ANDY BUERGO
NEW GRID-INTERACTIVE PHOTOVOLTAIC SYSTEM
DC SYSTEM SIZE (17.940 KW)

SYSTEM DETAILS

DESCRIPTION	NEW GRID-INTERACTIVE PHOTOVOLTAIC SYSTEM WITH NO BATTERY STORAGE
DC RATING OF SYSTEM	SYSTEM SIZE :17.940 KW DC STC
AC RATING OF SYSTEM	13.340 KW
AC OUTPUT CURRENT	55.66 A
NO. OF MODULES	(46) TRINA SOLAR TSM-DE09.07 (390W) SOLAR MODULES
NO. OF INVERTERS	(46) ENPHASE IQ8PLUS-72-2-US MICROINVERTERS
POINT OF INTERCONNECTION	LOAD SIDE TAP IN THE MMC
ARRAY STRINGING	(2) BRANCHES OF 12 MODULES (2) BRANCH OF 11 MODULES

SITE DETAILS

ASHRAE EXTREME LOW	-5°C
ASHRAE 2% HIGH	34°C
GROUND SNOW LOAD	0 PSF
WIND SPEED	120 MPH (ASCE 7-16)
RISK CATEGORY	II
WIND EXPOSURE CATEGORY	B

GOVERNING CODES

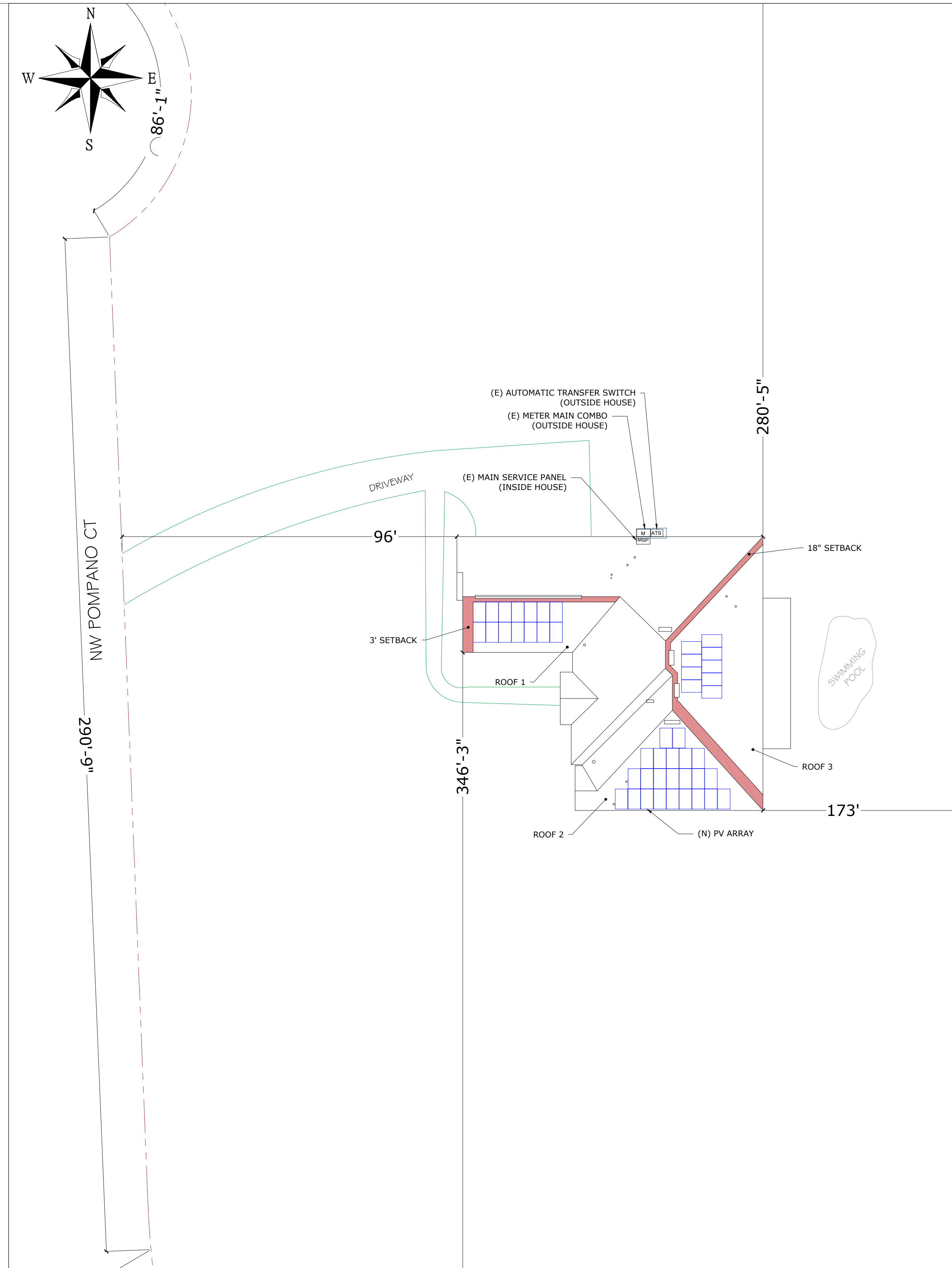
FLORIDA RESIDENTIAL CODE, 7TH EDITION 2020 (FRC)

FLORIDA BUILDING CODE, 7TH EDITION 2020 (FBC)

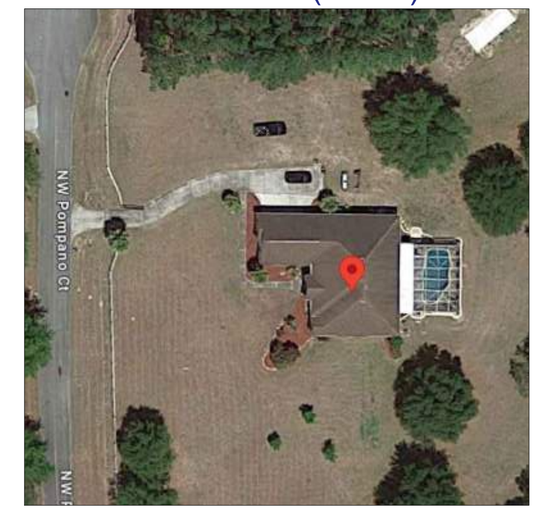
FLORIDA FIRE PREVENTION CODE, 7TH EDITION 2020 (FFPC)

