



Town of Erwin
Zoning Application & Permit
Planning & Inspections Department

Permit #
25-0113

Rev Sep2014

Each application should be submitted with an attached plot/site plan with the proposed use/structure showing lot shape, existing and proposed buildings, parking and loading areas, access drives and front, rear, and side yard dimensions.

Name of Applicant	Top Tier Solar Solutions LLC	Property Owner	James Bradley
Home Address	1530 Center Park Drive	Home Address	308 West E Street
City, State, Zip	Charlotte NC 28217	City, State, Zip	Erwin, NC 28339
Telephone	855.997.1213	Telephone	
Email	nc@top tiersolarsolutions.com	Email	

Address of Proposed Property		308 West E Street	
Parcel Identification Number(s) (PIN)		Estimated Project Cost	49,576.03
What is the applicant requesting to build / what is the proposed use of the subject property? Be specific.		20 Roof Mounted Solar Photovoltaic Modules on existing residence.	
Description of any proposed improvements to the building or property		20 Roof Mounted Solar Photovoltaic Modules on existing residence.	
What was the Previous Use of the subject property?		Residential	
Does the Property Access DOT road?			
Number of dwelling/structures on the property already		Property/Parcel size	
Floodplain SFHA <u>Yes</u> <u>No</u>	Watershed <u>Yes</u> <u>No</u>	Wetlands <u>Yes</u> <u>No</u>	
<u>MUST</u> circle one that applies to property		Existing/Proposed Septic System Or Existing/Proposed County/City Sewer	

Owner/Applicant Must Read and Sign

The undersigned property owner, or duly authorized agent/representative thereof certifies that this application and the forgoing answers, statements, and other information herewith submitted are in all respects true and correct to the best of their knowledge and belief. The undersigning party understands that any incorrect information submitted may result in the revocation of this application. Upon issuance of this permit, the undersigning party agrees to conform to all applicable town ordinances, zoning regulations, and the laws of the State of North Carolina regulating such work and to the specifications of plans herein submitted. The undersigning party authorizes the Town of Erwin to review this request and conduct a site inspection to ensure compliance to this application as approved.

Michael Whitson		3/10/2025
Print Name	Signature of Owner or Representative	Date

For Office Use

Zoning District	RMV	Existing Nonconforming Uses or Features	NA
Front Yard Setback	15	Other Permits Required	☐ Conditional Use ☒ Building ☐ Fire Marshal ☒ Other
Side Yard Setback	8	Requires Town Zoning Inspection(s)	☐ Foundation ☐ Prior to C. of O.
Rear Yard Setback	15	Zoning Permit Status	☒ Approved ☐ Denied
Fee Paid: 825		Date Paid:	Staff Initials:

Comments	Electrical permits from Hammett Co
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Signature of Town Representative: 	Date Approved/Denied: 3/10/25
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PHOTOVOLTAIC ROOF MOUNT SYSTEM

20 MODULES-ROOF MOUNTED - 8.100 kW DC, 7.600 kW AC

308 W E ST, ERWIN, NC 28339

TOP TIER
SOLAR SOLUTIONS

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

PROJECT DATA

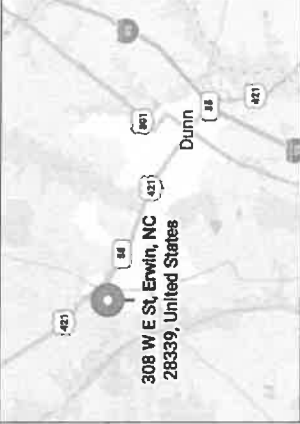
PROJECT ADDRESS: 308 W E ST,
ERWIN, NC 28339
OWNER: JAMES BRADLEY
DESIGNER: ESR
SCOPE: 8.100 kW DC ROOF MOUNT
SOLAR PV SYSTEM WITH
20 JA SOLAR: JAM54S31-405MR 405W
PV MODULES WITH
01 SOLAREDGE: S440 POWER OPTIMIZERS AND
INVERTER

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

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 250.60 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 SHALL 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
2017 NATIONAL ELECTRICAL CODE

SIGNATURE



PROJECT NAME & ADDRESS

JAMES BRADLEY
RESIDENCE
308 W E ST,
ERWIN, NC 28339

DRAWN BY

ESR

SHEET NAME

COVER SHEET

SHEET SIZE

ANSI B

11" X 17"

SHEET NUMBER

PV-1

STRUCTURAL ONLY

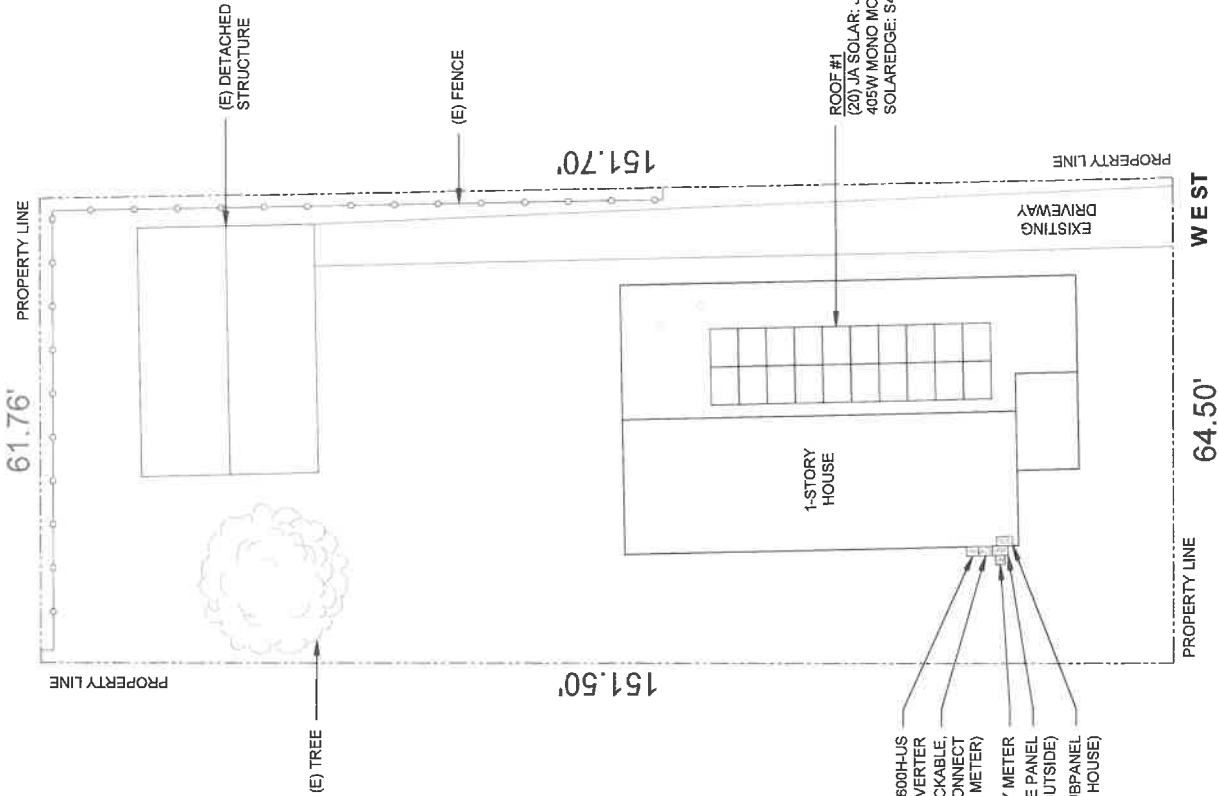
03/10/2025

PROJECT DESCRIPTION:

20 X JA SOLAR: JAM54S31-405/MR 405W MONO MODULES
ROOF MOUNTED SOLAR PHOTOVOLTAIC MODULES
DC SYSTEM SIZE: 8,100 KW DC
AC SYSTEM SIZE: 7,600 KW AC
EQUIPMENT SUMMARY
20 JA SOLAR: JAM54S31-405/MR 405W MONO MODULES
20 SOLAREEDGE: S440 POWER OPTIMIZERS
01 SOLAREEDGE: SE7600H-US (240V/7600W) INVERTER

ROOF ARRAY AREA #1:- 420.20 SQ. FT.

