



TOWN OF COATS

ZONING PERMIT APPLICATION

NOTE: Attach a site plan that includes property lines (front, side, and rear), location of proposed structures (including driveways, decks, etc.), and existing structures. This plan should be drawn to scale. This permit along with plans shall be submitted to the Harnett County Building Inspections Department.

Permit No.: 3-11-25-5 Date: 3-11-25 Fee: 50

Parcel ID*: 0690-61-9012-000 Area Zoned As: RMST

APPLICANT:

PROPERTY OWNER:

Name (Print) Top Tier Solar Solutions LLC

Name James Cassidy

Address 1530 Center Park Drive

Address 35 Trace Turner Lane

City, State Charlotte NC

City, State Coats, NC

Zip Code 28217

Zip Code 27521

Phone # 704.270.4507

Phone # 910.514.1534

Location of Property: IN-TOWN ETJ ETJ (contiguous)

Present Use of Property: Residential

PROPOSED USE OF PROPERTY:

☐ Single Family Dwelling: # Rooms: # Bedrooms: Square Feet:

☐ Multi Family Dwelling: # of Units: #Bedrooms (per unit): Square Feet (per unit)

☐ Mobile Home (single lot): Single wide: Double Wide:

☐ Mobile Home Park: Section 16, Zoning Ordinance must apply

☐ Business: Total # of employees per day Type of business

☒ Others (specify): 15 Roof Mounted Solar Photovoltaic Modules on existing residence

☐ Existing structure: Renovate: Addition: Demolish:

WATER AND SEWER SUPPLY:

Water: ☐ Private ☐ Public ☐ Proposed ☐ Existing

Sewer: ☐ Private ☐ Public ☐ Proposed ☐ Existing

Applicant: I certify that all of the information presented in this application is true, complete, and accurate to the best of my knowledge. False information is grounds for rejection of the application.

Signature: [Signature] Date: 2/26/2025

ZONING ADMINISTRATOR USE ONLY

Notes:

Approved: ☒ Denied: ☐

Zoning Administrator: Elizabeth Krige Date: 3-11-2025

THIS PERMIT IS VALID FOR 12 MONTHS



PV LETTERS

Top Tier Solar Solutions

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

February 26, 2025

Subject: Proposed Solar Panel Installation
James Cassidy Residence, 35 Trace Turner Ln, Coats, NC
DC System Size: 6.075 kW
PV Letters Job #004-19468

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: Asphalt Shingles (1 layer)
Roof Slope: 33 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
Decking Mount Wood Screws: (6) #14 Self-Drilling Screw with a minimum penetration depth of 0.25", at 72" O.C. max
Note: Required installation of 75% / 25% between Framing and Decking Mounts.

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.

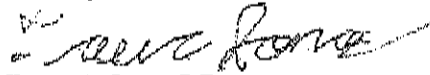
Limitations and Disclaimers

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.

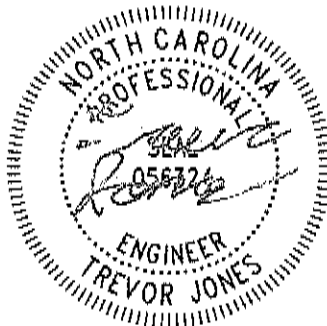
If you have any questions or concerns, please contact us at (208)-994-1680, or by email at Projects@pvletters.com.

Sincerely,



Trevor A. Jones, P.E.

2/26/2025





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	33		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	33	
Roof Layout	Gable	
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	1.00	(Table 26.9-1)
Velocity Pressure q_z , psf	26.5	(Table 26.10-1)

Zones:

	1	2	3
Spacing parallel to rail, in	72	72	72
GC_p (max)(Figure 29.4-7)	1.00	2.00	2.00
Exposed Panels? ($\gamma_E = 1.5$) (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)	18.8	37.5	37.5
Max. Uplift Force / Connection (0.6 WL), lbs	190.9	381.8	381.8
Solar Dead Load (0.6 DL), Lbs	30.5	30.5	30.5
Max. Uplift Force (0.6 WL - 0.6 DL), lbs	160.4	351.3	351.3

Connection Capacity

Attachment FTG	IronRidge QuickMount Halo Ultragrip	
Attachment location	Framing	Decking
Fastener Type	Wood Screw	Wood Screw
Fastener Diameter, in	0.242	0.242
Embedment Length, in	1.75	0.25
Lumber Species & Grade	SPF #2 (Assumed)	
Nominal Withdrawal Capacity W, lbs	213	30.4
# of Screws	2	6
Load Duration Factor C_d	1.6	1.6
Screw Adj. Withdrawal Cap. W', lbs	681	292
Attachment FTG Strength with C_d , lbs	1606	374
Assumed attachment distribution	75%	25%
Max applied load, lbs	351	
Max allowable load, lbs	584	

Compare Adjusted Withdrawal Capacity to ASD Factored Demand

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

PHOTOVOLTAIC ROOF MOUNT SYSTEM

15 MODULES-ROOF MOUNTED - 6.075 kW DC, 5.700 kW AC

35 TRACE TURNER LN, COATS, NC 27521

TOP TIER
SOLAR SOLUTIONS

TOP TIER SOLAR SOLUTIONS
1530 CENTER PARK DR #2011,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS	
DESCRIPTION	DATE
INITIAL DESIGN	02/20/2025
REV	



STRUCTURAL ONLY
2/20/2025

PROJECT NAME & ADDRESS

JAMES CASSIDY
RESIDENCE
35 TRACE TURNER LN,
COATS, NC 27521

DRAWN BY

ESR

SHEET NAME

COVER SHEET

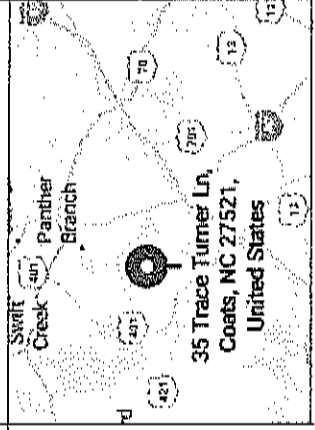
SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-1

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

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 QUALITY 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 18".
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 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 ANCHOR CLAMP, GROUNDING ELECTRODE CONDUCTORS SHALL BE NO LESS THAN #6 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 SWAGE TO BE PLACED IN ACCORDANCE WITH THE LOCAL BUILDING CODE. IF EXPOSED TO SUNLIGHT, IT SHALL BE UV RESISTANT. ALL PLUGS AND SNAPE WILL BE INSTALLED AS REQUIRED BY THE NEC AND AHJ.
12. INVERTER(S) USED IN UNGROUNDING 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 690.40).
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 GROUNDING 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 110.28(A)(1), 110.28(A)(2) AND 110.28(A)(3).
21. ROOFTOP MOUNTED PHOTOVOLTAIC PANELS AND MODULES SHALL BE TESTED, LISTED & IDENTIFIED IN ACCORDANCE WITH UL 1703.
22. ELECTRICAL CONTRACTOR TO PROVIDE CONDUIT EXPANSION JOINTS AND ANCHOR CONDUIT RUNS AS REQUIRED PER NEC.

