

**GENERAL NOTES**

**CODES AND STANDARDS**

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

**SITE NOTES / OSHA REGULATION**

1. A LADDER SHALL BE IN PLACE FOR INSPECTION IN COMPLIANCE WITH OSHA REGULATIONS.
2. THE PV MODULES ARE CONSIDERED NON-COMBUSTIBLE AND THIS SYSTEM IS A UTILITY INTERACTIVE SYSTEM 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

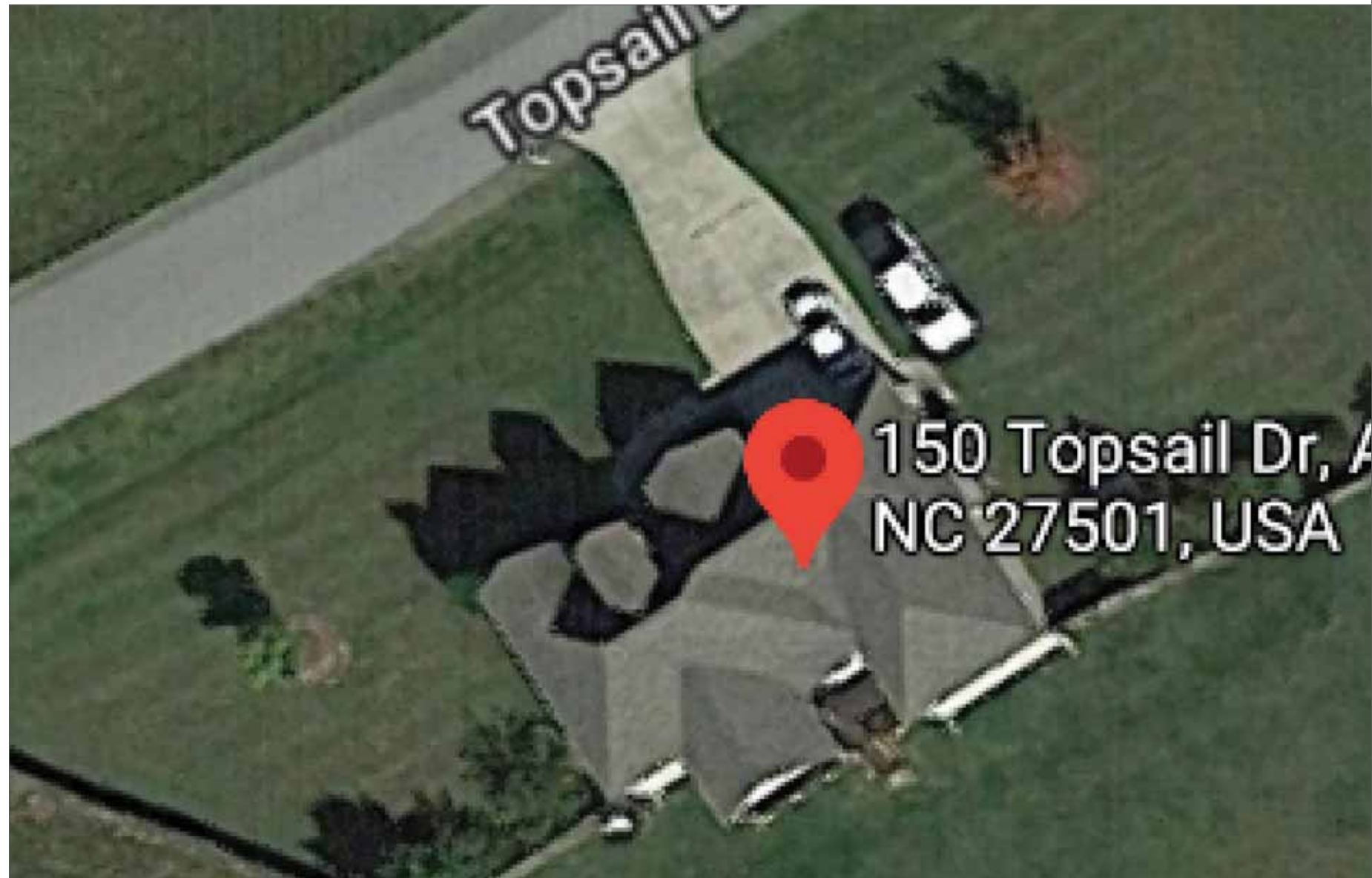
**SOLAR CONTRACTOR**

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)] 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**



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OREM, UT 84097

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CONTRACTOR:  
BRS FIELD OPS  
385.498.6700

SITE INFORMATION:

Christian Grest  
150 Topsail  
Angier, North Carolina 27501  
DC SYSTEM SIZE: 10.075 kW DC

DRAWING BY

Eric Thomas

DATE

June 30, 2021

PROJECT NUMBER

340881

SHEET NAME

COVER SHEET

PAGE NUMBER

PV1

REVISION

A

**DESIGN CRITERIA**

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

**SITE SPECIFICATIONS**

CONSTRUCTION - V-B  
ZONING: RESIDENTIAL

**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))

UTILITY COMPANY: Duke Energy NC  
PERMIT ISSUER: Harnett County

**SCOPE OF WORK**

INSTALLATION OF UTILITY INTERACTIVE PHOTOVOLTAIC SOLAR SYSTEM

10.075 kW DC PHOTOVOLTAIC SOLAR ARRAY  
ROOF TYPE: Comp Shingle  
MODULES: (31) Trinasolar 325 TSM-DD06M.05(II)  
INVERTER(S): Enphase IQ7-60-2-US,----  
RACKING: Unirac SFM Infinity

Digitally signed by John A. Calvert  
Date: 2021.07.02 10:06:12 -06'00'



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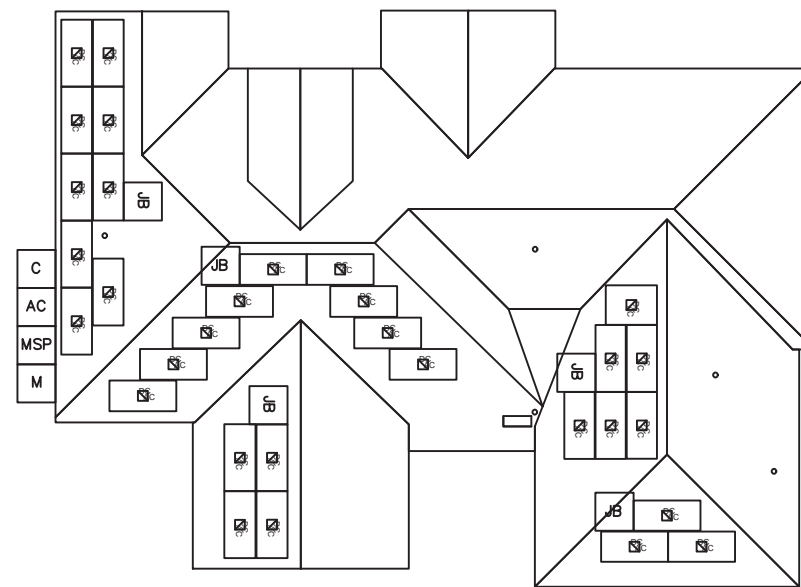
7/2/2021

Firm No. : D-0369

A

150 Topsail

FRONT OF HOME



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Firm No. : D-0369

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
- [Hatched Box] FIRE SETBACK
- [Green Line] EMT CONDUIT RUN (TO BE DETERMINED IN FIELD)
- [Pink Line] PV WIRE STRING
- [Dashed Line] PROPERTY LINE

SCALE: 1/16" = 1'-0"  
0' 4' 8' 16' 32'



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SITE INFORMATION:

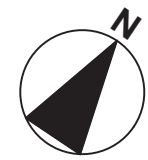
Christian Grest  
150 Topsail  
Angier, North Carolina 27501  
DC SYSTEM SIZE: 10.075 kW DC



|                             |               |
|-----------------------------|---------------|
| DRAWING BY<br>Eric Thomas   |               |
| DATE<br>June 30, 2021       |               |
| PROJECT NUMBER<br>340881    |               |
| SHEET NAME<br>PROPERTY PLAN |               |
| PAGE NUMBER<br>PV2          | REVISION<br>A |

A

FRONT OF HOME



MP5  
# OF MODULES: 9  
AZIMUTH:236°  
PITCH:39°  
TSRF:89%  
AREA: 271 SQ. FT

UNDERGROUND SERVICE LINE

MP1  
# OF MODULES: 9  
AZIMUTH:146°  
PITCH:39°  
TSRF:94%  
AREA: 353 SQ. FT

MP2  
# OF MODULES: 4  
AZIMUTH:236°  
PITCH:38°  
TSRF:89%  
AREA: 147 SQ. FT

MP3  
# OF MODULES: 3  
AZIMUTH:146°  
PITCH:40°  
TSRF:95%  
AREA: 121 SQ. FT

MP4  
# OF MODULES: 6  
AZIMUTH:236°  
PITCH:40°  
TSRF:86%  
AREA: 199 SQ. FT

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Firm No. : D-0369

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
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- PV PV REVENUE METER
- [Hatched Box] FIRE SETBACK
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SCALE: 3/32" = 1'-0"  
0 4 8 16



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SITE INFORMATION:

Christian Grest  
150 Topsail  
Angier, North Carolina 27501  
DC SYSTEM SIZE: 10.075 kW DC

