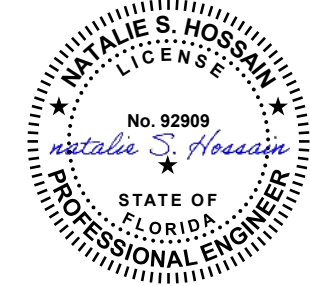
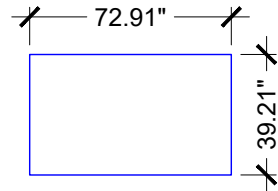
SHEET NUMBER

PV-1

MODULE TYPE, DIMENSIONS & WEIGHT

NUMBER OF MODULES = 32 MODULES  
MODULE TYPE = **TRINA SOLAR TSM-DE06X.05(II) (365W) MODULES**  
MODULE WEIGHT = 43.4 LBS / 19.7 KG.  
MODULE DIMENSIONS = 72.91"X 39.21" = 19.85 SF  
UNIT WEIGHT OF ARRAY = 2.19 PSF

PHOTOVOLTAIC MODULES  
TRINA SOLAR  
TSM-DE06X.05(II) (365W)

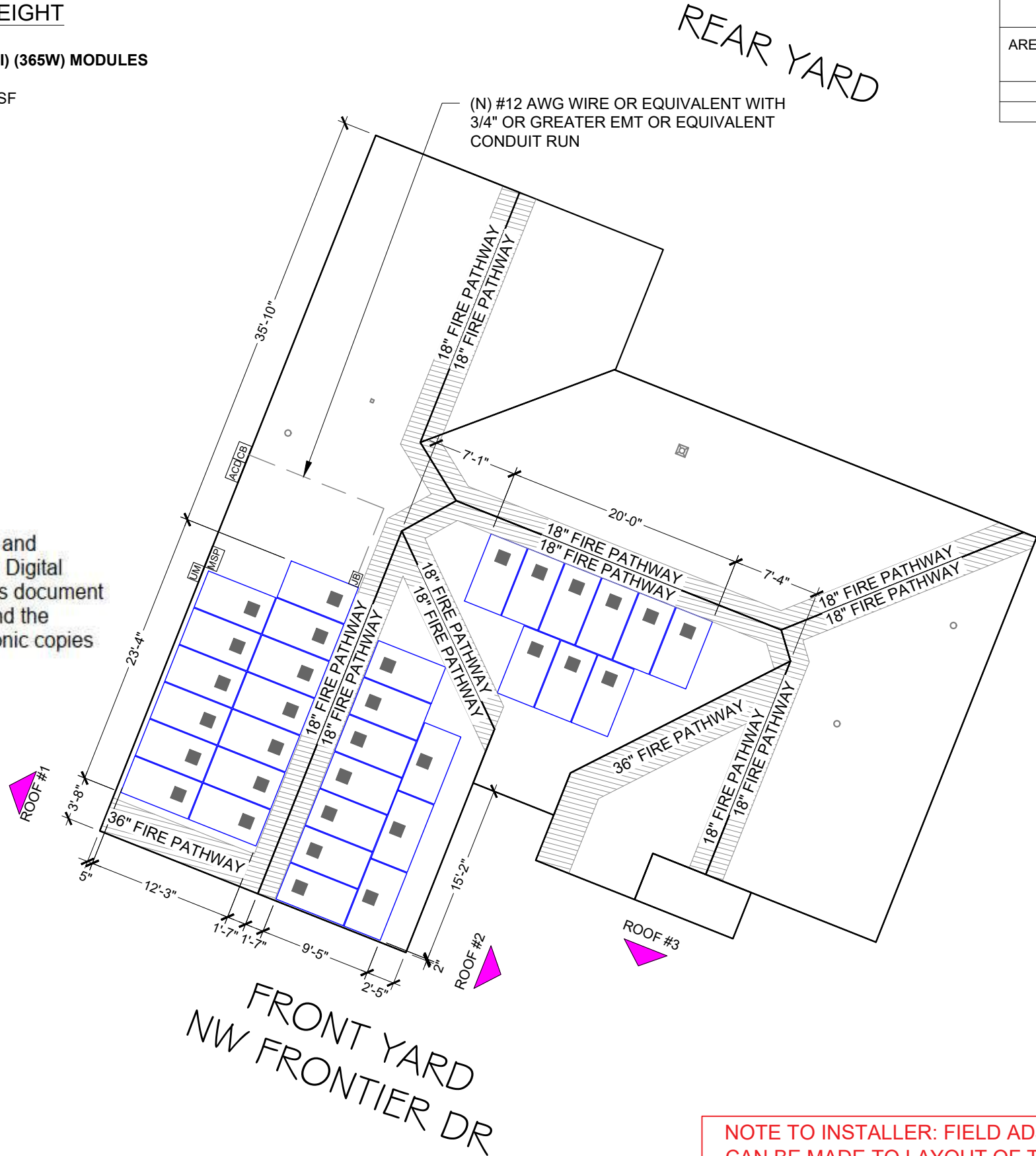


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**Natalie S Hossain**  
Digitally signed by Natalie S Hossain  
Date: 2022.10.27 13:09:45 -05'00'

PLUMBING VENTS, SKYLIGHTS AND MECHANICAL VENTS SHALL NOT BE COVERED, MOVED, RE-ROUTED OR RE-LOCATED.

**1** ROOF PLAN WITH MODULES  
SCALE: 3/32" = 1'-0"



NOTE TO INSTALLER: FIELD ADJUSTMENTS CAN BE MADE TO LAYOUT OF THE ARRAY

NOTE: ACTUAL ROOF CONDITIONS AND SEAMS (OR SEAM) LOCATIONS MAY VARY. INSTALL PER MANUFACTURER(S) INSTALLATION GUIDELINES AND ENGINEERED SPANS FOR ATTACHMENTS

ARRAY AREA & ROOF AREA CALC'S		
AREA OF NEW ARRAY (Sq. Ft.)	AREA OF ROOF(PLAN VIEW) (Sq. Ft.)	TOTAL ROOF AREA COVERED BY ARRAY %
635.29	3131.39	20%
20% ROOF AREA (ARRAY <33% OF ROOF AREA)		

ARRAY AREA & ROOF AREA CALC'S				
ROOF	# OF MODULES	ARRAY AREA (Sq. Ft.)	ROOF AREA (Sq. Ft.)	ROOF AREA COVERED BY ARRAY (%)
#1	13	258.09	880.29	29.32
#2	10	198.53	355.10	55.91
#3	9	178.68	423.35	42.21

ROOF DESCRIPTION				
ROOF TYPE			CORRUGATED METAL ROOF	
ROOF	ROOF TILT	AZIMUTH	SEAMS SIZE	SEAMS SPACING
#1	26°	292°	N/A	12" O.C.
#2	26°	112°	N/A	12" O.C.
#3	26°	202°	N/A	12" O.C.

LEGEND	
UM	UTILITY METER
MSP	MAIN SERVICE PANEL
ACD	AC DISCONNECT
CB	ENPHASE COMBINER BOX 4
JB	JUNCTION BOX
-----	CONDUIT
■	ENPHASE IQ8PLUS-72-2-US
●	ROOF ATTACHMENTS
-----	RAFTERS
○ □	VENT, ATTIC FAN (ROOF OBSTRUCTION)
⊞	CHIMNEY



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**1507 NW FRONTIER DR,**  
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**AHJ: COLUMBIA COUNTY**

SHEET NAME  
**ROOF PLAN WITH MODULES**

SHEET SIZE  
**ANSI B**  
**11" X 17"**

SHEET NUMBER  
**PV-2**

ROOF LAYOUT NOTE  
ROOFSOLAR PANEL LAYOUT IS  
CONCEPTUAL, BUT AS PROVIDED, CONFORMS  
WITH THE REQUIREMENTS SET IN SHEET PV-3  
CONTRACTOR MAY ADJUST PANEL LOCATION.  
SOLID CORNERS (4'X4') SHOWN THE PLAN IS WIND  
ZONE 3. SEE 2020 FLORIDA RESIDENTIAL CODE  
(7TH EDITION) FOR MORE DETAILS

APPLICABLE CODE: 2020 FLORIDA BUILDING CODE  
(7TH EDITION) & ASCE 7-16 MINIMUM DESIGN  
LOADS FOR BUILDING AND OTHER STRUCTURES.

LAG SCREW DIAMETER AND EMBEDMENT  
LENGTHS ARE DESIGNED PER 2020 FLORIDA  
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ALL WIND DESIGN CRITERIA AND PARAMETERS  
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CONSIDERING FROM A7° TO A MAXIMUM 23° (7/12  
TO A MAXIMUM 7/12 PITCH) ROOF IN SCHEDULE.  
CONTRACTOR TO FIELD VERIFY THAT MEAN ROOF  
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ROOF SEALANTS SHALL CONFORM TO ASTM C920  
AND ASTM 6511, AND IS THE RESPONSIBILITY OF  
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ALL ALUMINUM COMPONENTS SHALL BE  
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ALL SOLAR RAILING AND MODULES SHALL BE  
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CONTRACTOR SHALL ENSURE ALL ROOF  
PENETRATIONS TO BE INSTALLED AND SEALED  
PER 2020 FLORIDA BUILDING CODE (7TH EDITION)  
OR LOCAL GOVERNING CODE.

