GARDNER RESIDENCE

13.940 kW DC STC - 9.860 kW AC PV SYSTEM

102 SW JOSHUA DR,
LEES SUMMIT, MO 64081

PROJECT DESCRIPTION:

34x410 SOLAREVER: SE-182*91-410M-108N (410W) MODULES
ROOF MOUNTED SOLAR PHOTOVOLTAIC MODULES

SYSTEM SIZE 13.940 KW DC STC - 9.860 KW AC
ARRAY AREA #1: 147.28 SQ. FT.
ARRAY AREA #2: 231.44 SQ. FT.
ARRAY AREA #3: 273.52 SQ. FT.
ARRAY AREA #4: 63.12 SQ. FT.

EQUIPMENT SUMMARY
34 SOLAREVER: SE-182*91-410M-108N (410W) MODULES
34 ENPHASE: IQ8PLUS-72-2-US MICROINVERTERS

RACKING: IRONRIDGE XR10
ATTACHMENT: SUNMODO NANO MOUNT

DESIGN CRITERIA:

WIND SPEED (ULT):	115 MPH
WIND SPEED (ASD):	89 MPH
SNOW LOAD:	20 PSF
RISK CATEGORY:	II
EXPOSURE:	B
SEISMIC LOAD:	187.27 LBS

CODES AND STANDARDS

GOVERNING CODES:
2018 INTERNATIONAL BUILDING CODE AND AMENDMENTS
2018 INTERNATIONAL RESIDENTIAL CODE AND AMENDMENTS
2018 INTERNATIONAL PLUMBING CODE AND AMENDMENTS
2018 INTERNATIONAL MECHANICAL CODE AND AMENDMENTS
2018 INTERNATIONAL FIRE CODE AND AMENDMENTS
2017 NATIONAL ELECTRICAL CODE AND AMENDMENTS
ASCE-7-10

REV.	DESIGNER	DATE	COMMENTS

STRUCTURAL CERTIFICATION:

I ERMOCRATES CASTILLO PE# 2021029136 AN ENGINEER LICENSED PURSUANT TO SECTION 327.392, CERTIFY THAT THE INSTALLATION OF THE MODULES IS IN COMPLIANCE WITH IBC 2018, CHAPTER 3. RESIDENTIAL STRUCTURE WILL SAFELY ACCOMMODATE WIND LATERAL AND UPLIFT FORCES, SNOW LOADS, AND EQUIPMENT DEAD LOADS.

ELECTRICAL CERTIFICATION:

I ERMOCRATES CASTILLO PE# 2021029136 AN ENGINEER LICENSED PURSUANT TO SECTION 327.392, CERTIFY THAT THE PV ELECTRICAL SYSTEM AND ELECTRICAL COMPONENTS ARE DESIGNED AND APPROVED USING THE STANDARDS STANDARDS CONTAINED IN THE 2018 INTERNATIONAL BUILDING CODE SECTION AND THE NEC 2017.

OWNER

GARDNER, MICHAEL

INSTALLER

CORVUS PRO SOLAR LLP
867 S Miller Ave,
Springfield, MO 65802
(573)-528-3375

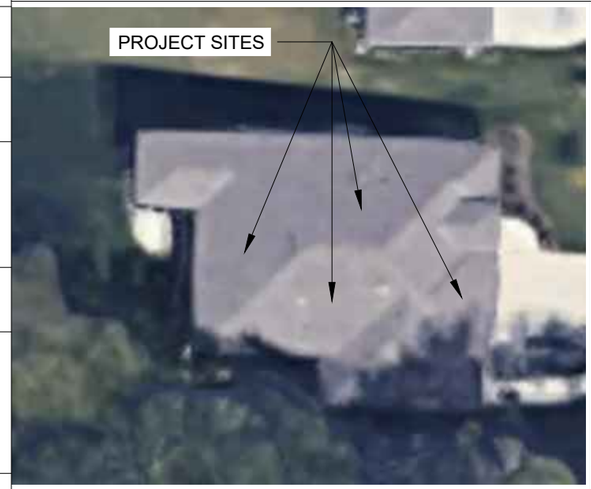
ENGINEER

Castillo Engineering Services LLC
620 N. Wymore Road, Suite 250, Maitland, FL 32751
TEL: (407) 289-2575

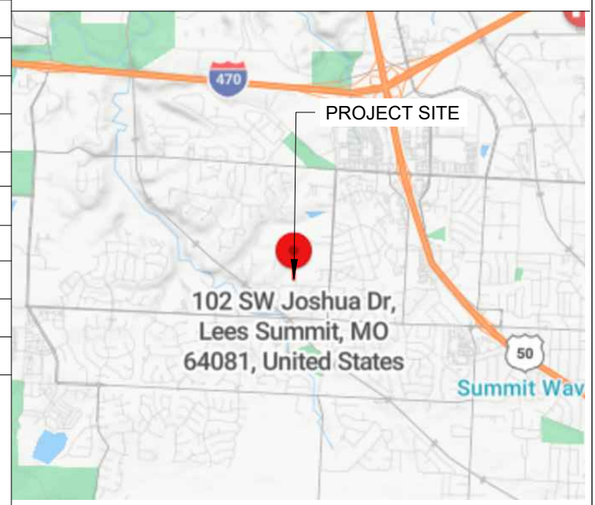
SHEET INDEX

SHEET #	SHEET DESCRIPTION
G-01	COVER SHEET
A-00	NOTES AND DESCRIPTION
A-01	ROOF PLAN
S-01	MODULE LAYOUT
S-02	ATTACHMENT DETAIL
S-02.1	STRUCTURE CALCULATION
E-01	ELECTRICAL LINE DIAGRAM
E-02	WIRING CALCULATIONS
E-03	SYSTEM LABELING
DS-01-07	DATA SHEETS

HOUSE PHOTO



VICINITY MAP



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ERMOCRATES E. CASTILLO -
MO PE# 2021029136

REVISIONS

DESCRIPTION	DATE	REV

PROJECT INSTALLER

CORVUS PRO SOLAR

Signature with Digital

STATE OF MISSOURI
ERMOCRATES CASTILLO
NUMBER PE-2021029136
PROFESSIONAL ENGINEER

Digitally signed by: Ermocrates E Castillo
Date: 2023.03.27 12:19:44

PROJECT NAME

GARDNER RESIDENCE
102 SW JOSHUA DR,
LEES SUMMIT, MO 64081

SHEET NAME
COVER SHEET

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
G-01

Symbols:

Section..... X / X-XX — Sheet where section is located

Elevation ..... X / X-XX — Detail ID Letter; Sheet where section is located

Detail ..... X / X-XX — Detail ID Letter; Sheet where section is located

Detail ..... (Enlarged Plan) X / X-XX — Detail ID Letter; Area to be enlarged; Sheet where section is located

Keyed Notes ..... 1 — Keyed note designation on applicable sheet

Ground Terminal .....

Grounding Point/rod....

Solar Panel ..... or 00 — Module with Source Circuit number

Combiner Box ..... CB

AC Disconnect ..... ACD

Main Distribution Panel ..... MDP

Fuse .....

Overcurrent Breaker ..

Inverter .....

Transformer .....

Automatic ..... Transfer Switch ATS

Vent, Attic fan (Roof obstruction)

PV Roof Attachment

Trusses

Conduit

Fire Access

Abbreviations:

AC	Alternating Current
ACD	AC Disconnect
APPROX	Approximate
AWG	American Wire Gauge
BAT	Battery
CB	Combiner Box
DC	Direct Current
DISC	Disconnect
(E)	Existing
EL	Elevation
EQ	Equal
GP	Generation Panel
JB	Junction Box
MCB	Main Combiner Box
MFR	Manufacturer
MID	Microgrid Interconnect Device
MIN	Minimum
MISC	Miscellaneous
MDP	Main Distribution Panel
(N)	New
NAVD	North American Vertical datum
OCPD	OverCurrent Protection Device
POCC	Point Of Common Coupling
PV	Photovoltaic
SF	Squarefoot/feet
STC	Standard Test Conditions
SD	Soladeck
TBD	To Be Determined
TYP	Typical
UNO	Unless Noted Otherwise
UM	Utility meter
VIF	Verify In Field
WP	Weather Proof

System Description

This system is a grid-tied, PV system, with PV generation consisting of 34x410 Solarever: SE-182*91-410M-108N (410W) Modules with a combined STC rated dc output power of 13,940W. The modules are connected into 34 ENPHASE: IQ8PLUS-72-2-US Microinverters 9,860W AC. The inverter has electronic maximum power point tracking to maximize energy captured by the PV modules. The inverter also has an internal ground fault detection and interruption device that is set to disconnect the array in the event that a ground fault that exceeds one ampere should occur. The inverter has DC and AC disconnect integrated system and labels are provided as required by the *National Electrical Code*.

When the sun is shining, power from the PV array is fed into the inverter, where it is converted from DC to AC. The inverter output is then used to contribute to the power requirements of the occupancy. If PV power meets the requirements of the loads of the occupancy, any remaining PV power is sold back to the utility. When utility power is available, but PV power is not available, building loads are supplied by the utility.

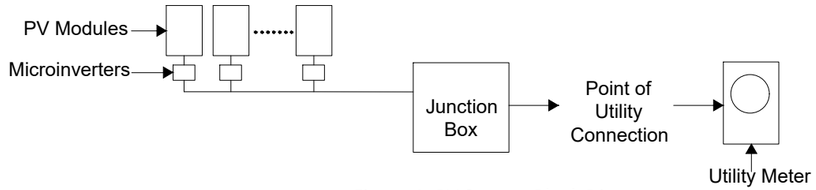


Figure 1: PV System Block Diagram

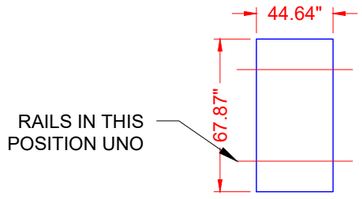
The inverter meets the requirements of IEEE 1547 and UL 1741.