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



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 #2811,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	03/10/2025	



STRUCTURAL ONLY
03/10/2025

PROJECT NAME & ADDRESS

JAMES BRADLEY
RESIDENCE
308 W E ST,
ERWIN, NC 28339

DRAWN BY
ESR

SHEET NAME
SITE PLAN

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-2

1 | SITE PLAN
PV-2 | SCALE: 1/16" = 1'-0"

MODULE TYPE, DIMENSIONS & WEIGHT

NUMBER OF MODULES = 20 MODULES
MODULE TYPE = JA SOLAR: JAM54S31-405/MR 405W MONO MODULES
MODULE WEIGHT = 47.39 LBS / 21.5 kg.
MODULE DIMENSIONS = 67.79" x 44.65" = 21.01 SF



ROOF DESCRIPTION				
ROOF TYPE		METAL ROOF		
ROOF	# OF MODULES	ROOF PITCH	TRUSS SIZE	SEAM SPACING
#1	20	27°	2"x4"	24"
ARRAY AREA & ROOF AREA CALC'S				
TOTAL PV ARRAY AREA (SQ. FT.)	420.20	TOTAL ROOF AREA (SQ. FT.)	1788.24	ROOF AREA COVERED BY ARRAY (%)
				24

TOP TIER SOLAR SOLUTIONS

1530 CENTER PARK DR #2911,
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03/10/2025

PROJECT NAME & ADDRESS

JAMES BRADLEY
RESIDENCE
308 W E ST,
ERWIN, NC 28339

DRAWN BY

ESR

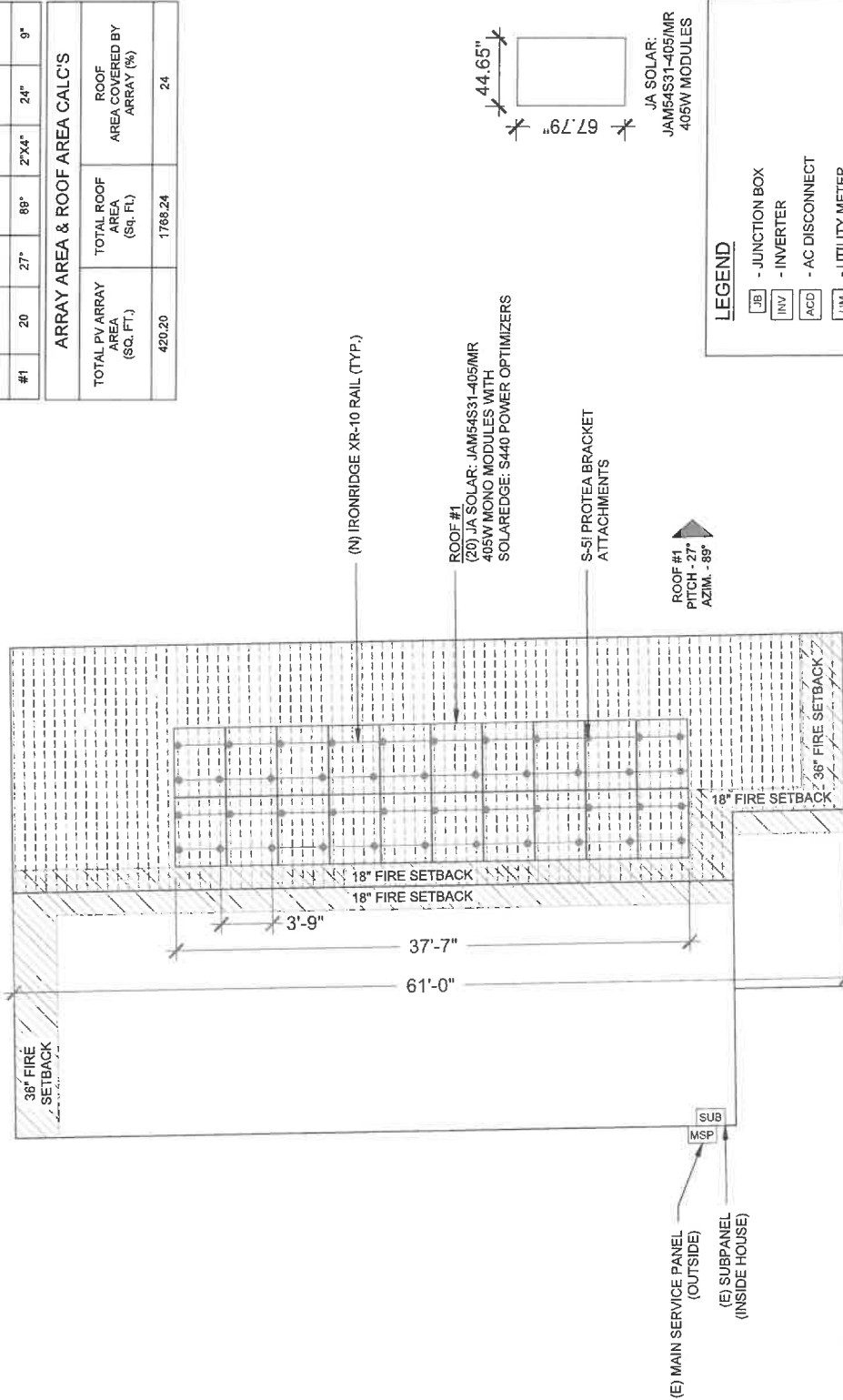
SHEET NAME
ROOF PLAN &
MODULES

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-3



LEGEND

- JUNCTION BOX
- INVERTER
- AC DISCONNECT
- UTILITY METER
- MAIN SERVICE PANEL
- SUB PANEL
- VENT, ATTIC FAN (ROOF OBSTRUCTION)
- ROOF ATTACHMENT
- SEAM
- CONDUIT

1 | ROOF PLAN & MODULES

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

DC SYSTEM SIZE: 8,100 kW DC
AC SYSTEM SIZE: 7,600 kW AC
(20) JA SOLAR: JAM54S31-405MR 405W MONO MODULES
WITH (20) SOLAREDDGE: S440 POWER OPTIMIZERS
LOCATED UNDER EACH PANEL AND
D1 SOLAREDDGE: SE7600H-JUS (240V/7600W) INVERTER

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



BILL OF MATERIALS	
EQUIPMENT DESCRIPTION	QTY
SOLAR PV MODULES: JA SOLAR: JAM54S31-405MR 405W MODULE	20
OPTIMIZERS: SOLAREDDGE: S440 POWER OPTIMIZERS	20
INVERTER: SOLAREDDGE: SE7600H-JUS (240V/7600W) INVERTER	01
JUNCTION BOX: 6"x6"x4" UL LISTED, STEEL WATER TIGHT NEMA TYPE 3R, UL LISTED	1
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)	12
BONDED SPLICE, XR10 (XR10-BOSS-01-M1)	8
UNIVERSAL MODULE CLAMP, CLEAR (UFO-CL-01-A1)	36
END FASTENING OBJECT (END CLAMP, 30-40MM), MILL (UFO-END-01-A1)	8
GROUNDING LUG (XR-LUG-03-A1)	2
S-51 PROTEA BRACKET ATTACHMENTS	46
T-BOLT BONDING HARDWARE (BHM-TB-02-A1) (PRODUCT CODE 590-0116)	46
OPTIMIZER BONDING HARDWARE T-BOLT (BHM-MI-01-A1) (PRODUCT CODE 270-0152)	20

