GENERAL NOTES

CODES AND STANDARDS

1. ALL WORK SHALL COMPLY WITH 2017 NATIONAL ELECTRIC CODE (NEC), 2018 NORTH CAROLINA BUILDING CODE (NCBC), 2015 INTERNATIONAL PLUMBING CODE, 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 AN UTILITY INTERACTIVE SYSTEM WITH NO STORAGE BATTERIES.
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.
5. NO. OF SHINGLE LAYERS : 2

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 MANUFACTURERS' 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 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)-(B)] AND [NEC TABLE 310.15 (B)].
3. ADDITIONAL AC DISCONNECTS SHALL BE PROVIDED WHERE THE INVERTER IS NOT ADJACENT TO THE UTILITY AC DISCONNECT, OR NOT WITHIN SIGHT OF THE UTILITY AC DISCONNECT.
4. ALL EQUIPMENT SHALL BE INSTALLED ACCESSIBLE TO QUALIFIED PERSONNEL ACCORDING TO NEC APPLICABLE CODES.
5. ALL COMPONENTS ARE LISTED FOR THEIR PURPOSE AND RATED FOR OUTDOOR USAGE WHEN APPROPRIATE.

AERIAL VIEW

DESIGN CRITERIA

WIND SPEED: 115 MPH
GROUND SNOW LOAD: 15 PSF
WIND EXPOSURE FACTOR: C
SEISMIC DESIGN CATEGORY: B

SITE SPECIFICATIONS

OCCUPANCY - R3
CONSTRUCTION - V-B
ZONING: RESIDENTIAL

SCOPE OF WORK

INSTALLATION OF UTILITY INTERACTIVE PHOTOVOLTAIC SOLAR SYSTEM

7.15 kW DC PHOTOVOLTAIC SOLAR ARRAY
ROOF TYPE: Comp Shingle
MODULES: (22) Trina 325
INVERTER(S): Enphase IQ7 Microinverters,----
RACKING: Unirac SFM Infinity

SHEET INDEX

PV1 - COVER SHEET
PV2 - PROPERTY PLAN
PV3 - SITE PLAN
PV4 - EQUIPMENT & ATTACHMENT DETAIL
PV5 - ELECTRICAL SINGLE LINE DIAGRAM
PV6 - ELECTRICAL CALCULATIONS & ELECTRICAL NOTES
PV7 - MAIN BREAKER DERATE CALCS. (IF NEEDED)
PV8 - LABELS & LOCATIONS
PV9 - CUSTOM DIRECTORY PLACARD (IF NEEDED - NEC 690.56(B))

NOTICE TO CONTRACTOR
All construction must comply with current NC Building Codes and is subject to field inspection and verification.
APPROVED
Limited building only review
Permit holder responsible for full compliance with the code
07/15/2020
Harnett COUNTY NORTH CAROLINA

BLUE RAVEN SOLAR
1403 N RESEARCH WAY, BUILDING J
OREM, UT 84097
800-377-4480
WWW.BLUERAVENSOLAR.COM

NABCEP CERTIFIED
PV INSTALLATION PROFESSIONAL
Scott Gurney
PV-011719-015866

CONTRACTOR:
BRS FIELD OPS
385.498.6700

SITE INFORMATION:
Tim Smith
70 Kinsale Ct
Fuquay-Varina, North Carolina 27526
DC SYSTEM SIZE: 7.15 kW DC

DRAWING BY
DIN ENGINEERING

DATE
June 15, 2020

PROJECT NUMBER
78643538

SHEET NAME
COVER SHEET

PAGE NUMBER
PV1

REVISION
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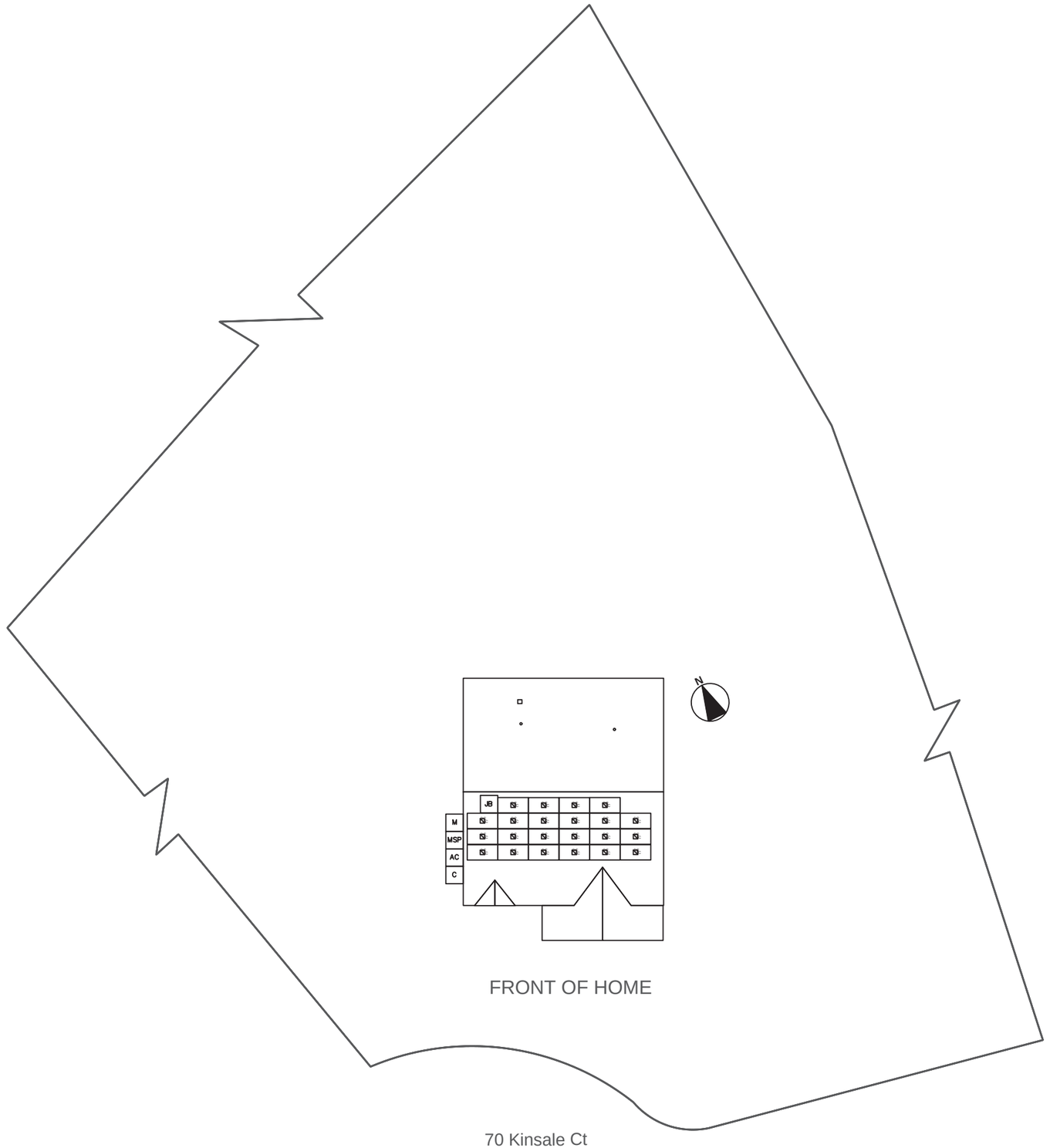

FRONT OF HOME

70 Kinsale Ct

LEGEND

INV	INVERTER & DC DISCONNECT
SUB	(E) SUBPANEL
LC	(N) LOAD CENTER
AC	AC DISCONNECT
M	UTILITY METER
MSP	MAIN SERVICE PANEL
JB	JUNCTION BOX
TS	TRANSFER SWITCH
C	COMBINER BOX/AGGREGATOR
PV	PV REVENUE METER
	FIRE SETBACK
	EMT CONDUIT RUN (TO BE DETERMINED IN FIELD)
	PV WIRE STRING
	PROPERTY LINE

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

0' 21' 42' 64' 128'

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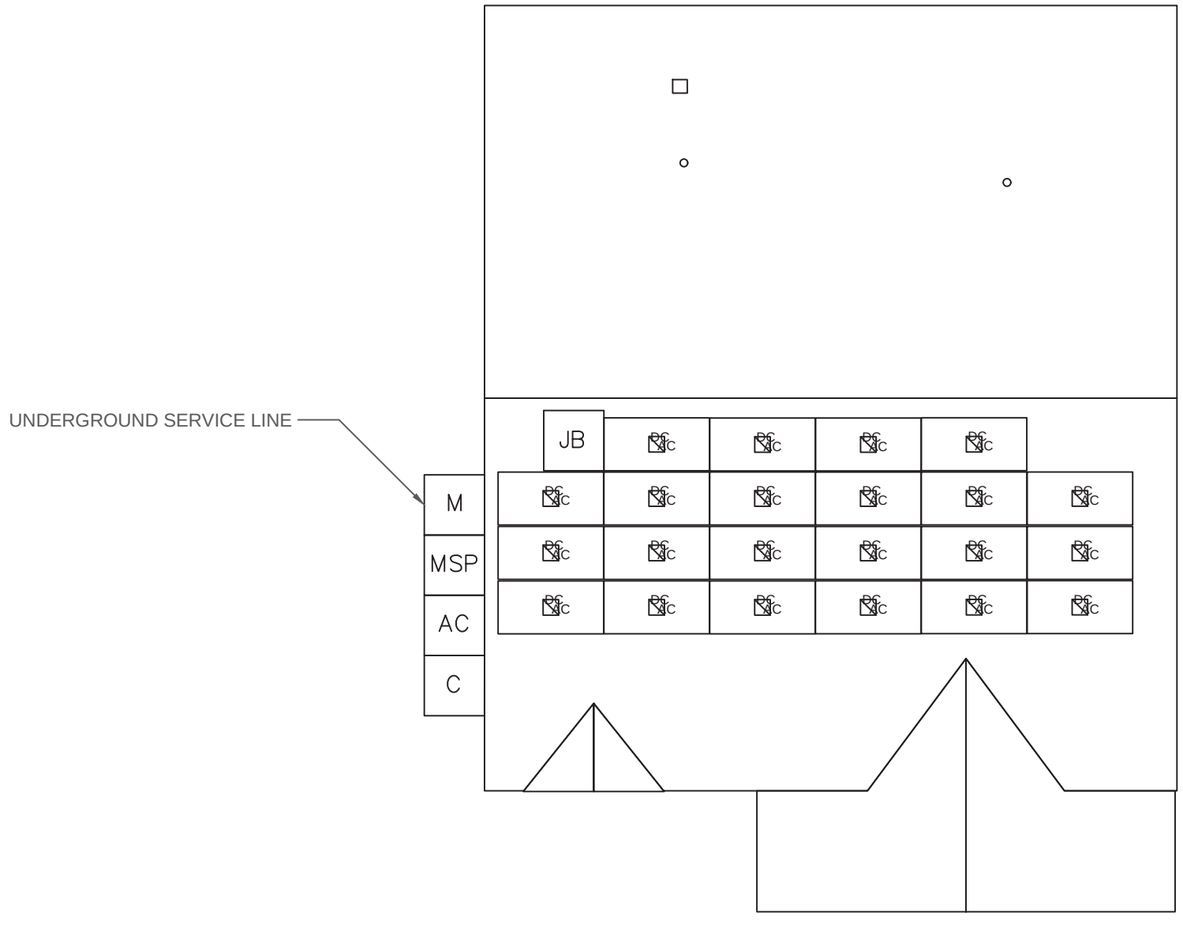
SHEET NAME
PROPERTY PLAN