DRAWING BY  
Eric Thomas

DATE  
June 30, 2021

PROJECT NUMBER  
340881

SHEET NAME  
SITE PLAN

PAGE NUMBER  
PV3

REVISION  
A

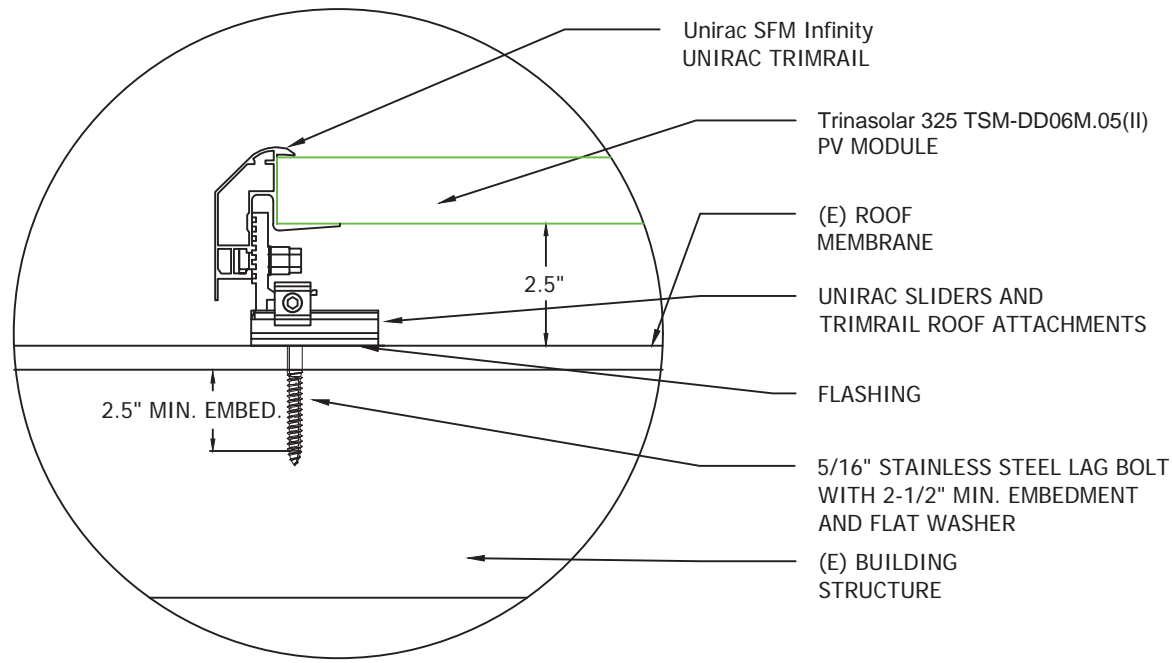


# PV ARRAY INFORMATION

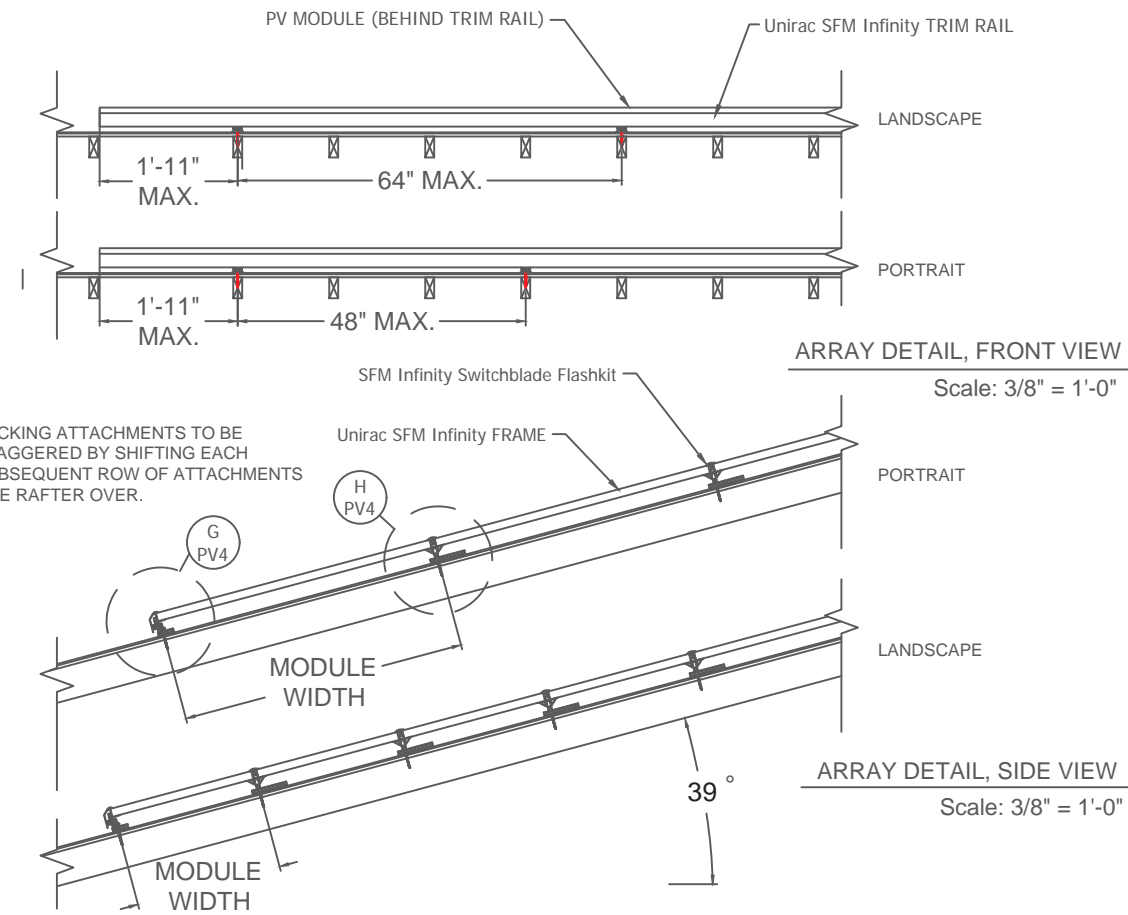
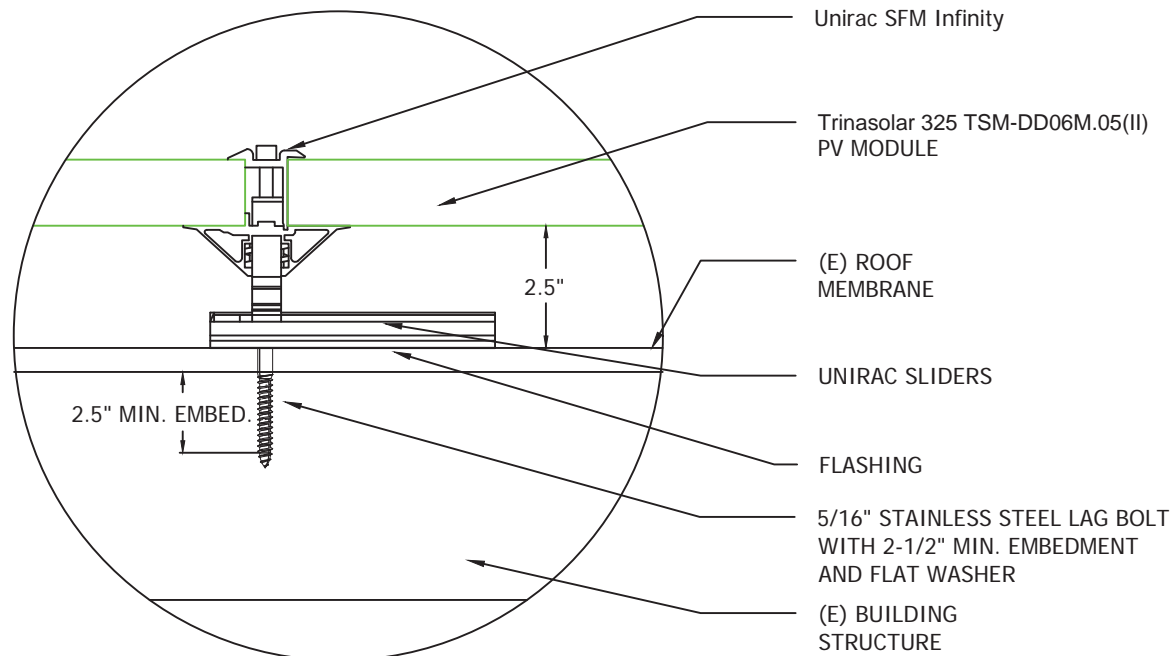
PV MODULE COUNT: 31 MODULES  
 # OF ATTACHMENT POINTS<sup>1</sup>: 78  
 ARRAY AREA: Module Count x 17.51ft<sup>2</sup> = 542.8ft<sup>2</sup>  
 ROOF AREA: 2542.0ft<sup>2</sup>  
 % OF ARRAY/ROOF: 21.4%  
 ARRAY WEIGHT: Module Count x 50lbs = 1550.0lbs  
 DISTRIBUTED LOAD: Array Weight ÷ Array Area = 2.86 lbs/ft<sup>2</sup>  
 POINT LOAD: Array Weight ÷ Attachments = 19.9lbs/attachment

1 - Number of attachment points estimated and may vary based on on-site conditions as long as maximum attachment spacing followed per engineered plans.

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



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



ROOF TYPE: Comp Shingle  
 ROOF FRAMING TYPE: Rafter  
 RAFTER OR TOP CHORD(TRUSS) 2x8 @ 16\"O.C.  
 CEILING JOIST OR BOTTOM CHORD(TRUSS) 2x8 @ 16\"O.C.

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 Christian Grest  
 150 Topsail  
 Angier, North Carolina 27501  
 DC SYSTEM SIZE: 10.075 kW DC

|                             |               |
|-----------------------------|---------------|
| DRAWING BY<br>Eric Thomas   |               |
| DATE<br>June 30, 2021       |               |
| PROJECT NUMBER<br>340881    |               |
| SHEET NAME<br>EQUIP. DETAIL |               |
| PAGE NUMBER<br>PV4          | REVISION<br>A |

|                  |  |                       |                  |  |                           |                  |  |                           |                  |                                  |                           |
|------------------|--|-----------------------|------------------|--|---------------------------|------------------|--|---------------------------|------------------|----------------------------------|---------------------------|
| 15               | (1) 6 AWG THHN/THWN-2, CU., BLACK (L1)   | 31.0 A AC<br>240 V AC | 3                | (2) 10 AWG THHN/THWN-2, CU., BLACK (L1)  | MAX 16.0 A AC<br>240 V AC | 2                | (1) 10 AWG THHN/THWN-2, CU., BLACK (L1)  | MAX 16.0 A AC<br>240 V AC | 1                | (1) 12-2 TC-ER, THHN/THWN-2, CU. | MAX 16.0 A AC<br>240 V AC |
|                  | (1) 6 AWG THHN/THWN-2, CU., RED (L2)     |                       |                  | (2) 10 AWG THHN/THWN-2, CU., RED (L2)    |                           |                  | (1) 10 AWG THHN/THWN-2, CU., RED (L2)    |                           |                  | (1) 6 AWG BARE, CU (EGC)         |                           |
|                  | (1) 10 AWG THHN/THWN-2, CU., WHITE (N)   |                       |                  | (1) 10 AWG THHN/THWN-2, CU., GREEN (EGC) |                           |                  | (1) 10 AWG THHN/THWN-2, CU., GREEN (EGC) |                           |                  |                                  |                           |
|                  | (1) 10 AWG THHN/THWN-2, CU., GREEN (EGC) |                       |                  |  |                           |                  |  |                           |                  |                                  |                           |
| (1) 3/4 INCH EMT |  | EXTERIOR              | (1) 3/4 INCH EMT |  | EXTERIOR                  | (1) 3/4 INCH EMT |  | EXTERIOR                  | (1) 3/4 INCH EMT |                                  |                           |



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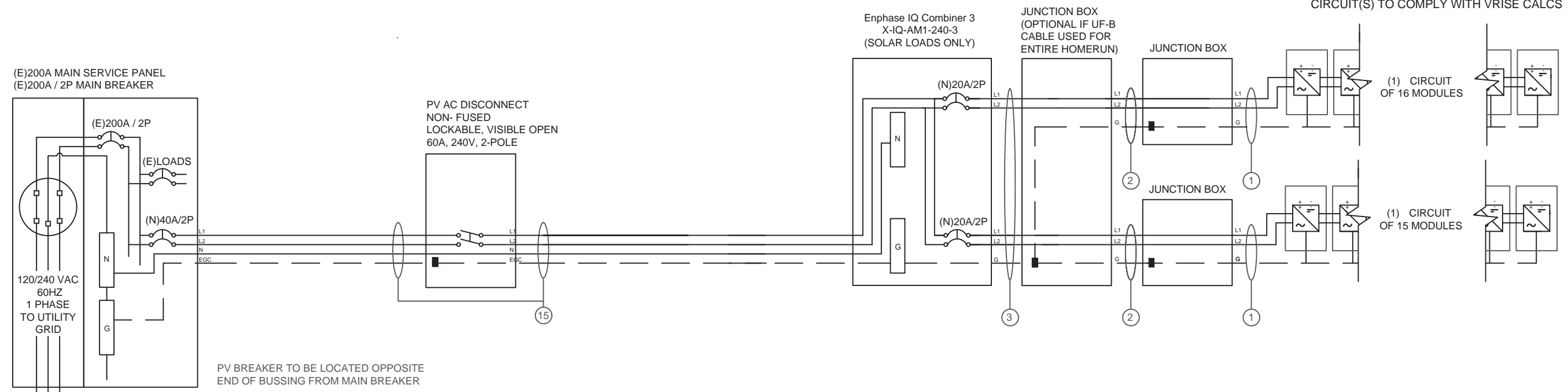
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31 INVERTERS x 240 W AC = 7.44 kW AC  
PANEL WATTAGE = 325 W DC

(31) Trinasolar 325 TSM-DD06M.05(II)  
UL 1703 COMPLIANT  
(31) Enphase IQ7-60-2-US MICRO INVERTERS  
UL 1741 COMPLIANT  
8 MODULES MAX FOR ALL SUB-BRANCH  
CIRCUIT(S) TO COMPLY WITH VRISE CALCS



(E) 200A MAIN SERVICE PANEL  
(E) 200A / 2P MAIN BREAKER  
(E) 200A / 2P  
(E) LOADS  
(N) 40A/2P  
120/240 VAC  
60HZ  
1 PHASE  
TO UTILITY  
GRID  
PV AC DISCONNECT  
NON- FUSED  
LOCKABLE, VISIBLE OPEN  
60A, 240V, 2-POLE  
Enphase IQ Combiner 3  
X-IQ-AM1-240-3  
(SOLAR LOADS ONLY)  
JUNCTION BOX  
(OPTIONAL IF UF-B  
CABLE USED FOR  
ENTIRE HOMERUN)  
JUNCTION BOX  
JUNCTION BOX  
(1) CIRCUIT  
OF 16 MODULES  
(1) CIRCUIT  
OF 15 MODULES  
PV BREAKER TO BE LOCATED OPPOSITE  
END OF BUSSING FROM MAIN BREAKER  
(E) GROUNDING  
ELECTRODE (S)  
VERIFICATION WILL BE  
DONE TO ENSURE THE  
GROUNDING ELECTRODE  
SYSTEM IS CONGRUENT  
WITH CURRENT  
REQUIREMENTS [NEC 250  
PART III.] IF NOT, A NEW  
GROUND ROD WILL BE  
INSTALLED.  
(N) 5/8" COPPER GROUND  
ROD, 8 FT LONG, AT  
LEAST 6' APART FROM  
(E) GROUND ROD.  
GEC INSTALLED PER  
NEC 250.64:  
4 AWG SOLID COPPER  
\*OR\*  
6 AWG SOLID COPPER  
GEC PROTECTED BY  
RMC/PVC/EMT

