

# PHOTOVOLTAIC ROOF MOUNT SYSTEM

21 MODULES-ROOF MOUNTED - 8.295 kW DC, 7.600 kW AC

167 ANGEL OAK DR, BUNNLEVEL, NC 28323



TOP TIER SOLAR SOLUTIONS

1530 CENTER PARK DR #2911,  
CHARLOTTE, NC 28217,  
UNITED STATES

## PROJECT DATA

PROJECT ADDRESS: 167 ANGEL OAK DR,  
BUNNLEVEL, NC 28323

OWNER: MICHAEL THORESON

DESIGNER: ESR

SCOPE: 8.295 KW DC ROOF MOUNT  
SOLAR PV SYSTEM WITH  
21 MISSION SOLAR: MSE395SX9R 395W  
PV MODULES WITH  
21 SOLAREEDGE: S440 POWER OPTIMIZERS AND  
01 SOLAREEDGE: SE7600H-US (240V/7600W)  
INVERTER

AUTHORITIES HAVING JURISDICTION:  
BUILDING: HARNETT COUNTY  
ZONING: HARNETT COUNTY  
UTILITY: SOUTH RIVER ELECTRIC

## SHEET INDEX

PV-1	COVER SHEET
PV-2	SITE PLAN
PV-3	ROOF PLAN & MODULES
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PV-7	WIRING CALCULATIONS
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PV-9+	EQUIPMENT SPECIFICATIONS

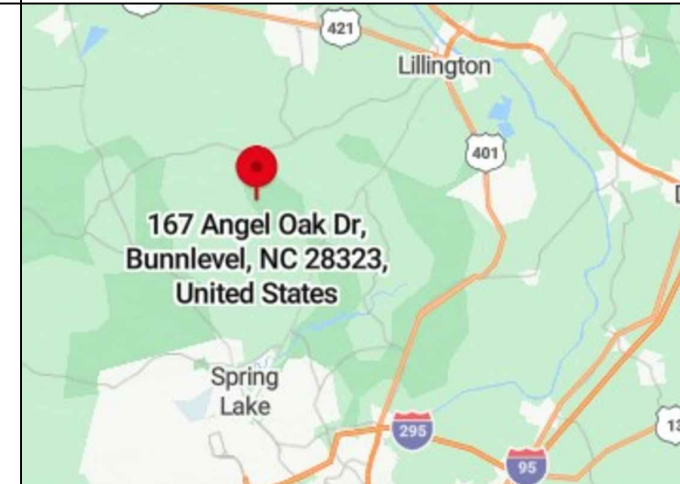
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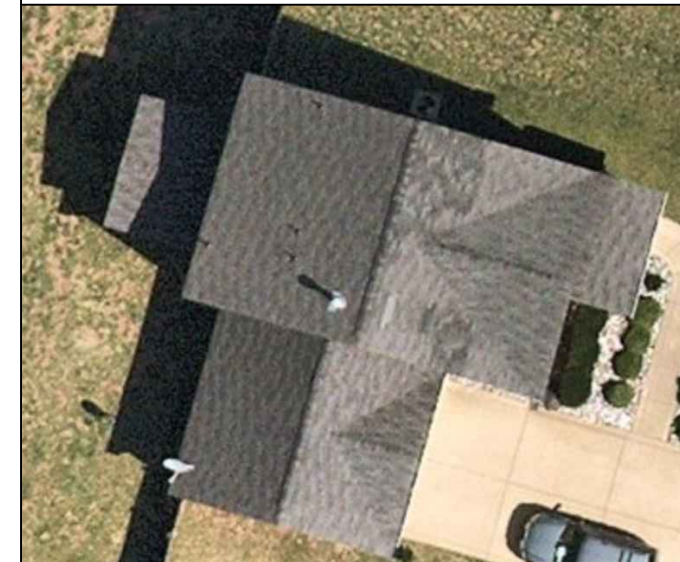
## GENERAL NOTES

- ALL COMPONENTS ARE UL LISTED AND CEC CERTIFIED, WHERE WARRANTED.
- THE SOLAR PV SYSTEM WILL BE INSTALLED IN ACCORDANCE WITH ARTICLE 690 OF THE NEC 2017.
- THE UTILITY INTERCONNECTION APPLICATION MUST BE APPROVED AND PV SYSTEM INSPECTED PRIOR TO PARALLEL OPERATION.
- ALL CONDUCTORS OF A CIRCUIT, INCLUDING THE EGC, MUST BE INSTALLED IN THE SAME RACEWAY, OR CABLE, OR OTHERWISE RUN WITH THE PV ARRAY CIRCUIT CONDUCTORS WHEN THEY LEAVE THE VICINITY OF THE PV ARRAY.
- WHERE METALLIC CONDUIT CONTAINING DC CONDUCTORS IS USED INSIDE THE BUILDING, IT SHALL BE IDENTIFIED AS "CAUTION: SOLAR CIRCUIT" EVERY 10FT.
- HEIGHT OF THE AC DISCONNECT SHALL NOT EXCEED 6'-7" PER NEC CODE 240.24.
- A GROUNDING ELECTRODE SYSTEM IN ACCORDANCE WITH CEC 690.47 AND 250.50 THROUGH 60 AND 250-166 SHALL BE PROVIDED. PER NEC GROUNDING ELECTRODE SYSTEM OF EXISTING BUILDING MAY BE USED AND BONDED TO THE SERVICE ENTRANCE. IF EXISTING SYSTEM IS INACCESSIBLE OR INADEQUATE A SUPPLEMENTAL GROUNDING ELECTRODE WILL BE USED AT THE INVERTER LOCATION CONSISTING OF A UL LISTED 8 FT. GROUND ROD WITH ACORN CLAMP. GROUNDING ELECTRODE CONDUCTORS SHALL BE NO LESS THAN #8 AWG AND NO LARGER THAN #6 AWG COPPER AND BONDED TO THE EXISTING GROUNDING ELECTRODE TO PROVIDE FOR A COMPLETE SYSTEM.
- PHOTOVOLTAIC MODULES ARE TO BE CONSIDERED NON-COMBUSTIBLE.
- PHOTOVOLTAIC INSTALLATION WILL NOT OBSTRUCT ANY PLUMBING, MECHANICAL, OR BUILDING ROOF VENTS.
- ALL WIRING MUST BE PROPERLY SUPPORTED BY DEVICES OR MECHANICAL MEANS DESIGNED AND LISTED FOR SUCH USE. WIRING MUST BE PERMANENTLY AND COMPLETELY HELD OFF THE ROOF SURFACE.
- ALL SINAGE TO BE PLACED IN ACCORDANCE WITH THE LOCAL BUILDING CODE. IF EXPOSED TO SUNLIGHT, IT SHALL BE UV RESISTANT. ALL PLAQUES AND SINAGE WILL BE INSTALLED AS REQUIRED BY THE NEC AND AHJ.
- INVERTER(S) USED IN UNGROUNDED SYSTEM SHALL BE UL 1741 LISTED.
- THE INSTALLATION OF EQUIPMENT AND ALL ASSOCIATED WIRING AND INTERCONNECTION SHALL BE PERFORMED ONLY BY QUALIFIED PERSONS [NEC 690.4(C)]
- ALL OUTDOOR EQUIPMENT SHALL BE NEMA 3R RATED (OR BETTER), INCLUDING ALL ROOF MOUNTED TRANSITION BOXES AND SWITCHES.
- ALL EQUIPMENT SHALL BE PROPERLY GROUNDED AND BONDED IN ACCORDANCE WITH NEC ARTICLE 250.
- SYSTEM GROUNDING SHALL BE IN ACCORDANCE WITH NEC 690.41.
- PV SYSTEM CIRCUITS INSTALLED ON OR IN BUILDINGS SHALL INCLUDE A RAPID SHUTDOWN FUNCTION IN ACCORDANCE WITH NEC 690.12
- DISCONNECTING MEANS SHALL BE LOCATED IN A VISIBLE, READILY ACCESSIBLE LOCATION WITHIN THE PV SYSTEM EQUIPMENT OR A MAXIMUM OF 10 FEET AWAY FROM THE SYSTEM [NEC 690.13(A)]
- ALL WIRING METHODS SHALL BE IN ACCORDANCE WITH NEC 690.31
- WORK CLEARANCES AROUND ELECTRICAL EQUIPMENT WILL BE MAINTAINED PER NEC 110.26(A)(1), 110.26(A)(2) AND 110.26(A)(3).
- ROOFTOP MOUNTED PHOTOVOLTAIC PANELS AND MODULES SHALL BE TESTED, LISTED & IDENTIFIED IN ACCORDANCE WITH UL1703
- ELECTRICAL CONTRACTOR TO PROVIDE CONDUIT EXPANSION JOINTS AND ANCHOR CONDUIT RUNS AS REQUIRED PER NEC.

## VICINITY MAP



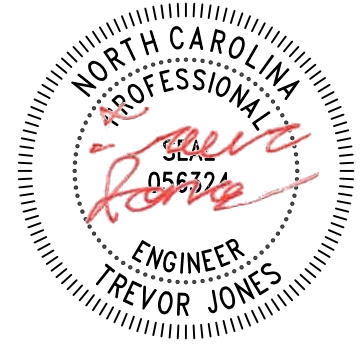
## HOUSE PHOTO



## CODE REFERENCES

2018 NORTH CAROLINA BUILDING CODE  
2018 NORTH CAROLINA RESIDENTIAL CODE  
2018 NORTH CAROLINA FIRE CODE  
2017 NATIONAL ELECTRICAL CODE

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	07/19/2023	



STRUCTURAL ONLY  
07/19/2023

PROJECT NAME & ADDRESS

MICHAEL THORESON  
RESIDENCE  
167 ANGEL OAK DR,  
BUNNLEVEL, NC 28323

DRAWN BY

ESR

SHEET NAME

COVER SHEET

SHEET SIZE

ANSI B  
11" X 17"

SHEET NUMBER

PV-1

# PROJECT DESCRIPTION:

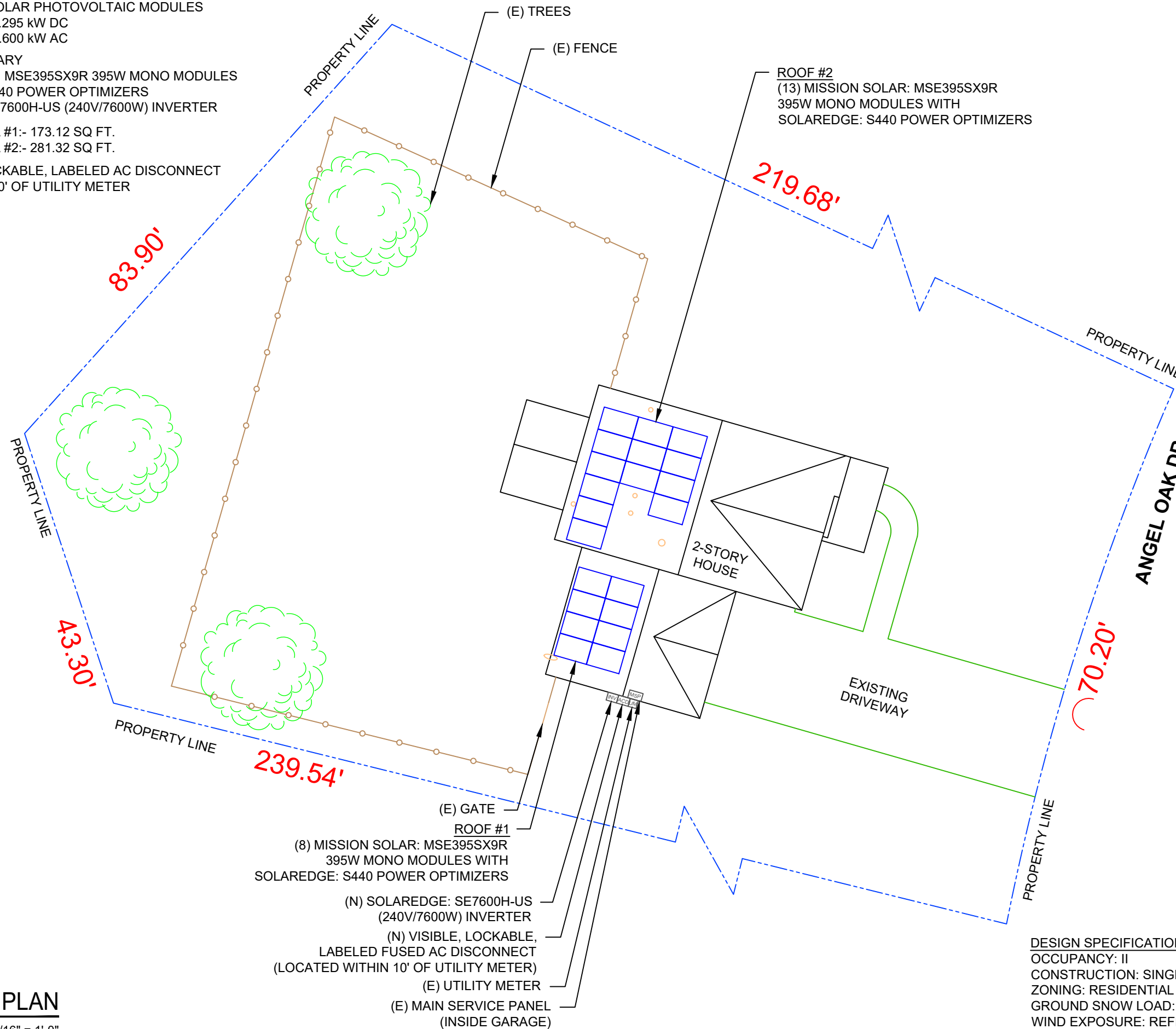
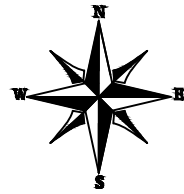
21 X MISSION SOLAR: MSE395SX9R 395W MONO MODULES  
 ROOF MOUNTED SOLAR PHOTOVOLTAIC MODULES  
 DC SYSTEM SIZE: 8.295 kW DC  
 AC SYSTEM SIZE: 7.600 kW AC

## EQUIPMENT SUMMARY

21 MISSION SOLAR: MSE395SX9R 395W MONO MODULES  
 21 SOLAREEDGE: S440 POWER OPTIMIZERS  
 01 SOLAREEDGE: SE7600H-US (240V/7600W) INVERTER

ROOF ARRAY AREA #1:- 173.12 SQ FT.  
 ROOF ARRAY AREA #2:- 281.32 SQ FT.