PAGE NUMBER	REVISION
PV2	0



FRONT OF HOME

MP1
OF MODULES: 22
AZIMUTH:206°
PITCH:32°
TSRF:98%
AREA: 704.48 SQ. FT

LEGEND

- INV — INVERTER & DC DISCONNECT
- SUB — (E) SUBPANEL
- LC — (N) LOAD CENTER
- AC — AC DISCONNECT
- M — UTILITY METER
- MSP — MAIN SERVICE PANEL
- JB — JUNCTION BOX
- TS — TRANSFER SWITCH
- C — COMBINER BOX/AGGREGATOR
- PV — PV REVENUE METER
- FIRE SETBACK
- EMT CONDUIT RUN (TO BE DETERMINED IN FIELD)
- PV WIRE STRING
- PROPERTY LINE

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

0' 2' 4' 8' 16'

Sealed For Existing Roof & Attachment Only

NORTH CAROLINA PROFESSIONAL SEAL 035433 ENGINEER JOHN A. CALVERT

6/15/2020

Firm No. : D-0369

Digitally signed by John Calvert
Date: 2020.06.15 14:04:26 -06'00'

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SHEET NAME
SITE PLAN

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PV3

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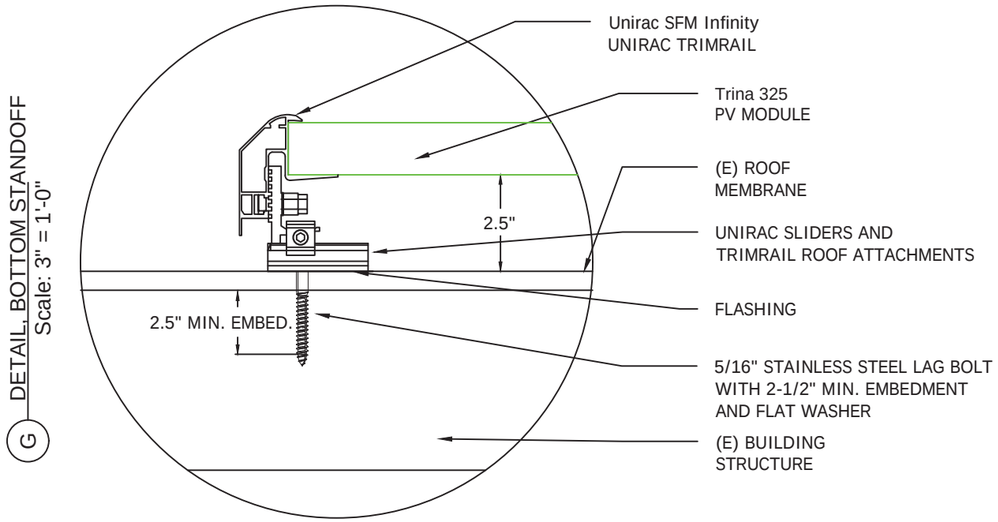
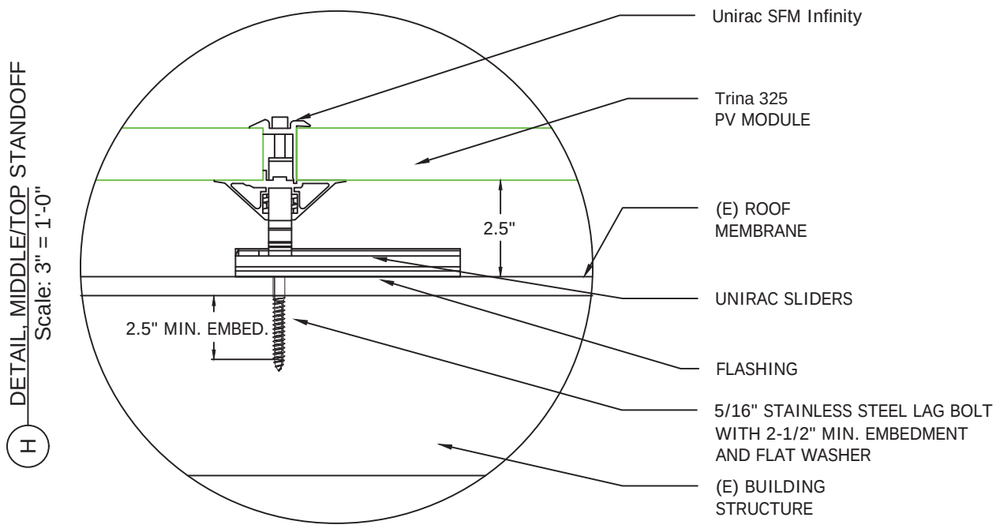
0

PV ARRAY INFORMATION

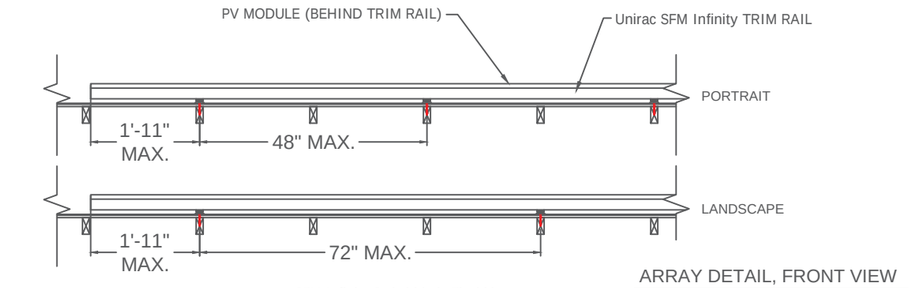
PV MODULE COUNT:	22 MODULES
# OF ATTACHMENT POINTS:	33
ARRAY AREA:	Module Count x 17.51ft² = 385.2ft²
ROOF AREA:	1656.8ft²
% OF ARRAY/ROOF:	23.3%
ARRAY WEIGHT:	Module Count x 50lbs = 1100.0lbs
DISTRIBUTED LOAD:	Array Weight ÷ Array Area = 2.86 lbs/ft²
POINT LOAD:	Array Weight ÷ Attachments = 33.3lbs/attachment



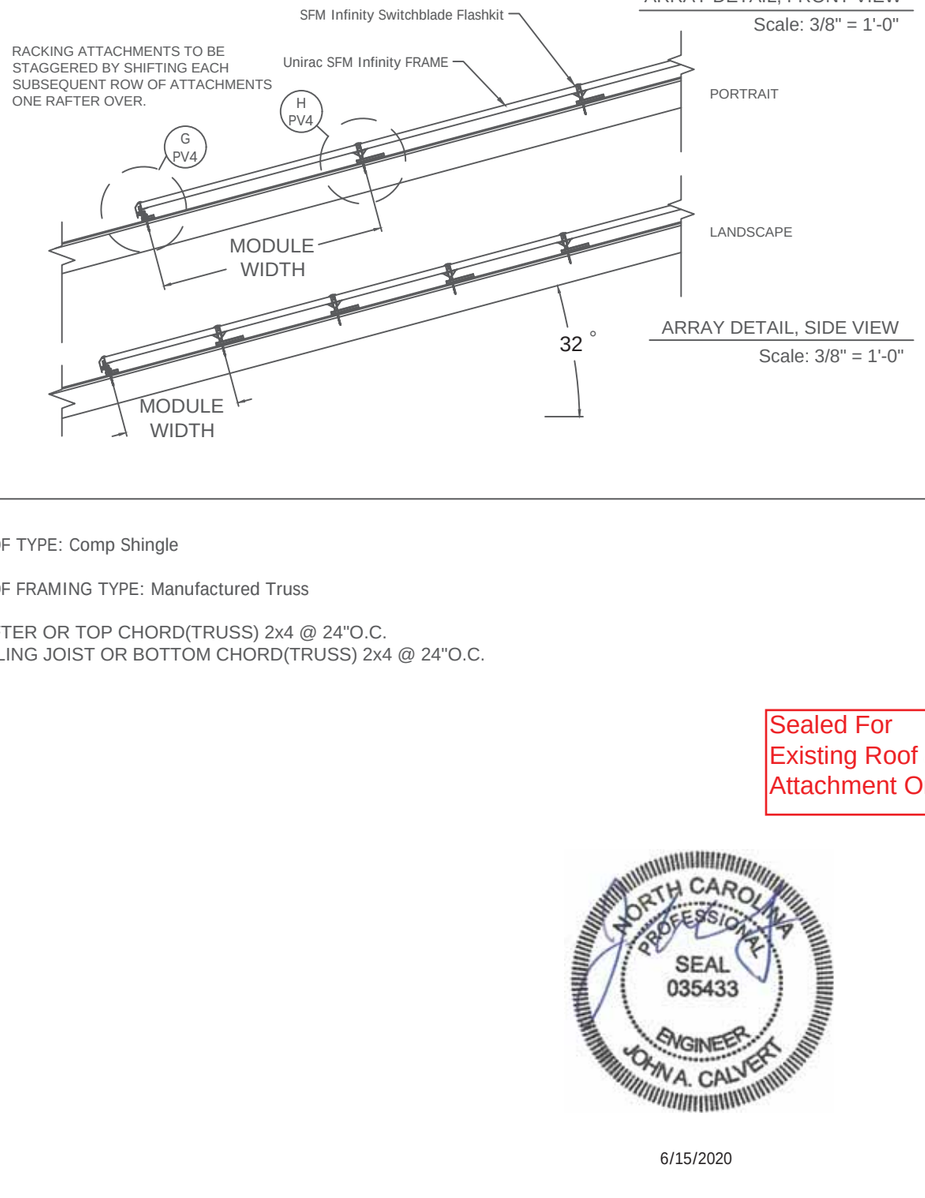
G DETAIL, BOTTOM STANDOFF
Scale: 3" = 1'-0"



H DETAIL, MIDDLE/TOP STANDOFF
Scale: 3" = 1'-0"



ARRAY DETAIL, FRONT VIEW
Scale: 3/8" = 1'-0"



ARRAY DETAIL, SIDE VIEW
Scale: 3/8" = 1'-0"

ROOF TYPE: Comp Shingle

ROOF FRAMING TYPE: Manufactured Truss

RAFTER OR TOP CHORD(TRUSS) 2x4 @ 24"O.C.
CEILING JOIST OR BOTTOM CHORD(TRUSS) 2x4 @ 24"O.C.

