ELECTRICAL RESIDENTIAL

910-893-7525

www.harnett.org

PERMIT NUMBER

ERES2503-0054

JOB ADDRESS: 3861 US 401 N	**PERMIT SUBTYPE:** RESIDENTIAL SOLAR PANELS	**PARCEL NO:** 0651-15-0767.000
DESCRIPTION: install 14 roof mounted PV modules on existing structure	**DATE ISSUED:** 4/8/2025	**DATE EXPIRED:**
PLAN NAME:	**ZONING DISTRICT:** RA-30 - 2.33 acres (100.0%)	

APPLICANT: Top Tier Solar Solutions, LLC 1530 Center Park Dr. Charlotte, NC 28217	**PHONE:** (855)997-1213 **EMAIL:** nc@toptiersolarsolutions.com
CONTRACTOR: Top Tier Solar Solutions, LLC 1530 Center Park Dr. Charlotte, NC 28217	**PHONE:** (855)997-1213 **EMAIL:** nc@toptiersolarsolutions.com
OWNER: MANGUM JAMES L 3861 US 401 N FUQUAY-VARINA, NC 27526 FUQUAY VARINA, NC 27526	**PHONE:** **EMAIL:**

REQUIRED INSPECTIONS

INSPECTION TYPE	APPROVAL	DATE	COMMENTS
FINAL**			
ROUGH IN			

PV LETTERS

April 10, 2025

Subject: James Mangum Solar Panel Installation
3861 US 401 N, Fuquay-Varina, NC 27526

Contractor Name: Top Tier Solar Solutions
Contractor Address: 1530 Center Park Dr #2911, Charlotte, NC

To Whom It May Concern,

This letter is submitted on behalf of my client, EnergyScape Renewables.

I am a North Carolina registered Professional Engineer. A field inspection of the installation has been performed by a person under my direct supervisory control. I hereby affirm the following:

1. The PV equipment's structural installation has been designed and inspected,
2. The equipment will not create a negative impact on the building's structural design, including any additional loads imposed (dead, snow, wind), and
3. The installation is in compliance with the North Carolina Residential Code.

Limitations and Disclaimers

Electrical design is excluded from this analysis. Structural design and analysis of the adequacy of solar panels, racks, mounts, rails, and other components is performed by each component's respective manufacturer. This letter and the opinions expressed herein are rendered solely for the benefit of the permitting authority (city or county building department) and my client's office and may not be utilized or relied on by any other party.

Sincerely,

Trevor Jones, P.E.

April 10, 2025

PV LETTERS

Top Tier Solar Solutions
Contractor Address: 1530 Center Park Dr #2911, Charlotte, NC 28217

April 04, 2025

Subject: Proposed Solar Panel Installation
James Mangum Residence, 3861 US 401 N , Fuquay Varina, NC
DC System Size: 13.470 kW
PV Letters Job #004-19716

To Whom it May Concern,

We have reviewed information, provided by our client, related to the proposed solar panel installation at the above-referenced address. The purpose of the review was to determine if the existing roof is structurally adequate for the proposed installation. Based on our review and analysis of the given information, and in accordance with governing building codes, I certify that the capacity of the structural roof framing that directly supports the additional gravity loading due to the solar panel supports and modules had been reviewed and determined to meet or exceed the requirements in accordance with the Design Criteria.

Design Parameter Summary

Governing Building Code: 2018 North Carolina Residential Code
Risk Category: II
Wind Exposure: C
Design Wind Speed: 120 mph
Ground Snow Load: 15 psf

Roof Information

Roof Structure: 2x4 Manufactured Trusses @ 24" O.C.
Roofing Material: Asphalt Shingles (1 layer)
Roof Slope: 18 degrees

Roof Connection Details

Framing Mount Wood Screws: (2) #14 Self-Drilling Screw with a minimum penetration depth of 1.75" into roof truss top chord only, at 72" O.C. max
Stagger attachments to avoid overloading any individual truss top chord.

Engineering Analysis

The proposed installation - including weight of panels, racking, mounts, and inverters where applicable - will be approximately 3 psf. In the areas where panels are installed, roof live loads will not be present. The reduction of roof live load is adequate to fully or partially compensate for the addition of the panel installation. Because the member forces in the area of the solar panels are not increased by more than 5%, and so per provisions in the adopted building codes, the structure need not be altered for gravity loading.

The proposed installation will be 6" max. above the roof surface (flush mounted) and parallel to the roof surface. Therefore, any increase in wind loading on the building structure from the solar panel installation is expected to be negligible. Wind is the governing lateral load case. Because the increase in lateral loading is not increased by more than 10%, per provisions in the adopted building codes, the structure need not be altered for lateral loading.
Wind uplift on the panels has been calculated in accordance with the relevant provisions of ASCE 7-10. This loading has been used to verify the adequacy of the connection specified above. Connection locations should be in accordance with design drawings.

IronRidge XR10 rails will support the modules and will fasten to the roof structure with IronRidge QuickMount Halo Ultragrip along the rail.

Conclusion

The roof structure need not be altered for either gravity loading (including snow) or lateral loading (including wind). Therefore, the existing structure is permitted to remain unaltered. Connections to the roof must be made per the "Roof Connection Details" section above. Copies of all relevant calculations are enclosed.

Limitations and Disclaimers

The opinion expressed in this letter is made in reliance on the following assumptions: the existing structure is in good condition; the existing structure is free from defects in design or workmanship; and the existing structure was code-compliant at the time of its design and construction. These assumptions have not been independently verified, and we have relied on representations made by our client with respect to the foregoing. The undersigned has not inspected the structure for defects, although we have reviewed the information provided by our client, including pictures where applicable.

Electrical design is excluded from this analysis. Waterproofing is the sole responsibility of the installer and is also excluded from this analysis. Solar panels must be installed per manufacturer specifications. Structural design and analysis of the adequacy of solar panels, racks, mounts, and other components is performed by each component's respective manufacturer; the undersigned makes no statement of opinion regarding such components. This letter and the opinions expressed herein are rendered solely for the benefit of the permitting authority (city or county building department) and your office, and may not be utilized or relied on by any other party.

If you have any questions or concerns, please contact us at (208)-994-1680, or by email at Projects@pvletters.com.

Sincerely,
Trevor A. Jones, P.E.
4/4/2025

PV LETTERS

Standard Loading Comparison

This calculation justifies the additional solar load by comparing existing to proposed gravity loads in the location of the solar panels.

	Without Solar	With Solar	
Dead Load			
Asphalt Shingles	3	3	psf
1/4" Plywood	1	1	psf
Framing	4	4	psf
Insulation	1	1	psf
1/2" Gypsum Ceiling	2	2	psf
M,E, & Misc	1.5	1.5	psf
Solar Panel	0	3	psf
Total Dead Load	12.5	15.5	psf
Snow Load			
Ground Snow Load, P_g	15		psf
Exposure Factor, C_e	1.00		
Thermal Factor, C_t	1.1		
Importance Factor, I_s	1		
Flat Roof Snow Load	12		ASCE 7 Eqn. 7.3-1 or jurisdiction min.
Slope	18		degrees
Unobstructed Slippery Surface?	No	No	
Slope Factor, C_s	1.00	1.00	
Sloped Roof Snow Load	11.6	11.6	psf
Live Load			
Roof Live Load	20	0	psf
Load Combination			
D + Lr	32.5	15.5	psf
D + S	24.1	27.1	psf
Max. Load	32.5	27.1	psf
% of original		**83.23%**	

Result: **Because the total forces are decreased, per the relevant code provisions stated in the body of the letter, the existing roof structure is permitted to remain unaltered.**

PV LETTERS

Wood Screw Calculation (per ASCE 7-10)

This calculation justifies the connection of the solar panels to existing roof members, by showing the connection capacity is equal to or greater than the uplift force demands.

Connection Demand

Spacing perpendicular to rail, in	34	
Roof Angle, degrees	18	
Roof Layout	Hip	
Wind Speed, mph	120	
Exposure Coefficient, K_z	0.85	(Table 26.10-1)
Topographic Factor, K_{zt}	1.00	(Table 26.8.1)
Directionality Factor, K_d	0.85	(Table 26.6-1)
Elevation Factor, K_e	0.99	(Table 26.9-1)
Velocity Pressure q_z, psf	26.4	(Table26.10-1)

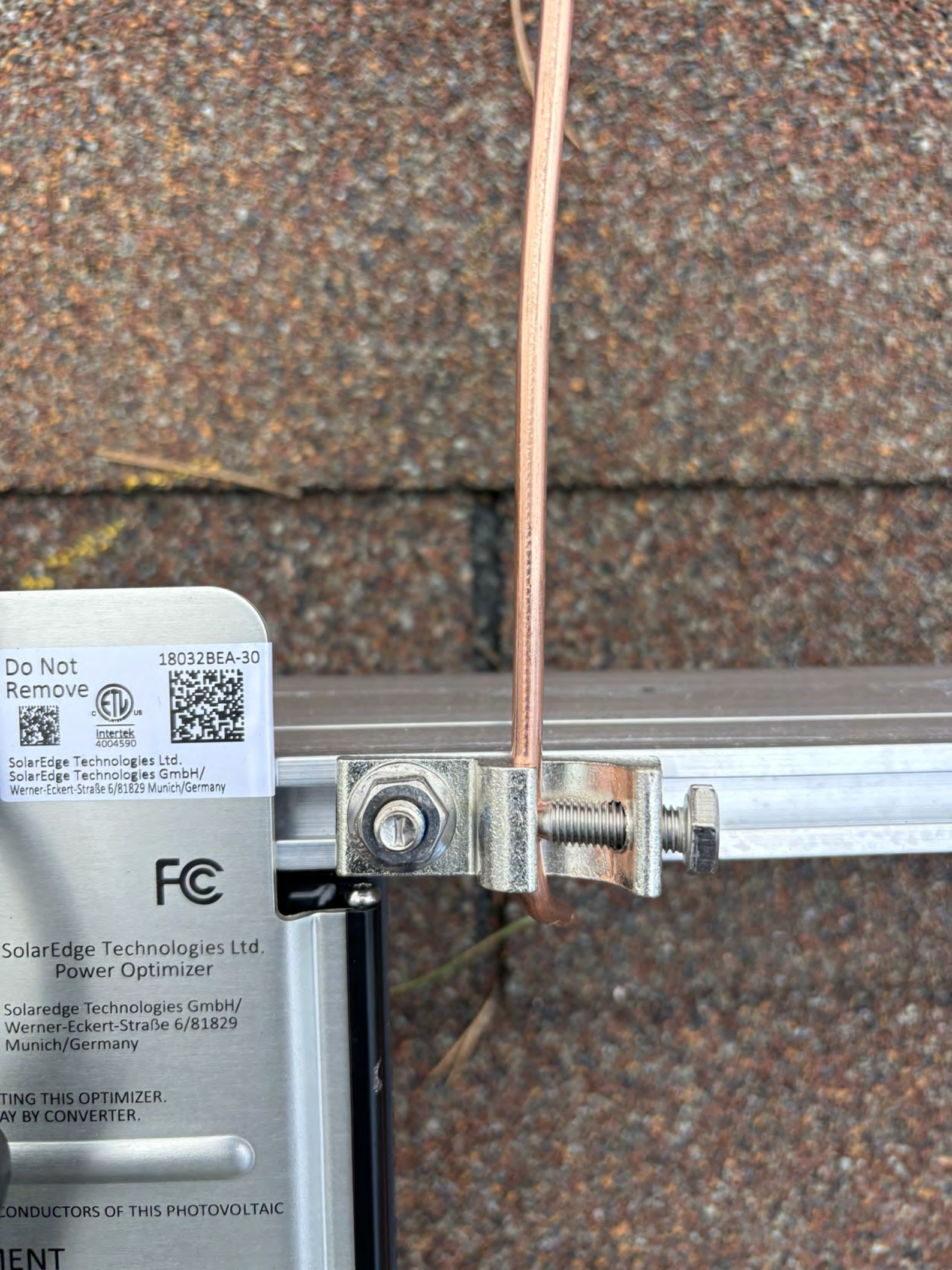
Zones:	1	2	3
Spacing parallel to rail, in	72	72	72
GC_p (max)(Figure 29.4-7)	0.90	2.20	2.60
Exposed Panels? (γ_E = 1.5) (Fig. 29.4-7)	No	No	No
Effective Wind Area on each con., ft^2	16.9	16.9	16.9
Pressure Equalization Factor, γ_a (Figure 29.4-8)	0.71	0.71	0.71
Uplift Force, psf (Equation 29.4-7)	16.8	41.1	48.6
Max. Uplift Force / Connection (0.6 WL), lbs	170.9	417.8	493.8
Solar Dead Load (0.6 DL). Lbs	30.5	30.5	30.5
Max. Uplift Force (0.6 WL - 0.6 DL), lbs	**140.4**	**387.3**	**463.3**