PROJECT DATA

PROJECT ADDRESS: 35 TRACE TURNER LN,
COATS, NC 27521
OWNER: JAMES CASSIDY
DESIGNER: ESR
SCOPE: 6.075 kW DC ROOF MOUNT
SOLAR PV SYSTEM WITH
15 JA SOLAR: JAM54531-405MR 405W
PV MODULES WITH
15 SOLAREXGE: 5440 POWER OPTIMIZERS AND
01 INVERTER: SE5700H-US (240V/5700W)
AUTHORITIES HAVING JURISDICTION:
BUILDING: HARNETT COUNTY
ZONING: HARNETT COUNTY
UTILITY: DUKE ENERGY PROGRESS

SHEET INDEX

PV-1 COVER SHEET
PV-2 SITE PLAN
PV-3 ROOF PLAN & MODULES
PV-4 ELECTRICAL PLAN
PV-5 STRUCTURAL DETAIL
PV-6 ELECTRICAL LINE DIAGRAM
PV-7 WIRING CALCULATIONS
PV-8 LABELS
PV-9+ EQUIPMENT SPECIFICATIONS

SIGNATURE

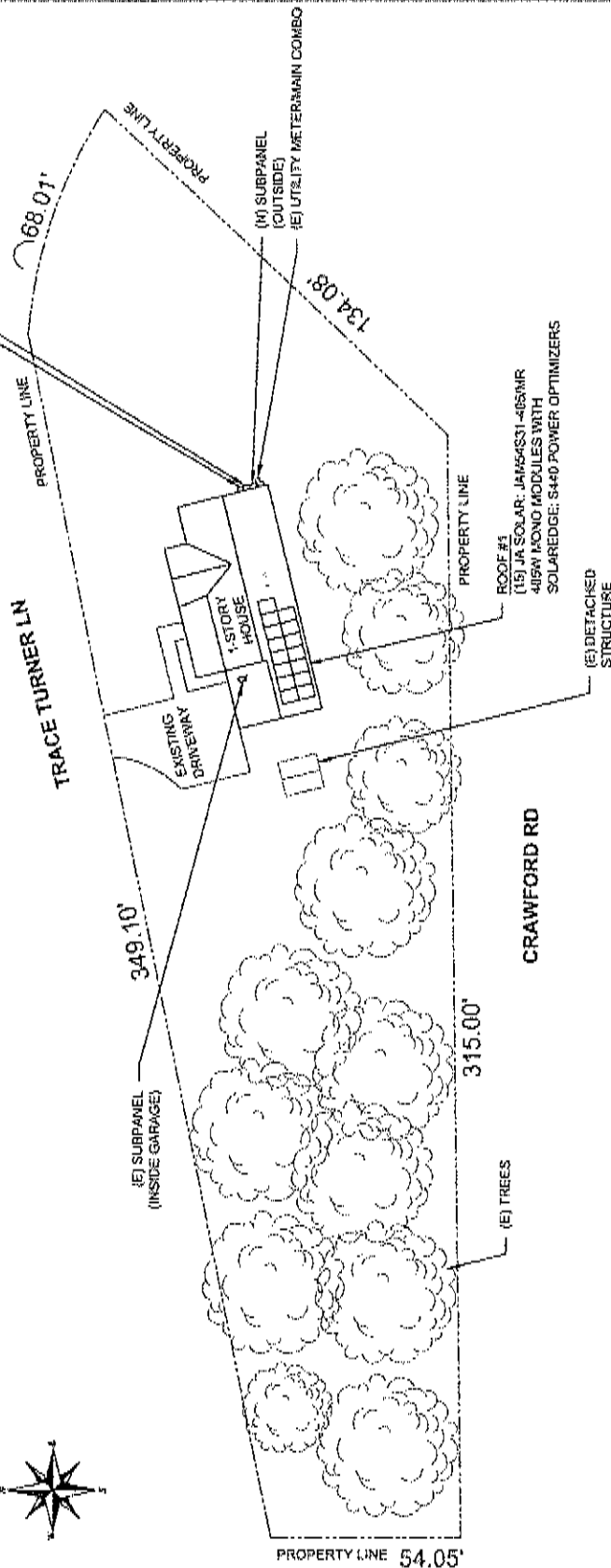
PROJECT DESCRIPTION:

15 X JA SOLAR: JAMS4S31-405MR 405W MONO MODULES
 ROOF MOUNTED SOLAR PHOTOVOLTAIC MODULES
 DC SYSTEM SIZE: 6.975 KW DC
 AC SYSTEM SIZE: 5.700 KW AC

EQUIPMENT SUMMARY

15 JA SOLAR: JAMS4S31-405MR 405W MONO MODULES
 15 SOLAREGE: S440 POWER OPTIMIZERS
 01 SOLAREGE: SE5700H-US (240V/5700W) INVERTER
 ROOF ARRAY AREA #1- 315.15 SQ. FT.

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



TOP TIER
 SOLAR SOLUTIONS

TOP TIER SOLAR SOLUTIONS
 1530 CENTER PARK DR #2011,
 CHARLOTTE, NC 28217,
 UNITED STATES

REVISIONS	DATE	BY
DESCRIPTION	DATE	BY
INITIAL DESIGN		



STRUCTURAL ONLY
 2/26/2025

PROJECT NAME & ADDRESS

JAMES CASSIDY
 RESIDENCE
 35 TRACE TURNER LN,
 COATS, NC 27521

DRAWN BY
 ESR

SHEET NAME

SITE PLAN

SHEET SIZE
 ANSI B
 11" X 17"

SHEET NUMBER
 PV-2

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

1 SITE PLAN

SCALE: 1/32" = 1'-0"