**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



**SITE INFORMATION:**

Christian Grest  
150 Topsail  
Angier, North Carolina 27501  
DC SYSTEM SIZE: 10.075 kW DC

|                                  |               |
|----------------------------------|---------------|
| DRAWING BY<br>Eric Thomas        |               |
| DATE<br>June 30, 2021            |               |
| PROJECT NUMBER<br>340881         |               |
| SHEET NAME<br>ELEC. 3 LINE DIAG. |               |
| PAGE NUMBER<br>PV5               | REVISION<br>A |

| 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          |  | 44.1 V DC                       |
| ADJ. MODULE VMP @ ASHRAE 2% AVG. HIGH TEMP |  | 28.5 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 PHOTOVOLTAIC MODULE MARKING (NEC 690.52) |               |
|---|---------------|
| NOMINAL OPERATING AC VOLTAGE                | 240 V AC      |
| NOMINAL OPERATING AC FREQUENCY              | 47 - 68 HZ AC |
| MAXIMUM AC POWER                            | 240 VA AC     |
| MAXIMUM AC CURRENT                          | 1.0 A AC      |
| MAXIMUM OCPD RATING FOR AC MODULE           | 20 A AC       |

| DESIGN LOCATION AND TEMPERATURES |                          |
|----------------------------------|--------------------------|
| TEMPERATURE DATA SOURCE          | ASHRAE 2% AVG. HIGH TEMP |
| STATE                            | North Carolina           |
| CITY                             | Angier                   |
| WEATHER STATION                  | SEYMOUR-JOHNSON AFB      |
| ASHRAE EXTREME LOW TEMP (°C)     | -10                      |
| ASHRAE 2% AVG. HIGH TEMP (°C)    | 35                       |

| SYSTEM ELECTRICAL SPECIFICATIONS   | CIR 1      | CIR 2 | CIR 3 | CIR 4 | CIR 5 | CIR 6 |
|------------------------------------|------------|-------|-------|-------|-------|-------|
| NUMBER OF MODULES PER MPPT         | 16         | 15    |       |       |       |       |
| DC POWER RATING PER CIRCUIT (STC)  | 5200       | 4875  |       |       |       |       |
| TOTAL MODULE NUMBER                | 31 MODULES |       |       |       |       |       |
| STC RATING OF ARRAY                | 10075W DC  |       |       |       |       |       |
| AC CURRENT @ MAX POWER POINT (IMP) | 16.0       | 15.0  |       |       |       |       |
| MAX. CURRENT (IMP X 1.25)          | 20         | 18.75 |       |       |       |       |
| OCPD CURRENT RATING PER CIRCUIT    | 20         | 20    |       |       |       |       |
| MAX. COMB. ARRAY AC CURRENT (IMP)  | 31.0       |       |       |       |       |       |
| MAX. ARRAY AC POWER                | 7440W AC   |       |       |       |       |       |

| AC VOLTAGE RISE CALCULATIONS        | DIST (FT) | COND.  | √RISE(V) | VEND(V) | %VRISE | IQ7-8 |
|-------------------------------------|-----------|--------|----------|---------|--------|-------|
| VRISE SEC. 1 (MICRO TO JBOX)        | 28.8      | 12 Cu. | 0.93     | 240.93  | 0.39%  |       |
| VRISE SEC. 2 (JBOX TO COMBINER BOX) | 75        | 10 Cu. | 3.05     | 243.05  | 1.27%  |       |
| VRISE SEC. 3 (COMBINER BOX TO POI)  | 10        | 6 Cu.  | 0.32     | 240.32  | 0.13%  |       |
| TOTAL VRISE                         |           |        | 4.30     | 244.30  | 1.79%  |       |

| PHOTOVOLTAIC AC DISCONNECT OUTPUT LABEL (NEC 690.54) |           |
|--|-----------|
| AC OUTPUT CURRENT                                    | 31.0 A AC |
| NOMINAL AC VOLTAGE                                   | 240 V AC  |

| CONDUCTOR SIZE CALCULATIONS       |   |
|-----------------------------------|---|
| MICROINVERTER TO JUNCTION BOX (1) | MAX. SHORT CIRCUIT CURRENT (ISC) = 16.0 A AC<br>MAX. CURRENT (ISC X1.25) = 20.0 A AC<br>CONDUCTOR (TC-ER, COPPER (90°C)) = 12 AWG<br>CONDUCTOR RATING = 30 A<br>AMB. TEMP. AMP. CORRECTION = 0.96<br>ADJUSTED AMP. = 28.8 > 20.0                                      |
| JUNCTION BOX TO JUNCTION BOX (2)  | MAX. SHORT CIRCUIT CURRENT (ISC) = 16.0 A AC<br>MAX. CURRENT (ISC X1.25) = 20.0 A AC<br>CONDUCTOR (THWN-2, COPPER (75°C TERM.)) = 10 AWG<br>CONDUCTOR RATING = 35 A<br>CONDUIT FILL DERATE = 1<br>AMB. TEMP. AMP. CORRECTION = 0.96<br>ADJUSTED AMP. = 33.6 > 20.0    |
| JUNCTION BOX TO COMBINER BOX (3)  | MAX. SHORT CIRCUIT CURRENT (ISC) = 16.0 A AC<br>MAX. CURRENT (ISC X1.25) = 20.0 A AC<br>CONDUCTOR (THWN-2, COPPER (75°C TERM.)) = 10 AWG<br>CONDUCTOR RATING = 35 A<br>CONDUIT FILL DERATE = 0.8<br>AMB. TEMP. AMP. CORRECTION = 0.96<br>ADJUSTED AMP. = 26.88 > 20.0 |
| COMBINER BOX TO MAIN PV OCPD (15) | INVERTER RATED AMPS = 31.0 A AC<br>MAX. CURRENT (RATED AMPS X1.25) = 38.75 A AC<br>CONDUCTOR (THWN-2, COPPER (75°C TERM.)) = 6 AWG<br>CONDUCTOR RATING = 65 A<br>CONDUIT FILL DERATE = 1<br>AMB. TEMP. AMP. CORRECTION = 0.96<br>ADJUSTED AMP. = 62.4 > 38.8          |



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CONTRACTOR:  
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**GROUNDING NOTES**

- 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.
- 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].
- 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.
- 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].
- MODULE SOURCE CIRCUITS SHALL BE GROUNDED IN ACCORDANCE TO [NEC 690.42].
- 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.
- EACH MODULE WILL BE GROUNDED USING THE SUPPLIED CONNECTIONS POINTS IDENTIFIED IN THE MANUFACTURER'S INSTALLATION INSTRUCTIONS.
- ENCLOSURES SHALL BE PROPERLY PREPARED WITH REMOVAL OF PAINT/FINISH AS APPROPRIATE WHEN GROUNDING EQUIPMENT WITH TERMINATION GROUNDING LUGS.
- GROUNDING SYSTEM COMPONENTS SHALL BE LISTED FOR THEIR PURPOSE, AND GROUNDING DEVICES EXPOSED TO THE ELEMENTS SHALL BE RATED FOR DIRECT BURIAL.
- GROUNDING AND BONDING CONDUCTORS SHALL BE COPPER, SOLID OR

STRANDED, AND BARE WHEN EXPOSED.

- 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).
- GROUNDING AND BONDING CONDUCTORS, IF INSULATED, SHALL BE COLOR CODED GREEN (OR MARKED GREEN IF #4 AWG OR LARGER)
- ALL CONDUIT BETWEEN THE UTILITY AC DISCONNECT AND THE POINT OF CONNECTION SHALL HAVE GROUNDED BUSHINGS AT BOTH ENDS.
- 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.
- 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**

- ALL CONDUIT SIZES AND TYPES, SHALL BE LISTED FOR ITS PURPOSE AND APPROVED FOR THE SITE APPLICATIONS
- BOLTED CONNECTION REQUIRED IN DC DISCONNECTS ON THE WHITE GROUNDED CONDUCTOR (USE POLARIS BLOCK OR NEUTRAL BAR)
- ANY CONNECTION ABOVE LIVE PARTS MUST BE WATERTIGHT. REDUCING WASHERS DISALLOWED ABOVE LIVE PARTS, MEYERS HUBS RECOMMENDED
- 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
- SOLADECK JUNCTION BOXES MOUNTED FLUSH W/ROOF SURFACE TO BE USED FOR WIRE MANAGEMENT AND AS FLASHED ROOF PENETRATIONS FOR INTERIOR CONDUIT RUNS.
- 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
- ALL CONDUCTORS AND OCPD SIZES AND TYPES SPECIFIED ACCORDING TO [NEC

690.8] FOR MULTIPLE CONDUCTORS

- 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)].
- 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
- PHASE AND NEUTRAL CONDUCTORS SHALL BE DUAL RATED THHN/THWN-2 INSULATED, 90°C RATED, WET AND UV RESISTANT, RATED FOR 600V
- 4-WIRE DELTA CONNECTED SYSTEMS HAVE THE PHASE WITH THE HIGHER VOLTAGE TO GROUND MARKED ORANGE OR IDENTIFIED BY OTHER EFFECTIVE MEANS.
- ALL SOURCE CIRCUITS SHALL HAVE INDIVIDUAL SOURCE CIRCUIT PROTECTION
- VOLTAGE DROP LIMITED TO 2% FOR DC CIRCUITS AND 3% FOR AC CIRCUITS
- NEGATIVE GROUNDED SYSTEMS DC CONDUCTORS SHALL BE COLOR CODED AS FOLLOWS: DC POSITIVE- RED (OR MARKED RED), DC NEGATIVE- GREY (OR MARKED GREY)
- POSITIVE GROUNDED SYSTEMS DC CONDUCTORS COLOR CODED: DC POSITIVE- GREY (OR MARKED GREY), DC NEGATIVE- BLACK (OR MARKED BLACK)
- 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
- RIGID CONDUIT, IF INSTALLED, (AND/OR NIPPLES) MUST HAVE A PULL BUSHING TO PROTECT WIRES.
- 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
- 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).

SITE INFORMATION:

Christian Grest  
150 Topsail  
Angier, North Carolina 27501  
DC SYSTEM SIZE: 10.075 kW DC

DRAWING BY  
Eric Thomas

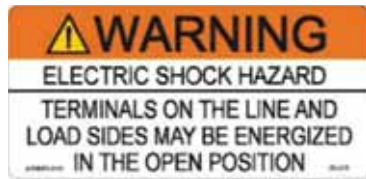
DATE  
June 30, 2021

PROJECT NUMBER  
340881

SHEET NAME  
ELEC. CALCS.

PAGE NUMBER  
PV6

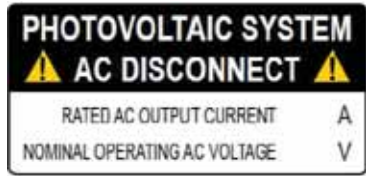
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LABEL 1  
FOR PV DISCONNECTING MEANS WHERE ALL TERMINALS OF THE DISCONNECTING MEANS MAY BE ENERGIZED IN THE OPEN POSITION. [NEC 690.13(B), NEC 705.22]



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)]



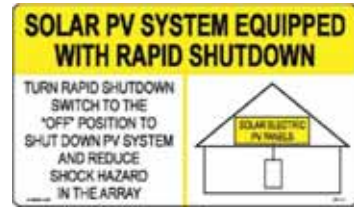
LABEL 6  
(ONLY IF 3 OR MORE SUPPLY SOURCES TO A BUSBAR)  
SIGN LOCATED AT LOAD CENTER IF IT CONTAINS 3 OR MORE POWER SOURCES. [NEC 705.12(B)(2)(3)(C)]

LABELING NOTES:

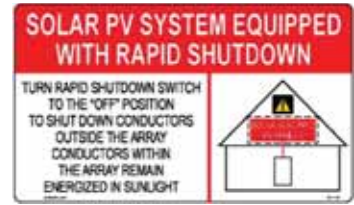
1. LABELS CALLED OUT ACCORDING TO ALL COMMON CONFIGURATIONS. ELECTRICIAN TO DETERMINE EXACT REQUIREMENTS IN THE FIELD PER CURRENT NEC AND LOCAL CODES AND MAKE APPROPRIATE ADJUSTMENTS.
2. LABELING REQUIREMENTS BASED ON THE 2017 NATIONAL ELECTRIC CODE, OSHA STANDARD 19010.145, ANSI Z535.
3. MATERIAL BASED 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]

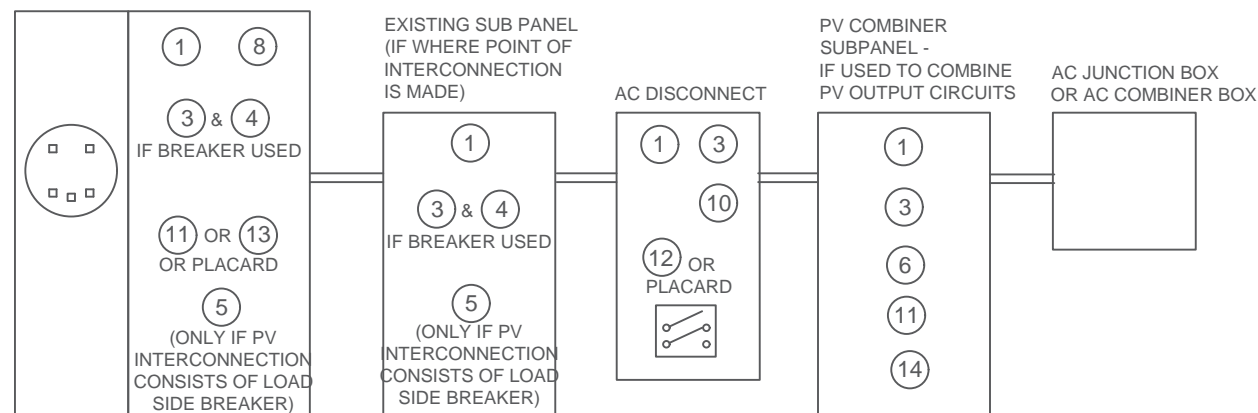


LABEL 13  
PERMANENT DIRECTORY TO BE LOCATED AT MAIN SERVICE EQUIPMENT DENOTING THE LOCATION OF THE PV RAPID SHUTDOWN SYSTEM DISCONNECTING MEANS IF SOLAR ARRAY RAPID SHUT DOWN DISCONNECT SWITCH IS NOT GROUPED AND WITHIN LINE OF SITE OF MAIN SERVICE DISCONNECTING MEANS. [NEC 705.10, NEC 690.56(C)(1)]