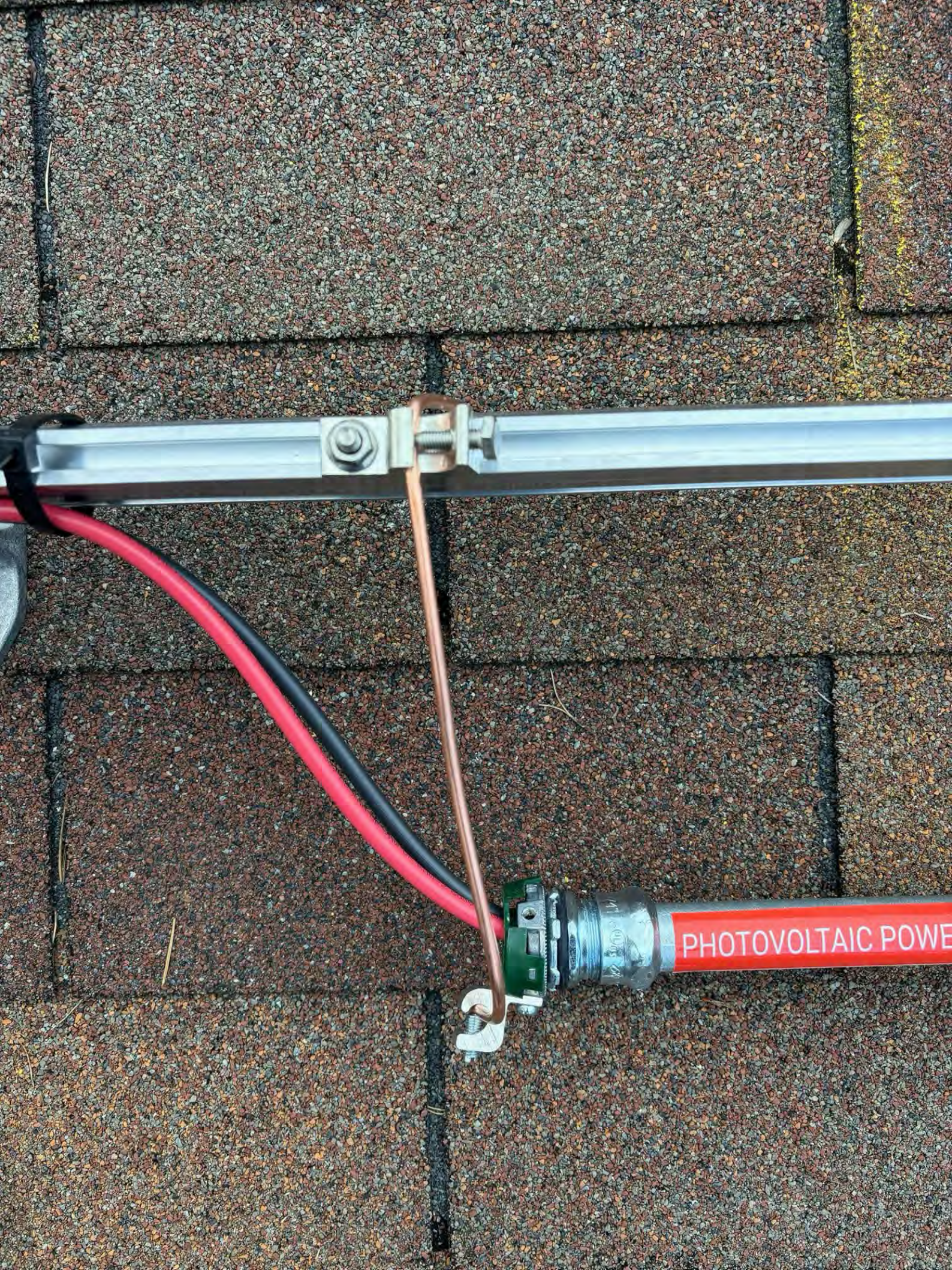
Connection Capacity

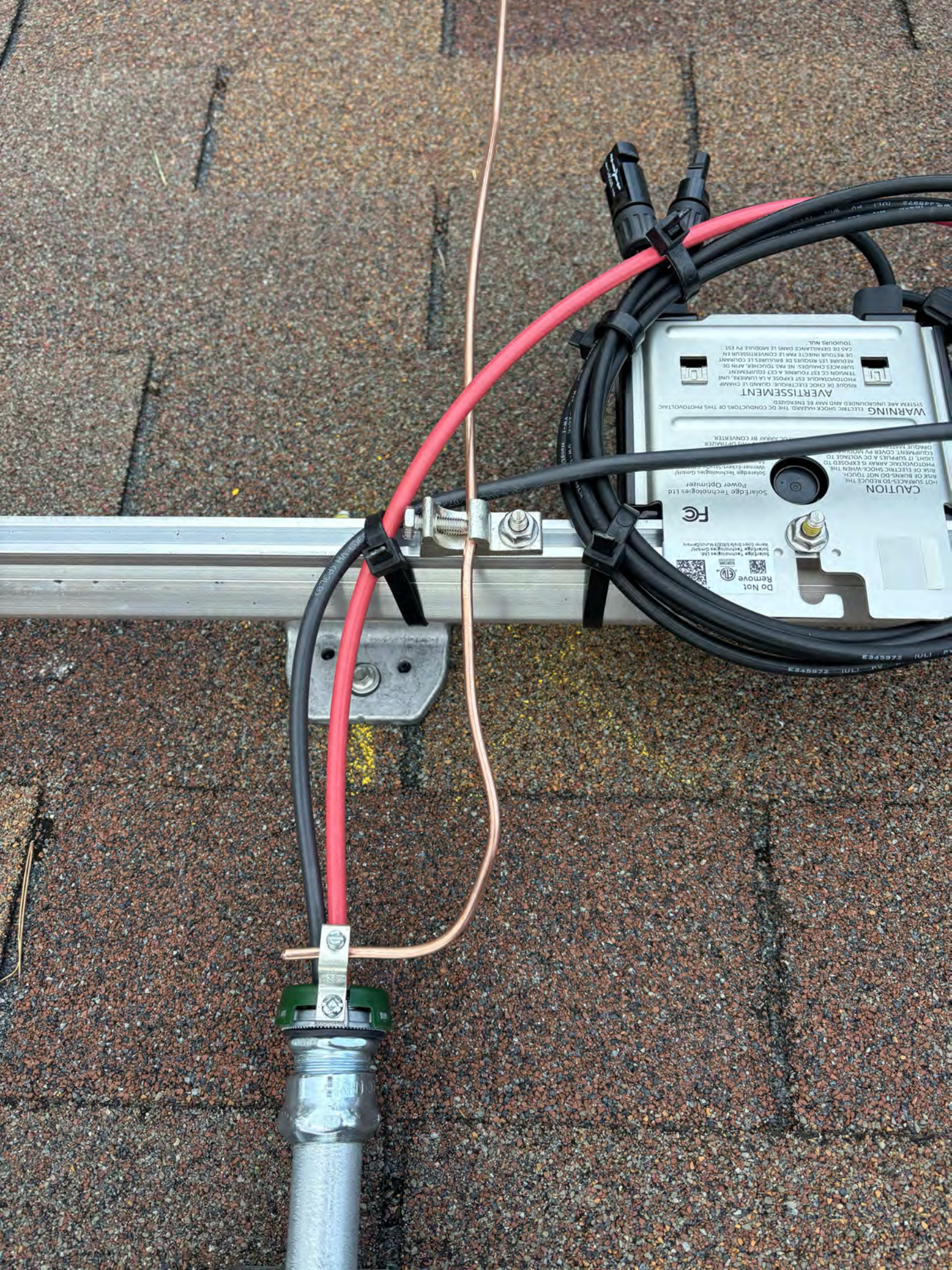
Attachment FTG	IronRidge QuickMount Halo Ultragrip	
Attachment location	Framing	
Fastener Type	Wood Screw	
Fastener Diameter, in	0.242	
Embedment Length, in	1.75	
Lumber Species & Grade	SPF #2 (Assumed)	
Nominal Withdrawal Capacity W, lbs	213	
# of Screws	2	
Load Duration Factor C_d	1.6	
Screw Adj. Withdrawal Cap. W', lbs	**681**	
Attachment FTG Strength with Cd, lbs	**1606**	
Max applied load, lbs	463	
Max allowable load, lbs	681	

Compare Adjusted Withdrawal Capacity to ASD Factored Demand

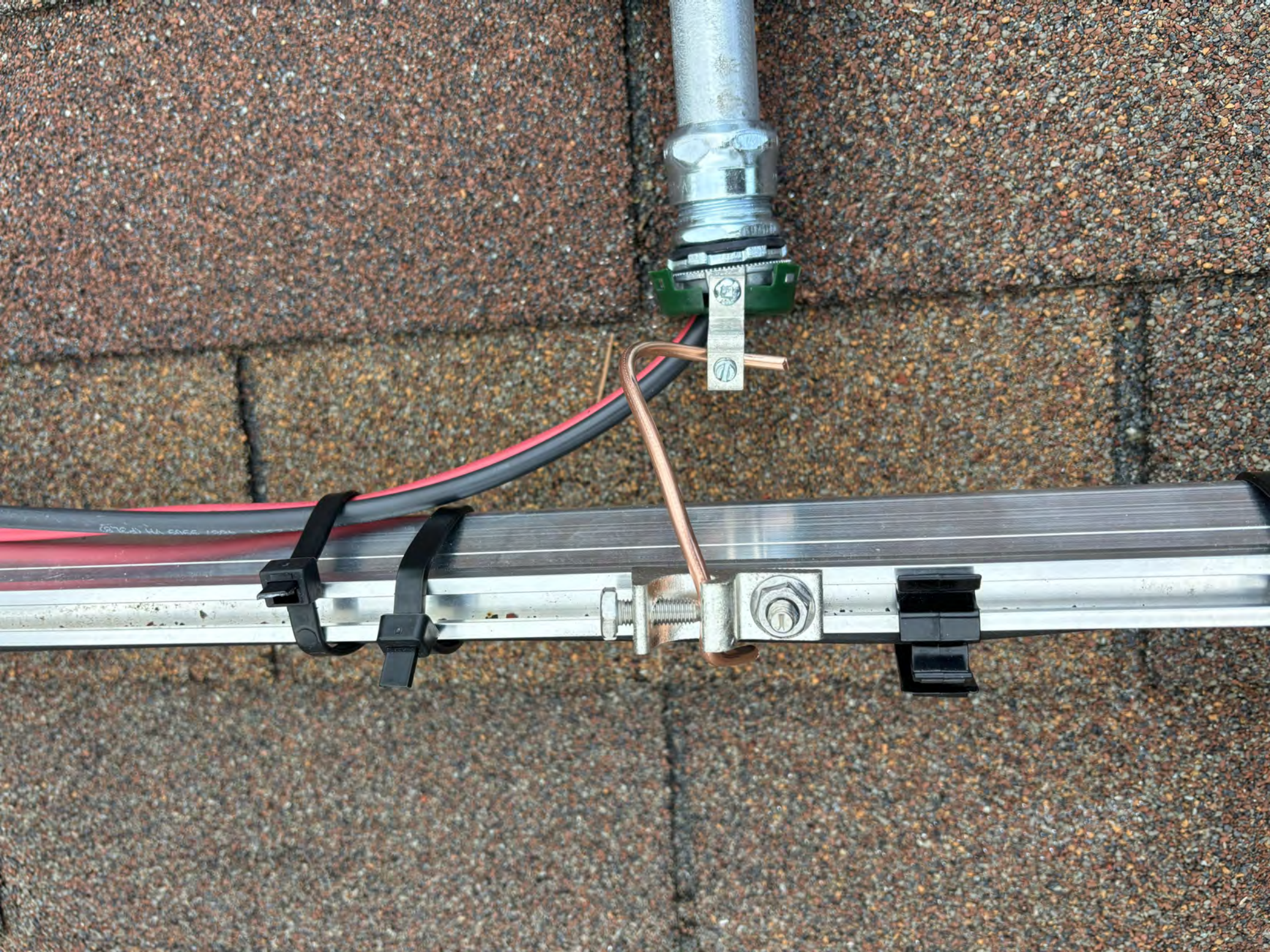
Zones:	1	2	3
	O.K.	O.K.	O.K.


Do Not
Remove
18032BEA-30
Intertek
4004590
SolarEdge Technologies Ltd.
SolarEdge Technologies GmbH/
Werner-Eckert-Straße 6/81829 Munich/Germany
SolarEdge Technologies Ltd.
Power Optimizer
Solaredge Technologies GmbH/
Werner-Eckert-Straße 6/81829
Munich/Germany
TING THIS OPTIMIZER.
AY BY CONVERTER.
CONDUCTORS OF THIS PHOTOVOLTAIC
IENT


PHOTOVOLTAIC POWE


WARNING
AVERTISSEMENT
CAUTION
Do Not Remove
SolarEdge Technologies Ltd
Power Optimizer


PHOTOVOLTAIC POWER SOURCE




CAUTION
AVERTISSEMENT


CAUTION
WARNING
AVERTISSEMENT

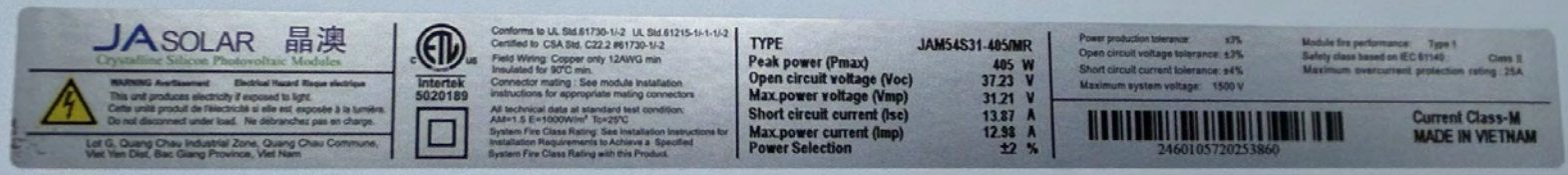

CAUTION
AVERTISSEMENT

CAUTION
AVERTISSEMENT
WARNING


WARNING
AVERTISSEMENT

WARNING
AVERTISSEMENT


0180328EA-30
0180310D9-04
0180310FC-27
018024C84-EA
017AB21FB-DE
018032C30-77
0180312C9-F6
01802FF57-70
01802F3B9-C6
018030923-47
0188A6107-0A
01802D4D9-C7
018031526-56
01802689D-1F


JA SOLAR 晶澳
Crystalline Silicon Photovoltaic Modules
WARNING Avertissement Electrical Hazard Risque électrique
This unit produces electricity if exposed to light.
Cette unité produit de l'électricité si elle est exposée à la lumière.
Do not disconnect under load. Ne débranchez pas en charge.
Lot G, Quang Chau Industrial Zone, Quang Chau Commune,
Viet Yen Dist, Bac Giang Province, Viet Nam
intertek
5020189
Conforms to UL Std.61730-1/-2 UL Std.61215-1/-1-1/-2
Certified to CSA Std. C22.2 #61730-1/-2
Field Wiring: Copper only 12AWG min
Insulated for 90°C min.
Connector mating : See module installation
instructions for appropriate mating connectors
All technical data at standard test condition:
AM=1.5 E=1000W/m² To=25°C
System Fire Class Rating: See Installation Instructions for
Installation Raquirements to Achieve a Specified
System Fire Class Rating with this Product.
TYPE JAM54S31-485/MR
Peak power (Pmax) 485 W
Open circuit voltage (Voc) 37.23 V
Max.power voltage (Vmp) 31.21 V
Short circuit current (Isc) 13.87 A
Max.power current (Imp) 12.98 A
Power Selection ±2 %
Power production tolerance: ±3%
Open circuit voltage tolerance: ±3%
Short circuit current tolerance: ±4%
Maximum system voltage: 1500 V
Module fire performance: Type 1
Safety class based on IEC 61140: Class II
Maximum overcurrent protection rating : 25A
2460105720253860
Current Class-M
MADE IN VIETNAM

instructions for more information.

solaredge SE11400H – US

Grid Support Utility Interactive Non – Isolated Photovoltaic Inverter With stand – alone Mode

Operating Voltage Range	270 – 480 Vdc
Max Input Current	31 Adc
Max Continuous Output Power Grid connected	11400Wac @ 240V
Max Continuous Output Power stand – alone	11400Wac
Voltage Min – Nom – Max	211 – 240 – 264 Vac 183 – 208 – 229 Vac
Max stand – alone Capacity	11.4 KVA
Max Continuous Output Current Grid Connected	48Aac
Max Continuous Output Current stand – alone	48Aac
Max Output Fault Current	74 Aac
Max Utility Backfeed Current	0 Aac
Frequency Min – Nom – Max	59.3 – 60.0 – 60.5 Hz
Output Power Factor	+/– 0.85 – 1
Max Ambient Temperature	60 C
Enclosure	IP65/NEMA 4X

With integrated ground fault protection per NEC 690.35 (C)
Type 1 Photovoltaic Arc – Fault Circuit – Protection
ATTENTION: The maximum operating current of this system may be controlled electronically. Refer to manufacturer's instructions for more information.

Wi – Fi Password:
y3QBRoPq
Activation:
ZSFx Frw0 zLCd 3vS+ gKX4 Y1ZZ IHM=
WiFi MAC:
84:D6:C5:A3:5D:07
PN: USE11400H – USMNBL75
SN: SB0125 – 0750F1D2F – D0

solaredge

PHOTOVOLTAIC RAPID SHUTDOWN SYSTEM

solaredge

ETL LISTED
CONFORMS TO
ANSI/UL 1741
CERTIFIED TO
CAN/CSA
C22.2 NO 107

c ETL US
Intertek
4004590

750F1D2F-D0

Grid Support Interactive Inverter – CSA C22.3 No. 9 - Basic" or "Grid Support Interactive Inverter – CSA C22.3 No. 9 - Supplemental.
Contains FCC ID: 2AGPT-PLNX, IC: 20916-PNLX. The enclosed device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(i.) this device may not cause harmful interference.
(ii.) this device must accept any interference received, including interference that may cause undesired operation.
PATENT MARKING NOTICE: SEE www.solaredge.com/groups/patent
Made in the USA From Imported Parts


DC DISCONNECT

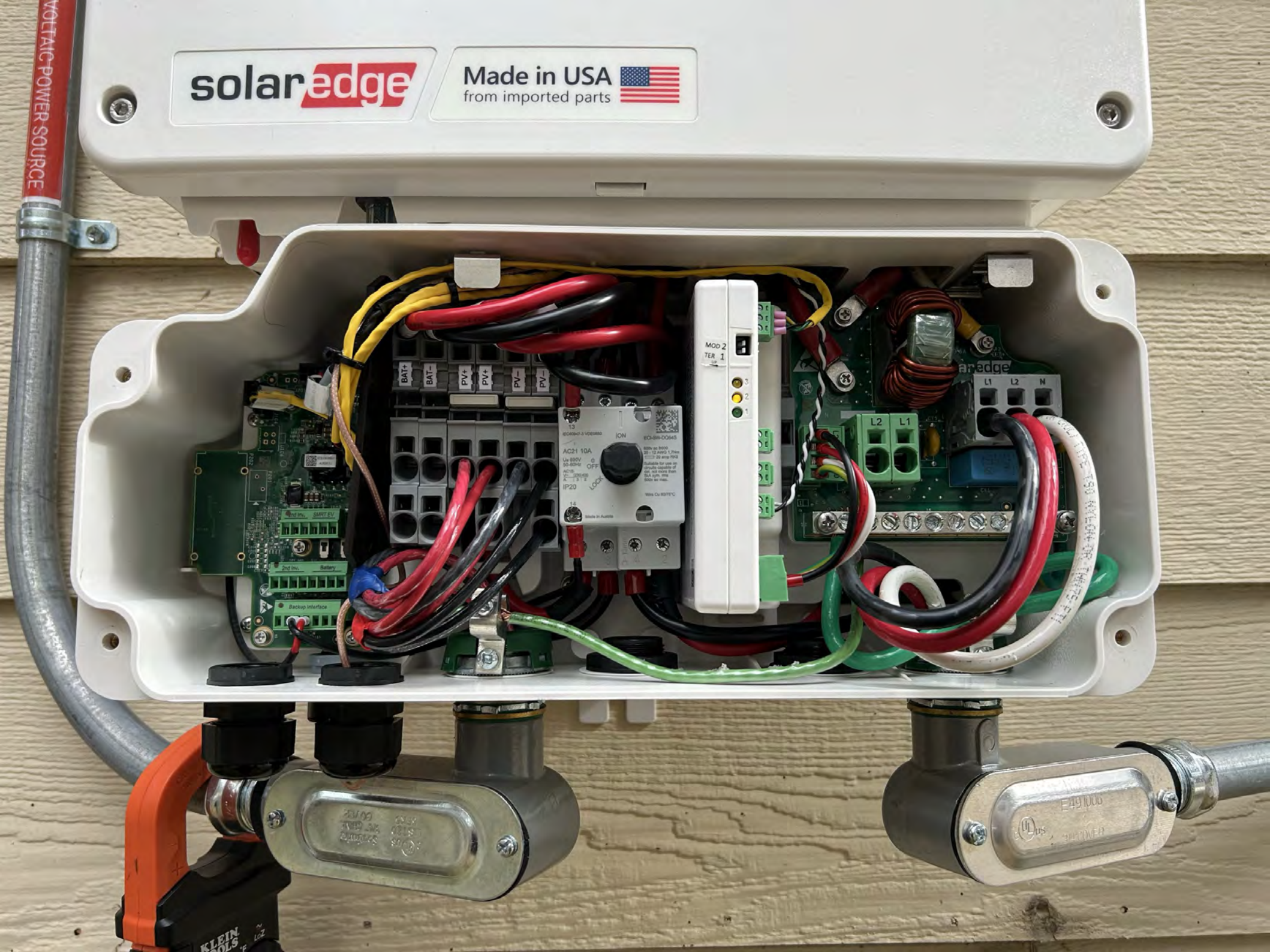

PHOTOVOLTAIC POWER SOURCE
solaredge
Made in USA
from imported parts
ON
OFF
DC DISCONNECT
solaredge