NATIONAL ELECTRICAL CODE, NEC 2017 CODE BOOK, NFPA 70

SHEET INDEX

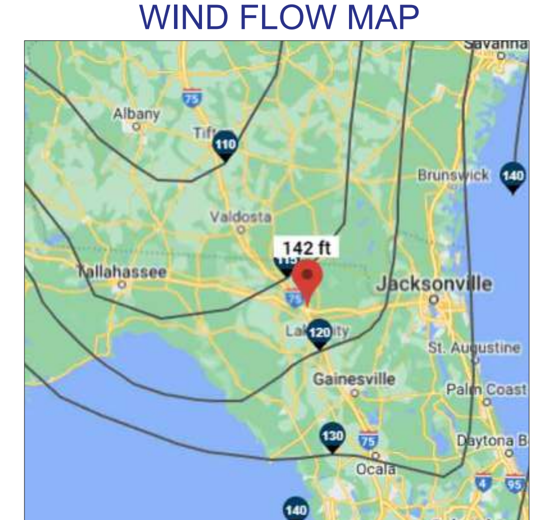


SITE MAP (N.T.S)



VICINITY MAP

WIND FLOW MAP



EnLight Energy

978 SW 2ND AVE GAINESVILLE , FL 32601

CONTACT:-(800) 798-0315

ENGINEER OF RECORD

VINCENT MWUMVANEZA LICENSE No. 88689 STATE OF FLORIDA PROFESSIONAL ENGINEER

Exp:02/28/2025 STRUCTURAL ONLY

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Vincent Mwumvaneza — Digitally signed by Vincent Mwumvaneza Date: 2023.12.21 00:18:34 -05'00'

ANDY BUERGO

241 NW POMPANO CT, LAKE CITY, FL 32055, USA

REVISIONS

REV	ENGG.	DESCRIPTION	DATE

PERMIT DEVELOPER	
DATE	12/05/2023
DESIGNER	OKD
REVIEWER	

SHEET NAME

SITE MAP & VICINITY MAP

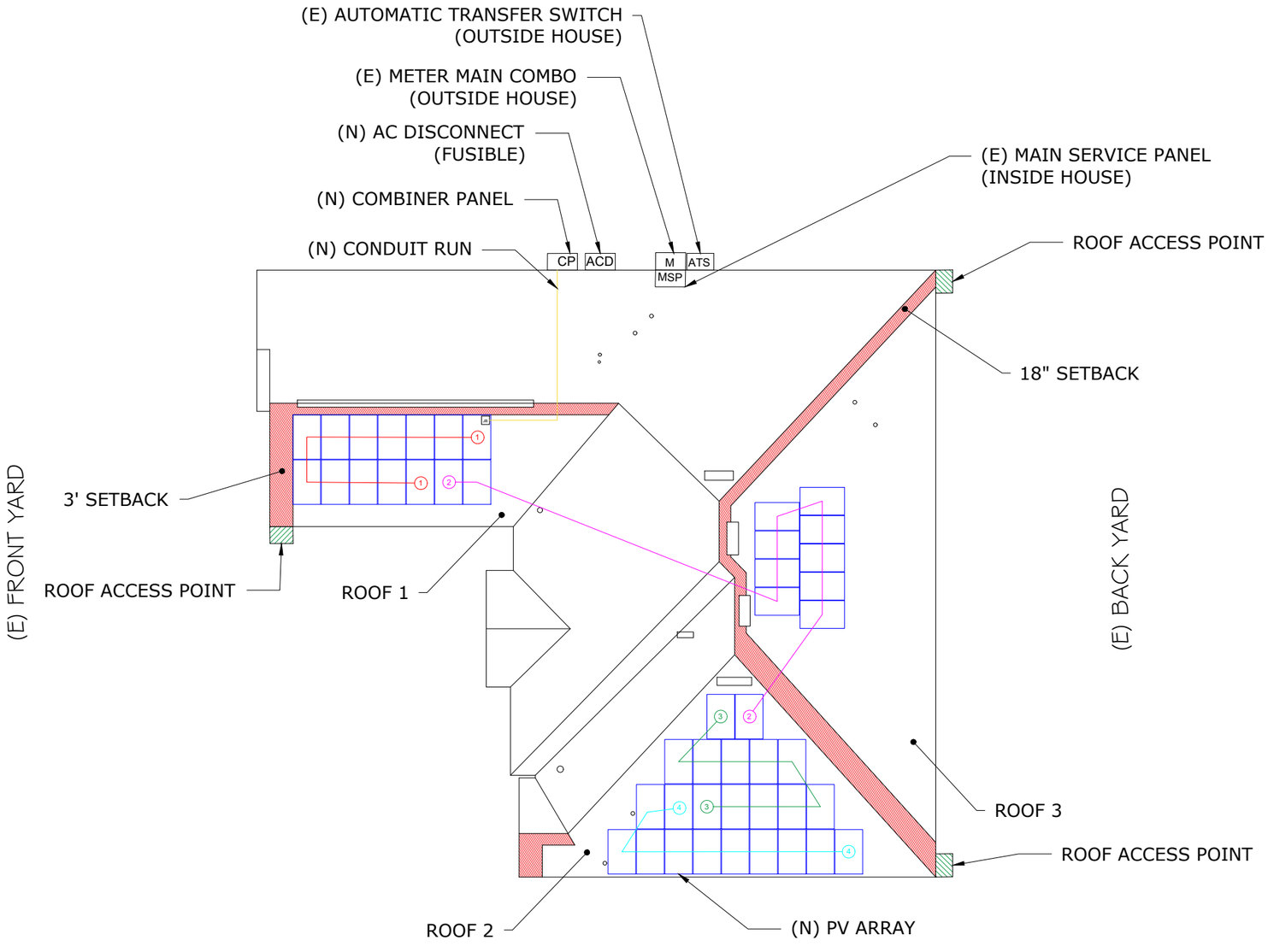
SHEET NUMBER

A-01

MODULE TYPE, DIMENSIONS & WEIGHT

NUMBER OF MODULES = 46 MODULES
MODULE TYPE = TRINA SOLAR TSM-DE09.07 (390W) SOLAR MODULES
MODULE WEIGHT = 46.3 LBS / 21 KG.
MODULE DIMENSIONS = 69.06" X 43.15" = 20.69 SF