TOP TIER SOLAR SOLUTIONS

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

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PROJECT NAME & ADDRESS

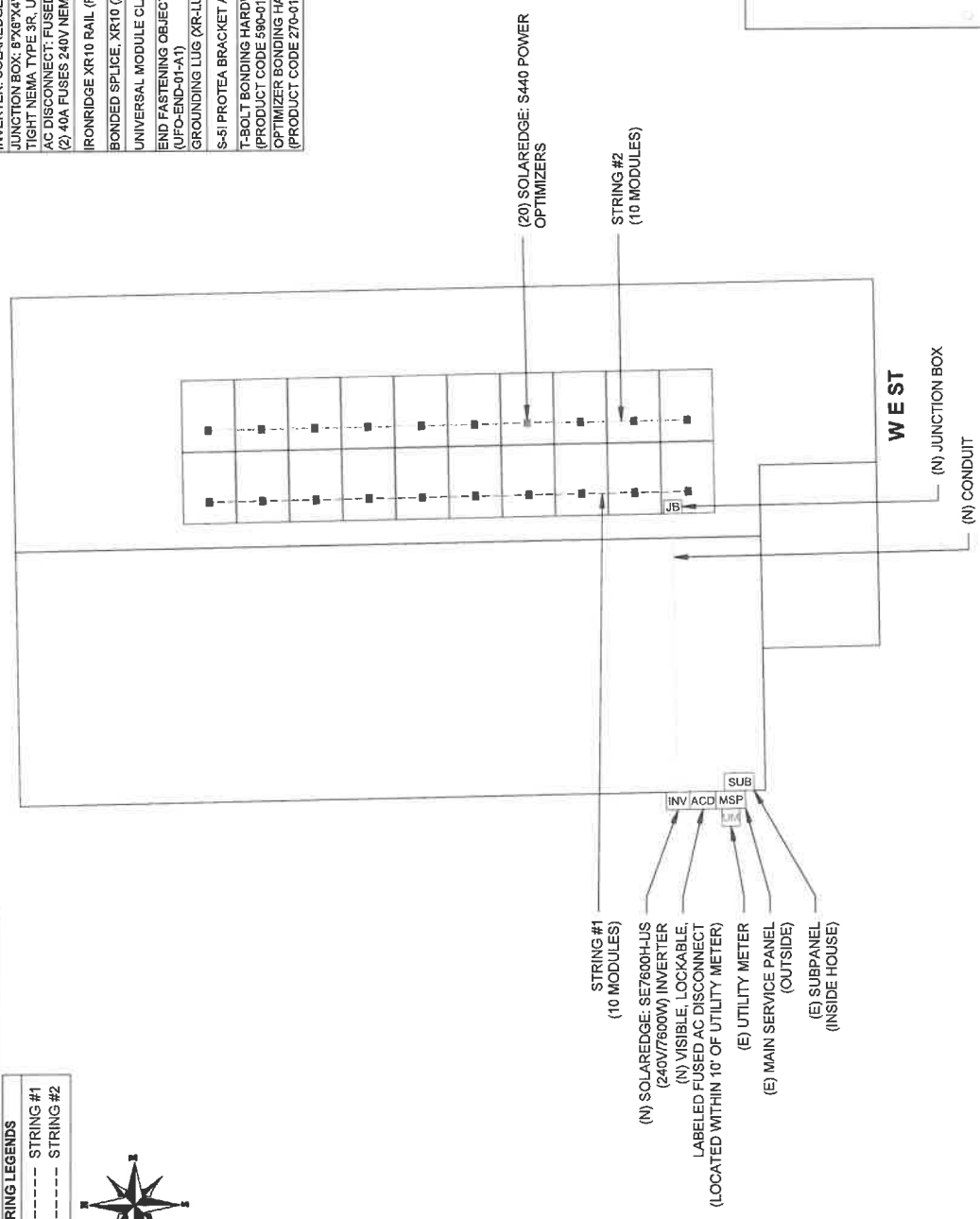
JAMES BRADLEY
RESIDENCE
308 W E ST,
ERWIN, NC 28339

DRAWN BY
ESR

SHEET NAME
ELECTRICAL PLAN

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-4



LEGEND

JB

 - JUNCTION BOX

INV

 - INVERTER

ACD

 - AC DISCONNECT

UM

 - UTILITY METER

MSP

 - MAIN SERVICE PANEL

SUB

 - SUB PANEL

JB

 - VENT, ATTIC FAN (ROOF OBSTRUCTION)

•

 - ROOF ATTACHMENT

—

 - TRUSS

—

 - CONDUIT

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	03/10/2025	



STRUCTURAL ONLY
03/10/2025

PROJECT NAME & ADDRESS

JAMES BRADLEY
RESIDENCE
308 W E ST,
ERWIN, NC 28339

DRAWN BY

ESR

SHEET NAME

STRUCTURAL DETAIL

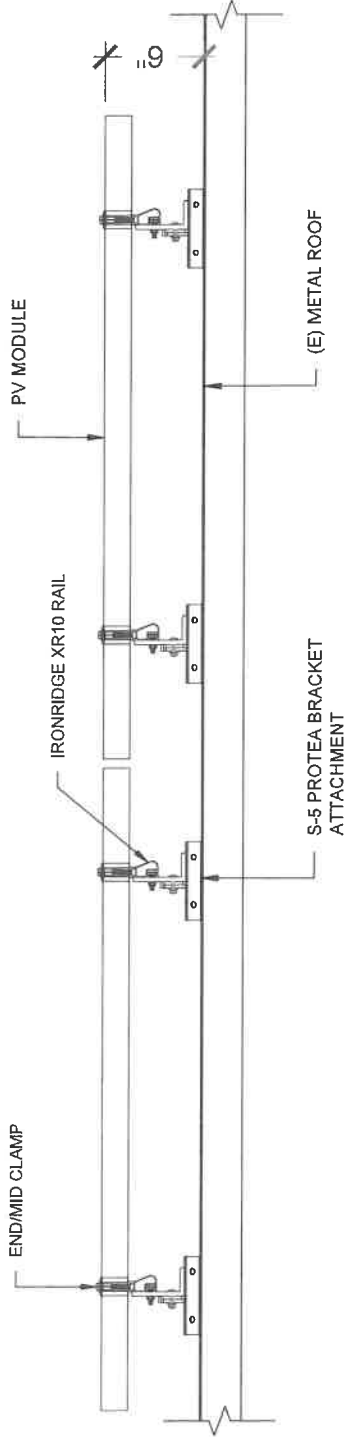
SHEET SIZE

ANSI B

11" X 17"

SHEET NUMBER

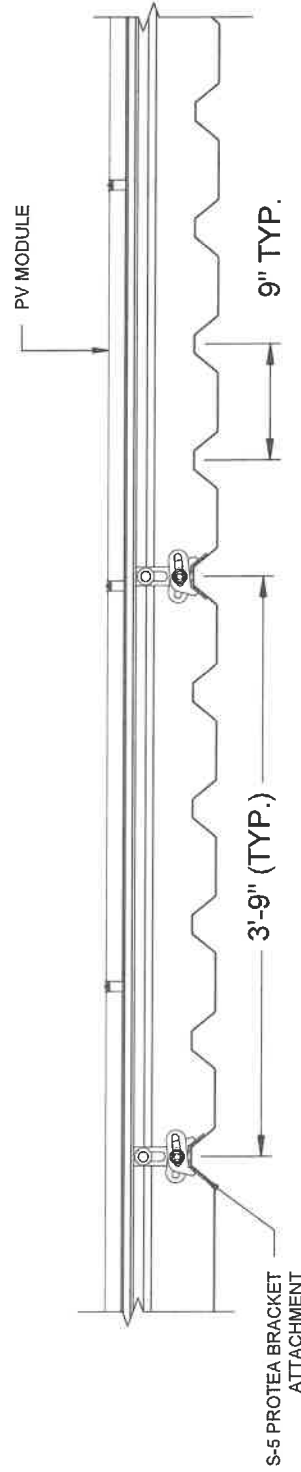
PV-5



1 ATTACHMENT DETAIL (side view)

PV-5

SCALE: N.T.S.