FALL PROTECTION:
ANCHORAGES USED FOR ATTACHMENT OF PERSONAL FALL ARREST EQUIPMENT MUST BE INDEPENDENT OF ANY ANCHORAGE BEING USED TO SUPPORT OR SUSPEND PLATFORMS, AND CAPABLE OF SUPPORTING AT LEAST 5,000 POUNDS PER EMPLOYEE ATTACHED, OR MUST BE DESIGNED AND USED AS FOLLOWS:

- AS PART OF A COMPLETE PERSONAL FALL ARREST SYSTEM WHICH MAINTAINS A SAFETY FACTOR OF AT LEAST TWO.
- UNDER THE SUPERVISION OF A QUALIFIED PERSON

ADDITIONAL INFORMATION

- 29 CFR 1926 SUBPART M, FALL PROTECTION. OSHA STANDARD.
- 1926.502, FALL PROTECTION SYSTEMS CRITERIA AND PRACTICES
- 1926.502(D)(15)



SOLAREVER:
SE-182*91-410M-108N
(410W) MODULES

ALLOWABLE/DESIGN PRESSURE	PSF
DOWN PRESSURE	75
UPLIFT PRESSURE, 2 RAILS	33.4

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REVISIONS

DESCRIPTION	DATE	REV

PROJECT INSTALLER

CORVUS PRO SOLAR

Signature with seal
STATE OF MISSOURI
ERMOCRATES CASTILLO
NUMBER PE-2021029136
PROFESSIONAL ENGINEER
Digitally signed by: Ermocrates E Castillo
Date: 2023.03.27 12:19:45

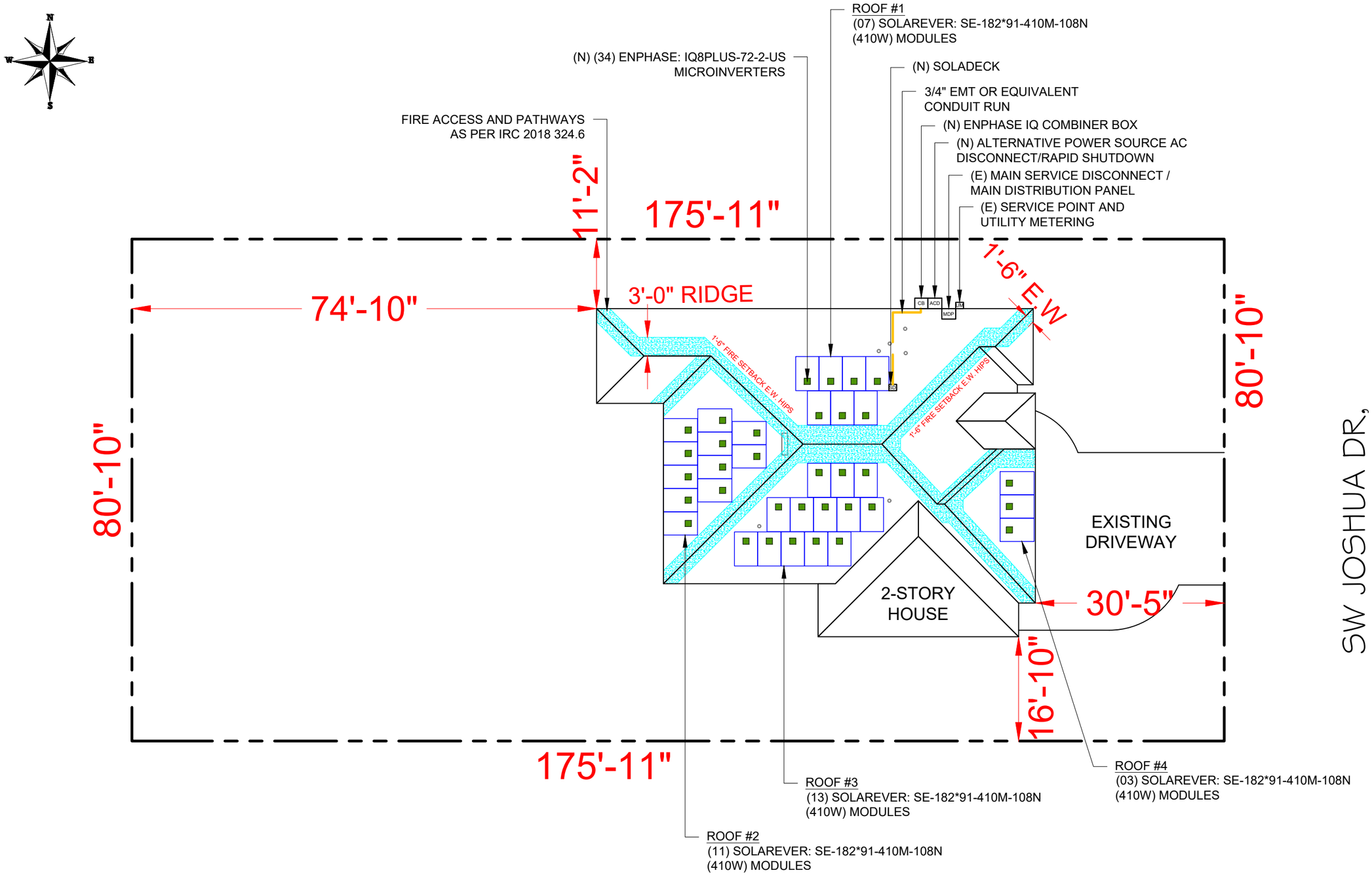
PROJECT NAME

GARDNER RESIDENCE
102 SW JOSHUA DR,
LEES SUMMIT, MO 64081

SHEET NAME
NOTES AND DESCRIPTION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
A-00



1 A-01 ROOF PLAN WITH FIRE SETBACK AND PROPERTY LINES SCALE: 1/16" = 1'-0"

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SHEET NAME
ROOF PLAN

SHEET SIZE
ANSI B
11" X 17"

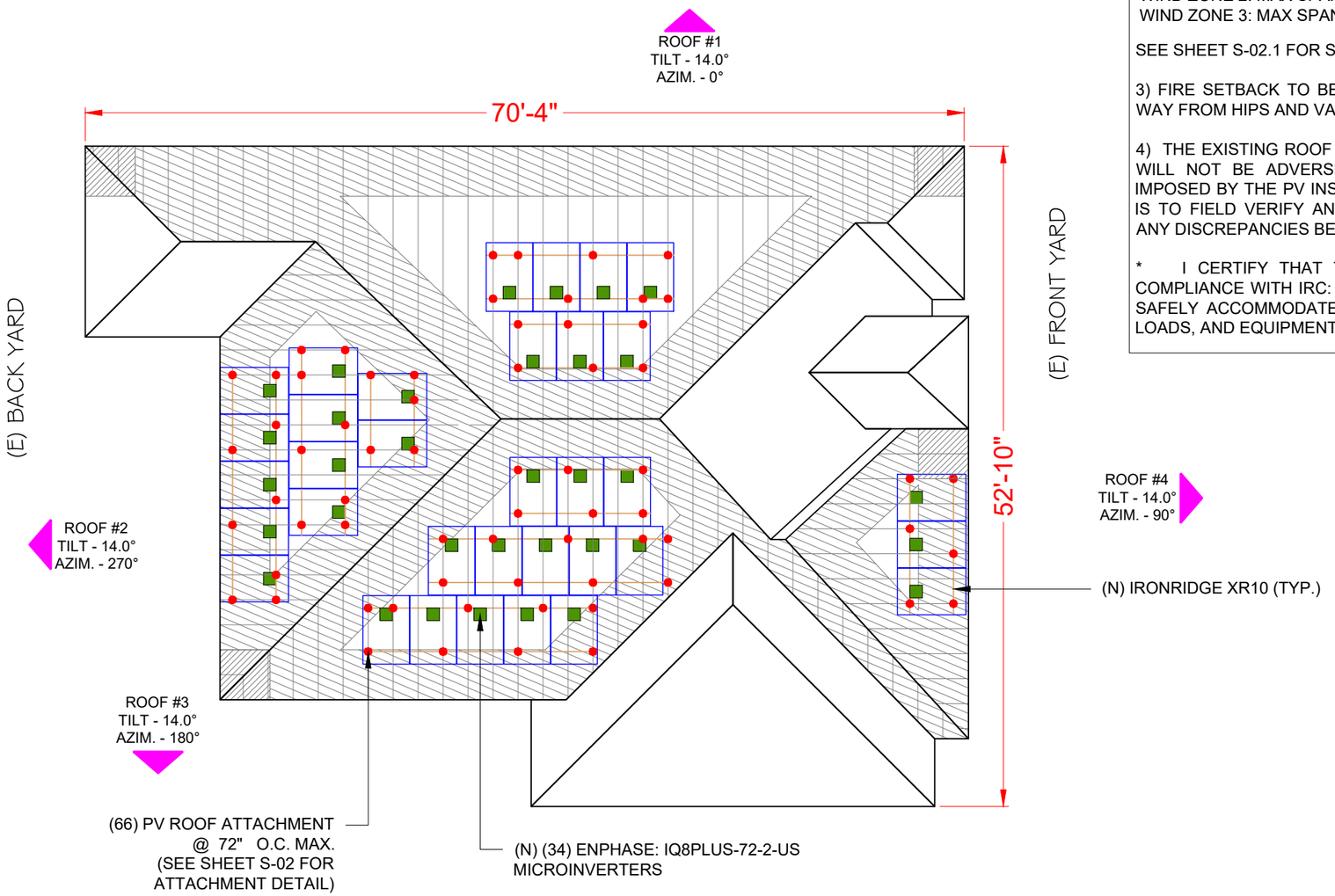
SHEET NUMBER
A-01

MODULE TYPE, DIMENSIONS & WEIGHT

NUMBER OF MODULES = 34 MODULES
MODULE TYPE = SOLAREVER: SE-182*91-410M-108N (410W) MODULES
MODULE WEIGHT = 47.40 LBS / 21.5 KG.
MODULE DIMENSIONS = 67.87" x 44.64" = 21.04 SF
UNIT WEIGHT OF ARRAY = 2.25 PSF

ARRAY AREA & ROOF AREA CALC'S

ROOF	ROOF TYPE	NO. OF MODULES	ARRAY AREA (sq.Ft.)	ROOF AREA (Sq. Ft.)	ROOF AREA COVERED BY ARRAY (%)	TILT	AZIMUTH	TRUSS SIZE	TRUSS SPACING
#1	ASPHALT SHINGLE	7	147.28	861.15	17.10	14.0°	0°	2"X4"	24" o.c.
#2	ASPHALT SHINGLE	11	231.44	437.34	52.92	14.0°	270°	2"X4"	24" o.c.
#3	ASPHALT SHINGLE	13	273.52	618.38	44.23	14.0°	180°	2"X4"	24" o.c.
#4	ASPHALT SHINGLE	3	63.12	203.75	30.98	14.0°	90°	2"X4"	24" o.c.
TOTAL PLAN VIEW		34	715.35	3095.54	23.11				



GENERAL INSTALLATION PLAN NOTES:

1) STRUCTURE PROPERTIES
- ROOF FINISH: SHINGLE ROOF
- MEAN ROOF HEIGHT: 25 FT
- ROOF SLOPES: 14.0°
- PRE ENGINEERED TRUSS
- WOOD SPECIES: SPF #2
- TRUSS SIZE: 2"X4"
- TRUSS: 24" O.C.
- ROOF SHEATHING: 7/16 " OSB

2) ROOF ATTACHMENTS TO SPF #2 TRUSS SHALL BE INSTALLED AS SHOWN IN SHEET S-02 AND AS FOLLOWS FOR EACH WIND ZONE:

WIND ZONE 1: MAX SPAN 6'-0" O.C. - MAX CANTILEVER 1'- 4"
WIND ZONE 2: MAX SPAN 6'-0" O.C. - MAX CANTILEVER 1'- 4"
WIND ZONE 3: MAX SPAN 4'-0" O.C. - MAX CANTILEVER 1'- 4"

SEE SHEET S-02.1 FOR SUPPORTING CALCULATIONS.