NOTE TO INSTALLER:  
NOTE FIELD ADJUSTMENTS CAN BE MADE TO  
THE LAYOUT OF THE ARRAY.

PLUMBING VENTS, SKYLIGHTS AND  
MECHANICAL VENTS SHALL NOT BE  
COVERED, MOVED, RE-ROUTED OR  
RE-LOCATED.

NOTE: ACTUAL ROOF CONDITIONS AND SEAMS (OR SEAM)  
LOCATIONS MAY VARY. INSTALL PER MANUFACTURER(S)  
INSTALLATION GUIDELINES AND ENGINEERED SPANS FOR  
ATTACHMENTS

NOTE TO INSTALLER: FIELD ADJUSTMENTS  
CAN BE MADE TO LAYOUT OF THE ARRAY

BILL OF MATERIALS		
EQUIPMENT	QTY	DESCRIPTION
RAIL	18	UNIRAC SM LIGHT RAIL 168" DARK
SPLICE	10	BND SPLICE BAR PRO SERIES DRK
MID CLAMP	52	UNIVERSAL AF MID CLAMPS
END CLAMP	24	UNIVERSAL AF END CLAMPS
ATTACHMENT	74	S-5-PROTEA BRACKET ATTACHMENTS
GROUNDING LUG	06	GROUNDING LUG

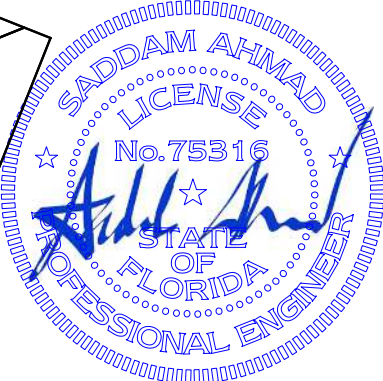


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Saddam Ahmad  
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14:10:04 -05'00'

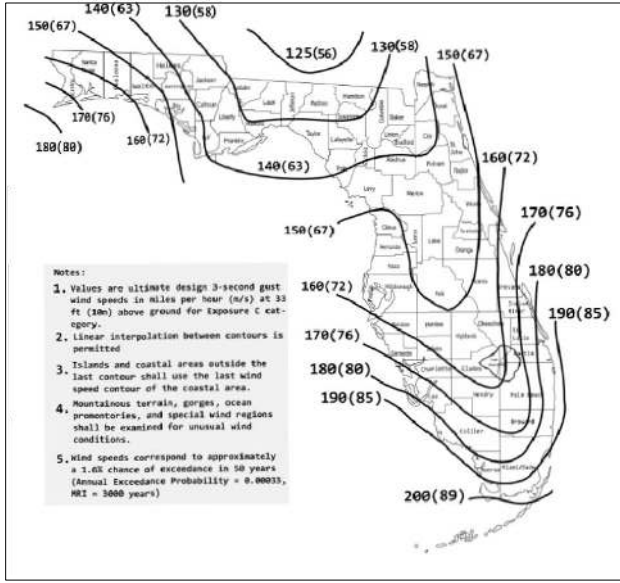
LEGEND	
●	ROOF ATTACHMENTS SPACED AT 48" O.C.
—	RAIL
----	SEAMS 12" O.C .
▨	- WIND ZONE
■	- CORNER WIND ZONE



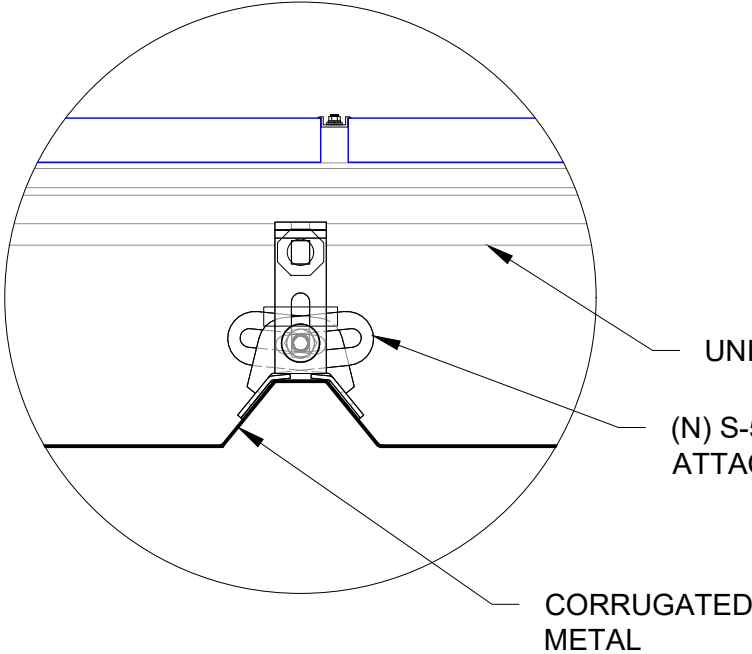
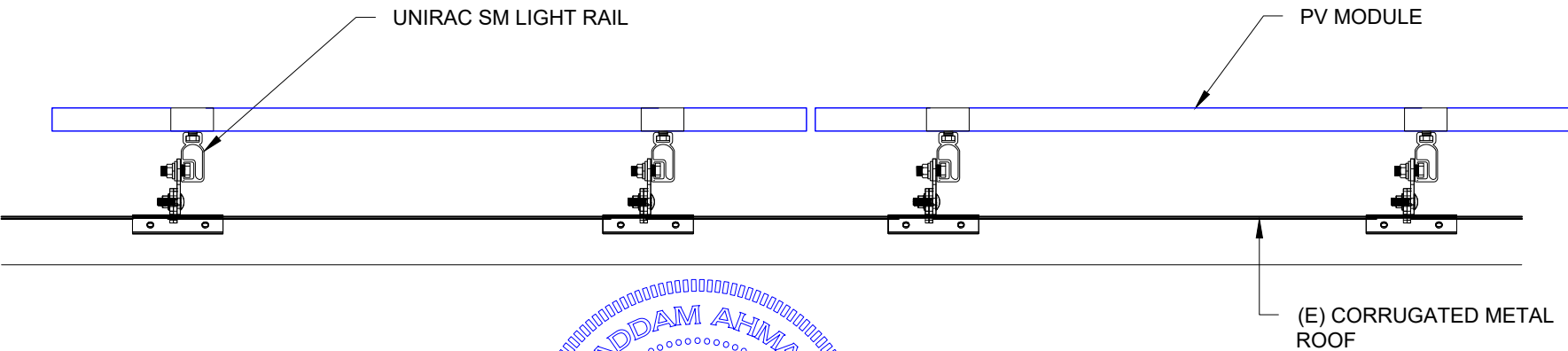
# 1 ROOF ZONING AND ATTACHMENT PLAN

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



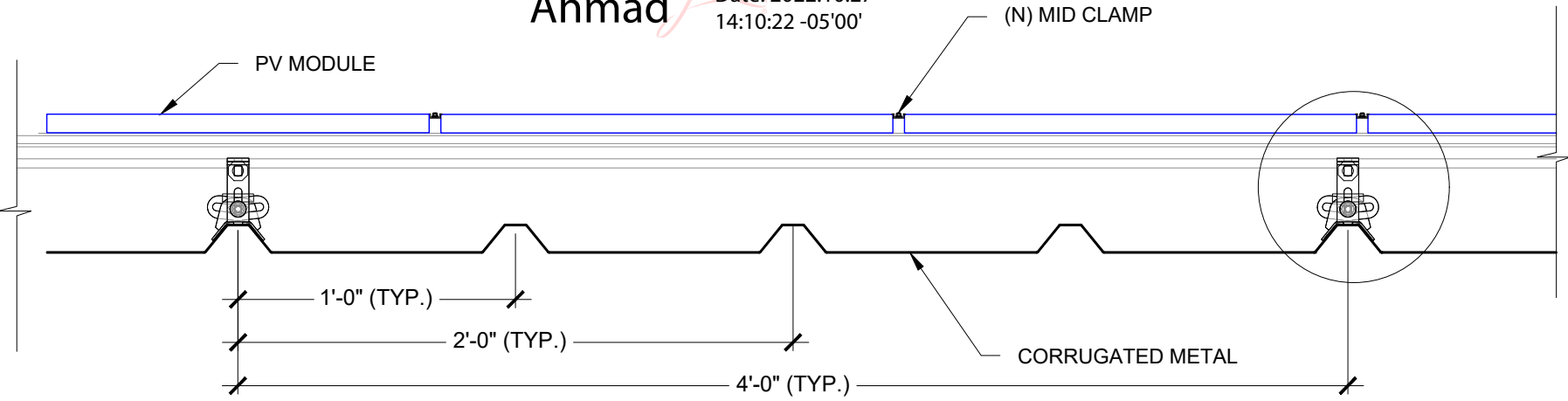


NOTE: ACTUAL ROOF CONDITIONS AND RAFTERS (OR SEAM) LOCATIONS MAY VARY. INSTALL PER MANUFACTURER(S) INSTALLATION GUIDELINES AND ENGINEERED SPANS FOR ATTACHMENTS