2 ATTACHMENT DETAIL (front view)

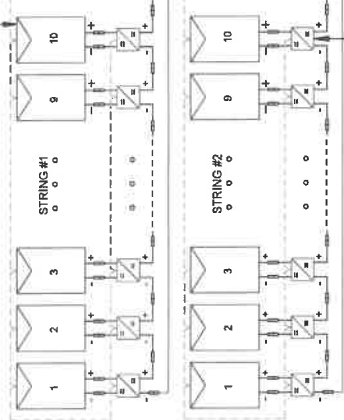
PV-5

SCALE: N.T.S.

DC SYSTEM SIZE: 8,100 KW DC
AC SYSTEM SIZE: 7,600 KW AC

(20) JA SOLAR: JAMS4S31-405/MR 405W MONO MODULES
WITH (20) SOLAREGE: S440 POWER OPTIMIZERS
LOCATED UNDER EACH PANEL (240V) AND
(01) SOLAREGE: SE7600H-US (240V/7600W) INVERTER
(2) STRINGS OF 10 MODULES ARE CONNECTED IN SERIES

(20) JA SOLAR: JAMS4S31-405/MR
405W MODULES



SOLAREGE POWER OPTIMIZERS S440 RATED
DC INPUT POWER - 440WATTS
MAXIMUM INPUT VOLTAGE - 60 VDC
MPPT RANGE - 8 TO 60 VDC
MAXIMUM SHORT CIRCUIT CURRENT - 14.5 ADC
MAXIMUM OPEN CIRCUIT VOLTAGE - 60 VDC
STRING LIMITATIONS - 8 TO 25 OPTIMIZERS,
5700 WATTS STC PER STRING MAXIMUM

INTERCONNECTION NOTES:

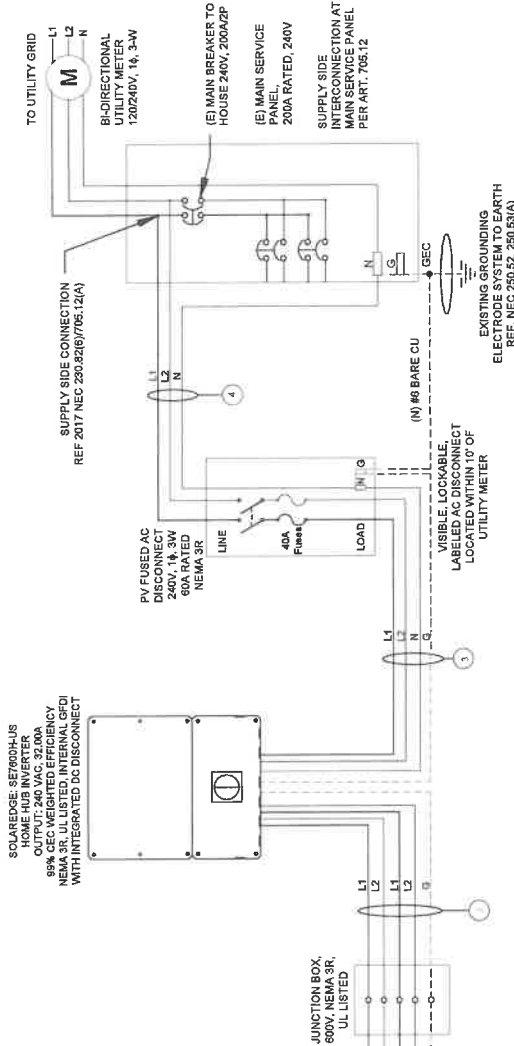
1. INTERCONNECTION SIZING, LIMITATIONS AND COMPLIANCE DETERMINED IN ACCORDANCE WITH (NEC 705.12), AND (NEC 680.59).
2. GROUND FAULT PROTECTION IN ACCORDANCE WITH (NEC 216.9), (NEC 230.95).
3. ALL EQUIPMENT TO BE RATED FOR BACKFEEDING.
4. PV BREAKER TO BE POSITIONED AT THE OPPOSITE END OF THE BUSBAR RELATIVE 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 "LINE" TERMINAL).
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 680.43)
 2. PV INVERTER IS UNGROUNDED, TRANSFORMER-LESS TYPE.
 3. DC GEC AND AC GEC 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 INSTALLATION.
 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.
- PACKING NOTE:
1. BOND EVERY OTHER RAIL WITH #6 BARE COPPER



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

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

1 ELECTRICAL LINE DIAGRAM

SCALE: NTS

PV-6

TOP TIER
SOLAR SOLUTIONS

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

REVISIONS	DESCRIPTION	DATE	REV
	INITIAL DESIGN	03/10/2025	

PROJECT NAME & ADDRESS

JAMES BRADLEY
RESIDENCE
308 W E ST
ERWIN, NC 28339

DRAWN BY
ESR

SHEET NAME

ELECTRICAL LINE DIAGRAM

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-6

REVISIONS	DATE	REV
DESCRIPTION	INITIAL DESIGN	03/10/2025

AMBIENT TEMPERATURE SPECS	
AMBIENT TEMP (HIGH TEMP 2%)	38°
RECORD LOW TEMPERATURE	-9°
MODULE TEMPERATURE COEFFICIENT OF Voc	-0.275%/°C

INVERTER SPECIFICATIONS	
MANUFACTURER / MODEL #	SOLAREDGE SE7600H-US (240V/7600W)
NOMINAL AC POWER	7,600 kW
NOMINAL OUTPUT VOLTAGE	240 VAC
NOMINAL OUTPUT CURRENT	32.00A

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

SOLAR MODULE SPECIFICATIONS	
MANUFACTURER / MODEL #	JA SOLAR: JAM64S31-405MR 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 44.65" W x 1.18" D (in inch)

DC FEEDER CALCULATIONS																								
CIRCUIT ORIGIN	CIRCUIT DESTINATION	VOLTAGE (V)	FULL LOAD AMPS * FLA" (A)	FLA*1.25 (A)	OCBP SIZE (A)	GROUND SIZE	CONDUCTOR SIZE	75°C AMPACITY (A)	AMPACITY CHECK #1	AMBIENT TEMP. (°C)	TOTAL CC CONDUCTORS ORS 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/100FT)	VOLTAGE DROP AT FLA (%)	CONDUIT SIZE	CONDUIT FULL (IN)			
STRING 1	JUNCTION BOX	380	15.00	18.75	20	BARE COPPER RE 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 RE 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	0.9	29.12	PASS	15	1.24	0.147	3/4" EMT	10.79352			
																		String 1 Voltage Drop	0.136		String 2 Voltage Drop		0.196	

AC FEEDER CALCULATIONS																										
CIRCUIT ORIGIN	CIRCUIT DESTINATION	VOLTAGE [V]	FULL LOAD AMPS FLA (A)	FLA*1.25 (A)	DGPD 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	DERATION FACTOR FOR CONDUCTORS PER RACEWAY NEC	90°C AMPACITY DERATED (A)	AMPACITY CHECK #2	FEEDER LENGTH (FEET)	CONDUCTOR RESISTANCE (OHM/100FT)	VOLTAGE DROP AT FLA (%)	CONDUIT SIZE	CONDUIT FULL (IN)				
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	0.095	3/4" EMT	30.088				
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	0.095	3/4" EMT	30.596				
																			CUMULATIVE VOLTAGE DROP		0.131					

ELECTRICAL NOTES

- ALL EQUIPMENT TO BE LISTED BY UL OR OTHER NRTL, AND LABELED FOR ITS APPLICATION.
- ALL CONDUCTORS SHALL BE RATED UP TO 600V FOR RESIDENTIAL AND 1000V FOR COMMERCIAL 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 FULL FILL 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