A~
V~
NCV
OFF
SEL
RANGE
MAX
MIN
ZERO
6000 Counts
600A AC/DC Digital Clamp Meter
True RMS
TOUGH METER
CAT III 1000V
CAT IV 600V
COM
V Ω
Hz % Temp

Replacement successful

Inverter SN: 7508ABDD-05
Successfully replaced with
Inverter SN: 750F1D2F-D0
In site: James Mangum

Done


VOLTAIC POWER SOURCE
solaredge
Made in USA
from imported parts
BAT+
BAT−
PV+
PV+
PV−
PV−
AC21 10A
IP20
L1
L2
N
L2
L1


Hz%
A≂
V≂
NCV
OFF
SEL
RANGE
MAX
MIN
ZERO
6000 Counts
600A AC/DC Digital Clamp Meter
True RMS
TOUGH METER
CAT III 1000V
CAT IV 600V
COM
Hz % Temp


Hz%
A≂
V≂
NCV
OFF
SEL
RANGE
MAX
MIN
ZERO
6000 Counts
600A AC/DC Digital Clamp Meter
True RMS
TOUGH METER
CAT III 1000V
CAT IV 600V
COM
Hz % Temp


PHOTOVOLTAIC
SYSTEM kWh METER
CENTRON
00021A477A
02 000561
kW h
CL200 240V 3W TYPE C2M 30TA 1.0Kh
ZZZ 496243 H67
CA 0.5
FM2S
60HZ
DUKE ENERGY PROGRESS
325 130 943
F120529
OpenWay
MILBANK

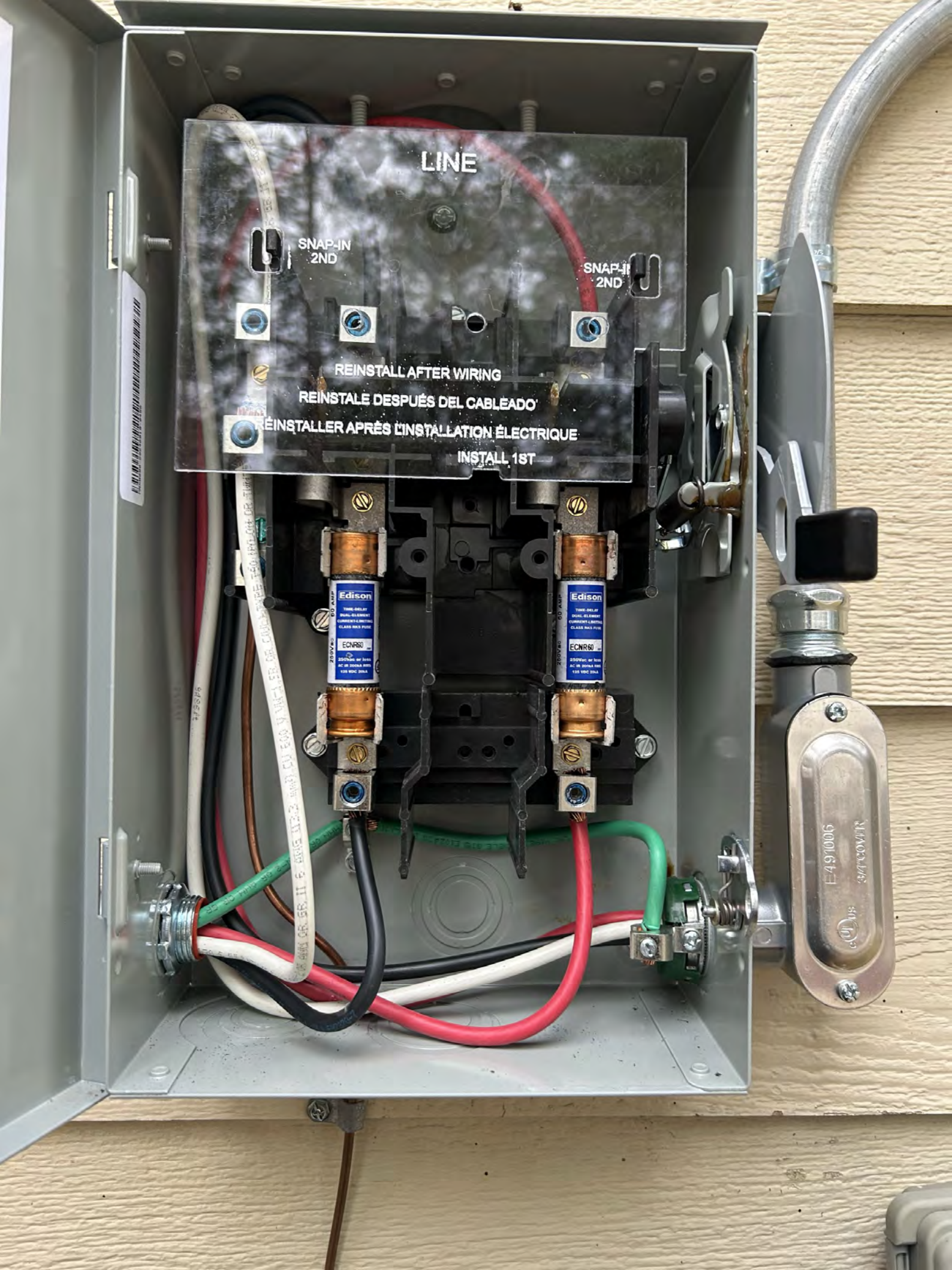

GENERAL ELECTRIC
WARNING
DUAL POWER SUPPLY
SOURCES: UTILITY GRID
AND PV SOLAR
ELECTRIC SYSTEM
CAUTION:
MULTIPLE SOURCES OF POWER
THE PV DISCONNECT IS LOCATED
BESIDE THE SERVICE METER
CAUTION
SOLAR ELECTRIC SYSTEM CONNECTED
PHOTOVOL
SYSTEM kWh
CUSTOMER
ACCESS
ACCÈS
DU CLIENT

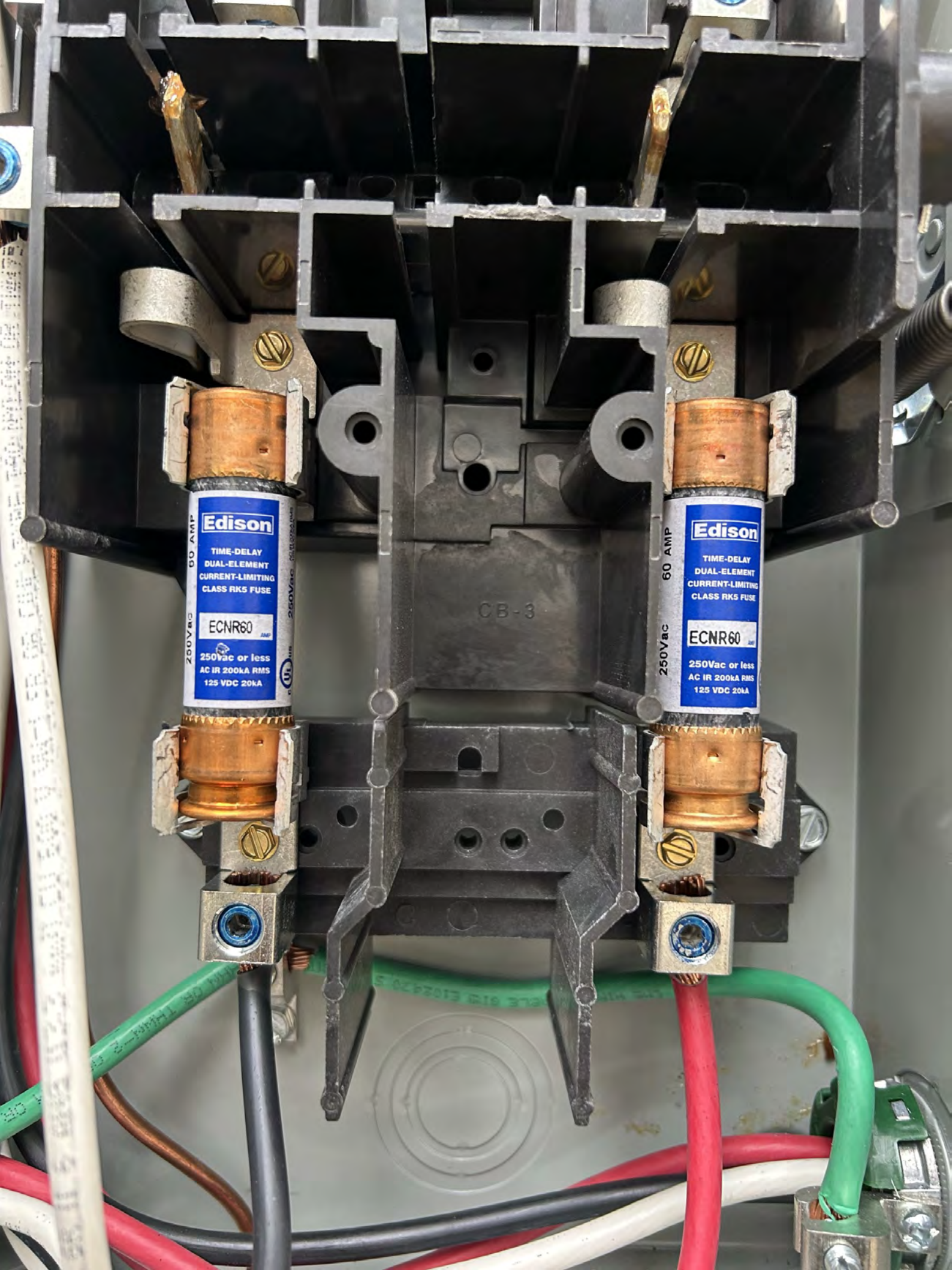

3/4 HW
REPAIR SERVICE.

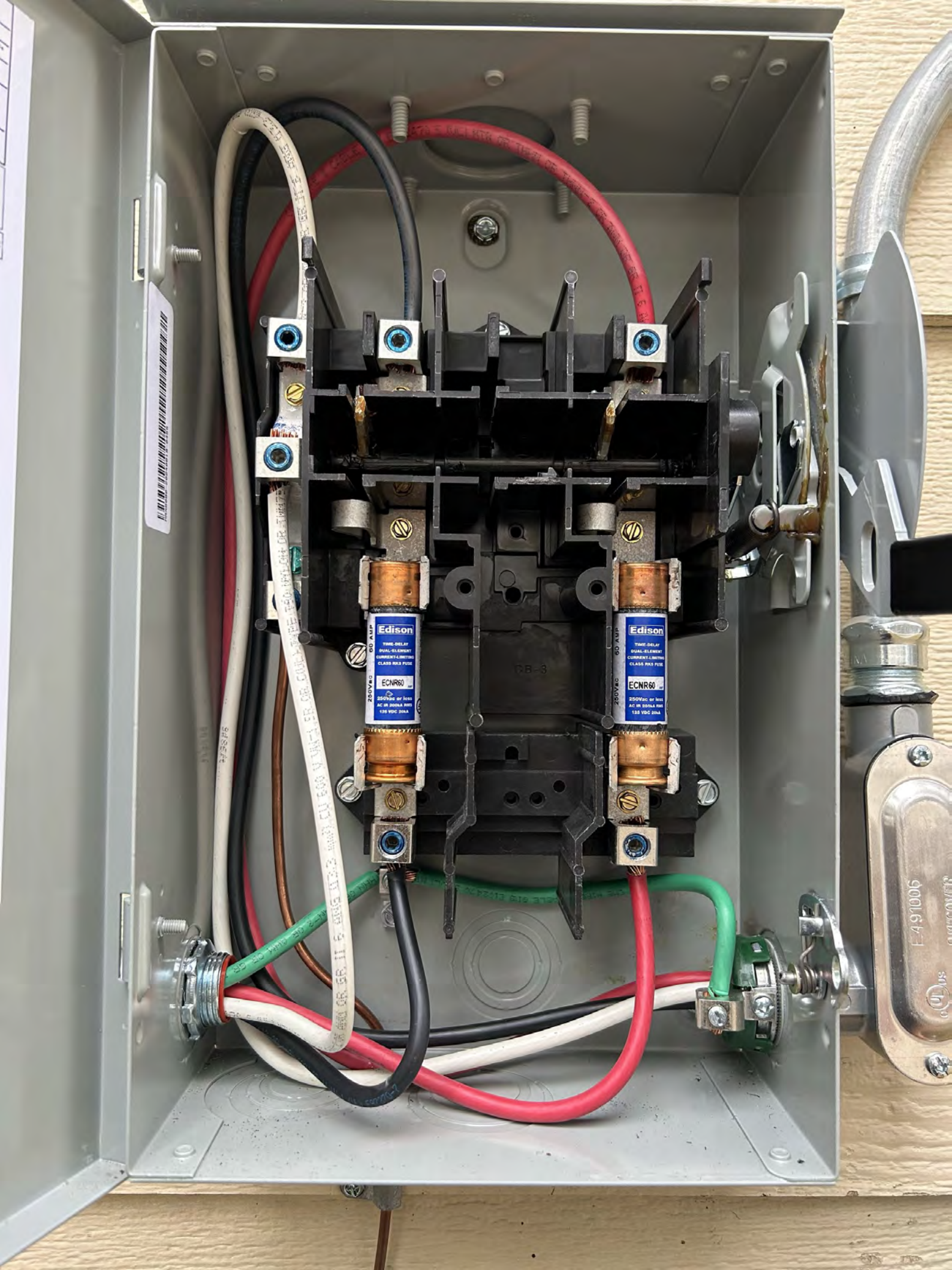

EATON
General Duty Safety Switch
Interrupteur de sécurité à usage général
Interruptor de seguridad de servicio general
60 A, 240 V~, 60 Hz
Complete ratings inside
Valeurs nominales complètes à l'intérieur
Información completa de capacidades en el interior
Further instructions inside
Autres instructions à l'intérieur
Instrucciones adicionales en el interior
Made in U.S.A. / Fabriqué aux É.-U. / Hecho en E.U.A.
DANGER
HAZARDOUS VOLTAGE. WILL CAUSE SEVERE INJURY OR DEATH.
Never operate switch with cover open.
Turn OFF power ahead of switch before doing any work inside. Replace all parts. Close cover before turning power ON.
TENSION DANGEREUSE. PEUT CAUSER DES BLESSURES GRAVES OU LA MORT.
Ne jamais manœuvrer l'interrupteur lorsque le couvercle est ouvert.
Couper l'alimentation en amont de l'interrupteur avant toute intervention. Remplacer les pièces. Fermer le couvercle avant de remettre sous tension.
PELIGRO
VOLTAJE PELIGROSO. PUEDE CAUSAR HERIDAS SEVERAS O LA MUERTE.
Nunca opere el interruptor con la cubierta abierta.
Desconectar la alimentación del interruptor antes de trabajar dentro del mismo. Reemplazar todas las partes. Cerrar la cubierta antes de energizar el interruptor
30-43080
ON
1
AC DISCONNECT
PHOTOVOLTAIC SYSTEM
POWER SOURCE
RATED AC OUTPUT CURRENT
48
AMPS
NOMINAL OPERATING AC VOLTAGE
240
VOLTS
WARNING
ELECTRIC SHOCK HAZARD
TERMINALS ON THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION
MADE IN U.S.A.
OFF
SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN
SOLAR ELECTRIC PV PANELS
TURN RAPID SHUTDOWN SWITCH TO THE "OFF" POSITION TO SHUT DOWN PV SYSTEM AND REDUCE SHOCK HAZARD IN THE ARRAY
RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM
E491006
3/4" COVER