NOTE: VISIBLE, LOCKABLE, LABELED AC DISCONNECT  
 LOCATED WITHIN 10' OF UTILITY METER



**ROOF #1**  
 (8) MISSION SOLAR: MSE395SX9R  
 395W MONO MODULES WITH  
 SOLAREEDGE: S440 POWER OPTIMIZERS  
 (N) SOLAREEDGE: SE7600H-US  
 (240V/7600W) INVERTER  
 (N) VISIBLE, LOCKABLE,  
 LABELED FUSED AC DISCONNECT  
 (LOCATED WITHIN 10' OF UTILITY METER)  
 (E) UTILITY METER  
 (E) MAIN SERVICE PANEL  
 (INSIDE GARAGE)

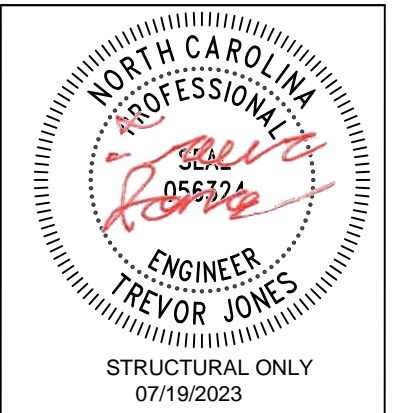
**ROOF #2**  
 (13) MISSION SOLAR: MSE395SX9R  
 395W MONO MODULES WITH  
 SOLAREEDGE: S440 POWER OPTIMIZERS

**DESIGN SPECIFICATION**  
 OCCUPANCY: II  
 CONSTRUCTION: SINGLE-FAMILY  
 ZONING: RESIDENTIAL  
 GROUND SNOW LOAD: REFER STRUCTURAL LETTER  
 WIND EXPOSURE: REFER STRUCTURAL LETTER  
 WIND SPEED: REFER STRUCTURAL LETTER



**TOP TIER SOLAR SOLUTIONS**  
 1530 CENTER PARK DR #2911,  
 CHARLOTTE, NC 28217,  
 UNITED STATES

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**PROJECT NAME & ADDRESS**  
**MICHAEL THORESON  
 RESIDENCE**  
 167 ANGEL OAK DR,  
 BUNNLEVEL, NC 28323

**DRAWN BY**  
 ESR

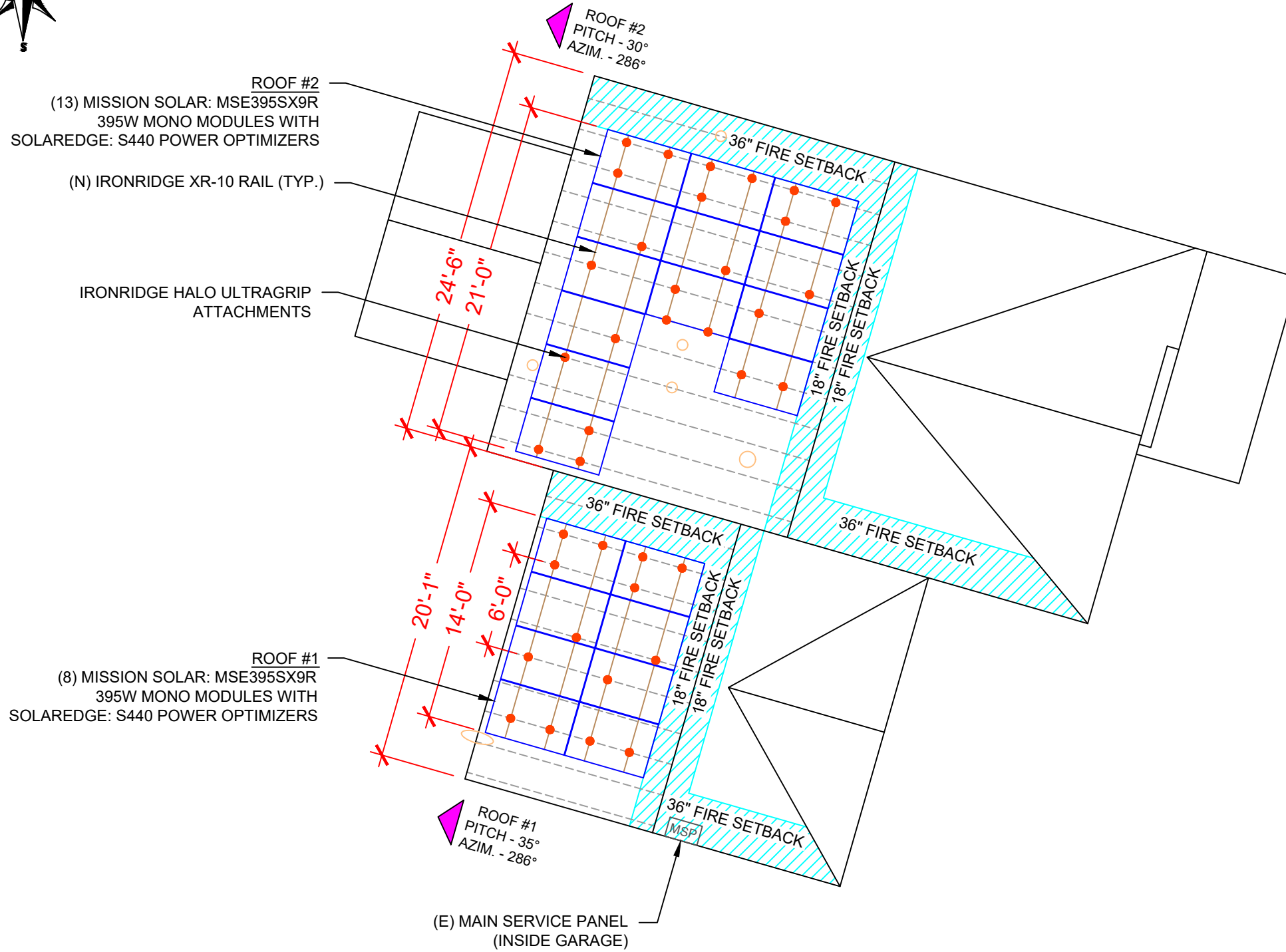
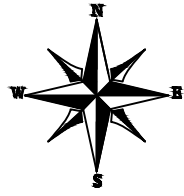
**SHEET NAME**  
 SITE PLAN

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

**SHEET NUMBER**  
 PV-2

# MODULE TYPE, DIMENSIONS & WEIGHT

NUMBER OF MODULES = 21 MODULES  
 MODULE TYPE = MISSION SOLAR: MSE395SX9R 395W MONO MODULES  
 MODULE WEIGHT = 48.5 LBS / 22.0 kg.  
 MODULE DIMENSIONS = 75.08" x 41.50" = 21.64 SF



ROOF DESCRIPTION					
ROOF TYPE				ASPHALT SHINGLE	
ROOF LAYER				1 LAYER	
ROOF	# OF MODULES	ROOF PITCH	AZIMUTH	TRUSS SIZE	TRUSS SPACING
#1	8	35°	286°	2"X4"	24"
#2	13	30°	286°	2"X4"	24"

ARRAY AREA & ROOF AREA CALC'S		
TOTAL PV ARRAY AREA (SQ. FT.)	TOTAL ROOF AREA (Sq. Ft.)	ROOF AREA COVERED BY ARRAY (%)
454.44	1683.94	27

**TOP TIER SOLAR SOLUTIONS**

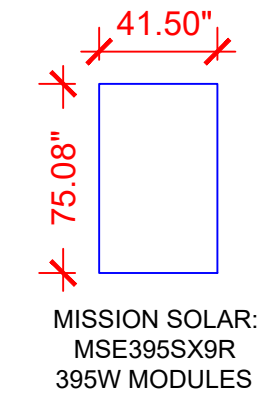
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**NORTH CAROLINA PROFESSIONAL ENGINEER**

TREVOR JONES

STRUCTURAL ONLY  
 07/19/2023



**LEGEND**

- [JB] - JUNCTION BOX
- [INV] - INVERTER
- [ACD] - AC DISCONNECT
- [UM] - UTILITY METER
- [MSP] - MAIN SERVICE PANEL
- [SUB] - SUB PANEL
- - VENT, ATTIC FAN (ROOF OBSTRUCTION)
- - ROOF ATTACHMENT
- - TRUSS
- - - - CONDUIT

PROJECT NAME & ADDRESS

**MICHAEL THORESON RESIDENCE**

167 ANGEL OAK DR,  
 BUNNLEVEL, NC 28323

DRAWN BY  
**ESR**

SHEET NAME  
**ROOF PLAN & MODULES**

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

SHEET NUMBER  
**PV-3**

DC SYSTEM SIZE: 8.295 kW DC  
 AC SYSTEM SIZE: 7.600 kW AC  
 (21) MISSION SOLAR: MSE395SX9R 395W MONO MODULES  
 WITH (21) SOLAREEDGE: S440 POWER OPTIMIZERS  
 LOCATED UNDER EACH PANEL AND  
 01 SOLAREEDGE: SE7600H-US (240V/7600W) INVERTER

**STRING LEGENDS**  
 - - - - - STRING #1  
 - - - - - STRING #2



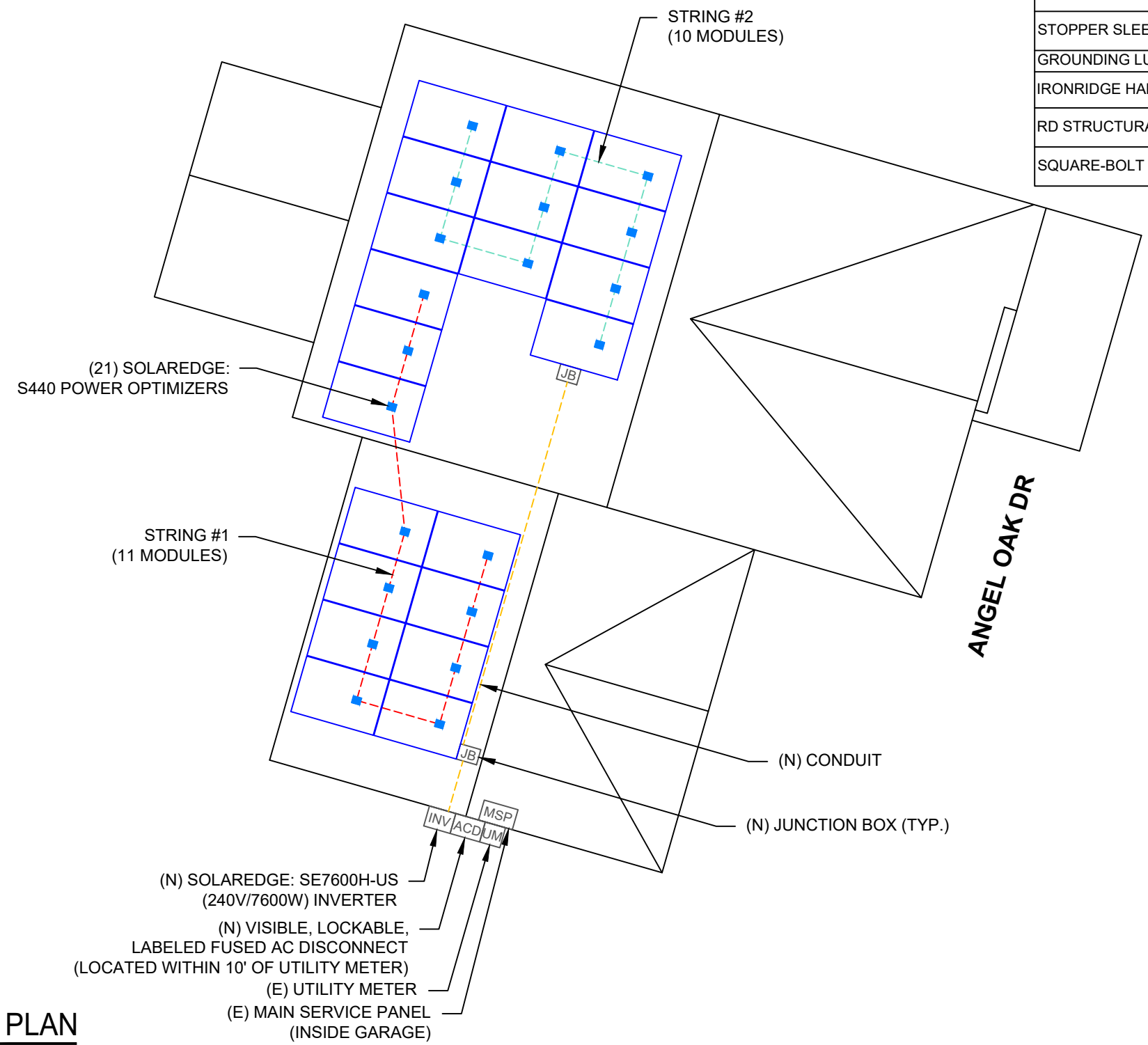
BILL OF MATERIALS	
EQUIPMENT DESCRIPTION	QTY
SOLAR PV MODULES: MISSION SOLAR: MSE395SX9R 395W MODULE	21
OPTIMIZERS: SOLAREEDGE: S440 POWER OPTIMIZERS	21
INVERTER: SOLAREEDGE: SE7600H-US (240V/7600W) INVERTER	01
JUNCTION BOXES: JUNCTION BOX UL 1741, NEMA 3R CSA C22.2 NO.290	2
AC DISCONNECT: FUSED AC DISCONNECT, 60A FUSED, (2) 40A FUSES 240V NEMA 3R, UL LISTED	1
IRONRIDGE XR10 RAIL (RAIL 168" (14 FEET) CLEAR) (XR-10-168A)	18
BONDED SPLICE, XR10 (XR10-BOSS-01-M1)	8
UNIVERSAL MODULE CLAMP, CLEAR (UFO-CL-01-A1)	52
STOPPER SLEEVE, 40MM, MILL (UFO-STP-40MM-M1)	20
GROUNDING LUG (XR-LUG-03-A1)	5
IRONRIDGE HALO ULTRAGRIP ATTACHMENTS (QM-HUG-01-M1)	35
RD STRUCTURAL SCREW,3.0L (HW-RD1430-01-M1)	70
SQUARE-BOLT BONDING HARDWARE (BHW-SQ-02-A1 )	35