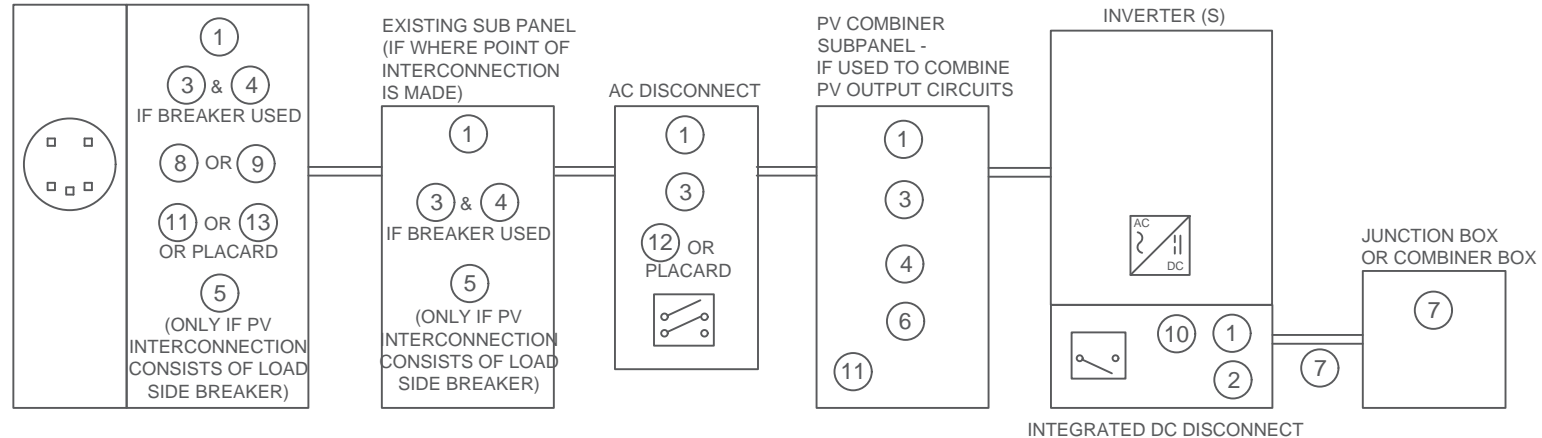


LABEL 14  
PERMANENT DIRECTORY TO BE LOCATED AT AC COMBINER PANEL [NEC 110.21(B)]

LABELING DIAGRAM FOR MICRO INV.:  
MAIN SERVICE PANEL



LABELING DIAGRAM FOR STRING INV. / DC OPTIMIZER INV.:  
MAIN SERVICE PANEL



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



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SITE INFORMATION:

Christian Grest  
150 Topsail  
Angier, North Carolina 27501  
DC SYSTEM SIZE: 10.075 kW DC

DRAWING BY  
Eric Thomas

DATE  
June 30, 2021

PROJECT NUMBER  
340881

SHEET NAME  
LABELS

PAGE NUMBER  
PV8

REVISION  
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# 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/120 half-cell and 72-cell/144 half-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/144 half-cell modules.



## Enphase IQ 7 and IQ 7+ Microinverters

| INPUT DATA (DC)  | IQ7-60-2-US   |                   | IQ7PLUS-72-2-US  |                   |
|--|---|-------------------|--|-------------------|
| Commonly used module pairings <sup>1</sup>               | 235 W - 350 W +   |                   | 235 W - 440 W +  |                   |
| Module compatibility                                     | 60-cell/120 half-cell PV modules only   |                   | 60-cell/120 half-cell and 72-cell/144 half-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   |                   |
| Oversoltage 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 20A 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 <sup>2</sup>                 | 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 <sup>3</sup> | 16 (240 VAC)  | 13 (208 VAC)      | 13 (240 VAC)   | 11 (208 VAC)      |
| Oversoltage 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                                | -40°C to +65°C  |                   |  |                   |
| 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)<br>UL 62109-1, UL1741/IEEE 1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01<br>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 C22.1-2015 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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To learn more about Enphase offerings, visit [enphase.com](https://enphase.com)

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**SPEC SHEET**

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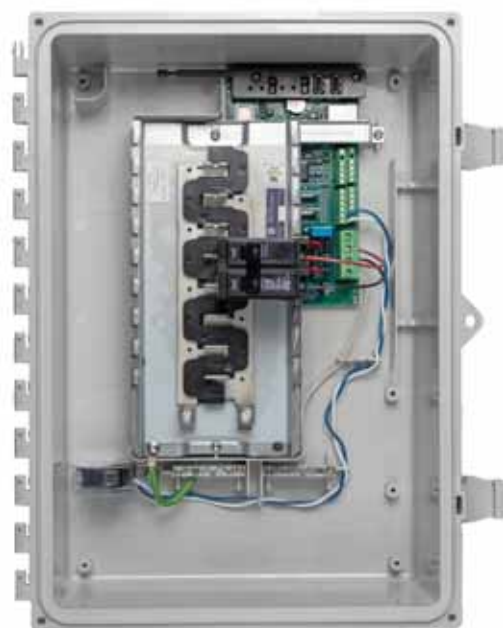
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# Enphase IQ Combiner 3 (X-IQ-AM1-240-3)

The **Enphase IQ Combiner 3™** with Enphase IQ Envoy™ consolidates interconnection equipment into a single enclosure and streamlines PV 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 Envoy for communication and control
- Flexible networking supports Wi-Fi, Ethernet, or cellular
- Optional AC receptacle available for PLC bridge
- Provides production metering and optional consumption monitoring

### Simple

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

### Reliable

- Durable NRTL-certified NEMA type 3R enclosure
- Five-year limited warranty
- UL listed

## Enphase IQ Combiner 3

| MODEL NUMBER   |   |
|--|---|
| IQ Combiner 3<br>X-IQ-AM1-240-3  | IQ Combiner 3 with Enphase IQ Envoy™ printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and optional* consumption monitoring (+/- 2.5%).  |
| ACCESSORIES and REPLACEMENT PARTS (not included, order separately)   |   |
| Enphase Mobile Connect™<br>CELLMODEM-03 (4G/12-year data plan)<br>CELLMODEM-01 (3G/5-year data plan)<br>CELLMODEM-M1 (4G based LTE-M/5-year data plan) | Plug and play industrial grade cellular modem with data plan 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.)   |
| Consumption Monitoring* CT<br>CT-200-SPLIT   | Split core current transformers enable whole home consumption metering (+/- 2.5%).  |
| * Consumption monitoring is required for Enphase Storage Systems   |   |
| Wireless USB adapter<br>COMMS-KIT-01   | Installed at the IQ Envoy. For communications with Enphase Encharge™ storage and Enphase Enpower™ smart switch. Includes USB cable for connection to IQ Envoy or Enphase IQ Combiner™ and allows redundant wireless communication with Encharge and Enpower.  |
| Circuit Breakers<br>BRK-10A-2-240<br>BRK-15A-2-240<br>BRK-20A-2P-240   | Supports Eaton BR210, BR215, BR220, BR230, BR240, BR250, and BR260 circuit breakers.<br>Circuit breaker, 2 pole, 10A, Eaton BR210<br>Circuit breaker, 2 pole, 15A, Eaton BR215<br>Circuit breaker, 2 pole, 20A, Eaton BR220   |
| EPLC-01  | Power line carrier (communication bridge pair), quantity - one pair   |
| XA-PLUG-120-3  | Accessory receptacle for Power Line Carrier in IQ Combiner 3 (required for EPLC-01)   |
| XA-ENV-PCBA-3  | Replacement IQ Envoy printed circuit board (PCB) for Combiner 3   |
| ELECTRICAL SPECIFICATIONS  |   |
| Rating   | Continuous duty   |
| System voltage   | 120/240 VAC, 60 Hz  |
| Eaton BR series busbar rating  | 125 A   |
| Max. continuous current rating (output to grid)  | 65 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. continuous current rating (input from PV)   | 64 A  |
| Max. total branch circuit breaker rating (input)   | 80A of distributed generation / 90A with IQ Envoy breaker included  |
| Production Metering CT   | 200 A solid core pre-installed and wired to IQ Envoy  |
| MECHANICAL DATA  |   |
| Dimensions (WxHxD)   | 49.5 x 37.5 x 16.8 cm (19.5" x 14.75" 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   | <ul style="list-style-type: none"> <li>• 20 A to 50 A breaker inputs: 14 to 4 AWG copper conductors</li> <li>• 60 A breaker branch input: 4 to 1/0 AWG copper conductors</li> <li>• Main lug combined output: 10 to 2/0 AWG copper conductors</li> <li>• Neutral and ground: 14 to 1/0 copper conductors</li> </ul> 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   |
| Ethernet   | Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included)   |
| Cellular   | Optional, CELLMODEM-01 (3G) or CELLMODEM-03 (4G) or CELLMODEM-M1 (4G based LTE-M) (not included)  |
| COMPLIANCE   |   |
| Compliance, Combiner   | UL 1741, CAN/CSA C22.2 No. 107.1, 47 CFR, Part 15, Class B, ICES 003<br>Production metering: ANSI C12.20 accuracy class 0.5 (PV production)   |
| Compliance, IQ Envoy   | UL 60601-1/CANCSA 22.2 No. 61010-1  |

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

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# THE Residential Module

## MULTI-BUSBAR120 HALF-CELL BOB MODULE



**120-Cell**  
MONOCRYSTALLINE MODULE

**310-335W**  
POWER OUTPUT RANGE

**19.9%**  
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  
IEC61215/IEC61730/IEC61701/IEC62716  
ISO 9001: Quality Management System  
ISO 14001: Environmental Management System  
ISO14064: Greenhouse Gases Emissions Verification  
OHSAS 18001: Occupation Health and Safety Management System



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

FRAME COLOR: Black



### 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



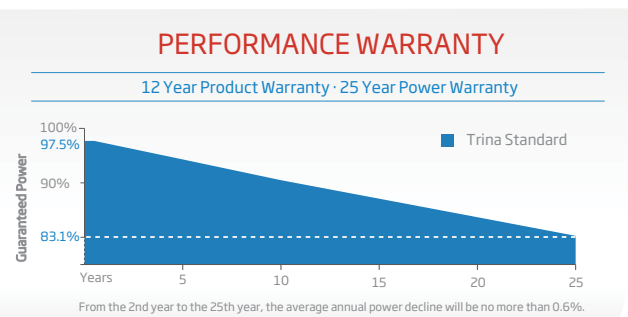
### Outstanding visual appearance, easy to install

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



### Certified to perform in highly challenging environments

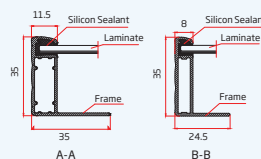
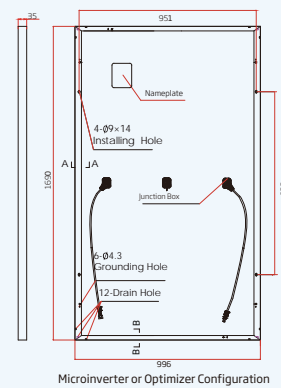
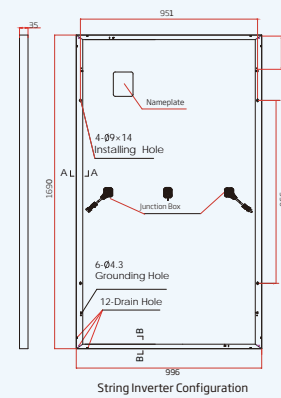
- High PID resistance through cell process and module material control
- Resistant to salt, acid, sand, and ammonia
- Over 30 in-house tests (UV, TC, HF etc)
- Certified to 5400 Pa positive load and 2400 Pa negative load



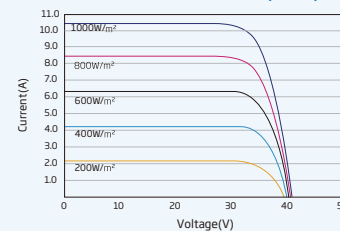
## Residential Module

## MULTI-BUSBAR 120 HALF-CELL BOB MODULE

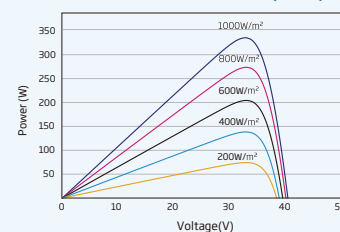
### DIMENSIONS OF PV MODULE(mm)



### I-V CURVES OF PV MODULE (335W)



### P-V CURVES OF PV MODULE (335W)



### ELECTRICAL DATA (STC)

|   | 310   | 315   | 320   | 325   | 330   | 335   |
|---|-------|-------|-------|-------|-------|-------|
| Peak Power Watts-P <sub>MAX</sub> (Wp)*     |       |       |       | 0~+5  |       |       |
| Power Output Tolerance-P <sub>MAX</sub> (W) |       |       |       | 0~+5  |       |       |
| Maximum Power Voltage-V <sub>MPP</sub> (V)  | 33.0  | 33.2  | 33.4  | 33.6  | 33.8  | 34.0  |
| Maximum Power Current-I <sub>MPP</sub> (A)  | 9.40  | 9.49  | 9.58  | 9.67  | 9.76  | 9.85  |
| Open Circuit Voltage-V <sub>OC</sub> (V)    | 39.9  | 40.1  | 40.3  | 40.4  | 40.6  | 40.7  |
| Short Circuit Current-I <sub>SC</sub> (A)   | 10.03 | 10.12 | 10.20 | 10.30 | 10.40 | 10.50 |
| Module Efficiency η(%)                      | 18.4  | 18.7  | 19.0  | 19.3  | 19.6  | 19.9  |

STC: Irradiance 1000W/m<sup>2</sup>, Cell Temperature 25°C, Air Mass AM1.5.  
\*Measuring tolerance: ±3%.

