

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.

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



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CONTRACTOR:
BRS FIELD OPS
385.498.6700

SITE INFORMATION:

Charles Gast
450 Cokesbury Park Ln
Fuquay Varina, North Carolina 27526
DC SYSTEM SIZE: 7.04 kW DC

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

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))

SCOPE OF WORK
INSTALLATION OF UTILITY INTERACTIVE PHOTOVOLTAIC SOLAR SYSTEM
7.04 kW DC PHOTOVOLTAIC SOLAR ARRAY
ROOF TYPE: Comp Shingle
MODULES: (22) Trina 320
INVERTER(S): Enphase IQ7 Microinverters,----
RACKING: Unirac SFM Infinity

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

06/05/2020

DRAWING BY
Cameron Lawson

DATE
March 12, 2020

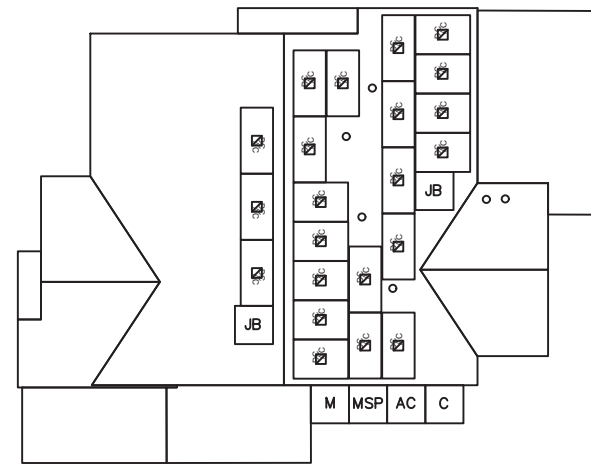
PROJECT NUMBER
75016795

SHEET NAME
COVER SHEET

| | |
|---------------------------|------------------|
| PAGE NUMBER PV1 | REVISION ---- |
|---------------------------|------------------|

450 Cokesbury Park Ln

FRONT OF HOME



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



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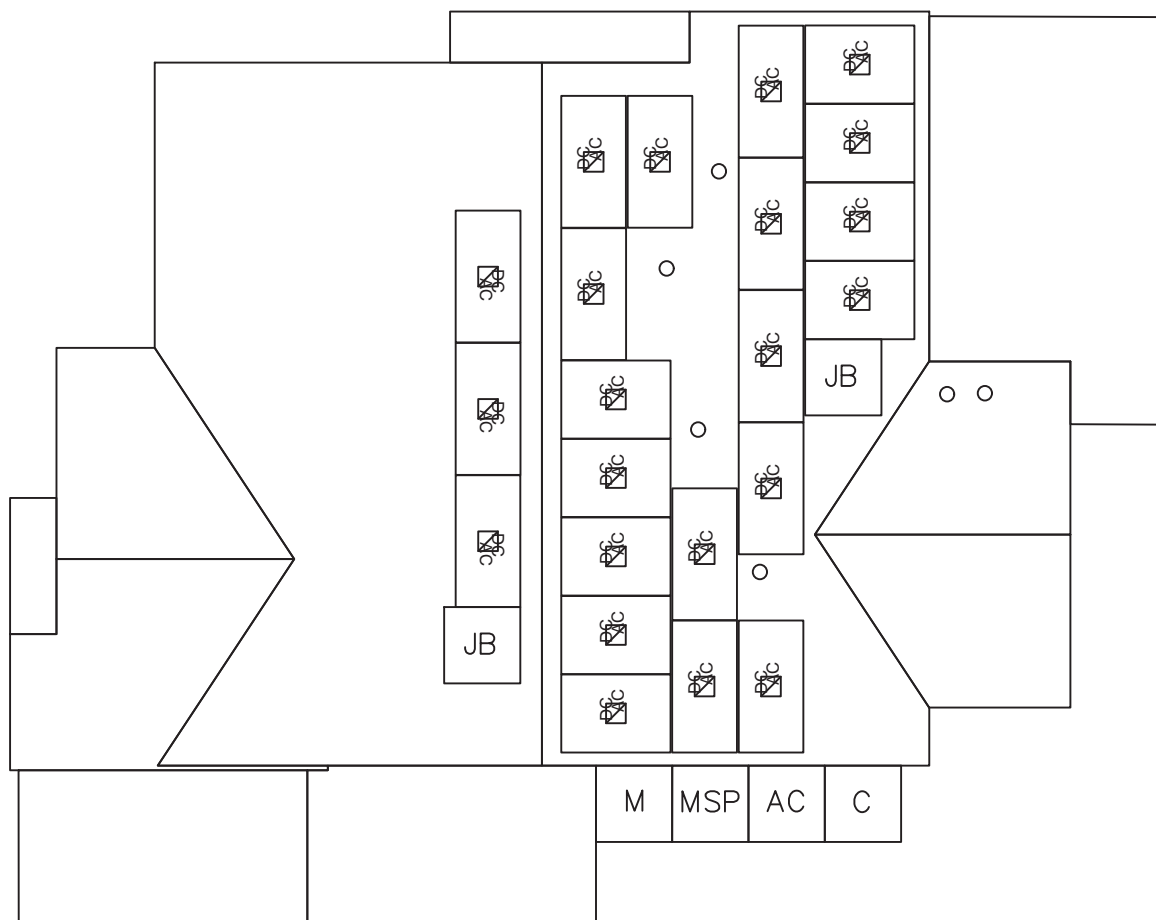
SHEET NAME
PROPERTY PLAN

PAGE NUMBER
PV2

REVISION

FRONT OF HOME

MP2
OF MODULES: 3
AZIMUTH:288°
PITCH:34°
TSRF:74%
AREA: 421 SQ. FT



MP1
OF MODULES: 19
AZIMUTH:108°
PITCH:34°
TSRF:87%
AREA: 459 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
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Digitally signed
by John Calvert
Date: 2020.04.03
15:08:22 -06'00'

4/3/2020

Firm No. : D-0369

SITE INFORMATION:
Charles Gast
450 Cokesbury Park Ln
Fuquay Varina, North Carolina 27526
DC SYSTEM SIZE: 7.04 kW DC