CAUTION
WARNING
EZ
SOLAR
PHOTOVOLTAIC POWER SOURCE
PHOTOVOLTAIC POWER SOURCE

Milwaukee
Do not disconnect under load
Do not disconnect under load
Do not disconnect under load
ENCORE WIRE CORP
PHOTOVOLTAIC PO


LINE
SNAP-IN
2ND
SNAP-IN
2ND
REINSTALL AFTER WIRING
REINSTALE DESPUÉS DEL CABLEADO
RÉINSTALLER APRÈS L'INSTALLATION ÉLECTRIQUE
INSTALL 1ST
Edison
ECNR60
Edison
ECNR60
E491006


Edison
TIME-DELAY
DUAL-ELEMENT
CURRENT-LIMITING
CLASS RK5 FUSE
ECNR60
250Vac or less
AC IR 200kA RMS
125 VDC 20kA
60 AMP
250Vac
CB-3


Edison
60 AMP
250Vac
ECNR60
250Vac or less
Edison
60 AMP
250Vac
ECNR60
250Vac or less

PHOTOVOLTAIC ROOF MOUNT SYSTEM

(E) 20 + (N) 14 MODULES-ROOF MOUNTED - 13.470 kW DC, (N) 11.400 kW AC

3861 US 401 N, FUQUAY-VARINA, NC 27526

PROJECT DATA

PROJECT ADDRESS: 3861 US 401 N, FUQUAY-VARINA, NC 27526

OWNER: JAMES MANGUM

DESIGNER: ESR

SCOPE:

(N) 5.670 kW DC ROOF MOUNT SOLAR PV SYSTEM WITH
(N) 14 JA SOLAR: JAM54S31 405/MR 405W PV MODULES WITH
(N) 14 SOLAREDGE: S440 POWER OPTIMIZERS AND
(N) 01 SOLAREDGE: SE11400H-US (240V/11400W) INVERTER

EXISTING:

(E) 7.800kW DC ROOF MOUNT SOLAR PV SYSTEM WITH
(E) 20 JINKO SOLAR: JKM390M-72HBL-V 390W PV MODULES WITH
(E) 20 SOLAREDGE: S440 POWER OPTIMIZERS

AUTHORITIES HAVING JURISDICTION:
BUILDING: HARNETT COUNTY
ZONING: HARNETT COUNTY
UTILITY: DUKE ENERGY PROGRESS

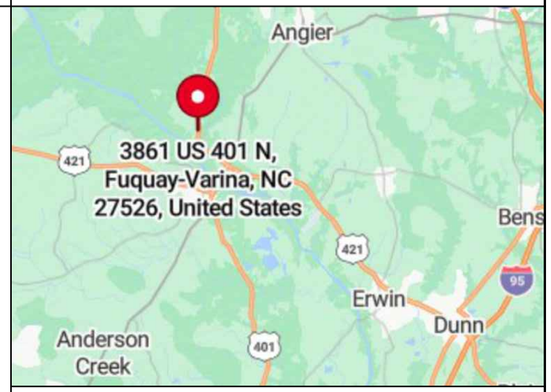
SHEET INDEX

SIGNATURE

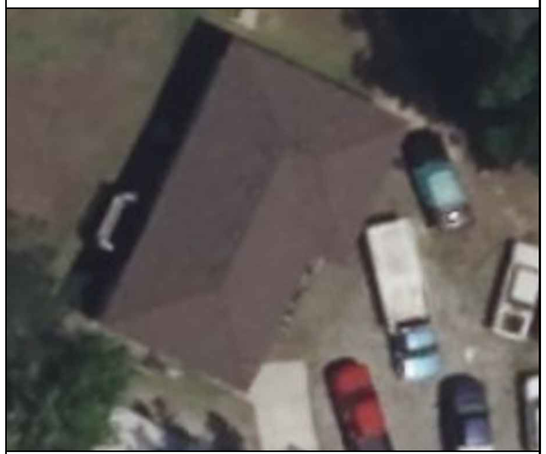
GENERAL NOTES

1. ALL COMPONENTS ARE UL LISTED AND CEC CERTIFIED, WHERE WARRANTED.
2. THE SOLAR PV SYSTEM WILL BE INSTALLED IN ACCORDANCE WITH ARTICLE 690 OF THE NEC 2017.
3. THE UTILITY INTERCONNECTION APPLICATION MUST BE APPROVED AND PV SYSTEM INSPECTED PRIOR TO PARALLEL OPERATION.
4. 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.
5. WHERE METALLIC CONDUIT CONTAINING DC CONDUCTORS IS USED INSIDE THE BUILDING, IT SHALL BE IDENTIFIED AS "CAUTION: SOLAR CIRCUIT" EVERY 10FT.
6. HEIGHT OF THE AC DISCONNECT SHALL NOT EXCEED 6'-7" PER NEC CODE 240.24.
7. 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.
8. PHOTOVOLTAIC MODULES ARE TO BE CONSIDERED NON-COMBUSTIBLE.
9. PHOTOVOLTAIC INSTALLATION WILL NOT OBSTRUCT ANY PLUMBING. MECHANICAL, OR BUILDING ROOF VENTS.
10. 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.
11. 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.
12. INVERTER(S) USED IN UNGROUNDED SYSTEM SHALL BE UL 1741 LISTED.
13. THE INSTALLATION OF EQUIPMENT AND ALL ASSOCIATED WIRING AND INTERCONNECTION SHALL BE PERFORMED ONLY BY QUALIFIED PERSONS [NEC 690.4(C)]
14. ALL OUTDOOR EQUIPMENT SHALL BE NEMA 3R RATED (OR BETTER), INCLUDING ALL ROOF MOUNTED TRANSITION BOXES AND SWITCHES.
15. ALL EQUIPMENT SHALL BE PROPERLY GROUNDED AND BONDED IN ACCORDANCE WITH NEC ARTICLE 250.
16. SYSTEM GROUNDING SHALL BE IN ACCORDANCE WITH NEC 690.41.
17. PV SYSTEM CIRCUITS INSTALLED ON OR IN BUILDINGS SHALL INCLUDE A RAPID SHUTDOWN FUNCTION IN ACCORDANCE WITH NEC 690.12
18. 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)]
19. ALL WIRING METHODS SHALL BE IN ACCORDANCE WITH NEC 690.31
20. WORK CLEARANCES AROUND ELECTRICAL EQUIPMENT WILL BE MAINTAINED PER NEC 110.26(A)(1), 110.26(A)(2) AND 110.26(A)(3).
21. ROOFTOP MOUNTED PHOTOVOLTAIC PANELS AND MODULES SHALL BE TESTED, LISTED & IDENTIFIED IN ACCORDANCE WITH UL1703
22. 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

TOP TIER SOLAR SOLUTIONS

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

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	03/04/2025	
REVISION	04/04/2025	A

NORTH CAROLINA PROFESSIONAL SEAL 056724 ENGINEER TREVOR JONES

STRUCTURAL ONLY
4-4-2025

PROJECT NAME & ADDRESS

JAMES MANGUM RESIDENCE

3861 US 401 N,
FUQUAY-VARINA, NC 27526

DRAWN BY: ESR

SHEET NAME: COVER SHEET

SHEET SIZE: ANSI B 11" X 17"

SHEET NUMBER: PV-1

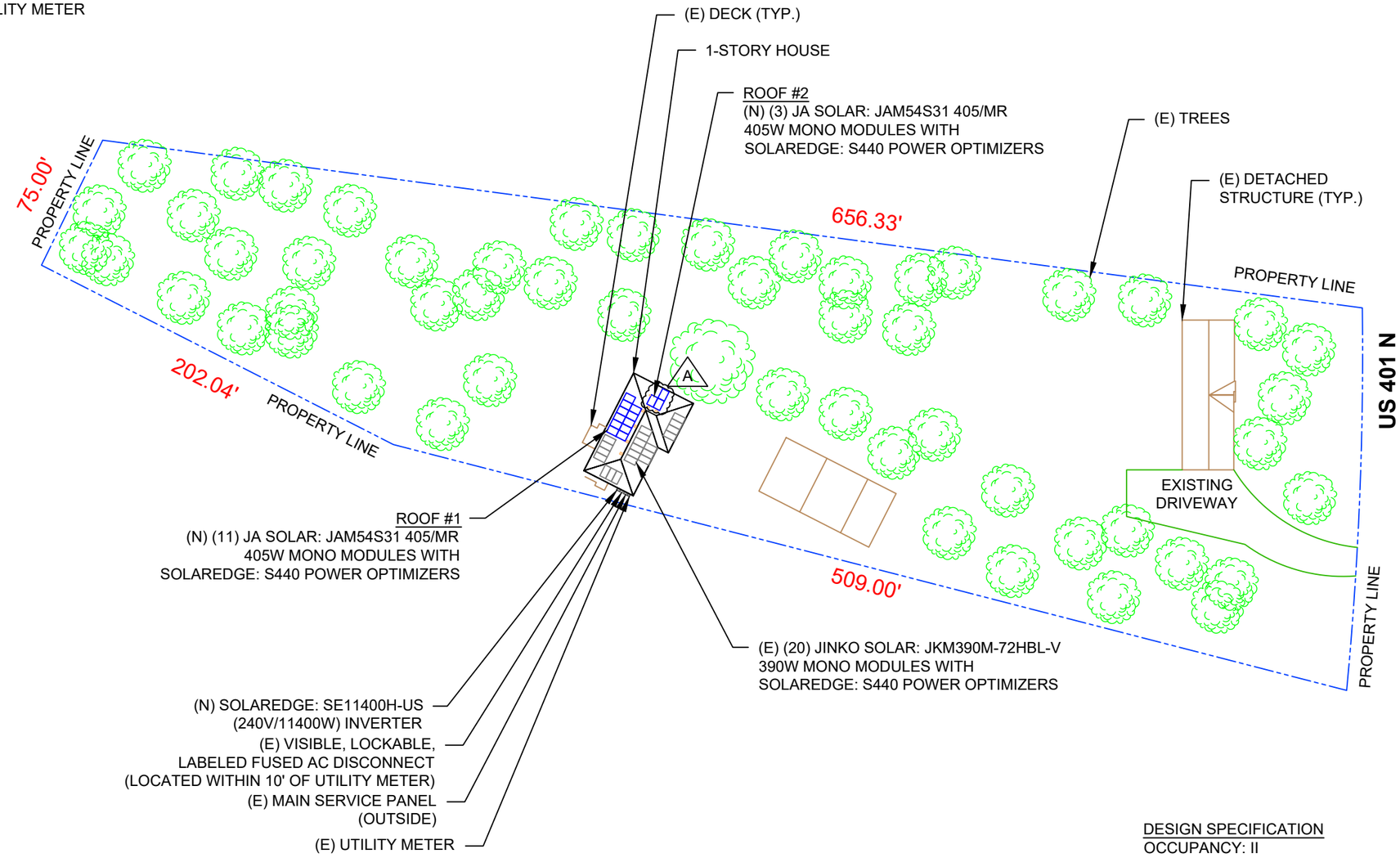
PROJECT DESCRIPTION:

(N) 14 X JA SOLAR: JAM54S31 405/MR 405W MONO MODULES AND
(E) 20 X JINKO SOLAR: JKM390M-72HBL-V 390W MONO MODULES
ROOF MOUNTED SOLAR PHOTOVOLTAIC MODULES
DC SYSTEM SIZE: (N) 14 X 405W + (E) 20 X 390W = 13.470 kW DC
AC SYSTEM SIZE: (N) 11.400 kW AC

EQUIPMENT SUMMARY
(N) 14 JA SOLAR: JAM54S31 405/MR 405W MONO MODULES
(N) 14 SOLAREDGE: S440 POWER OPTIMIZERS
(N) 01 SOLAREDGE: SE11400H-US (240V/11400W) INVERTER
(E) 20 JINKO SOLAR: JKM390M-72HBL-V 390W MONO MODULES
(E) 20 SOLAREDGE: S440 POWER OPTIMIZERS

(N) ROOF ARRAY AREA #1:- 231.11 SQ FT.
(N) ROOF ARRAY AREA #2:- 63.03 SQ FT.

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



1 SITE PLAN
PV-2 SCALE: 1/64" = 1'-0"

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

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

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	03/04/2025	
REVISION	04/04/2025	A

NORTH CAROLINA PROFESSIONAL SEAL 056724 ENGINEER TREVOR JONES

STRUCTURAL ONLY
4-4-2025

PROJECT NAME & ADDRESS

JAMES MANGUM RESIDENCE
3861 US 401 N,
FUQUAY-VARINA, NC 27526

DRAWN BY
ESR

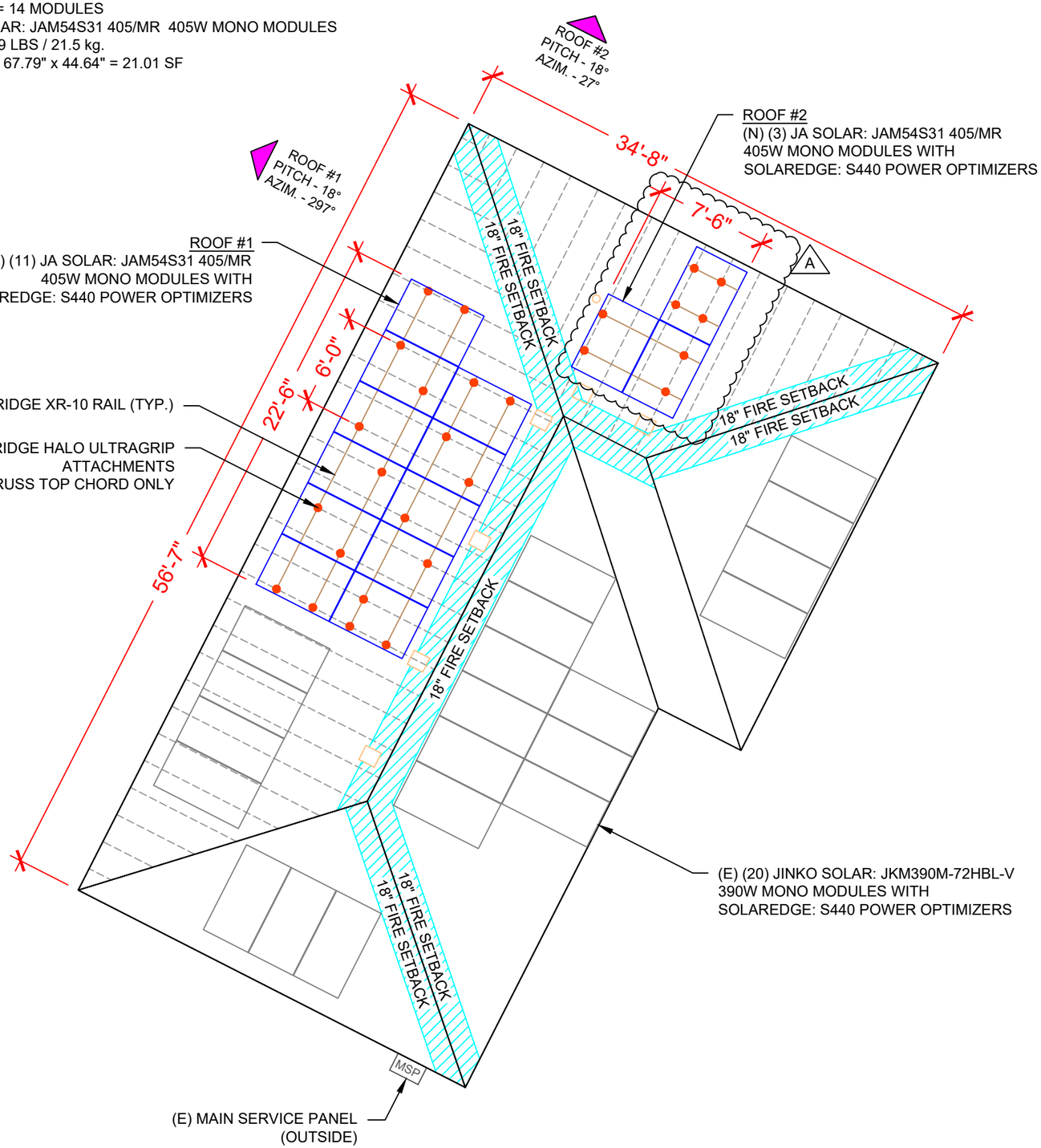
SHEET NAME
SITE PLAN

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-2

MODULE TYPE, DIMENSIONS & WEIGHT

NUMBER OF MODULES = 14 MODULES
MODULE TYPE = JA SOLAR: JAM54S31 405/MR 405W MONO MODULES
MODULE WEIGHT = 47.39 LBS / 21.5 kg.
MODULE DIMENSIONS = 67.79" x 44.64" = 21.01 SF



ROOF #2
(N) (3) JA SOLAR: JAM54S31 405/MR
405W MONO MODULES WITH
SOLAREDGE: S440 POWER OPTIMIZERS

ROOF #1
(N) (11) JA SOLAR: JAM54S31 405/MR
405W MONO MODULES WITH
SOLAREDGE: S440 POWER OPTIMIZERS

(N) IRONRIDGE XR-10 RAIL (TYP.)