Sealed For
Existing Roof &
Attachment Only

6/15/2020

Firm No. : D-0369

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SITE INFORMATION:
Tim Smith
70 Kinsale Ct
Fuquay-Varina, North Carolina 27526
DC SYSTEM SIZE: 7.15 kW DC

DRAWING BY
DIN ENGINEERING

DATE
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SHEET NAME
EQUIP. DETAIL

PAGE NUMBER
PV4

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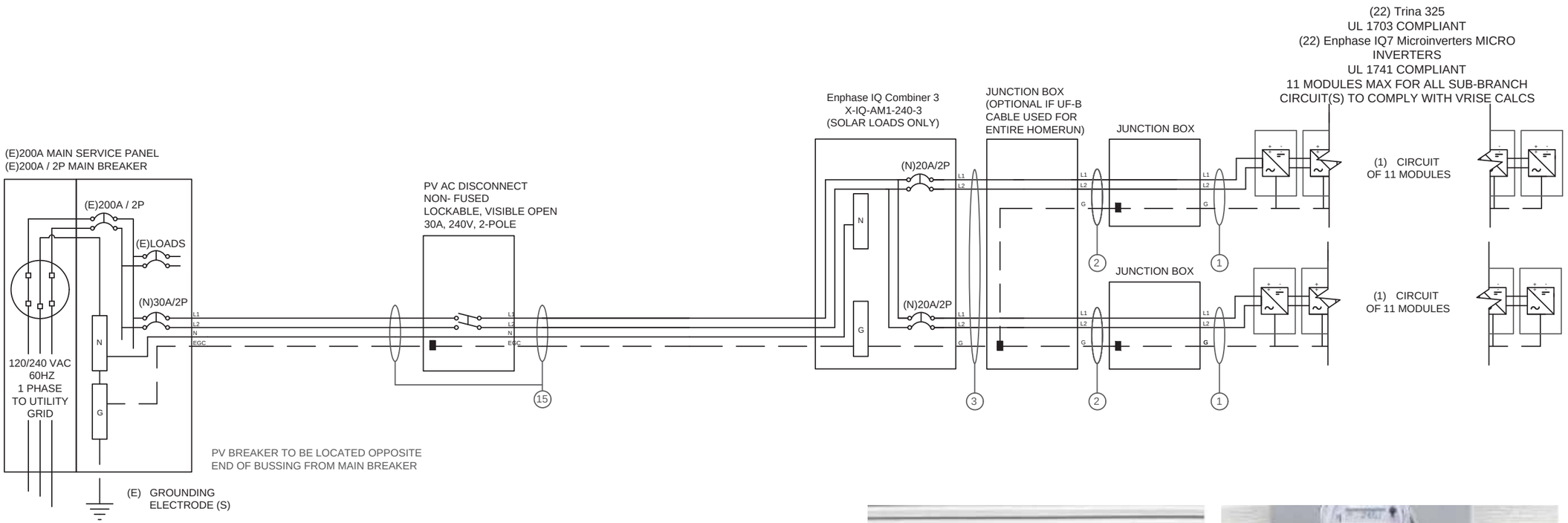
15	(1) 10 AWG THHN/THWN-2, CU., BLACK (L1) (1) 10 AWG THHN/THWN-2, CU., RED (L2) (1) 10 AWG THHN/THWN-2, CU., WHITE (N) (1) 10 AWG THHN/THWN-2, CU., GREEN (EGC) (1) 3/4 INCH EMT	22.0 A AC 240 V AC EXTERIOR	3	(2) 10 AWG THHN/THWN-2, CU., BLACK (L1) (2) 10 AWG THHN/THWN-2, CU., RED (L2) (1) 10 AWG THHN/THWN-2, CU., GREEN (EGC) (1) 3/4 INCH EMT	MAX 11.0 A AC 240 V AC EXTERIOR	2	(1) 10 - 2 UF-B (or NM) W/G, THHN/THWN-2, SC	MAX 11.0 A AC 240 V AC INTERIOR	1	(1) 12-2 TC-ER, THHN/THWN-2, CU. (1) 6 AWG BARE, CU (EGC)	MAX 11.0 A AC 240 V AC EXTERIOR

22 INVERTERS x 240 W AC = 5.28 kW AC
PANEL WATTAGE = 325 W DC



INTERCONNECTION NOTES

1. ONE OF THE METHODS THAT FOLLOWS SHALL BE USED TO DETERMINE THE RATINGS OF BUSBARS AND PANELBOARDS. (a) THE SUM OF 125 PERCENT OF THE INVERTER(S) OUTPUT CIRCUIT CURRENT AND THE RATING OF THE OVERCURRENT DEVICE PROTECTING THE BUSBAR SHALL NOT EXCEED THE AMPACITY OF THE BUS BAR. (b) WHERE TWO SOURCES, ONE THE UTILITY AND THE OTHER AN INVERTER ARE LOCATED AT OPPOSITE ENDS OF A BUSBAR THAT CONTAINS LOADS, THE SUM OF 125 PERCENT OF THE INVERTER(S) OUTPUT CIRCUIT CURRENT AND THE RATING OF THE OVERCURRENT DEVICE PROTECTING THE BUSBAR SHALL NOT EXCEED 120 PERCENT OF THE AMPACITY OF THE BUSBAR [NEC 705.12].

DISCONNECT NOTES

1. DISCONNECTING SWITCHES SHALL BE WIRED SUCH THAT WHEN THE SWITCH IS OPENED THE CONDUCTORS REMAINING LIVE ARE CONNECTED TO THE TERMINALS MARKED “LINE SIDE” (TYPICALLY THE UPPER TERMINALS)
2. AC DISCONNECT MUST BE ACCESSIBLE TO QUALIFIED UTILITY PERSONNEL, BE LOCKABLE, AND BE A VISIBLE-BREAK SWITCH

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DC SYSTEM SIZE: 7.15 kW DC

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SHEET NAME
ELEC. 3 LINE DIAG.

PAGE NUMBER
PV5

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MODULE SPECIFICATIONS	Trinasolar 325 TSM-DD06M.05(II)
RATED POWER (STC)	325 W
MODULE VOC	40.4 V DC
MODULE VMP	33.6 V DC
MODULE IMP	9.67 A DC
MODULE ISC	10.3 A DC
VOC CORRECTION	-0.26 %/°C
VMP CORRECTION	-0.36 %/°C
SERIES FUSE RATING	20 A DC
ADJ. MODULE VOC @ ASHRAE LOW TEMP	44.3 V DC
ADJ. MODULE VMP @ ASHRAE 2% AVG. HIGH TEMP	28.6 V DC

MICROINVERTER SPECIFICATIONS	Enphase IQ7 Microinverters
POWER POINT TRACKING (MPPT) MIN/MAX	22 - 48 V DC
MAXIMUM INPUT VOLTAGE	48 V DC
MAXIMUM DC SHORT CIRCUIT CURRENT	15 A DC
MAXIMUM USABLE DC INPUT POWER	350 W
MAXIMUM OUTPUT CURRENT	1 A AC
AC OVERCURRENT PROTECTION	20 A
MAXIMUM OUTPUT POWER	240 W
CEC WEIGHTED EFFICIENCY	97 %

AC PHOTOVOLATIC 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	Fuquay-Varina
WEATHER STATION	RALEIGH DURHAM INTERNATIONAL
ASHRAE EXTREME LOW TEMP (°C)	-12
ASHRAE 2% AVG. HIGH TEMP (°C)	34

SYSTEM ELECTRICAL SPECIFICATIONS	CIR 1	CIR 2	CIR 3	CIR 4	CIR 5	CIR 6
NUMBER OF MODULES PER MPPT	11	11				
DC POWER RATING PER CIRCUIT (STC)	3575	3575				
TOTAL MODULE NUMBER	22 MODULES					
STC RATING OF ARRAY	7150W DC					
AC CURRENT @ MAX POWER POINT (IMP)	11.0	11.0				
MAX. CURRENT (IMP X 1.25)	13.75	13.75				
OCPD CURRENT RATING PER CIRCUIT	20	20				
MAX. COMB. ARRAY AC CURRENT (IMP)	22.0					
MAX. ARRAY AC POWER	5280W AC					

AC VOLTAGE RISE CALCULATIONS	DIST (FT)	COND.	∕RISE(V)	VEND(V'	%VRISE	IQ7-11
VRISE SEC. 1 (MICRO TO JBOX)	39.6	12 Cu.	1.76	241.76	0.73%	
VRISE SEC. 2 (JBOX TO COMBINER BOX)	40	10 Cu.	1.12	241.12	0.47%	
VRISE SEC. 3 (COMBINER BOX TO POI)	10	10 Cu.	0.56	240.56	0.23%	
TOTAL VRISE			3.44	243.44	1.43%	

PHOTOVOLTAIC AC DISCONNECT OUTPUT LABEL (NEC 690.54)	
AC OUTPUT CURRENT	22.0 A AC
NOMINAL AC VOLTAGE	240 V AC

CONDUCTOR SIZE CALCULATIONS					
MICROINVERTER TO JUNCTION BOX (1)	MAX. SHORT CIRCUIT CURRRENT (ISC) =	11.0	A AC		
	MAX. CURRENT (ISC X1.25) =	13.8	A AC		
	CONDUCTOR (TC-ER, COPPER (90°C)) =	12	AWG		
	CONDUCTOR RATING =	30	A		
	AMB. TEMP. AMP. CORRECTION =	0.96			
	ADJUSTED AMP. =	28.8	>	13.8	
JUNCTION BOX TO JUNCTION BOX (2)	MAX. SHORT CIRCUIT CURRRENT (ISC) =	11.0	A AC		
	MAX. CURRENT (ISC X1.25) =	13.8	A AC		
	CONDUCTOR (UF-B, COPPER (60°C)) =	10	AWG		
	CONDUCTOR RATING =	30	A		
	CONDUIT FILL DERATE =	1			
	AMB. TEMP. AMP. CORRECTION =	0.96			
	ADJUSTED AMP. =	28.8	>	13.8	
JUNCTION BOX TO COMBINER BOX (3)	MAX. SHORT CIRCUIT CURRRENT (ISC) =	11.0	A AC		
	MAX. CURRENT (ISC X1.25) =	13.8	A AC		
	CONDUCTOR (UF-B, COPPER (60°C)) =	10	AWG		
	CONDUCTOR RATING =	30	A		
	CONDUIT FILL DERATE =	0.8			
	AMB. TEMP. AMP. CORRECTION =	0.96			
	ADJUSTED AMP. =	23.04	>	13.8	
COMBINER BOX TO MAIN PV OCPD (15)	INVERTER RATED AMPS =	22.0	A AC		
	MAX. CURRENT (RATED AMPS X1.25) =	27.5	A AC		
	CONDUCTOR (THWN-2, COPPER (75°C TERM.)) =	10	AWG		
	CONDUCTOR RATING =	35	A		
	CONDUIT FILL DERATE =	1			
	AMB. TEMP. AMP. CORRECTION =	0.96			
	ADJUSTED AMP. =	33.6	>	27.5	

GROUNDING NOTES

1. A GROUNDING ELECTRODE SYSTEM IN ACCORDANCE WITH [NEC 690-47] AND [NEC 250-50] THROUGH [NEC 250-60] SHALL BE PROVIDED. PER NEC, GROUNDING ELECTRODE SYSTEM OF EXISTING BUILDING MAY BE USED AND BONDED TO 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 250-64B. THE GROUNDING ELECTRODE CONDUCTOR WILL BE CONTINUOUS, EXCEPT FOR SPLICES OR JOINTS AT BUSBARS WITHIN LISTED EQUIPMENT PER [NEC 250.64C.].
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 CONNECTIONS 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 DEVISES 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 SIZE ACCORDING TO [NEC 690.45] AND BE A MINIMUM OF #10AWG WHEN NOT EXPOSED TO DAMAGE (#6AWG 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 #8AWG WHEN INSULATED, #6AWG WHEN EXPOSED TO DAMAGE.
15. EXPOSED NON-CURRENT CARRYING METAL PARTS OF MODULE FRAMES, EQUIPMENTS, AND CONDUCTOR ENCLOSURES SHALL BE GROUNDED IN ACCORDANCE WITH 250.134 OR 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). 300.4
5. SOLADECK JUNCTION BOXES MOUNTED FLUSH W/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 690.13 AND 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).