DRAWING BY
Cameron Lawson

DATE
March 12, 2020

PROJECT NUMBER
75016795

SHEET NAME
SITE PLAN

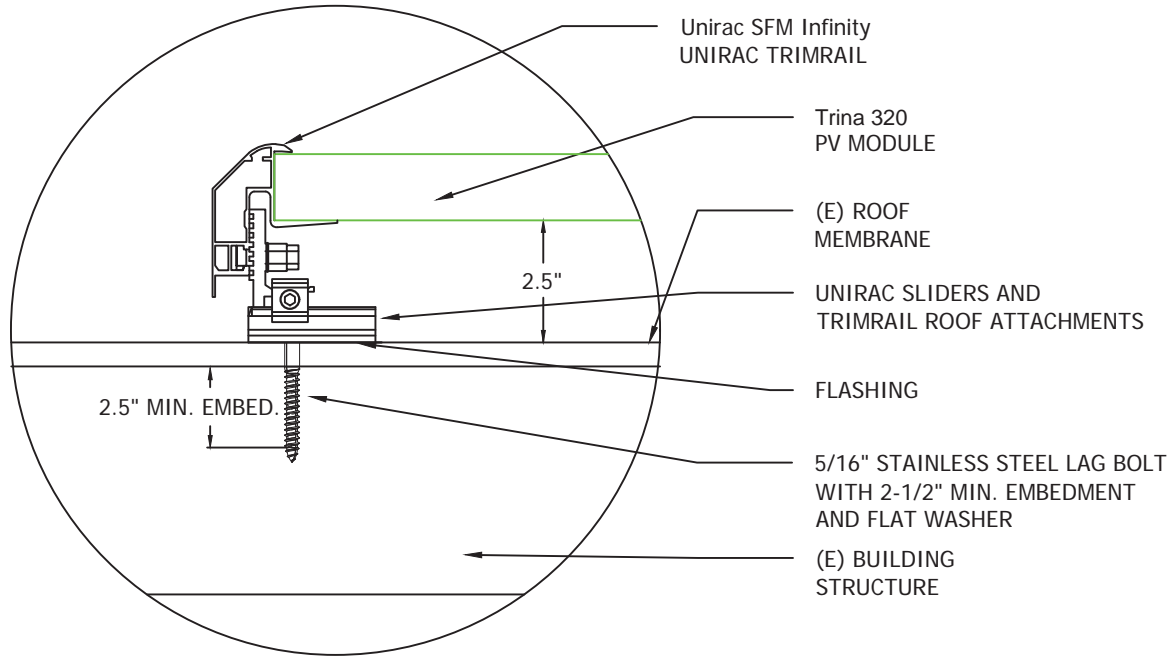
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PV3

REVISION

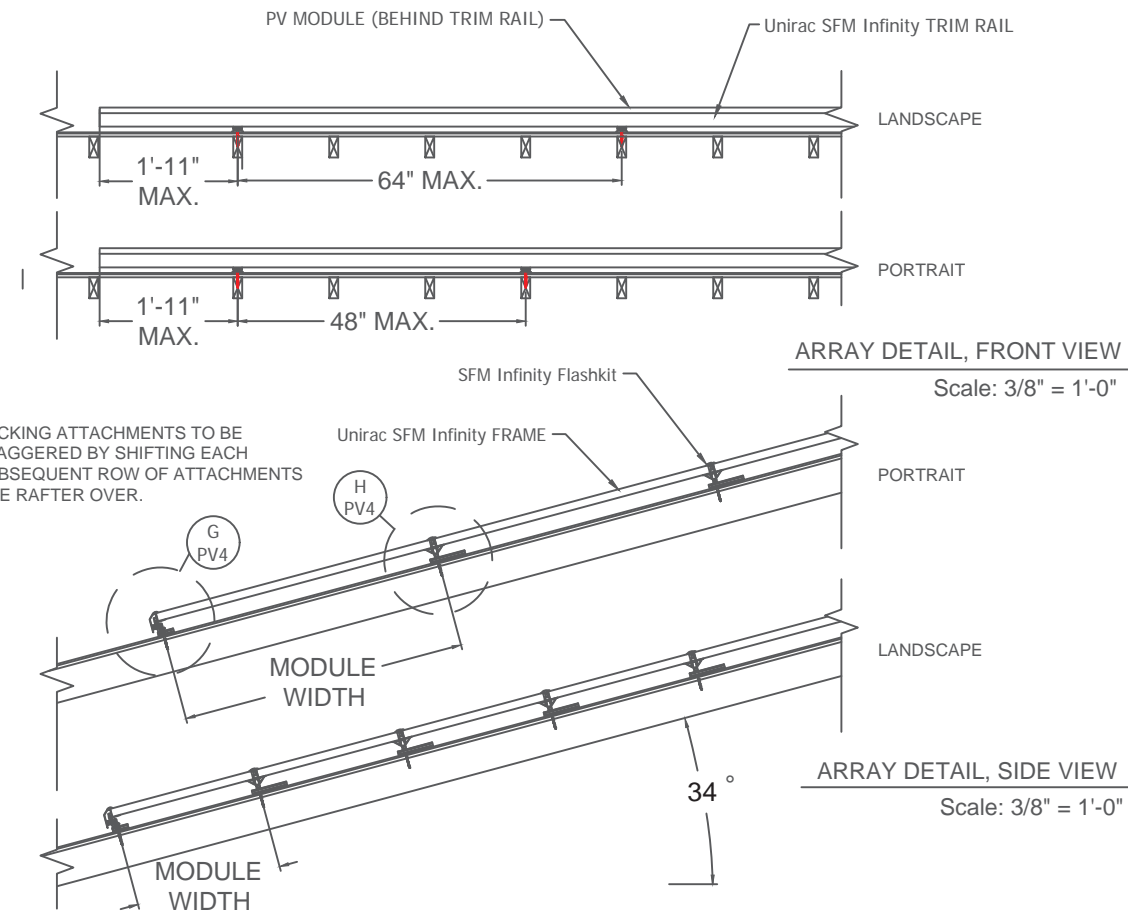
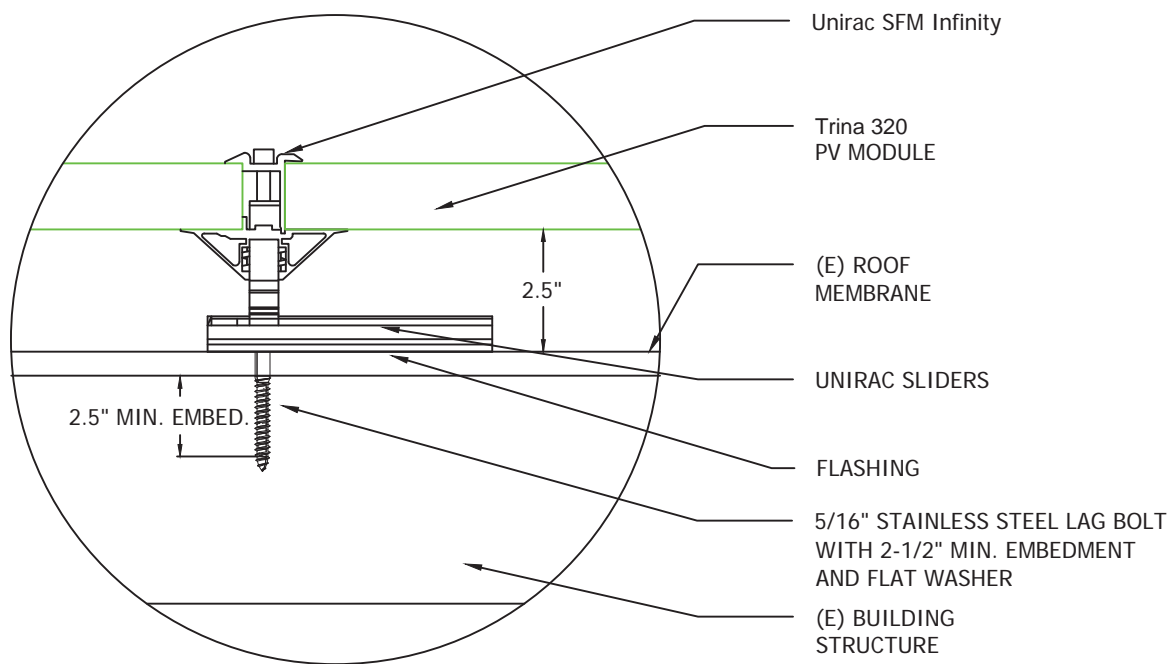
PV ARRAY INFORMATION