(N) IRONRIDGE HALO ULTRAGRIP
ATTACHMENTS
IN ROOF TRUSS TOP CHORD ONLY

(E) (20) JINKO SOLAR: JKM390M-72HBL-V
390W MONO MODULES WITH
SOLAREDGE: S440 POWER OPTIMIZERS

(E) MAIN SERVICE PANEL
(OUTSIDE)

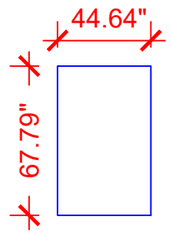
1 ROOF PLAN & MODULES
PV-3 SCALE: 1/8" = 1'-0"

ROOF DESCRIPTION

ROOF TYPE				ASPHALT SHINGLE	
ROOF LAYER				1 LAYER	
ROOF	# OF MODULES	ROOF PITCH	AZIMUTH	TRUSS SIZE	TRUSS SPACING
#1	11	18°	297°	2"X4"	24"
#2	3	18°	27°	2"X4"	24"

ARRAY AREA & ROOF AREA CALC'S

PV SYSTEM	TOTAL PV ARRAY AREA (SQ. FT.)	TOTAL ROOF AREA (Sq. Ft.)	ROOF AREA COVERED BY ARRAY (%)
NEW	294.14	1793.22	16
EXISTING	433.20	1793.22	24
TOTAL	449.40	1793.22	25



JA SOLAR:
JAM54S31 405/MR
405W MODULES

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

TOP TIER SOLAR SOLUTIONS

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

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	03/04/2025	
REVISION	04/04/2025	A

NORTH CAROLINA PROFESSIONAL SEAL 056724 ENGINEER TREVOR JONES

STRUCTURAL ONLY
4-4-2025

PROJECT NAME & ADDRESS

JAMES MANGUM RESIDENCE
3861 US 401 N,
FUQUAY-VARINA, NC 27526

DRAWN BY
ESR

SHEET NAME
ROOF PLAN & MODULES

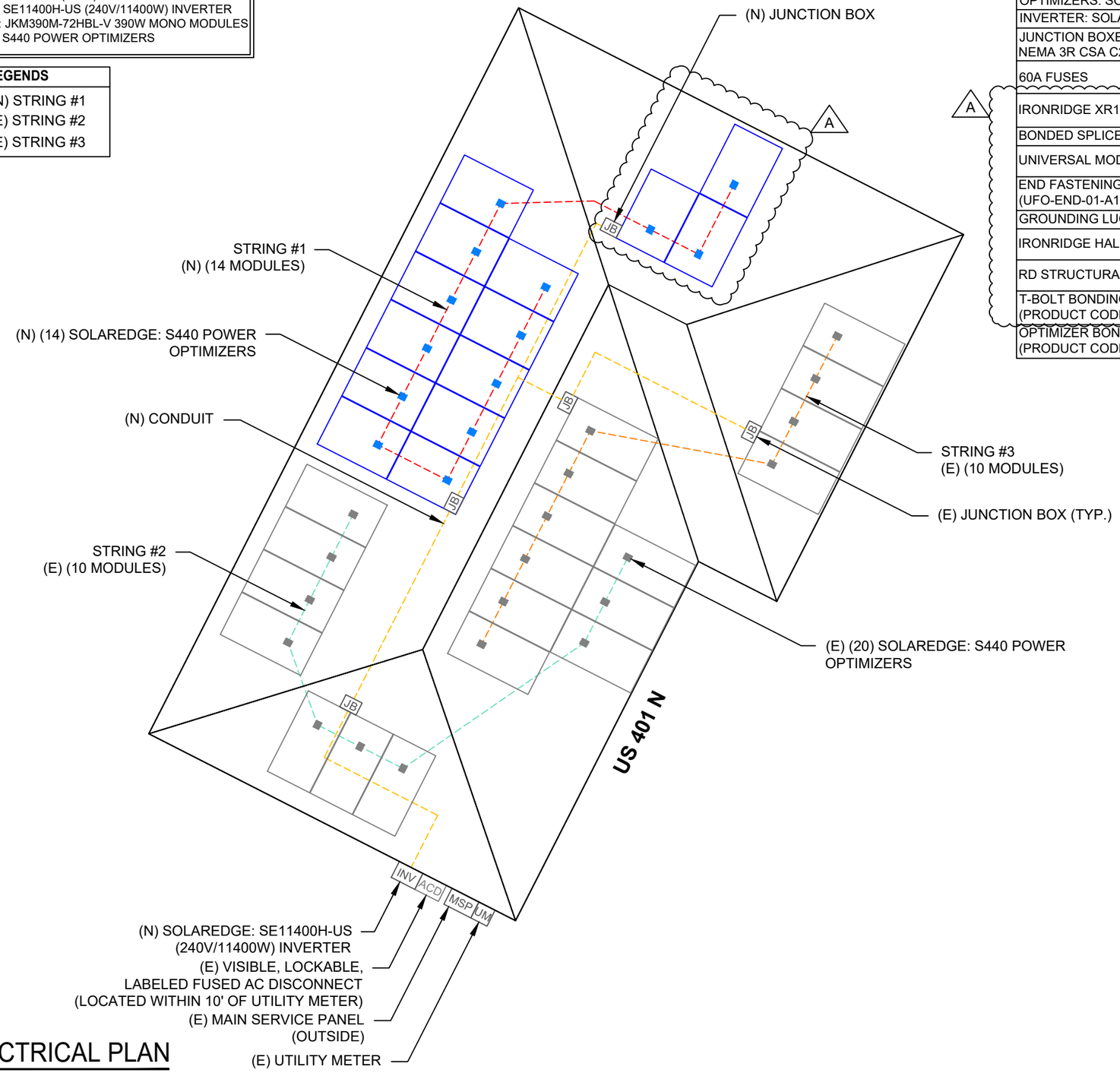
SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-3

DC SYSTEM SIZE: (N) 14 X 405W + (E) 20 X 390W = 13.470 kW DC
AC SYSTEM SIZE: (N) 11.400 kW AC

(N) (14) JA SOLAR: JAM54S31 405/MR 405W MONO MODULES
WITH (N) (14) SOLAREDGE: S440 POWER OPTIMIZERS
LOCATED UNDER EACH PANEL (240V) AND
(N) (01) SOLAREDGE: SE11400H-US (240V/11400W) INVERTER
(E) (20) JINKO SOLAR: JKM390M-72HBL-V 390W MONO MODULES
(E) (20) SOLAREDGE: S440 POWER OPTIMIZERS

STRING LEGENDS
(N) STRING #1
(E) STRING #2
(E) STRING #3



BILL OF MATERIALS

EQUIPMENT DESCRIPTION	QTY
SOLAR PV MODULES: JA SOLAR: JAM54S31 405/MR 405W MODULE	14
OPTIMIZERS: SOLAREDGE: S440 POWER OPTIMIZERS	14
INVERTER: SOLAREDGE: SE11400H-US (240V/11400W) INVERTER	1
JUNCTION BOXES: JUNCTION BOX UL 1741, NEMA 3R CSA C22.2 NO.290	1
60A FUSES	2
IRONRIDGE XR10 RAIL (RAIL 168" (14 FEET) CLEAR) (XR-10-168A)	12
BONDED SPLICE, XR10 (XR10-BOSS-01-M1)	4
UNIVERSAL MODULE CLAMP, CLEAR (UFO-CL-01-A1)	20
END FASTENING OBJECT (END CLAMP, 30-40MM), MILL (UFO-END-01-A1)	16
GROUNDING LUG (XR-LUG-03-A1)	4
IRONRIDGE HALO ULTRAGRIP ATTACHMENTS (QM-HUG-01-M1)	29
RD STRUCTURAL SCREW,3.0L (HW-RD1430-01-M1)	58
T-BOLT BONDING HARDWARE (BHW-TB-02-A1) (PRODUCT CODE 590-0116)	29
OPTIMIZER BONDING HARDWARE T-BOLT (BHW-MI-01-A1) (PRODUCT CODE 270-0152)	14

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

1 ELECTRICAL PLAN
PV-4
SCALE: 1/8" = 1'-0"

TOP TIER SOLAR SOLUTIONS

TOP TIER SOLAR SOLUTIONS

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

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	03/04/2025	
REVISION	04/04/2025	A

PROJECT NAME & ADDRESS

JAMES MANGUM RESIDENCE

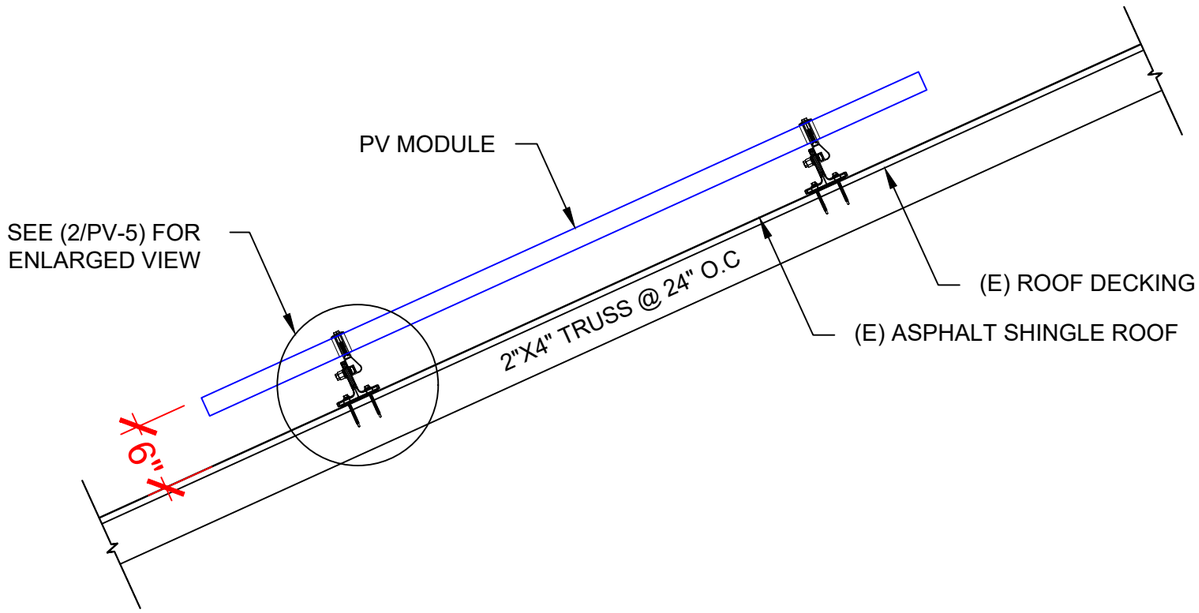
3861 US 401 N,
FUQUAY-VARINA, NC 27526

DRAWN BY
ESR

SHEET NAME
ELECTRICAL PLAN

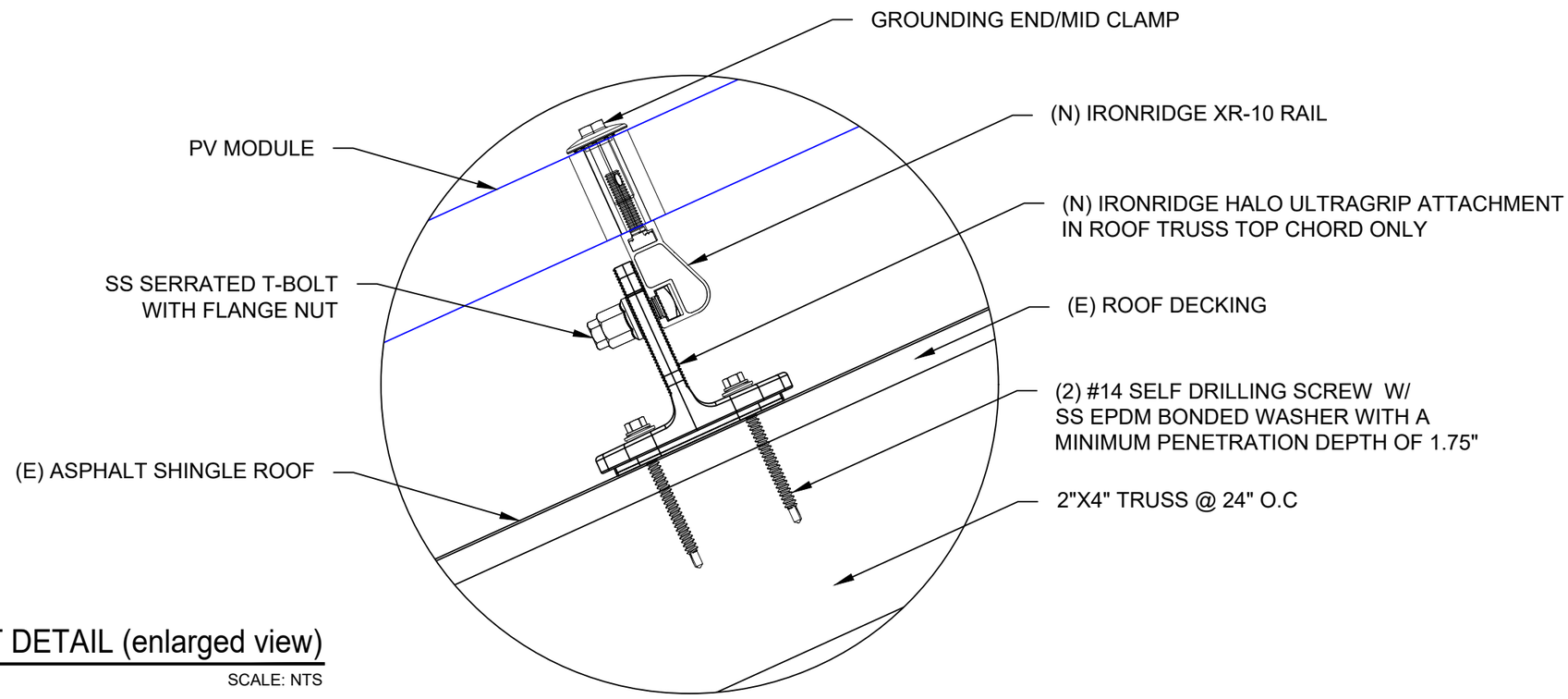
SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-4



1 | PV-5 — STRUCTURAL ATTACHMENT (Side view)

SCALE: N.T.S



2 | PV-5 — ATTACHMENT DETAIL (enlarged view)

SCALE: NTS

TOP TIER SOLAR SOLUTIONS

TOP TIER SOLAR SOLUTIONS

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

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	03/04/2025	
REVISION	04/04/2025	A