### ELECTRICAL DATA (NMOT)

|  | 235  | 238  | 242  | 246  | 250  | 254  |
|--|------|------|------|------|------|------|
| Maximum Power-P <sub>MAX</sub> (Wp)        | 235  | 238  | 242  | 246  | 250  | 254  |
| Maximum Power Voltage-V <sub>MPP</sub> (V) | 31.0 | 31.2 | 31.4 | 31.6 | 31.7 | 31.9 |
| Maximum Power Current-I <sub>MPP</sub> (A) | 7.57 | 7.64 | 7.71 | 7.79 | 7.86 | 7.94 |
| Open Circuit Voltage-V <sub>OC</sub> (V)   | 37.6 | 37.8 | 38.0 | 38.1 | 38.3 | 38.4 |
| Short Circuit Current-I <sub>SC</sub> (A)  | 8.08 | 8.15 | 8.22 | 8.30 | 8.38 | 8.46 |

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

### MECHANICAL DATA

|                      |  |
|----------------------|--|
| Solar Cells          | Monocrystalline  |
| Cell Orientation     | 120 cells (6 × 20)   |
| Module Dimensions    | 1690 × 996 × 35 mm (66.54 × 39.21 × 1.38 inches)   |
| Weight               | 18.0kg (39.7lb)  |
| 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 4.0mm <sup>2</sup> (0.006 inches <sup>2</sup> )<br>Portrait: N 140mm/P 285mm (5.51/11.22 inches)<br>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 <sub>MAX</sub> | -0.36%/°C   |
| Temperature Coefficient of V <sub>OC</sub>  | -0.26%/°C   |
| Temperature Coefficient of I <sub>SC</sub>  | 0.04%/°C    |

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

### MAXIMUM RATINGS

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

### WARRANTY

- 12 year Product Workmanship Warranty
  - 25 year Power Warranty
- (Please refer to product warranty for details)

### PACKAGING CONFIGURATION

- Modules per pallet: 30 pieces
- Modules per 40' container: 780 pieces
- Pallet dimensions (L x W x H): 1735 x 1120 x 1153 mm
- Pallet weight: 585kg (1,290lb)

CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.  
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Version number: TSM\_DD06M.05(II)\_EN\_2020\_RD\_B [www.trinasolar.com](http://www.trinasolar.com)



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## General Duty Non-Fusible Safety Switch

DG222UGB

UPC:782114731130

### Dimensions:

- Height: 7 IN
- Length: 6.41 IN
- Width: 8.4 IN

Weight:6 LB

**Notes:**WARNING! Switch is not approved for service entrance unless a neutral kit is installed.

### Warranties:

- Eaton Selling Policy 25-000, one (1) year from the date of installation of the Product or eighteen (18) months from the date of shipment of the Product, whichever occurs first.

### Specifications:

- Type: General Duty/Non-Fusible
- Amperage Rating: 60A
- Enclosure: NEMA 1
- Enclosure Material: Painted steel
- Fuse Configuration: Non-fusible
- Number Of Poles: Two-pole
- Number Of Wires: Two-wire
- Product Category: General Duty Safety Switch
- Voltage Rating: 240V

### Supporting documents:

- [Eatons Volume 2-Commercial Distribution](#)
- [Eaton Specification Sheet - DG222UGB](#)

### Certifications:

- UL Listed

Product compliance: No Data



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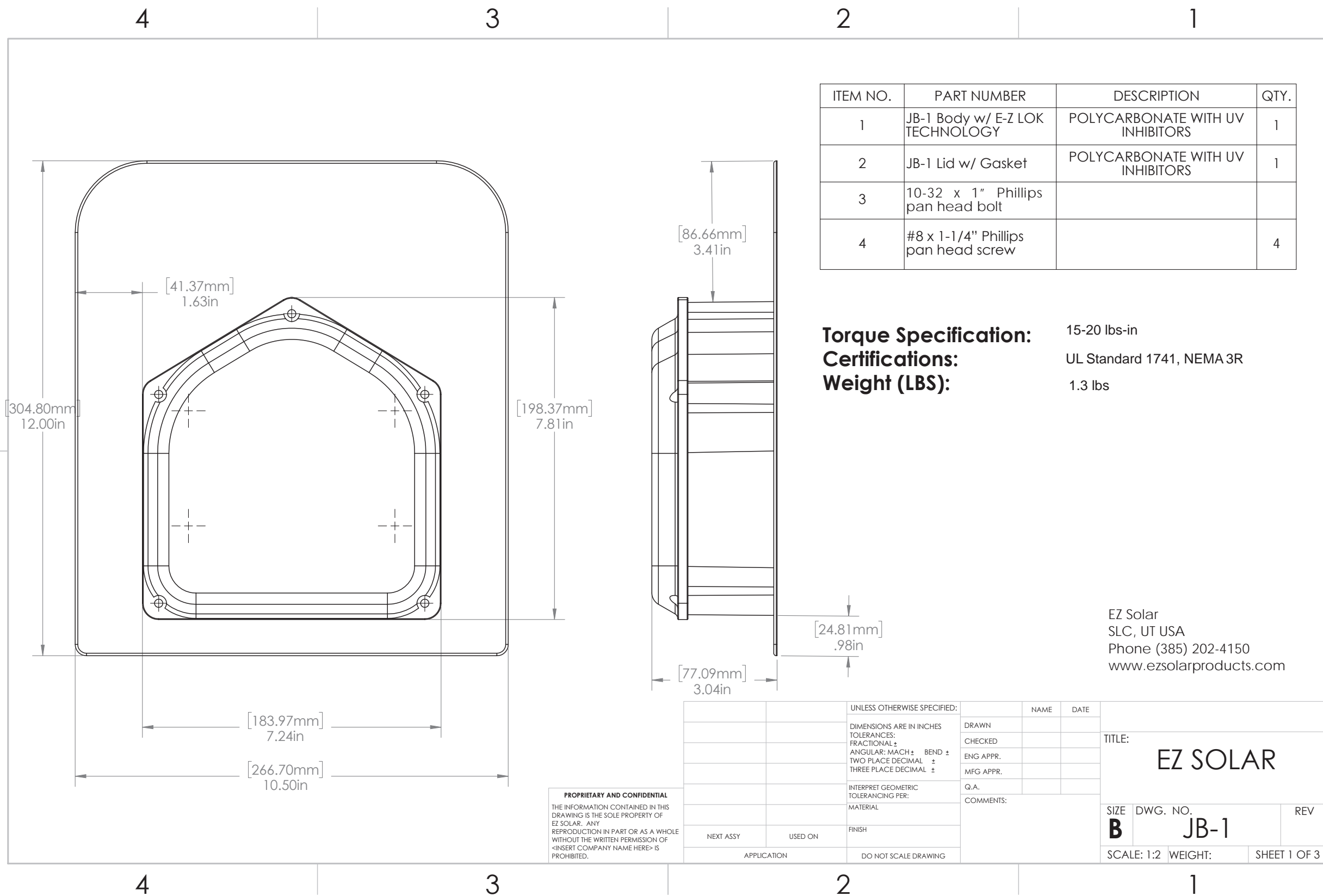
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| ITEM NO. | PART NUMBER                         | DESCRIPTION                      | QTY. |
|----------|-------------------------------------|----------------------------------|------|
| 1        | JB-1 Body w/ E-Z LOK TECHNOLOGY     | POLYCARBONATE 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

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

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|--------------------------------------|---------|----------------------|------|------------------------------------|
| UNLESS OTHERWISE SPECIFIED:          |         | NAME                 | DATE | TITLE:<br><b>EZ SOLAR</b>          |
| DIMENSIONS ARE IN INCHES             |         | DRAWN                |      |                                    |
| TOLERANCES:                          |         | CHECKED              |      |                                    |
| FRACTIONAL: ±                        |         | ENG APPR.            |      |                                    |
| ANGULAR: MACH ±                      |         | MFG APPR.            |      | SIZE DWG. NO. REV<br><b>B JB-1</b> |
| TWO PLACE DECIMAL ±                  |         | Q.A.                 |      |                                    |
| THREE PLACE DECIMAL ±                |         | COMMENTS:            |      | SCALE: 1:2 WEIGHT: SHEET 1 OF 3    |
| INTERPRET GEOMETRIC TOLERANCING PER: |         |                      |      |                                    |
| NEXT ASSY                            | USED ON | FINISH               |      |                                    |
| APPLICATION                          |         | DO NOT SCALE DRAWING |      |                                    |

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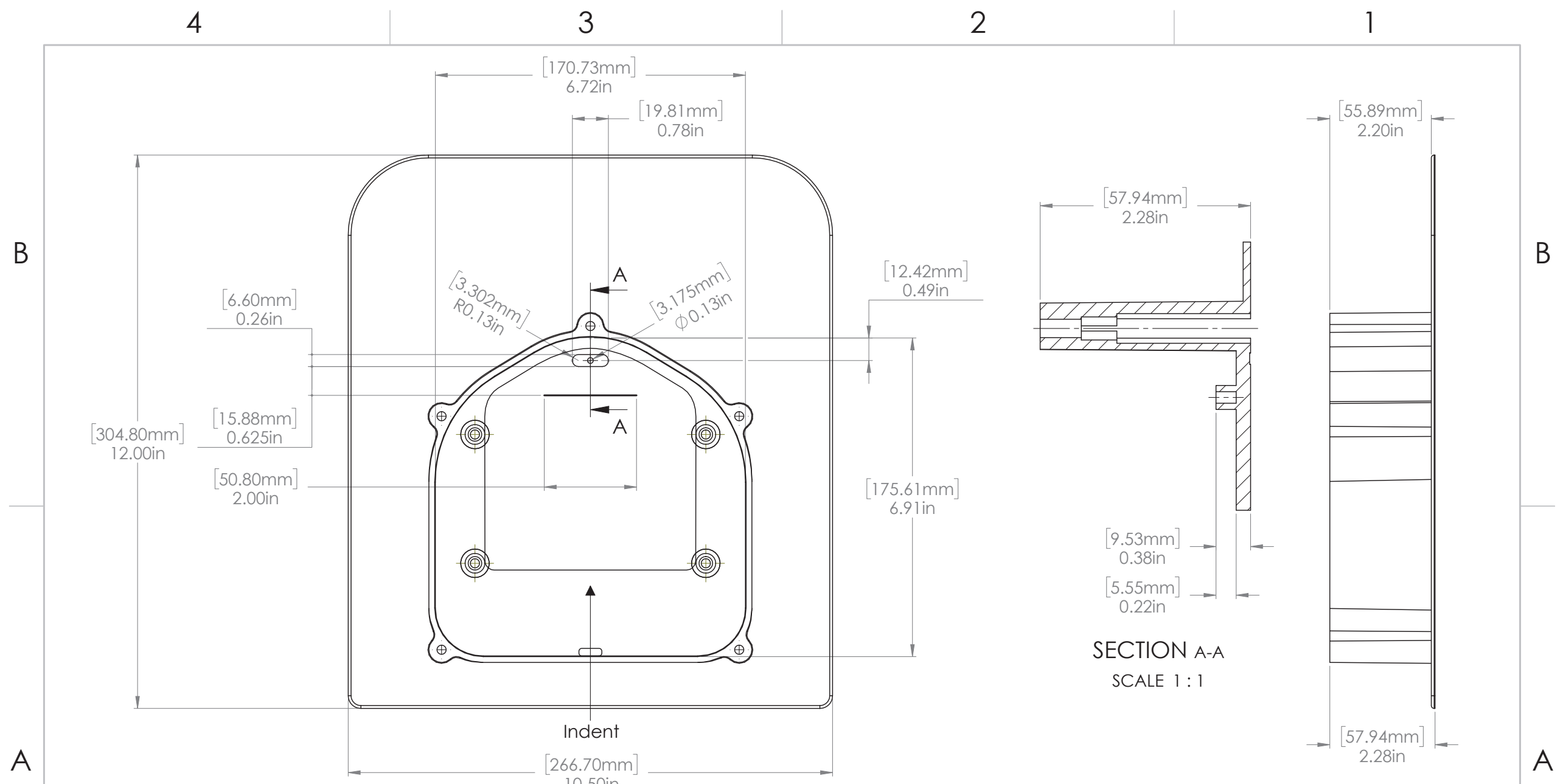