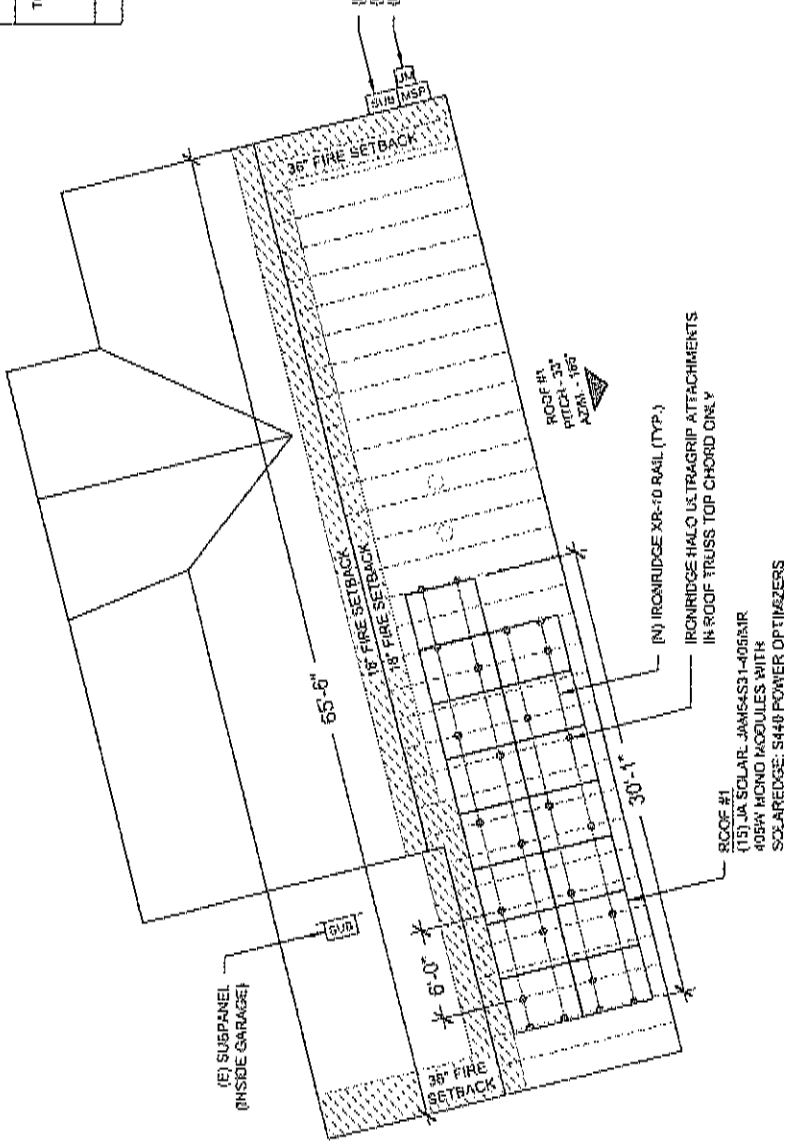
MODULE TYPE, DIMENSIONS & WEIGHT

NUMBER OF MODULES = 15 MODULES
MODULE TYPE = JA SOLAR JAM4S31-405MR 405W MONO MODULES
MODULE WEIGHT = 47.35 LBS / 21.5 kg
MODULE DIMENSIONS = 67.79" x 44.65" = 21.01 SF



ROOF DESCRIPTION				
ROOF TYPE	ASPHALT SHINGLE			
ROOF LAYER	1 LAYER			
ROOF	4 CF MODULES	ROOF PITCH	TRUSS SIZE	TRUSS SPACING
#1	15	3:12	27x5	24"

ARRAY AREA & ROOF AREA CALC'S			
TOTAL PV ARRAY AREA (SQ. FT.)	TOTAL ROOF AREA (SQ. FT.)	ROOF AREA COVERED BY ARRAY (%)	
315.15	1528.83	15	



LEGEND

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

1 | ROOF PLAN & MODULES

PV-3 SCALE: 1/8" = 1'-0"

TOP TIER

TOP TIER SOLAR SOLUTIONS
1530 CENTER PARK DR #2011,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS	
DESCRIPTION	DATE
FINAL DESIGN	02/28/2025



STRUCTURAL ONLY
2/28/2025

PROJECT NAME & ADDRESS

JAMES CASSIDY
RESIDENCE
35 TRACE TURNER LN,
COATS, NC 27521

DRAWN BY
ESR

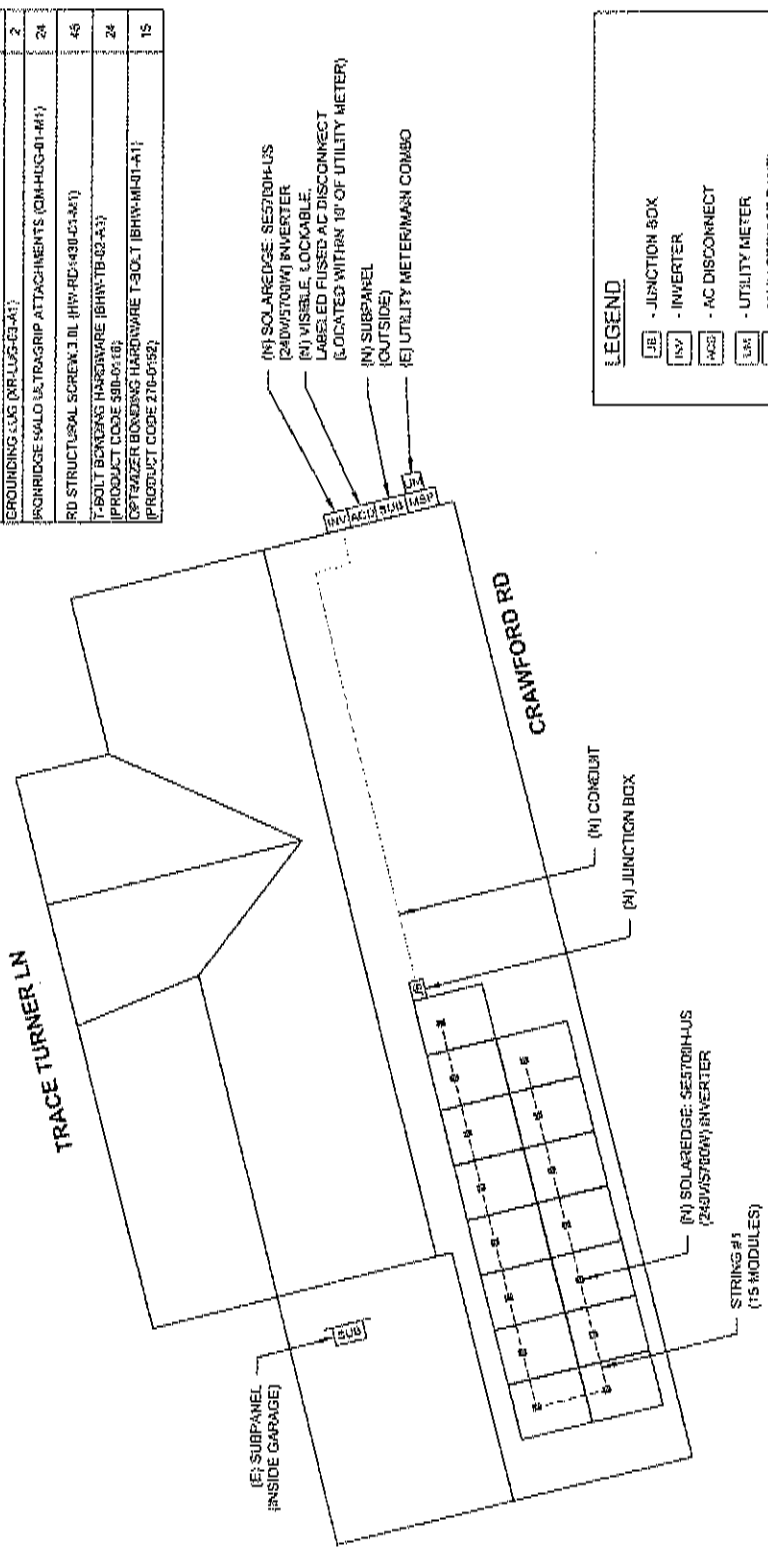
SHEET NAME
ROOF PLAN &
MODULES

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-3

DC SYSTEM SIZE: 6.075 KW DC
AC SYSTEM SIZE: 5.700 KW AC
(1) JA SOLAR: JAM64S31-405NMR 105W MONO MODULES
WITH (1) SOLAREDGE: S65700H-US 240V/5750VA INVERTER
LOCATED UNDER EACH PANEL AND
(1) SOLAREDGE: S65700H-US 240V/5750VA INVERTER