NUMBER OF INVERTER = 46 MICROINVERTERS
INVERTER TYPE = ENPHASE IQ8PLUS-72-2-US MICROINVERTERS
DC SYSTEM SIZE: 17.940 KW
AC SYSTEM SIZE: 13.340 KW



GENERAL INSTALLATION PLAN NOTES:

1) ROOF ATTACHMENTS TO TRUSSES SHALL BE INSTALLEDAS SHOWN IN SHEET S-01 AND AS FOLLOWS FOR EACH WINDZONE:.

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

3) EXISTING RESIDENTIAL BUILDING ROOF WITH MEAN ROOF HEIGHT 15 FT AND 2"X4" WOOD ROOF TRUSSES SPACED 24" O.C.

CONTRACTOR TO FIELD VERIFY AND SHALL REPORT TO THE ENGINEER IF ANY DISCREPANCIES EXIST BETWEEN PLANS AND IN FIELD CONDITIONS.

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

NOTES:

1. LOCATION OF JUNCTION BOX(ES), AC DISCONNECTS(S), AC COMBINER PANEL(S), AND OTHER ELECTRICAL EQUIPMENT(S) RELEVANT TO PV INSTALLATION SUBJECT TO CHANGE BASED ON SITE CONDITIONS.
2. SETBACKS AT RIDGES CAN BE REDUCED TO 18 INCHES IN COMPLIANCE WITH FBC R 324.6.2:
TOTAL PLAN VIEW AREA = 5105 SQFT
TOTAL PV AREA = 46(69.06 IN)(43.15 IN)/(144 IN^2)
= 951.92 SQFT
(951.92 SQFT/ 5105 SQFT)100 = 18.65 %
TOTAL PV AREA POPULATES 18.65 % OF TOTAL PLAN VIEW AREA AND IS WITHIN THE 33% REQUIREMENT.

1 - MODULE STRING
2 - MODULE STRING
3 - MODULE STRING
4 - MODULE STRING

LEGENDS

- UM - UTILITY METER
- MSP - MAIN SERVICE PANEL
- M - METER MAIN COMBO
- ATS - AUTOMATIC TRANSFER SWITCH
- JB - JUNCTION BOX
- ACD - AC DISCONNECT
- CP - COMBINER PANEL
- FIRE SETBACK
- ROOF ACCESS POINT
- MICROINVERTER
- VENT, ATTIC FAN (ROOF OBSTRUCTION)
- CONDUIT

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CONTACT:-(800) 798-0315

ENGINEER OF RECORD

VINCENT MWUMVANEZA LICENSE No. 88696 STATE OF FLORIDA PROFESSIONAL ENGINEER
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Date: 2023.12.21 00:18:15 -05'00'

ANDY BUERGO
241 NW POMPANO CT, LAKE CITY, FL 32055, USA

REVISIONS	DESCRIPTION	DATE
REV	ENGG.	

PERMIT DEVELOPER	
DATE	12/05/2023
DESIGNER	OKD
REVIEWER	

SHEET NAME
ROOF PLAN & MODULES

SHEET NUMBER
A-02

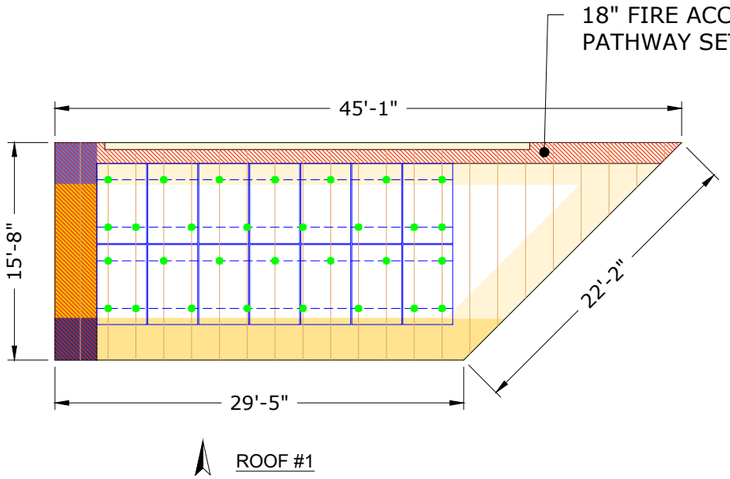
ROOF DESCRIPTION:

(ROOF #1)
MODULES -14
ROOF TILT - 30°
ROOF AZIMUTH - 180°
TRUSSES SIZE - 2"X4" @ 24" O.C.
ROOF TYPE : STONE-COATED STEEL

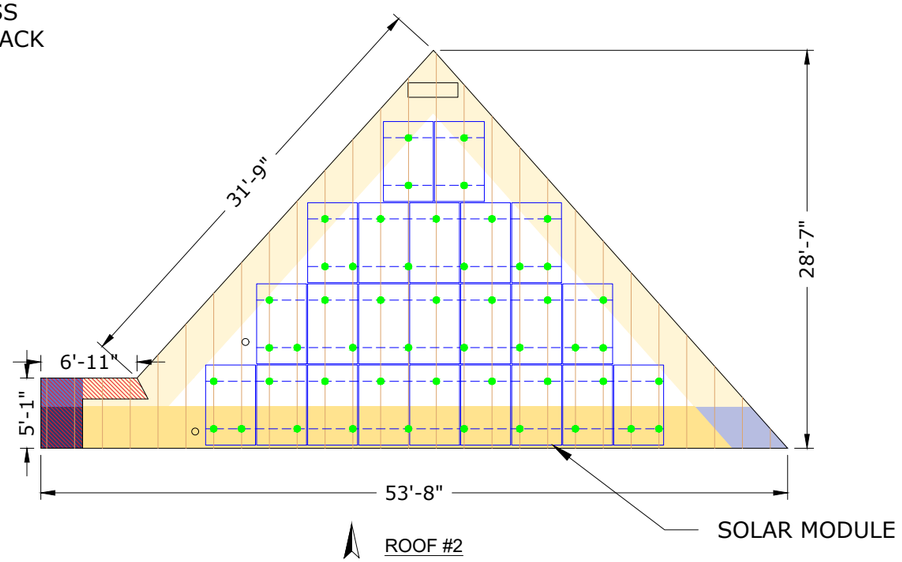
(ROOF #2)
MODULES -23
ROOF TILT - 30°
ROOF AZIMUTH - 180°
TRUSSES SIZE - 2"X4" @ 24" O.C.
ROOF TYPE : STONE-COATED STEEL

(ROOF #3)
MODULES -9
ROOF TILT - 30°
ROOF AZIMUTH - 90°
TRUSSES SIZE - 2"X4" @ 24" O.C.
ROOF TYPE : STONE-COATED STEEL

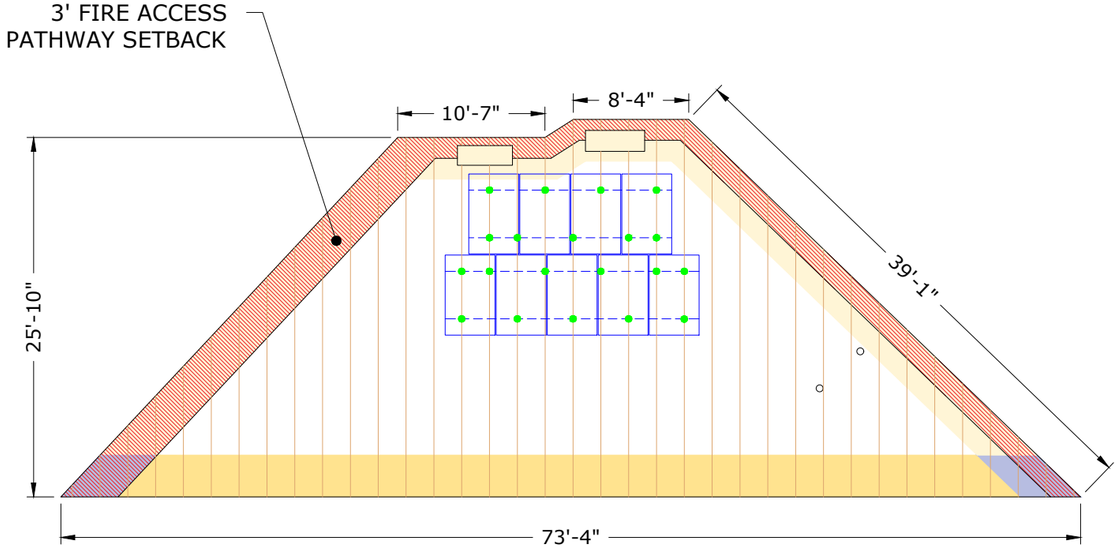
WIND LOAD INFORMATION:
THIS SYSTEM HAS BEEN DESIGN TO MEET THE REQUIREMENTS OF THE 7TH EDITION OF THE FLORIDA BUILDING CODE AND USED THE FOLLOWING DESIGN PARAMETERS:
ULTIMATE WIND SPEED: 120 MPH
EXPOSURE CATEGORY: B
RISK CATEGORY: II
MEAN ROOF HEIGHT: 15 FEET
ROOF SLOPE: 27-45°



ROOF #1



ROOF #2



ROOF #3

LEGENDS
- FIRE SETBACK
- VENT, ATTIC FAN (ROOF OBSTRUCTION)
- PV ROOF ATTACHMENT
- RAIL
- RAFTERS / TRUSSES
- METAL SEAM

WIND ZONE 1
- WIND ZONE 1
- WIND ZONE 1'

WIND ZONE 2
- WIND ZONE (2)
- WIND ZONE (2r)
- WIND ZONE (2e)
- WIND ZONE (2n)

WIND ZONE 3
- WIND ZONE (3)
- WIND ZONE (3r)
- WIND ZONE (3e)