**TOP TIER**  
 SOLAR SOLUTIONS

**TOP TIER SOLAR SOLUTIONS**

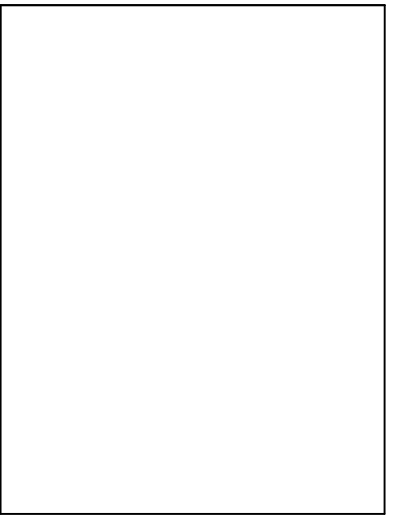
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 CHARLOTTE, NC 28217,  
 UNITED STATES

REVISIONS		
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**LEGEND**

- [JB] - JUNCTION BOX
- [INV] - INVERTER
- [ACD] - AC DISCONNECT
- [UM] - UTILITY METER
- [MSP] - MAIN SERVICE PANEL
- [SUB] - SUB PANEL
- - VENT, ATTIC FAN (ROOF OBSTRUCTION)
- - ROOF ATTACHMENT
- - - - - TRUSS
- - - - - CONDUIT



PROJECT NAME & ADDRESS

**MICHAEL THORESON  
 RESIDENCE**

167 ANGEL OAK DR,  
 BUNNLEVEL, NC 28323

DRAWN BY  
**ESR**

SHEET NAME  
**ELECTRICAL PLAN**

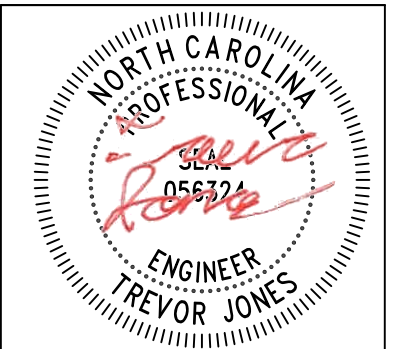
SHEET SIZE  
**ANSI B  
 11" X 17"**

SHEET NUMBER  
**PV-4**

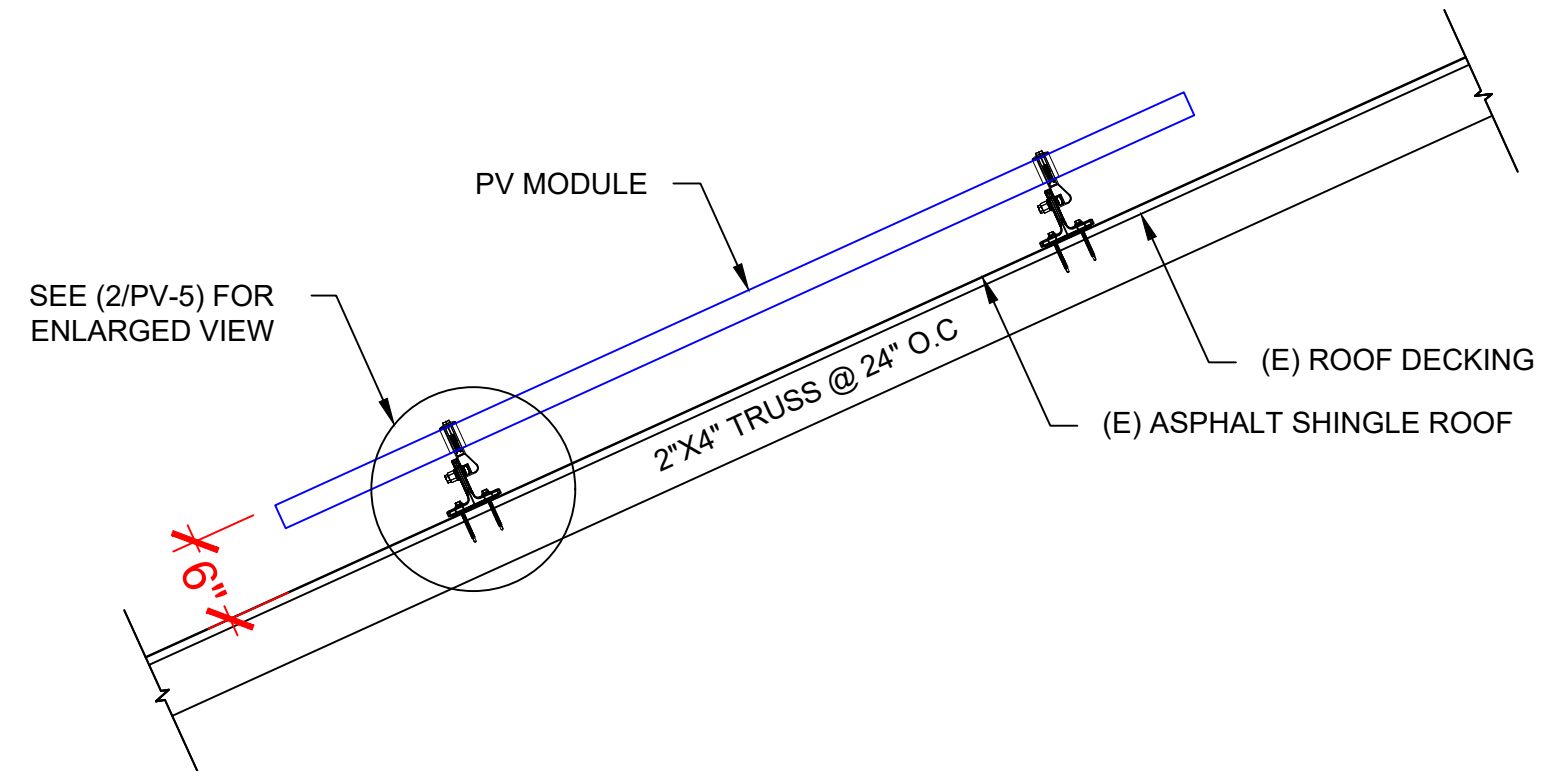


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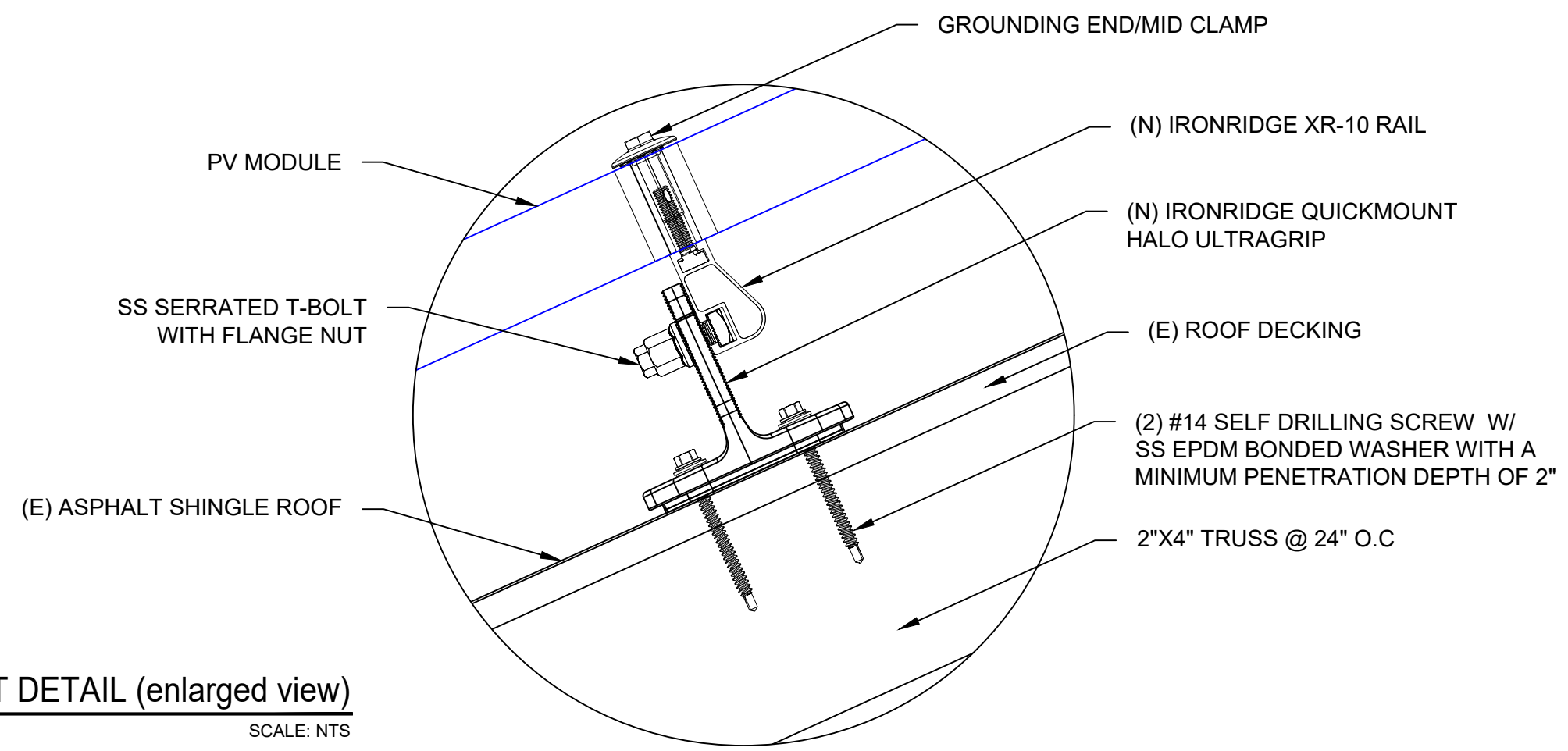
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 07/19/2023



**1** | **STRUCTURAL ATTACHMENT (Side view)**  
 PV-5 | SCALE: N.T.S



**2** | **ATTACHMENT DETAIL (enlarged view)**  
 PV-5 | SCALE: NTS

PROJECT NAME & ADDRESS  
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 BUNNLEVEL, NC 28323

DRAWN BY  
**ESR**

SHEET NAME  
**STRUCTURAL DETAIL**

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

SHEET NUMBER  
**PV-5**

DC SYSTEM SIZE: 8.295 kW DC  
AC SYSTEM SIZE: 7.600 kW AC

(21) MISSION SOLAR: MSE395SX9R 395W MONO MODULES WITH (21) SOLAREEDGE: S440 POWER OPTIMIZERS LOCATED UNDER EACH PANEL (240V) AND (01) SOLAREEDGE: SE7600H-US (240V/7600W) INVERTER (1) STRING OF 11 MODULES AND (1) STRING OF 10 MODULES ARE CONNECTED IN SERIES

**INTERCONNECTION NOTES:**

1. INTERCONNECTION SIZING, LIMITATIONS AND COMPLIANCE DETERMINED IN ACCORDANCE WITH [NEC 705.12], AND [NEC 690.59].
2. GROUND FAULT PROTECTION IN ACCORDANCE WITH [NEC 215.9], [NEC 230.95].
3. ALL EQUIPMENT TO BE RATED FOR BACKFEEDING.
4. PV BREAKER TO BE POSITIONED AT THE OPPOSITE END OF THE BUSBAR RELATIVE TO THE MAIN BREAKER.