PV MODULE COUNT: 22 MODULES
 # OF ATTACHMENT POINTS: 57
 ARRAY AREA: Module Count x 17.51ft² = 385.2ft²
 ROOF AREA: 1168.0ft²
 % OF ARRAY/ROOF: 33.0%
 ARRAY WEIGHT: Module Count x 50lbs = 1100.0lbs
 DISTRIBUTED LOAD: Array Weight ÷ Array Area = 2.86 lbs/ft²
 POINT LOAD: Array Weight ÷ Attachments = 19.3lbs/attachment

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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 Firm No. : D-0369



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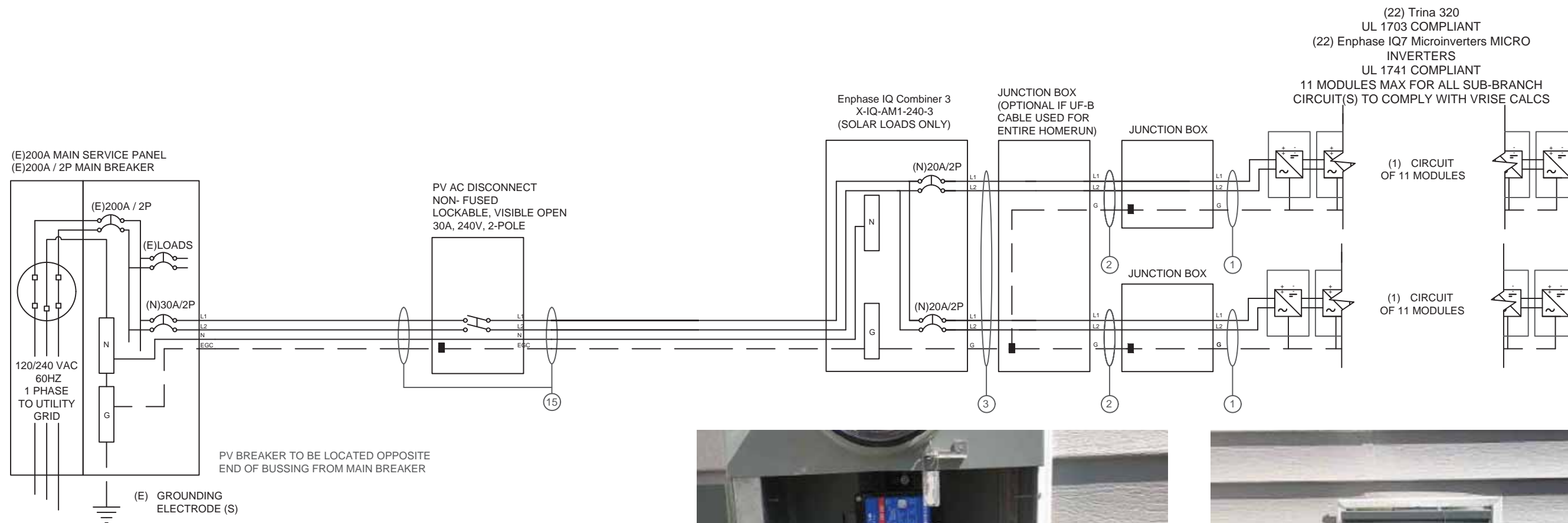
CONTRACTOR:
 BRS FIELD OPS
 385.498.6700

SITE INFORMATION:
 Charles Gast
 450 Cokesbury Park Ln
 Fuquay Varina, North Carolina 27526
 DC SYSTEM SIZE: 7.04 kW DC

| | |
|------------------------------|------------------|
| DRAWING BY Cameron Lawson | |
| DATE March 12, 2020 | |
| PROJECT NUMBER 75016795 | |
| SHEET NAME EQUIP. DETAIL | |
| PAGE NUMBER PV4 | REVISION ---- |

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

22 INVERTERS x 240 W AC = 5.28 kW AC
 PANEL WATTAGE = 320 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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DRAWING BY
 Cameron Lawson

DATE
 March 12, 2020

PROJECT NUMBER
 75016795

SHEET NAME
 ELEC. 3 LINE DIAG.

PAGE NUMBER
 PV5

REVISION

| MODULE SPECIFICATIONS | | Trinasolar 320 TSM-DD06M.05(II) |
|--|--|---------------------------------|
| RATED POWER (STC) | | 320 W |
| MODULE VOC | | 40.3 V DC |
| MODULE VMP | | 33.4 V DC |
| MODULE IMP | | 9.58 A DC |
| MODULE ISC | | 10.2 A DC |
| VOC CORRECTION | | -0.26 %/°C |
| VMP CORRECTION | | -0.36 %/°C |
| SERIES FUSE RATING | | 20 A DC |
| ADJ. MODULE VOC @ ASHRAE LOW TEMP. | | 44.2 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 | 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) | 3520 | 3520 | | | | |
| TOTAL MODULE NUMBER | 22 MODULES | | | | | |
| STC RATING OF ARRAY | 7040W 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) | 5 | 10 Cu. | 0.28 | 240.28 | 0.12% | |
| TOTAL VRISE | | | 3.16 | 243.16 | 1.32% | |

| 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 CURRENT (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 = | 34 0.96 |
| | ADJUSTED AMP. = | 28.8 > 13.8 |
| JUNCTION BOX TO JUNCTION BOX (2) | MAX. SHORT CIRCUIT CURRENT (ISC) = | 11.0 A AC |
| | MAX. CURRENT (ISC X1.25) = | 13.8 A AC |
| | CONDUCTOR (UF-B, COPPER (60°C)) = | 15 10 AWG |
| | CONDUCTOR RATING = | 15 30 A |
| | CONDUIT FILL DERATE = | 2 1 |
| | AMB. TEMP. AMP. CORRECTION = | 34 0.96 |
| | ADJUSTED AMP. = | 28.8 > 13.8 |
| JUNCTION BOX TO COMBINER BOX (3) | MAX. SHORT CIRCUIT CURRENT (ISC) = | 11.0 A AC |
| | MAX. CURRENT (ISC X1.25) = | 13.8 A AC |
| | CONDUCTOR (UF-B, COPPER (60°C)) = | 18 10 AWG |
| | CONDUCTOR RATING = | 18 30 A |
| | CONDUIT FILL DERATE = | 4 0.8 |
| | AMB. TEMP. AMP. CORRECTION = | 34 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.)) = | 29 10 AWG |
| | CONDUCTOR RATING = | 29 35 A |
| | CONDUIT FILL DERATE = | 3 1 |
| | AMB. TEMP. AMP. CORRECTION = | 34 0.96 |
| | ADJUSTED AMP. = | 33.6 > 27.5 |



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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:

Charles Gast
450 Cokesbury Park Ln
Fuquay Varina, North Carolina 27526
DC SYSTEM SIZE: 7.04 kW DC

DRAWING BY
Cameron Lawson

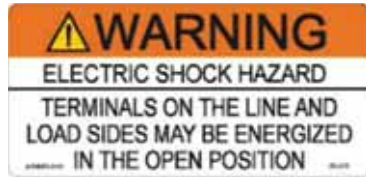
DATE
March 12, 2020

PROJECT NUMBER
75016795

SHEET NAME
ELEC. CALCS.