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ENGINEER OF RECORD

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ANDY BUERGO

241 NW POMPANO CT, LAKE CITY, FL 32055, USA

REVISIONS

REV	ENGG.	DESCRIPTION	DATE

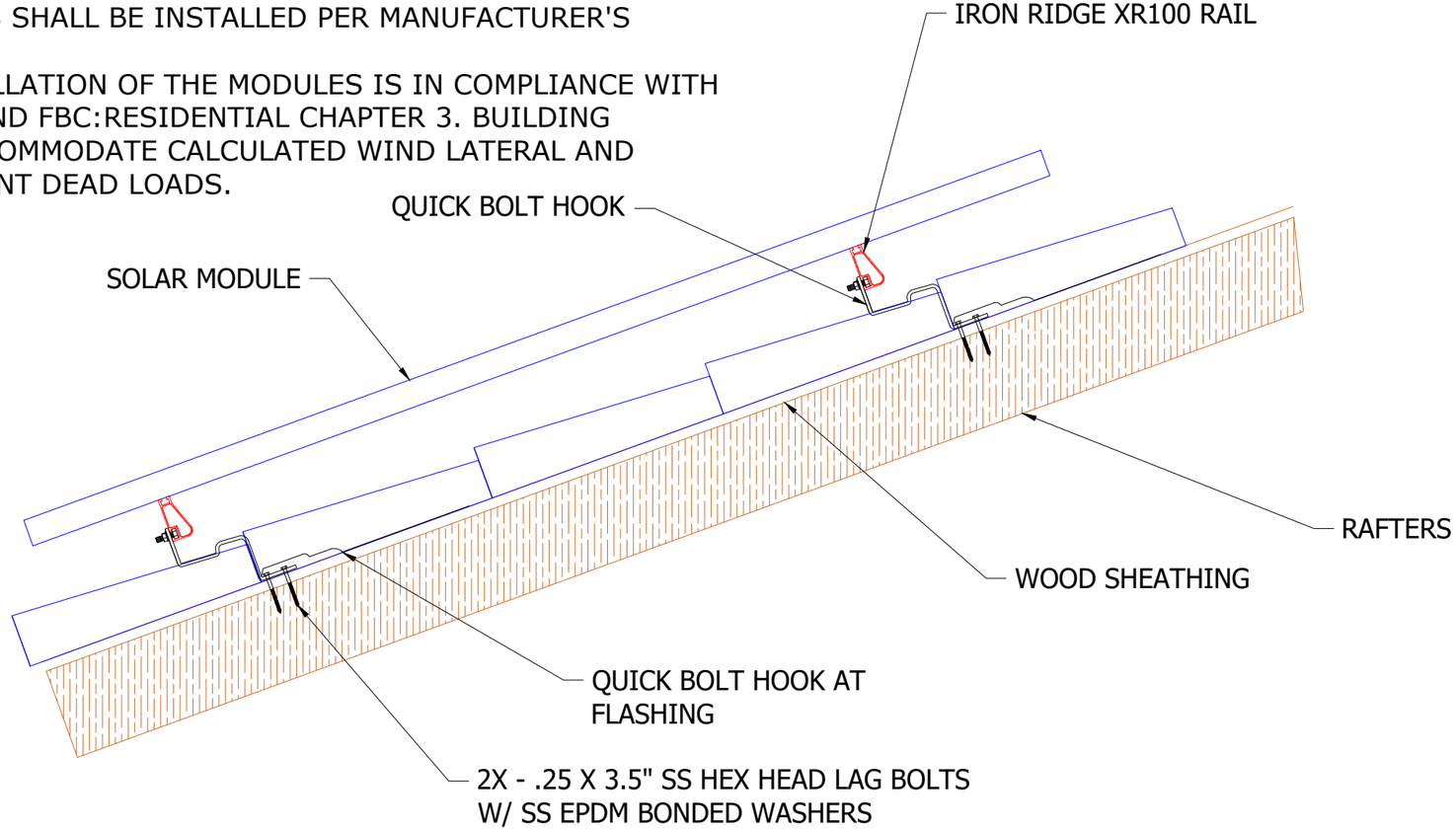
PERMIT DEVELOPER	
DATE	12/05/2023
DESIGNER	OKD
REVIEWER	

SHEET NAME
ARRAY LAYOUT

SHEET NUMBER
S-01

STRUCTURAL ATTACHMENT DETAILS

1. APPLICABLE CODE: 2020 FLORIDA BUILDING CODE 7th ED. & ASCE 7-16 MINIMUM DESIGN LOADS FOR BUILDING AND OTHER STRUCTURES
2. BOLT DIAMETER AND EMBEDMENT LENGTHS ARE DESIGNED PER NDS(2012)REQUIREMENTS. ALL BOLT CAPACITIES ARE BASED ON A WOOD ROOF TRUSS AS EMBEDMENT MATERIAL.
3. ALL WIND DESIGN CRITERIA AND PARAMETERS ARE FOR HIP AND GABLERESIDENTIAL ROOFS, CONSIDERING FROM A 7° TO A MAXIMUM 27° (2/12 TO AMAXIMUM 6/12 PITCH) ROOF IN SCHEDULE. ALL RESIDENTIAL ROOFS SHALL NOTEXCEED 30'-0" MEAN ROOF HEIGHT.
4. ROOF SEALANTS SHALL CONFORM TO ASTM C920 AND ASTM 6511.
5. THIS SHEET REFLECTS STRUCTURAL CONNECTIONS ONLY. REFER TOMANUFACTURER'S MANUAL FOR ALL ARCHITECTURAL, MECHANICAL, ELECTRICAL AND SOLAR SPECS.
6. ALL ALUMINIUM COMPONENTS SHALL BE ANODIZED ALUMINIUM 6105-T5 UNLESS OTHERWISE NOTED.
7. LAG BOLTS SHALL BE ASTM A276 STAINLESS STEEL UNLESS OTHERWISE NOTED.
8. ALL RAILING AND MODULES SHALL BE INSTALLED PER MANUFACTURER'S INSTRUCTIONS.
9. I CERTIFY THAT THE INSTALLATION OF THE MODULES IS IN COMPLIANCE WITH FBC:BUILDING CHAPTER 16 AND FBC:RESIDENTIAL CHAPTER 3. BUILDING STRUCTURE WILL SAFELY ACCOMMODATE CALCULATED WIND LATERAL AND UPLIFT FORCES AND EQUIPMENT DEAD LOADS.