STRING LEGENDS
----- STRING #1



BILL OF MATERIALS		
EQUIPMENT DESCRIPTION	QTY	
SOLAR PV MODULES: JA SOLAR: JAM64S31-405NMR 105W MODULE	15	
OPTIMIZERS: SOLAREDGE: S65700H-US 240V/5750VA	15	
INVERTER: SOLAREDGE: S65700H-US 240V/5750VA	01	
JUNCTION BOX: JUNCTION BOX 1/2 174T	1	
NEMA 3R CSA C22.2 NO.250	1	
AC DISCONNECT: FUSED AC DISCONNECT, 60A FUSED	1	
(2) 30A FUSES 240V NEMA 3R UL LISTED	10	
BRIDGE: XR10 RAIL (RAIL 12" (34 FEET) CLEAR) (XR-10-105A)	6	
BONDED SPLICE: XR10 (XR10-BOSS-01-M1)	26	
UNIVERSAL MODULE CLAMP: CLEAR (UFO-CL-01-M1)	6	
END FASTENING OBJECT (END CLAMP, 30-40MM) MILL	2	
GROUNDING BUS (XR10-GB-01-M1)	24	
BRIDGE W/ALU UL TRAGRIP ATTACHMENTS (QIM-HUG-01-M1)	45	
RD STRUCTURAL SCREW 3 DL (HHW-RD-1430-01-M1)	24	
T-BOLT BONDING HARDWARE (BHW-TB-02-A3)	24	
OPTIMIZER BONDING HARDWARE T-SOLT (BHW-M1-01-A1)	15	
(PRODUCT CODE 270-0192)		

TOP TIER

SOLAR SOLUTIONS

TOP TIER SOLAR SOLUTIONS
1530 CENTER PARK DR ES21L
CHARLOTTE, NC 28217
UNITED STATES

REVISIONS	
DESCRIPTION	DATE
REV	DATE
001	07/23/23

PROJECT NAME & ADDRESS
JAMES CASSIDY
RESIDENCE
35 TRACE TURNER LN.
COATS, NC 27521

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

MSPP

MAIN SERVICE PANEL

SUBP

SUB PANEL

VENT, ATTIC FAN (ROOF OBSTRUCTION)

ROOF ATTACHMENT

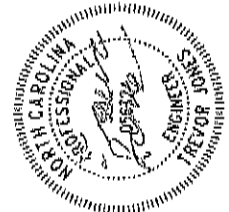
TRUSS

CONDUIT

TOP TIER

TOP TIER SOLAR SOLUTIONS
1530 CENTER PARK DR #2311,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS		
REVISION	DATE	BY



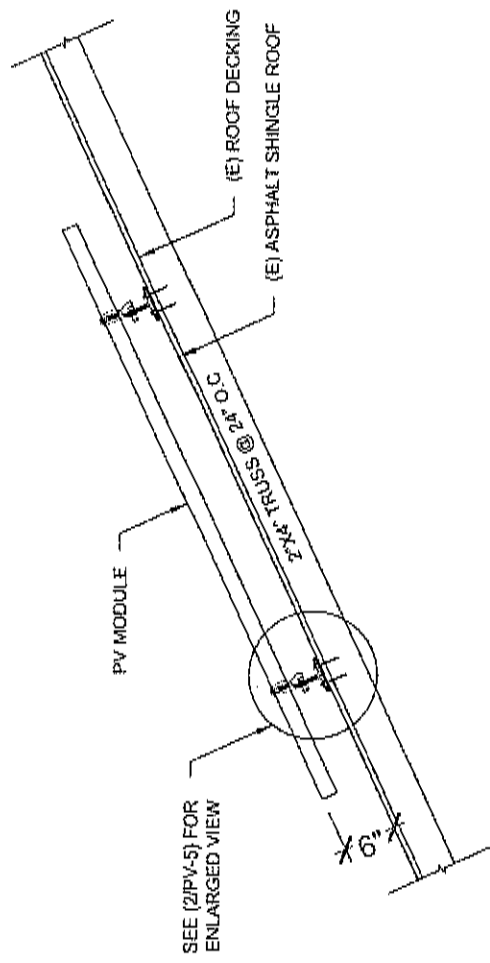
STRUCTURAL ONLY
2/26/2025

JAMES CASSIDY
RESIDENCE
36 TRACE TURNER LN,
COATS, NC 27621

DRAWN BY
ESR
SHEET NAME
STRUCTURAL DETAIL

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-5

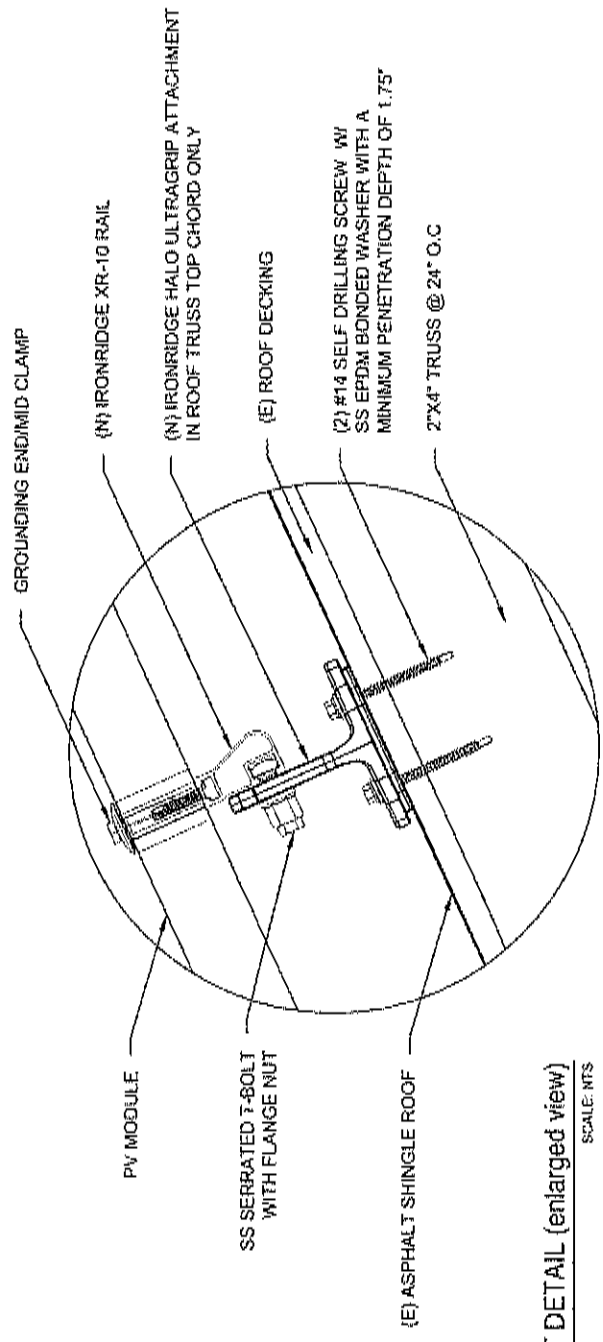


SEE (2/PV-5) FOR
ENLARGED VIEW

1 | STRUCTURAL ATTACHMENT (Side view)