3) FIRE SETBACK TO BE 3' FROM RIDGES AND EDGES AND 18" EACH WAY FROM HIPS AND VALLEYS PER IRC 2018 324.6

4) THE EXISTING ROOF AND STRUCTURE IS IN GOOD CONDITION AND WILL NOT BE ADVERSELY AFFECTED BY THE ADDITIONAL LOADS IMPOSED BY THE PV INSTALLATION. THE INSTALLER OR CONTRACTOR IS TO FIELD VERIFY AND REPORT TO THE ENGINEER IF THERE ARE ANY DISCREPANCIES BETWEEN THE PLANS AND IN FIELD CONDITIONS

* I CERTIFY THAT THE INSTALLATION OF THE MODULES IS IN COMPLIANCE WITH IRC: 2018, CHAPTER 3. BUILDING STRUCTURE WILL SAFELY ACCOMMODATE WIND LATERAL AND UPLIFT FORCES, SNOW LOADS, AND EQUIPMENT DEAD LOADS. *

LEGEND

- WIND ZONE 1 (TYP)
- WIND ZONE 2 (TYP)
- WIND ZONE 3 (TYP)

1 MODULE LAYOUT
S-01 SCALE: 3/32" = 1'-0"

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REVISIONS

DESCRIPTION	DATE	REV

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CORVUS PRO SOLAR

Signature with Seal
STATE OF MISSOURI
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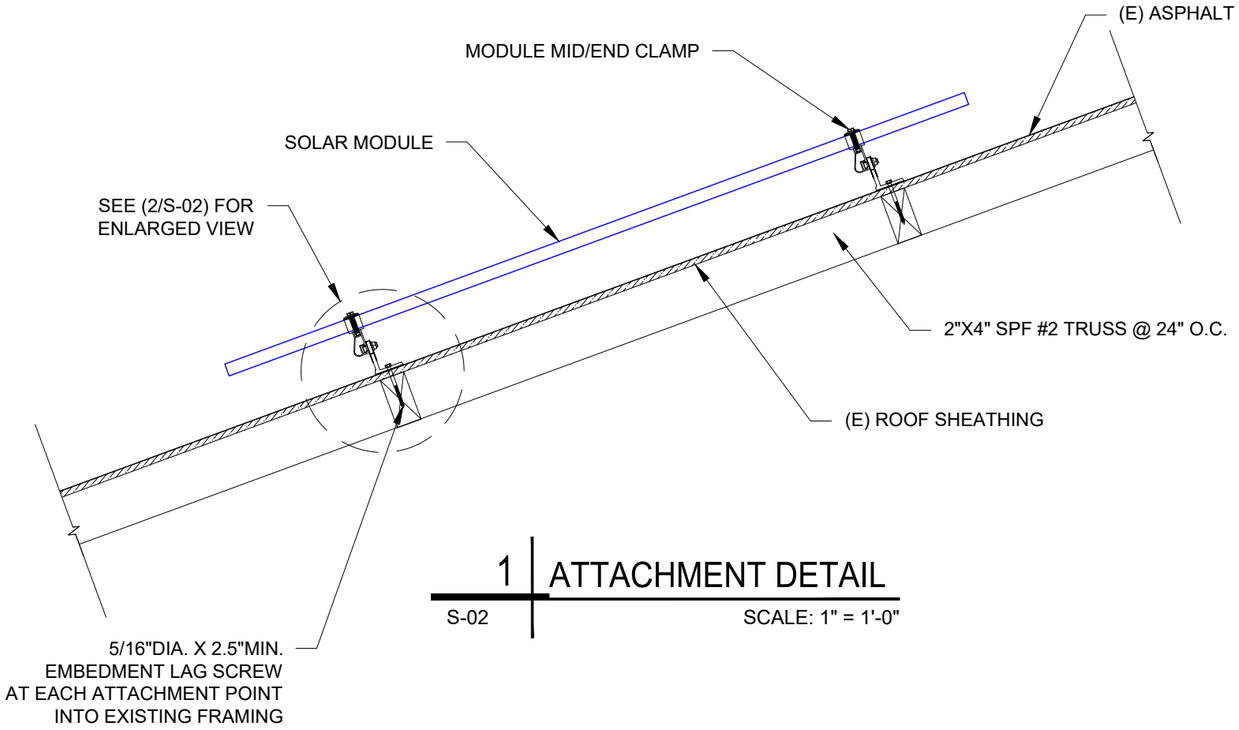
NUMBER PE-2021029136
PROFESSIONAL ENGINEER
Digitally signed by: Ermocrates E Castillo
Date: 2023.03.27 12:19:46

PROJECT NAME
GARDNER RESIDENCE
102 SW JOSHUA DR,
LEES SUMMIT, MO 64081

SHEET NAME
MODULE LAYOUT

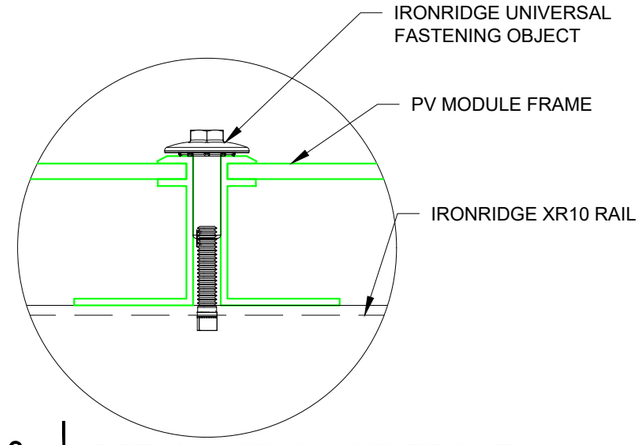
SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
S-01



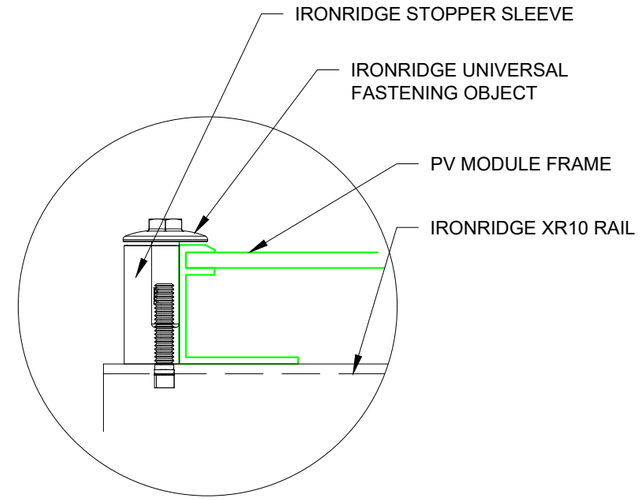
1 | ATTACHMENT DETAIL

S-02 | SCALE: 1" = 1'-0"



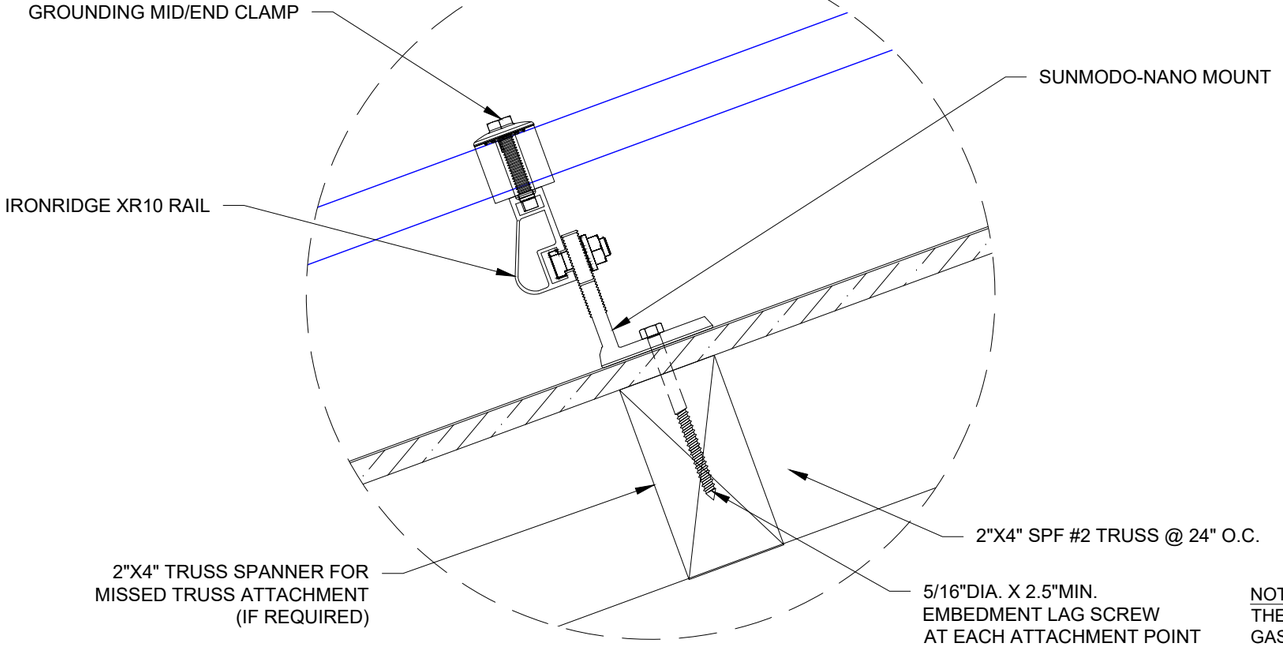
3 | DETAIL, MID CLAMP FRONT

S-02 | Scale: 6"=1'-0"



4 | DETAIL, END CLAMP (UFO) FRONT

S-02 | Scale: 6"=1'-0"



2 | ATTACHMENT DETAIL (ENLARGED VIEW)

S-02 | SCALE: 1' = 1'-0"

NOTE:
THE ATTACHMENT HAS AN INTEGRATED GASKET TO PREVENT THE WATER PENETRATION. PLEASE SEE SHEET DS-06 FOR THE DETAILS OF THE INTEGRATED GASKET AND SHEET DS-07 FOR THE TEST OF WIND AND RAIN DRIVEN RESISTANCE.

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ERMOCRATES E. CASTILLO -
MO PE# 2021029136

REVISIONS

DESCRIPTION	DATE	REV

PROJECT INSTALLER

CORVUS PRO SOLAR

Signature with Seal

STATE OF MISSOURI
ERMOCRATES CASTILLO
NUMBER PE-2021029136
PROFESSIONAL ENGINEER

Digitally signed by: Ermocrates E Castillo
Date: 2023.03.27 12:19:46

PROJECT NAME

GARDNER RESIDENCE
102 SW JOSHUA DR,
LEES SUMMIT, MO 64081

SHEET NAME

ATTACHMENT DETAIL

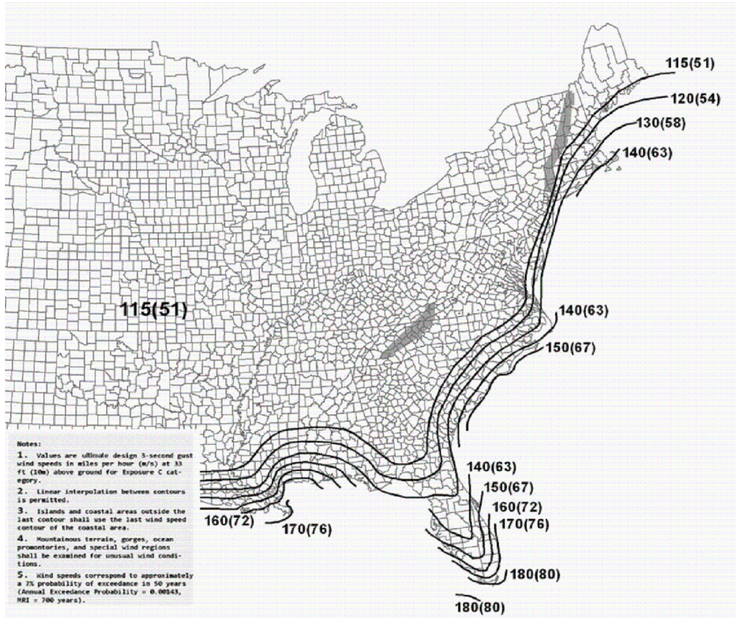
SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

S-02

WIND MAP



ACSE 7-10 Figure 26.5 (Excerpt)
ULTIMATE DESIGN WIND SPEED, Vult,
FOR CATEGORY II BUILDINGS AND OTHER STRUCTURES

SNOW MAP

FIGURE 1608.2—continuedGROUND SNOW LOADS, p_g, FOR THE UNITED STATES (psf)

WIND LOAD CALCULATIONS FOR MODULES INSTALLED ON ROOFS WITH A HEIGHT LESS THAN 60'