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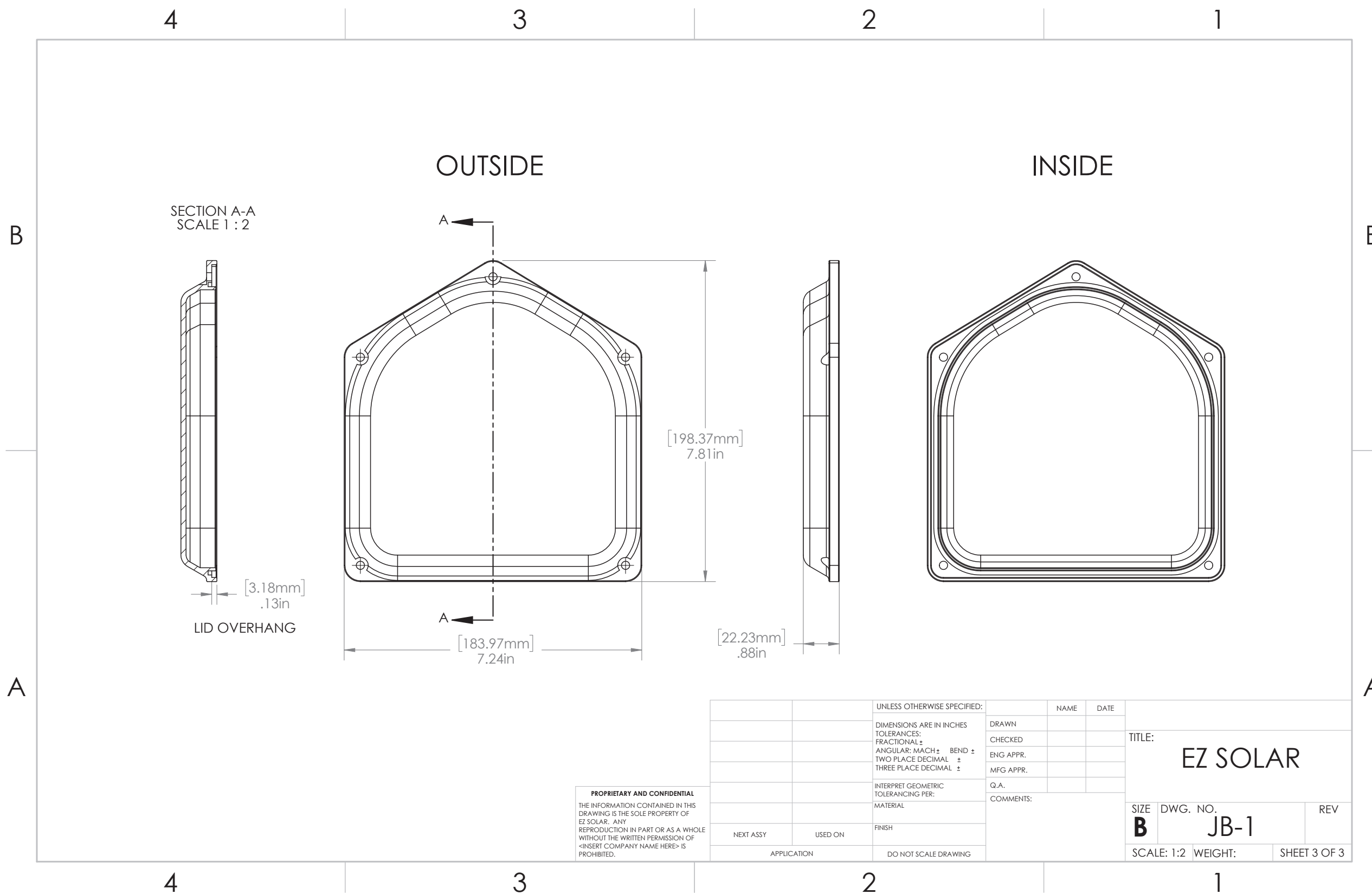


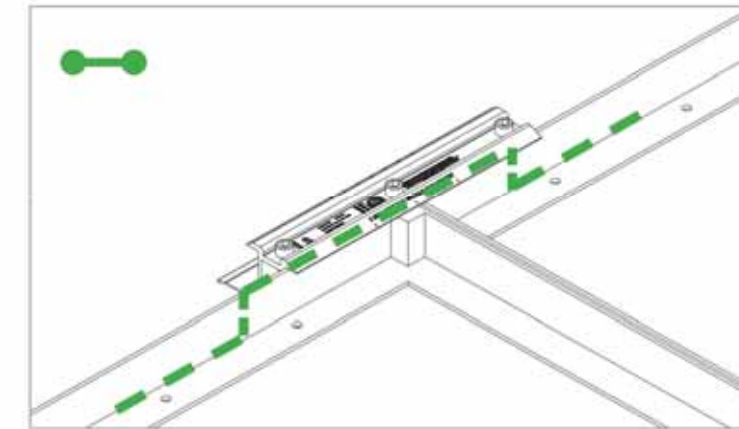
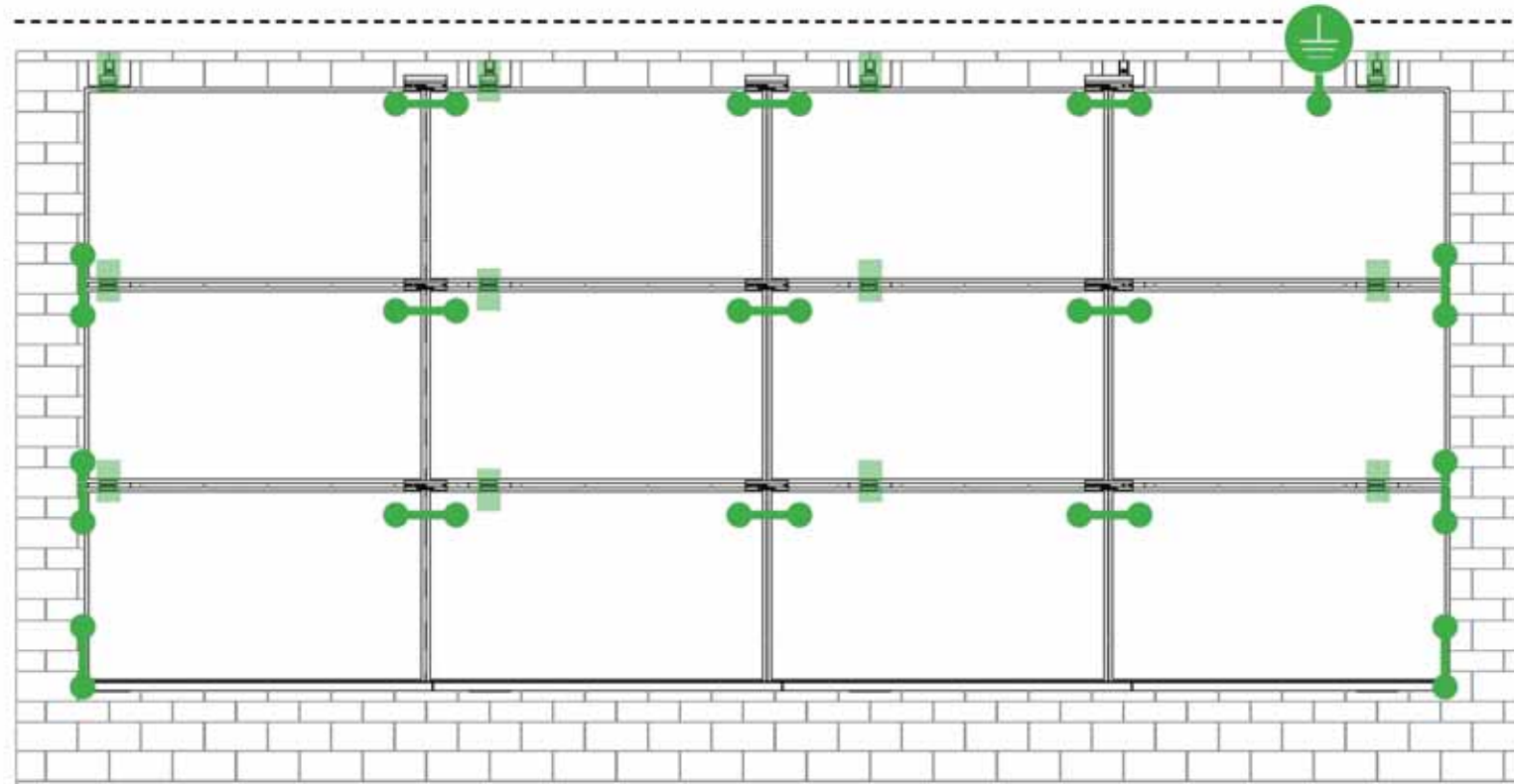
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|---|----------------------|------|------|
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| TOLERANCES:                             |                      |      |      |
| FRACTIONAL ±                            |                      |      |      |
| ANGULAR: MACH ± BEND ±                  |                      |      |      |
| TWO PLACE DECIMAL ±                     |                      |      |      |
| THREE PLACE DECIMAL ±                   |                      |      |      |
| INTERPRET GEOMETRIC<br>TOLERANCING PER: |                      |      |      |
| MATERIAL                                |                      |      |      |
| FINISH                                  |                      |      |      |
| NEXT ASSY                               | USED ON              |      |      |
| APPLICATION                             | DO NOT SCALE DRAWING |      |      |

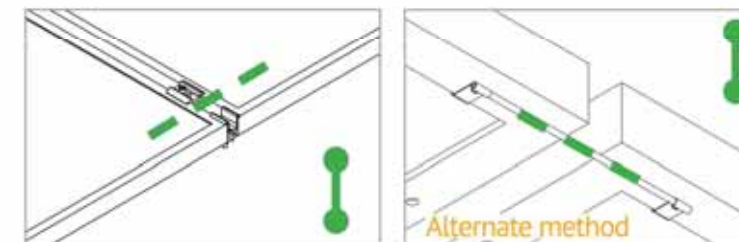
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|------------------------|----------------------|--------------|
| TITLE: <b>EZ SOLAR</b> |                      |              |
| SIZE <b>B</b>          | DWG. NO. <b>JB-1</b> | REV          |
| SCALE: 1:2             | WEIGHT:              | SHEET 2 OF 3 |

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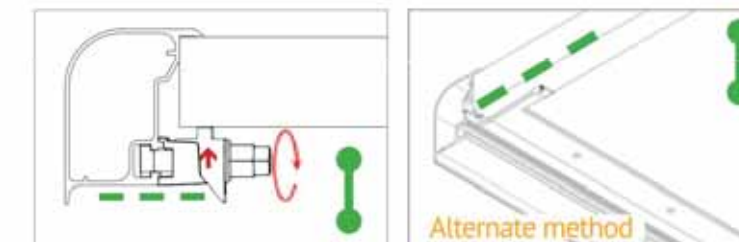




**E-W BONDING PATH:**  
E-W module to module bonding is accomplished with 2 pre-installed bonding pins which engage on the secure side of the Microrail™ and splice.



**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 )

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

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



WEEBLUG Single Use Only



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

**LUG DETAIL & TORQUE INFO**  
**IlSCO Flange Lug(SGB-4)**

- 1/4" mounting hardware
- Torque = 75 in-lb
- AWG 4-14 - Solid or Stranded

**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.**

### SYSTEM LEVEL FIRE CLASSIFICATION

The system fire class rating requires installation in the manner specified in the SUNFRAME MICRORAIL (SFM) Installation Guide. SFM has been classified to the system level fire portion of UL 1703. This UL 1703 classification has been incorporated into the UL 2703 product certification. SFM has achieved Class A, B & C system level performance for low slope & steep sloped roofs when used in conjunction with type 1 and type 2 modules. Class A, B & C system level fire

performance is inherent in the SFM design, and no additional mitigation measures are required. The fire classification rating is valid for any roof pitch. There is no required minimum or maximum height limitation above the roof deck to maintain the Class A, B & C fire rating for SFM. SUNFRAME MICRORAIL™ components shall be mounted over a fire resistant roof covering rated for the application.

| Module Type       | Roof Slope              | System Level Fire Rating | Microrail Direction | Module Orientation    | Mitigation Required |
|-------------------|-------------------------|--------------------------|---------------------|-----------------------|---------------------|
| Type 1 and Type 2 | Steep Slope & Low Slope | Class A, B & C           | East-West           | Landscape OR Portrait | None Required       |