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AHJ: COLUMBIA COUNTY

SHEET NAME

ATTACHMENT  
DETAIL

SHEET SIZE

ANSI B  
11" X 17"

SHEET NUMBER

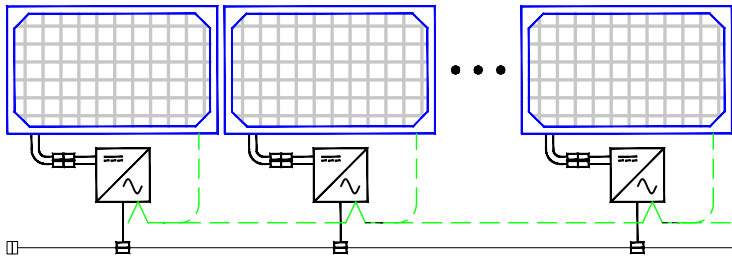
PV-3.1

NEW INVERTER SPECIFICATIONS			
MANUFACTURER / MODEL #	QUANTITY	NOMINAL OUTPUT VOLTAGE	NOMINAL OUTPUT CURRENT
ENPHASE IQ8PLUS-72-2-US	32	240 VAC	1.21A

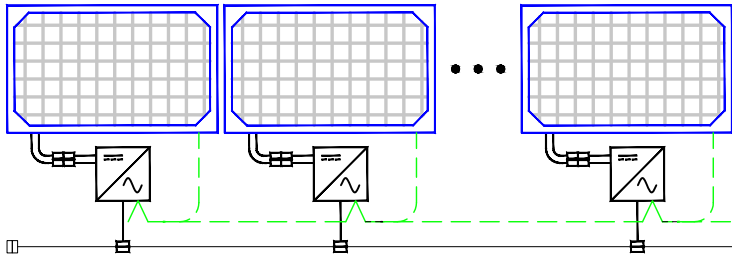
SOLAR MODULE SPECIFICATIONS					
MANUFACTURER / MODEL #	VMP	IMP	VOC	ISC	TEMPERATURE COEFFICIENT OF Voc
TRINA SOLAR TSM-DE06X.05(II) (365W)	37.2	9.82	45.0	10.35	-0.25%/°C
MODULE DIMENSION	72.91" L x 39.21" W x 1.38" D				

AMBIENT TEMPERTURE SPECIFICATIONS				
RECORD LOW TEMP	AMBIENT TEMP (HIGH TEMP 2%)	CONDUIT HEIGHT	CONDUCTOR TEMPERATURE RATE	
			ON ROOF	OFF ROOF
-7°	35°	7/8"	90°	75°

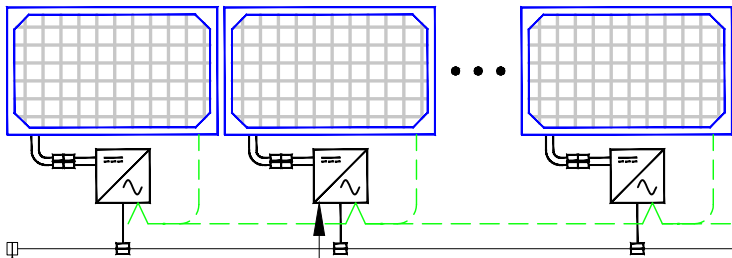
11 MICRO-INVERTERS IN BRANCH CIRCUIT #1



11 MICRO-INVERTERS IN BRANCH CIRCUIT #2



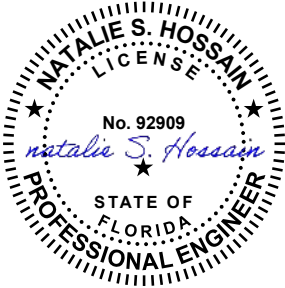
10 MICRO-INVERTERS IN BRANCH CIRCUIT #3



ENPHASE IQ8PLUS-72-2-US MICRO-INVERTERS

TERMINATOR CAP ON LAST CABLE CONNECTOR AC TRUNK CABLE (TYP)

Natalie S Hossain  
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(N) JUNCTION BOX

(N) ENPHASE IQ COMBINER BOX 4

(N) AC DISCONNECT:  
60A FUSED, 50A/2P FUSES, 240V NEMA 3R, UL LISTED,

LINE SIDE TAP

BI-DIRECTIONAL UTILITY METER  
1-PHASE, 3-W,  
120V/240V, 60Hz

(E) 200A MAIN SERVICE PANEL  
WITH (E) 200A MAIN BREAKER (TOP FED)

EXISTING GROUNDING SYSTEM

CONDUCTOR SCHEDULE AND CALCULATIONS

Wire Tag	Conduit	Wire Qty	Wire Gauge	Wire Type	Temp. Rating	Wire Ampacity (A)	Temp. Derate	Conduit Fill Derate	Derated Ampacity (A)	Inverter Qty	NOC (A)	NEC Correction	Design Current (A)	Ground Size	Ground Wire Type
A	OPEN AIR	3	12 AWG	Q Cable	90°C	30	0.96	1.0	28.80	11	1.21	1.25	16.64	06 AWG	BARE CU
B	3/4" EMT OR EQUIVALENT	6	12 AWG	THWN-2	90°C	30	0.96	0.80	23.04	11	1.21	1.25	16.64	10 AWG	THWN-2
C	3/4" EMT OR EQUIVALENT	3 + G	8 AWG	THWN	75°C	50	0.94	1.0	47.00	32	1.21	1.25	48.40	08 AWG	THWN
D	3/4" EMT OR EQUIVALENT	3	6 AWG	THWN	75°C	65	0.94	1.0	61.10	32	1.21	1.25	48.40	08 AWG	THWN

1 ELECTRICAL LINE DIAGRAM  
SCALE: NTS



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SHEET NAME  
ELECTRICAL LINE  
DIAGRAM

SHEET SIZE  
ANSI B  
11" X 17"

SHEET NUMBER  
PV-4



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ELECTRICAL LINE  
DIAGRAM

SHEET SIZE  
ANSI B  
11" X 17"

SHEET NUMBER  
PV-4.1

PV-5

Mono Multi Solutions

THE

# Residential Module

MULTI-BUSBAR MONO PERC MODULE

132-Cell  
MONOCRYSTALLINE MODULE

355-380W  
POWER OUTPUT RANGE

20.6%  
MAXIMUM EFFICIENCY

0~+5W  
POSITIVE POWER TOLERANCE

Founded in 1997, Trina Solar is the world's leading total solution provider for solar energy. With local presence around the globe, Trina Solar is able to provide exceptional service to each customer in each market and deliver our innovative, reliable products with the backing of Trina as a strong, bankable brand. Trina Solar now distributes its PV products to over 100 countries all over the world. We are committed to building strategic, mutually beneficial collaborations with installers, developers, distributors and other partners in driving smart energy together.

## Comprehensive Products and System Certificates

UL 61730  
IEC 61215 / IEC 61730 / IEC 61701 / IEC 62716  
ISO 9001: Quality Management System  
ISO 14001: Environmental Management System  
ISO 14064: Greenhouse Gases Emissions Verification  
OHSAS 18001: Occupation Health and Safety Management System



Trinasolar

PRODUCTS  
TSM-DE06X.05(II)

POWER RANGE  
355-380W



### High power and High Efficiency

- Up to 380W front power and 20.6% module efficiency with half-cut and MBB (Multi Busbar) technology bringing more BOS savings
- Reduce BOS cost with higher power bin and 1500V system voltage



### Outstanding visual appearance

- Designed with aesthetics in mind
- Excellent cell color control
- Thinner wires that appear all black at a distance



### High reliability

- Ensured PID resistance through cell process and module material control
- Resistant to salt, acid and ammonia
- Mechanical performance: Up to 5400 Pa positive load and 2400 Pa negative load



### Certified to withstand the most challenging environmental conditions

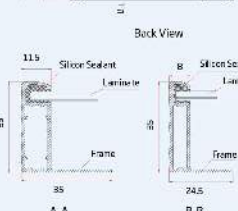
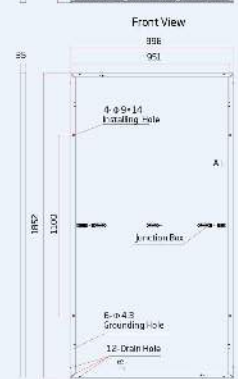
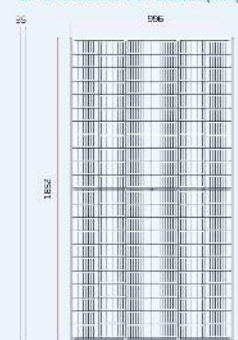
- Excellent IAM and low light performance validated
- Lower temp co-efficient (-0.34%) and NOCT bring more energy leading to lower LCOE
- Better anti-shading performance and lower operating temperature