SITE INFORMATION			
IRC VERSION	2018	RISK CATEGORY	II
MEAN ROOF HEIGHT (ft)	25.0	EXPOSURE CATEGORY	B
ROOF LENGTH (ft)	70.4	ROOF SLOPE	3 /12
ROOF WIDTH (ft)	52.1	ROOF SLOPE (°)	14.0
PARAPET HEIGHT (ft)	0	ULTIMATE WIND SPEED	115 mph
MODULE LENGTH (in)	67.87	NOMINAL WIND SPEED	89 mph
MODULE WIDTH (in)	44.64	EXPOSURE FACTOR (C_e)	1.000
COMPONENT AMPLIFICATION (a_p)	1.00	h_z (ROOF TO MODULE) ft	0.500
COMPONENT OPERATING WEIGHT	47.40	SPECTRAL ACCELERATION (S_{DS})	0.459
COMPONENT RESPONSE FACTOR	1.50	TOTAL MODULES IN ARRAY	27
EFFECTIVE WIND AREA (ft^2)	21.0	TEMPERATURE FACTOR (C_t)	1.000
GROUND SNOW LOAD (psf)	20.0	IMPORTANCE FACTOR (I_s)	1.000
DEAD LOAD (psf)	3.0	SLOPE FACTOR (C_s)	0.861
SLOPED ROOF SNOW LOAD (psf)	12.1	K_D	0.85
HVHZ?	NO	K_{ZT}	1.0
		K_z	1.00

DESIGN CALCULATIONS					
VELOCITY PRESSURE (q) = $.00256*K_z K_{ZT} K_D V^2$					
VELOCITY PRESSURE(ASD)	17.3 psf				
WIDTH OF PRESSURE COEFFICIENT	52.1' * 10%	=	5.21'	ZONE WIDTH "A"	4 FT
	25' * 40%	=	10'		
EXTERNAL PRESSURE COEFFICIENT	ZONE 1	0.9	-0.866		
	ZONE 2	0.9	-1.519		
	ZONE 3	0.9	-2.389		
INTERNAL PRESSURE COEFFICIENT (+/-)	0				

DESIGN PRESSURES						
ROOF ZONE	DOWN	UP				
1	16.0	-15.0	psf	Module allowable Down pressure	75	psf
2	16.0	-26.2	psf	Module allowable Uplift pressure	33.4	psf
3	16.0	-41.2	psf			

ATTACHMENTS USED		
ATTACHMENT MODEL	Sunmodo	
ATTACHMENT STRENGTH	476	lbs

ALLOWABLE LOADS DETERMINED FROM SINGLE 5/16" LAG SCREW WITH MINIMUM 2.5" EMBEDMENT INTO STRUCTURAL MEMBER PER NDS 2018.

MAX SEISMIC LOAD FOR THE SYSTEM		
HORIZONTAL FORCE	176.91	Pounds
VERTICAL FORCE	4.35	Pounds
TOTAL SEISMIC LOAD (1.2D + E_v + E_h+ .2S)	187.27	Pounds
ATTACHMENT SHEAR	476	Pounds

MAX DESIGN LOADS ALLOWABLE						
LIMIT MAX SPAN TO		N/A	in			
RAFTER/SEAM SPACING		24	in	NO. OF RAILS	2	
ROOF ZONE	DOWN	UP (N. Exposed)		SPANS (E)		
1	271.5	253.8	lbs	72	in	
2	271.5	445.0	lbs	72	in	
3	181.0	466.5	lbs	48	in	

NOTES

1. Module allowable wind pressure obtained frommanufacturer datasheet or literature
2. Maximum spacing between supports is 72"
4. For Hip roofs with slopes less than 25°, Zone 3 shall be treated as Zone 2 per ASCE 7-10 Figure 30.4-2B, Note 7
5. For flat roofs with parapets 3' or higher, Zone 3 shall be treated as Zone 2 per ASCE 7-10 figure 30.4-2A, Note 5
6. Lag screw withdrawal resistance obtained from the USDA Wood Handbook, Wood as an Engineering Material
7. Roof rafters are SPF #2
8. HVHZ defined as Miami-Dade and Broward Counties

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ERMOCRATES E. CASTILLO - MO PE# 2021029136

REVISIONS

DESCRIPTION	DATE	REV

PROJECT INSTALLER

CORVUS PRO SOLAR

Signature with Seal

STATE OF MISSOURI
ERMOCRATES CASTILLO
NUMBER PE-2021029136
PROFESSIONAL ENGINEER

Digitally signed by: Ermocrates E Castillo
Date: 2023.03.27 12:19:46

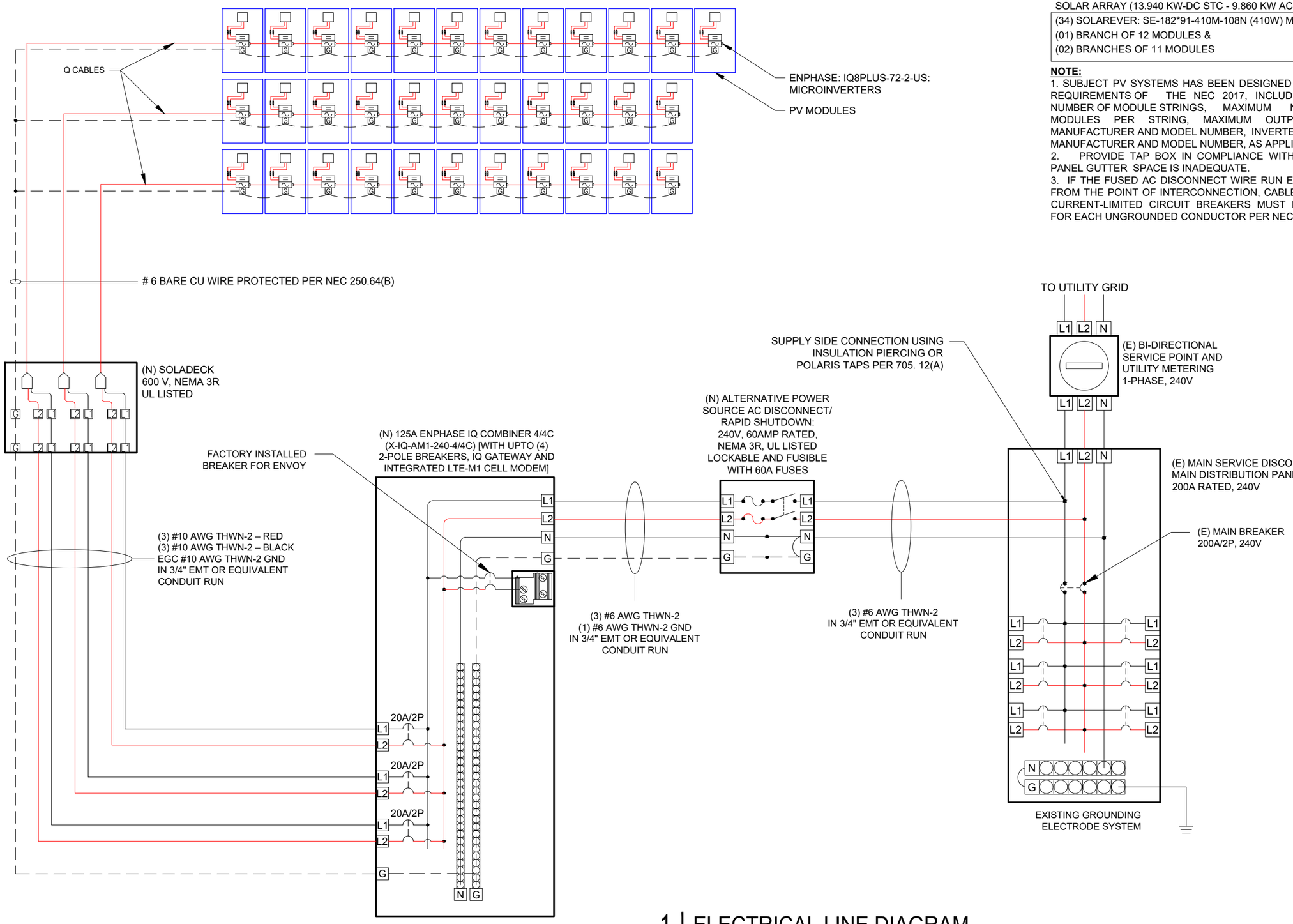
PROJECT NAME

GARDNER RESIDENCE
102 SW JOSHUA DR,
LEES SUMMIT, MO 64081

SHEET NAME
STRUCTURE CALCULATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
S-02.1



SOLAR ARRAY (13.940 KW-DC STC - 9.860 KW AC)

(34) SOLAREVER: SE-182*91-410M-108N (410W) MODULES
(01) BRANCH OF 12 MODULES &
(02) BRANCHES OF 11 MODULES

NOTE:

1. SUBJECT PV SYSTEMS HAS BEEN DESIGNED TO MEET THE REQUIREMENTS OF THE NEC 2017, INCLUDING MAXIMUM NUMBER OF MODULE STRINGS, MAXIMUM NUMBER OF MODULES PER STRING, MAXIMUM OUTPUT, MODULE MANUFACTURER AND MODEL NUMBER, INVERTER MANUFACTURER AND MODEL NUMBER, AS APPLICABLE.
2. PROVIDE TAP BOX IN COMPLIANCE WITH NEC 312.8 IF PANEL GUTTER SPACE IS INADEQUATE.
3. IF THE FUSED AC DISCONNECT WIRE RUN EXCEEDS 10 FT FROM THE POINT OF INTERCONNECTION, CABLE LIMITERS OR CURRENT-LIMITED CIRCUIT BREAKERS MUST BE INSTALLED FOR EACH UNGROUNDED CONDUCTOR PER NEC 705.31.

1 | ELECTRICAL LINE DIAGRAM

E-01 | SCALE: NTS

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STATE OF MISSOURI · ERMOCRATES CASTILLO · NUMBER PE-2021029136 · PROFESSIONAL ENGINEER

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Date: 2023.03.27 12:19:47

PROJECT NAME

GARDNER RESIDENCE

102 SW JOSHUA DR,
LEES SUMMIT, MO 64081

SHEET NAME

ELECTRICAL LINE DIAGRAM

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

E-01

ELECTRICAL CALCULATION

Module Manufacturer	Solarever
Module Model	SE-182*91-410M-108N
Inverter Manufacturer	Enphase
Inverter Model	Enphase IQ 8 Plus
Modules/Branch Circuit 1	12
Modules/Branch Circuit 2	11
Modules/Branch Circuit 3	11
Total Array Power (kW)	13.940
System ac Voltage	240V 1-Phase

Module Properties			
Voc	37.12	Isc	13.96
Vmpp	31.35	Imp	13.08
TC Voc	-0.29%/C	TC Vmp	-0.39%/C
Pmp	410.0	NOCT	45 °C

Design Temperature	
Min. Ambient Temp. °F	-4
Max. Ambient Temp. °F	95
Calculated Max. Voc	42
Calculated Min Vmp	26
Conduit Fill	
Number of conduits	1

Inverter Properties	
Output Voltage	240 L-L 1-PH
Max Input dc Voltage	60 Vdc
Operating Range	16 - 58 Vdc
MPPT Voltage Range	27 - 45 Vdc
Start Voltage	22 Vdc
Max Input Power	440 Wdc
Continuous AC Power	290 VA

Ampacity Calcultions

Circuit	Max Amps	1.25 x Max Amps	AWG	90 °C Ampacity	AmbientT emp °F	Temp Derate	Conduit Fill	Fill Derate	Derated Ampacity	Maximum Circuit Breaker
Circuit 1	14.52	18.15	#10	40	130	0.76	6	0.8	24.32	20 A
Circuit 2	13.31	16.64	#10	40	130	0.76	6	0.8	24.32	20 A
Circuit 3	13.31	16.64	#10	40	130	0.76	6	0.8	24.32	20 A
IQ Combiner Output	41.14	51.43	#6	75	95	0.96	3	1	72	60 A