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WWW.BLUERAVENSOLAR.COM

NABCEP CERTIFIED
PV INSTALLATION PROFESSIONAL
Scott Gurney
PV-011719-015866

CONTRACTOR:
BRS FIELD OPS
385.498.6700

SITE INFORMATION:
Tim Smith
70 Kinsale Ct
Fuquay-Varina, North Carolina 27526
DC SYSTEM SIZE: 7.15 kW DC

DRAWING BY
DIN ENGINEERING

DATE
June 15, 2020

PROJECT NUMBER
78643538

SHEET NAME
ELEC. CALCS.

PAGE NUMBER
PV6

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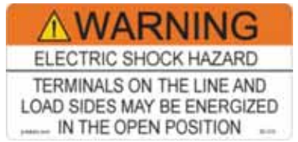
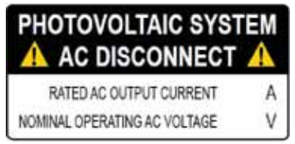


LABEL 1
FOR PV DISCONNECTING MEANS WHERE ALL TERMINALS OF THE DISCONNECTING MEANS MAY BE ENERGIZED IN THE OPEN POSITION.
[NEC 690.13(B), NEC 705.22]

LABEL 2
AT EACH DC DISCONNECTING MEANS, INCLUDING THE DC DISCONNECT AT THE INVERTER.
[NEC 690.53, NEC 690.13(B)]



LABEL 3
AT POINT OF INTERCONNECTION, MARKED AT AC DISCONNECTING MEANS.
[NEC 690.54, NEC 690.13 (B)]

LABEL 4
IF INTERCONNECTING ON THE LOAD SIDE, INSTALL THIS LABEL ANYWHERE THAT IS POWERED BY BOTH THE UTILITY AND THE SOLAR PV SYSTEM: THE MAIN SERVICE PANEL AND SUB-PANELS.
[NEC 705.12(B)(3)]

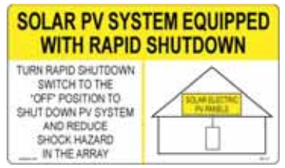
LABEL 5
PLACED ADJACENT TO THE BACK-FED BREAKER FROM THE INVERTER IF TIE IN CONSISTS OF LOAD SIDE CONNECTION TO BUSBAR.
[NEC 705.12(B)(2)(3)(b)]

LABEL 6
(ONLY IF 3 OR MORE SUPPLY SOURCES TO A BUSBAR)
SIGN LOCATED AT LOAD CENTER IF IT CONTAINS 3 OR MORE POWER SOURCES.
[NEC 705.12(B)(2)(3)(C)]

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 NATIONAL ELECTRIC CODE, OSHA STANDARD 19010.145, ANSI Z535.
3. MATERIAL BASED ON THE REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION.
4. LABELS TO BE OF SUFFICIENT DURABILITY TO WITHSTAND THE ENVIRONMENT INVOLVED AND SHALL NOT BE HANDWRITTEN [NEC 110.21]
5. LABELS TO BE A MINIMUM LETTER HEIGHT OF 3/8", WHITE ON RED BACKGROUND; REFLECTIVE, AND PERMANENTLY AFFIXED [IFC 605.11.1.1]

LABEL 7
AT DIRECT-CURRENT EXPOSED RACEWAYS, CABLE TRAYS, COVERS AND ENCLOSURES OF JUNCTION BOXES, AND OTHER WIRING METHODS; SPACED AT MAXIMUM 10FT SECTION OR WHERE SEPARATED BY ENCLOSURES, WALLS, PARTITIONS, CEILINGS, OR FLOORS.
[NEC 690.31(G)(3&4)]

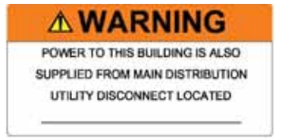


LABEL 8
FOR PV SYSTEMS THAT SHUT DOWN THE ARRAY AND CONDUCTORS LEAVING THE ARRAY:
SIGN TO BE LOCATED ON OR NO MORE THAN 3 FT AWAY FROM SERVICE DISCONNECTING MEANS TO WHICH THE PV SYSTEMS ARE CONNECTED AND SHALL INDICATE THE LOCATION OF ALL IDENTIFIED RAPID SHUTDOWN SWITCHES IF NOT AT THE SAME LOCATION.
[NEC 690.56(C)(1)(A)]

LABEL 9
FOR PV SYSTEMS THAT ONLY SHUT DOWN CONDUCTORS LEAVING THE ARRAY:
SIGN TO BE LOCATED ON OR NO MORE THAN 3 FT AWAY FROM SERVICE DISCONNECTING MEANS TO WHICH THE PV SYSTEMS ARE CONNECTED AND SHALL INDICATE THE LOCATION OF ALL IDENTIFIED RAPID SHUTDOWN SWITCHES IF NOT AT THE SAME LOCATION.
[NEC 690.56(C)(1)(B)]

LABEL 10
SIGN LOCATED AT RAPID SHUT DOWN DISCONNECT SWITCH [NEC 690.56(C)(3)].

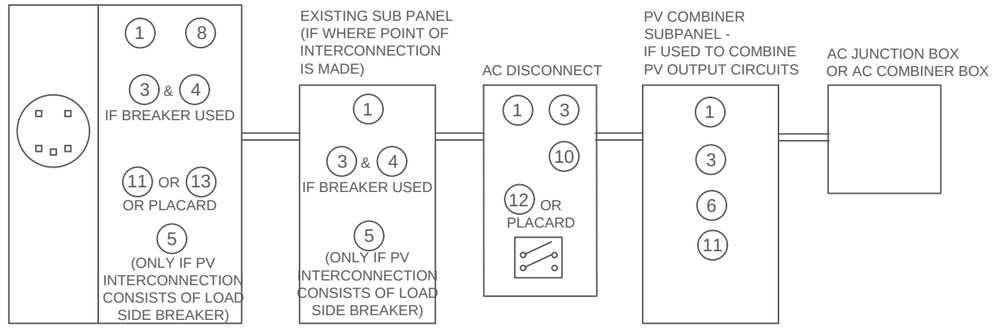
LABEL 11
PERMANENT DIRECTORY TO BE LOCATED AT MAIN SERVICE EQUIPMENT LOCATION IF ALL ELECTRICAL POWER SOURCE DISCONNECTING MEANS (SOLAR ARRAY RAPID SHUTDOWN SWITCH) ARE GROUPED AND IN LINE OF SITE OF MAIN SERVICE DISCONNECTING MEANS.
[NEC 690.56(C) & NEC 705.10].



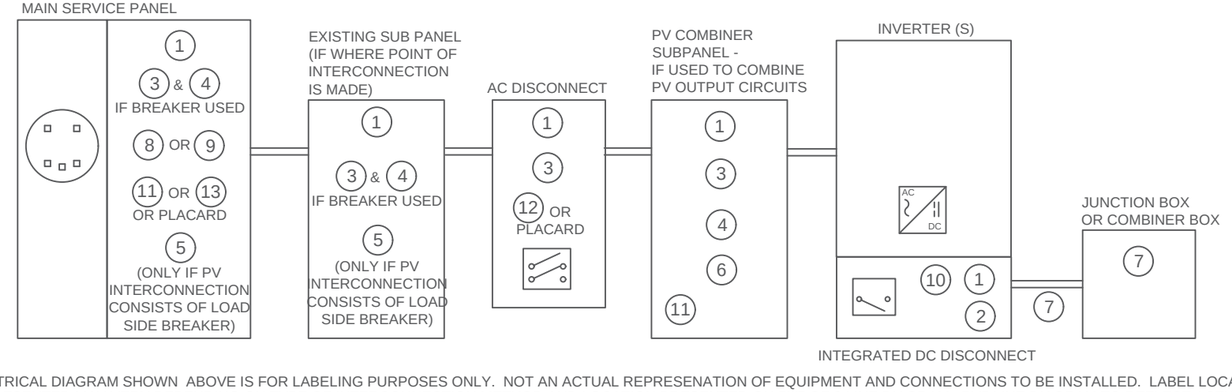
LABEL 12
PERMANENT DIRECTORY TO BE LOCATED AT SOLAR ARRAY RAPID SHUTDOWN SWITCH DENOTING THE LOCATION OF THE SERVICE EQUIPMENT LOCATION IF SOLAR ARRAY RAPID SHUT DOWN DISCONNECT SWITCH IS NOT GROUPED AND WITHIN LINE OF SITE OF MAIN SERVICE DISCONNECTING MEANS.
[NEC 705.10]

LABEL 13
PERMANENT DIRECTORY TO BE LOCATED AT MAIN SERVICE EQUIPMENT DENOTING THE LOCATION OF THE PV RAPID SHUTDOWN SYSTEM DISCONNECTING MEANS IF SOLAR ARRAY RAPID SHUT DOWN DISCONNECT SWITCH IS NOT GROUPED AND WITHIN LINE OF SITE OF MAIN SERVICE DISCONNECTING MEANS. [NEC 705.10, NEC 690.56(C)(1)]

LABELING DIAGRAM FOR MICRO INV.:



LABELING DIAGRAM FOR STRING INV. / DC OPTIMIZER INV.:



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

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SITE INFORMATION:
Tim Smith
70 Kinsale Ct
Fuquay-Varina, North Carolina 27526
DC SYSTEM SIZE: 7.15 kW DC

DRAWING BY
DIN ENGINEERING

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Data Sheet
Enphase Microinverters
Region: AMERICAS

Enphase IQ 7 and IQ 7+ Microinverters

The high-powered smart grid-ready **Enphase IQ 7 Micro™** and **Enphase IQ 7+ Micro™** dramatically simplify the installation process while achieving the highest system efficiency.

Part of the Enphase IQ System, the IQ 7 and IQ 7+ Microinverters integrate with the Enphase IQ Envoy™, Enphase IQ Battery™, and the Enphase Enlighten™ monitoring and analysis software.

IQ Series Microinverters extend the reliability standards set forth by previous generations and undergo over a million hours of power-on testing, enabling Enphase to provide an industry-leading warranty of up to 25 years.

Easy to Install

- Lightweight and simple
- Faster installation with improved, lighter two-wire cabling
- Built-in rapid shutdown compliant (NEC 2014 & 2017)

Productive and Reliable

- Optimized for high powered 60-cell and 72-cell* modules
- More than a million hours of testing
- Class II double-insulated enclosure
- UL listed

Smart Grid Ready

- Complies with advanced grid support, voltage and frequency ride-through requirements
- Remotely updates to respond to changing grid requirements
- Configurable for varying grid profiles
- Meets CA Rule 21 (UL 1741-SA)

* The IQ 7+ Micro is required to support 72-cell modules.