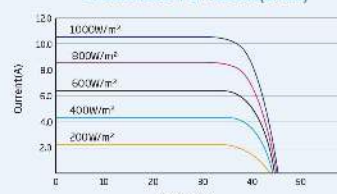
## Residential Module

MULTI-BUSBAR MONO PERC MODULE

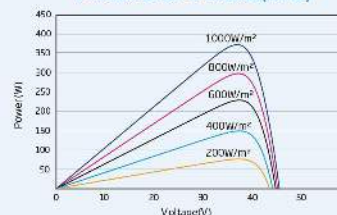
DIMENSIONS OF PV MODULE(mm)



I-V CURVES OF PV MODULE(370W)



P-V CURVES OF PV MODULE(370W)



### ELECTRICAL DATA (STC)

Peak Power Watts- $P_{max}(Wp)^*$	355	360	365	370	375	380
Power Output Tolerance- $P_{max}(W)$			0~+5			
Maximum Power Voltage- $V_{mp}(V)$	36.8	37.0	37.2	37.4	37.6	37.8
Maximum Power Current- $I_{mp}(A)$	9.66	9.74	9.82	9.90	9.98	10.07
Open Circuit Voltage- $V_{oc}(V)$	44.6	44.8	45.0	45.2	45.3	45.5
Short Circuit Current- $I_{sc}(A)$	10.24	10.30	10.35	10.40	10.45	10.51
Module Efficiency $\eta_m(\%)$	19.2	19.5	19.8	20.1	20.3	20.6

STC: Irradiance 1000W/m<sup>2</sup>, Cell Temperature 25°C, Air Mass AML5.  
\*Measurement tolerance: ±3%.

### ELECTRICAL DATA (NOCT)

Maximum Power- $P_{max}(Wp)$	268	272	276	279	283	287
Maximum Power Voltage- $V_{mp}(V)$	34.4	34.7	34.9	35.1	35.3	35.6
Maximum Power Current- $I_{mp}(A)$	7.80	7.85	7.90	7.96	8.01	8.06
Open Circuit Voltage- $V_{oc}(V)$	42.0	42.2	42.4	42.6	42.6	42.8
Short Circuit Current- $I_{sc}(A)$	8.25	8.30	8.34	8.38	8.42	8.47

NOCT: Irradiance at 800W/m<sup>2</sup>, Ambient Temperature 20°C, Wind Speed 1m/s.

### MECHANICAL DATA

Solar Cells	Monocrystalline
Cell Orientation	132 cells
Module Dimensions	1852 × 996 × 35 mm (72.91 × 39.21 × 1.38 inches)
Weight	19.7 kg (43.4 lb)
Glass	3.2 mm (0.13 inches), High Transmission, AR Coated Heat Strengthened Glass
Encapsulant Material	EVA / POE
Backsheet	Black-White
Frame	35 mm (inches) Anodized Aluminium Alloy
J-Box	IP 5B rated
Cables	Photovoltaic Technology Cable 4.0mm <sup>2</sup> (0.006 inches <sup>2</sup> ), Portrait: N 280mm/P 280mm(11.02/11.02inches) Landscape: N 1400 mm/P 1400 mm (55.12/55.12 inches)
Connector	MC4 EV02
Fire Type	Type 1

### TEMPERATURE RATINGS

NOCT (Nominal Operating Cell Temperature)	43°C (±2°C)
Temperature Coefficient of $P_{max}$	-0.34%/°C
Temperature Coefficient of $V_{oc}$	-0.25%/°C
Temperature Coefficient of $I_{sc}$	0.04%/°C

### MAXIMUM RATINGS

Operational Temperature	-40~+85°C
Maximum System Voltage	1500V DC (UL)
Max Series Fuse Rating	20A

### WARRANTY

- 25 year Product Workmanship Warranty
- 25 year Linear Power Warranty

(Please refer to product warranty for details)

### PACKAGING CONFIGURATION

Modules per box: 31 pieces
Modules per 40' container: 744 pieces
Pallet dimensions (L x W x H): 1880 x 1125 x 1173 mm
Pallet weight: 658.6kg (1,452lb)

Trinasolar

CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.  
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Version number: TSM\_DE06X.05(II)\_NA\_2021\_A  
www.trinasolar.com



Unicity  
Solar Energy

UNICITY SOLAR ENERGY  
LICENSE # EC13010036  
ADDRESS: 4612 FLORIDA AVE  
PALM HARBOR, FL 34683 USA  
PHONE: 727-945-6060

### REVISIONS

DESCRIPTION	DATE	REV
INITIAL RELEASE	10/27/2022	UR

### PROJECT NAME

WILLIAM NAILLER  
1507 NW FRONTIER DR,  
LAKE CITY, FL 32055 USA  
AHJ: COLUMBIA COUNTY

### SHEET NAME

SPEC SHEETS

### SHEET SIZE

ANSI B  
11" X 17"

### SHEET NUMBER

PV-6



DATA SHEET



## IQ8 Series 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.

### 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. IQ8H-208V operates only in grid-tied mode.  
\*\* IQ8 Series Microinverters supports split phase, 240V. IQ8H-208 supports split phase, 208V only.

## IQ8 Series Microinverters

INPUT DATA (DC)		IQ8-60-2-US	IQ8PLUS-72-2-US	IQ8M-72-2-US	IQ8A-72-2-US	IQ8H-240-72-2-US	IQ8H-208-72-2-US¹
Commonly used module pairings²	W	235 – 350	235 – 440	260 – 460	295 – 500	320 – 540+	295 – 500+
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	33 – 45	36 – 45	38 – 45	38 – 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 current³ [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	IQ8M-72-2-US	IQ8A-72-2-US	IQ8H-240-72-2-US	IQ8H-208-72-2-US¹
Peak output power	VA	245	300	330	366	384	366
Max continuous output power	VA	240	290	325	349	380	360
Nominal (L-L) voltage/range⁴	V	240 / 211 – 264					208 / 183 – 250
Max continuous output current	A	1.0	1.21	1.35	1.45	1.58	1.73
Nominal frequency	Hz	60					
Extended frequency range	Hz	50 – 68					
AC short circuit fault current over 3 cycles	Arms	2					4.4
Max units per 20 A (L-L) branch circuit⁵		16	13	11	11	10	9
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	97.6	97.6	97.6	97.4
CEC weighted efficiency	%	97	97	97	97.5	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) The IQ8H-208 variant will be operating in grid-tied mode only at 208V AC. (2) No enforced DC/AC ratio. See the compatibility calculator at <https://link.enphase.com/module-compatibility> (3) Maximum continuous input DC current is 10.6A (4) Nominal voltage range can be extended beyond nominal if required by the utility. (5) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

IQ8SE-DS-0001-01-EN-US-2022-03-17



UNICITY SOLAR ENERGY  
LICENSE # EC13010036  
ADDRESS: 4612 FLORIDA AVE  
PALM HARBOR, FL 34683 USA  
PHONE: 727-945-6060

### REVISIONS

DESCRIPTION	DATE	REV
INITIAL RELEASE	10/27/2022	UR

### PROJECT NAME

WILLIAM NAILLER  
1507 NW FRONTIER DR,  
LAKE CITY, FL 32055 USA  
AHJ: COLUMBIA COUNTY

### SHEET NAME

SPEC SHEETS

### SHEET SIZE

ANSI B  
11" X 17"

### SHEET NUMBER

PV-7

# Enphase IQ Combiner 4/4C

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



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

The **Enphase IQ Combiner 4/4C** with Enphase 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.
ACCESSORIES AND REPLACEMENT PARTS (not included, order separately)	
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
Envoy 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	To 2000 meters (6,560 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](https://enphase.com)

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PHONE: 727-945-6060

### REVISIONS

DESCRIPTION	DATE	REV
INITIAL RELEASE	10/27/2022	UR

### PROJECT NAME

WILLIAM NAILLER  
1507 NW FRONTIER DR,  
LAKE CITY, FL 32055 USA  
AHJ: COLUMBIA COUNTY

### SHEET NAME

SPEC SHEETS

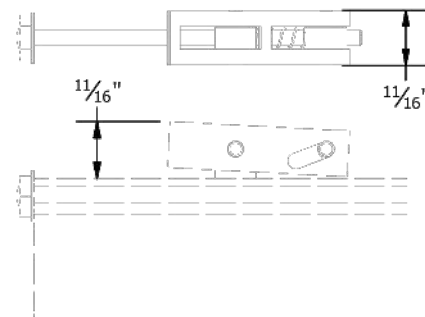
### SHEET SIZE

ANSI B  
11" X 17"