JAMES BRADLEY
RESIDENCE
308 W E ST,
ERWIN, NC 28339

DRAWN BY
ESR

SHEET NAME

WIRING CALCULATIONS

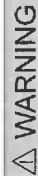
SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-7

PHOTOVOLTAIC POWER SOURCE

EVERY 10' ON CONDUIT & ENCLOSURES

LABEL-1:
LABEL LOCATION:
DUE TO CONDUIT RACEWAY
SOLAR DECK / JUNCTION BOX
CODE REF: NEC 690.31 (D)(2)



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)



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



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 VOLTAGE	240 V
RATED AC OUTPUT CURRENT	12.00 A

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

MAXIMUM VOLTAGE	480 V
MAXIMUM CIRCUIT CURRENT	40.00 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	09/10/2025	

PROJECT NAME & ADDRESS

JAMES BRADLEY
RESIDENCE
308 W E ST,
ERWMN, NC 28339

DRAWN BY
ESR

SHEET NAME
LABELS

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-8

Harvest the Sunshine

DEEP BLUE 3.0 Light

405W/MBB
Half-cell Black Module
JAM54S31 380-405/MR Series

Mono

Introduction

Assured with 100% PERC cells, the half-cell configuration of the module offers the advantages of higher power output, better temperature coefficient performance, reduced shading effects on the entire panel, and superior low light performance. The half-cell configuration is the most effective way to reduce the shading effect on the entire panel.



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

Comprehensive Certificates

- IEC 61215: IEC 61730, UL 61730, 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 43894: 2016 Temperature coefficient (TC) module - Guidelines for increased confidence in PV module design qualification and type approval

■ New linear power warranty ■ Standard module linear power warranty

JA SOLAR

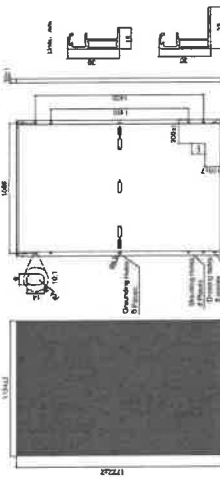


www.jasolar.com
Contact Sales & Marketing: info@jasolar.com
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JA SOLAR

JAM54S31 380-405/MR

MECHANICAL DIAGRAMS



SPECIFICATIONS

Cell	Mono
Weight	21.5kg/3%
Dimensions	1722±2mm×1134±2mm×30±1mm
Cable Cross Section Size	4mm ² (IEC) / 12 AWG (UL)
No. of cable	100 (6±18)
Junction Box	IP68, 3 inlets
Connector	MC4-EVO2 (1500V)
Cable Length (Including Connector)	Positive: 360mm (adjustable) Negative: 1200mm (1/200mm±)
Packaging Configuration	35pcs/Pallet, 840pcs/40ft Container

ELECTRICAL PARAMETERS AT STC

TYPE	JAM54S31 380MR	JAM54S31 385MR	JAM54S31 400MR	JAM54S31 405MR	JAM54S31 405MR
Rated Maximum Power (P _{max}) [W]	380	385	390	395	400
Open Circuit Voltage (V _{oc}) [V]	36.58	36.71	36.88	36.98	37.23
Maximum Power Voltage (V _{mp}) [V]	30.78	30.86	30.94	31.01	31.11
Short Circuit Current (I _{sc}) [A]	13.44	13.52	13.61	13.70	13.79
Maximum Power Current (I _{mp}) [A]	12.58	12.64	12.71	12.81	12.89
Module Efficiency [%]	18.5	18.7	18.9	19.0	19.1
Power Tolerance	±3%				
Temperature Coefficient of P _{max} [W/°C]	-0.045%/°C				
Temperature Coefficient of V _{oc} [V/°C]	-0.273%/°C				
Temperature Coefficient of P _{max} (r. Pmp) [W/°C]	-0.307%/°C				

STC: Irradiance 1000W/m², cell temperature 25°C, AM 1.5G

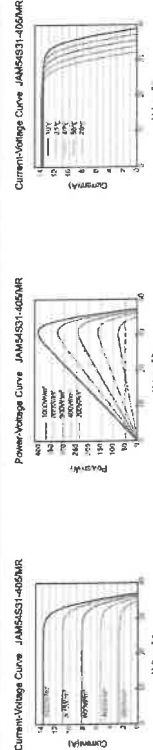
Remark: Thermal data in the module data is for a single module and they are not part of the data. They only serve for comparison among different module types.

ELECTRICAL PARAMETERS AT NOCT

TYPE	JAM54S31 380MR	JAM54S31 385MR	JAM54S31 400MR	JAM54S31 405MR	JAM54S31 405MR
Rated Max Power (P _{max}) [W]	388	390	394	398	402
Open Circuit Voltage (V _{oc}) [V]	34.36	34.49	34.62	34.75	34.88
Max Power Voltage (V _{mp}) [V]	28.51	28.60	28.67	28.75	28.82
Short Circuit Current (I _{sc}) [A]	10.75	10.82	10.86	10.93	11.00
Max Power Current (I _{mp}) [A]	10.03	10.11	10.16	10.25	10.30

NOCT: Irradiance 800W/m², ambient temperature 20°C, and speed 1m/s, AM 1.5G

CHARACTERISTICS



PROJECT NAME & ADDRESS

JAMES BRADLEY
RESIDENCE
308 W 5TH ST,
ERWIN, NC 28339

DRAWN BY
ESR

SHEET NAME
EQUIPMENT
SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-9

TOP TIER
SOLAR SOLUTIONS

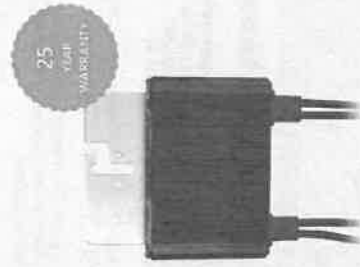
TOP TIER SOLAR SOLUTIONS
1530 CENTER PARK DR #2911,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS	DATE	REV
DESCRIPTION	INITIAL DESIGN	09/10/2025

Residential Power Optimizer

For North America

S440 / S500B / S650B



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



/ Residential Power Optimizer

For North America

S440 / S500B / S650B

INPUT		S440	S500B	S650B
Rated Input DC Power*		440W	500W	650W
Absolute Maximum Input Voltage (Voc)		60V	125V	150V
MPPT Operating Range		10-60V	12.5-105V	12.5-150V
Maximum Input Current (Maximum of Connected PV Modules)		14.5A	15A	15A
Maximum Input Short Circuit Current ¹		18.75A	18.75A	18.75A
Maximum Efficiency		99.5%	99.5%	99.5%
Weighted Efficiency		99.6%	99.6%	99.6%
Over-voltage Category		I	I	I
OUTPUT DURING OPERATION (POWER OPTIMIZER CONNECTED TO OPERATING SOLAREGE INVERTER)				
Maximum Output Current		15A	15A	15A
Maximum Output Voltage		60V	125V	150V
OUTPUT DURING STANDBY (POWER OPTIMIZER DISCONNECTED FROM SOLAREGE INVERTER OR INVERTER OFF)				
Safety Output Voltage per Power Optimizer		15V ± 0.1V	15V ± 0.1V	15V ± 0.1V
STANDARD COMPLIANCE				
Photovoltaic Rapid Shutdown System		Yes	Yes	Yes
EMC		Yes	Yes	Yes
Safety		Yes	Yes	Yes
Material		UL 94 V-0 UV Resistant	UL 94 V-0 UV Resistant	UL 94 V-0 UV Resistant
RoHS		Yes	Yes	Yes
Fire Safety		Yes	Yes	Yes
UL 48 E-2007-712-2019-05		Yes	Yes	Yes
INSTALLATION SPECIFICATIONS				
Maximum Allowed System Voltage		150V	150V	150V
Dimensions (W x L x H)		150 x 75 x 30 / 5.07 x 2.95 x 1.18	150 x 75 x 30 / 5.07 x 2.95 x 1.18	150 x 75 x 30 / 5.07 x 2.95 x 1.18
Weight		720 g / 1.6 lb	720 g / 1.6 lb	720 g / 1.6 lb
Input Connector		MC4	MC4	MC4
Input Wire Length		0.1 / 0.32 m / ft	0.1 / 0.32 m / ft	0.1 / 0.32 m / ft
Output Connector		MC4	MC4	MC4
Output Wire Length		1 / 2.3 (10 / 41) 754 (1) 0.12 m / ft	1 / 2.3 (10 / 41) 754 (1) 0.12 m / ft	1 / 2.3 (10 / 41) 754 (1) 0.12 m / ft
Operating Temperature Range ²		-40 to +85 °C / -40 to +185 °F	-40 to +85 °C / -40 to +185 °F	-40 to +85 °C / -40 to +185 °F
Protection Rating		IP68 / NEMA4	IP68 / NEMA4	IP68 / NEMA4
Relative Humidity		0 - 100%	0 - 100%	0 - 100%