Enphase IQ 7 and IQ 7+ Microinverters

INPUT DATA (DC)	IQ7-60-2-US		IQ7PLUS-72-2-US	
Commonly used module pairings[1]	235 W - 350 W +		235 W - 440 W +	
Module compatibility	60-cell PV modules only		60-cell and 72-cell PV modules	
Maximum input DC voltage	48 V		60 V	
Peak power tracking voltage	27 V - 37 V		27 V - 45 V	
Operating range	16 V - 48 V		16 V - 60 V	
Min/Max start voltage	22 V / 48 V		22 V / 60 V	
Max DC short circuit current (module Isc)	15 A		15 A	
Overvoltage class DC port	II		II	
DC port backfeed current	0 A		0 A	
PV array configuration	1 x 1 ungrounded array; No additional DC side protection required; AC side protection requires max 20 per branch circuit			
OUTPUT DATA (AC)	**IQ 7 Microinverter**		**IQ 7+ Microinverter**	
Peak output power	250 VA		295 VA	
Maximum continuous output power	240 VA		290 VA	
Nominal (L-L) voltage/range[2]	240 V / 211-264 V	208 V / 183-229 V	240 V / 211-264 V	208 V / 183-229 V
Maximum continuous output current	1.0 A (240 V)	1.15 A (208 V)	1.21 A (240 V)	1.39 A (208 V)
Nominal frequency	60 Hz		60 Hz	
Extended frequency range	47 - 68 Hz		47 - 68 Hz	
AC short circuit fault current over 3 cycles	5.8 Arms		5.8 Arms	
Maximum units per 20 A (L-L) branch circuit[3]	16 (240 VAC)	13 (208 VAC)	13 (240 VAC)	11 (208 VAC)
Overvoltage class AC port	III		III	
AC port backfeed current	18 mA		18 mA	
Power factor setting	1.0		1.0	
Power factor (adjustable)	0.85 leading ... 0.85 lagging		0.85 leading ... 0.85 lagging	
EFFICIENCY	**@240 V**	**@208 V**	**@240 V**	**@208 V**
Peak efficiency	97.6 %	97.6 %	97.5 %	97.3 %
CEC weighted efficiency	97.0 %	97.0 %	97.0 %	97.0 %
MECHANICAL DATA				
Ambient temperature range	-40ºC to +65ºC			
Relative humidity range	4% to 100% (condensing)			
Connector type	MC4 (or Amphenol H4 UTX with additional Q-DCC-5 adapter)			
Dimensions (HxWxD)	212 mm x 175 mm x 30.2 mm (without bracket)			
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			
Environmental category / UV exposure rating	NEMA Type 6 / outdoor			
FEATURES				
Communication	Power Line Communication (PLC)			
Monitoring	Enlighten Manager and MyEnlighten monitoring options. Both options require installation of an Enphase IQ Envoy.			
Disconnecting means	The AC and DC connectors have been evaluated and approved by UL for use as the load-break disconnect required by NEC 690.			
Compliance	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. 107.1-01 This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC-2014 and NEC-2017 section 690.12 and C22.1-2015 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according manufacturer's instructions.			

1. No enforced DC/AC ratio. See the compatibility calculator at https://enphase.com/en-us/support/module-compatibility.
2. Nominal voltage range can be extended beyond nominal if required by the utility.
3. Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

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Mono Multi Solutions

This is the planned module at this time, but market availability may require us to change to another 60 cell 300W+ module.

THE

Residential Module

MULTI-BUSBAR 120 HALF-CELL BOB MODULE

PRODUCTS	BACKSHEET COLOR	POWER RANGE
TSM-DD06M.05(II)	Black	310-335W

FRAME COLOR: Black

120-Cell
MONOCRYSTALLINE MODULE

310-335W
POWER OUTPUT RANGE

19.7%
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 beneÿcial collaborations with installers, developers, distributors and other partners in driving smart energy together.

Comprehensive Products and System Certificates

IEC61215/IEC61730/IEC61701/IEC62716
ISO 9001: Quality Management System
ISO 14001: Environmental Management System
ISO14064: Greenhouse Gases Emissions Veriÿcation
OHSAS 18001: Occupation Health and Safety Management System

Trinasolar

High power output

- Reduce BOS cost with high power bin and module efficiency
- New cell string layout and split J-box location reduces the energy loss caused by inter-row shading
- Lower resistance of half-cut cells and increased MBB (Multi Busbar) reflectance ensure higher power

High energy generation, low LCOE

- Excellent 3rd party validated IAM and low light performance with cell process and module material optimization
- Low Pmax temp coefficient (-0.36%) increases energy production
- Better anti-shading performance and lower operating temperature

Outstanding visual appearance, easy to install

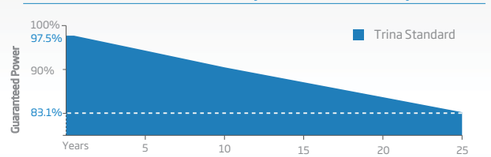
- Designed for superior rooftop aesthetics
- Thinner wires give a eye cacthing all black look
- Safe and easy to transport, handle, and install

Certified to perform in highly challenging environment

- High PID resistance through cell process and module material control
- Resistant to salt, acid, sand, and ammonia
- Over 30 in-house tests (UV, TC, HF etc)
- Certified to 5400 Pa positive load and 2400 Pa negative load

PERFORMANCE WARRANTY

10 Year Product Warranty · 25 Year Power Warranty



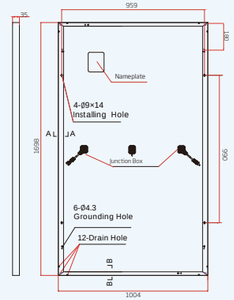
From the 2nd year to the 25th year, the average annual power decline will be no more than 0.6%.

Trinasolar

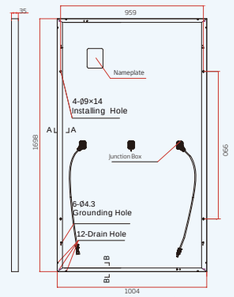
Residential Module

MULTI-BUSBAR 120 HALF-CELL BOB MODULE

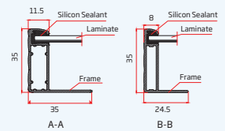
DIMENSIONS OF PV MODULE(mm)



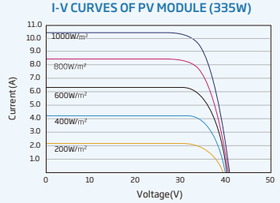
String Inverter Configuration



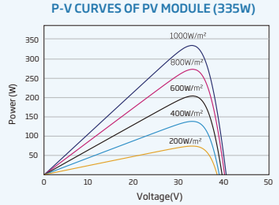
Microinverter or Optimizer Configuration



I-V CURVES OF PV MODULE (335W)



P-V CURVES OF PV MODULE (335W)



ELECTRICAL DATA (STC)

Peak Power Watts-P_{MAX} (Wp)*	310	315	320	325	330	335
Power Output Tolerance-P_{MAX} (W)	0 ~ +5					
Maximum Power Voltage-V_{MPP} (V)	33.0	33.2	33.4	33.6	33.8	34.0
Maximum Power Current-I_{MPP} (A)	9.40	9.49	9.56	9.67	9.76	9.85
Open Circuit Voltage-V_{OC} (V)	39.9	40.1	40.3	40.4	40.6	40.7
Short Circuit Current-I_{SC} (A)	10.03	10.12	10.20	10.30	10.40	10.50
Module Efficiency η_m(%)	18.2	18.5	18.8	19.1	19.4	19.7

STC: Irradiance 1000W/m², Cell Temperature 25°C, Air Mass AM1.5.
*Measuring tolerance: ±3%.

ELECTRICAL DATA (NMOT)

Maximum Power-P_{MAX} (Wp)	235	238	242	246	250	254
Maximum Power Voltage-V_{MPP} (V)	31.0	31.2	31.4	31.6	31.7	31.9
Maximum Power Current-I_{MPP} (A)	7.57	7.64	7.71	7.79	7.86	7.94
Open Circuit Voltage-V_{OC} (V)	37.6	37.8	38.0	38.1	38.3	38.4
Short Circuit Current-I_{SC} (A)	8.08	8.15	8.22	8.30	8.38	8.46

NMOT: Irradiance at 800W/m², Ambient Temperature 20°C, Wind Speed 1m/s.

MECHANICAL DATA

Solar Cells	Monocrystalline
Cell Orientation	120 cells (6× 20)
Module Dimensions	1698 × 1004 × 35 mm (66.85× 39.53 × 1.38 inches)
Weight	18.7kg (41.2lb)
Glass	3.2mm (0.13 inches), High Transmission, AR Coated Tempered Glass
Encapsulant Material	EVA
Backsheet	Black
Frame	35 mm (1.38 inches) Anodized Aluminium Alloy
J-Box	IP 68 rated
Cables	Photovoltaic Technology Cable 4.0mm² (0.006 inches²) Portrait: N 140mm/P 285mm (5.51/11.22 inches) Landscape: N 1200 mm /P 1200 mm (47.24/47.24 inches)
Connector	MC4

TEMPERATURE RATINGS

NMOT(Nominal Module Operating Temperature)	41°C (±3°C)
Temperature Coefficient of P_{MAX}	- 0.36%/°C
Temperature Coefficient of V_{OC}	- 0.26%/°C
Temperature Coefficient of I_{SC}	0.04%/°C

MAXIMUM RATINGS

Operational Temperature	-40~+85°C
Maximum System Voltage	1000V DC (IEC) 1000V DC (UL)
Max Series Fuse Rating	20A

(Do not connect Fuse in Combiner Box with two or more strings in parallel connection)

WARRANTY

10 year Product Workmanship Warranty
25 year Power Warranty

(Please refer to product warranty for details)

PACKAGING CONFIGURATION

Modules per box: 30 pieces
Modules per 40'container: 780 pieces

Trinasolar

CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.

Version number: TSM_DD06M.05(II)_EN_2019_B
www.trinasolar.com

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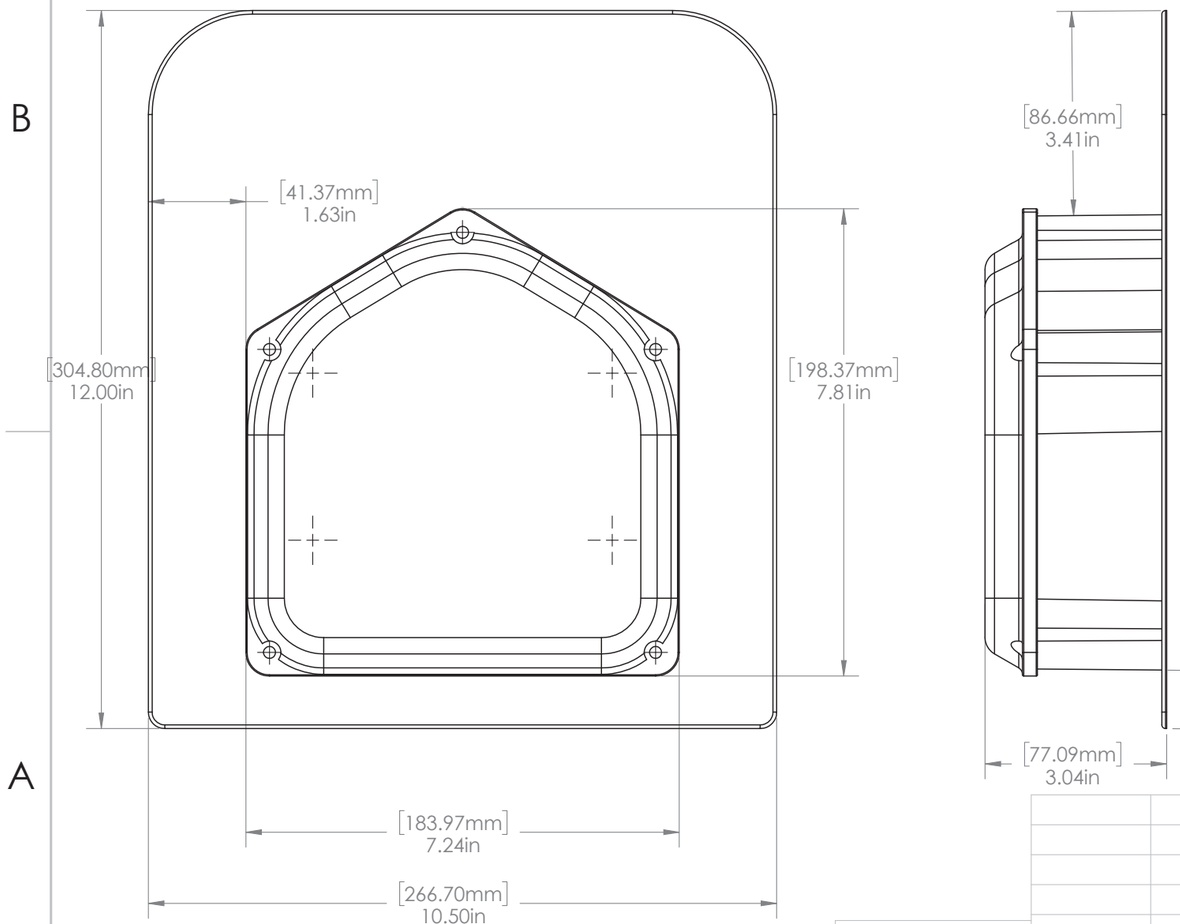