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ENGINEER OF RECORD

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REVISIONS						
REV	ENGG.	DESCRIPTION	DATE			

PERMIT DEVELOPER	
DATE	12/05/2023
DESIGNER	OKD
REVIEWER	

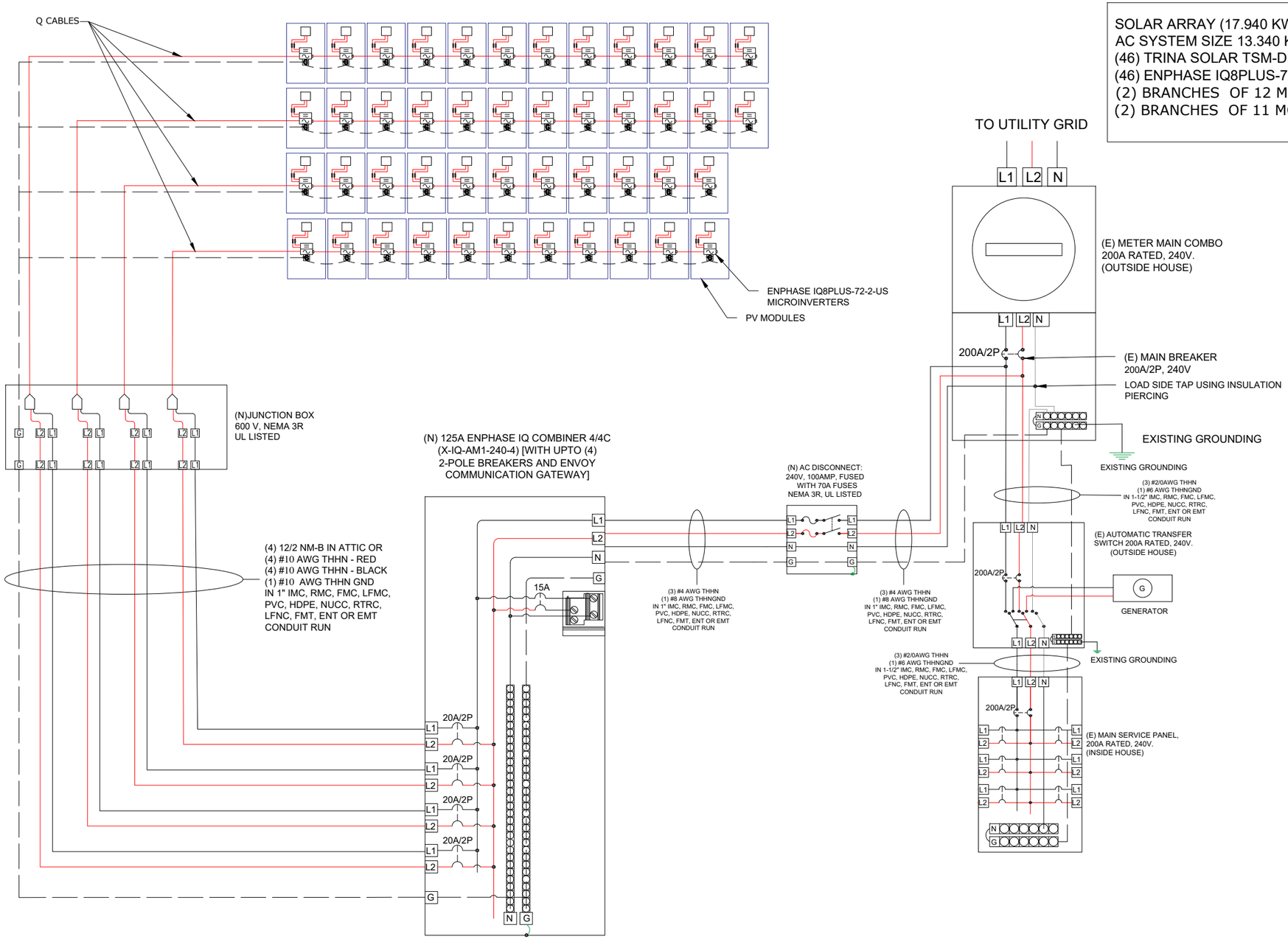
SHEET NAME
STRUCTURAL ATTACHMENT DETAILS

SHEET NUMBER
S-02

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 312.8 IF PANEL GUTTER SPACE IS INADEQUATE.

SOLAR ARRAY (17.940 KW KW-DC STC)
AC SYSTEM SIZE 13.340 KW KW AC
(46) TRINA SOLAR TSM-DE09.07 (390W) SOLAR MODULES
(46) ENPHASE IQ8PLUS-72-2-US MICROINVERTER
(2) BRANCHES OF 12 MODULES
(2) BRANCHES OF 11 MODULES



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ENGINEER OF RECORD

ANDY BUERGO

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REVISIONS	DATE	DESCRIPTION	ENGG.
REV			

PERMIT DEVELOPER	
DATE	12/05/2023
DESIGNER	OKD
REVIEWER	

SHEET NAME

SINGLE LINE DIAGRAM

SHEET NUMBER

E-01

ELECTRICAL CALCULATIONS:

1. CURRENT CARRYING CONDUCTOR

(A) BEFORE IQ COMBINER PANEL

AMBIENT TEMPERATURE = 34°C
CONDUIT INSTALLED AT DISTANCE OF 7/8 INCHES ABOVE ROOF .....NEC 310.15(B)(3)(c)
TEMPERATURE DERATE FACTOR - 0.96 ...NEC 310.15(B)(2)(a)
GROUPING FACTOR - 0.7...NEC 310.15(B)(3)(a)

CONDUCTOR AMPACITY
= (INV O/P CURRENT) x 1.25 / A.T.F / G.F ...NEC 690.8(B)
= [(12 x 1.21) x 1.25] / 0.96 / 0.7
= 27.01 A
SELECTED CONDUCTOR - #10 THHN ...NEC 310.15(B)(16)

(B) AFTER IQ COMBINER PANEL

TEMPERATURE DERATE FACTOR - 0.96
GROUPING FACTOR - 1

CONDUCTOR AMPACITY
=(TOTAL INV O/P CURRENT) x 1.25 / 0.96 / 1 ...NEC 690.8(B)
=[(46x 1.21) x 1.25] /0.96 / 1
=72.47 A
2. SELECTED CONDUCTOR - #4 THHN ....NEC 310.15(B)(16)

3. PV OVER CURRENT PROTECTION ..NEC 690.9(B)

= (NO OF MICROINVERTER) O/P CURRENT) x 1.25
=(46 x 1.21) x 1.25 = 69.58 A
SELECTED OCPD = 70A

SELECTED EQUIPMENT GROUND CONDUCTOR (EGC) = #8 THHN ... NEC 250.122(A)