Maximum Circuit Voltage Drop	2%

Voltage Drop Calculations

Circuit	AWG	Circular Mills	I	V	Max Length
Circuit 1	#10	10380	14.52	240	133 Feet
Circuit 2	#10	10380	13.31	240	145 Feet
Circuit 3	#10	10380	13.31	240	145 Feet
IQ Combiner Output	#6	26240	41.14	240	119 Feet

Notes

	Temp derate based on NEC Table 310.15(B)(2)(a)
	Conduit fill derate based on NEC Table 310.15(B)(3)(a)
	Maximum Voc calculated using module manufacture temperature coefficients per NEC 690.7(A)
	Unless otherwise specified, all wiring must be THHN or THWN-2 Copper
	All wire sizes listed are the minimum allowable
	In any cell indicates that the system is safe and complies with NEC requirements
	In any cell indicates a potentially unsafe condition
	Information input by system designer
	Informaton obtained from manufacturer datasheets

ELECTRICAL NOTES

1. ALL EQUIPMENT TO BE LISTED BY UL OR OTHER NRTL, AND LABELED FOR ITS APPLICATION.
2. ALL CONDUCTORS SHALL BE COPPER, RATED FOR 600 V AND 90 DEGREE C WET ENVIRONMENT. THE TERMINALS ARE RATED FOR 75 DEGREE C.
3. THE WIRES ARE SIZED ACCORDING TO NEC 110.14.
4. 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.
5. WORKING CLEARANCES AROUND ALL NEW AND EXISTING ELECTRICAL EQUIPMENT SHALL COMPLY WITH NEC 110.26.
6. DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS. CONTRACTOR SHALL FURNISH ALL NECESSARY OUTLETS, SUPPORTS, FITTINGS AND ACCESSORIES TO FULFILL APPLICABLE CODES AND STANDARDS.
7. WHERE SIZES OF JUNCTION BOXES, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, THE CONTRACTOR SHALL SIZE THEM ACCORDINGLY.
8. ALL WIRE TERMINATIONS SHALL BE APPROPRIATELY LABELED AND READILY VISIBLE.
9. MODULE GROUNDING CLIPS TO BE INSTALLED BETWEEN MODULE FRAME AND MODULE SUPPORT RAIL, PER THE GROUNDING CLIP MANUFACTURER'S INSTRUCTION.
10. MODULE SUPPORT RAIL TO BE BONDED TO CONTINUOUS COPPER G.E.C. VIA WEEB LUG OR ILSCO GBL-4DBT LAY-IN LUG.
11. THE POLARITY OF THE GROUNDED CONDUCTORS IS NEGATIVE .
12. UTILITY HAS 24-HR UNRESTRICTED ACCESS TO ALL PHOTOVOLTAIC SYSTEM COMPONENTS LOCATED AT THE SERVICE ENTRANCE.
13. MODULES CONFORM TO AND ARE LISTED UNDER UL 1703.
14. RACKING CONFORMS TO AND IS LISTED UNDER UL 2703.
15. CONDUCTORS EXPOSED TO SUNLIGHT SHALL BE LISTED AS SUNLIGHT RESISTANT PER NEC ARTICLE 300.6 (C) (1) AND ARTICLE 310.10 (D).
16. CONDUCTORS EXPOSED TO WET LOCATIONS SHALL BE SUITABLE FOR USE IN WET LOCATIONS PER NEC ARTICLE 310.10 (C).
17. THIS SYSTEM IS EQUIPPED WITH RAPID SHUTDOWN OF PV CONDUCTORS IN COMPLIANCE WITH NEC 690.12.
18. LABELING IN COMPLIANCE WITH NEC 690.12 AND 690.56(C) IS SHOWN ON SHEET E-03.
19. ALL CONDUITS TO BE INSTALLED A MIN OF 7/8" ABOVE THE ROOF SURFACE.

I ERMOCRATES CASTILLO PE# 2021029136 AN ENGINEER LICENSED PURSUANT TO SECTION 327.392, CERTIFY THAT THE PV ELECTRICAL SYSTEM AND ELECTRICAL COMPONENTS ARE DESIGNED AND APPROVED USING THE STANDARDS STANDARDS CONTAINED IN THE 2018 INTERNATIONAL RESIDENTIAL CODE SECTION R106 AND THE NEC 2017.

Castillo Engineering
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TEL: (407) 289-2575
ERMOCRATES E. CASTILLO - MO PE# 2021029136

REVISIONS

DESCRIPTION	DATE	REV

PROJECT INSTALLER

CORVUS PRO SOLAR

Signature with Seal

STATE OF MISSOURI · ERMOCRATES CASTILLO · NUMBER PE-2021029136 · PROFESSIONAL ENGINEER

Digitally signed by: Ermocrates E Castillo
Date: 2023.03.27 12:19:47

PROJECT NAME

GARDNER RESIDENCE

102 SW JOSHUA DR,
LEES SUMMIT, MO 64081

SHEET NAME

WIRING CALCULATIONS

SHEET SIZE

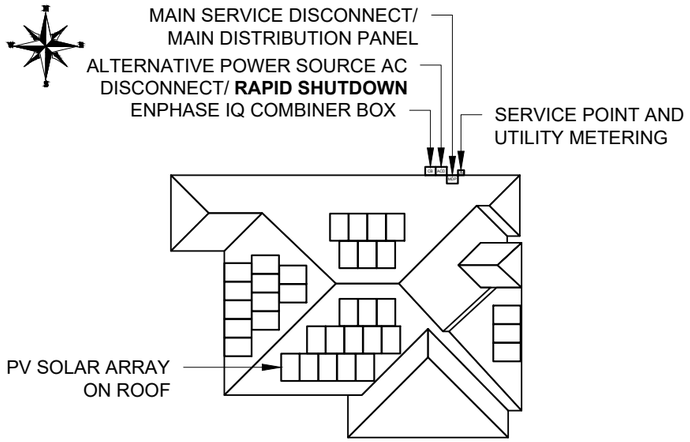
ANSI B
11" X 17"

SHEET NUMBER

E-02

CAUTION!

POWER TO THIS BUILDING
SUPPLIED FROM MULTIPLE SOURCES

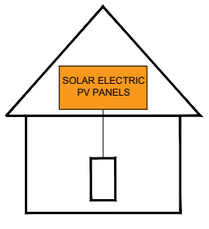


102 SW JOSHUA DR, LEES SUMMIT, MO 64081

LABEL LOCATION:
MAIN SERVICE DISCONNECT / MAIN DISTRIBUTION PANEL, PV DISCONNECT
LOCATED NO MORE THAN 3FT (1M) FROM THE SERVICE DISCONNECT
(TEXT HEIGHT SHOULD BE A MINIMUM OF 3/8")
PER CODE NEC 705.10

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 LOCATION:
AC DISCONNECT, POINT OF INTERCONNECTION
(PER CODE: NEC 690.56(C)(1)(a), IFC 1204.5.1

⚠ WARNING

ELECTRIC SHOCK HAZARD
TERMINALS ON BOTH LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

LABEL LOCATION:
AC DISCONNECT, POINT OF INTERCONNECTION
(PER CODE: NEC 690.13(B))

⚠ WARNING DUAL POWER SOURCE
SECOND SOURCE IS PHOTOVOLTAIC SYSTEM

LABEL LOCATION:
POINT OF INTERCONNECTION
(PER CODE: NEC 705.12(B)(2)(3)(b))

PHOTOVOLTAIC SYSTEM AC DISCONNECT

RATED AC OPERATING CURRENT 41.14 AMPS
AC NOMINAL OPERATING VOLTAGE 240 VOLTS

LABEL LOCATION:
AC DISCONNECT, POINT OF INTERCONNECTION
(PER CODE: NEC 690.54)

WARNING:

POWER SOURCE OUTPUT CONNECTION DO NOT RELOCATE THIS OVERCURRENT DEVICE

LABEL LOCATION:
POINT OF INTERCONNECTION
(PER CODE: NEC 705.12(B)(2)(3)(b))

DATA PER PANEL

NOMINAL OPERATING AC VOLTAGE -	240	**V**
NOMINAL OPERATING AC FREQUENCY-	60	**Hz**
MAXIMUM AC POWER-	290	**VA**
MAXIMUM AC CURRENT-	1.21	**A**
MAXIMUM OVERCURRENT DEVICE RATING FOR AC MODULE PROTECTION PER CIRCUIT-	20	**A**

LABEL LOCATION:
COMBINER BOX
(PER CODE: NEC 690.52)

RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

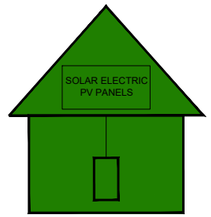
LABEL LOCATION:
AC DISCONNECT
(PER CODE: NEC 690.56(C)(3))

EMERGENCY RESPONDER
THIS SOLAR PV SYSTEM IS EQUIPPED WITH RAPID SHUTDOWN.

TURN RAPID SHUTDOWN SWITCH TO THE "OFF" POSITION TO SHUT DOWN ENTIRE PV SYSTEM

- SECTIONS OF THE PV SYSTEM THAT ARE SHUT DOWN WHEN THE RAPID SHUTDOWN SWITCH IS OPERATED.

- SECTIONS OF THE PV SYSTEM THAT ARE NOT SHUT DOWN WHEN THE RAPID SHUTDOWN SWITCH IS OPERATED.



LABEL LOCATION:
AC DISCONNECT
(TEXT HEIGHT SHOULD BE A MINIMUM OF 3/8")
(PER CODE: NFPA 1.11.12.2.1.1)

CORVUS PRO SOLAR LLP

⚠ EMERGENCY CONTACT: ⚠
PH:(573)-528-3375

LABEL LOCATION:
MAIN DISCONNECT
(PER CODE: NFPA 1 2015 - 11.12.2.1.5)

ADHESIVE FASTENED SIGNS:
- THE LABEL SHALL BE VISIBLE, REFLECTIVE AND SUITABLE FOR THE ENVIRONMENT WHERE IT IS INSTALLED [NFPA 1, 11.12.2.1]
- WHERE REQUIRED ELSEWHERE IN THIS CODE, ALL FIELD APPLIED LABELS, WARNINGS, AND MARKINGS SHOULD COMPLY WITH ANSI Z535.4 [NEC 110.21(B) FIELD MARKING].
- ADHESIVE FASTENED SIGNS MAY BE ACCEPTABLE IF PROPERLY ADHERED. VINYL SIGNS SHALL BE WEATHER RESISTANT [IFC 605.11.1.3]

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ERMOCRATES E. CASTILLO -
MO PE# 2021029136

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PROJECT INSTALLER

CORVUS PRO SOLAR

Signature with Seal

STATE OF MISSOURI
ERMOCRATES CASTILLO
NUMBER PE-2021029136
PROFESSIONAL ENGINEER

Digitally signed by: Ermocrates E Castillo
Date: 2023.03.27 12:19:48

PROJECT NAME

GARDNER RESIDENCE
102 SW JOSHUA DR,
LEES SUMMIT, MO 64081

SHEET NAME

SYSTEM LABELING

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

E-03

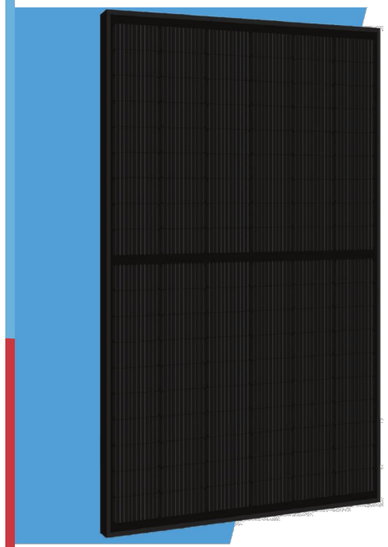
Solarever USA

Module HC 108M

400-410 Watt

Positive power tolerance of 0~+3%

HALF CELL - MONO PERC 108 CELL



KEY **FEATURES**

Multi Busbar Solar Cell
Multi busbar solar cell adopts new technology to improve the efficiency of modules , offers a better aesthetic appearance, making it perfect for rooftop installation.