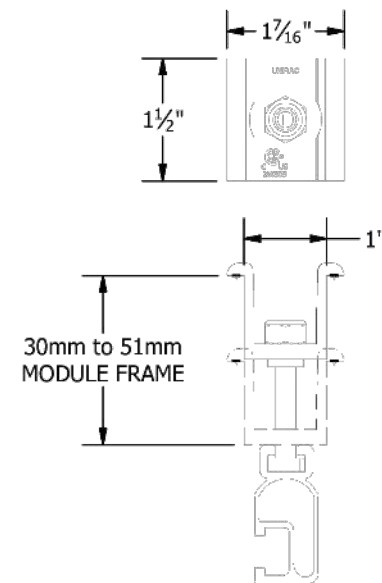
### SHEET NUMBER

PV-8

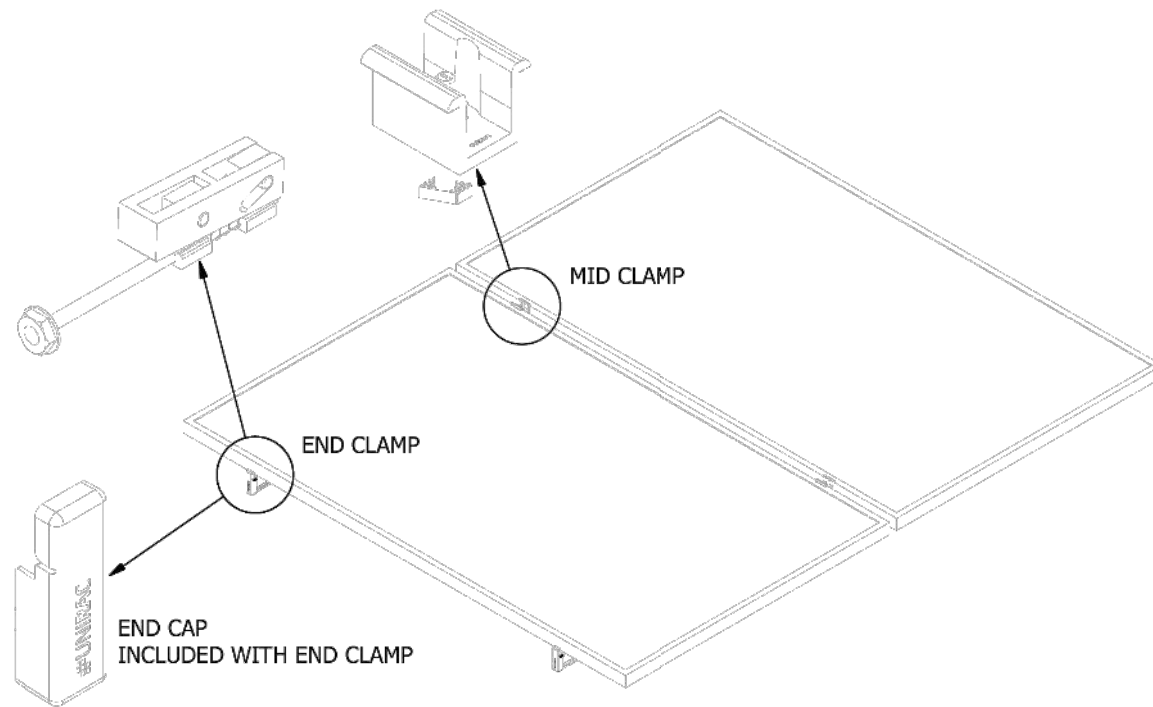
# PRO SERIES END CLAMP



# PRO SERIES MID CLAMP



PART # TABLE	
P/N	DESCRIPTION
302035M	ENDCLAMP PRO
302030M	MIDCLAMP PRO - MILL
302030D	MIDCLAMP PRO - DRK



**UNIRAC**  
1411 BROADWAY BLVD. NE  
ALBUQUERQUE, NM 87102 USA  
PHONE: 505.242.6411  
WWW.UNIRAC.COM

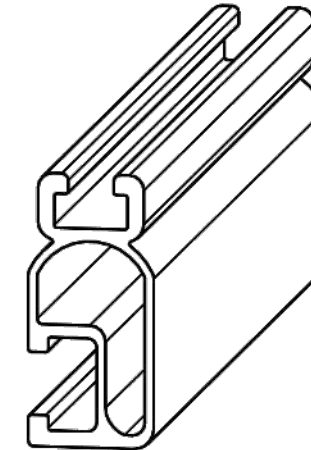
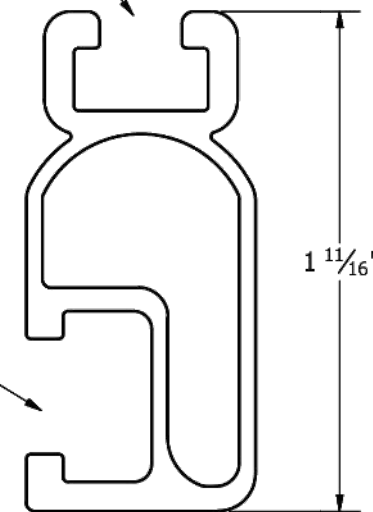
PRODUCT LINE: SOLARMOUNT  
DRAWING TYPE: PART & ASSEMBLY  
DESCRIPTION: PRO SERIES BONDING CLAMPS  
REVISION DATE: 10/26/2017

DRAWING NOT TO SCALE  
ALL DIMENSIONS ARE NOMINAL  
PRODUCT PROTECTED BY ONE OR MORE US PATENTS  
LEGAL NOTICE

SM-A01  
SHEET

1/4" BOLT LOCATION

3/8" BOLT LOCATION



PART # TABLE		
P/N	DESCRIPTION	LENGTH
315168M	SM LIGHT RAIL 168" MILL	168"
315168D	SM LIGHT RAIL 168" DRK	168"
315240M	SM LIGHT RAIL 240" MILL	240"
315240D	SM LIGHT RAIL 240" DRK	240"

**UNIRAC**  
1411 BROADWAY BLVD. NE  
ALBUQUERQUE, NM 87102 USA  
PHONE: 505.242.6411  
WWW.UNIRAC.COM

PRODUCT LINE: SOLARMOUNT  
DRAWING TYPE: PART DETAIL  
DESCRIPTION: LIGHT RAIL  
REVISION DATE: 9/11/2017

DRAWING NOT TO SCALE  
ALL DIMENSIONS ARE NOMINAL  
PRODUCT PROTECTED BY ONE OR MORE US PATENTS  
LEGAL NOTICE

SM-P02  
SHEET



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PALM HARBOR, FL 34683 USA  
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## PROJECT NAME

WILLIAM NAILLER  
1507 NW FRONTIER DR,  
LAKE CITY, FL 32055 USA  
AHJ: COLUMBIA COUNTY

## SHEET NAME

SPEC SHEETS

## SHEET SIZE

ANSI B  
11" X 17"

## SHEET NUMBER

PV-9

# S-5!®

## The Right Way!™

NEW

NOW AVAILABLE  
IN ALUMINUM

ProteaBracket™

### ProteaBracket™

A versatile bracket for  
mounting solar PV to  
trapezoidal roof profiles

ProteaBracket™ is now made in aluminum. Still the most versatile trapezoidal metal roof attachment solution on the market, the S-5! ProteaBracket just got better!

The bracket features an adjustable attachment base and module attachment options to accommodate different roof profile dimensions and mounting options.

Our pre-applied EPDM gasket with peel and stick adhesive makes installation a snap, ensuring accurate and secure placement the first time.

With no messy sealants, faster installation, and a weather-proof fit, ProteaBracket offers you the most versatile solar attachment solution available.

ProteaBracket\* can be used for  
rail mounting or "direct-attach"  
with S-5! PVKIT™

### Features and Benefits

- 34% lighter - saves on shipping
- Stronger L-Foot™
- Load-tested for engineered application
- Corrosion-resistant materials
- Adjustable - Fits rib profiles up to 3"
- Peel-and-Stick prevents accidental shifting during installation
- Fully pre-assembled
- 25-year warranty\*

\*When ProteaBracket is used in conjunction with the S-5! PVKIT, an additional nut is required during installation.

\*See [www.S-5.com](http://www.S-5.com) for details.



888-825-3432 | [www.S-5.com](http://www.S-5.com)

# S-5!®

The Right Way!™

ProteaBracket™ is the perfect solar attachment solution for most trapezoidal rib, exposed-fastened metal roof profiles!

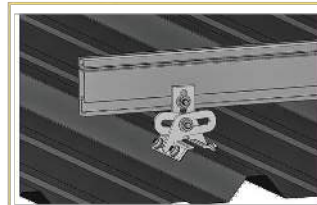
ProteaBracket™ is compatible with common metal roofing materials and comes with a pre-applied EPDM gasket on the base.

**Note:** All four pre-punched holes must be used to achieve tested strength. Fasteners are provided.

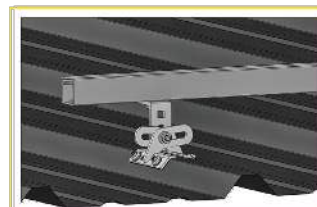
For design assistance, ask your distributor, or visit [www.S-5.com](http://www.S-5.com) for the independent lab test data that can be used for load-critical designs and applications. Also, please visit our website for more information including metallurgical compatibilities and specifications.

S-5!® holding strength is unmatched in the industry.