**DISCONNECT NOTES:**

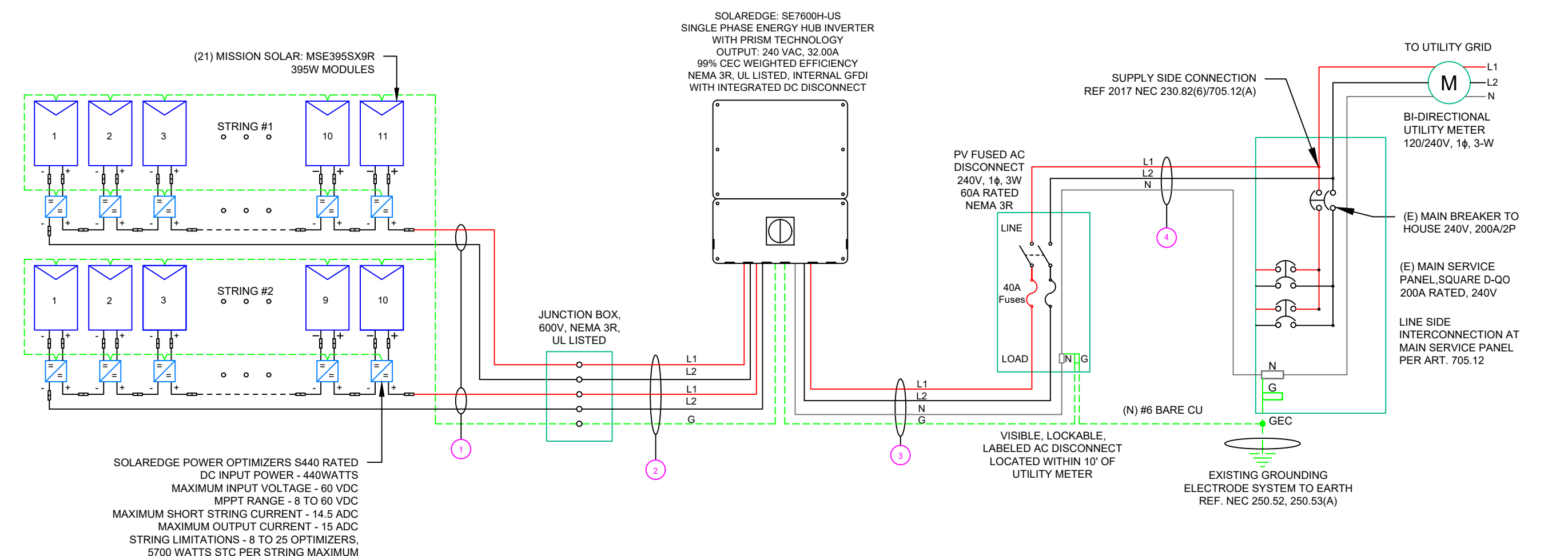
1. DISCONNECTING SWITCHES SHALL BE WIRED SUCH THAT WHEN THE SWITCH IS OPENED THE CONDUCTORS REMAINING LIVE ARE CONNECTED TO THE TERMINALS MARKED "LINE SIDE" (TYPICALLY THE UPPER TERMINALS)
2. AC DISCONNECT MUST BE ACCESSIBLE TO QUALIFIED UTILITY PERSONNEL, BE LOCKABLE, AND BE A VISIBLE-BREAK SWITCH
3. DISCONNECT MEANS AND THEIR LOCATION SHALL BE IN ACCORDANCE WITH [NEC 225.31] AND [NEC 225.32].

**GROUNDING & GENERAL NOTES:**

1. PV GROUNDING ELECTRODE SYSTEM NEEDS TO BE INSTALLED IN ACCORDANCE WITH [NEC 690.43]
2. PV INVERTER IS UNGROUNDED, TRANSFORMER-LESS TYPE.
3. DC GEC AND AC EGC TO REMAIN UNSPLICED, OR SPLICED TO EXISTING ELECTRODE
4. ANY EXISTING WIRING INVOLVED WITH PV SYSTEM CONNECTION THAT IS FOUND TO BE INADEQUATE PER CODE SHALL BE CORRECTED PRIOR TO FINAL INSPECTION.
5. JUNCTION BOX QUANTITIES, AND PLACEMENT SUBJECT TO CHANGE IN THE FIELD - JUNCTION BOX DEPICTED ON ELECTRICAL DIAGRAM REPRESENT WIRE TYPE TRANSITIONS.
6. AC DISCONNECT NOTED IN EQUIPMENT SCHEDULE OPTIONAL IF OTHER AC DISCONNECTING MEANS IS LOCATED WITHIN 10' OF SERVICE DISCONNECT.
7. RACEWAYS AND CABLES EXPOSED TO SUNLIGHT ON ROOFTOPS SHOULD BE INSTALLED MORE THAN 7/8" ABOVE THE ROOF USING CONDUIT SUPPORTS.

**RACKING NOTE:**

1. BOND EVERY OTHER RAIL WITH #6 BARE COPPER



NOTE: CONDUIT TO BE UL LISTED FOR WET LOCATIONS AND UV PROTECTED

QTY	CONDUCTOR INFORMATION		CONDUIT TYPE	CONDUIT SIZE
1 (4)	#10AWG -	PV WIRE/USE-2	N/A	N/A
1 (1)	#6AWG -	BARE COPPER IN FREE AIR		
2 (4)	#10AWG -	CU, THWN-2	EMT OR LFMC IN ATTIC	3/4"
1 (1)	#10AWG -	CU, THWN-2 GND		
3 (2)	#6AWG -	CU, THWN-2	EMT, LFMC OR PVC	3/4"
1 (1)	#6AWG -	CU, THWN-2 N		
4 (1)	#6AWG -	CU, THWN-2 GND	EMT, LFMC OR PVC	3/4"
5 (2)	#6AWG -	CU, THWN-2		
6 (1)	#6AWG -	CU, THWN-2 N		

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167 ANGEL OAK DR, BUNNLEVEL, NC 28323

DRAWN BY **ESR**

SHEET NAME **ELECTRICAL LINE DIAGRAM**

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

SHEET NUMBER **PV-6**

SOLAR MODULE SPECIFICATIONS	
MANUFACTURER / MODEL #	MISSION SOLAR: MSE395SX9R 395W MODULE
VMP	36.99V
IMP	10.68A
VOC	45.18V
ISC	11.24A
TEMP. COEFF. VOC	-0.259%/°C
MODULE DIMENSION	75.08"L x 41.50"W x 1.57"D (In Inch)

INVERTER SPECIFICATIONS	
MANUFACTURER / MODEL #	SOLAREEDGE: SE7600H-US (240V/7600W) INVERTER
NOMINAL AC POWER	7.600 kW
NOMINAL OUTPUT VOLTAGE	240 VAC
NOMINAL OUTPUT CURRENT	32.00A

PERCENT OF VALUES	NUMBER OF CURRENT CARRYING CONDUCTORS IN EMT
.80	4-6
.70	7-9
.50	10-20

AMBIENT TEMPERATURE SPECS	
AMBIENT TEMP (HIGH TEMP 2%)	38°
RECORD LOW TEMPERATURE	-11°
MODULE TEMPERATURE COEFFICIENT OF Voc	-0.259%/°C



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AC FEEDER CALCULATIONS																						
CIRCUIT ORIGIN	CIRCUIT DESTINATION	VOLTAGE (V)	FULL LOAD AMPS "FLA" (A)	FLA*1.25 (A)	OCPD SIZE (A)	NEUTRAL SIZE	GROUND SIZE	CONDUCTOR SIZE	75°C AMPACITY (A)	AMPACITY CHECK #1	AMBIENT TEMP. (°C)	TOTAL CC CONDUCTORS IN RACEWAY	90°C AMPACITY (A)	DERATION FACTOR FOR AMBIENT TEMPERATURE NEC 310.15(B)(2)(a)	DERATION FACTOR FOR CONDUCTORS PER RACEWAY NEC 310.15(B)(3)(a)	90°C AMPACITY DERATED (A)	AMPACITY CHECK #2	FEEDER LENGTH (FEET)	CONDUCTOR RESISTANCE (OHM/KFT)	VOLTAGE DROP AT FLA (%)	CONDUIT SIZE	CONDUIT FILL (%)
INVERTER	AC DISCONNECT	240	32	40	40	CU #6 AWG	CU #6 AWG	CU #6 AWG	65	PASS	38	2	75	0.91	1	68.25	PASS	5	0.491	0.065	3/4" EMT	38.0488
AC DISCONNECT	POI	240	32	40	40	CU #6 AWG	N/A	CU #6 AWG	65	PASS	38	2	75	0.91	1	68.25	PASS	5	0.491	0.065	3/4" EMT	28.5366
<b>CUMULATIVE VOLTAGE</b>																			0.131			

DC FEEDER CALCULATIONS																						
CIRCUIT ORIGIN	CIRCUIT DESTINATION	VOLTAGE (V)	FULL LOAD AMPS "FLA" (A)	FLA*1.25 (A)	OCPD SIZE (A)	GROUND SIZE	CONDUCTOR SIZE	75°C AMPACITY (A)	AMPACITY CHECK #1	AMBIENT TEMP. (°C)	TOTAL CC CONDUCTORS IN RACEWAY	90°C AMPACITY (A)	DERATION FACTOR FOR AMBIENT TEMPERATURE NEC 310.15(B)(2)(a)	DERATION FACTOR FOR CONDUCTORS PER RACEWAY NEC 310.15(B)(3)(a)	90°C AMPACITY DERATED (A)	AMPACITY CHECK #2	FEEDER LENGTH (FEET)	CONDUCTOR RESISTANCE (OHM/KFT)	VOLTAGE DROP AT FLA (%)	CONDUIT SIZE	CONDUIT FILL (%)	
STRING 1	JUNCTION BOX	380	15.00	18.75	20	BARE COPPER #6 AWG	CU #10 AWG	35	PASS	38	2	40	0.91	1	36.4	PASS	5	1.24	0.049	N/A	#N/A	
STRING 2	JUNCTION BOX	380	15.00	18.75	20	BARE COPPER #6 AWG	CU #10 AWG	35	PASS	38	2	40	0.91	1	36.4	PASS	5	1.24	0.049	N/A	#N/A	
JUNCTION BOX	INVERTER	380	15.00	18.75	20	CU #10 AWG	CU #10 AWG	35	PASS	38	4	40	0.91	0.8	29.12	PASS	25	1.24	0.245	3/4" EMT	19.79362	
<b>String 1 Voltage Drop</b>																			0.294			
<b>String 2 Voltage Drop</b>																			0.294			

**ELECTRICAL NOTES**

- ALL EQUIPMENT TO BE LISTED BY UL OR OTHER NRTL, AND LABELED FOR ITS APPLICATION.
- ALL CONDUCTORS SHALL BE COPPER, RATED FOR 600 V AND 90 DEGREE C WET ENVIRONMENT.
- WIRING, CONDUIT, AND RACEWAYS MOUNTED ON ROOFTOPS SHALL BE ROUTED DIRECTLY TO, AND LOCATED AS CLOSE AS POSSIBLE TO THE NEAREST RIDGE, HIP, OR VALLEY.
- WORKING CLEARANCES AROUND ALL NEW AND EXISTING ELECTRICAL EQUIPMENT SHALL COMPLY WITH NEC 110.26.
- DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS. CONTRACTOR SHALL FURNISH ALL NECESSARY OUTLETS, SUPPORTS, FITTINGS AND ACCESSORIES TO FULFILL APPLICABLE CODES AND STANDARDS.
- WHERE SIZES OF JUNCTION BOX, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, THE CONTRACTOR SHALL SIZE THEM ACCORDINGLY.
- ALL WIRE TERMINATIONS SHALL BE APPROPRIATELY LABELED AND READILY VISIBLE.
- MODULE GROUNDING CLIPS TO BE INSTALLED BETWEEN MODULE FRAME AND MODULE SUPPORT RAIL, PER THE GROUNDING CLIP MANUFACTURER'S INSTRUCTION.
- MODULE SUPPORT RAIL TO BE BONDED TO CONTINUOUS COPPER G.E.C. VIA WEEB LUG OR ILSCO GBL-4DBT LAY-IN LUG.
- TEMPERATURE RATINGS OF ALL CONDUCTORS, TERMINATIONS, BREAKERS, OR OTHER DEVICES ASSOCIATED WITH THE SOLAR PV SYSTEM SHALL BE RATED FOR AT LEAST 75 DEGREE C.