NORTH CAROLINA PROFESSIONAL SEAL 056724 ENGINEER TREVOR JONES

STRUCTURAL ONLY
4-4-2025

PROJECT NAME & ADDRESS

JAMES MANGUM RESIDENCE

3861 US 401 N,
FUQUAY-VARINA, NC 27526

DRAWN BY
ESR

SHEET NAME
STRUCTURAL DETAIL

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-5

DC SYSTEM SIZE: (N) 14 X 405W +(E) 20 X 390W = 13.470 kW DC
AC SYSTEM SIZE: (N) 11.400 kW AC

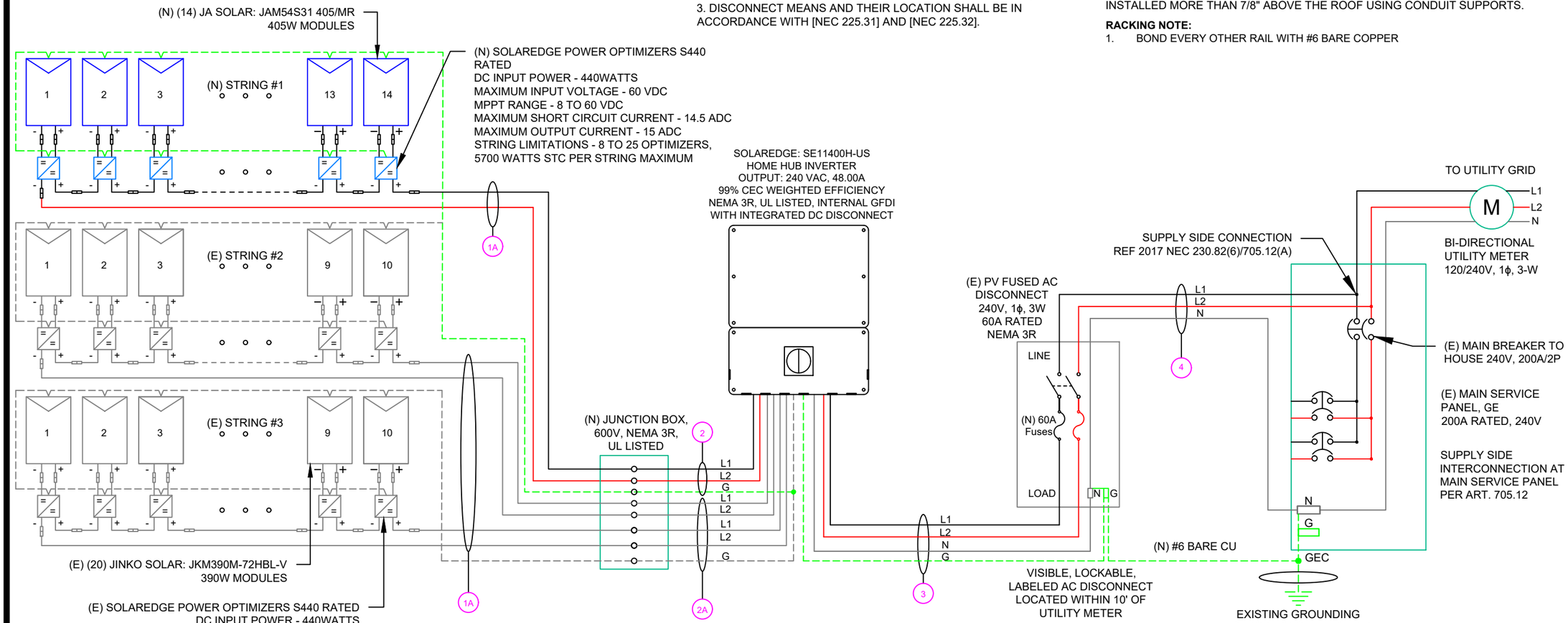
(N) (14) JA SOLAR: JAM54S31 405/MR 405W MONO MODULES
WITH (N) (14) SOLAREDGE: S440 POWER OPTIMIZERS
LOCATED UNDER EACH PANEL (240V) AND
(N) (01) SOLAREDGE: SE11400H-US (240V/11400W) INVERTER
(E) (20) JINKO SOLAR: JKM390M-72HBL-V 390W MONO MODULES
(E) (20) SOLAREDGE: S440 POWER OPTIMIZERS
(01) STRING OF (N) 14 MODULES AND
(02) STRINGS OF (E) 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



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

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

NOTE: WIRE SCHEDULE CALLOUT "1A" ARE EXISTING SYSTEM

1 ELECTRICAL LINE DIAGRAM
PV-6 SCALE: NTS

TOP TIER SOLAR SOLUTIONS

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

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	03/04/2025	
REVISION	04/04/2025	A

PROJECT NAME & ADDRESS

JAMES MANGUM RESIDENCE
3861 US 401 N,
FUQUAY-VARINA, NC 27526

DRAWN BY
ESR

SHEET NAME
ELECTRICAL LINE DIAGRAM

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-6

SOLAR MODULE SPECIFICATIONS	
MANUFACTURER / MODEL #	JA SOLAR: JAM54S31 405/MR 405W MODULE
VMP	31.21V
IMP	12.98A
VOC	37.23V
ISC	13.87A
TEMP. COEFF. VOC	-0.275%/°C
MODULE DIMENSION	67.79"L x 44.64"W x 1.18"D (In Inch)

INVERTER SPECIFICATIONS	
MANUFACTURER / MODEL #	SOLAREDGE: SE11400H-US (240V/11400W) INVERTER
NOMINAL AC POWER	11.400 kW
NOMINAL OUTPUT VOLTAGE	240 VAC
NOMINAL OUTPUT CURRENT	48.00A

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	-9°
MODULE TEMPERATURE COEFFICIENT OF Voc	-0.275%/°C

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
STRING 3	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	6	40	0.91	0.8	29.12	PASS	20	1.24	0.196	3/4" EMT	27.71107

String 1 Voltage Drop	0.245
String 2 Voltage Drop	0.245
String 3 Voltage Drop	0.245

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	48	60	60	CU #6 AWG	CU #6 AWG	CU #6 AWG	65	PASS	38	2	75	0.91	1	68.25	PASS	5	0.491	0.098	3/4" EMT	38.0488
AC DISCONNECT	POI	240	48	60	60	CU #6 AWG	N/A	CU #6 AWG	65	PASS	38	2	75	0.91	1	68.25	PASS	5	0.491	0.098	3/4" EMT	28.5366

CUMULATIVE VOLTAGE DROP	0.196

ELECTRICAL NOTES

1. ALL EQUIPMENT TO BE LISTED BY UL OR OTHER NRTL, AND LABELED FOR ITS APPLICATION.
2. ALL CONDUCTORS SHALL BE RATED UPTO 600V FOR RESIDENTIAL AND 1000V FOR COMMERCIAL AND 90 DEGREE C WET ENVIRONMENT.
3. 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.
4. WORKING CLEARANCES AROUND ALL NEW AND EXISTING ELECTRICAL EQUIPMENT SHALL COMPLY WITH NEC 110.26.
5. DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS. CONTRACTOR SHALL FURNISH ALL NECESSARY OUTLETS, SUPPORTS, FITTINGS AND ACCESSORIES TO FULFILL APPLICABLE CODES AND STANDARDS.
6. WHERE SIZES OF JUNCTION BOX, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, THE CONTRACTOR SHALL SIZE THEM ACCORDINGLY.
7. ALL WIRE TERMINATIONS SHALL BE APPROPRIATELY LABELED AND READILY VISIBLE.
8. MODULE GROUNDING CLIPS TO BE INSTALLED BETWEEN MODULE FRAME AND MODULE SUPPORT RAIL, PER THE GROUNDING CLIP MANUFACTURER'S INSTRUCTION.
9. MODULE SUPPORT RAIL TO BE BONDED TO CONTINUOUS COPPER G.E.C. VIA WEEB LUG OR ILSCO GBL-4DBT LAY-IN LUG.
10. 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.

TOP TIER SOLAR SOLUTIONS

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

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	03/04/2025	
REVISION	04/04/2025	A

PROJECT NAME & ADDRESS

JAMES MANGUM RESIDENCE

3861 US 401 N,
FUQUAY-VARINA, NC 27526

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:
DC/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

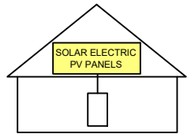
⚠ WARNING

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	48.00 A

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

MAXIMUM VOLTAGE	480 V
MAXIMUM CIRCUIT CURRENT	60.00 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 (PRE-EXISTING ON 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	03/04/2025	
REVISION	04/04/2025	A

PROJECT NAME & ADDRESS

JAMES MANGUM RESIDENCE

3861 US 401 N,
FUQUAY-VARINA, NC 27526

DRAWN BY
ESR

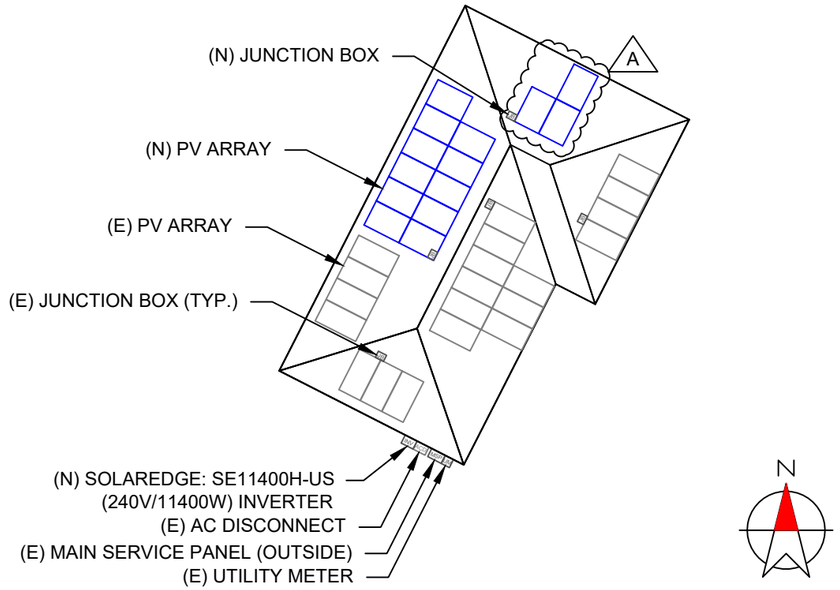
SHEET NAME
LABELS

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-8

CAUTION

POWER TO THIS BUILDING IS ALSO SUPPLIED FROM MULTIPLE SOURCES OF POWER WITH SAFETY DISCONNECTS AS SHOWN:



3861 US 401 N, FUQUAY-VARINA, NC 27526

DIRECTORY

PERMANENT PLAQUE OR DIRECTORY PROVIDING THE LOCATION OF THE SERVICE DISCONNECTING MEANS AND THE PHOTOVOLTAIC SYSTEM.

(ALL PLAQUES AND SIGNAGE WILL BE INSTALLED AS OUTLINED WITHIN: NEC 690.56(B)&(C), [NEC 705.10])
[NEC 690.56(C)(1)(A)]

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 [NEC 110.21]
5. LABELS TO BE A MINIMUM LETTER HEIGHT OF 3/8", WHITE ON RED BACKGROUND; REFLECTIVE, AND PERMANENTLY AFFIXED [NEC 690.56(C)(1)(A)].

TOP TIER SOLAR SOLUTIONS

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

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	03/04/2025	
REVISION	04/04/2025	A

PROJECT NAME & ADDRESS

JAMES MANGUM RESIDENCE
3861 US 401 N,
FUQUAY-VARINA, NC 27526

DRAWN BY
ESR

SHEET NAME
PLACARD

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-9

Introduction

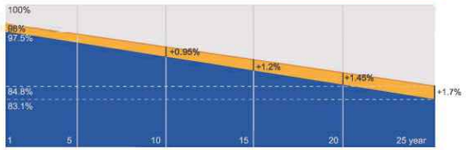
Assembled with 11BB PERC cells, the half-cell configuration of the modules offers the advantages of higher power output, better temperature-dependent performance, reduced shading effect on the energy generation, lower risk of hot spot, as well as enhanced tolerance for mechanical loading.

- Higher output power
- Lower LCOE
- Less shading and lower resistive loss
- Better mechanical loading tolerance

Superior Warranty

- 25-year product warranty
- 25-year linear power output warranty

0.55% Annual Degradation Over 25 years



New linear power warranty ■ Standard module linear power warranty

Comprehensive Certificates

- IEC 61215, IEC 61730,UL 61215, UL 61730
- ISO 9001: 2015 Quality management systems
- ISO 14001: 2015 Environmental management systems
- ISO 45001: 2018 Occupational health and safety management systems
- IEC TS 62941: 2016 Terrestrial photovoltaic (PV) modules – Guidelines for increased confidence in PV module design qualification and type approval

JA SOLAR

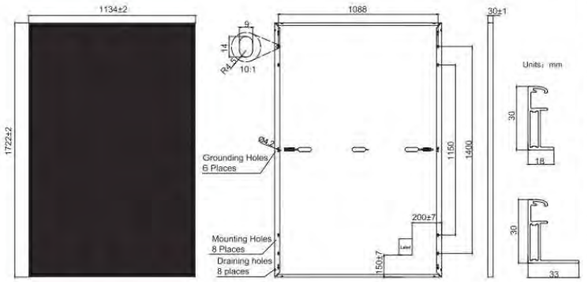
www.jasolar.com

Specifications subject to technical changes and tests.
JA Solar reserves the right of final interpretation.

JA SOLAR

JAM54S31 380-405/MR Series

MECHANICAL DIAGRAMS



Remark: customized frame color and cable length available upon request

SPECIFICATIONS

Cell	Mono
Weight	21.5kg±3%
Dimensions	1722±2mm×1134±2mm×30±1mm
Cable Cross Section Size	4mm² (IEC), 12 AWG(UL)
No. of cells	108(6x18)
Junction Box	IP68, 3 diodes
Connector	MC4-EVO2(1500V)
Cable Length (Including Connector)	Portrait: 300mm(+)/400mm(-); Landscape: 1200mm(+)/1200mm(-)
Packaging Configuration	36pcs/Pallet, 864pcs/40ft Container

ELECTRICAL PARAMETERS AT STC

TYPE	JAM54S31 -380/MR	JAM54S31 -385/MR	JAM54S31 -390/MR	JAM54S31 -395/MR	JAM54S31 -400/MR	JAM54S31 -405/MR
Rated Maximum Power(Pmax) [W]	380	385	390	395	400	405
Open Circuit Voltage(Voc) [V]	36.58	36.71	36.85	36.98	37.07	37.23
Maximum Power Voltage(Vmp) [V]	30.28	30.46	30.64	30.84	31.01	31.21
Short Circuit Current(Isc) [A]	13.44	13.52	13.61	13.70	13.79	13.87
Maximum Power Current(Imp) [A]	12.55	12.64	12.73	12.81	12.90	12.98
Module Efficiency [%]	19.5	19.7	20.0	20.2	20.5	20.7
Power Tolerance	±2%					
Temperature Coefficient of Isc(α_Isc)	+0.045%/℃					
Temperature Coefficient of Voc(β_Voc)	-0.275%/℃					
Temperature Coefficient of Pmax(γ_Pmp)	-0.350%/℃					
STC	Irradiance 1000W/m², cell temperature 25℃, AM1.5G					

Remark: Electrical data in this catalog do not refer to a single module and they are not part of the offer.They only serve for comparison among different module types.

ELECTRICAL PARAMETERS AT NOCT

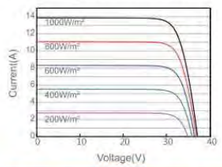
TYPE	JAM54S31 -380/MR	JAM54S31 -385/MR	JAM54S31 -390/MR	JAM54S31 -395/MR	JAM54S31 -400/MR	JAM54S31 -405/MR
Rated Max Power(Pmax) [W]	286	290	294	298	302	306
Open Circuit Voltage(Voc) [V]	34.36	34.49	34.62	34.75	34.88	35.12
Max Power Voltage(Vmp) [V]	28.51	28.68	28.87	29.08	29.26	29.47
Short Circuit Current(Isc) [A]	10.75	10.82	10.89	10.96	11.03	11.10
Max Power Current(Imp) [A]	10.03	10.11	10.18	10.25	10.32	10.38
NOCT	Irradiance 800W/m², ambient temperature 20°C,wind speed 1m/s, AM1.5G					

OPERATING CONDITIONS

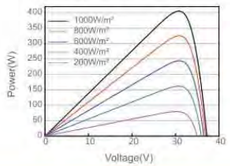
Maximum System Voltage	1000V/1500V DC
Operating Temperature	-40℃~+85℃
Maximum Series Fuse Rating	25A
Maximum Static Load,Front* Maximum Static Load,Back*	5400Pa(112lb/ft²) 2400Pa(50lb/ft²)
NOCT	45±2℃
Safety Class	Class Ⅱ
Fire Performance	UL Type 1

CHARACTERISTICS

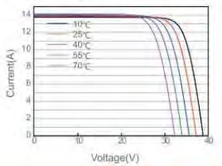
Current-Voltage Curve JAM54S31-405/MR



Power-Voltage Curve JAM54S31-405/MR



Current-Voltage Curve JAM54S31-405/MR



Premium Cells, Premium Modules

Version No.: Global_EN_20231130A

TOP TIER SOLAR SOLUTIONS

TOP TIER SOLAR SOLUTIONS

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

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	03/04/2025	
REVISION	04/04/2025	A

PROJECT NAME & ADDRESS

JAMES MANGUM RESIDENCE

3861 US 401 N,
FUQUAY-VARINA, NC 27526

DRAWN BY
ESR

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-10

Residential Power Optimizer

For North America

S440 / S500B / S650B

POWER OPTIMIZER

PV power optimization at the module level

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

solaredge.com

solaredge

Residential Power Optimizer

For North America

S440 / S500B / S650B

	S440	S500B	S650B	
INPUT				
Rated Input DC Power[1]	440[2]	500[3]	650	W
Absolute Maximum Input Voltage (Voc)	60	125	85	Vdc
MPPT Operating Range	8 – 60	12.5 – 105	12.5 – 85	Vdc
Maximum Input Current (Maximum Isc of Connected PV Module)[2][3]	14.5	15		Adc
Maximum Input Short Circuit Current[4]	18.75			Adc
Maximum Efficiency	99.5			%
Weighted Efficiency	98.6			%
Overvoltage Category	II			
OUTPUT DURING OPERATION (POWER OPTIMIZER CONNECTED TO OPERATING SOLAREDGE INVERTER)				
Maximum Output Current	15			Adc
Maximum Output Voltage	60	80		Vdc
OUTPUT DURING STANDBY (POWER OPTIMIZER DISCONNECTED FROM SOLAREDGE INVERTER OR INVERTER OFF)				
Safety Output Voltage per Power Optimizer	1 ± 0.1			Vdc
STANDARD COMPLIANCE				
Photovoltaic Rapid Shutdown System	CSA C22.2#330, NEC 2014 – 2023			
EMC	FCC Part 15 Class B; IEC 61000-6-2; IEC 61000-6-3			
Safety	CSA C22.2#107.1; IEC 62109-1 (Class II Safety); UL 1741			
Material	UL 94 V-0, UV Resistant			
RoHS	Yes			
Fire Safety	VDE-AR-E 2100-712:2013-05			
INSTALLATION SPECIFICATIONS				
Maximum Allowed System Voltage	1000			Vdc
Dimensions (W x L x H)	129 x 155 x 30 / 5.07 x 6.10 x 1.18	129 x 165 x 45 / 5.07 x 6.49 x 1.77		mm / in
Weight	720 / 1.6	790 / 1.74		gr / lb
Input Connector	MC4			
Input Wire Length	0.1 / 0.32			m / ft
Output Connector	MC4			
Output Wire Length	(+) 2.3, (-) 0.10 / (+) 7.54, (-) 0.32			m / ft
Operating Temperature Range[5]	-40 to +85			°C
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 S440 with part number S440-1GM4MRMP, the Rated Input DC Power is 650W, and the Maximum Input Current is 15A.
(3) For installations after Aug 1st, 2024, the Rated Input DC Power for S500B is 650W.
(4) The Maximum Input Short Circuit Current is adjusted for worst case conditions of ambient temperature, irradiance, bifacial gain, and so on, in accordance with NEC and CSA.
(5) Power derating is applied for ambient temperatures above +85°C / +185°F for S440, and for ambient temperatures above +75°C / 167°F for S500B and S650B. Refer to the Power Optimizers Temperature Derating technical note for more details.