PV-5

SCALE: N.T.S.



2 | ATTACHMENT DETAIL (enlarged view)

PV-5

SCALE: N.T.S.

TOP TIER

TOP TIER SOLAR SOLUTIONS
1539 CENTER PARK CR #2311,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	02/20/2025	

PROJECT NAME & ADDRESS

JAMES CASSIDY
RESIDENCE
35 TRACE TURNER LN,
COATS, NC 27521

DRAWN BY

ESR

SHEET NAME

WIRING CALCULATIONS

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-7

AMBIENT TEMPERATURE SPECS

AMBIENT TEMP (HIGH TEMP 2N)	30°
SECOND LOW TEMPERATURE	4°
MOODLE TEMPERATURE COEFFICIENT OF Voc	-0.275%/°C

INVERTER SPECIFICATIONS

MANUFACTURER / MODEL #	SOLAREDGE: BE570H-US (240V/570VA)
MAXIMUM AC POWER	5700W
NOMINAL OUTPUT VOLTAGE	240VAC
NOMINAL OUTPUT CURRENT	24.00A

PERCENT OF VALUES

NUMBER OF CURRENT CARRYING CONDUCTORS R.E.M.T	4-6
7-8	10-20
50	

SOLAR MODULE SPECIFICATIONS

MANUFACTURER / MODEL #	JIA SOLAR: JAUS45S1-456WR 408W MONOCIDE
VMP	51.25V
IMP	17.23A
VOC	57.98V
ISC	17.23A
TEMP COEFF. VOC	-0.275%/°C
MODULE DIMENSION	37.78" L x 44.65" W x 1.15" D (946mm)

DC FEEDER CALCULATIONS

CIRCUIT ORIGIN	CIRCUIT DESTINATION	VOLTAGE (V)	FEEDER SIZE (AWG)	FEEDER LENGTH (FEET)	CONDUCTOR RESISTANCE (OHM/FT)	VOLTAGE DROP AT FEEDER (V)	CONDUCTOR SIZE (AWG)	FEEDER LENGTH (FEET)	CONDUCTOR RESISTANCE (OHM/FT)	VOLTAGE DROP AT FEEDER (V)	CONDUCTOR SIZE (AWG)
STRING 1	INVERTER	380	15.00	18.75	29	0.001	10	18.75	29	0.001	10
JUNCTION BOX	INVERTER	380	15.00	18.75	29	0.001	10	18.75	29	0.001	10

AC FEEDER CALCULATIONS

CIRCUIT ORIGIN	CIRCUIT DESTINATION	VOLTAGE (V)	FEEDER SIZE (AWG)	FEEDER LENGTH (FEET)	CONDUCTOR RESISTANCE (OHM/FT)	VOLTAGE DROP AT FEEDER (V)	CONDUCTOR SIZE (AWG)	FEEDER LENGTH (FEET)	CONDUCTOR RESISTANCE (OHM/FT)	VOLTAGE DROP AT FEEDER (V)	CONDUCTOR SIZE (AWG)
INVERTER	AC DISCONNECT	240	10	10	1.24	0.001	10	10	1.24	0.001	10
SUPPANEL	METER WASH DOWN	120	14	45	0.001	0.001	14	45	0.001	0.001	14

ELECTRICAL NOTES

1. ALL EQUIPMENT TO BE LISTED BY UL OR OTHER MRTL, AND LABELED FOR ITS APPLICATION.
2. ALL CONDUCTORS SHALL BE RATED UP TO 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 WEBB LUG OR ILSCO GBL-40BT 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.

PHOTOVOLTAIC POWER SOURCE

EVERY 10' ON CONDUIT & ENCLOSURES

LABEL - 1:
LABEL LOCATION:
SOURCE UTILITY GRID AND
PV SOLAR ELECTRIC SYSTEM
SOURCE: JUNCTION BOX
CODE REF: NEC 690.51 (B)(2)

WARNING

ELECTRIC SHOCK HAZARD

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

LABEL - 2:
LABEL LOCATION:
MAIN SERVICE PANEL
CODE REF: NEC 690.51 (B)(3)

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 690.51

SOLAR PV BREAKER
BREAKER IS BACKED
DO NOT RELOCATE

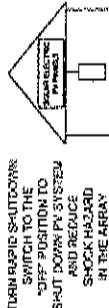
LABEL - 4:
LABEL LOCATION:
MAIN SERVICE PANEL
CODE REF: NEC 705.12(C) & NEC 690.51

WARNING

POWER SOURCE OUTPUT
CONNECTION. DO NOT
RELOCATE THIS
OVERCURRENT DEVICE

LABEL - 6:
LABEL LOCATION:
MAIN SERVICE PANEL (ONLY IF SOLAR IS BACK-FED)
SUBPANEL (ONLY IF SOLAR IS BACK-FED)
CODE REF: NEC 705.12(B)(2)

SOLAR PV SYSTEM EQUIPPED
WITH RAPID SHUTDOWN



LABEL - 5:
LABEL LOCATION:
AC DISCONNECT
CODE REF: NEC 690.56(C)(3)(II)

RAPID SHUTDOWN SWITCH
FOR SOLAR PV SYSTEM

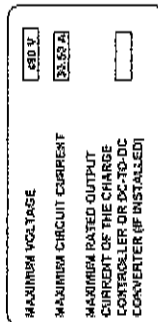
LABEL - 7:
LABEL LOCATION:
AC DISCONNECT
MAIN SERVICE PANEL (ONLY IF SOLAR IS BACK-FED)
CODE REF: NEC 690.56(C)(3)

DC DISCONNECT

LABEL - 8:
LABEL LOCATION:
INVERTER
CODE REF: NEC 690.12(B)



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



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 #2011
CHARLOTTE, NC 28217
UNITED STATES

REVISIONS	
REVISION	DATE
INITIAL DESIGN	REVISIONS

PROJECT NAME & ADDRESS

JAMES CASSIDY
RESIDENCE
35 TRACE TURNER LN,
COATS, NC 27521

DRAWN BY
ESR

SHEET NAME
LABELS

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-8

Harvest the Sunshine

DEEP BLUE SUNRAY

405W/MBB
Half-cell Black Module
JAM54S31 380-405MIR

Mono

Introduction

Introducing the JAM54S31 380-405MIR Mono Half-cell Black Module, a high-performance solar module designed for maximum energy output and long-term reliability. This module is ideal for residential and commercial applications, offering a sleek, modern look and superior performance in various weather conditions.