PROJECT NAME & ADDRESS

**MICHAEL THORESON  
 RESIDENCE**

167 ANGEL OAK DR,  
 BUNNLEVEL, NC 28323

DRAWN BY  
**ESR**

SHEET NAME  
**WIRING CALCULATIONS**

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

SHEET NUMBER  
**PV-7**

## PHOTOVOLTAIC POWER SOURCE

EVERY 10' ON CONDUIT & ENCLOSURES

LABEL- 1:  
LABEL LOCATION:  
EMT/CONDUIT RACEWAY  
SOLADECK / JUNCTION BOX  
CODE REF: NEC 690.31 (D)(2)

## ⚠ WARNING

### ELECTRIC SHOCK HAZARD

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

LABEL- 2:  
LABEL LOCATION:  
AC DISCONNECT  
CODE REF: NEC 690.13(B)

## ⚠ WARNING

### DUAL POWER SUPPLY

SOURCE: UTILITY GRID AND  
PV SOLAR ELECTRIC SYSTEM

LABEL- 3:  
LABEL LOCATION:  
MAIN SERVICE PANEL  
CODE REF: NEC 705.12(C) & NEC 690.59

## SOLAR PV BREAKER:

BREAKER IS BACKFED  
DO NOT RELOCATE

LABEL-4:  
LABEL LOCATION:  
MAIN SERVICE PANEL  
CODE REF: NEC 705.12(C) & NEC 690.59

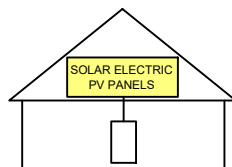
## ⚠ WARNING

POWER SOURCE OUTPUT  
CONNECTION. DO NOT  
RELOCATE THIS  
OVERCURRENT DEVICE

LABEL- 5:  
LABEL LOCATION:  
MAIN SERVICE PANEL (ONLY IF SOLAR IS BACK-FED)  
SUBPANEL (ONLY IF SOLAR IS BACK-FED)  
CODE REF: NEC 705.12(B)(3)(2)

## SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN

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



LABEL- 6:  
LABEL LOCATION:  
AC DISCONNECT  
CODE REF: [NEC 690.56(C)(1)(A)]

## RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

LABEL- 7:  
LABEL LOCATION:  
AC DISCONNECT  
MAIN SERVICE PANEL (ONLY IF SOLAR IS BACK-FED)  
CODE REF: NEC 690.56(C)(2)

## DC DISCONNECT

LABEL- 8:  
LABEL LOCATION:  
INVERTER  
CODE REF: NEC 690.13(B)

## AC DISCONNECT PHOTOVOLTAIC SYSTEM POWER SOURCE

NOMINAL OPERATING AC VOLATGE **240 V**  
RATED AC OUTPUT CURRENT **32.00 A**

LABEL- 9:  
LABEL LOCATION:  
AC DISCONNECT  
CODE REF: NEC 690.54

MAXIMUM VOLTAGE **480 V**  
MAXIMUM CIRCUIT CURRENT **20.00 A**  
MAXIMUM RATED OUTPUT  
CURRENT OF THE CHARGE  
CONTROLLER OR DC-TO-DC  
CONVERTER (IF INSTALLED)

LABEL- 10:  
LABEL LOCATION:  
ON THE RIGHT SIDE OF THE INVERTER  
CODE REF: NEC 690.53

# TOP TIER

SOLAR SOLUTIONS

## TOP TIER SOLAR SOLUTIONS

1530 CENTER PARK DR #2911,  
CHARLOTTE, NC 28217,  
UNITED STATES

### REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	07/19/2023	

### PROJECT NAME & ADDRESS

MICHAEL THORESON  
RESIDENCE

167 ANGEL OAK DR,  
BUNNLEVEL, NC 28323

DRAWN BY

ESR

SHEET NAME

LABELS

SHEET SIZE

ANSI B  
11" X 17"

SHEET NUMBER

PV-8



# MSE PERC 66

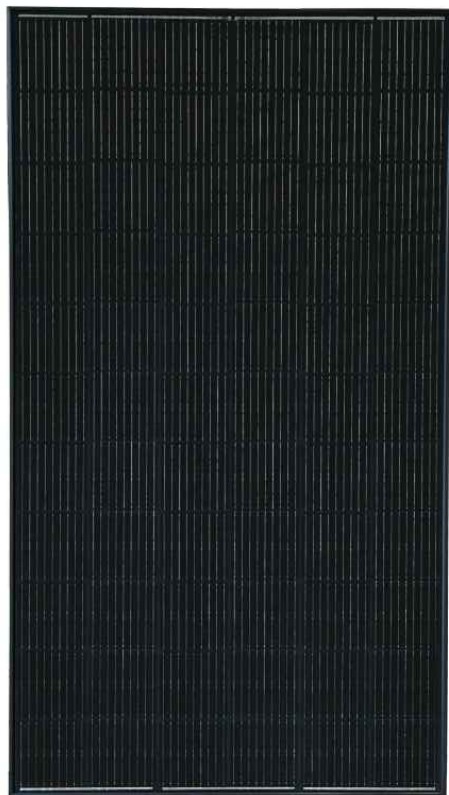
MISSION SOLAR ENERGY



## 395W

Class leading power output -0 to +3%

Positive Power Tolerance



## True American Quality True American Brand

Mission Solar Energy is headquartered in San Antonio, Texas where we manufacture our modules. We produce American, high-quality solar modules ensuring the highest-in-class power output and best-in-class reliability. Our product line is tailored for residential, commercial and utility applications. Every Mission Solar Energy solar module is certified and surpasses industry standard regulations, proving excellent performance over the long term.

Demand the best. Demand Mission Solar Energy.



### Certified Reliability

- Tested to UL 61730 & IEC Standards
- PID resistant
- Resistance to salt mist corrosion



### Advanced Technology

- 9 Busbar
- Passivated Emitter Rear Contact
- Ideal for all applications



### Extreme Weather Resilience

- Up to 5,400 Pa front load & 3,600 Pa back load
- Tested load to UL 61730
- 40 mm frame



### BAA Compliant for Government Projects

- Buy American Act
- American Recovery & Reinvestment Act

### FRAME-TO-FRAME WARRANTY

Degradation guaranteed not to exceed 2% in year one and 0.58% annually from years two to 30 with 84.08% capacity guaranteed in year 25. For more information, visit [www.missionsolar.com/warranty](http://www.missionsolar.com/warranty)

### CERTIFICATIONS

CEC



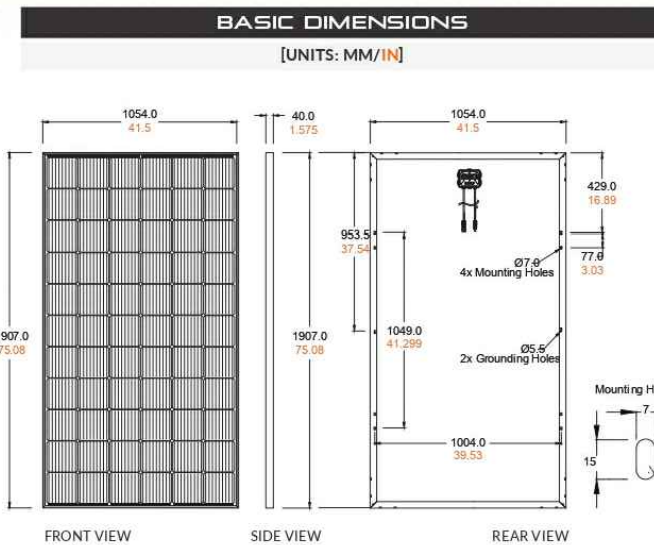
UL 61730 / IEC 61215 / IEC 61730 / IEC 61701

If you have questions or concerns about certification of our products in your area, please contact Mission Solar Energy.



Class Leading  
390-400W

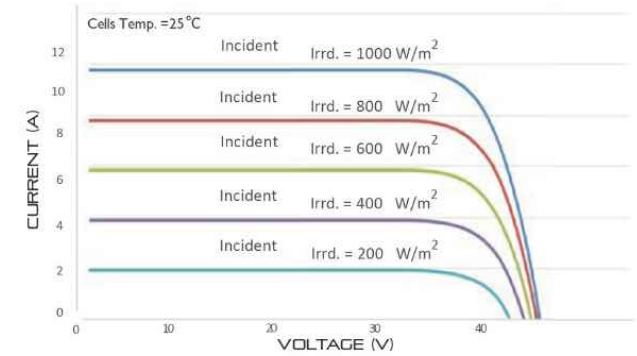
# MSE PERC 66



### CURRENT-VOLTAGE CURVE

MSE385SX9R: 385WP, 66 CELL SOLAR MODULE

Current-voltage characteristics with dependence on irradiance and module temperature



### CERTIFICATIONS AND TESTS

IEC	61215, 61730, 61701
UL	61730



CEC



## Mission Solar Energy

8303 S. New Braunfels Ave., San Antonio, Texas 78235  
[www.missionsolar.com](http://www.missionsolar.com) | [info@missionsolar.com](mailto:info@missionsolar.com)

Mission Solar Energy reserves the right to make specification changes without notice.  
C-SA2-MKTG-0027 REV 4 03/18/2022

### ELECTRICAL SPECIFICATION

PRODUCT TYPE	MSExxxSX9R (xxx = P <sub>max</sub> )	390	395	400
Power Output	P <sub>max</sub> W <sub>p</sub>	390	395	400
Module Efficiency	%	19.4	19.7	19.9
Tolerance	%	0/+3	0/+3	0/+3
Short Circuit Current	I <sub>sc</sub> A	11.19	11.24	11.31
Open Circuit Voltage	V <sub>oc</sub> V	45.04	45.18	45.33
Rated Current	I <sub>mp</sub> A	10.63	10.68	10.79
Rated Voltage	V <sub>mp</sub> V	36.68	36.99	37.07
Fuse Rating	A	20	20	20
System Voltage	V	1,000	1,000	1,000

### TEMPERATURE COEFFICIENTS

Normal Operating Cell Temperature (NOCT)	43.75°C (±3.7%)
Temperature Coefficient of P <sub>max</sub>	-0.367%/°C
Temperature Coefficient of V <sub>oc</sub>	-0.259%/°C
Temperature Coefficient of I <sub>sc</sub>	0.033%/°C

### OPERATING CONDITIONS

Maximum System Voltage	1,000Vdc
Operating Temperature Range	-40°F to 185°F (-40°C to +85°C)
Maximum Series Fuse Rating	20A
Fire Safety Classification	Type 1*
Front & Back Load (UL Standard)	Up to 5,400 Pa front and 3,600 Pa back load, Tested to UL 61730
Hail Safety Impact Velocity	25mm at 23 m/s

\*Mission Solar Energy uses quality sourced materials that result in a Type 1 fire rating. Please note, the "Fire Class" Rating is designated for the fully-installed PV system, which includes, but is not limited to, the module, the type of mounting used, pitch and roof composition.

### MECHANICAL DATA

Solar Cells	P-type mono-crystalline silicon
Cell Orientation	66 cells (6x11)
Module Dimension	1,907mm x 1,054mm x 40mm
Weight	48.5 lbs. (22 kg)
Front Glass	3.2mm tempered, low-iron, anti-reflective
Frame	40mm Anodized
Encapsulant	Ethylene vinyl acetate (EVA)
Junction Box	Protection class IP67 with 3 bypass-diodes
Cable	1.2m, Wire 4mm <sup>2</sup> (12AWG)
Connector	Staubli PV-KBT4/6II-UR and PV-KST4/6II-UR, MC4, Renhe 05-8

### SHIPPING INFORMATION

Container Feet	Ship To	Pallet	Panels	390W Bin
53'	Most States	30	780	304.20 kW
Double Stack	CA	26	676	263.64 kW

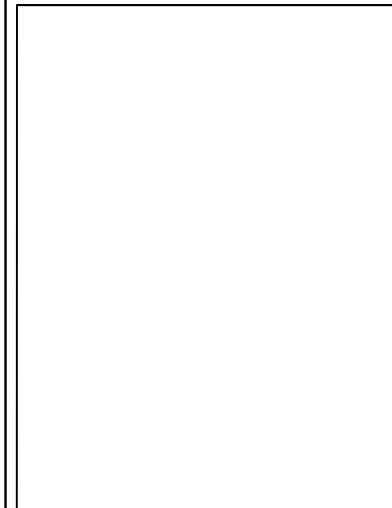
PALLET [26 PANELS]			
Weight	Height	Width	Length
1,300 lbs. (572 kg)	47.56 in (120.80 cm)	46 in (116.84 cm)	77 in (195.58 cm)



TOP TIER SOLAR SOLUTIONS  
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PROJECT NAME & ADDRESS

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RESIDENCE

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BUNNLEVEL, NC 28323

DRAWN BY  
ESR

SHEET NAME  
EQUIPMENT  
SPECIFICATION

SHEET SIZE  
ANSI B  
11" X 17"

SHEET NUMBER  
PV-9

# Power Optimizer For Residential Installations

S440, S500



POWER OPTIMIZER

## Enabling PV power optimization at the module level

- Specifically designed to work with SolarEdge residential inverters
- Mitigates all types of module mismatch loss, from manufacturing tolerance to partial shading
- Detects abnormal PV connector behavior, preventing potential safety issues\*
- Faster installations with simplified cable management and easy assembly using a single bolt
- Module-level voltage shutdown for installer and firefighter safety
- Flexible system design for maximum space utilization
- Superior efficiency (99.5%)
- Compatible with bifacial PV modules