High Efficiency
Higher module conversion efficiency (up to 20.38%) benefit from half cell structure (low resistance characteristic).

PID Resistance
Excellent Anti-PID performance guarantee limited power degradation for mass production.

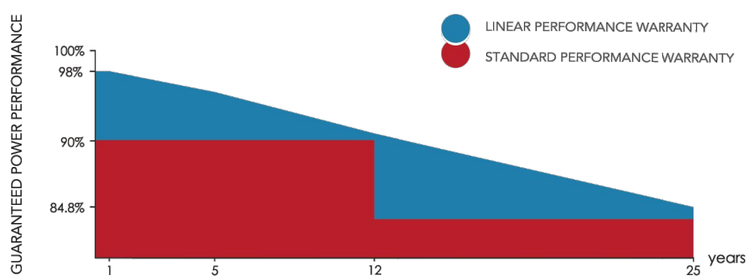
Low-light Performance
Advanced glass and cell surface textured design ensure excellent performance in low-light environment.

Severe Weather Resilience
Certified to withstand: wind load (2400 Pascal) and snow load (5400 Pascal).

Durability Against Extreme Environmental Conditions
High salt mist and ammonia resistance .

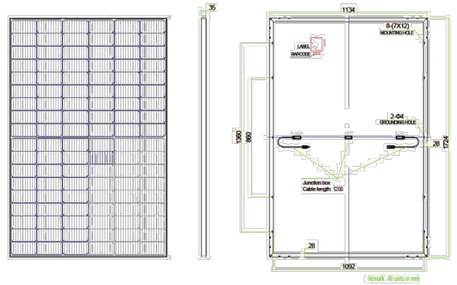
LINEAR **PERFORMANCE** WARRANTY

12 Year Product Warranty 25 Year Linear Power Warranty



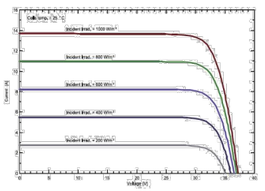
ISO9001:2015 certified factory
UL61730 certified product

ENGINEERING DRAWINGS

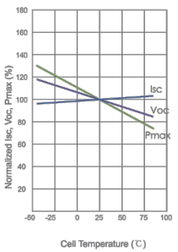


ELECTRICAL PERFORMANCE & TEMPERATURE DEPENDENCE

Current-Voltage & Power-Voltage Curves (40v0W)



Temperature Dependence of Isc,Voc,Pmax



MECHANICAL CHARACTERISTICS

Cell Type	Mono PERC 182x91mm
No.of Half-cells	108 (6×18)
Dimensions	1724x1134x35mm (67.87x44.64x1.37 inch)
Weight	21.5 kg (47.4 lbs)
Front Glass	3.2mm, Anti-Reflection Coating, High Transmission, Low Iron, Tempered Glass
Frame	Anodized Aluminium Alloy
Junction Box	IP68 Rated, connector compatible with MC4
Output Cables	TÜV 1x4.0mm² 450mm, (-) 1200mm or Customized Length
Fire rating	UL: Type 1, IEC: Class C
Maximum static load	5400Pa(front side), 2400Pa(back side)

PACKAGING CONFIGURATION

(Two pallets =One stack)

31pcs/pallet , 62pcs/stack, 868pcs/53FT Truck

SPECIFICATIONS

Module Type	SE-182*91-400M-108N		SE-182*91-405M-108N		SE-182*91-410M-108N	
	STC	NOCT	STC	NOCT	STC	NOCT
Maximum Power (Pmax)	400W	300W	405W	304W	410W	308W
Maximum Power Voltage (Vmp)	31.06	28.90	31.21	29.04	31.35	29.20
Maximum Power Current (Imp)	12.88	10.39	12.98	10.47	13.08	10.55
Open-circuit Voltage (Voc)	36.83	35.01	36.98	35.16	37.12	35.29
Short-circuit Current (Isc)	13.76	11.09	13.86	11.18	13.96	11.26
Module Efficiency STC (%)	20.46%		20.72%		20.97%	
Operating Temperature (℃)	-40℃~+85℃					
Maximum System Voltage	1500V DC (IEC)					
Maximum Series Fuse Rating	20A					
Power Tolerance	0~+3%					
Temperature Coefficients of Pmax	-0.35%/℃					
Temperature Coefficients of Voc	-0.29%/℃					
Temperature Coefficients of Isc	0.048%/℃					
Nominal Operating Cell Temperature (NOCT)	45±2℃					

STC: Irradiance 1000W/m² | Cell Temperature 25°C | AM=1.5

NOCT: Irradiance 800W/m² | Ambient Temperature 20°C | AM=1.5 | Wind Speed 1m/s

* Power measurement tolerance: ± 3%

Contact us! Become the best solar company for the world +1(956) 308 3075 contact@solareverusa.com

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CASTILLO ENGINEERING SERVICES, LLC
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TEL: (407) 289-2575
ERMOCRATES E. CASTILLO - MO PE# 2021029136

REVISIONS

DESCRIPTION	DATE	REV

PROJECT INSTALLER

CORVUS PRO SOLAR

Signature with Digital

STATE OF MISSOURI · ERMOCRATES CASTILLO · NUMBER PE-2021029136 · PROFESSIONAL ENGINEER

Digitally signed by: Ermocrates E Castillo
Date: 2023.03.27 12:19:48

PROJECT NAME

GARDNER RESIDENCE
102 SW JOSHUA DR,
LEES SUMMIT, MO 64081

SHEET NAME

DATA SHEET

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

DS-01

ENPHASE

DATA SHEET

IQ8 and IQ8+ Microinverters

Our newest IQ8 Microinverters are the industry's first microgrid-forming, software defined microinverters with split-phase power conversion capability to convert DC power to AC power efficiently. The brain of the semiconductor-based microinverter is our proprietary application specific integrated circuit (ASIC) which enables the microinverter to operate in grid-tied or off-grid modes. This chip is built in advanced 55nm technology with high speed digital logic and has superfast response times to changing loads and grid events, alleviating constraints on battery sizing for home energy systems.

Part of the Enphase Energy System, IQ8 Series Microinverters integrate with the IQ Battery, IQ Gateway, and the Enphase App monitoring and analysis software.

Enphase 25 year limited warranty

IQ8 Series Microinverters redefine reliability standards with more than one million cumulative hours of power-on testing, enabling an industry-leading limited warranty of up to 25 years.

Connect PV modules quickly and easily to IQ8 Series Microinverters using the included Q-DCC-2 adapter cable with plug-n-play MC4 connectors.

UL CERTIFIED SAFETY

IQ8 Series Microinverters are UL listed as PV Rapid Shutdown Equipment and conform with various regulations, when installed according to manufacturer's instructions.

*Only when installed with IQ System Controller 2, meets UL 1741.
**IQ8 and IQ8Plus support split-phase, 240V installations only.

Easy to install

- Lightweight and compact with plug-n-play connectors
- Power Line Communication (PLC) between components
- Faster installation with simple two-wire cabling

High productivity and reliability

- Produce power even when the grid is down*
- More than one million cumulative hours of testing
- Class II double-insulated enclosure
- Optimized for the latest high-powered PV modules

Microgrid-forming

- Complies with the latest advanced grid support**
- Remote automatic updates for the latest grid requirements
- Configurable to support a wide range of grid profiles
- Meets CA Rule 21 (UL 1741-SA) and IEEE 1547:2018 (UL 1741-SB)

Note:

IQ8 Microinverters cannot be mixed together with previous generations of Enphase microinverters (IQ7 Series, IQ6 Series, etc) in the same system.

IQ8 and IQ8+ Microinverters

INPUT DATA (DC)		IQ8-60-2-US	IQ8PLUS-72-2-US
Commonly used module pairings[1]	W	235 – 350	235 – 440
Module compatibility		60-cell / 120 half-cell	54-cell / 108 half-cell, 60-cell / 120 half-cell, 66-cell / 132 half-cell and 72-cell / 144 half-cell
MPPT voltage range	V	27 – 37	27 – 45
Operating range	V	16 – 48	16 – 58
Min. / Max. start voltage	V	22 / 48	22 / 58
Max. input DC voltage	V	50	60
Max. continuous input DC current	A	10	12
Max. input DC short-circuit current	A	25	
Max. module I_{sc}	A	20	
Overvoltage class DC port		II	
DC port backfeed current	mA	0	
PV array configuration		1 x 1 Ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit	
OUTPUT DATA (AC)		**IQ8-60-2-US**	**IQ8PLUS-72-2-US**
Peak output power	VA	245	300
Max. continuous output power	VA	240	290
Nominal (L-L) voltage / range[2]	V	240 / 211 – 264	
Max. continuous output current	A	1.0	1.21
Nominal frequency	Hz	60	
Extended frequency range	Hz	47 – 68	
AC short circuit fault current over 3 cycles	Arms	2	
Max. units per 20 A (L-L) branch circuit[3]		16	13
Total harmonic distortion		<5%	
Overvoltage class AC port		III	
AC port backfeed current	mA	30	
Power factor setting		1.0	
Grid-tied power factor (adjustable)		0.85 leading – 0.85 lagging	
Peak efficiency	%	97.7	
CEC weighted efficiency	%	97	
Night-time power consumption	mW	60	
MECHANICAL DATA			
Ambient temperature range		-40°C to +60°C (-40°F to +140°F)	
Relative humidity range		4% to 100% (condensing)	
DC Connector type		MC4	
Dimensions (H x W x D)		212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")	
Weight		1.08 kg (2.38 lbs)	
Cooling		Natural convection – no fans	
Approved for wet locations		Yes	
Pollution degree		PD3	
Enclosure		Class II double-insulated, corrosion resistant polymeric enclosure	
Environ. category / UV exposure rating		NEMA Type 6 / outdoor	
COMPLIANCE			
Certifications		CA Rule 21 (UL 1741-SA), UL 62109-1, IEEE 1547:2018 (UL 1741-SB), FCC Part 15 Class B, ICES-0003 Class B, CAN / CSA-C22.2 NO. 107.1-01 This product is UL Listed as PV Rapid Shutdown Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020 section 690.12 and C22.1-2018 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to manufacturer's instructions.	

(1) Pairing PV modules with wattage above the limit may result in additional clipping losses. See the compatibility calculator at https://link.enphase.com/module-compatibility. (2) Nominal voltage range can be extended beyond nominal if required by the utility. (3) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

IQ8SP-12A-DS-0067-02-EN-US-2022-12-02

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620 N. WYMORE ROAD, SUITE 250,
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ERMOCRATES E. CASTILLO - MO PE# 2021029136

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PROJECT INSTALLER

CORVUS PRO SOLAR

STATE OF MISSOURI ERMOCRATES CASTILLO NUMBER PE-2021029136 PROFESSIONAL ENGINEER

Signature with Seal

Digitally signed by: Ermocrates E Castillo
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102 SW JOSHUA DR,
LEES SUMMIT, MO 64081

SHEET NAME

DATA SHEET

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

DS-02

Data Sheet
Enphase Networking

Enphase IQ Combiner 4/4C

X-IQ-AM1-240-4
X-IQ-AM1-240-4C

X-IQ-AM1-240-4C

X-IQ-AM1-240-4

The **Enphase IQ Combiner 4/4C** with Enphase IQ Gateway and integrated LTE-M1 cell modem (included only with IQ Combiner 4C) consolidates interconnection equipment into a single enclosure and streamlines IQ microinverters and storage installations by providing a consistent, pre-wired solution for residential applications. It offers up to four 2-pole input circuits and Eaton BR series busbar assembly.