PV System Design Using a SolarEdge Inverter[6]		SolarEdge Home Wave/Hub Single Phase	Three Phase for 208V Grid	Three Phase for 277/480V Grid	
Minimum String Length (Power Optimizers)	S440	8	10	18	
	S500B, S650B	6	8	14	
Maximum String Length (Power Optimizers)		25		50[7]	
Maximum Usable Power Delivered per String		5700	6000	12,750	W
Maximum Allowed Connected Power per String[9][10]	Inverters with Rated AC Power ≤ 5700W	Per the inverter's maximum input DC power[8]	One string: 7200 Two strings or more: 7800	15,000	W
	Inverters with Rated AC Power of 6000W	5700			
	Inverters with Rated AC Power ≥ 7600W	6800, only when connected to at least two strings			
Parallel Strings of Different Lengths or Orientations		Yes			

(6) It is not allowed to mix S-series and P-series Power Optimizers in new installations in the same string.
(7) A string with more than 30 optimizers does not meet NEC rapid shutdown requirements; safety voltage will be above the 30V requirement.
(8) Refer to the Single String Design Guidelines application note for details.
(9) For the 208V grid, the maximum is permitted only when the difference in connected power between strings is 1,000W or less.
(10) For the 240V or 277/480V grids, the maximum is permitted only when the difference in connected power between strings 2,000W or less.

Intertek 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	03/04/2025	
REVISION	04/04/2025	A

PROJECT NAME & ADDRESS

JAMES MANGUM RESIDENCE

3861 US 401 N,
FUQUAY-VARINA, NC 27526

DRAWN BY
ESR

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-11

SolarEdge Home Hub Inverter

Single Phase, for North America

For Inverters Assembled in the USA

SE3800H-US / SE5700H-US / SE7600H-US / SE10000H-US / SE11400H-US

HOME BACKUP

Single phase inverter for storage and backup applications

- The ultimate home energy manager in charge of PV production, battery storage, backup operation during a power outage*, EV Charging, and smart energy devices
- Record-breaking 99% weighted efficiency with up to 300% DC oversizing
- Supports LRA – can provide the required energy for HVAC systems starting during backup operation
- Integrates seamlessly with the complete SolarEdge Home Smart Energy Ecosystem, through SolarEdge Home Network
- Module-level monitoring and visibility of battery status, PV production, and self-consumption data
- Fast and easy installation – small and lightweight, with reduced commissioning time
- A scalable solution that supports future homeowner needs through easy connection to a growing ecosystem of products
- Advanced safety features with integrated arc fault protection and rapid shutdown for 690.11 and 690.12
- Advanced reliability with automotive-grade components
- Embedded revenue grade production data, ANSI C12.20 Class 0.5
- IP65-rated, for indoor and outdoor installations

*Requires additional hardware and firmware version upgrade.

solaredge.com

solaredge

SolarEdge Home Hub Inverter

Single Phase, for North America

SE3800H-US / SE5700H-US / SE7600H-US / SE10000H-US / SE11400H-US

Model Number[1][2]	SE3800H-US	SE5700H-US	SE7600H-US	SE10000H-US	SE11400H-US	Units
OUTPUT – AC ON GRID						
Rated AC Power	3800 @ 240V 3300 @ 208V	5760 @ 240V 5000 @ 208V	7600	10000	11,400 @ 240V 10,000 @ 208V	W
Maximum AC Power Output	3800 @ 240V 3300 @ 208V	5760 @ 240V 5000 @ 208V	7600	10000	11,400 @ 240V 10,000 @ 208V	W
AC Output Voltage (Nominal)	208 / 240					Vac
AC Output Voltage (Range)	183 – 264					Vac
AC Frequency Range (min - nom - max)	59.3 – 60 – 60.5[3]					Hz
Maximum Continuous Output Current	16	24	32	42	48	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
OUTPUT – AC STAND-ALONE (BACKUP)[4][5]						
Rated AC Power in Stand-alone Operation	11,400[6]					W
Maximum Stand-alone Capacity	11,400					W
AC L-L Output Voltage Range in Stand-alone Operation	211 – 264					Vac
AC L-N Output Voltage Range in Stand-alone Operation	105 – 132					Vac
AC Frequency Range in Stand-alone (min - nom - max)	55 – 60 – 65					Hz
Maximum Continuous Output Current in Stand-alone Operation	48					A
GFDI	1					A
THD	< 5					%
OUTPUT – SOLAREDGE HOME EV CHARGER AC						
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
INPUT – DC (PV AND BATTERY)						
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					
INPUT – DC (PV)						
Maximum DC Power @ 240V	11,400	11,520	15,200	20,000	22,800	W
Maximum DC Power @ 208V	6600	10,000	-	-	20,000	W
Maximum Input Current[7] @ 240V	20	30.5	40	53	60	Adc
Maximum Input Current[7] @ 208V	17.5	27	-	-	53	Adc
Maximum Input Short Circuit Current	45					Adc
Maximum Inverter Efficiency	99.2					%
CEC Weighted Efficiency	98.5		99		99 @ 240V 98.5 @ 208V	%
2-pole Disconnection	Yes					

(1) These specifications apply to inverters with part numbers SExxxxH-USMNUxxx5 and SExxxxH-USMNFxxx5 and connection unit model number DCD-1PH-US-PxH-F-x.
(2) Inverters with part number SExxxxH-USMNFxxx5 are intended for upgrade installations only, as part of the "Re-Energize" program. Use on non-upgrade installations will revoke the product warranty.
(3) For other regional settings please refer to the SolarEdge Inverters, Power Control Options Application Note.
(4) Not designed for non-grid connected applications and requires AC for commissioning. Stand-alone (backup) functionality is only supported for the 240V grid.
(5) For LRA (Locked Rotor Amperage) values please refer to the LRA for NAM Application Note.
(6) For models SE7600H-US and below, the rated AC stand-alone power is configurable between 7600W or 11,400W from CPU version 4.20.xx.
(7) A higher current source may be used. The inverter will limit its input current to the values stated.

CE ETL Intertek

TOP TIER SOLAR SOLUTIONS

TOP TIER SOLAR SOLUTIONS

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

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	03/04/2025	
REVISION	04/04/2025	A

PROJECT NAME & ADDRESS

JAMES MANGUM RESIDENCE

3861 US 401 N,
FUQUAY-VARINA, NC 27526

DRAWN BY

ESR

SHEET NAME

EQUIPMENT SPECIFICATION

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-12

SolarEdge Home Hub Inverter

Single Phase, for North America

SE3800H-US / SE5700H-US / SE7600H-US / SE10000H-US / SE11400H-US

Model Number[1][2]	SE3800H-US	SE5700H-US	SE7600H-US	SE10000H-US	SE11400H-US	Units
OUTPUT – DC (BATTERY)						
Supported Battery Types	SolarEdge Home Battery, LG RESU Prime					
Number of Batteries per Inverter	Up to 3 SolarEdge Home Battery, up to 2 LG RESU Prime					
Continuous Power[8]	11,400 @ 240V 3800 @ 208V	11,400 @ 240V 5000 @ 208V	11400 @240V		11,400 @ 240V 10,000 @ 208V	W
Peak Power[8]	11,400 @ 240V 3800 @ 208V	11,400 @ 240V 5000 @ 208V	11400 @240V		11,400 @ 240V 10,000 @ 208V	W
Maximum Input Current	30					Adc
2-pole Disconnection	Up to the inverter's rated stand-alone power					
SMART ENERGY CAPABILITIES						
Consumption Metering	Built-in[9]					
Stand-alone & Battery Storage	With Backup Interface (purchased separately) for service up to 200A; up to 3 inverters					
EV Charging	Direct connection to the SolarEdge Home EV Charger					
ADDITIONAL FEATURES						
Supported Communication Interfaces	RS485, Ethernet, Cellular[10], Wi-Fi (optional), SolarEdge Home Network (optional)					
Revenue Grade Metering, ANSI C12.20	Built-in[9]					
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, NEC 690.12					
STANDARD COMPLIANCE						
Safety	UL 1741, UL 1741SA, UL 1741SB, UL 1699B, CSA 22.2#107.1, C22,2#330, C22.3#9, ANSI/CAN/UL 9540					
Grid Connection Standards	IEEE1547 and IEEE-1547.1, Rule 21, Rule 14H					
Emissions	FCC Part 15 Class B					
INSTALLATION SPECIFICATIONS						
AC Terminals	L1, L2, N terminal blocks, PE busbar for inverter connection L1, L2 terminal blocks, PE busbar for EV Charger AC connection					
DC Terminals	4 x terminal block pairs for PV input; 1 x terminal block pair for battery input					
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)	21.06 x 14.6 x 8.2 / 535 x 370 x 208					in / mm
Weight with Connection Unit	44.9 / 20.3					lb / kg
Noise	< 50					dBA
Cooling	Natural Convection					
Operating Temperature Range	-40 to +140 / -40 to +60[11]					°F / °C
Protection Rating	NEMA 4X					

(8) Discharge power is limited up to the inverter's rated AC power for on-grid and stand-alone applications, as well as up to the installed batteries' rating.
(9) For consumption metering current transformers should be ordered separately: SECT-SPL-225A-T-20 or SEACT1250-400NA-20. Revenue grade metering is only for production metering.
(10) Information concerning the data plan terms & conditions is available in SolarEdge Communication Plan Terms and Conditions.
(11) Full power up to at least 50°C / 122°F; for power derating information refer to the Temperature Derating Technical Note for North America.

TOP TIER SOLAR SOLUTIONS

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

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	03/04/2025	
REVISION	04/04/2025	A

PROJECT NAME & ADDRESS

JAMES MANGUM RESIDENCE

3861 US 401 N,
FUQUAY-VARINA, NC 27526

DRAWN BY
ESR

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-13

Tech Brief

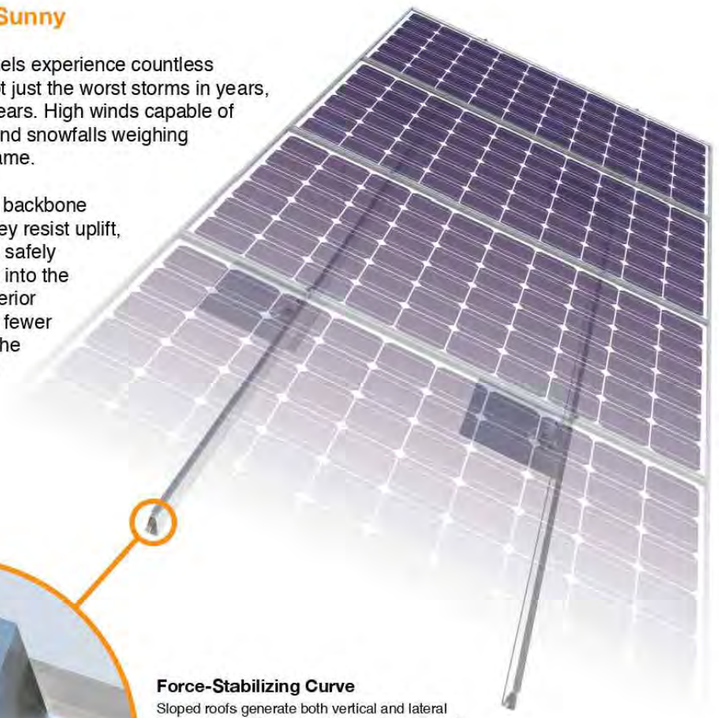
IRONRIDGE

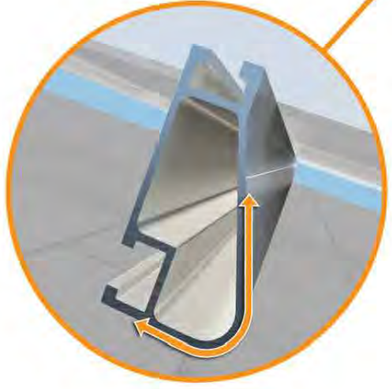
XR Rail® Family

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 6000-series aluminum alloy, then protected with an anodized finish. Anodizing prevents surface and structural corrosion, while also providing a more attractive appearance.

Tech Brief

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 spans up to 6 feet, while remaining light and economical.

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

XR100

XR100 is a residential and commercial mounting rail. It supports a range of wind and snow conditions, while also maximizing spans up to 10 feet.

- 10' 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 up to 12 feet for commercial applications.

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

Rail Selection

The table below was prepared in compliance with applicable engineering codes and standards.* Values are based on the following criteria: ASCE 7-16, Gable Roof Flush Mount, Roof Zones 1 & 2e, Exposure B, Roof Slope of 8 to 20 degrees and Mean Building Height of 30 ft. Visit IronRidge.com for detailed certification letters.

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

*Table is meant to be a simplified span chart for conveying general rail capabilities. Use approved certification letters for actual design guidance.

TOP TIER SOLAR SOLUTIONS

TOP TIER SOLAR SOLUTIONS

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

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	03/04/2025	
REVISION	04/04/2025	A

PROJECT NAME & ADDRESS

JAMES MANGUM RESIDENCE

3861 US 401 N,
FUQUAY-VARINA, NC 27526

DRAWN BY

ESR

SHEET NAME

EQUIPMENT SPECIFICATION

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-14

Tech Brief

IRONRIDGE

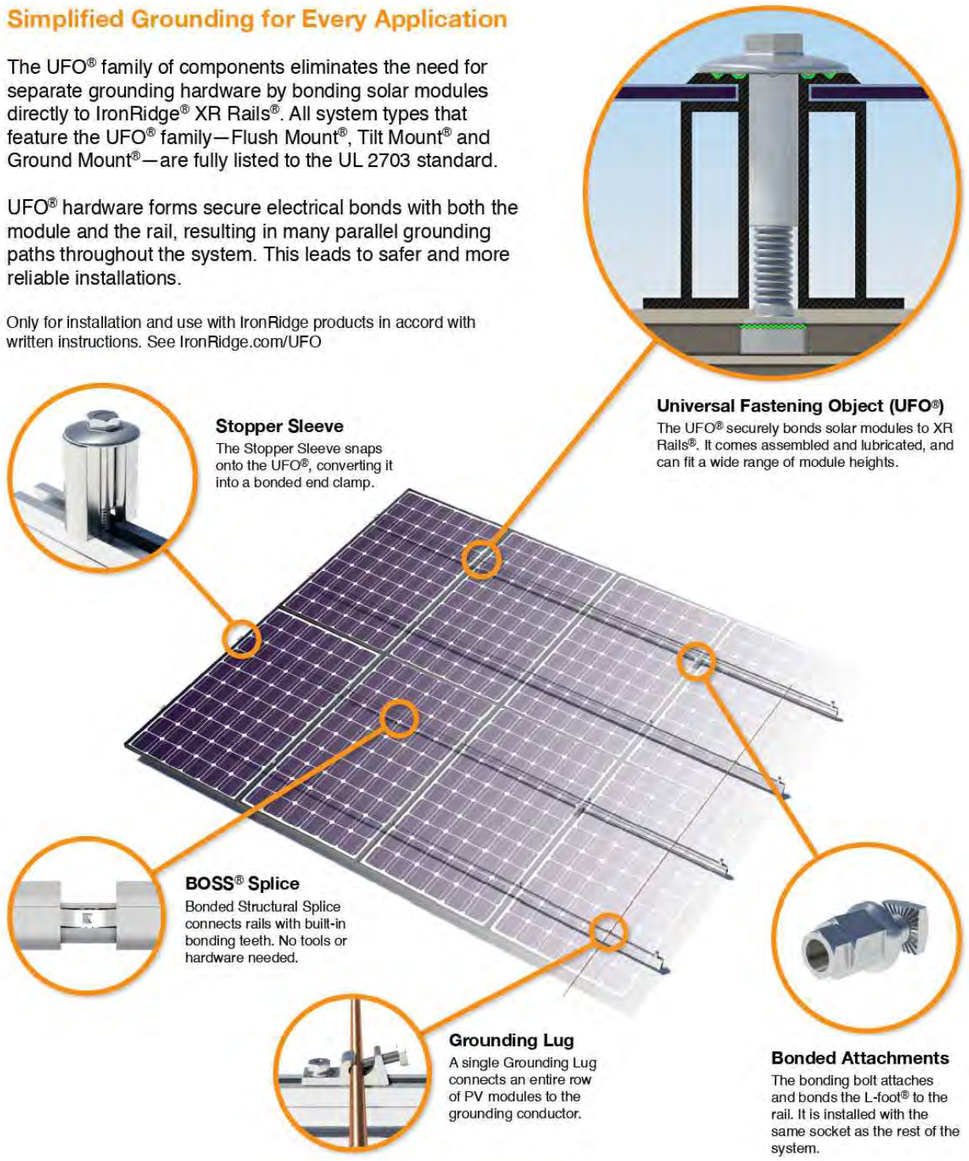
UFO® Family of Components

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.