\* Functionality subject to inverter model and firmware version

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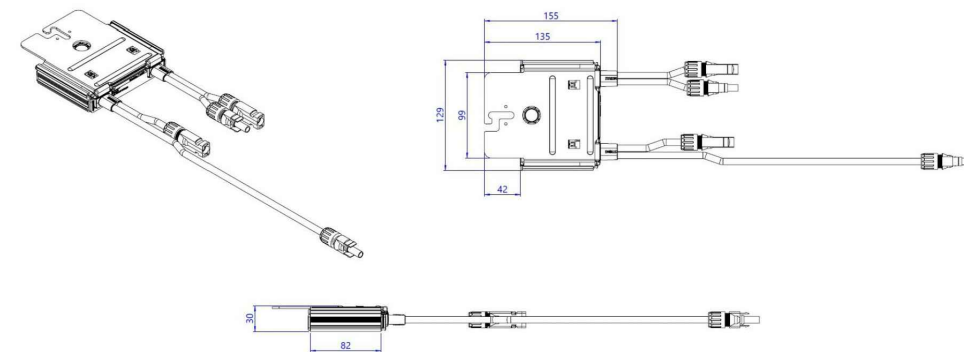
## Power Optimizer For Residential Installations S440, S500

	S440	S500	UNIT
Rated Input DC Power <sup>(1)</sup>	440	500	W
Absolute Maximum Input Voltage (Voc)		60	Vdc
MPPT Operating Range		8 - 60	Vdc
Maximum Short Circuit Current (Isc) of Connected PV Module	14.5	15	Adc
Maximum Efficiency		99.5	%
Weighted Efficiency		98.6	%
Overtoltage Category		II	
<b>OUTPUT DURING OPERATION</b>			
Maximum Output Current		15	Adc
Maximum Output Voltage		60	Vdc
<b>OUTPUT DURING STANDBY (POWER OPTIMIZER DISCONNECTED FROM INVERTER OR INVERTER OFF)</b>			
Safety Output Voltage per Power Optimizer		1	Vdc
<b>STANDARD COMPLIANCE</b>			
EMC	FCC Part 15 Class B, IEC61000-6-2, IEC61000-6-3, CISPR11, EN-55011		
Safety	IEC62109-1 (class II safety), UL1741		
Material	UL94 V-0, UV Resistant		
RoHS	Yes		
Fire Safety	VDE-AR-E 2100-712:2013-05		
<b>INSTALLATION SPECIFICATIONS</b>			
Maximum Allowed System Voltage		1000	Vdc
Dimensions (W x L x H)		129 x 155 x 30	mm
Weight (including cables)		655 / 1.5	gr / lb
Input Connector	MC4 <sup>(2)</sup>		
Input Wire Length	0.1		
Output Connector	MC4		
Output Wire Length	(+/-) 2.3, (-) 0.10		
Operating Temperature Range <sup>(3)</sup>	-40 to +85		
Protection Rating	IP68 / NEMA6P		
Relative Humidity	0 - 100		

(1) Rated power of the module at STC will not exceed the Power Optimizer Rated Input DC Power. Modules with up to +5% power tolerance are allowed  
 (2) For other connector types please contact SolarEdge  
 (3) For ambient temperature above +70°C / +158°F power de-rating is applied. Refer to Power Optimizers Temperature De-Rating Technical Note for more details

PV System Design Using a SolarEdge Inverter	Single Phase HD-Wave	Three Phase	Three Phase for 277/480V Grid	
Minimum String Length (Power Optimizers)	S440, S500	8	16	18
Maximum String Length (Power Optimizers)		25	50	
Maximum Nominal Power per String <sup>(4)</sup>		5700	11250 <sup>(5)</sup>	12750 <sup>(6)</sup>
Parallel Strings of Different Lengths or Orientations			Yes	

(4) If the inverters rated AC power ≤ maximum nominal power per string, then the maximum power per string will be able to reach up to the inverters maximum input DC power. Refer to: <https://www.solaredge.com/sites/default/files/se-power-optimizer-single-string-design-application-note.pdf>  
 (5) For the 230/400V grid: it is allowed to install up to 13,500W per string when the maximum power difference between each string is 2,000W  
 (6) For the 277/480V grid: it is allowed to install up to 15,000W per string when the maximum power difference between each string is 2,000W  
 (7) It is not allowed to mix S-series and P-series Power Optimizers in new installations



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CE RoHS

**TOP TIER**  
SOLAR SOLUTIONS

TOP TIER SOLAR SOLUTIONS

1530 CENTER PARK DR #2911,  
CHARLOTTE, NC 28217,  
UNITED STATES

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	07/19/2023	

PROJECT NAME & ADDRESS

MICHAEL THORESON  
RESIDENCE

167 ANGEL OAK DR,  
BUNNLEVEL, NC 28323

DRAWN BY

ESR

SHEET NAME  
EQUIPMENT  
SPECIFICATION

SHEET SIZE  
ANSI B  
11" X 17"

SHEET NUMBER  
PV-10

# Single Phase Energy Hub Inverter with Prism Technology

For North America

SE3000H-US / SE3800H-US / SE6000H-US / **SE7600H-US** / SE10000H-US / SE11400H-US<sup>(1)</sup>



**12-25  
YEAR  
WARRANTY**

**HOME BACKUP**

## Optimized battery storage with HD-Wave technology

- Record-breaking 99% weighted efficiency with 200% DC oversizing
- Multi-inverter, scalable storage solution
  - With enhanced battery power up to 10kW
- Small, lightweight, and easy to install
- Integrated arc fault protection and rapid shutdown for NEC 2014, NEC 2017 and NEC 2020, per article 690.11 and 690.12
- Modular design, future ready with optional upgrades to:
  - DC-coupled storage for full or partial home backup
  - Built-in consumption monitoring
  - Direct connection to the SolarEdge smart EV charger
- Embedded revenue grade production data, ANSI C12.20 Class 0.5

solaredge.com



## Single Phase Energy Hub Inverter with Prism Technology

For North America

SE3000H-US / SE3800H-US / SE6000H-US / **SE7600H-US** / SE10000H-US / SE11400H-US<sup>(1)</sup>

	SE3000H-US	SE3800H-US	SE6000H-US	<b>SE7600H-US</b>	SE10000H-US	SE11400H-US	UNITS
<b>OUTPUT - AC ON GRID</b>							
Rated AC Power	3000	3800 @ 240V 3300 @ 208V	6000 @ 240V 5000 @ 208V	7600	10000	11400 @ 240V 10000 @ 208V	W
Maximum AC Power Output	3000	3800 @ 240V 3300 @ 208V	6000 @ 240V 5000 @ 208V	7600	10000	11400 @ 240V 10000 @ 208V	W
AC Frequency Range (min - nom - max)	59.3 - 60 - 60.5 <sup>(2)</sup>						Hz
Maximum Continuous Output Current @ 240V	12.5	16	25	32	42	47.5	A
Maximum Continuous Output Current @ 208V	-	16	24	-	-	48.5	A
GFDI Threshold	1						A
Total Harmonic Distortion (THD)	<3						%
Power Factor	1, adjustable -0.85 to 0.85						
Utility Monitoring, Islanding Protection, Country Configurable Thresholds	Yes						
Charge Battery from AC (if allowed)	Yes						
Typical Nighttime Power Consumption	<2.5						W
<b>OUTPUT - AC BACKUP<sup>(3)</sup></b>							
Rated AC Power in Backup Operation <sup>(4)</sup>	3000	3800 7600*	6000	7600 10300*	10000	10300	W
AC L-L Output Voltage Range in Backup	211 - 264						Vac
AC L-N Output Voltage Range in Backup	105 - 132						Vac
AC Frequency Range in Backup (min - nom - max)	55 - 60 - 65						Hz
Maximum Continuous Output Current in Backup Operation	12.5	16 32*	25	32 43*	42	43	A
GFDI	1						A
THD	<5						%
<b>OUTPUT - SMART EV CHARGER AC</b>							
Rated AC Power	9600						W
AC Output Voltage Range	211 - 264						Vac
On-Grid AC Frequency Range (min - nom - max)	59.3 - 60 - 60.5						Hz
Maximum Continuous Output Current @ 240V (grid, PV and battery)	40						Aac
<b>INPUT - DC (PV AND BATTERY)</b>							
Transformer-less, Ungrounded	Yes						
Max Input Voltage	480						Vdc
Nom DC Input Voltage	380						Vdc
Reverse-Polarity Protection	Yes						
Ground-Fault Isolation Detection	600kΩ Sensitivity						
<b>INPUT - DC (PV)</b>							
Maximum DC Power @ 240V	6000	7600 15200*	12000	15200 22800*	22000	22800	W
Maximum DC Power @ 208V	-	6600	10000	-	-	20000	W
Maximum Input Current <sup>(5)</sup> @ 240V	8.5	10.5 20*	16.5	20 31*	27	31	Adc
Maximum Input Current <sup>(5)</sup> @ 208V	-	9	13.5	-	-	27	Adc
Max. Input Short Circuit Current	45						Adc
Maximum Inverter Efficiency	99	99.2					%
CEC Weighted Efficiency	99					99 @ 240V 98.5 @ 208V	%
2-pole Disconnection	Yes						

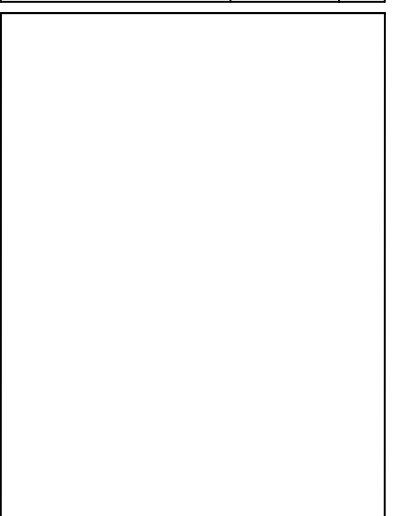
\* Supported with PN SExxxxH-USMxxxxx or SExxxxH-USMxxxxx  
 (1) These specifications apply to inverters with part numbers SExxxxH-USMxxxxx or SExxxxH-USMxxxxx and connection unit model number DCD-1PH-US-PxH-F-x  
 (2) For other regional settings please contact SolarEdge support.  
 (3) Not designed for standalone applications and requires AC for commissioning. Backup functionality is only supported for 240V grid  
 (4) Rated AC power in Backup Operation are valid for installations with multiple inverters. For a single backup inverter operation, rated AC power in Backup is 90% of the value stated.  
 (5) A higher current source may be used; the inverter will limit its input current to the values stated.

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DRAWN BY  
**ESR**

SHEET NAME  
**EQUIPMENT  
SPECIFICATION**

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

SHEET NUMBER  
**PV-11**

# / Single Phase Energy Hub Inverter with Prism Technology For North America

SE3000H-US / SE3800H-US / SE6000H-US / **SE7600H-US** / SE10000H-US / SE11400H-US<sup>(1)</sup>

	SE3000H-US	SE3800H-US	SE6000H-US	<b>SE7600H-US</b>	SE10000H-US	SE11400H-US	UNITS
<b>INPUT - DC (BATTERY)</b>							
Supported Battery Types	SolarEdge Energy Bank, LG RESU Prime <sup>(6)</sup>						
Number of Batteries per Inverter	Up to 3 SolarEdge Energy Bank, up to 2 LG RESU Prime						
Continuous Power <sup>(7)</sup>	6000	7600		10000			W
Peak Power <sup>(7)</sup>	6000	7600		10000			W
Max Input Current	16	20		26.5			Adc
2-pole Disconnection	Yes						
<b>SMART ENERGY CAPABILITIES</b>							
Consumption Metering	Built - in <sup>(8)</sup>						
Backup & Battery Storage	With Backup Interface (purchased separately) for service up to 200A; Up to 3 inverters						
EV Charging	Direct connection to Smart EV charger						
<b>ADDITIONAL FEATURES</b>							
Supported Communication Interfaces	RS485, Ethernet, Cellular <sup>(9)</sup> , Wi-Fi (optional), SolarEdge Energy Net (optional)						
Revenue Grade Metering, ANSI C12.20	Built - in <sup>(8)</sup>						
Integrated AC, DC and Communication Connection Unit	Yes						
Inverter Commissioning	With the SetApp mobile application using built-in Wi-Fi Access Point for local connection						
DC Voltage Rapid Shutdown (PV and Battery)	Yes, according to NEC 2014, NEC 2017 and NEC 2020 690.12						
<b>STANDARD COMPLIANCE</b>							
Safety	UL1741, UL1741 SA, UL1741 PCS, UL1699B, UL1998, UL9540, CSA 22.2						
Grid Connection Standards	IEEE1547, Rule 21, Rule 14H						
Emissions	FCC part 15 class B						
<b>INSTALLATION SPECIFICATIONS</b>							
AC Output and EV AC Output Conduit Size / AWG Range	1" maximum / 14-4 AWG						
DC Input (PV and Battery) Conduit Size / AWG Range	1" maximum / 14-6 AWG						
Dimensions with Connection Unit (H x W x D)	17.7 x 14.6 x 6.8 / 450 x 370 x 174		17.7 x 14.6 x 6.8 / 450 x 370 x 174		17.7 x 14.6 x 6.8 / 450 x 370 x 174		in / mm
Weight with Connection Unit	26 / 11.8		26 / 11.8		41.7 / 18.9		lb / kg
Noise	< 25	< 25 < 50*	< 25	< 50			dB(A)
Cooling	Natural Convection						
Operating Temperature Range	-40 to +140 / -40 to +60 <sup>(10)</sup>						
Protection Rating	NEMA 4						