Higher output power



Less shading and lower resistive loss



Lower LCOE



Better mechanical loading tolerance

Superior Warranty

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

Comprehensive Certificates

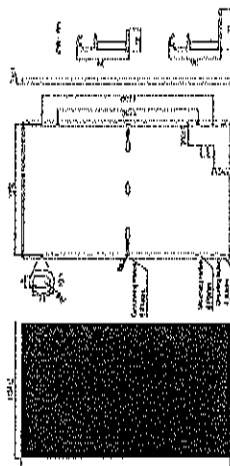
- IEC 61215, IEC 61730, UL 61010, UL 61730
- ISO 9001: 2015 Quality management system
- ISO 14001: 2015 Environmental management system
- ISO 45001: 2018 Occupational health and safety management system
- IEC TS 62641: 2018 Immune performance (IP) modules - Guidelines for improved performance in PV module design, installation and life cycle

High power density • Standard module rear power warranty

JASOLAR

JASOLAR

MECHANICAL DIAGRAMS



JAM54S31 380-405MIR

SPECIFICATIONS

Cell	Monocrystalline
Weight	21.5kg/47.5lb
Dimensions	1722mm x 1134mm x 30mm
Cable-Outlet Section Size	4mm - 6mm (1/8" - 1/4")
No. of Cells	108 (6x18)
Cell Voltage	18V (0.5V/cell)
Cell Length	180mm (7.09in)
Cell Width	180mm (7.09in)
Cell Area	32400mm² (3.99m²)
Cell Efficiency	20.5%

ELECTRICAL PARAMETERS AT STC

TYPE	JAM54S31 380-405MIR	JAM54S31 405W/MBB	JAM54S31 405W/MBB
Rated Maximum Power (P _{max}) [W]	380	380	405
Open Circuit Voltage (V _{oc}) [V]	39.11	39.11	39.11
Maximum Power Voltage (V _{mp}) [V]	30.25	30.25	30.25
Short Circuit Current (I _{sc}) [A]	13.44	13.44	13.44
Maximum Power Current (I _{mp}) [A]	12.55	12.55	12.55
Module Efficiency [%]	19.5	19.5	20.5
Power Tolerance	±2%	±2%	±2%
Temperature Coefficient of P _{max} [1/°C]	-0.415	-0.415	-0.415
Temperature Coefficient of V _{oc} [1/°C]	-0.275	-0.275	-0.275
Temperature Coefficient of I _{sc} [1/°C]	0.005	0.005	0.005

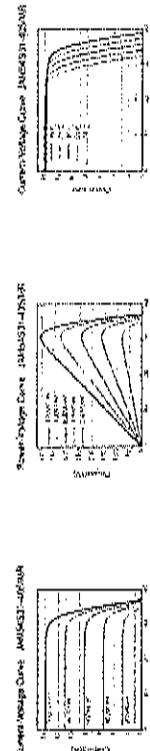
Standard Test Conditions: 1000W/m², 25°C, AM1.5G

ELECTRICAL PARAMETERS AT NOCT

TYPE	JAM54S31 380-405MIR	JAM54S31 405W/MBB	JAM54S31 405W/MBB
Rated Maximum Power (P _{max}) [W]	358	358	382
Open Circuit Voltage (V _{oc}) [V]	39.11	39.11	39.11
Maximum Power Voltage (V _{mp}) [V]	30.25	30.25	30.25
Short Circuit Current (I _{sc}) [A]	13.44	13.44	13.44
Maximum Power Current (I _{mp}) [A]	12.55	12.55	12.55
Module Efficiency [%]	19.5	19.5	20.5
Power Tolerance	±2%	±2%	±2%
Temperature Coefficient of P _{max} [1/°C]	-0.415	-0.415	-0.415
Temperature Coefficient of V _{oc} [1/°C]	-0.275	-0.275	-0.275
Temperature Coefficient of I _{sc} [1/°C]	0.005	0.005	0.005

Standard Test Conditions: 1000W/m², 45°C, AM1.5G

CHARACTERISTICS



Premium Cells, Premium Benefits

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1530 CENTER PARK DR #2011,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS	DATE	REV
DESCRIPTION	15/05/2021	1

PROJECT NAME & ADDRESS

JAMES CASSIDY
RESIDENCE
35 TRACE TURNER LN,
COATS, NC 27521

DRAWN BY
ESR

SHEET NAME
EQUIPMENT
SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-9

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

500	51-8280119	50-9623712	50-9623713	51-8280120	50-9623715	51-8280121
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TOP TIER SOLAR SOLUTIONS
1500 CENTER PARK DR #2511,
CHARLOTTE, NC 28207,
UNITED STATES

REVISIONS		
DESCRIPTION	DATE	REV
ORIGINAL DESIGN	10/25/72	

PROJECT NAME & ADDRESS

JAMES CASSIDY
RESIDENCE
35 TRACE TURNER LN,
COATS, NC 27521

ABSTRACT

SHEET NAME
EQUIPMENT
SPECIFICATION

ANSI B
11" X 17"
SHEET SIZE

PV-12



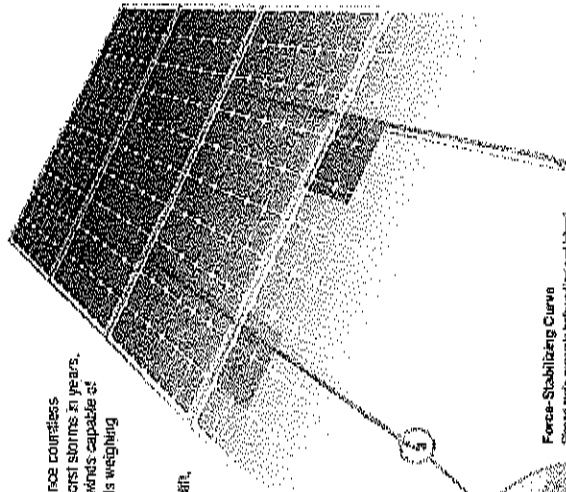
IRONRIDGE

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 tipping 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, braced 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 Curves

Sloped rails provide both vertical and lateral loads on securing clips which can cause them to bend and twist. The curved shape of XR Rails® is specially designed to increase strength in both directions while holding the railing. The unique design allows for easy installation during adverse weather and a longer system lifetime.