Smart

- Includes IQ Gateway for communication and control
- Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), included only with IQ Combiner 4C
- Includes solar shield to match Enphase IQ Battery aesthetics and deflect heat
- Flexible networking supports Wi-Fi, Ethernet, or cellular
- Optional AC receptacle available for PLC bridge
- Provides production metering and consumption monitoring

Simple

- Centered mounting brackets support single stud mounting
- Supports bottom, back and side conduit entry
- Up to four 2-pole branch circuits for 240 VAC plug-in breakers (not included)
- 80A total PV or storage branch circuits

Reliable

- Durable NRTL-certified NEMA type 3R enclosure
- Five-year limited warranty
- Two years labor reimbursement program coverage included for both the IQ Combiner SKU's
- UL listed

UL LISTED

To learn more about Enphase offerings, visit **enphase.com**

ENPHASE.

Enphase IQ Combiner 4/4C

MODEL NUMBER	
IQ Combiner 4 (X-IQ-AM1-240-4)	IQ Combiner 4 with Enphase IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes a silver solar shield to match the IQ Battery system and IQ System Controller 2 and to deflect heat.
IQ Combiner 4C (X-IQ-AM1-240-4C)	IQ Combiner 4C with Enphase IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), a plug-and-play industrial-grade cell modem for systems up to 60 microinverters. (Available in the US, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.) Includes a silver solar shield to match the IQ Battery and IQ System Controller and to deflect heat.
ACCESSORIES AND REPLACEMENT PARTS	(not included, order separately)
Ensemble Communications Kit COMMS-CELLMODEM-M1-06 CELLMODEM-M1-06-SP-05 CELLMODEM-M1-06-AT-05	- Includes COMMS-KIT-01 and CELLMODEM-M1-06-SP-05 with 5-year Sprint data plan for Ensemble sites - 4G based LTE-M1 cellular modem with 5-year Sprint data plan - 4G based LTE-M1 cellular modem with 5-year AT&T data plan
Circuit Breakers BRK-10A-2-240V BRK-15A-2-240V BRK-20A-2P-240V BRK-15A-2P-240V-B BRK-20A-2P-240V-B	Supports Eaton BR210, BR215, BR220, BR230, BR240, BR250, and BR260 circuit breakers. Circuit breaker, 2 pole, 10A, Eaton BR210 Circuit breaker, 2 pole, 15A, Eaton BR215 Circuit breaker, 2 pole, 20A, Eaton BR220 Circuit breaker, 2 pole, 15A, Eaton BR215B with hold down kit support Circuit breaker, 2 pole, 20A, Eaton BR220B with hold down kit support
EPLC-01	Power line carrier (communication bridge pair), quantity - one pair
XA-SOLARSHIELD-ES	Replacement solar shield for IQ Combiner 4/4C
XA-PLUG-120-3	Accessory receptacle for Power Line Carrier in IQ Combiner 4/4C (required for EPLC-01)
XA-ENV-PCBA-3	Replacement IQ Gateway printed circuit board (PCB) for Combiner 4/4C
X-IQ-NA-HD-125A	Hold down kit for Eaton circuit breaker with screws.
ELECTRICAL SPECIFICATIONS	
Rating	Continuous duty
System voltage	120/240 VAC, 60 Hz
Eaton BR series busbar rating	125 A
Max. continuous current rating	65 A
Max. continuous current rating (input from PV/storage)	64 A
Max. fuse/circuit rating (output)	90 A
Branch circuits (solar and/or storage)	Up to four 2-pole Eaton BR series Distributed Generation (DG) breakers only (not included)
Max. total branch circuit breaker rating (input)	80A of distributed generation / 95A with IQ Gateway breaker included
Production metering CT	200 A solid core pre-installed and wired to IQ Gateway
Consumption monitoring CT (CT-200-SPLIT)	A pair of 200 A split core current transformers
MECHANICAL DATA	
Dimensions (WxHxD)	37.5 x 49.5 x 16.8 cm (14.75" x 19.5" x 6.63"). Height is 21.06" (53.5 cm) with mounting brackets.
Weight	7.5 kg (16.5 lbs)
Ambient temperature range	-40° C to +46° C (-40° to 115° F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction
Wire sizes	• 20 A to 50 A breaker inputs: 14 to 4 AWG copper conductors • 60 A breaker branch input: 4 to 1/0 AWG copper conductors • Main lug combined output: 10 to 2/0 AWG copper conductors • Neutral and ground: 14 to 1/0 copper conductors Always follow local code requirements for conductor sizing.
Altitude	To 2000 meters (6,560 feet)
INTERNET CONNECTION OPTIONS	
Integrated Wi-Fi	802.11b/g/n
Cellular	CELLMODEM-M1-06-SP-05, CELLMODEM-M1-06-AT-05 (4G based LTE-M1 cellular modem). Note that an Enphase Mobile Connect cellular modem is required for all Ensemble installations.
Ethernet	Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included)
COMPLIANCE	
Compliance, IQ Combiner	UL 1741, CAN/CSA C22.2 No. 107.1, 47 CFR, Part 15, Class B, ICES 003 Production metering: ANSI C12.20 accuracy class 0.5 (PV production) Consumption metering: accuracy class 2.5
Compliance, IQ Gateway	UL 60601-1/CANCSA 22.2 No. 61010-1

To learn more about Enphase offerings, visit **enphase.com**

ENPHASE.

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ERMOCRATES E. CASTILLO - MO PE# 2021029136

REVISIONS

DESCRIPTION	DATE	REV

PROJECT INSTALLER

CORVUS PRO SOLAR

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Date: 2023.03.27 12:19:49

PROJECT NAME

GARDNER RESIDENCE
102 SW JOSHUA DR,
LEES SUMMIT, MO 64081

SHEET NAME

DATA SHEET

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

DS-03

Tech Brief

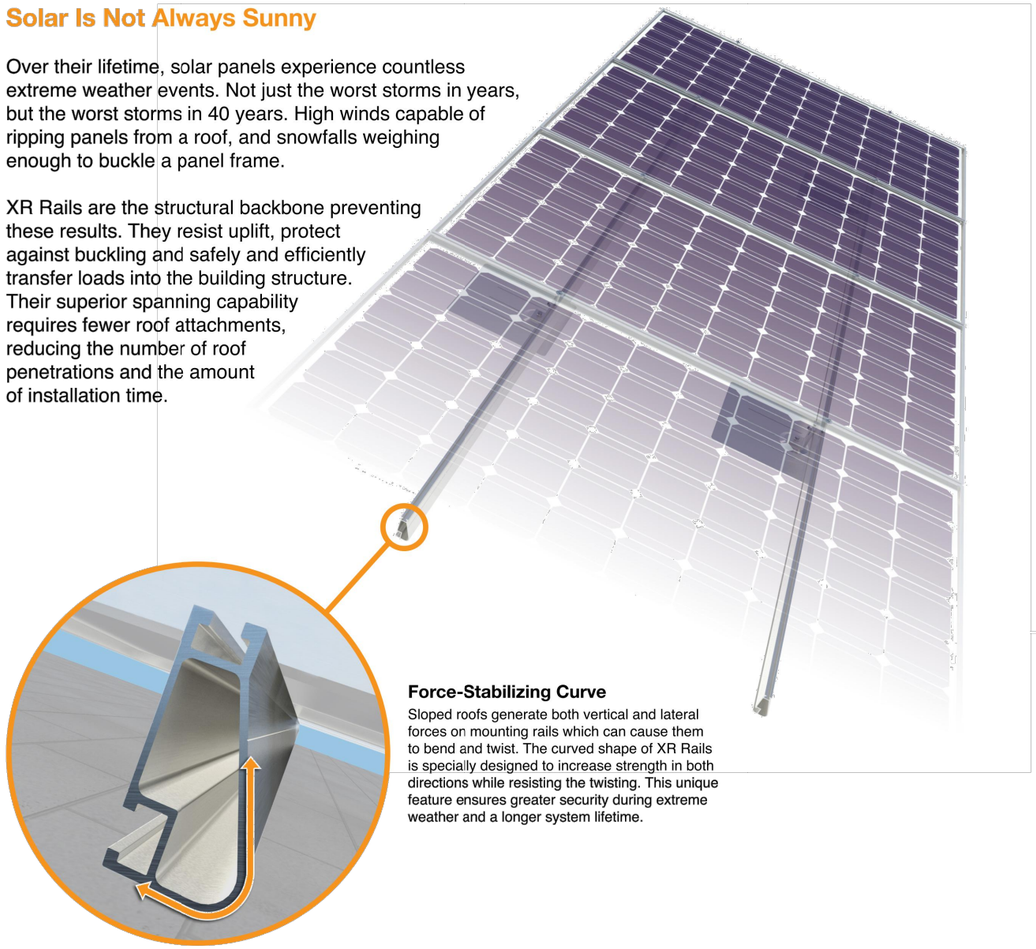
IRONRIDGE

XR Rail Family

Solar Is Not Always Sunny

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

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



Force-Stabilizing Curve

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

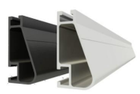
Compatible with Flat & Pitched Roofs

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

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

Corrosion-Resistant Materials

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



Tech Brief

XR Rail Family

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

XR10

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

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

XR100

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

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

XR1000

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

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

Rail Selection

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

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

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

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NUMBER PE-2021029136
PROFESSIONAL ENGINEER