PV System Design Using a SolarEdge Inverter		Single Phase	Three Phase, Inc. 208V/120V	Three Phase, Inc. 277/480V/208V
Minimum String Length (Power Optimizers)		6	6	6
Maximum String Length (Power Optimizers)		25	25	25
Maximum Usable Power (Power Optimizers)		6000W	6000W	6000W
Maximum Allowed Connected Power per String ³		One string 7200W Two strings or more 7800W	One string 7200W Two strings or more 7800W	One string 7200W Two strings or more 7800W
Parallel Strings of Different Lengths or Orientations		Yes	Yes	Yes

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

REVISIONS	DESCRIPTION	DATE	REV
1	INITIAL DESIGN	03/10/2025	

PROJECT NAME & ADDRESS

JAMES BRADLEY
RESIDENCE
308 W E ST,
ERWIN, NC 28339

DRAWN BY

ESR

SHEET NAME
EQUIPMENT
SPECIFICATION

SHEET SIZE

ANSI B

11" X 17"

SHEET NUMBER

PV-11

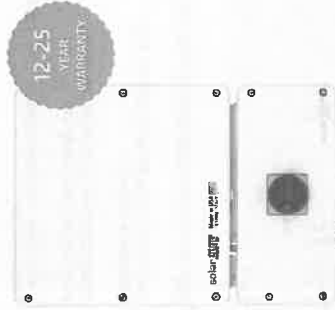


SolarEdge Home Hub Inverter

Single Phase, for North America

For Inverters Assembled in the USA

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



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

HOME BACKUP

/ SolarEdge Home Hub Inverter

Single Phase, for North America

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

Model Number	SE3800H-US	SE5700H-US	SE7600H-US	SE10000H-US	SE11400H-US
OUTPUT – AC ON GRID					
Rated AC Power	3600 @ 240V 3900 @ 208V 3900 @ 208V	5700 @ 240V 5900 @ 208V 5900 @ 208V	7600 7600 7600	10000	11400 @ 240V 10000 @ 208V 10000 @ 208V
Maximum AC Power Output	3600 @ 240V 3900 @ 208V 3900 @ 208V	5700 @ 240V 5900 @ 208V 5900 @ 208V	7600 7600 7600	10000	11400 @ 240V 10000 @ 208V 10000 @ 208V
AC Output Voltage (Nominal)	208 / 240	208 / 240	208 / 240	208 / 240	208 / 240
AC Output Voltage Range	183 – 264	183 – 264	183 – 264	183 – 264	183 – 264
AC Frequency Range (min - nom - max)	59.3 – 60 – 60.5 ¹	59.3 – 60 – 60.5 ¹	59.3 – 60 – 60.5 ¹	59.3 – 60 – 60.5 ¹	59.3 – 60 – 60.5 ¹
Maximum Continuous Output Current	15	24	32	42	48
GFI Threshold	1	1	1	1	1
Total Harmonic Distortion (THD)	< 3	< 3	< 3	< 3	< 3
Power Factor	Yes	Yes	Yes	Yes	Yes
Utility Monitoring, Handing Protection, Country Configurable	Yes	Yes	Yes	Yes	Yes
Change Battery from AC (if allowed)	Yes	Yes	Yes	Yes	Yes
Typical No-Tie Power Consumption	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5
OUTPUT – AC STAND-ALONE (BACKUP)(W)					
Rated AC Power in Stand-alone Operation	3600	5700	7600	10000	11400
Maximum Stand-alone Capacity	3600	5700	7600	10000	11400
AC L-L Output Voltage Range in Stand-alone Operation	211 – 264	211 – 264	211 – 264	211 – 264	211 – 264
AC L-N Output Voltage Range in Stand-alone Operation	105 – 132	105 – 132	105 – 132	105 – 132	105 – 132
AC Frequency Range in Stand-alone (min - nom - max)	55 – 60 – 65	55 – 60 – 65	55 – 60 – 65	55 – 60 – 65	55 – 60 – 65
Maximum Continuous Output Current in Stand-alone Operation	48	48	48	48	48
GFI	1	1	1	1	1
THD	< 3	< 3	< 3	< 3	< 3
OUTPUT – SOLAREGE HOME EV CHARGER AC					
Rated AC Power	9600	9600	9600	9600	9600
AC Output Voltage Range	211 – 264	211 – 264	211 – 264	211 – 264	211 – 264
On-Grid AC Frequency Range (min - nom - max)	59.3 – 60 – 60.5	59.3 – 60 – 60.5	59.3 – 60 – 60.5	59.3 – 60 – 60.5	59.3 – 60 – 60.5
Maximum Continuous Output Current @ 240V (incl. PV and battery)	40	40	40	40	40
INPUT – DC (PV AND BATTERY)					
Total Energy Loss, Unweighted	Yes	Yes	Yes	Yes	Yes
Max Input Voltage	480	480	480	480	480
Min DC Input Voltage	360	360	360	360	360
Reverse-Polarity Protection	Yes	Yes	Yes	Yes	Yes
Ground-Fault Isolation Detection	Yes	Yes	Yes	Yes	Yes
INPUT – DC (PV)					
Maximum DC Power @ 240V	11,400	11,520	15,200	20,000	22,800
Maximum DC Power @ 208V	6600	10,000	10,000	20,000	20,000
Maximum Input Current ² @ 240V	20	30.5	40	53	60
Maximum Input Current ² @ 208V	17.5	27	35	45	53
Maximum Input Short-Circuit Current	45	45	45	45	45
Maximum Inverter Efficiency	98.5	98.5	98.5	98.5	98.5
CEC Weighted Efficiency	98.5	98.5	98.5	98.5	98.5
2-pole Disconnection	Yes	Yes	Yes	Yes	Yes

(1) These units are designed to meet with all applicable UL and NEC requirements and connection with model number ECD-9H-US-240V-F-E.
(2) Inverters with part number ECD-9H-US-240V-F-E are designed for use with the SolarEdge Smart Energy Ecosystem. Use on non-specified inverters will void the product warranty.
(3) For other regional settings please refer to the SolarEdge Inverter Output Control Configuration Guide.
(4) For other regional settings please refer to the SolarEdge Inverter Output Control Configuration Guide.
(5) For 100 (grounded wye) applications please refer to the UL 1681 (NFPA 70) requirements.
(6) For models SE7600H-US and below, the rated AC stand-alone power is configurable between 7600W or 11,400W from CEU version 4.20m.
(7) A higher current sensor may be used. The inverter will have its input current on the values listed.