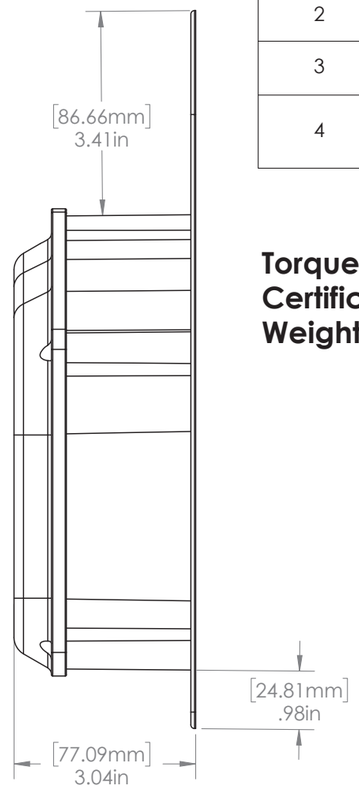

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	JB-1 Body w/ E-Z LOK TECHNOLOGY	POLYCARBONATE WITH UV INHIBITORS	1
2	JB-1 Lid w/ Gasket	POLYCARBONATE WITH UV INHIBITORS	1
3	10-32 x 1" Phillips pan head bolt		
4	#8 x 1-1/4" Phillips pan head screw		4

Torque Specification: 15-20 lbs-in
Certifications: UL Standard 1741, NEMA 3R
Weight (LBS): 1.3 lbs

EZ Solar
SLC, UT USA
Phone (385) 202-4150
www.ezsolarproducts.com

		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ±	DRAWN		
			CHECKED		
			ENG APPR.		
			MFG APPR.		
		INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.		
		MATERIAL	COMMENTS:		
NEXT ASSY	USED ON	FINISH			
APPLICATION		DO NOT SCALE DRAWING			

TITLE: EZ SOLAR

SIZE	DWG. NO.	REV
B	JB-1	
SCALE: 1:2	WEIGHT:	SHEET 1 OF 3

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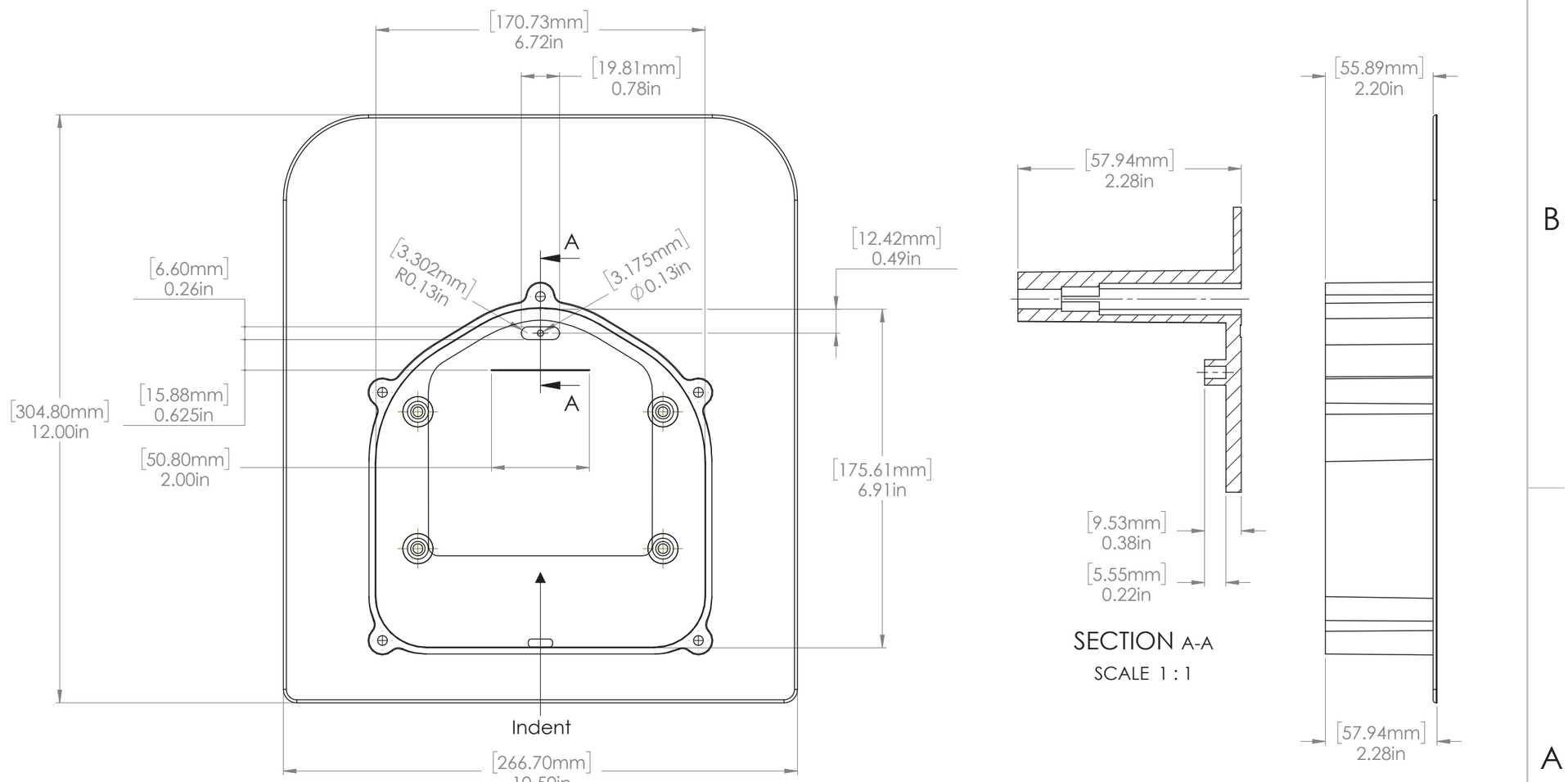

		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ±	DRAWN		
			CHECKED		
			ENG APPR.		
			MFG APPR.		
		INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.		
		MATERIAL	COMMENTS:		
NEXT ASSY	USED ON	FINISH			
APPLICATION		DO NOT SCALE DRAWING			

TITLE: EZ SOLAR

SIZE	DWG. NO.	REV
B	JB-1	

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

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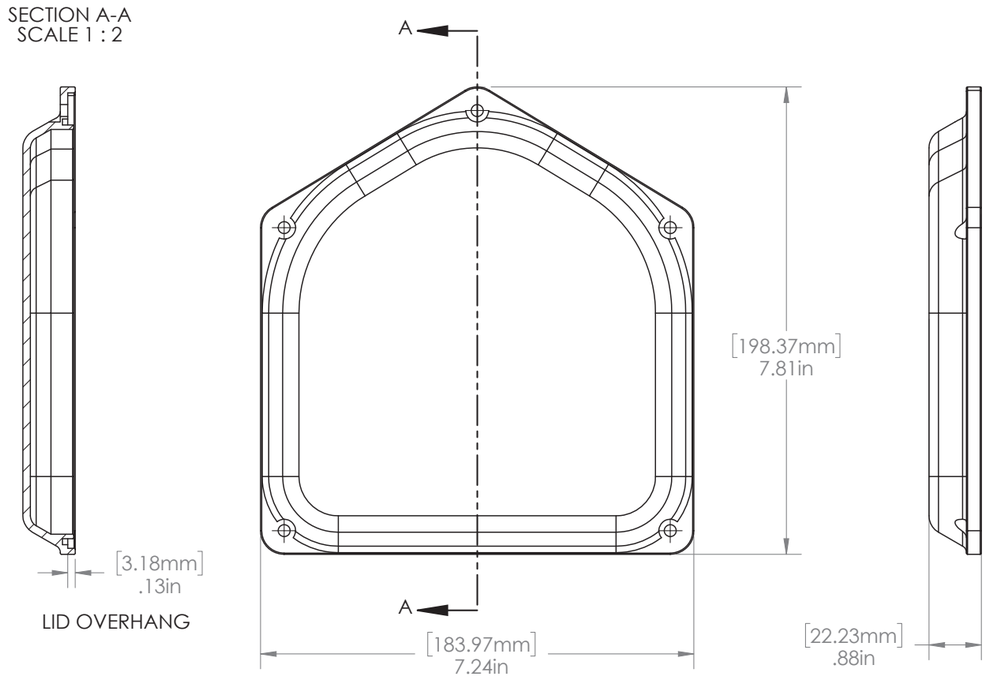
B B

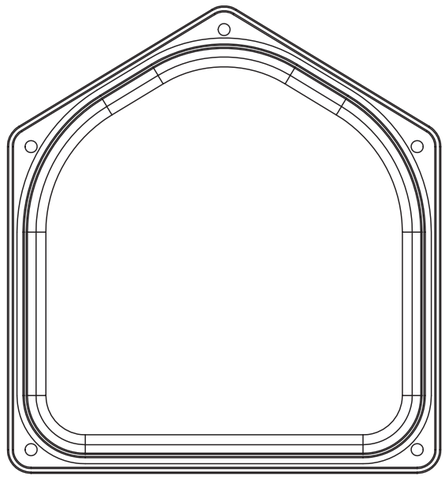
A A

OUTSIDE

INSIDE

SECTION A-A
SCALE 1 : 2





NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED:

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TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±

INTERPRET GEOMETRIC TOLERANCING PER:

MATERIAL

FINISH

DO NOT SCALE DRAWING

	NAME	DATE
DRAWN		
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		

COMMENTS:

TITLE:
EZ SOLAR

SIZE	DWG. NO.	REV
B	JB-1	
SCALE: 1:2	WEIGHT:	SHEET 3 OF 3

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SFM SUN FRAME MICRORAIL™

SYSTEM BONDING & GROUNDING

INSTALLATION GUIDE

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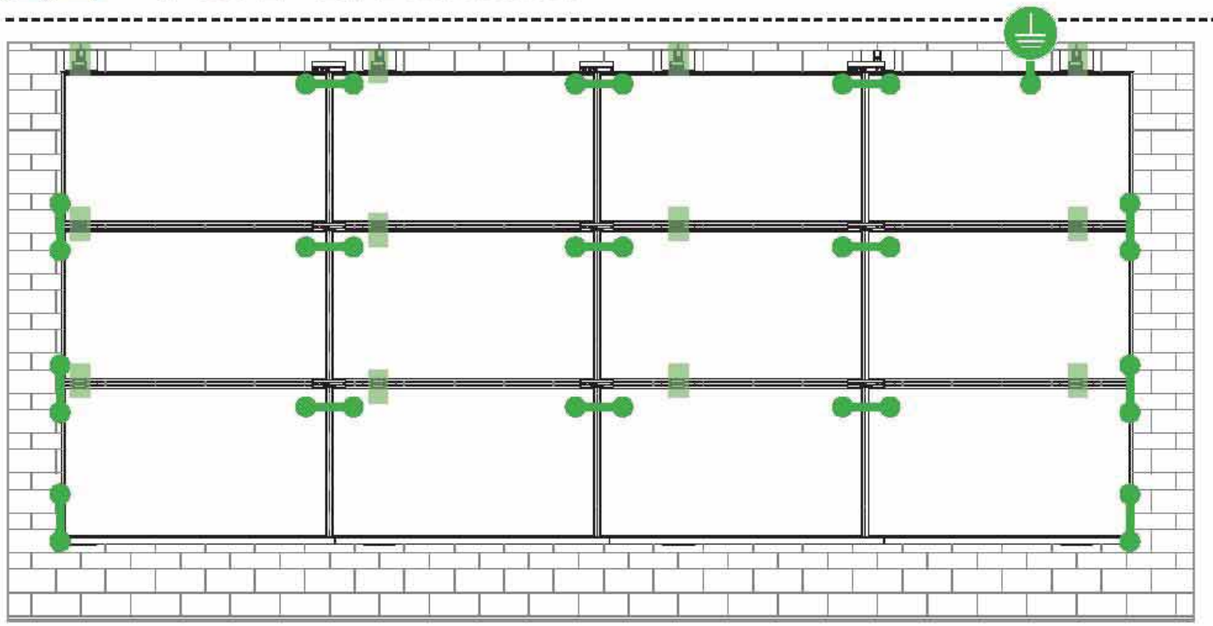


Star Washer is Single Use Only

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

LUG DETAIL & TORQUE INFO
Ilsco Lay-In Lug (GBL-4DBT)
- 10-32 mounting hardware
- Torque = 5 ft-lb
- AWG 4-14 - Solid or Stranded

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

LUG DETAIL & TORQUE INFO
Ilsco Flange Lug(SGB-4)
- 1/4" mounting hardware
- Torque = 75 in-lb
- AWG 4-14 - Solid or Stranded

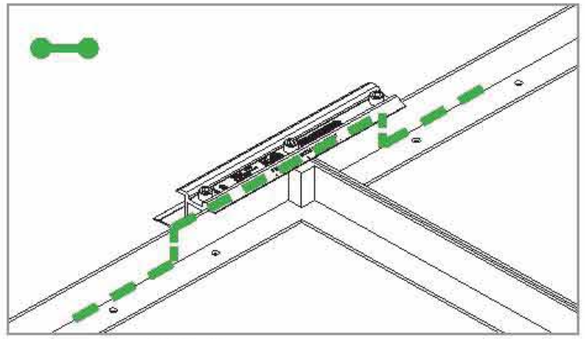
WEEBLUG
Single Use Only

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

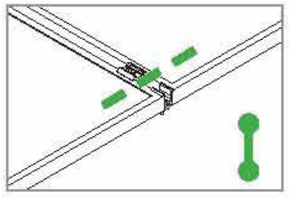
LUG DETAIL & TORQUE INFO
Wiley WEEBLug (6.7)
- 1/4" mounting hardware
- Torque = 10 ft-lb
- AWG 6-14 - Solid or Stranded

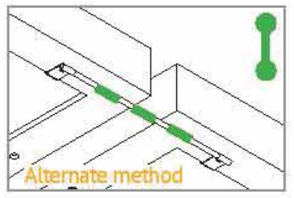
NOTE: ISOLATE COPPER FROM ALUMINUM CONTACT TO PREVENT CORROSION

System bonding is accomplished through modules. System grounding accomplished by attaching a ground lug to any module at a location on the module specified by the module manufacturer.

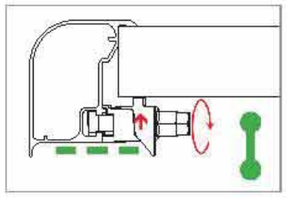


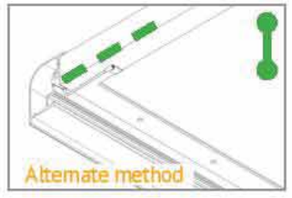
E-W BONDING PATH:
E-W module to module bonding is accomplished with 2 pre-installed bonding pins which engage on the secure side of the MicrorailTM and splice.





N-S BONDING PATH:
N-S module to module bonding is accomplished with bonding clamp with 2 integral bonding pins. **(refer also to alternate method)**





TRIMRAIL BONDING PATH:
Trimrail to module bonding is accomplished with bonding clamp with integral bonding pin and bonding T-bolt. **(refer also to alternate method)**

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This authorizes the application of the Certification Mark(s) shown below to the models described in the Product(s) Covered section when made in accordance with the conditions set forth in the Certification Agreement and Listing Report. This authorization also applies to multiple listee model(s) identified on the correlation page of the Listing Report.

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Applicant:	Unirac, Inc	**Manufacturer:**	Cixi Emeka Aluminum Co. Ltd
Address:	1411 Broadway Blvd NE Albuquerque, NM 87102	**Address:**	No. 688 ChaoSheng Road Cixi City Zhejiang Province 315311
Country:	USA	**Country:**	China
Contact:	Klaus Nicolaedis Tom Young	**Contact:**	Jia Liu Robin Luo
Phone:	505-462-2190 505-843-1418	**Phone:**	+86-15267030962 +86-13621785753
FAX:	NA	**FAX:**	NA
Email:	klaus.nicolaedis@unirac.com toddg@unirac.com	**Email:**	jia.liu@cxymj.com buwan.luo@cxymj.com

Party Authorized To Apply Mark: Same as Manufacturer
Report Issuing Office: Lake Forest, CA U.S.A.

Control Number: *5003705* **Authorized by:** Natalie Tohmay
for Dean Davidson, Certification Manager

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Telephone 800-345-3851 or 847-439-5667 Fax 312-283-1672

Standard(s):	Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels [UL 2703: 2015 Ed.1]
Product:	Photovoltaic Mounting System, Sun Frame Microrail - Installed Using Unirac Installation Guide, Rev PUB2019MAR01 with Annex North Row Extension Installation Guide Rev PUB2019FEB20
Brand Name:	Unirac
Models:	Unirac SFM

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SFM SUN FRAME MICRORAIL™

SYSTEM COMPONENTS
INSTALLATION GUIDE

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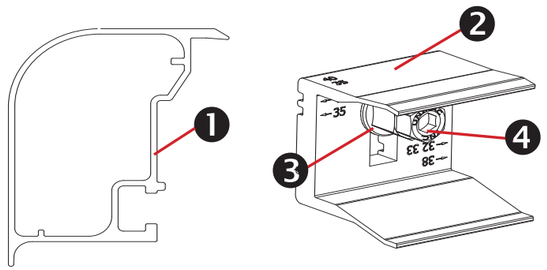


Trimrail™ and Module Clips

Sub-Components:
1. Trim Rail
2. Module Clip
3. T-Bolt
4. Tri-Drive Nut

Trimrail™

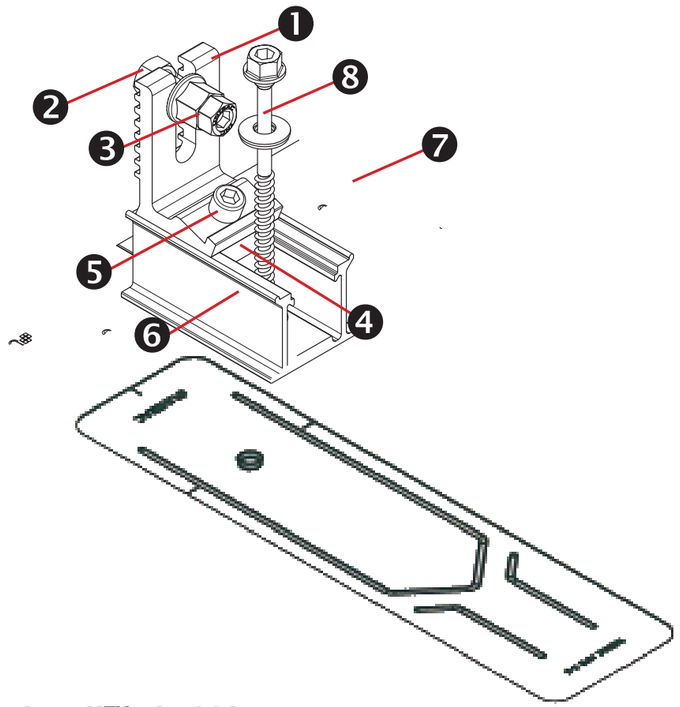
Functions:
- Required front row structural support (with module clips)
- Module mounting
- Installation aid
- Aesthetic trim

Features:
- Mounts directly to L-feet
- Aligns and captures module leading edge
  - Supports discrete module thicknesses from 32, 33, 35, 38, and 40mm

Module Clips

Functions:
- Required front row structural support (with trimrail)
- Module mounting

Features:
- Mounts to Trimrail™ with T-bolt and tri-drive nut
- Manually adjustable to fit module thicknesses 32, 33, 35, 38, and 40mm.