PAGE NUMBER
PV6

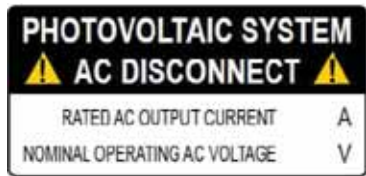
REVISION



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)]



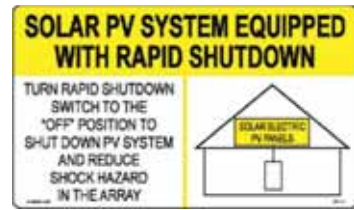
LABEL 6
(ONLY IF 3 OR MORE SUPPLY SOURCES TO A BUSBAR)
SIGN LOCATED AT LOAD CENTER IF IT CONTAINS 3 OR MORE POWER SOURCES. [NEC 705.12(B)(2)(3)(C)]

LABELING NOTES:

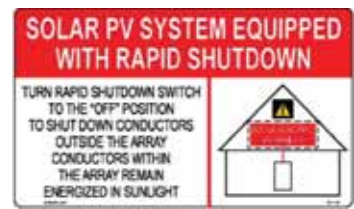
1. LABELS CALLED OUT ACCORDING TO ALL COMMON CONFIGURATIONS. ELECTRICIAN TO DETERMINE EXACT REQUIREMENTS IN THE FIELD PER CURRENT NEC AND LOCAL CODES AND MAKE APPROPRIATE ADJUSTMENTS.
2. LABELING REQUIREMENTS BASED ON THE 2017 NATIONAL ELECTRIC CODE, OSHA STANDARD 19010.145, ANSI Z535.
3. MATERIAL BASED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

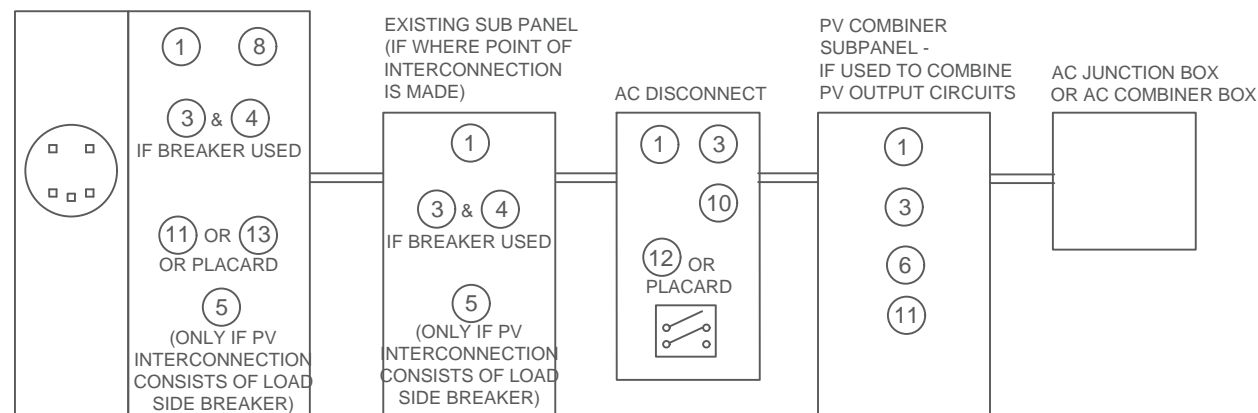


LABEL 12
PERMANENT DIRECTORY TO BE LOCATED AT SOLAR ARRAY RAPID SHUTDOWN SWITCH DENOTING THE LOCATION OF THE SERVICE EQUIPMENT LOCATION IF SOLAR ARRAY RAPID SHUT DOWN DISCONNECT SWITCH IS NOT GROUPED AND WITHIN LINE OF SITE OF MAIN SERVICE DISCONNECTING MEANS. [NEC 705.10]

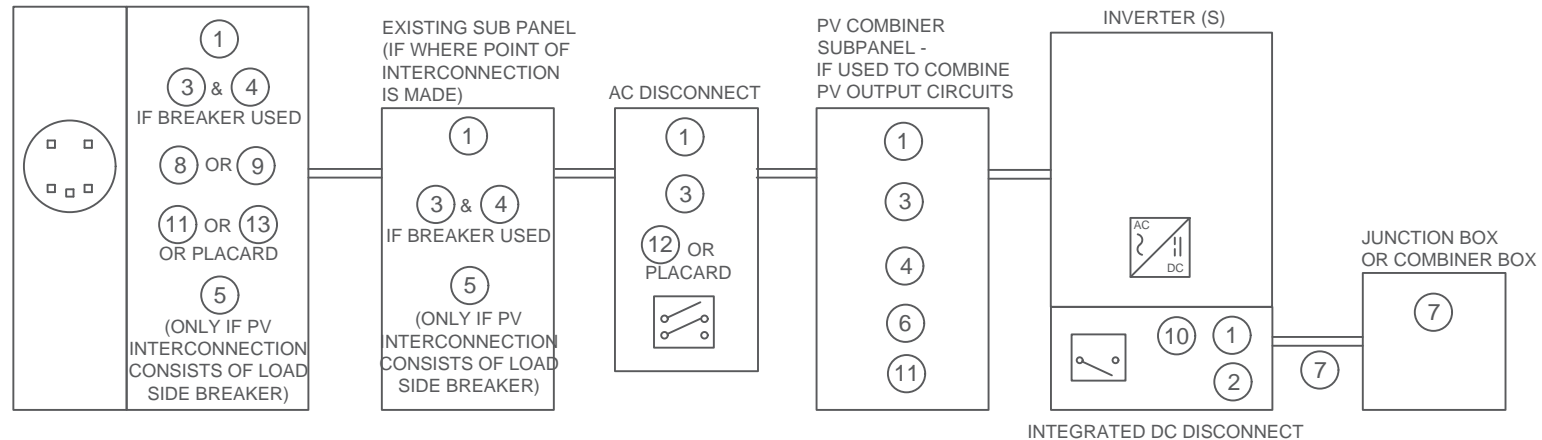


LABEL 13
PERMANENT DIRECTORY TO BE LOCATED AT MAIN SERVICE EQUIPMENT DENOTING THE LOCATION OF THE PV RAPID SHUTDOWN SYSTEM DISCONNECTING MEANS IF SOLAR ARRAY RAPID SHUT DOWN DISCONNECT SWITCH IS NOT GROUPED AND WITHIN LINE OF SITE OF MAIN SERVICE DISCONNECTING MEANS. [NEC 705.10, NEC 690.56(C)(1)]

LABELING DIAGRAM FOR MICRO INV.:
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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CONTRACTOR:
BRS FIELD OPS
385.498.6700

SITE INFORMATION:

Charles Gast
450 Cokesbury Park Ln
Fuquay Varina, North Carolina 27526
DC SYSTEM SIZE: 7.04 kW DC

DRAWING BY
Cameron Lawson

DATE
March 12, 2020

PROJECT NUMBER
75016795

SHEET NAME
LABELS

PAGE NUMBER
PV8

REVISION

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.