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TOP TIER
SOLAR SOLUTIONS

TOP TIER SOLAR SOLUTIONS
1530 CENTER PARK DR #211,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS	DATE	REV
INITIAL DESIGN	03/10/2025	

PROJECT NAME & ADDRESS

JAMES BRADLEY
RESIDENCE
308 W E ST
ERWIN, NC 28339

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		SE3800H-US	SE5700H-US	SE7600H-US	SE10000H-US	SE11400H-US	Units
OUTPUT – DC (BATTERY)							
Supported Battery Types							
Number of Batteries per Inverter							
Continuous Power ^a							
Peak Power ^a							
Maximum Input Current							
2-pole Disconnection							
SMART ENERGY CAPABILITIES							
Consumption Metering							
Stand-alone & Battery Storage							
EV Charging							
ADDITIONAL FEATURES							
Supported Communication Interfaces							
Revenue Grade Metering, ANSI C12.20							
Integrated AC DC and Communication Connection Unit							
Inverter Commissioning							
DC Voltage Rapid Shutdown (PV and Battery)							
STANDARD COMPLIANCE							
Safety							
Grid Connection Standards							
Emissions							
INSTALLATION SPECIFICATIONS							
AC Terminals							
DC Terminals							
AC Output and IV AC Output Conduit Size / AWG Range							
DC Input (PV and Battery) Conduit Size / AWG Range							
Dimensions with Connection Unit (H x W x D)							
Weight with Connection Unit							
Noise							
Cooling							
Operating Temperature Range							
Protection Rating							

^a 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 battery's rating.
^b For consumption metering, current transformers should be ordered separately. (ECT-594, 225A, 1.20 or SPAC-1250-400VA-20) Revenue grade metering is only for production metering.
^c For consumption metering, current transformers should be ordered separately. (ECT-594, 225A, 1.20 or SPAC-1250-400VA-20) Revenue grade metering is only for production metering.
^d Full power up to a rate 50°C / 121°F for power derating information refer to the [SOLAREDGE Derating Chart](#) (SE-5000-1) (English)

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TOP TIER
SOLAR SOLUTIONS

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

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	03/10/2025	

PROJECT NAME & ADDRESS

JAMES BRADLEY
RESIDENCE
308 W E ST,
ERWIN, NC 28339

DRAWN BY

ESR

SHEET NAME
EQUIPMENT
SPECIFICATION

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-13



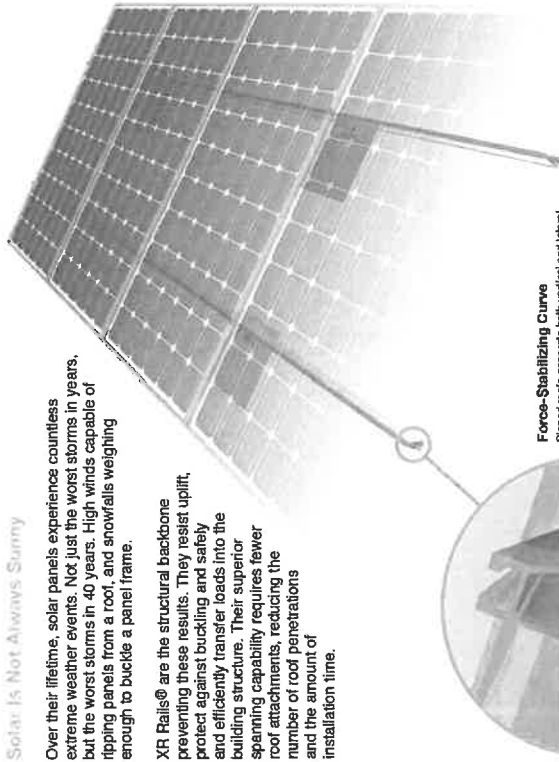
XR Rail® Family

Tech Brief

Solar Is Not Always Sunny

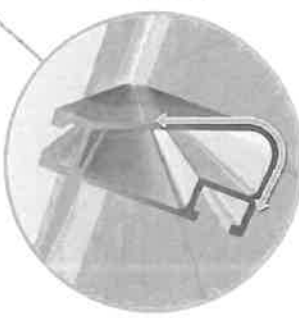
Over their lifetime, solar panels experience countless extreme weather events. Not just the worst storms in years, but the worst storms in 40 years. High winds capable of ripping panels from a roof, and snowfalls weighing enough to buckle a panel frame.

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 loads on mounting rails which must be transferred to the building structure. 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 flat-roof and pitched-roof attachments.



Ironridge® offers a range of tie leg options for flat and pitched roof applications.

Corrosion-Resistant Materials

All XR Rails® are made of 6000-series aluminum alloy, then protected with an anodized finish. Anodizing prevents surface corrosion and also provides a more attractive appearance.



XR Rail® Family

Tech Brief

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 use with light to medium snow loads. It achieves spans up to 6 feet, while remaining light and economical.

- 6' spanning capability
- Medium load capacity
- Anodized finish
- Internal splice available

XR100



XR100 is a standard commercial mounting rail designed for use with medium to heavy snow loads, while also maximizing spans up to 10 feet.

- 10' spanning capability
- Heavy load capacity
- Anodized finish
- Internal splice available

XR1000



XR1000 is a heavyweight, rugged mounting rail designed for use in extreme climates and spans up to 12 feet for commercial applications.

- 12' spanning capability
- Extreme load capacity
- Anodized finish
- Internal splice 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					
		4'	5' 4"	6'	10'	12'	
Snow (psf)	90						
	120						
	140						
	160						
None							
20	90						
	120						
	140						
	160						
30	90						
	120						
	140						
	160						
40	90						
	120						
	140						
	160						
80	90						
	120						
	140						
	160						
120	90						
	120						
	140						
	160						

*Table is meant to be a simplified design 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
INITIAL DESIGN	03/10/2025

PROJECT NAME & ADDRESS

JAMES BRADLEY
RESIDENCE
308 W E ST,
ERWIN, NC 28339

DRAWN BY
ESR

SHEET NAME
EQUIPMENT
SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-14



UFO® Family of Components

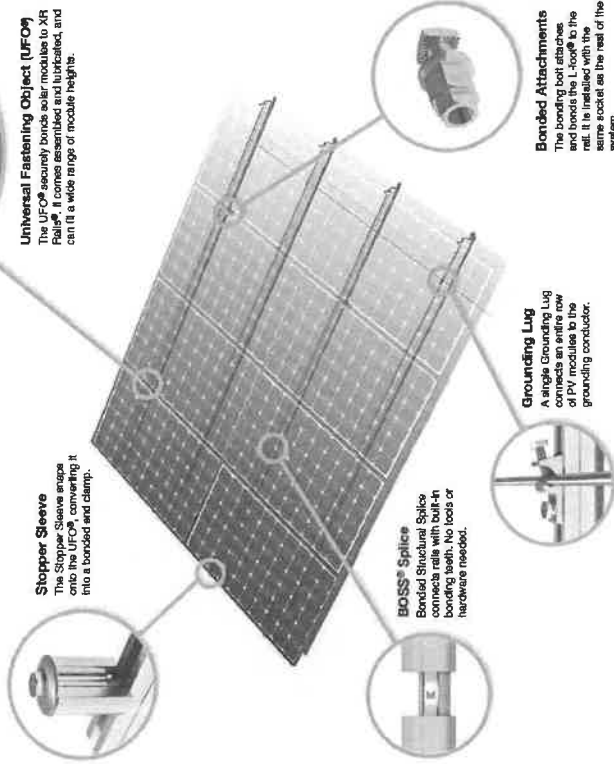
Tech Brief

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.

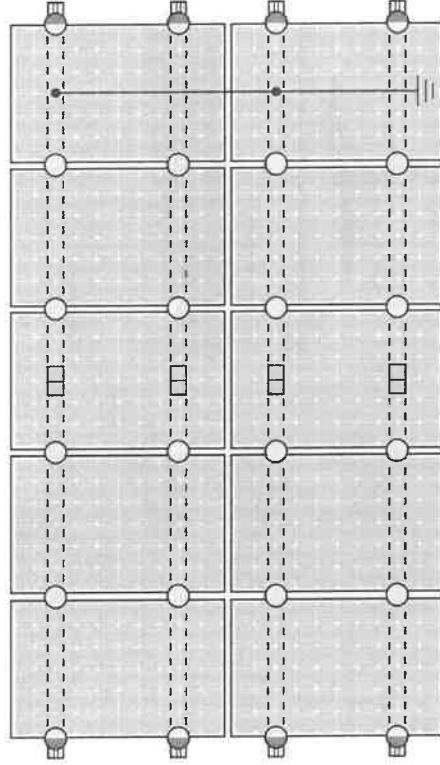
BOSS® Splice
Bonded Structural Splice connects rails with built-in bonding both. No bolts or hardware needed.