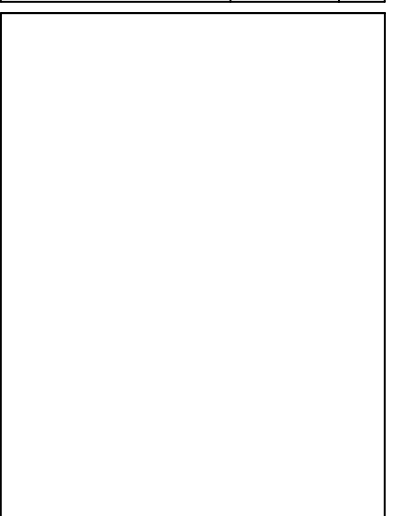
(6) The part numbers SExxxxH-USxMxxxx only support the SolarEdge Energy Bank. The part numbers SExxxxH-USxNxxxx support both SolarEdge Energy Bank and LG RESU Prime batteries. Requires supporting Inverter firmware.  
 (7) Discharge power is limited up to the inverter rated AC power for on-grid and backup applications.  
 (8) For consumption metering current transformers should be ordered separately: SECT-SPL-225A-T-20 or SEACT0750-400NA-20 units per box. Revenue grade metering is only for production metering.  
 (9) Information concerning the Data Plan's terms & conditions is available in the following link: <https://www.solaredge.com/sites/default/files/se-communication-plan-terms-and-conditions-eng.pdf>  
 (10) Full power up to at least 50°C / 122°F; for power de-rating information refer to: <https://www.solaredge.com/sites/default/files/se-temperature-derating-nc-en-na.pdf>



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DRAWN BY <b>ESR</b>
SHEET NAME <b>EQUIPMENT SPECIFICATION</b>
SHEET SIZE <b>ANSI B 11" X 17"</b>
SHEET NUMBER <b>PV-12</b>



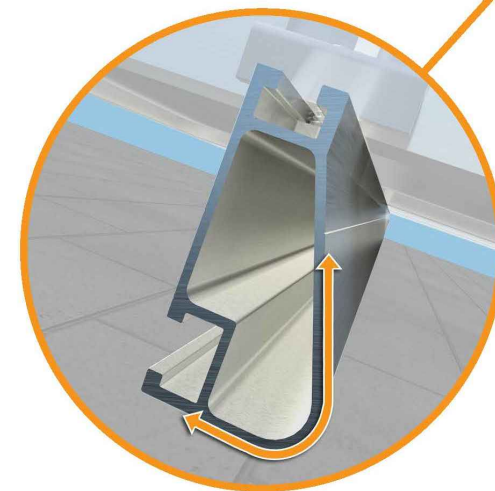
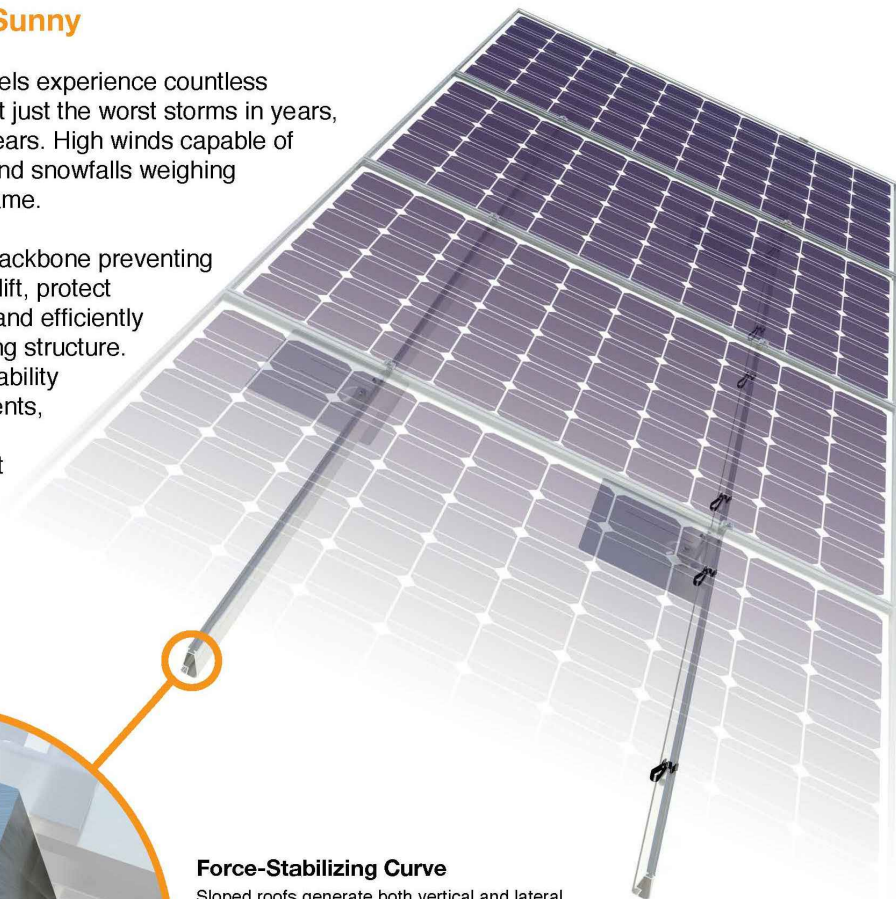
Tech Brief

## XR Rail Family

### Solar Is Not Always Sunny

Over their lifetime, solar panels experience countless extreme weather events. Not just the worst storms in years, but the worst storms in 40 years. High winds capable of ripping panels from a roof, and snowfalls weighing enough to buckle a panel frame.

XR Rails are the structural backbone preventing these results. They resist uplift, protect against buckling and safely and efficiently transfer loads into the building structure. Their superior spanning capability requires fewer roof attachments, reducing the number of roof penetrations and the amount of installation time.



#### Force-Stabilizing Curve

Sloped roofs generate both vertical and lateral forces on mounting rails which can cause them to bend and twist. The curved shape of XR Rails is specially designed to increase strength in both directions while resisting the twisting. This unique feature ensures greater security during extreme weather and a longer system lifetime.

#### Compatible with Flat & Pitched Roofs



XR Rails are compatible with FlashFoot and other pitched roof attachments.



IronRidge offers a range of tilt leg options for flat roof mounting applications.

#### Corrosion-Resistant Materials

All XR Rails are made of marine-grade aluminum alloy, then protected with an anodized finish. Anodizing prevents surface and structural corrosion, while also providing a more attractive appearance.



### XR Rail Family

The XR Rail Family offers the strength of a curved rail in three targeted sizes. Each size supports specific design loads, while minimizing material costs. Depending on your location, there is an XR Rail to match.



**XR10**

XR10 is a sleek, low-profile mounting rail, designed for regions with light or no snow. It achieves 6 foot spans, while remaining light and economical.

- 6' spanning capability
- Moderate load capability
- Clear anodized finish
- Internal splices available



**XR100**

XR100 is the ultimate residential mounting rail. It supports a range of wind and snow conditions, while also maximizing spans up to 8 feet.

- 8' spanning capability
- Heavy load capability
- Clear & black anodized finish
- Internal splices available



**XR1000**

XR1000 is a heavyweight among solar mounting rails. It's built to handle extreme climates and spans 12 feet or more for commercial applications.

- 12' spanning capability
- Extreme load capability
- Clear anodized finish
- Internal splices available

### Rail Selection

The following table was prepared in compliance with applicable engineering codes and standards. Values are based on the following criteria: ASCE 7-10, Roof Zone 1, Exposure B, Roof Slope of 7 to 27 degrees and Mean Building Height of 30 ft. Visit IronRidge.com for detailed span tables and certifications.

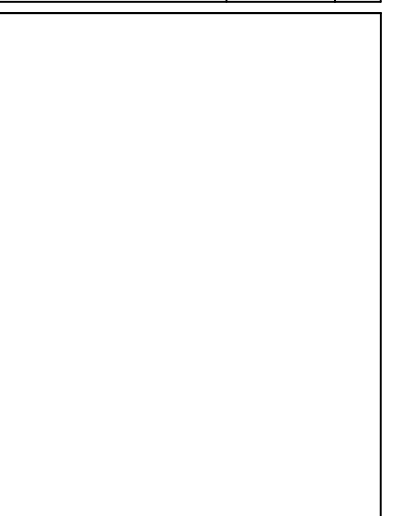
Load		Rail Span					
Snow (PSF)	Wind (MPH)	4'	5' 4"	6'	8'	10'	12'
None	100						
	120						
	140	XR10		XR100		XR1000	
	160						
10-20	100						
	120						
	140						
	160						
30	100						
	160						
40	100						
	160						
50-70	160						
80-90	160						



### TOP TIER SOLAR SOLUTIONS

1530 CENTER PARK DR #2911,  
CHARLOTTE, NC 28217,  
UNITED STATES

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	07/19/2023	



PROJECT NAME & ADDRESS

**MICHAEL THORESON  
RESIDENCE**

167 ANGEL OAK DR,  
BUNNLEVEL, NC 28323

DRAWN BY  
**ESR**

SHEET NAME  
**EQUIPMENT  
SPECIFICATION**

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

SHEET NUMBER  
**PV-13**

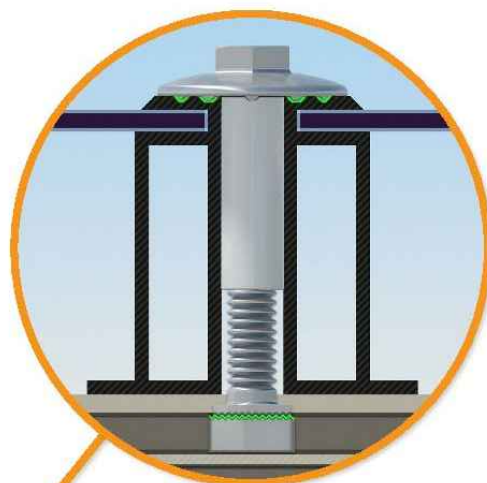


## UFO Family of Components

### Simplified Grounding for Every Application

The UFO family of components eliminates the need for separate grounding hardware by bonding solar modules directly to IronRidge XR Rails. All system types that feature the UFO family—Flush Mount, Tilt Mount and Ground Mount—are fully listed to the UL 2703 standard.

UFO hardware forms secure electrical bonds with both the module and the rail, resulting in many parallel grounding paths throughout the system. This leads to safer and more reliable installations.



#### Universal Fastening Object (UFO)

The UFO securely bonds solar modules to XR Rails. It comes assembled and lubricated, and can fit a wide range of module heights.



#### Stopper Sleeve

The Stopper Sleeve snaps onto the UFO, converting it into a bonded end clamp.



#### Bonded Splice

Each Bonded Splice uses self-drilling screws to form a secure connection. No bonding strap needed.



#### Grounding Lug

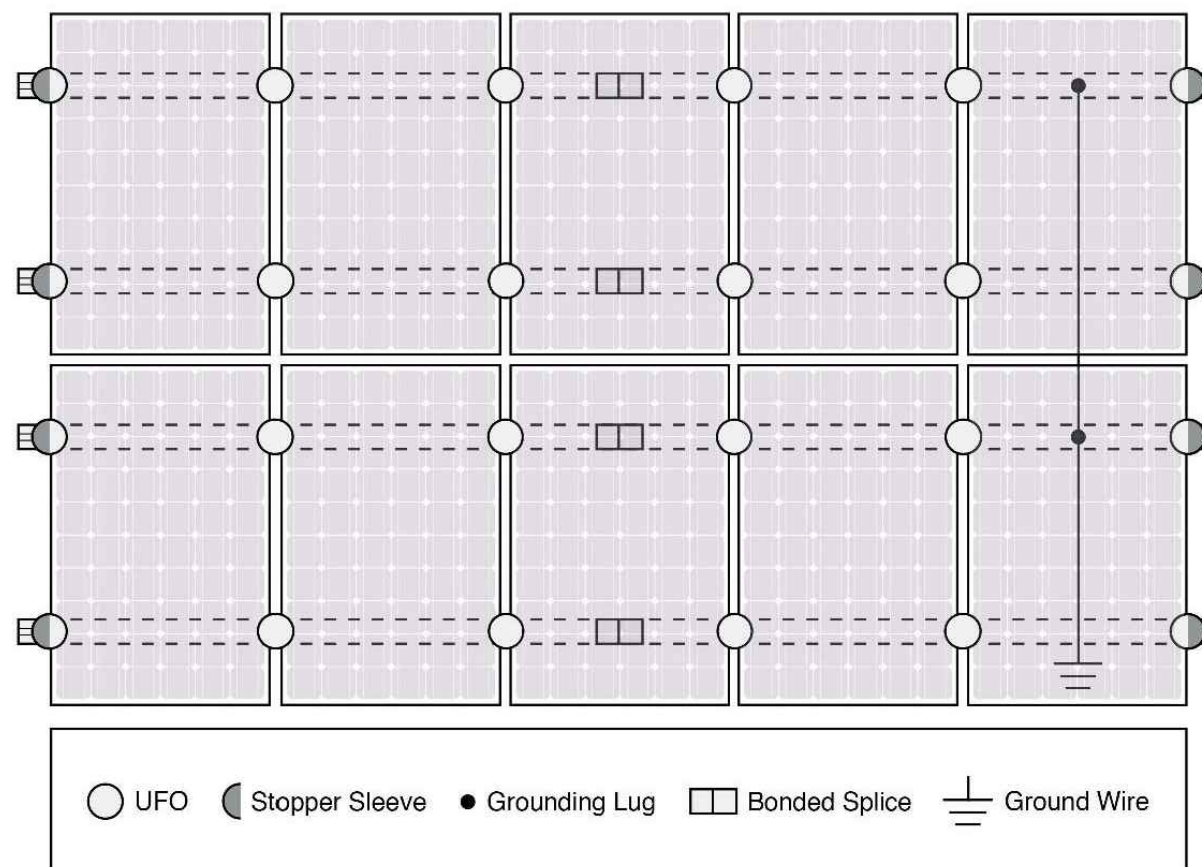
A single Grounding Lug connects an entire row of PV modules to the grounding conductor.