To learn more about Enphase offerings, visit enphase.com



Enphase IQ 7 and IQ 7+ Microinverters

| INPUT DATA (DC) | IQ7-60-2-US / IQ7-60-B-US | | IQ7PLUS-72-2-US / IQ7PLUS-72-B-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 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 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 | 0 A | | 0 A | |
| Power factor setting | 1.0 | | 1.0 | |
| Power factor (adjustable) | 0.7 leading ... 0.7 lagging | | 0.7 leading ... 0.7 lagging | |
| EFFICIENCY | @240 V | | @208 V | |
| Peak CEC efficiency | 97.6 % | | 97.3 % | |
| CEC weighted efficiency | 97.0 % | | 97.0 % | |
| MECHANICAL DATA | | | | |
| Ambient temperature range | -40°C to +65°C | | | |
| Relative humidity range | 4% to 100% (condensing) | | | |
| Connector type (IQ7-60-2-US & IQ7PLUS-72-2-US) | MC4 (or Amphenol H4 UTX with additional Q-DCC-5 adapter) | | | |
| Connector type (IQ7-60-B-US & IQ7PLUS-72-B-US) | Friends PV2 (MC4 intermateable). Adaptors for modules with MC4 or UTX connectors: - PV2 to MC4: order ECA-S20-S22 - PV2 to UTX: order ECA-S20-S25 | | | |
| Dimensions (WxHxD) | 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.

To learn more about Enphase offerings, visit enphase.com

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CONTRACTOR:
 BRS FIELD OPS
 385.498.6700

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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 warranty
- UL listed



To learn more about Enphase offerings, visit enphase.com



Enphase IQ Combiner 3

| MODEL NUMBER | |
|--|--|
| IQ Combiner 3 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™ CELLMODEM-03 (4G / 12-year data plan) CELLMODEM-01 (3G / 5-year data plan) 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 CT-200-SPLIT | Split core current transformers enable whole home consumption metering (+/- 2.5%). |
| Circuit Breakers BRK-10A-2-240 BRK-15A-2-240 BRK-20A-2P-240 | Supports Eaton BR210, BR215, BR220, BR230, BR240, BR250, and BR260 circuit breakers. Circuit breaker, 2 pole, 10A, Eaton BR210 Circuit breaker, 2 pole, 15A, Eaton BR215 Circuit breaker, 2 pole, 20A, Eaton BR220 |
| EPLC-01 | Power line carrier (communication bridge pair), quantity 2 |
| 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 | • 20 A to 50 A breaker inputs: 14 to 4 AWG copper conductors • 60 A breaker branch input: 4 to 1/0 AWG copper conductors • Main lug combined output: 10 to 2/0 AWG copper conductors • Neutral and ground: 14 to 1/0 copper conductors Always follow local code requirements for conductor sizing. |
| Altitude | To 2000 meters (6,560 feet) |
| INTERNET CONNECTION OPTIONS | |
| Integrated Wi-Fi | 802.11b/g/n |
| 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. 1071 47 CFR, Part 15, Class B, ICES 003 Production metering: ANSI C12.20 accuracy class 0.5 (PV production) |
| Compliance, IQ Envoy | UL 60601-1/CANCSA 22.2 No. 61010-1 |

* Consumption monitoring is required for Enphase Storage Systems.

To learn more about Enphase offerings, visit enphase.com

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2018-09-13



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THE Residential Module

MULTI-BUSBAR 120 HALF-CELL BOB MODULE

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 beneficial 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 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

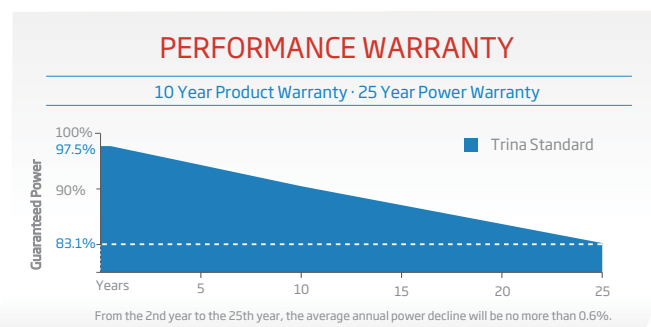
- Excellent 3rd party validated IAM and low light performance with cell process and module material optimization
- Low Pmax temp coefficient (-0.36%) increases energy production
- Better anti-shading performance and lower operating temperature

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 environment

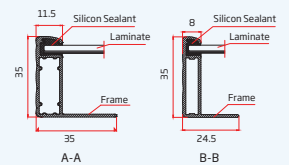
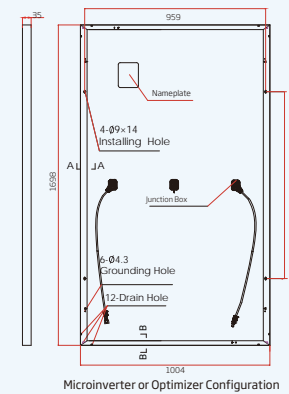
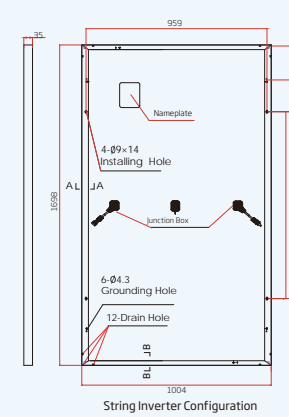
- High PID resistance through cell process and module material control
- Resistant to salt, acid, sand, and ammonia
- Over 30 in-house tests (UV, TC, HF etc)
- Certified to 5400 Pa positive load and 2400 Pa negative load



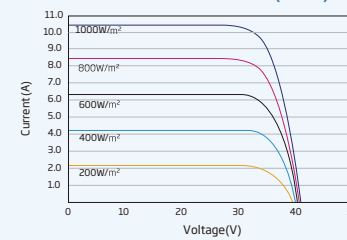
Residential Module

MULTI-BUSBAR 120 HALF-CELL BOB MODULE

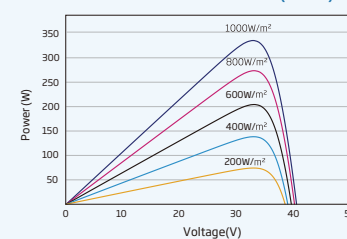
DIMENSIONS OF PV MODULE(mm)



I-V CURVES OF PV MODULE (335W)



P-V CURVES OF PV MODULE (335W)



ELECTRICAL DATA (STC)

| Parameter | 310 | 315 | 320 | 325 | 330 | 335 |
|---|-------|-------|-------|-------|-------|-------|
| 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 | 9.58 | 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(%) | 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)

| Parameter | 235 | 238 | 242 | 246 | 250 | 254 |
|--|------|------|------|------|------|------|
| 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 4.0mm ² (0.006 inches ²) 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



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

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CONTRACTOR:
BRS FIELD OPS
385.498.6700



CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.
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Version number: TSM_DD06M.05(II)_EN_2019_B www.trinasolar.com