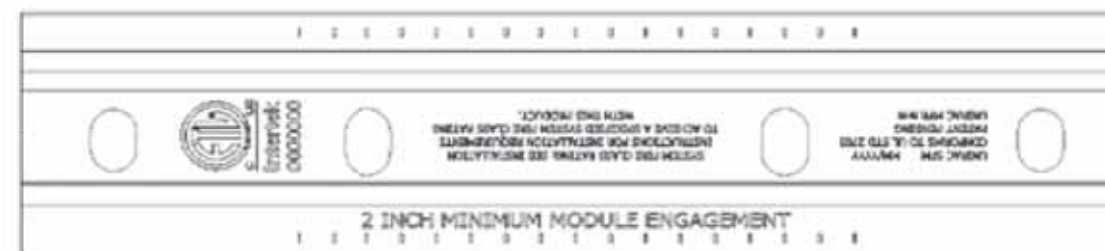
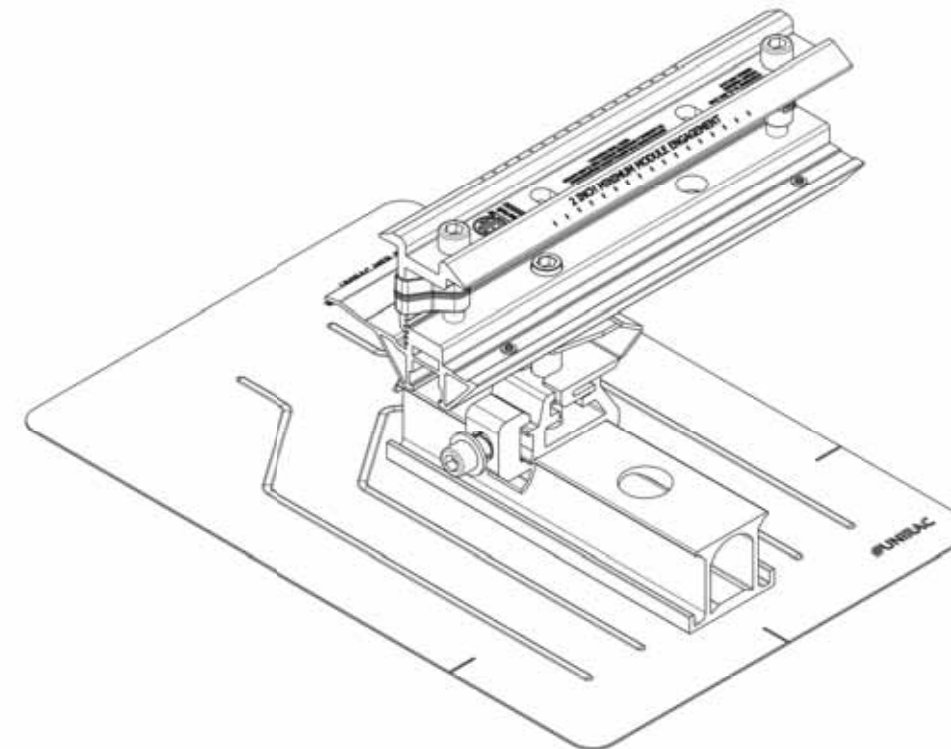
### UL2703 TEST MODULES

See page "S" for a list of modules that were electrically and mechanically tested or qualified with the SUNFRAME MICRORAIL (SFM) components outlined within this Installation Guide.

- Maximum Area of Module = 22.3 sqft
- UL2703 Design Load Ratings:
  - Downward Pressure – 113 PSF / 5400 Pa
  - Upward Pressure – 50 PSF / 2400 Pa
  - Down-Slope Load – 30 PSF / 1400 Pa
- Tested Loads:
  - Downward Pressure – 170 PSF / 8000 Pa
  - Upward Pressure – 75 PSF / 3500 Pa
  - Down-Slope Load – 45 PSF / 2100 Pa
- Maximum Span = 6ft
- Use with a maximum over current protection device OCPD of 30A
- System conforms to UL Std 2703, certified to LTR AE-001-2012
- Rated for a design load of 2400 Pa / 5400 Pa with 24 inch span

### LABEL MARKINGS

- System fire class rating: See installation instructions for installation requirements to achieve a specified system fire class rating with Unirac.
- Unirac SUNFRAME MICRORAIL™ is listed to UL 2703.
- All splices within a system are shipped with marking indicating date and location of manufacture.



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# TESTED / CERTIFIED MODULE LIST

## INSTALLATION GUIDE

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PV INSTALLATION  
PROFESSIONAL

Scott Gurney  
#PV-011719-015866

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| Manufacture         | Module Model / Series   |
|---------------------|---|
| Aleo                | P-Series  |
| Astronergy          | CHSM6612P, CHSM6612P/HV, CHSM6612M, CHSM6612M/HV, CHSM6610M (BL)(BF)/(HF), CHSM72M-HC   |
| Auxin               | AXN6M610T, AXN6P610T, AXN6M612T & AXN6P612T   |
| Axitec              | AXIblackpremium 60 (35mm), AXIpower 60 (35mm), AXIpower 72 (40mm), AXIpremium 60 (35mm), AXIpremium 72 (40mm).  |
| Aptos               | DNA-120-MF26<br>DNA-144-MF26  |
| Boviet              | BVM6610,<br>BVM6612   |
| BYD                 | P6K & MHK-36 Series   |
| Canadian Solar      | CS6V-M, CS6P-P, CS6K-M, CS5A-M, CS6K-MS, CS6U-P, CS6U-M, CS6X-P, CS6K-MS, CS6K-M, CS6K-P, CS6P-P, CS6P-M, CS3U-P, CS3U-MS, CS3K-P, CS3K-MS, CS1K-MS, CS3K, CS3U, CS3U-MB-AG, CS3K-MB-AG, CS6K, CS6U, CS3L, CS3W, CS1H-MS, CS1U-MS |
| Centrosolar America | C-Series & E-Series   |
| CertainTeed         | CT2xxMxx-01, CT2xxPxx-01, CTxxMxx-02, CTxxM-03, CTxxMxx-04, CTxxHC11-04   |
| Dehui               | DH-60M  |
| Eco Solargy         | Orion 1000 & Apollo 1000  |
| FreeVolt            | Mono PERC   |
| GCL                 | GCL-P6 & GCL-M6 Series  |

| Manufacture    | Module Model / Series  |
|----------------|--|
| Hansol         | TD-AN3, TD-AN4,<br>UB-AN1, UD-AN1  |
| Heliene        | 36M, 60M, 60P, 72M & 72P Series  |
| HT Solar       | HT60-156(M) (NDV) (-F),<br>HT 72-156(M/P)  |
| Hyundai        | KG, MG, TG, RI, RG, TI, MI, HI & KI Series   |
| ITEK           | iT, iT-HE & iT-SE Series   |
| Japan Solar    | JPS-60 & JPS-72 Series   |
| JA Solar       | JAP6 60-xxx, JAM6-60-xxx/SI, JAM6(K)-60/<br>xxx, JAP6(k)-72-xxx/4BB, JAP72SYY-xxx/ZZ,<br>JAP6(k)-60-xxx/4BB, JAP60SYY-xxx/ZZ,<br>JAM6(k)-72-xxx/ZZ, JAM72SYY-xxx/ZZ,<br>JAM6(k)-60-xxx/ZZ, JAM60SYY-xxx/ZZ.<br>i. YY: 01, 02, 03, 09, 10<br>ii. ZZ: SC, PR, BP, HiT, IB, MW            |
| Jinko          | JKM & JKMS Series  |
| Kyocera        | KU Series  |
| LG Electronics | LGxxxN2T-A4<br>LGxxx(A1C/E1C/E1K/N1C/N1K/N2T/N2W/<br>Q1C/Q1K/S1C/S2W)-A5<br>LGxxx(A1C/M1C/M1K/N1C/N1K/Q1C/Q1K/<br>QAC/QAK)-A6<br>LGxxx(N2T/N2W)-E6<br>LGxxx(N1C/N1K/N2W/S1C/S2W)-G4<br>LGxxxN2T-J5<br>LGxxx(N1K/N2T/N2W)-L5<br>LGxxx(N1C/Q1C/Q1K)-N5<br>LGxxx (N1C/N1K/N2W/Q1C/Q1K)-V5 |

| Manufacture          | Module Model / Series  |
|----------------------|--|
| LONGi                | LR4-60(HIB/HIH/HPB/HPH)-xxxM<br>LR4-72(HIH/HPH)-xxxM<br>LR6-60(BP/HBD/HIBD)-xxxM (30mm)<br>LR6-60(BK)(PE)(HPB)(HPH)-xxxM (35mm)<br>LR6-60(BK)(PE)(PB)(PH)-xxxM (40mm)<br>LR6-72(BP)(HBD)(HIBD)-xxxM (30mm)<br>LR6-72(HV)(BK)(PE)(PH)(PB)(HPH)-xxxM<br>(35mm)<br>LR6-72(BK)(HV)(PE)(PB)(PH)-xxxM (40mm) |
| Mission Solar Energy | MSE Series   |
| Mitsubishi           | MJE & MLE Series   |
| Neo Solar Power Co.  | D6M & D6P Series   |
| Panasonic            | VBHNxxxSA15 & SA16,<br>VBHNxxxSA17 & SA18,<br>VBHNxxxSA17(E/G) & SA18E,<br>VBHNxxxKA01 & KA03 & KA04,<br>VBHNxxxZA01, VBHNxxxZA02,<br>VBHNxxxZA03, VBHNxxxZA04   |
| Peimar               | SGxxxM (FB/BF)   |
| Phono Solar          | PS-60, PS-72   |
| Q.Cells              | Plus, Pro, Peak, G3, G4, G5, G6(+), G7, G8(+)<br>Pro, Peak L-G2, L-G4, L-G5, L-G6, L-G7  |
| REC                  | Alpha (72) (Black)<br>N-Peak (Black)<br>PEAK Energy Series<br>PEAK Energy BLK2 Series<br>PEAK Energy 72 Series<br>TwinPeak Series<br>TwinPeak 2 Series<br>TwinPeak 2 BLK2 Series<br>TwinPeak 2S(M)72(XV)<br>TwinPeak 3 Series (38mm)   |

Please see the SFM UL2703Construction Data Report at Unirac.com to ensure the exact solar module selected is approved for use with SFM. SFM Infinity is not compatible with module frame height of less than 30mm and more than 40mm. See page J for further information.

SHEET NAME:

**SPEC SHEETS**

REVISION:

0

PAGE NUMBER:

SS



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| <b>Address:</b> 1411 Broadway Blvd NE<br>Albuquerque, NM 87102 | <b>Address:</b>      |
| <b>Country:</b> USA  | <b>Country:</b>      |
| <b>Contact:</b> Klaus Nicolaedis<br>Todd Ganshaw               | <b>Contact:</b>      |
| <b>Phone:</b> 505-462-2190<br>505-843-1418                     | <b>Phone:</b>        |
| <b>FAX:</b> NA   | <b>FAX:</b>          |
| <b>Email:</b> klaus.nicolaedis@unirac.com<br>toddg@unirac.com  | <b>Email:</b>        |

**Party Authorized To Apply Mark:** Same as Manufacturer  
**Report Issuing Office:** Lake Forest, CA  
**Control Number:** 5003705      **Authorized by:** *Jovany Alvarez*  
 for L. Matthew Snyder, Certification Manager



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Intertek Testing Services NA Inc.  
545 East Algonquin Road, Arlington Heights, IL 60005  
Telephone 800-345-3851 or 847-439-5667 Fax 312-283-1672

|                     |   |
|---------------------|---|
| <b>Standard(s):</b> | Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels [UL 2703: 2015 Ed.1]<br>Photovoltaic Module Racking Systems [CSA LTR AE-001:2012] |
| <b>Product:</b>     | Photovoltaic Mounting System, Sun Frame Microrail Installation Guide, PUB2021JAN13  |
| <b>Brand Name:</b>  | Unirac  |
| <b>Models:</b>      | Unirac SFM  |



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| <b>Country:</b> USA  | <b>Country:</b>      |
| <b>Contact:</b> Klaus Nicolaedis<br>Todd Ganshaw               | <b>Contact:</b>      |
| <b>Phone:</b> 505-462-2190<br>505-843-1418                     | <b>Phone:</b>        |
| <b>FAX:</b> NA   | <b>FAX:</b>          |
| <b>Email:</b> klaus.nicolaedis@unirac.com<br>toddg@unirac.com  | <b>Email:</b>        |

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**Control Number:** 5014989      **Authorized by:** *Jovany Alvarez*  
 for L. Matthew Snyder, Certification Manager



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|                     |   |
|---------------------|---|
| <b>Standard(s):</b> | Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels [UL 2703: 2015 Ed.1]<br>Photovoltaic Module Racking Systems [CSA LTR AE-001:2012] |
| <b>Product:</b>     | Photovoltaic Mounting System, Sun Frame Microrail Installation Guide, PUB2021JAN13  |
| <b>Brand Name:</b>  | Unirac  |
| <b>Models:</b>      | Unirac SFM  |



1403 N. Research Way  
Orem, UT 84097  
800.377.4480  
WWW.BLUERAVENSOLAR.COM

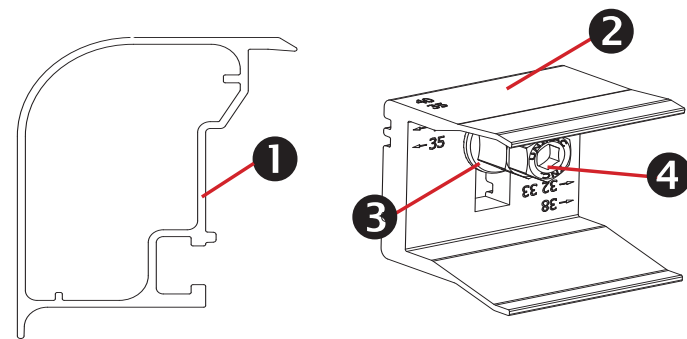
CONFIDENTIAL- THE INFORMATION HEREIN CONTAINED SHALL NOT BE USED FOR THE BENEFIT OF ANYONE EXCEPT BLUE RAVEN SOLAR NOR SHALL IT BE DISCLOSED IN WHOLE OR IN PART TO OTHERS OUTSIDE RECIPIENTS ORGANIZATION, EXCEPT IN CONNECTION WITH THE SALE AND USE OF THE RESPECTIVE EQUIPMENT, WITHOUT THE WRITTEN PERMISSION OF BLUE RAVEN SOLAR LLC.