MODULE SPECIFICATION	
MODEL NO.	TRINA SOLAR TSM-DE09.05 (390W) SOLAR MODULES
PEAK POWER	390W
RATED VOLTAGE (Vmpp)	33.8 V
RATED CURRENT (Impp)	11.54 A
OPEN CIRCUIT VOLTAGE (Voc)	40.8 V
SHORT CIRCUIT CURRENT (Isc)	12.14 A

INVERTER SPECIFICATIONS	
MANUFACTURER	ENPHASE
MODEL NO.	IQ8PLUS-72-2-US
PEAK OUTPUT POWER	290 VA
NOMINAL AC OUTPUT VOLTAGE	240 V
NOMINAL AC OUTPUT CURRENT	1.21 A

ELECTRICAL NOTES

1. ALL EQUIPMENT TO BE LISTED BY UL OR OTHER NRTL AND LABELED FOR ITS APPLICATION.
2. COPPER CONDUCTORS SHALL BE RATED FOR 600 V AND 90 DEGREE C WET ENVIRONMENT.THE TERMINALS ARE RATED FOR 75 DEGREE C ROMEX/NM-B (NONMETALLIC-SHEATHED) CABLE MAY BE USED FOR BOTH EXPOSED AND CONCEALED WORK IN NORMALLY DRY LOCATIONS AT TEMPERATURES NOT TO EXCEED 90°C (WITH AMPACITY LIMITED TO THAT FOR 60°C CONDUCTORS) AS SPECIFIED IN THE NATIONAL ELECTRICAL CODE. VOLTAGE RATING FOR NM-B CABLE IS 600 VOLTS.
3. CONDUCTOR TERMINATION AND SPLICING AS PER NEC 110.14 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.SHALL BE ROUTED DIRECTLY TO, AND LOCATED AS CLOSE AS
4. WORKING CLEARANCES AROUND ALL NEW AND EXISTING ELECTRICAL EQUIPMENT SHALL COMPLY WITH NEC 110.265. WORKING CLEARANCES AROUND ALL NEW AND EXISTING
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 BOXES, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, THE CONTRACTOR SHALL SIZE THEM ACCORDINGLY.
7. ALL WIRE TERMINATIONS SHALL BE APPROPRIATELY LABELED AND READILY VISIBLE.
8. MODULE GROUNDING CLIPS TO BE INSTALLED BETWEEN MODULE FRAME AND MODULE SUPPORT RAIL, PER THE GROUNDING CLIP MANUFACTURER'S INSTRUCTION.
9. MODULE SUPPORT RAIL TO BE BONDED TO CONTINUOUS COPPER G.E.C. VIA WEEB LUG OR ILSCO GBL-4DBT LAY-IN LUG.
10. THE POLARITY OF THE GROUNDED CONDUCTORS IS NEGATIVE.
11. UTILITY HAS 24-HR UNRESTRICTED ACCESS TO ALL PHOTOVOLTAIC SYSTEM COMPONENTS LOCATED AT THE SERVICE ENTRANCE.
12. MODULES CONFORM TO AND ARE LISTED UNDER UL 1703.
13. RACKING CONFORMS TO AND IS LISTED UNDER UL 2703.
14. CONDUCTORS EXPOSED TO SUNLIGHT SHALL BE LISTED AS SUNLIGHT RESISTANT PER NEC ARTICLE 300.6 (C) (1) AND ARTICLE 310.10 (D).
15. CONDUCTORS EXPOSED TO WET LOCATIONS SHALL BE SUITABLE FOR USE IN WET LOCATIONS PER NEC ARTICLE 310.10 (C).

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ENGINEER OF RECORD

ANDY BUERGO

241 NW POMPANO CT, LAKE CITY, FL 32055, USA

REVISIONS	DESCRIPTION	DATE	REV. ENGG.

PERMIT DEVELOPER	
DATE	12/05/2023
DESIGNER	OKD
REVIEWER	

SHEET NAME
WIRING CALCULATIONS

SHEET NUMBER
E-02

⚠ WARNING

ELECTRIC SHOCK HAZARD
DO NOT TOUCH TERMINALS
TERMINALS ON BOTH LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

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

WARNING PHOTOVOLTAIC POWER SOURCE

LABEL LOCATION:
CONDUIT RUNWAY
(PER CODE: NEC690.31(G)(3)(4))

⚠ WARNING DUAL POWER SOURCE
SECOND SOURCE IS PHOTOVOLTAIC SYSTEM

LABEL LOCATION:
MAIN SERVICE DISCONNECT
(NEC 705.12(B)(3-4) & NEC 690.59)

ADHESIVE FASTENED SIGNS:

·ANSI Z535.4-2011 PRODUCT SAFETY SIGNS AND LABELS, PROVIDES GUIDELINES FOR SUITABLE FONT SIZES, WORDS, COLORS, SYMBOLS, AND LOCATION REQUIREMENTS FOR LABELS. NEC 110.21(B)(1)
·THE LABEL SHALL BE OF SUFFICIENT DURABILITY TO WITHSTAND THE ENVIRONMENT INVOLVED. NEC 110.21(B)(3)
·ADHESIVE FASTENED SIGNS MAY BE ACCEPTABLE IF PROPERLY ADHERED. VINYL SIGNS SHALL BE WEATHER RESISTANT. IFC 605.11.1.3

PHOTOVOLTAIC SYSTEM AC DISCONNECT
RATED AC OPERATING CURRENT 55.66 AMPS
AC NOMINAL OPERATING VOLTAGE 240 VOLTS

LABEL LOCATION:
AC DISCONNECT, INVERTER
(PER CODE: NEC 690.54)