SHEET NAME
SPEC SHEET

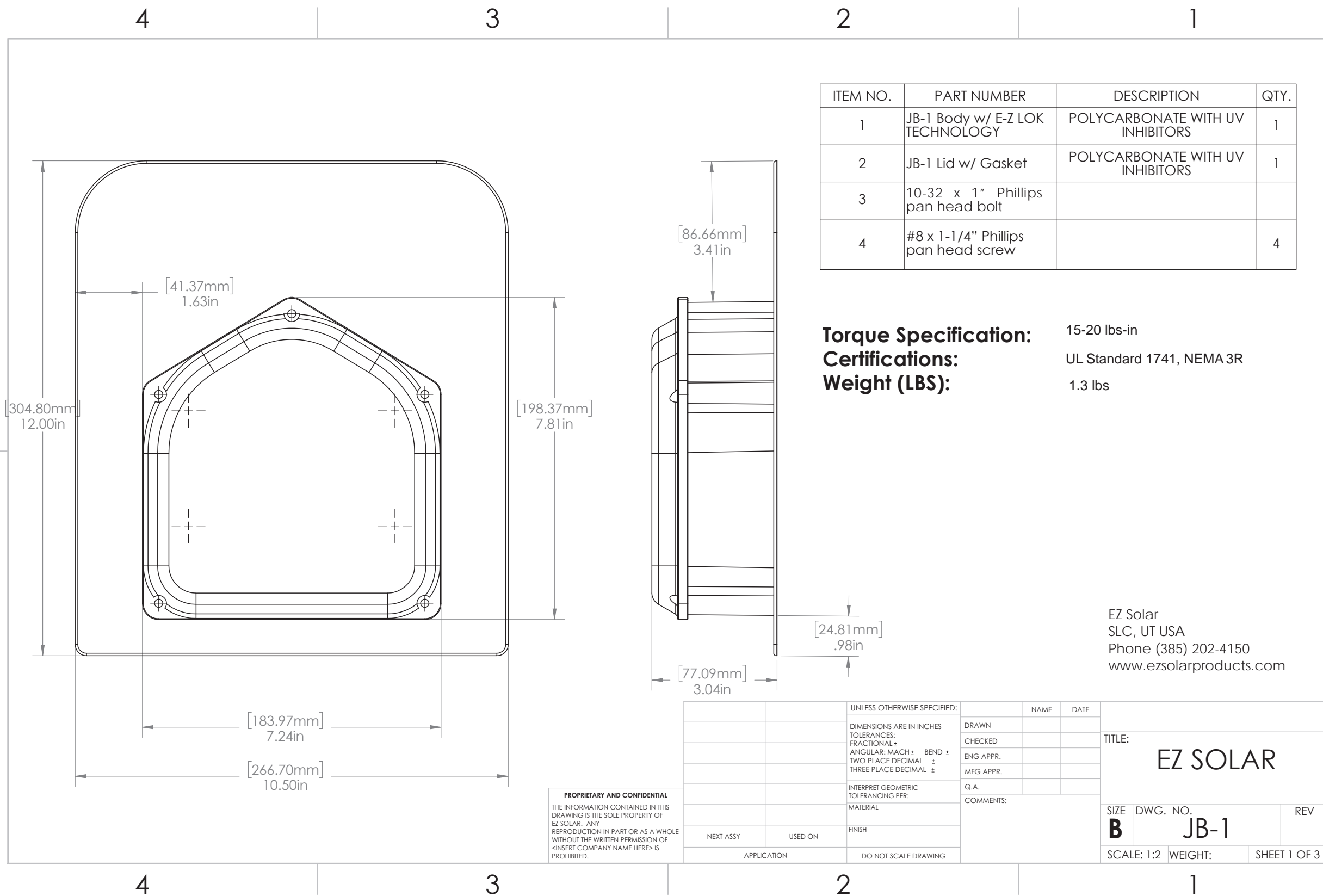
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|-----------------------------|----------------------|------|------|
| DRAWN | | | |
| CHECKED | | | |
| ENG APPR. | | | |
| MFG APPR. | | | |
| Q.A. | | | |
| COMMENTS: | | | |
| NEXT ASSY | USED ON | | |
| APPLICATION | DO NOT SCALE DRAWING | | |

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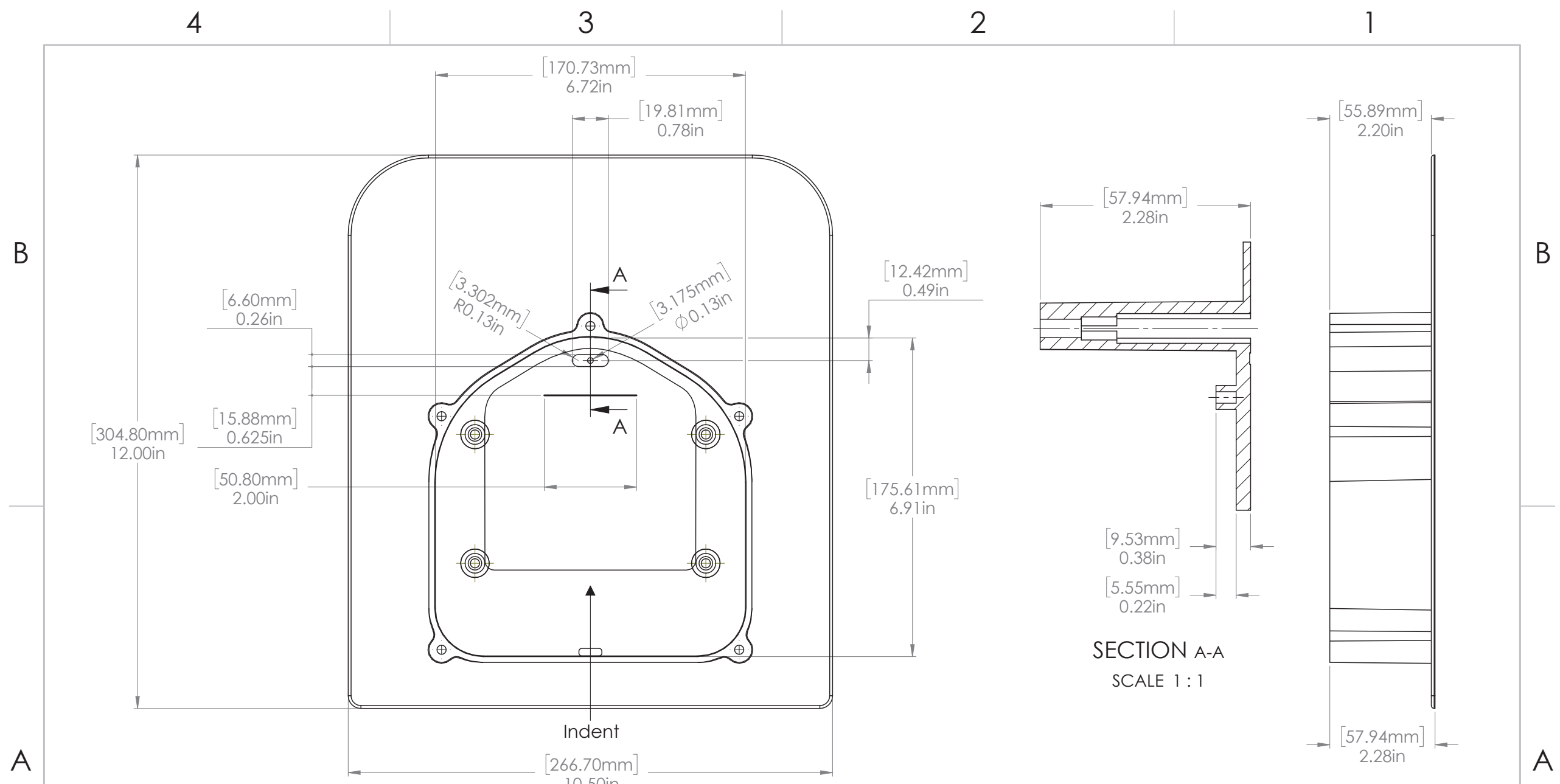
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SCALE: 1:2 **WEIGHT:** **SHEET 1 OF 3**