### Multiple Attachment Options:



Side  
Mount Rail



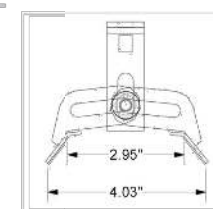
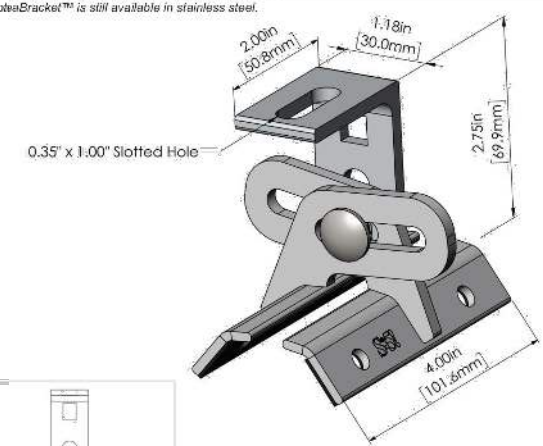
Bottom  
Mount Rail



w/ S-5!  
PVKIT™  
(rail-less)

### ProteaBracket™

ProteaBracket™ is still available in stainless steel.



ProteaBracket fits profiles  
up to 3 inches

INSTALLATION:

**No surface preparation needed.** (1) Wipe away excess oil and debris. (2) Peel off adhesive release paper. (3) Align and mount bracket directly onto crown of panel. (4) Secure ProteaBracket through pre-punched holes, using piercing-point S-5! screws.



ProteaBracket™ and the S-5! PVKIT™ 2.0  
mounted on a trapezoidal roof profile

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

Products are protected by multiple U.S. and foreign patents. For published data regarding holding strength, bolt torque, patents, and trademarks, visit the S-5! website at [www.S-5.com](http://www.S-5.com).

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WILLIAM NAILLER  
1507 NW FRONTIER DR,  
LAKE CITY, FL 32055 USA  
AHJ: COLUMBIA COUNTY

SHEET NAME

SPEC SHEETS

SHEET SIZE

ANSI B  
11" X 17"

SHEET NUMBER

PV-10

#### 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 UL 1703. This UL 1703 classification has been incorporated into our UL 2703 product certification. SOLARMOUNT has achieved system level performance for steep sloped roofs. System level fire performance is inherent in the SOLARMOUNT design, and no additional mitigation measures are required. 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 are listed below:

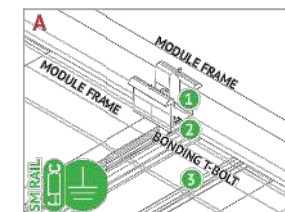
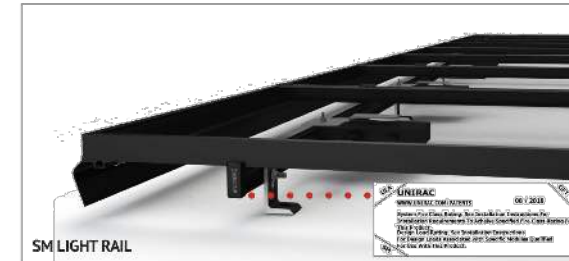
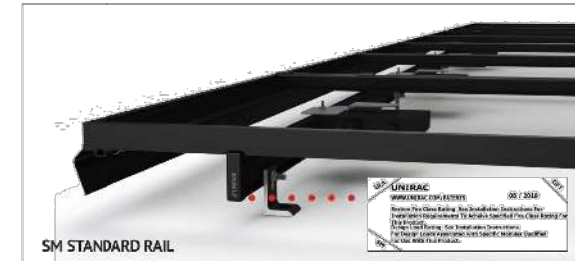
Rail Type	Module Type	System Level Fire Rating	Rail Direction	Module Orientation	Mitigation Required
Standard Rail	Type 1, Type 2, Type 3 & Type 10	Class A, Class B & Class C	East-West	Landscape OR Portrait	None Required
			North-South	Landscape OR Portrait	None Required
Light Rail	Type 1 & Type 2	Class A, Class B & Class C	East-West	Landscape OR Portrait	None Required
			North-South	Landscape OR Portrait	None Required

This racking system may be used to ground and/or mount a PV module complying with UL1703 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.

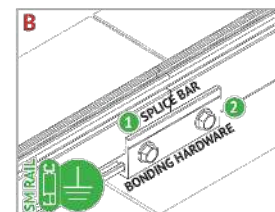


#### BONDING MIDCLAMP ASSEMBLY

- Aluminum mid clamp with stainless steel bonding pins that pierce module frame anodization to bond module to module through clamp
- Stainless steel nut bonds aluminum clamp to stainless steel T-bolt
- Serrated T-bolt head penetrates rail anodization to bond T-bolt, nut, clamp, and modules to SM rail



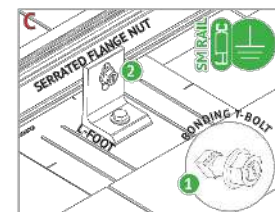
#### BONDING MIDCLAMP ASSEMBLY



#### BONDING RAIL SPLICE BAR

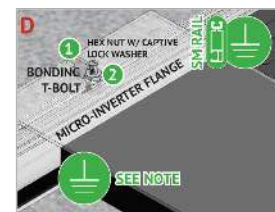
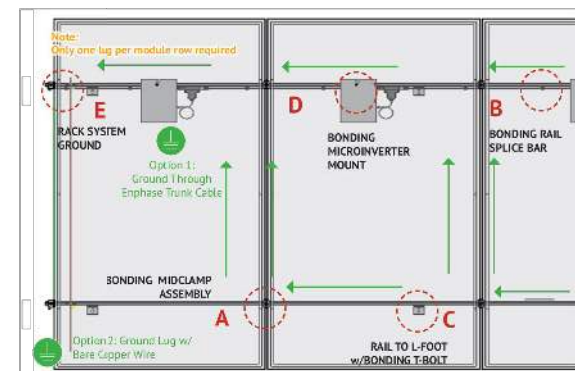
- Bonding Hardware creates bond between splice bar and each rail section
- Aluminum splice bar spans across rail gap to create rail to rail bond. Rail on at least one side of splice will be grounded.

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



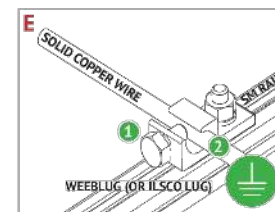
#### RAIL TO L-FOOT w/BONDING T-BOLT

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



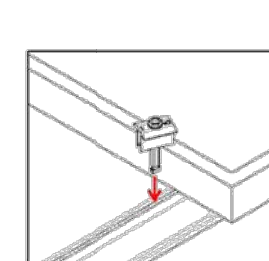
#### BONDING MICROINVERTER MOUNT

- Hex nut with captive lock washer bonds metal microinverter flange to stainless steel T-bolt
- 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 I for details

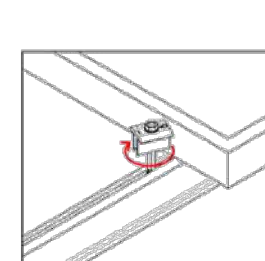


#### RACK SYSTEM GROUND

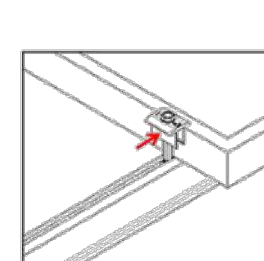
- WEEB washer dimples pierce anodized rail to create bond between rail and lug
- Solid copper wire connected to lug is routed to provide final system ground connection. NOTE: If lug can also be used when secured to the side of the rail. See page J for details



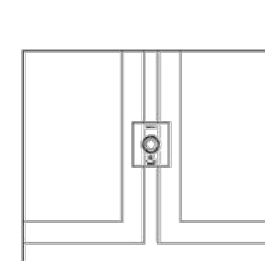
- Position clamp to align T-bolt with rail slot. Lower clamp and insert T-bolt into rail slot



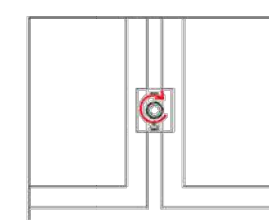
- Rotate clamp clockwise 2/3 of a turn to engage T-bolt inside rail slot.



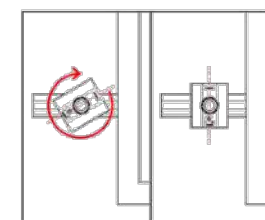
- Slide clamp into position against module.



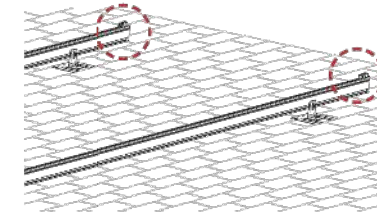
- Place second module.



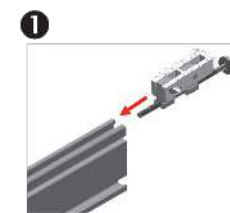
- Tighten bolt and torque to 15 ft-lbs.



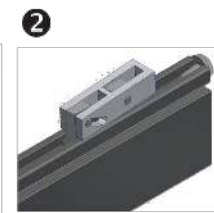
NOTE: If excessive force is applied in step 2, the cap may over-rotate causing it to be mis-aligned with the module frame. If this occurs, keep rotating the cap clockwise until it returns to the original position.