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PROJECT NAME

GARDNER RESIDENCE
102 SW JOSHUA DR,
LEES SUMMIT, MO 64081

SHEET NAME

DATA SHEET

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

DS-04

Tech Brief

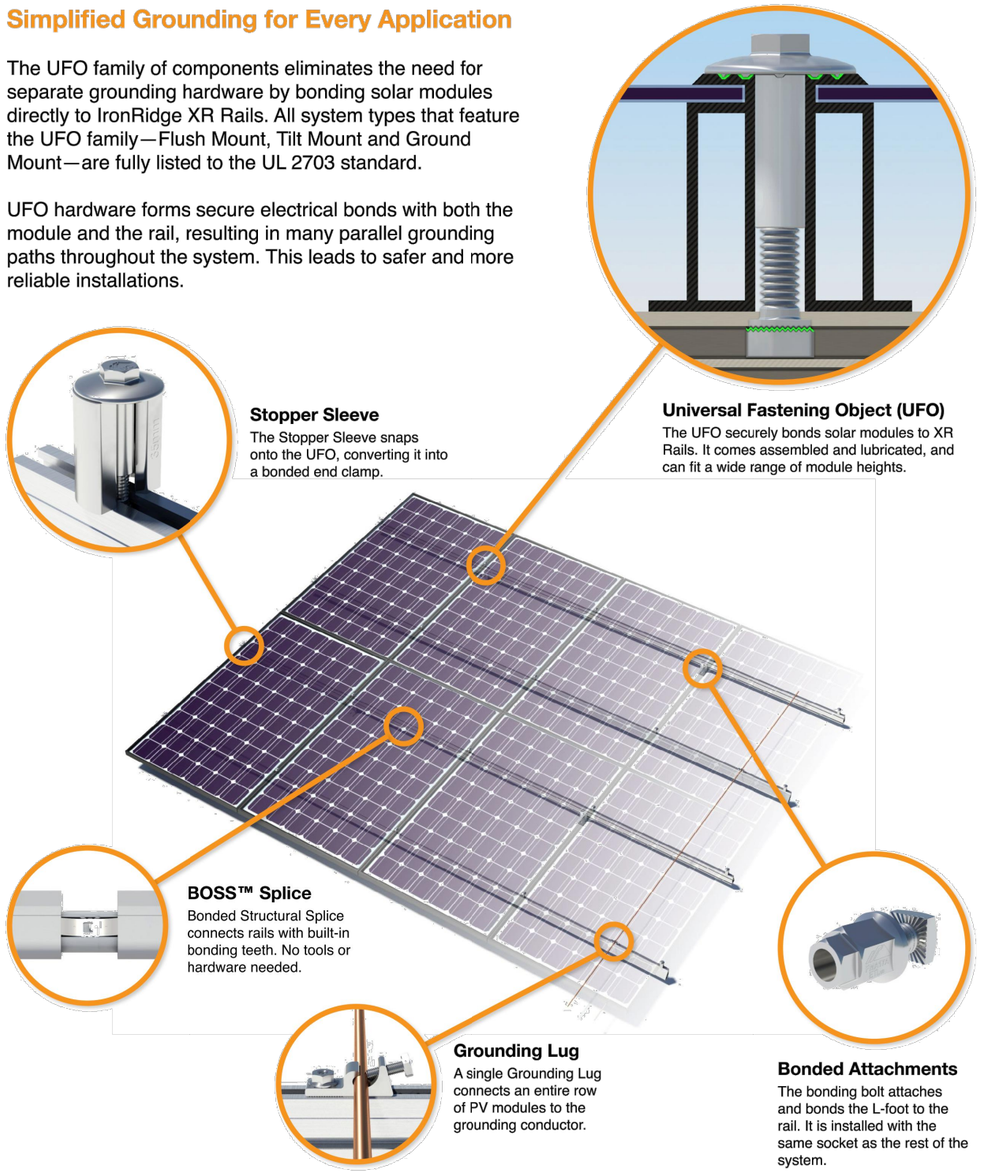
IRONRIDGE

UFO Family of Components

Simplified Grounding for Every Application

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

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



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

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.

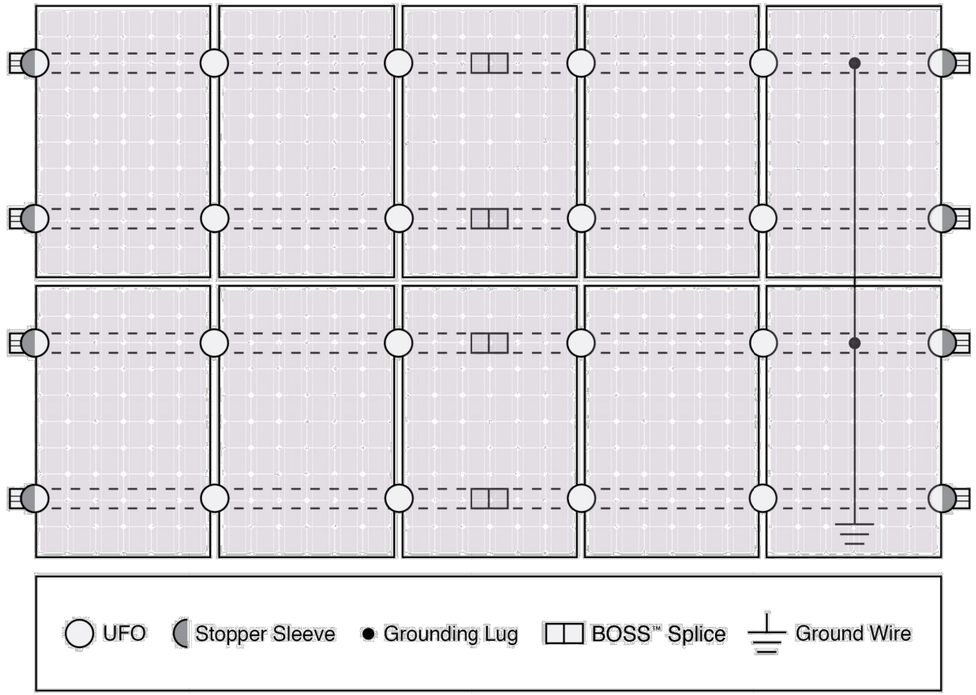
BOSS™ Splice
Bonded Structural Splice connects rails with built-in bonding teeth. No tools or hardware needed.

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

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

Tech Brief

System Diagram



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

UL Certification

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

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

Go to IronRidge.com/UFO

Cross-System Compatibility

Feature	Flush Mount	Tilt Mount	Ground Mount
XR Rails	✔	✔	XR1000 Only
UFO/Stopper	✔	✔	✔
BOSS™ Splice	✔	✔	N/A
Grounding Lugs	1 per Row	1 per Row	1 per Array
Microinverters & Power Optimizers	Compatible with most MLPE manufacturers. Refer to system installation manual.		
Fire Rating	Class A	Class A	N/A
Modules	Tested or Evaluated with over 400 Framed Modules Refer to installation manuals for a detailed list.		

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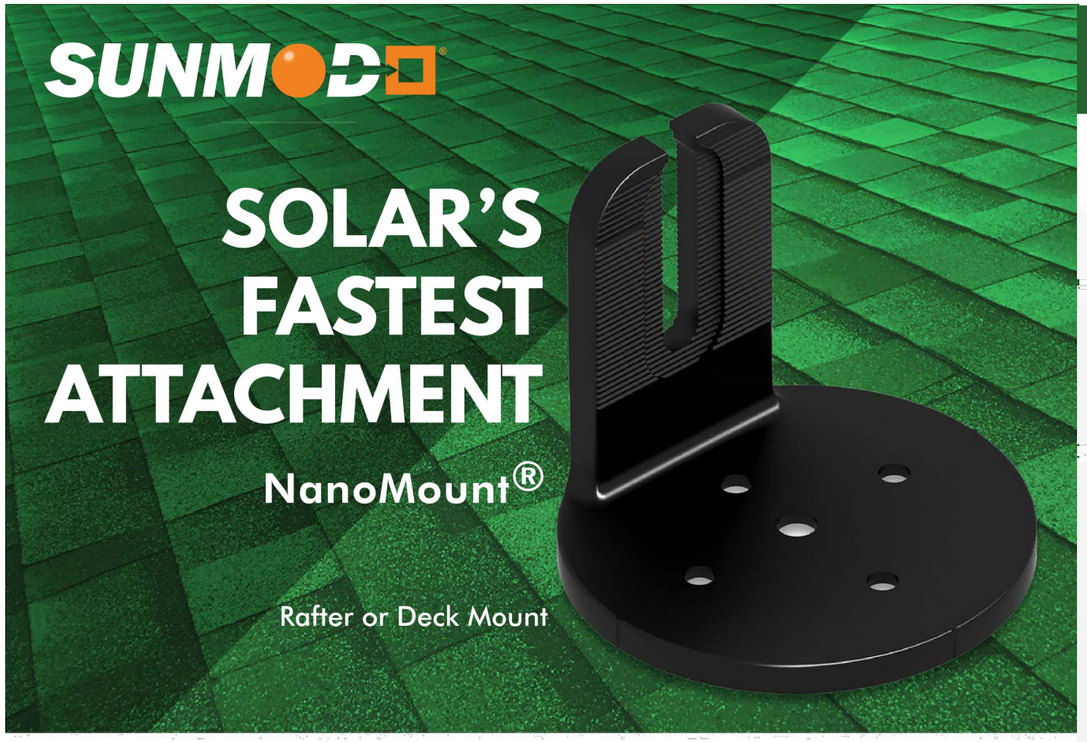
PROJECT NAME

GARDNER RESIDENCE
102 SW JOSHUA DR,
LEES SUMMIT, MO 64081

SHEET NAME
DATA SHEET

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
DS-05



Damaging roof shingles used to be one of a solar installers' worst challenges.

Now, the easy, affordable solution is NanoMount®, SunModo's patented solar mounting innovation.

The mount eliminates the need for lifting shingles and dramatically reduces the installation time.

The NanoMount® Advantage

- ✓ The fastest roof attachment in solar.
- ✓ Versatile mounting options including direct-to-decking.
- ✓ Eliminates the need to lift shingles and prevents damage to shingles.
- ✓ High-Velocity Hurricane Zone Approved - Passed TAS 100 (a) Wind-Driven Rain Test.
- ✓ All materials are compatible with asphalt shingles and single-ply roof membranes.

Key Features of NanoMount®

SUNMODO

5 levels of protection against water penetration

Technical Data

Application	Residential roof coverings, commercial single-ply roof membranes
Material	High grade aluminum, 304 stainless steel hardware
Finish	Black powder coating
Roof Attachment	Rafter and decking
Structural integrity	IBC and IRC Compliant
Warranty	25 years

SunModo, Corp. Vancouver, WA., USA • www.sunmodo.com • 360.844.0048 • info@sunmodo.com

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Date: 2023.03.27 12:19:52

PROJECT NAME

GARDNER RESIDENCE
102 SW JOSHUA DR,
LEES SUMMIT, MO 64081

SHEET NAME
DATA SHEET

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
DS-06

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SUNMODO CORPORATION MIAMI-DADE TEST REPORT

SCOPE OF WORK
TAS 100(A) TESTING ON NANOMOUNT, ROOF MOUNTS

REPORT NUMBER
K6195.02-109-18

TEST DATE(S)
02/13/20

ISSUE DATE
03/03/20

RECORD RETENTION END DATE
02/13/30

MIAMI-DADE COUNTY NOTIFICATION NO.
ATI 20009

LABORATORY CERTIFICATION NO.
19-0321.16

PAGES
13

DOCUMENT CONTROL NUMBER
ATI 00651 (08/21/17)
RT-R-AMER-Test-2816

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130 Derry Court
York, Pennsylvania 17406

Telephone: 717-764-7700
Facsimile: 717-764-4129
www.intertek.com/building

SECTION 2
TEST METHOD(S)

The specimens were evaluated in accordance with the following:

TAS 100(A)-95, *Test Procedure for Wind and Wind Driven Rain Resistance and/or Increased Windspeed Resistance of Soffit Ventilation Strip and Continuous or Intermittent Ventilation System Installed at the Ridge Area.*

SECTION 3
CALIBRATION

Windstream, water supply, and water distribution calibration were performed prior to testing. Reference Intertek B&C Calibration Report No. K5146.02-109-18, dated 1/8/20, for descriptions and results.

SECTION 4
MATERIAL SOURCE

Test specimens were provided by the client. Representative samples of the test specimen(s) will be retained by Intertek B&C for a minimum of ten years from the test completion date.

SECTION 5
EQUIPMENT

Vane Axial Fan – Y003346
Stopwatch - INT00974

SECTION 6
LIST OF OFFICIAL OBSERVERS

NAME	COMPANY
Tyler J. Holland	Intertek B&C
John A. Shanabrook	Intertek B&C
Timothy J. McGill	Intertek B&C
Daniel C. Culbert, P.E.	Intertek B&C
Kyle W. Ruth	Intertek B&C

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TEST REPORT FOR SUNMODO CORPORATION
Report No.: K6195.02-109-18
Date: 03/03/20

Photo No. 2
Nano Deck Mounted Test Specimen

Photo No. 3
Nano Rafter Mounted Test Specimen

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SHEET NAME
DATA SHEET

SHEET SIZE
ANSI B
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SHEET NUMBER
DS-07