SHEET NAME
SPEC SHEET

PAGE NUMBER
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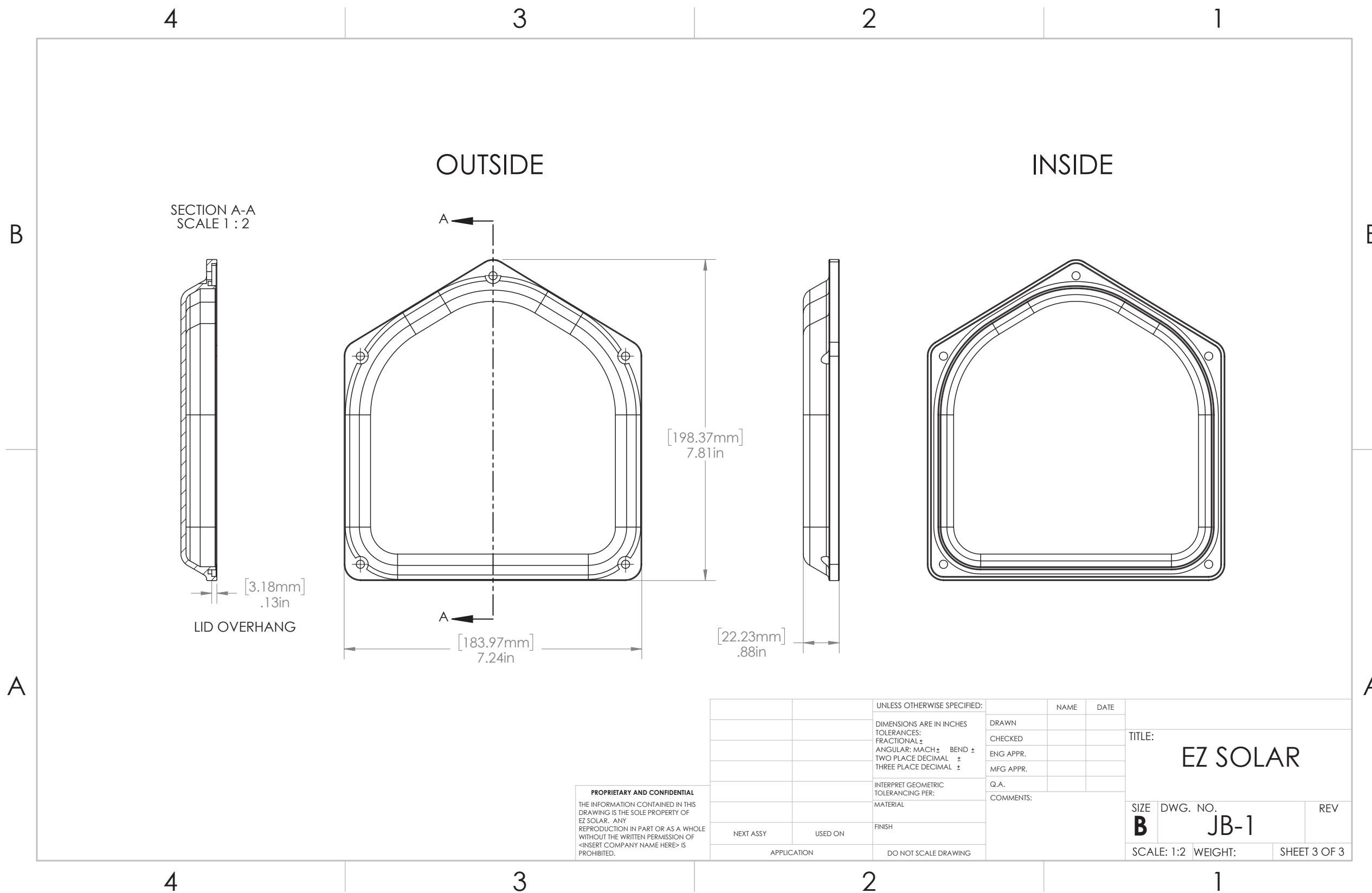
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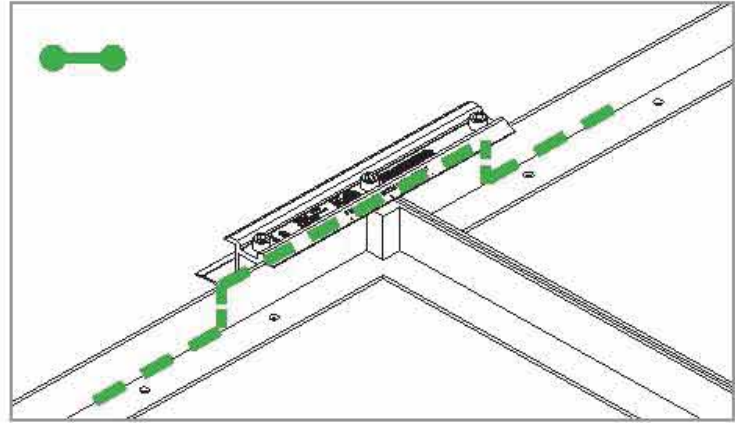
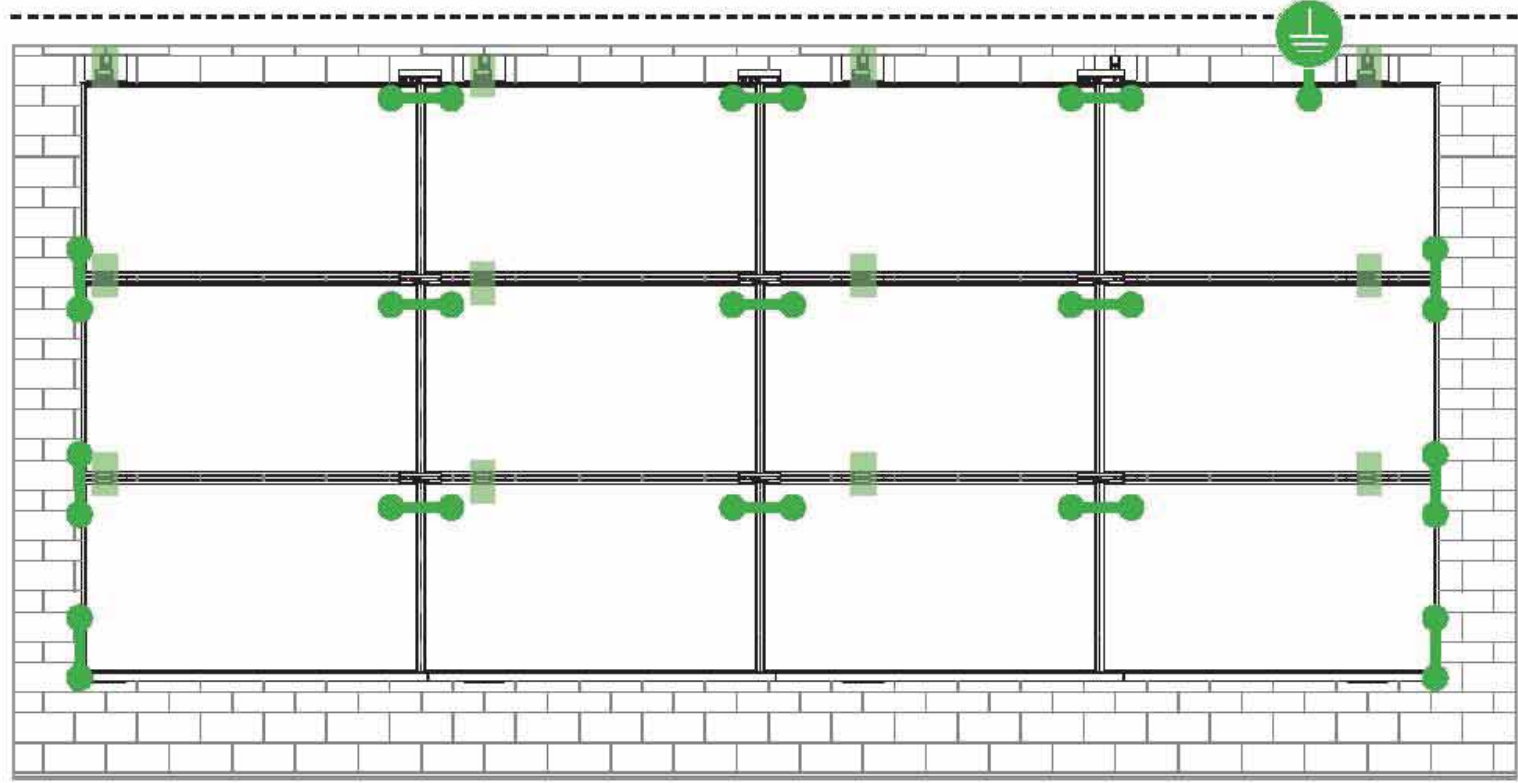
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| TOLERANCES: | CHECKED | | |
| FRACTIONAL \pm | ENG APPR. | | |
| ANGULAR: MACH \pm BEND \pm | MFG APPR. | | |
| TWO PLACE DECIMAL \pm | Q.A. | | |
| THREE PLACE DECIMAL \pm | COMMENTS: | | |
| INTERPRET GEOMETRIC TOLERANCING PER: | | | |
| MATERIAL | | | |
| FINISH | | | |
| NEXT ASSY | USED ON | | |
| APPLICATION | DO NOT SCALE DRAWING | | |