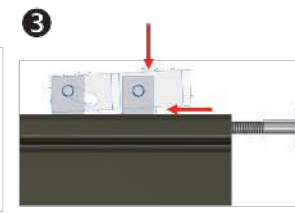
INSTALL MODULE END CLAMPS: The end clamp is supplied as an assembly with a 1/2" hex head bolt that is accessible at the ends of rails. The clamp should be installed on the rails prior to installing end modules.



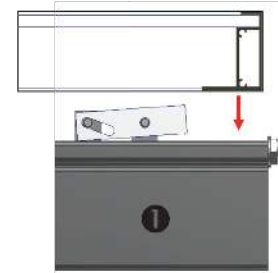
INSTALL END CLAMPS ON RAIL: Slide end clamp on to rail by engaging the two t-guide brackets with the top slot of the rails. Ensure bolt is extended as far as possible so that clamp is positioned at max. distance from end of rail.



POSITION END CLAMPS: Slide end clamp assembly on to rail until bolt head engages with end of rail. End clamps are positioned on rails prior to the first end module and prior to the last end module.



NOTE: To assist insertion of clamp into rail slot, pressure may be applied to top or side of bracket as shown. Do not force clamp into rail by pushing on bolt with excessive force.



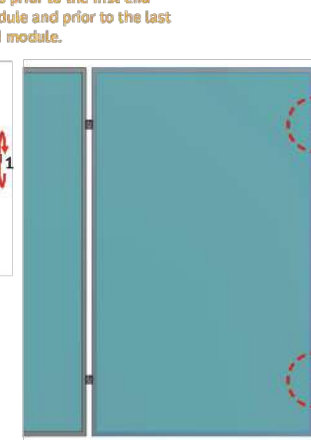
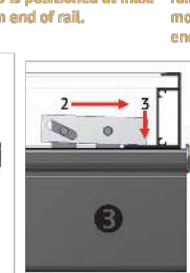
INSTALL FIRST MODULE: Install the first end module onto rails with the flange of the module frame positioned between end clamps at an ends of rails.



ENGAGE CLAMP: While holding module in position and with flange in full contact with rail, rotate end clamp bolt until clamp engages with flange to provide clamp force.

To ensure bolt is not over-torqued, use low torque setting on drill or if using an impact driver, stop rotation as soon as impact action of driver begins.

TORQUE VALUE (See table and notes on PG. A)  
End clamp bolt to 3 ft-lbs, No anti-seize



For best appearance, position module flush with ends of rails. Rails should not extend more than 1/2" beyond module. Module must be fully supported by rails and cannot overhang ends of rails.

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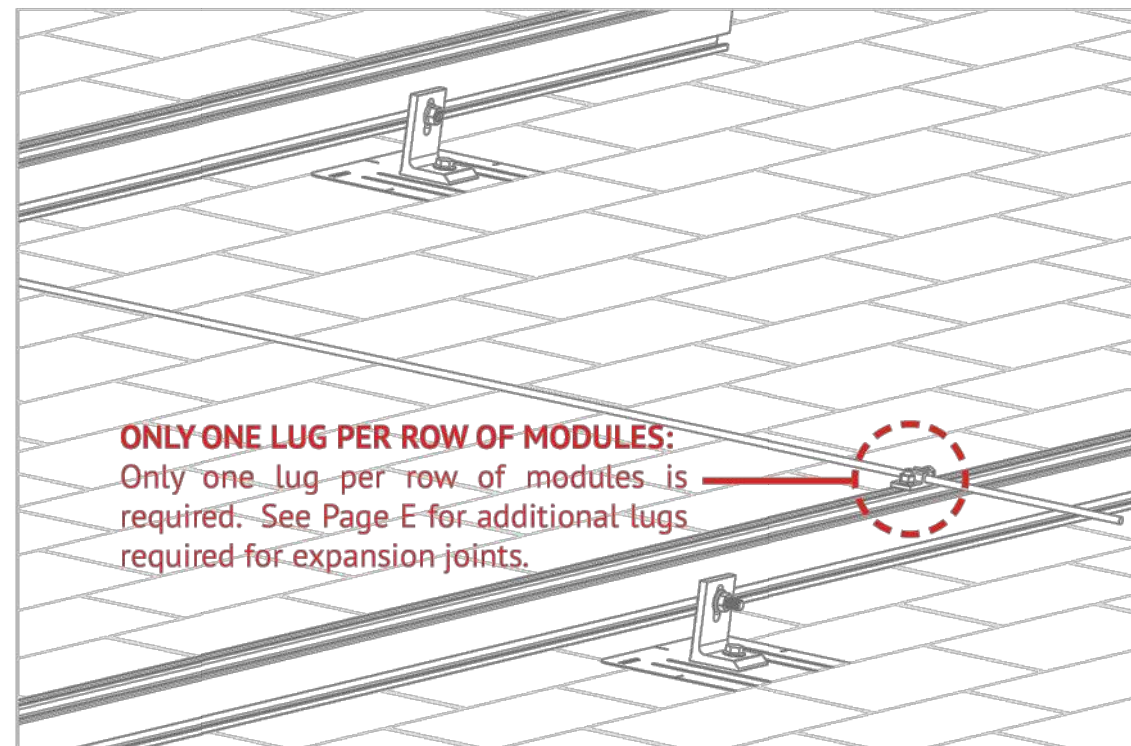
SPEC SHEETS

#### SHEET SIZE

ANSI B  
11" X 17"

#### SHEET NUMBER

PV-11

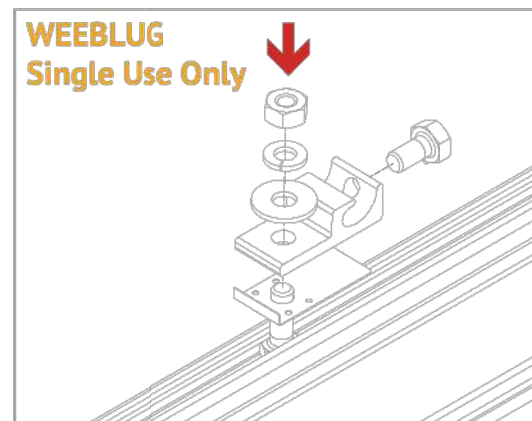


**GROUNDING LUG MOUNTING DETAILS:**

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**

GROUNDING LUG - BOLT SIZE & DRILL SIZE		
GROUND LUG	BOLT SIZE	DRILL SIZE
WEEBLug	1/4"	N/A - Place in Top SM Rail Slot
ILSCO Lug	#10-32	7/32"
<ul style="list-style-type: none"><li>Torque value depends on conductor size.</li><li>See product data sheet for torque value.</li></ul>		

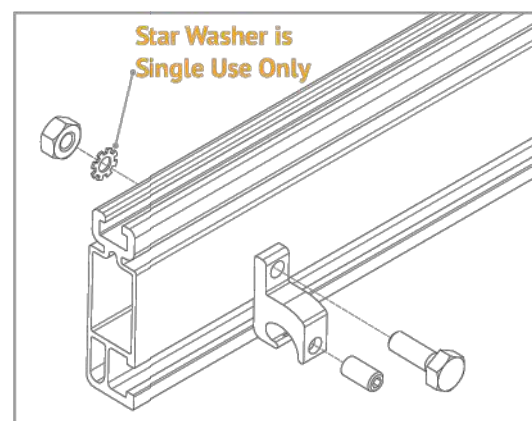
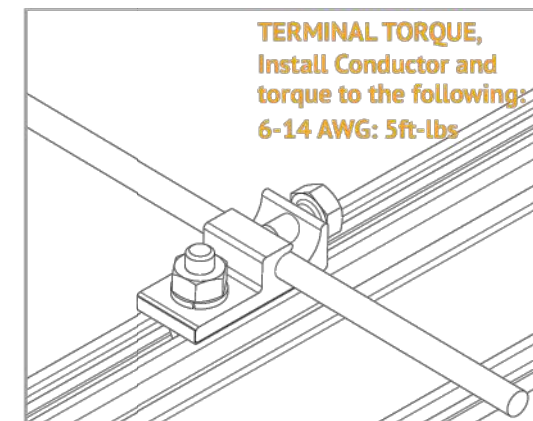


**WEEBLUG CONDUCTOR - UNIRAC P/N 008002S:**

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)**

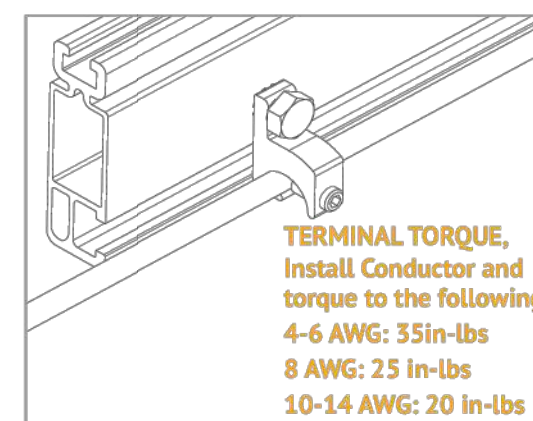
**See product data sheet for more details, Model No. WEEB-LUG-6.7**



**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**

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SPEC SHEETS

**SHEET SIZE**

ANSI B  
11" X 17"