Compatible with Flat & Pitched Roofs

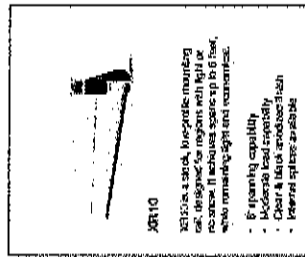
XR Rails® are compatible with a range of flat and pitched roof attachment methods.

Corrosion-Resistant Materials

XR Rails® are made of 6061-oxide aluminum which is highly resistant to corrosion and structural corrosion, while also providing a more attractive appearance.

XR Rail® Family

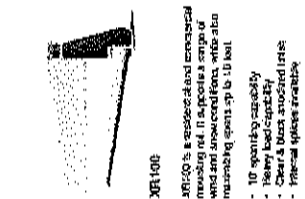
The XR Rail® Family offers the strength of a curved rail in three targeted sizes. Each size supports specific design loads, while minimizing material costs. Depending on your location, there is an XR Rail® to match.



XR110

XR110 is a curved, hydrostatic mounting rail, designed for regions with light to moderate wind and snow conditions, while also allowing spans up to 16 feet.

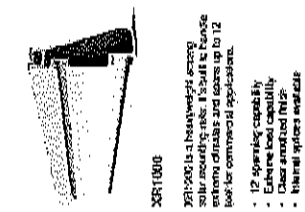
- 6" spanning capability
- Moderate load capacity
- Clear & black anodized finish
- Internal splices available



XR100

XR100 is a curved and commercial mounting rail. It supports a range of wind and snow conditions, while also allowing spans up to 16 feet.

- 10" spanning capability
- Heavy load capacity
- Clear & black anodized finish
- Internal splices available



XR1000

XR1000 is a heavy-duty, commercial solar mounting rail. It's built to handle extreme winds and snows up to 12 feet for commercial applications.

- 12" spanning capability
- Extra heavy load capacity
- 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 Push Mount, Roof Zones 1 & 2a, Exposure B, Roof Slope of 8 to 20 degrees and Mean Building Height of 30 ft. Visit Ironridge.com for detailed certification letters.

	90	120	140	160	90	120	140	160	90	120	140	160	90	120	140	160
None																
20																
30																
40																
80																
120																

*Values shown are for standard conditions. See engineering codes for more information on actual design practices.

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CHARLOTTE, NC 28217
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REVISIONS	DATE	BY
REVISION	DATE	BY
REVISION	DATE	BY

PROJECT NAME & ADDRESS

JAMES CASSIDY
RESIDENCE
35 TRACE TURNER LN,
COATS, NC 27521

DRAWN BY

ESR

SHEET NAME EQUIPMENT SPECIFICATION

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-13



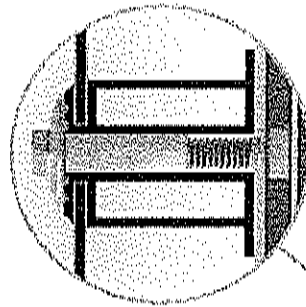
UFO® Family of Components

Simplified Grounding for Every Application

The UFO® family of components eliminates the need for separate grounding hardware by bonding solar modules directly to IronRidge® XTR 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.

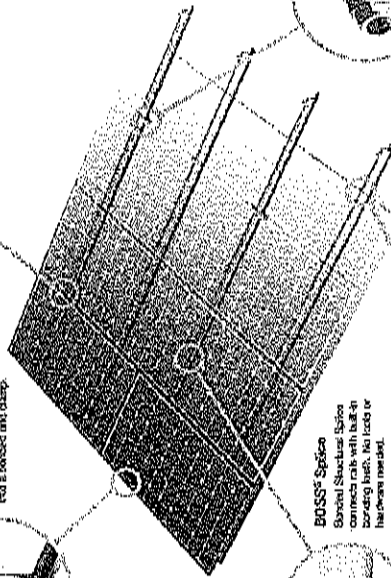
Only for installation and use with IronRidge products in accord with official instructions. See IronRidge.com/UFO



Universal Fastening Object (UFO)
The UFO® securely bonds solar modules to XTR Rails®. Locks are mounted and tightened, and can fit a wide range of module heights.



Stopper Sleeve
The Stopper Sleeve secures the UFO®, securing it to the rail and clamp.

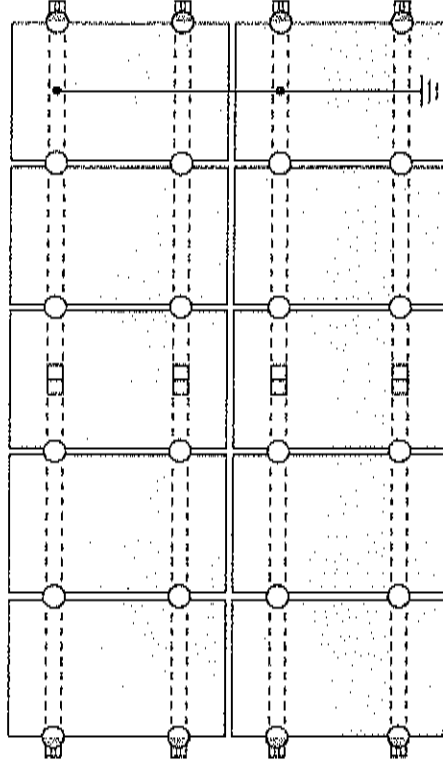


BOSS® Splice
Special Structure Splice connects rails with built-in bonding paths. No tools or hardware needed.

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

Bonded Attachments
The bonding our electric and mechanical connections over an extended period of time in extreme outdoor environments.

System Diagram



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

Approved Etichouse 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 Inc.

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

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.		

TOP TIER
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TOP TIER SOLAR SOLUTIONS
1330 CENTER PARK DR #2211,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS	DATE	REV
DESCRIPTION		
SHEET DESIGN		
QUANTITY		

PROJECT NAME & ADDRESS

JAMES CASSIDY
RESIDENCE
35 TRACH TURNER LN,
COATS, NC 27521

DRAWN BY
ESR

SHEET NAME
EQUIPMENT
SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-14

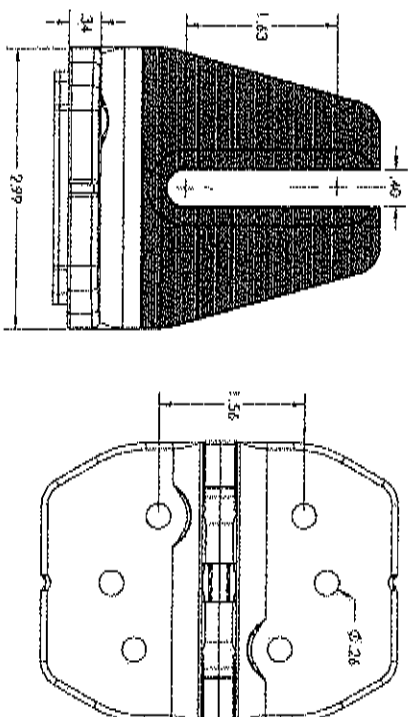
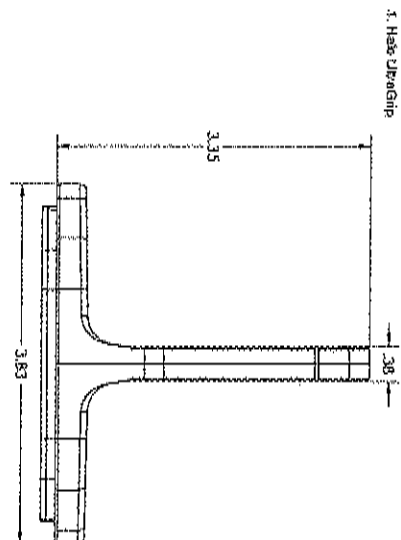
QuickMount® Halo UltraGrip