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|---------------------------|-------------------------|--------------|
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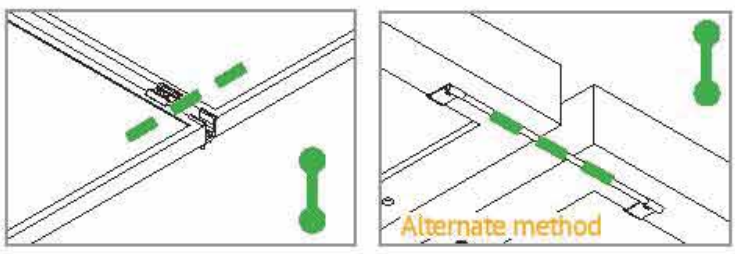


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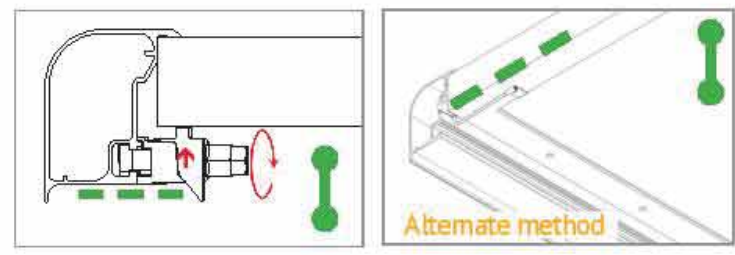
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| INTERPRET GEOMETRIC TOLERANCING PER: | | CHECKED | | SIZE DWG. NO. REV B JB-1 |
| MATERIAL | | ENG APPR. | | |
| FINISH | | MFG APPR. | | SCALE: 1:2 WEIGHT: SHEET 3 OF 3 |
| NEXT ASSY | USED ON | Q.A. | | |
| APPLICATION | | COMMENTS: | | |
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E-W 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.

AUTHORIZATION TO MARK

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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| 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 klaus.nicolaedis@unirac.com | FAX: NA |
| Email: 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.

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| | |
|---------------------|--|
| 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 |

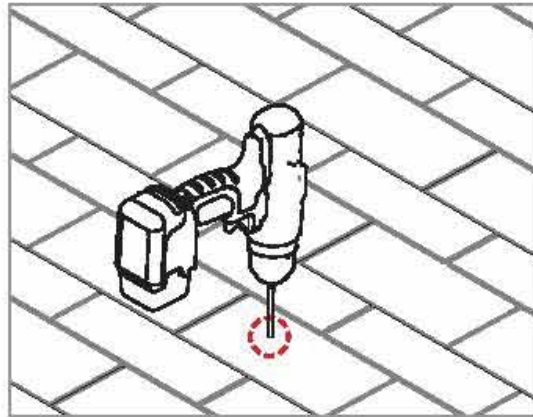


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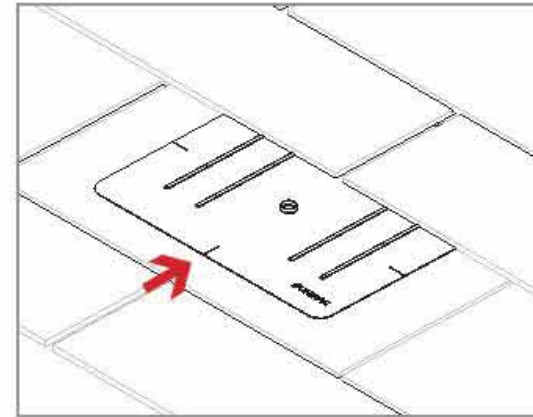


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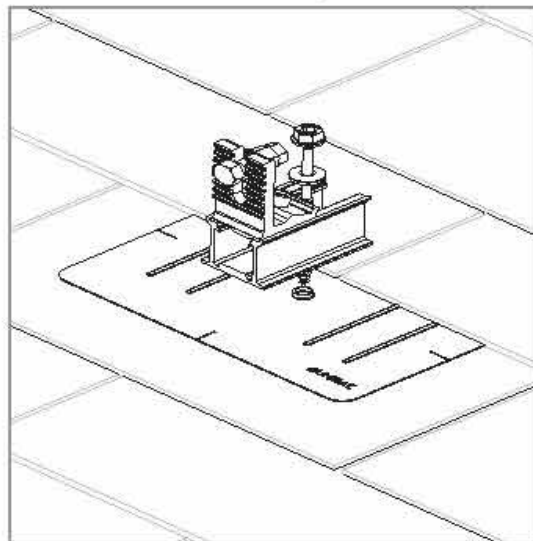
PILOT HOLES:

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.