**SHEET NUMBER**

PV-12



# APPENDIX A

## System Certification

### C

#### PAGE

### 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
REC	RECxxxTP72, RECxxxTP RECxxxPE72, RECxxxPE RECxxxTP2S(M)72, RECxxxTP2 BLK2, RECxxxTP2(M) RECxxxNP (N-PEAK) RECxxxAA(BLK)
Renesola	All 60-cell modules
Risen	RSM Series
S-Energy	SN72 & SN60 Series
Seraphim	SEG-6 & SRP-6 Series
Sharp	NU-SA & NU-SC Series
Silfab	SLA-M, SLA-P, SLG-M, SLG-P & BC Series SIL - ML, NL, BL, NT Series

Manufacture	Module Model / Series
Solaria	PowerXT
Solartech	STU HJT, STU PERC & Quantum PERC
SolarWorld	Sunmodule Protect, Sunmodule Plus/Pro
Suntech	STP
Suniva	MV Series & Optimus Series (35mm)
Sun Edison	F-Series, R-Series
SunPower	AC, X-Series, E-Series & P-Series
Talesun	TP572, TP596, TP654, TP660, TP672, Hipor M, Smart
Tesla	SC, SC B, SC B1, SC B2

Manufacture	Module Model / Series
Trina	PA05, PD05, DD05, DD06, DE06 PD14, PE14, DD14, DE14, DE15
TSMC	TS-150C2 CIGSw
Upsolar	UP-MxxxP, UP-MxxxM(-B)
URE	D7MxxxH8A, D7KxxxH8A, D7MxxxH7A, D7KxxxH7A
Vikram	Eldora, Somera, Ultima
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

- 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
- Please see the SM UL2703Construction Data Report at Unirac.com to ensure the exact solar module selected is approved for use with SM
- **Listed models can be used to achieve a Class A fire system rating, for steep slope applications, only with module fire typed 1, 2, 3, or 10. See appendix A, page A**



**Unicity**  
Solar Energy

UNICITY SOLAR ENERGY  
LICENSE # EC13010036  
ADDRESS: 4612 FLORIDA AVE  
PALM HARBOR, FL 34683 USA  
PHONE: 727-945-6060

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#### SHEET SIZE

ANSI B  
11" X 17"

#### SHEET NUMBER

PV-13



# Certificate of Compliance

Certificate: 70131735 Master Contract: 266909  
Project: 80111014 Date Issued: 2022-02-28  
Issued To: Unirac  
1411 Broadway NE  
Albuquerque, New Mexico, 87102  
United States

Attention: Klaus Nicolaedis

The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US or with adjacent indicator 'US' for US only or without either indicator for Canada only.



Issued by: Michael Hoffnagle  
Michael Hoffnagle

## 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

Models:	SM	-	SOLARMOUNT Flush-to-Roof is an extruded aluminum rail PV racking system that is installed parallel to the roof in landscape or portrait orientations.
---------	----	---	---



Certificate: 70131735  
Project: 80111014

Master Contract: 266909  
Date Issued: 2022-02-28

	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), 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:

Downward Design Load (lb/ft²)	113.5
Upward Design Load (lb/ft²)	50.7
Down-Slope Load (lb/ft²)	16.13

Test Loads:

Downward Load (lb/ft²)	170.20
Upward Load (lb/ft²)	76.07
Down-Slope Load (lb/ft²)	24.2

## Unirac Large Array

ULA is a ground mount system using the SolarMount (SM) platform for the bonding and grounding of PV modules. ULA aluminum components merge with SM rails and installer-supplied steel pipe. The SM rail system is secured to the horizontal Pipe using the Rail Bracket components. The Rear and Front cap secures the horizontal Pipe to the vertical Pipe. The Front cap is also used to secure the Cross brace. A Slider is attached to the vertical Pipe to secure the Cross brace. The SM rails, caps, slider, rail brackets, and cross braces materials are



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Solar Energy  
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## SHEET NAME

SPEC SHEETS

## SHEET SIZE

ANSI B  
11" X 17"

## SHEET NUMBER

PV-14



UNICITY SOLAR ENERGY  
LICENSE # EC13010036  
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PALM HARBOR, FL 34683 USA  
PHONE: 727-945-6060

January 20, 2021

Unirac  
1411 Broadway Blvd. NE  
Albuquerque, NM 87102

Attn.: Unirac - Engineering Department

Re: Engineering Certification for the Unirac U-Builder 2.0 SOLARMOUNT Flush Rail

PZSE, Inc. - Structural Engineers has reviewed the Unirac SOLARMOUNT rails, proprietary mounting system constructed from modular parts which is intended for rooftop installation of solar photovoltaic (PV) panels; and has reviewed the U-builder Online tool. This U-Builder software includes analysis for the SOLARMOUNT LIGHT rail, SOLARMOUNT STANDARD rail, and SOLARMOUNT HEAVY DUTY rail with Standard and Pro Series hardware. All information, data and analysis contained within are based on, and comply with the following codes and typical specifications:

1. 2020 Florida Building Code, by Florida Building Commission
2. Minimum Design Loads for Buildings and other Structures, ASCE/SEI 7-16
3. 2018 International Building Code, by International Code Council, Inc. w/ Provisions from SEAOC PV-2 2017.
4. 2018 International Residential Code, by International Code Council, Inc. w/ Provisions from SEAOC PV-2 2017.
5. AC428, Acceptance Criteria for Modular Framing Systems Used to Support Photovoltaic (PV) Panels, November 1, 2012 by ICC-ES.
6. 2015 Aluminum Design Manual, by The Aluminum Association, 2015

Following are typical specifications to meet the above code requirements:

<b>Design Criteria:</b>	Ground Snow Load = 0 - 100 (psf) Basic Wind Speed = 85 - 190 (mph) Roof Mean Height = 0 - 60 (ft) Roof Pitch = 0 - 45 (degrees) Exposure Category = B, C & D
<b>Attachment Spacing:</b>	Per U-builder Engineering report.
<b>Cantilever:</b>	Maximum cantilever length is L/3, where "L" is the span noted in the U-Builder online tool.
<b>Clearance:</b>	2" to 10" clear from top of roof to top of PV panel.
<b>Tolerance(s):</b>	1.0" tolerance for any specified dimension in this report is allowed for installation.
<b>Installation Orientation:</b>	See SOLARMOUNT Rail Flush Installation Guide. Landscape - PV Panel long dimension is parallel to ridge/eave line of roof and the PV panel is mounted on the long side. Portrait - PV Panel short dimension is parallel to ridge/eave line of roof and the PV panel is mounted on the short side.

1478 Stone Point Drive, Suite 190, Roseville, CA 95661  
T 916.961.3960 F 916.961.3965 W www.pzse.com  
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#### Components and Cladding Roof Zones:

The Components and Cladding Roof Zones shall be determined based on ASCE 7-16 Component and Cladding design.

- Notes:
- 1) U-builder Online tool analysis is only for Unirac SM SOLARMOUNT Rail Flush systems only and do not include roof capacity check.
  - 2) Risk Category II per ASCE 7-16.
  - 3) Topographic factor,  $k_{zt}$  is 1.0.
  - 4) Array Edge Factor  $Y_E = 1.5$
  - 5) Average parapet height is 0.0 ft.
  - 6) Wind speeds are LRFD values.
  - 7) Attachment spacing(s) apply to a seismic design category E or less.

#### Design Responsibility:

The U-Builder design software is intended to be used under the responsible charge of a registered design professional where required by the authority having jurisdiction. In all cases, this U-builder software should be used under the direction of a design professional with sufficient structural engineering knowledge and experience to be able to:

- Evaluate whether the U-Builder Software is applicable to the project, and
- Understand and determine the appropriate values for all input parameters of the U-Builder software.

This letter certifies that the Unirac SM SOLARMOUNT Rails Flush, when installed according to the U-Builder engineering report and the manufacture specifications, is in compliance with the above codes and loading criteria.

This certification excludes evaluation of the following components:

- 1) The structure to support the loads imposed on the building by the array; including, but not limited to: strength and deflection of structural framing members, fastening and/or strength of roofing materials, and/or the effects of snow accumulation on the structure.
- 2) The attachment of the SM SOLARMOUNT Rails to the existing structure.
- 3) The capacity of the solar module frame to resist the loads.

This requires additional knowledge of the building and is outside the scope of the certification of this racking system.

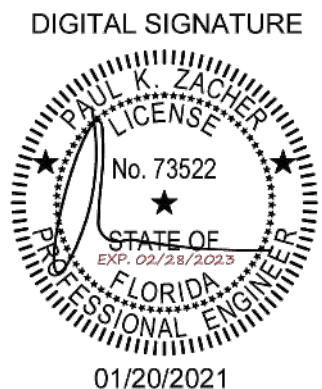
If you have any questions on the above, do not hesitate to call.

Prepared by:  
PZSE, Inc. - Structural Engineers  
Roseville, CA

THIS ITEM HAS BEEN ELECTRONICALLY SIGNED AND SEALED BY PAUL K. ZACHER, PE ON 01/20/2021 USING A SHA-1 AUTHENTICATION CODE.

PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SHA-1 AUTHENTICATION CODE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

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