PART NUMBER	DESCRIPTION
CM-HUG-Q1-M1	Holo UltraGrip - M1
CM-HUG-Q1-B1	Holo UltraGrip - Black

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DATE: 01/01/2015 15:04



Property	Value
Material	3080 Series Aluminum
Finish	Mile or Black

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QUESTIONS FOR THE

TOP TIER

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

REVISIONS		
DESCRIPTION	DATE	PER
REVIEW DESIGN	12/20/2013	

PROJECT NAME & ADDRESS

JAMES CASSIDY
RESIDENCE

35 TRACE TURNER LN,
COATS, NC 27521

CRUISE BY

三

SHEET 204ME

SPECIFICATION

SHEET SIZE

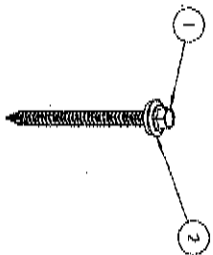
ANSI B
11" X 17"

Sheet Number



IRONRIDGE

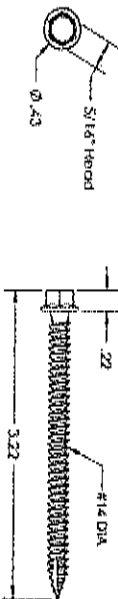
QuickMount[®] RD Structural Screw



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

PART NUMBER	DESCRIPTION
RD-1420-01-A15	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

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Q418-1420-01-A15 Q418-1420-01-A15

TOP TIER
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TOP TIER SOLAR SOLUTIONS
1530 CENTER PARK CR #2071
CHARLOTTE, NC 28217
UNITED STATES

REVISIONS	DATE	REV
DESCRIPTION		
INITIAL DESCRIPTION	08/26/2016	

PROJECT NAME & ADDRESS

JAMES CASSIDY
RESIDENCE

35 TRACE TURNER LN,
COAT'S, NC 27521

DRAWN BY
ESR

SHEET NAME
EQUIPMENT
SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-16

EZ SOLAR
PHONE: 336-202-4150
WWW.EZSOLARPRODUCTS.COM

PHONE: 336-202-4150
WWW.EZSOLARPRODUCTS.COM

EZ SOLAR
PHONE: 336-202-4150
WWW.EZSOLARPRODUCTS.COM

PHONE: 336-202-4150
WWW.EZSOLARPRODUCTS.COM

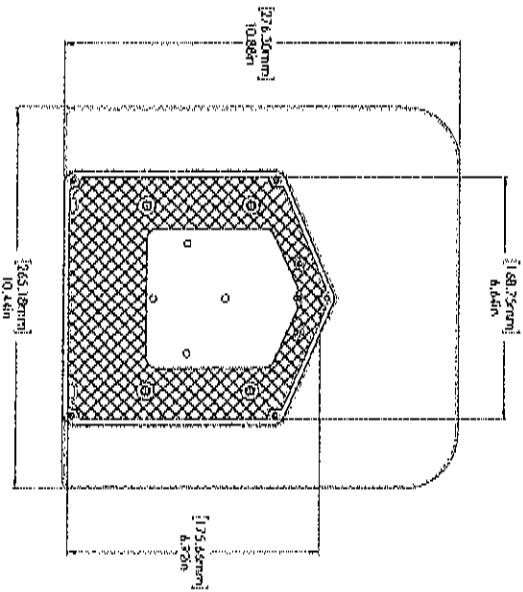
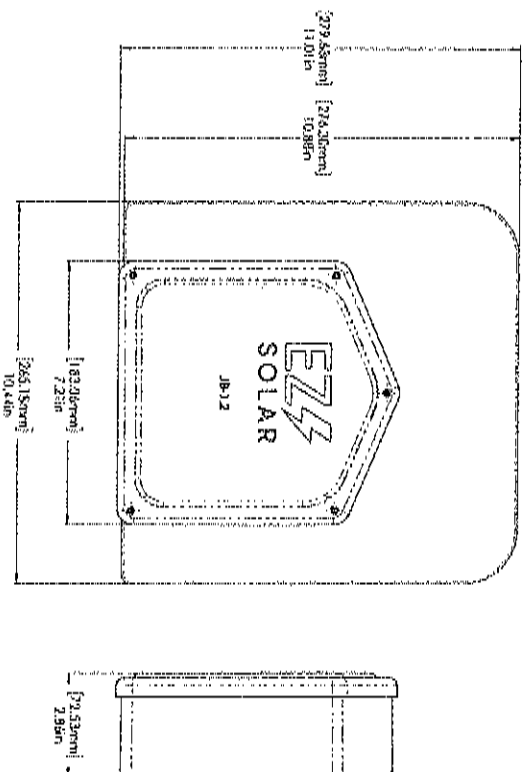
ITEM NO.	PART NUMBER	DESCRIPTION	QTY
1	5-12 BOLT	RAVENSPOURTE MOUNTING BRACKET	1
2	JB-12 LUG	RAVENSPOURTE MOUNTING BRACKET	1
3	4-10 X 1-1/4 PHILIPS PANEL SCREW		6
4	4-3/4 PHILIPS PANEL SCREW		6

SIZE	DESCRIPTION	REV
B	JB-12	
STATE 12	WEIGHT 145 LBS	SHEET 1 OF 3
TYPE SPECIFICATION	15-20 LBS	
IDENTIFICATION	UL 1741, NEMA 3R CSA C22.2 NO. 280	
WEIGHT	145 LBS	

SIZE	DESCRIPTION	REV
B	JB-12	
STATE 12	WEIGHT 145 LBS	SHEET 1 OF 3

REVISIONS	DATE	REV
DESCRIPTION		
INITIAL DESIGN		

TOP TIER
SOLAR SOLUTIONS
1530 CENTER PARK DR #2341
CHARLOTTE, NC 28217
UNITED STATES



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PROJECT NAME & ADDRESS	
JAMES CASSIDY RESIDENCE 35 TRACE TURNER LN, COATS, NC 27521	
DESIGN BY ESR	
SHEET TITLE EQUIPMENT SPECIFICATION	
SHEET SIZE ANSI B 11" X 17"	
SHEET NUMBER PV-17	