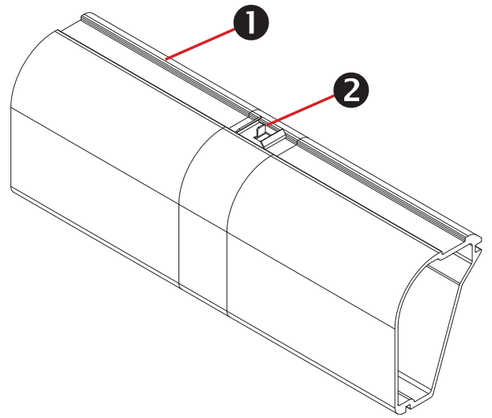
Trimrail™ Flashkit

Sub-Components:

L-Foot
Hex bolt
Tri-drive nut
Channel Nut
Scocket Head Cap Screw
3"Channel/Slider w/grommet
3" Wide Flashing
Structural Screw & SS EPDM Washer

Functions:
- Attach Trimrail™ to roof attachment / flashing
- Patented roof sealing technology at roof attachment point

Features:
- Slot provides vertical adjustments to level array
- Slider provides north/south adjustment along the slope of the roof
- Shed and Seal Technology



Trimrail™ Splice

Sub-Components:
1. Structural Splice Extrusion
2. Bonding Clip

Functions:
- Front row structural support
- Installation aid
- Structurally connects 2 pieces of Trimrail™
- Electrically bonds 2 pieces of Trimrail™

Features:
- Aligns and connects Trimrail™ pieces
- Tool-less installation

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SFM SUN FRAME MICRORAIL™

SYSTEM COMPONENTS
INSTALLATION GUIDE

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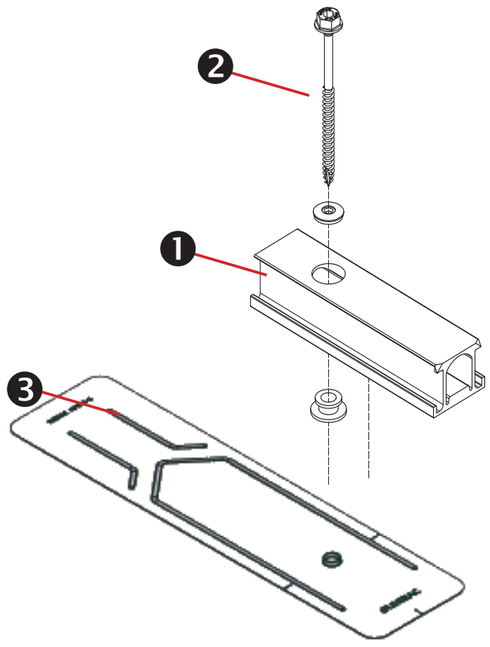
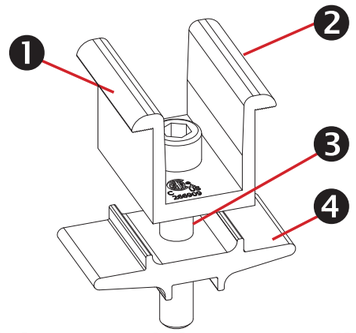


SFM Slider Flashkit

Sub-Components:
1. Slider w/grommet
2. Structural Screw & SS EPDM washer
3. 3" Wide Flashing

Functions:
- Patented Shed & Seal roof sealing technology at roof attachment point
- For use with compatible 2" Microrail or 8" Attached Splices

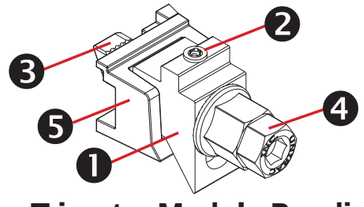
Features:
- Slider provides north/south adjustment along the slope of the roof
- Shed and Seal Technology



Module-to-Module N-S Bonding

Sub-Components:
1. Clamp
2. Bonding Pins (2)
3. 5/16" Socket Head Cap Screw
4. Clamp Base

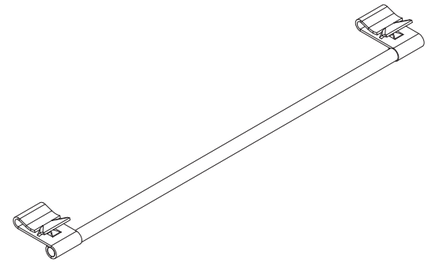
Functions/ Features:
- Row to row bonding
- Single Use Only
- Fits module sizes 32-40mm



Trim -to- Module Bonding Clamp and Floating Trim Clamp

Sub-Components:
1. Wedge
2. Bonding Pin
3. T-Bolt
4. Nut
5. Cast Base

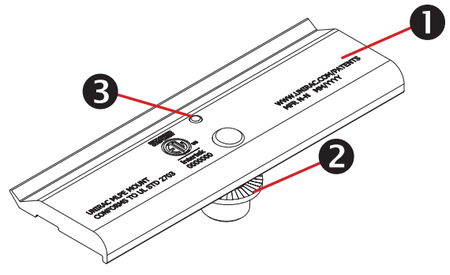
Functions/ Features:
- Module to Trimrail™ bonding - single use only
- Attaches Trimrail™ to module when fewer than 2 rafter attachment points are available
- Fits module sizes 32-40mm
- Fits module sizes 32-40mm



Wire Bonding Clip w/ 8AWG

Functions:
- Row to row bonding
- Module to Trimrail™ bonding
- Single Use Only

Features:
Tool-less installation



MLPE Mounting Assembly

Sub-Components:
1. MLPE Mount Base
2. 5/16 Socket Head Cap Screw
3. Bonding Pin

Functions:
- Securely mounts MLPE to module frames
- MLPE to module bonding

Features:
- Mounts easily to typical module flange
- UL2703 Recognized

MLPE = Module Level Power Electronics, e.g. microinverter or power optimizer

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SFM SUN FRAME MICRORAIL™

3″ FLASHING & SLIDERS INSTALLATION GUIDE

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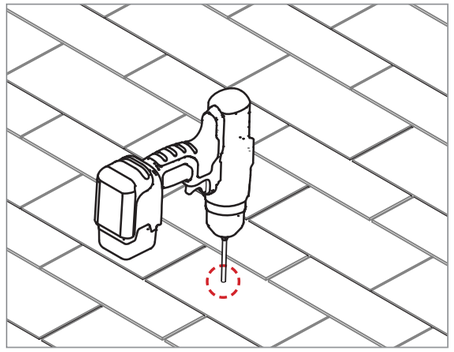
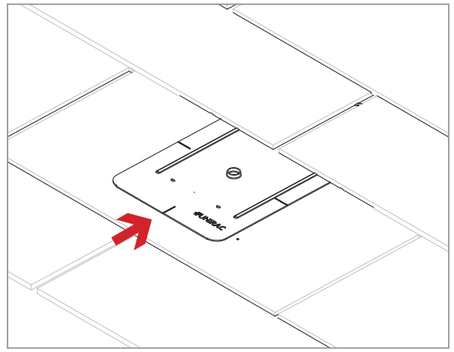
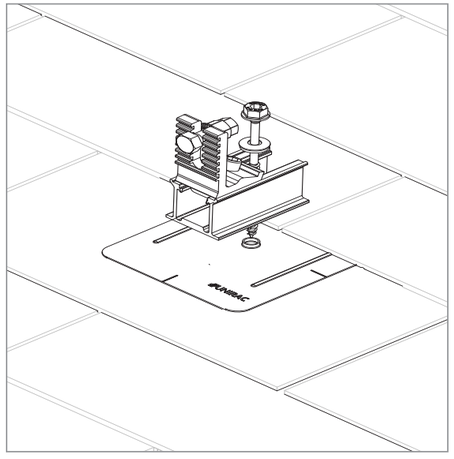
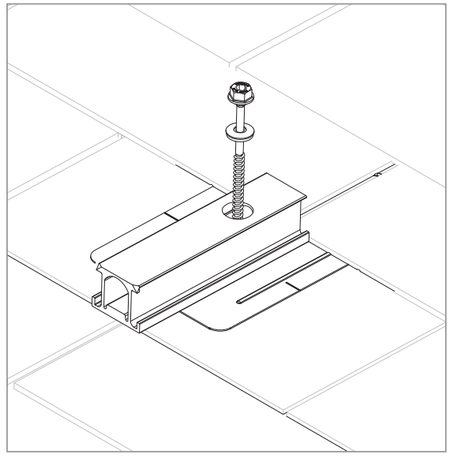


PILOT HOLES:
Drill pilot holes for lag screws or structural screws (as necessary) at marked attachement points



FLASHINGS:
Place flashings





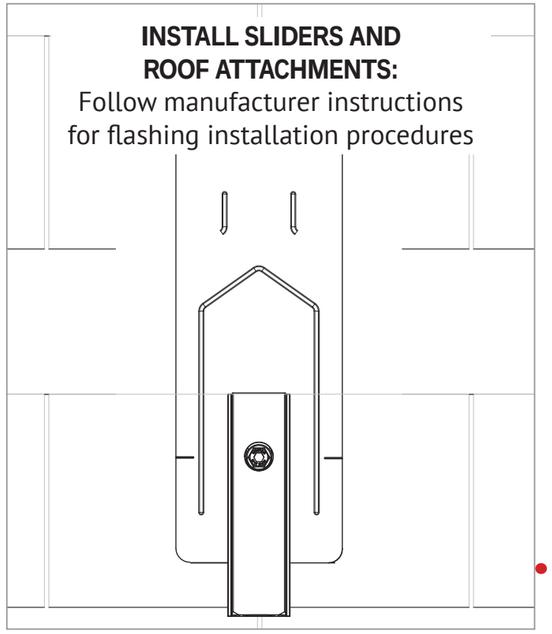
INSTALL SLIDERS AND TRIMRAIL ROOF ATTACHMENTS:

- Insert flashings per manufacturer instructions

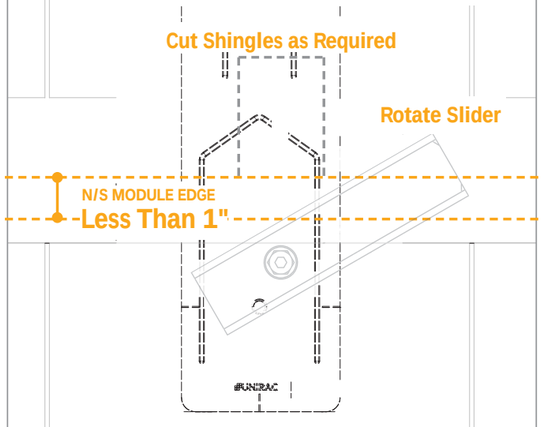
NOTE: Use Lag screw or structural fastener with a maximum diameter of 5/16"

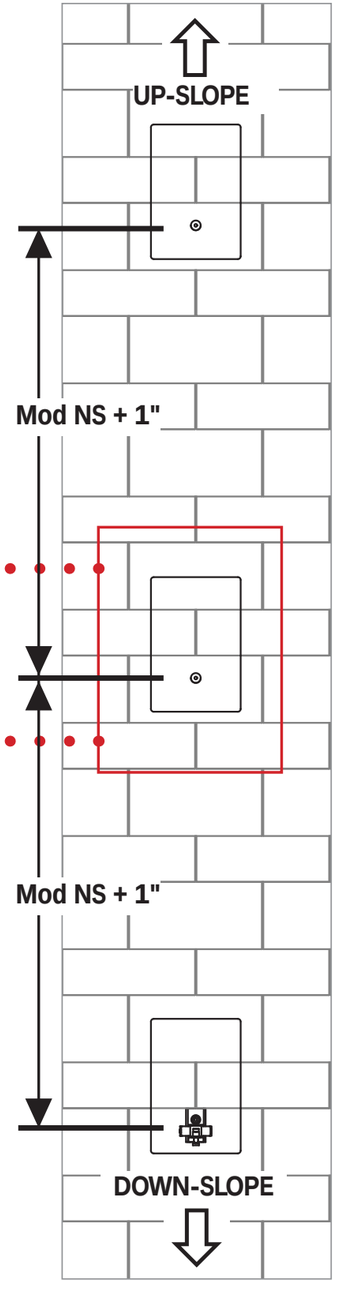
- Attach sliders to rafters
- Verify proper row to row spacing for module size (Mod NS + 1")
- Ensure that TrimrailTM roof attachments in each row have sufficient engagement with slider dovetails for proper attachment.

INSTALL SLIDERS AND ROOF ATTACHMENTS:
Follow manufacturer instructions for flashing installation procedures



NOTE: If N-S module edge is within 1" of the shingle course above, you have the option to pivot / rotate slider at the attachment point to span the next course and cut shingles as required.





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