Only for installation and use with IronRidge products in accord with written instructions. See IronRidge.com/UFO



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.

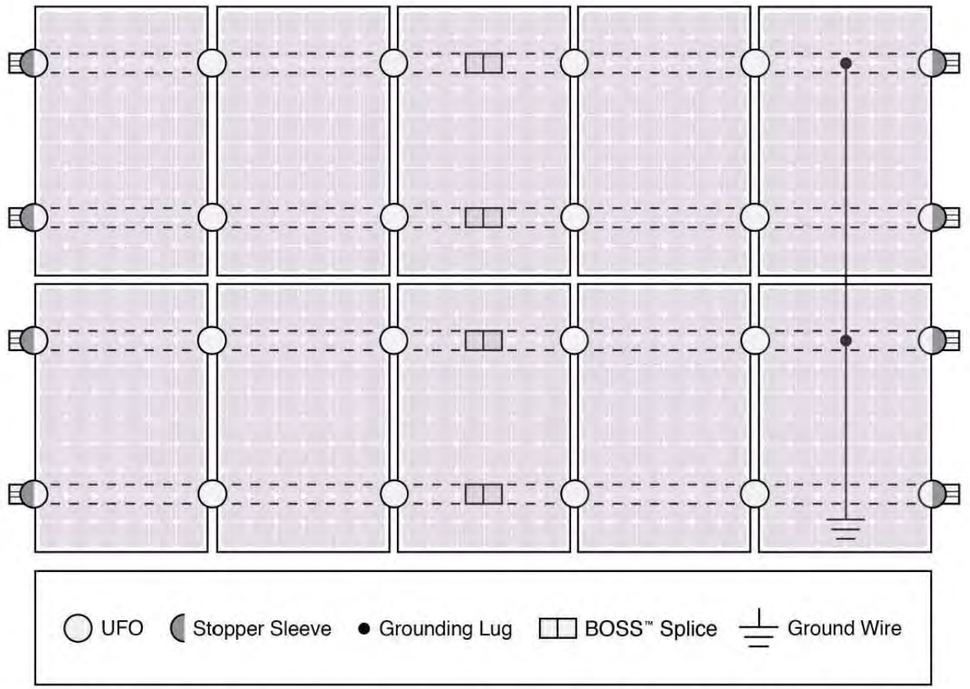
BOSS® Splice
Bonded Structural Splice connects rails with built-in bonding teeth. No tools or hardware needed.

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.

Tech Brief

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

Cross-System Compatibility			
Feature	**Flush Mount**	**Tilt Mount**	**Ground Mount**
XR Rails®	✔	✔	XR100 & XR1000
UFO®/Stopper	✔	✔	✔
BOSS® Splice	✔	✔	N/A
Grounding Lugs	1 per Row	1 per Row	1 per Array
Microinverters & Power Optimizers	Compatible with most MLPE manufacturers. Refer to system installation manual.		
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.		

TOP TIER SOLAR SOLUTIONS

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

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	03/04/2025	
REVISION	04/04/2025	A

PROJECT NAME & ADDRESS

JAMES MANGUM RESIDENCE
3861 US 401 N,
FUQUAY-VARINA, NC 27526

DRAWN BY
ESR

SHEET NAME
EQUIPMENT SPECIFICATION

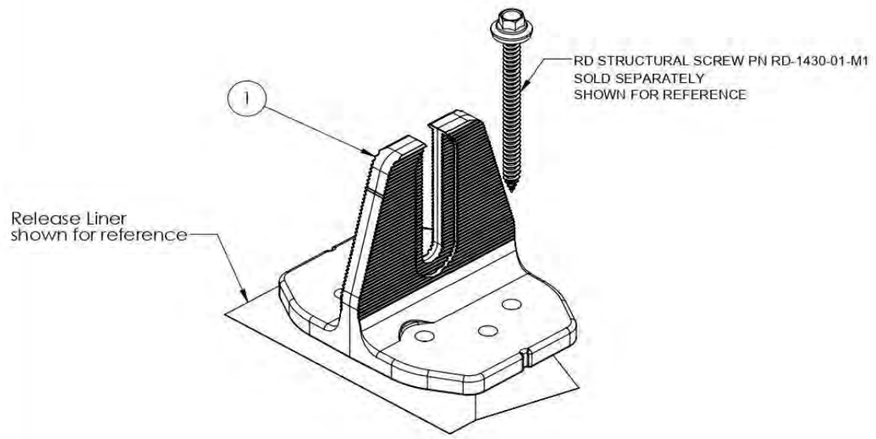
SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-15

Cut Sheet

IRONRIDGE

QuickMount® Halo UltraGrip

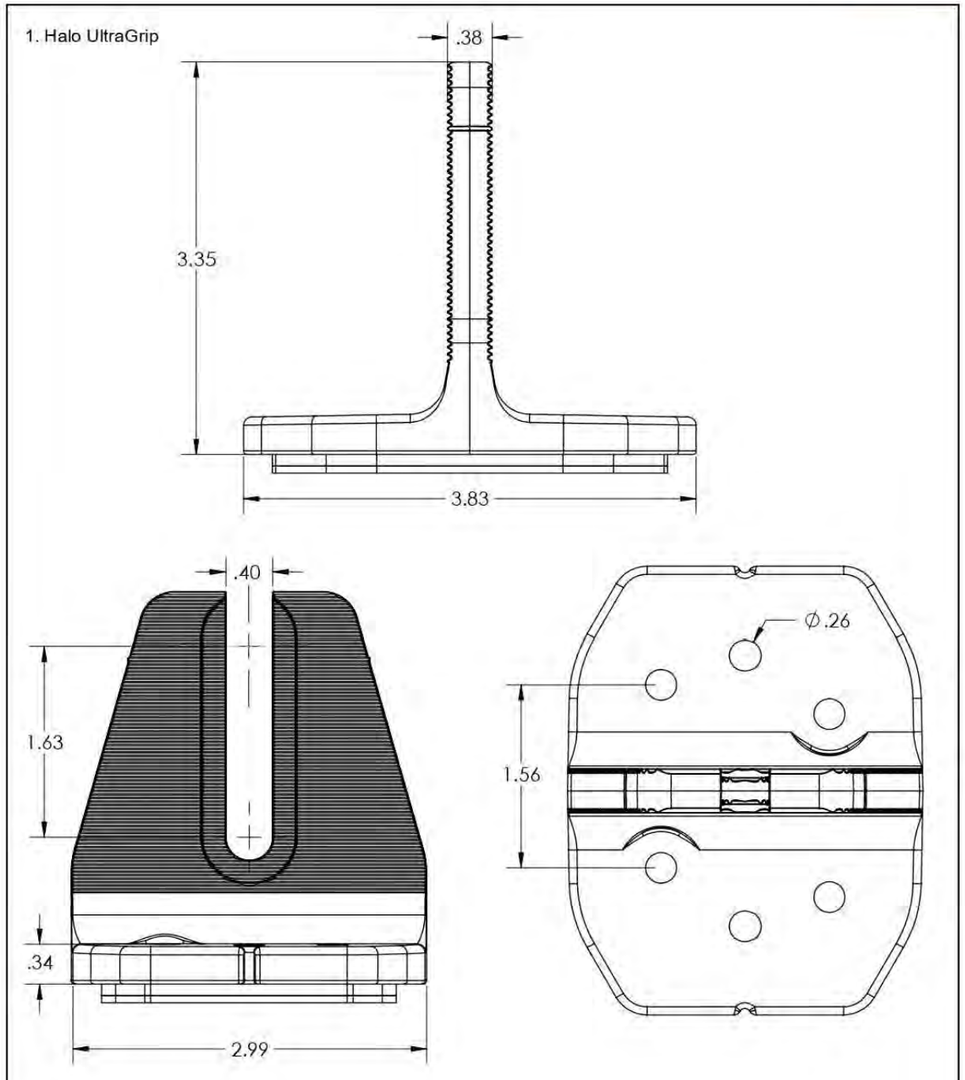


ITEM NO	DESCRIPTION	QTY IN KIT
1	QM Halo UltraGrip(Mill or Black)	1

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

Cut Sheet

1. Halo UltraGrip



Property	Value
Material	3000 Series Aluminium
Finish	Mill or Black

TOP TIER SOLAR SOLUTIONS

TOP TIER SOLAR SOLUTIONS

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

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	03/04/2025	
REVISION	04/04/2025	A

PROJECT NAME & ADDRESS

JAMES MANGUM RESIDENCE

3861 US 401 N,
FUQUAY-VARINA, NC 27526

DRAWN BY

ESR

SHEET NAME

EQUIPMENT SPECIFICATION

SHEET SIZE

ANSI B
11" X 17"

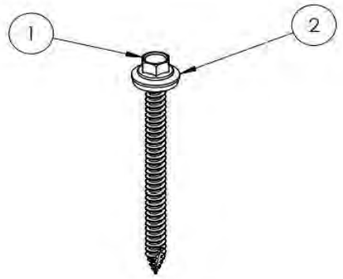
SHEET NUMBER

PV-16

Cut Sheet

IRONRIDGE

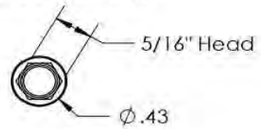
QuickMount® RD Structural Screw

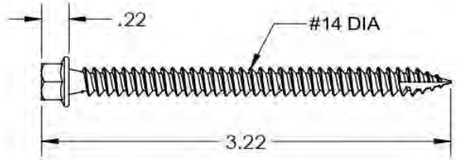


ITEM NO	DESCRIPTION	QTY IN KIT
1	Self Drilling Screw, #14, Wood Tip	1
2	Washer, EPDM Backed	1

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

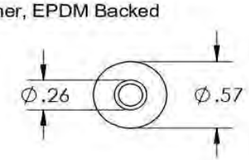
1. Self Drilling Screw, #14, Wood Tip

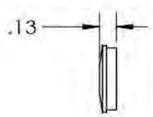




Property	Value
Material	300 Series Stainless Steel
Finish	Clear

2. Washer, EPDM Backed





Property	Value
Material	300 Series Stainless Steel
Finish	Clear

TOP TIER SOLAR SOLUTIONS

TOP TIER SOLAR SOLUTIONS

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

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	03/04/2025	
REVISION	04/04/2025	A

PROJECT NAME & ADDRESS

JAMES MANGUM RESIDENCE

3861 US 401 N,
FUQUAY-VARINA, NC 27526

DRAWN BY

ESR

SHEET NAME

EQUIPMENT SPECIFICATION

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-17

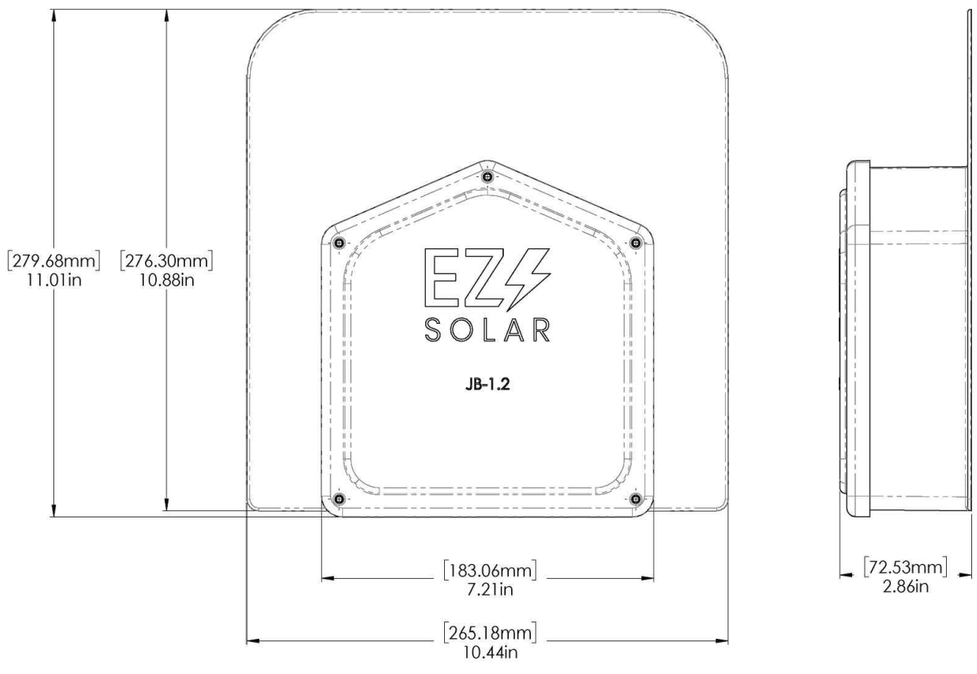
EZ SOLAR
making solar simple.

PHONE: 385-202-4150
WWW.EZSOLARPRODUCTS.COM

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	DWG. NO.	REV
B	JB-1.2	
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

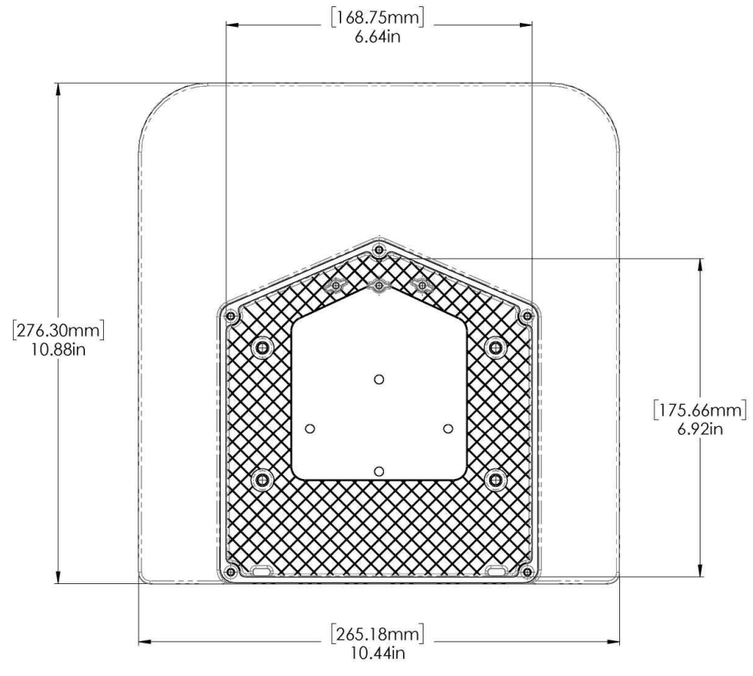


Intertek 5015705

EZ SOLAR
making solar simple.

PHONE: 385-202-4150
WWW.EZSOLARPRODUCTS.COM

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



PROPRIETARY AND CONFIDENTIAL: THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF EZ SOLAR. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF EZ SOLAR IS PROHIBITED.

Intertek 5015705

TOP TIER SOLAR SOLUTIONS

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

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	03/04/2025	
REVISION	04/04/2025	A

PROJECT NAME & ADDRESS

JAMES MANGUM RESIDENCE
3861 US 401 N,
FUQUAY-VARINA, NC 27526

DRAWN BY
ESR

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-18