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

Bonded Attachments
The bonding foot attaches the module to the rail. The rail is installed with the same socket as the rest of the system.

System Diagram

Tech Brief



○ UFO ● Stopper Sleeve ● Grounding Lug □ BOSS® Splice — Ground Wire

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.

Cross-System Compatibility				
Features	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 Row	1 per Array
Microinverters & Power Optimizers	Compatible with most MLPE manufacturers. Refer to system installation manual.			
Fire Rating	Class A	Class A	Class A	N/A
Modules	Tested or Evaluated with over 400 Framed Modules. Refer to installation manuals for a detailed list.			

Go to IronRidge.com/UFO

TOP TIER SOLAR SOLUTIONS

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

REVISIONS	
DESCRIPTION	DATE
INITIAL DESIGN	03/10/2025

PROJECT NAME & ADDRESS

JAMES BRADLEY
RESIDENCE
308 W E ST,
ERWIN, NC 28339

DRAWN BY
ESR

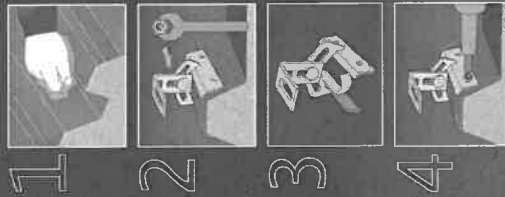
SHEET NAME
EQUIPMENT
SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-15

The right way to attach almost anything to metal roofs:

ProteaBracket™



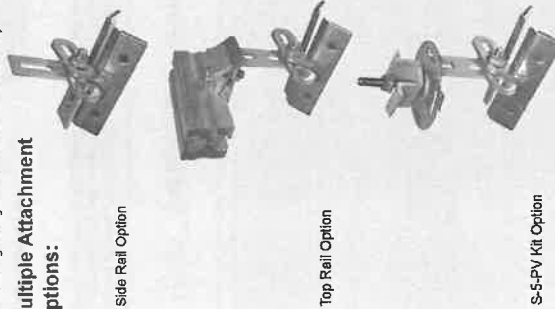
S-51[®] ProteaBracket[™] is a versatile bracket that adjusts easily to most trapezoidal roof profiles.

888-825-3432 | www.S-5.com

S-5!
The Right Way!

Each **ProteBriquet™** comes with a factory-applied, adhesive rubber sealant on the base. A structural A2 stainless steel liner attachment bracket, ProteBriquet is compatible with most common metal roofing materials. All four pre-punched holes must be used to achieve tested strength. Mounting hardware is furnished with the ProteBriquet. For design assistance, ask your distributor, or visit www.S-5.com for the independent lab test data that can be used for load-critical designs and applications. Also, please visit our website for more information including metallurgical compatibilities and specifications. S-5's holding strength is unmatched in the industry.

Multiple Attachment Options:

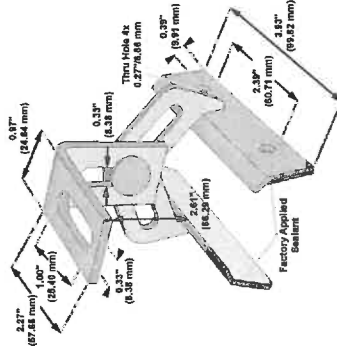


S-5® Warning! Please use this product responsibly!

Products are protected by multiple U.S. and foreign patents. For published data regarding holding strength, bolt torque, patents, and trademarks, visit the S-5 website at www.s-5.com.

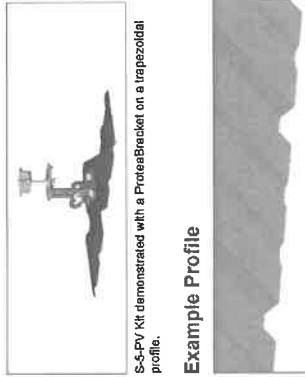
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ProteaBracket™



Please note: All measurements are rounded to the second decimal place.

Example Applications



S-5-PV Kit demonstrated with a ProteaBracket on a trapezoidal profile.

Example Profile

TOP TIER
SOLAR SOLUTIONS

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1530 CENTER PARK DR #2811,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	03/10/2025	

JAMES BRADLEY
RESIDENCE
308 W E ST,
ERWIN, NC 28339

DRAWN BY ESR
SHEET NAME EQUIPMENT SPECIFICATION
SHEET SIZE ANSI B 11" X 17"
SHEET NUMBER PV-16



PV LETTERS

Top Tier Solar Solutions

Contractor Address: 1530 Center Park Dr #2911, Charlotte, NC
28217

March 10, 2025

Subject: Proposed Solar Panel Installation
James Bradley Residence, 308 W E St, Erwin, NC
DC System Size: 8.100 kW
PV Letters Job #004-19920

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. (assumed)
Roofing Material: Corrugated Metal
Roof Slope: 27 degrees

Roof Connection Details

S-5! ProteaBracket to existing metal roof, at 45" 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 S-5! ProteaBracket 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.

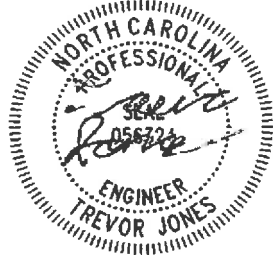
If you have any questions or concerns, please contact us at (208)-994-1680, or by email at Projects@pvletters.com.

Sincerely,



Trevor A. Jones, P.E.

3/10/2025





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.

	<u>Without Solar</u>	<u>With Solar</u>	
Dead Load			
Corrugated Metal	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	27		degrees
Unobstructed Slippery Surface?	Yes	Yes	
Slope Factor, C_s	0.72	0.72	
Sloped Roof Snow Load	8.3	8.3	psf
Live Load			
Roof Live Load	20	0	psf
Load Combination			
D + L _r	32.5	15.5	psf
D + S	20.8	23.8	psf
Max. Load	32.5	23.8	psf
% of original		73.17%	

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

Bracket Connection 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
Roof Angle, degrees
Roof Layout
Wind Speed, mph
Exposure Coefficient, K_z
Topographic Factor, K_{zt}
Directionality Factor, K_d
Elevation Factor, K_e
Velocity Pressure q_z , psf
Prying Coefficient

34
27
Gable
120
0.85
1.00
0.85
1.00
26.5
1

Zones:

Spacing parallel to rail, in
 GC_p (max)
Exposed Panels? ($\gamma_E = 1.5$)
Effective Wind Area on each con., ft^2
Pressure Equalization Factor, γ_a
Uplift Force, psf
Max. Uplift Force / Connection (0.6 WL), lbs
Solar Dead Load (0.6 DL). Lbs
Max. Uplift Force (0.6 WL - 0.6 DL), lbs

<u>1</u>	<u>2</u>	<u>3</u>
45	45	45
0.90	2.20	2.60
No	No	No
10.6	10.6	10.6
0.79	0.79	0.79
18.8	46.1	54.4
119.8	292.8	346.0
19.1	19.1	19.1
100.7	273.7	326.9

Connection Capacity

Connection Type
Ultimate Capacity, lbs
Factor of Safety
Total Capacity, lbs

S-5! ProteaBracket

817
2.00
408.5

Compare ASD Factored Demand to Capacity

Demand, lbs
Capacity, lbs
Result

326.9
408.5

Capacity exceeds demands. Therefore, connection passes.