#### Bonded Attachments

The bonding bolt attaches and bonds the L-foot to the rail. It is installed with the same socket as the rest of the system.

### System Diagram



Approved Enphase microinverters can provide equipment grounding of IronRidge systems, eliminating the need for grounding lugs and field installed equipment ground conductors (EGC). A minimum of two microinverters mounted to the same rail and connected to the same Engage cable is required. Refer to installation manuals for additional details.

### UL Certification

The IronRidge Flush Mount, Tilt Mount, and Ground Mount Systems have been listed to UL 2703 by Intertek Group plc.

UL 2703 is the standard for evaluating solar mounting systems. It ensures these devices will maintain strong electrical and mechanical connections over an extended period of time in extreme outdoor environments.

[Go to IronRidge.com/UFO](http://Go to IronRidge.com/UFO)

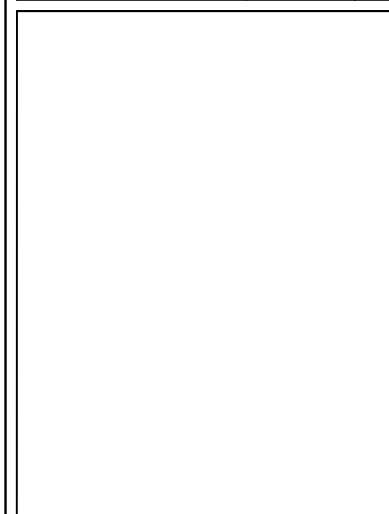
Cross-System Compatibility			
Feature	Flush Mount	Tilt Mount	Ground Mount
XR Rails	✓	✓	XR1000 Only
UFO/Stopper	✓	✓	✓
Bonded Splice	✓	✓	N/A
Grounding Lugs	1 per Row	1 per Row	1 per Array
Microinverters & Power Optimizers	Enphase - M250-72, M250-60, M215-60, C250-72 Darfon - MIG240, MIG300, G320, G640 SolarEdge - P300, P320, P400, P405, P600, P700, P730		
Fire Rating	Class A	Class A	N/A
Modules	Tested or Evaluated with over 400 Framed Modules Refer to installation manuals for a detailed list.		



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RESIDENCE

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DRAWN BY  
ESR

SHEET NAME  
EQUIPMENT  
SPECIFICATION

SHEET SIZE  
ANSI B  
11" X 17"

SHEET NUMBER  
PV-14



QuickMount® Halo UltraGrip

Cut Sheet

Cut Sheet

ITEM NO	DESCRIPTION	QTY IN KIT
1	QM Halo UltraGrip(Mill or Black)	1

PART NUMBER	DESCRIPTION
QM-HUG-01-M1	Halo UltraGrip - Mill
QM-HUG-01-B1	Halo UltraGrip - Black

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QM-HUG-01-B1 or QM-HUG-01-M1 Cut Sheet Rev 1.0

1. Halo UltraGrip

Property	Value
Material	3000 Series Aluminium
Finish	Mill or Black

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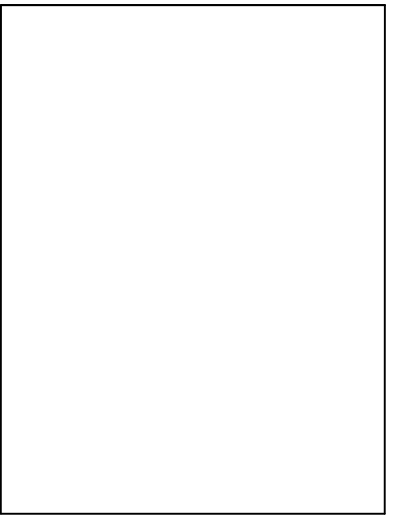
QM-HUG-01-B1 or QM-HUG-01-M1 Cut Sheet Rev 1.0



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DRAWN BY  
ESR

SHEET NAME  
EQUIPMENT  
SPECIFICATION

SHEET SIZE  
ANSI B  
11" X 17"

SHEET NUMBER  
PV-15



# QuickMount® RD Structural Screw



**TOP TIER SOLAR SOLUTIONS**

1530 CENTER PARK DR #2911,  
CHARLOTTE, NC 28217,  
UNITED STATES

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	07/19/2023	

ITEM NO	DESCRIPTION	QTY IN KIT
1	Self Drilling Screw, #14, Wood Tip	1
2	Washer, EPDM Backed	1

PART NUMBER	DESCRIPTION
RD-1430-01-M1	RD Structural Screw

1. Self Drilling Screw, #14, Wood Tip

5/16" Head  
Ø .43

.22  
#14 DIA  
3.22

Property	Value
Material	300 Series Stainless Steel
Finish	Clear

2. Washer, EPDM Backed

Ø .26    Ø .57

.13

Property	Value
Material	300 Series Stainless Steel
Finish	Clear

PROJECT NAME & ADDRESS

**MICHAEL THORESON  
RESIDENCE**

167 ANGEL OAK DR,  
BUNNLEVEL, NC 28323

DRAWN BY  
**ESR**

SHEET NAME  
**EQUIPMENT  
SPECIFICATION**

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

SHEET NUMBER  
**PV-16**

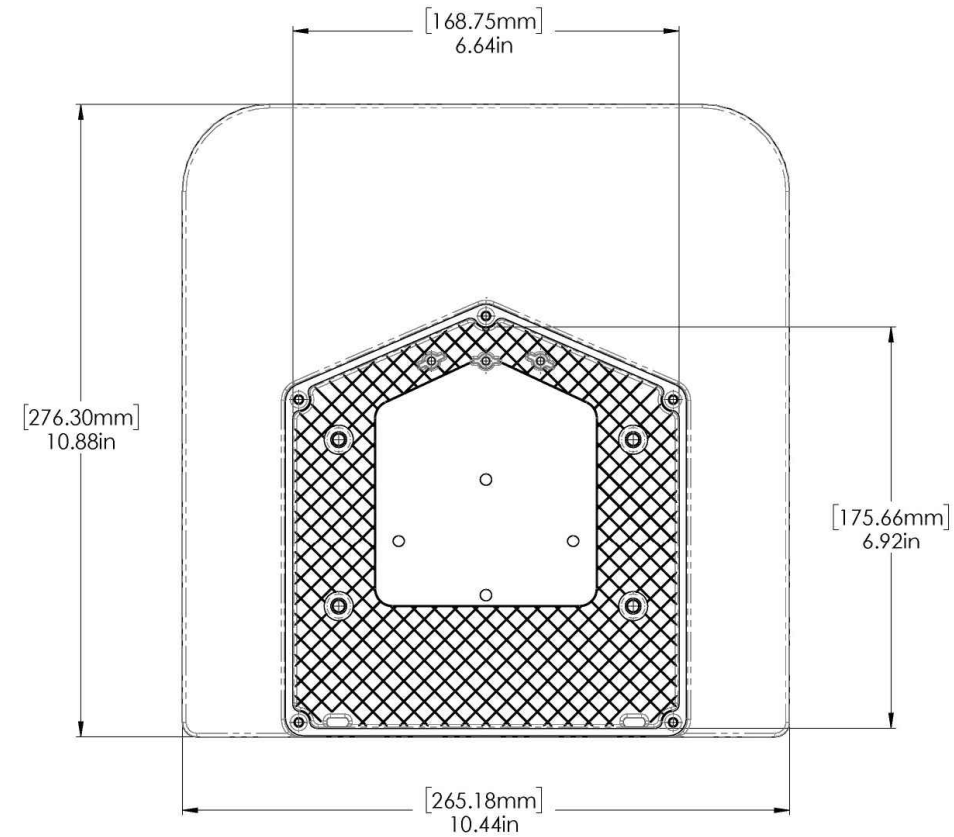
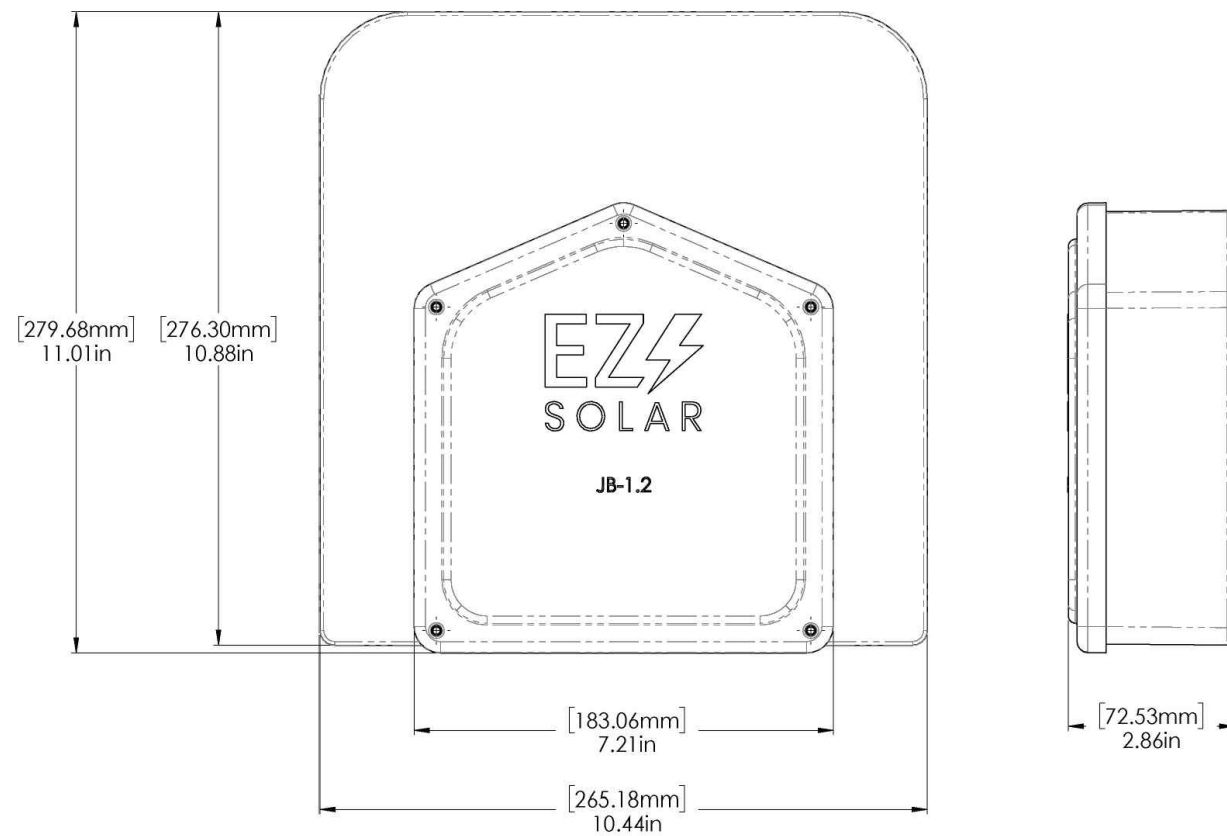


ITEM NO.	PART NUMBER	DESCRIPTION	QTY
1	JB-1.2 BODY	POLYCARBONATE WITH UV INHIBITORS	1
2	JB-1.2 LID	POLYCARBONATE WITH UV INHIBITORS	1
3	#10 X 1-1/4" PHILLIPS PAN HEAD SCREW		6
4	#8 X 3/4" PHILLIPS PAN HEAD SCREW		6

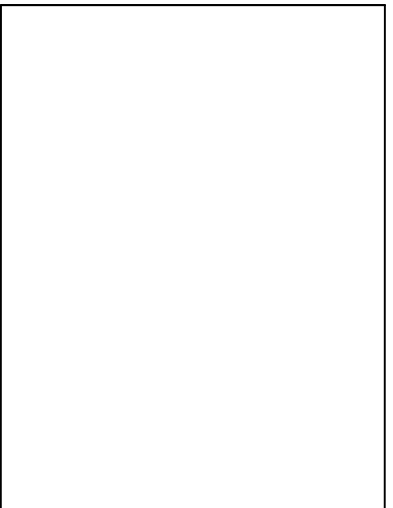
SIZE <b>B</b>	DWG. NO. JB-1.2	REV
SCALE: 1:2	WEIGHT: 1.45 LBS	SHEET 1 OF 3

TORQUE SPECIFICATION:	15-20 LBS
CERTIFICATION:	UL 1741, NEMA 3R CSA C22.2 NO. 290
WEIGHT:	1.45 LBS

SIZE <b>B</b>	DWG. NO. JB-1.2	REV
SCALE: 1:2	WEIGHT: 1.45 LBS	SHEET 2 OF 3



REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	07/19/2023	



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11" X 17"**

SHEET NUMBER  
**PV-17**