PV INSTALLATION PROFESSIONAL  
Scott Gurney  
#PV-011719-015866

CONTRACTOR:  
BRS FIELD OPS  
385-498-6700

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| SHEET NAME:<br><b>SPEC SHEETS</b> |                    |
| REVISION:<br>0                    | PAGE NUMBER:<br>SS |



### 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

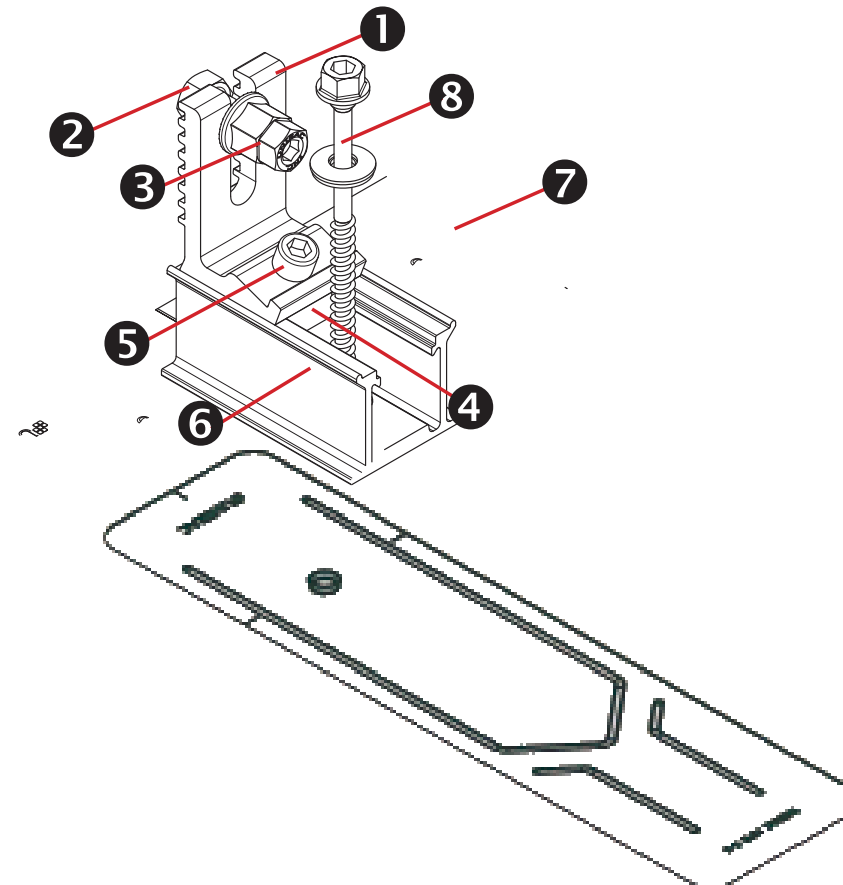
#### Module Clips

##### 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:

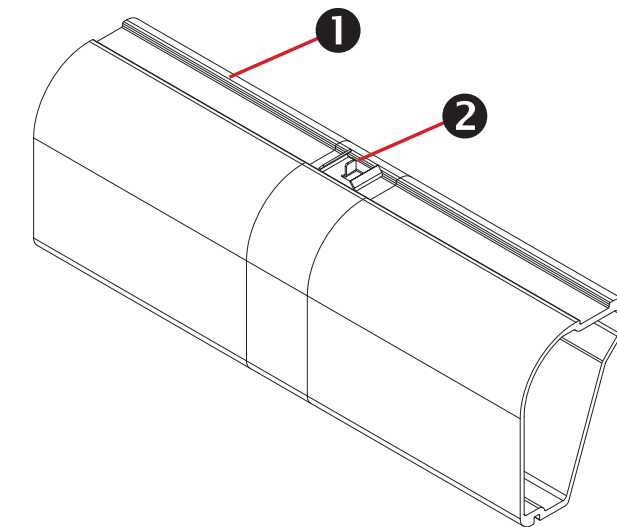
- L-Foot
- Hex bolt
- Tri-drive nut
- Channel Nut
- Socket Head Cap Screw
- 3\" Channel/Slider w/grommet
- 3\" Wide Flashing
- Structural Screw & SS EPDM Washer

##### 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:

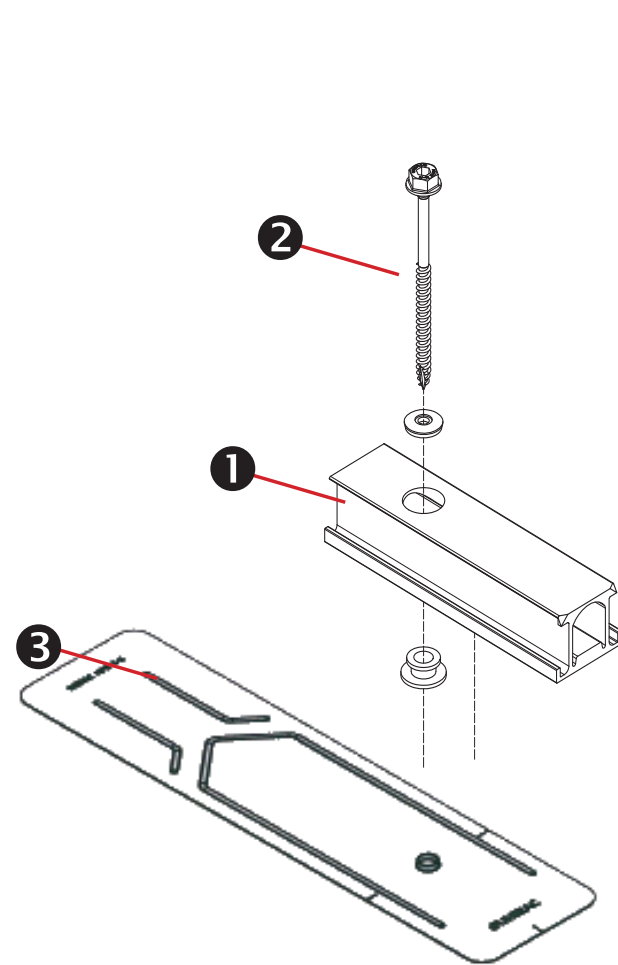
1. Structural Splice Extrusion
2. Bonding Clip

##### 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



### SFM Slider Flashkit

#### Sub-Components:

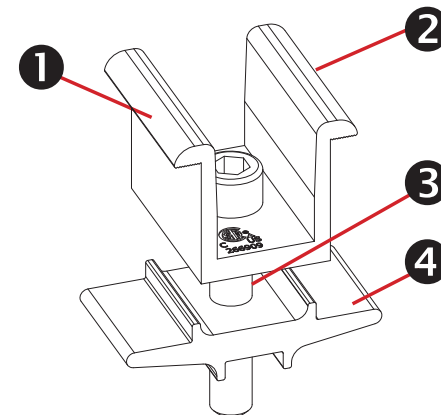
1. Slider w/grommet
2. Structural Screw & SS EPDM washer
3. 3" Wide Flashing

#### 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



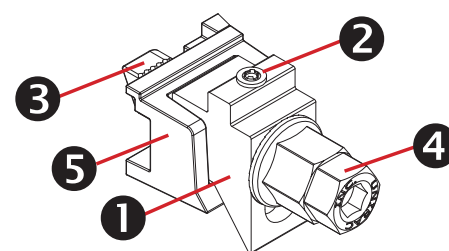
### Module-to-Module N-S Bonding

#### 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



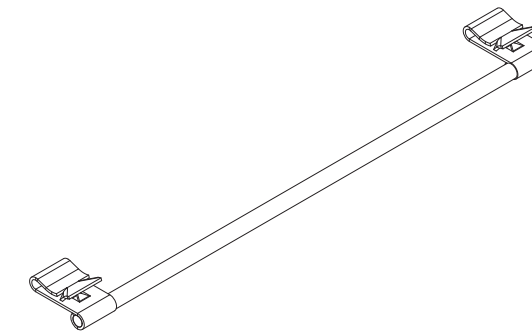
### Trim -to- Module Bonding Clamp and Floating Trim Clamp

#### 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



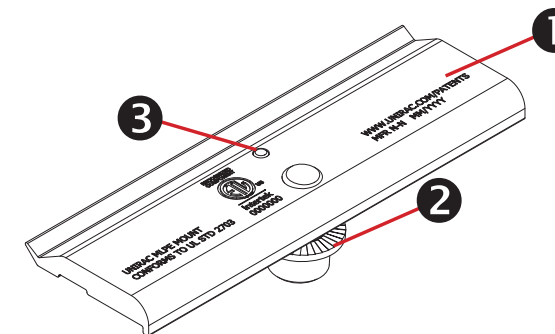
### Wire Bonding Clip w/ 8AWG

#### 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

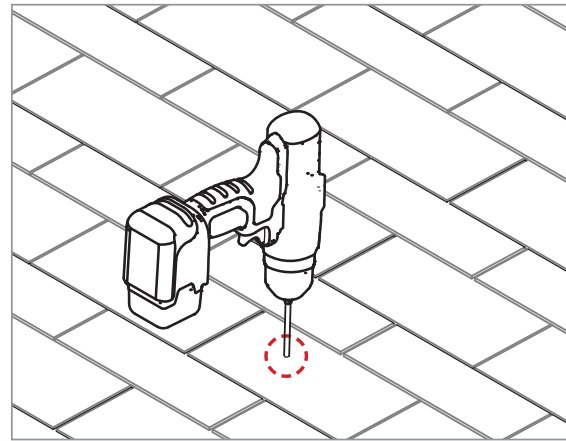
#### Functions:

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

#### Features:

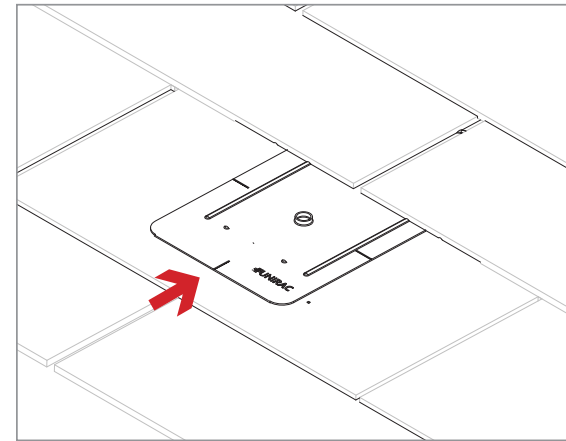
- Mounts easily to typical module flange
- UL2703 Recognized

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



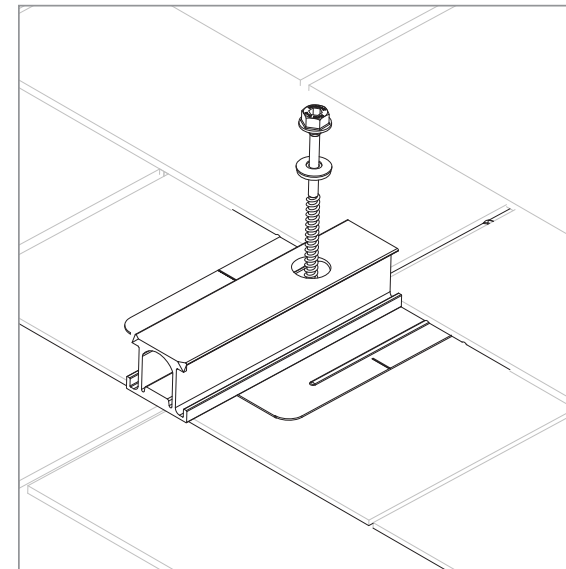
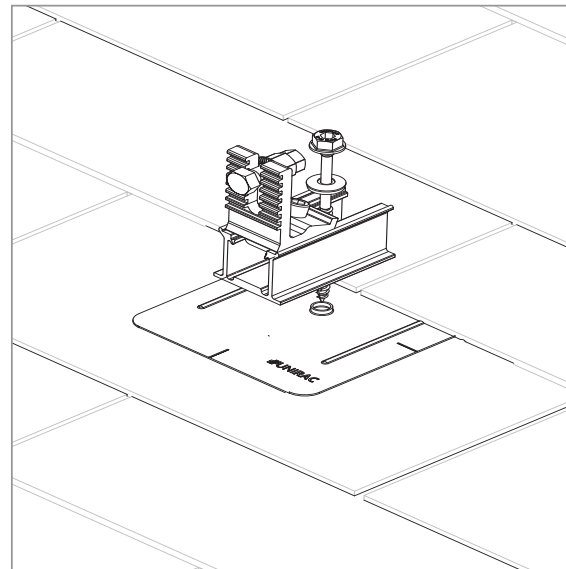
**PILOT HOLES:**

Drill pilot holes for lag screws or structural screws (as necessary) at marked attachment 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 Trimrail™ roof attachments in each row have sufficient engagement with slider dovetails for proper attachment.