WARNING
INVERTER OUTPUT CONNECTION DO NOT RELOCATE THIS OVERCURRENT DEVICE

LABEL LOCATION:
POINT OF INTERCONNECTION, MAIN SERVICE DISCONNECT
(PER CODE: NEC 705.12 (B)(2)(c))
[Not required if panelboard is rated not less than sum of ampere ratings of all overcurrent devices supplying it]

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 PANEL, AC DISCONNECT
(PER CODE: NEC 690.52)

PHOTOVOLTAIC SYSTEM EQUIPPED WITH RAPID SHUTDOWN

LABEL LOCATION:
AC DISCONNECT, DC DISCONNECT, POINT OF INTERCONNECTION
(PER CODE: NEC 690.56(C)(3))

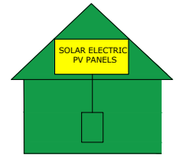
⚠ WARNING
DEDICATED SOLAR PANELS DO NOT CONNECT ANY OTHER LOADS

⚠ WARNING
INVERTER OUTPUT CONNECTION DO NOT RELOCATE THIS OVERCURRENT DEVICE

EMERGENCY CONTACT
(800) 798-0315

EMERGENCY RESPONDER THIS SOLAR PV SYSTEM IS EQUIPPED WITH RAPID SHUTDOWN

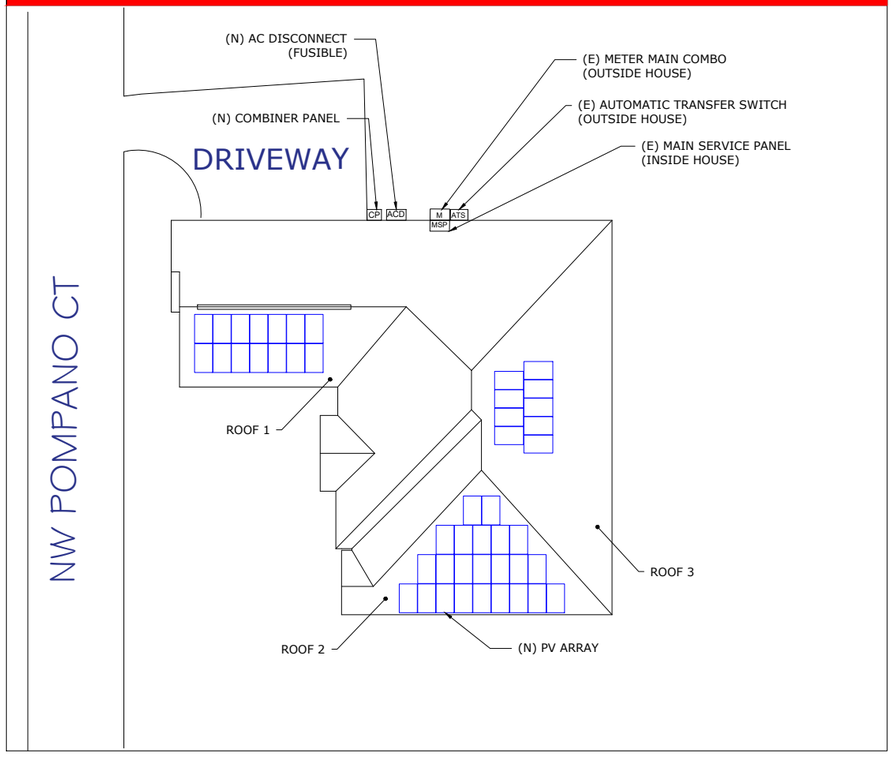
TURN RAPID SHUTDOWN SWITCH TO THE "OFF" POSITION TO SHUTDOWN PV SYSTEM.



NEC690.56(C)(1) AND NFPA 111.12.2.1.1.1.1, 11.12.2.1.4

CAUTION

MULTIPLE SOURCES OF POWER WITH DISCONNECTS LOCATED AS SHOWN:



AUXILIARY GENERATION DISCONNECT

LABEL LOCATION:
AC DISCONNECT

WARNING
ELECTRIC SHOCK HAZARD
DO NOT TOUCH TERMINALS
TERMINALS ON BOTH THE LINE AND LOADS SIDES MAY BE ENERGIZED IN THE OPEN POSITION

LABEL LOCATION:
METER, AC DISCONNECT

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ENGINEER OF RECORD

ANDY BUERGO

241 NW POMPANO CT, LAKE CITY, FL 32055, USA

REVISIONS	DESCRIPTION	DATE
REV. ENGG.		

PERMIT DEVELOPER	
DATE	12/05/2023
DESIGNER	OKD
REVIEWER	

SHEET NAME
SYSTEM LABELING

SHEET NUMBER
E-03

Mono Multi Solutions

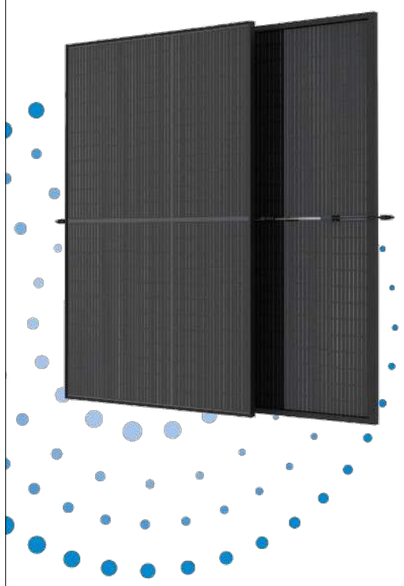
Vertex S

BACKSHEET MONOCRYSTALLINE MODULE

PRODUCT: TSM-DE09C.07

PRODUCT RANGE: 380-405W

405W	0~+5W	21.1%
MAXIMUM POWER OUTPUT	POSITIVE POWER TOLERANCE	MAXIMUM EFFICIENCY



High value

- More productivity from same roof size.
- Outstanding visual appearance.
- Leading 210mm cell technology.

Small in size, big on power

- Small format module allow greater energy generation in limited space.
- Up to 405W, 21.1% module efficiency with high density interconnect technology.
- Multi-busbar technology for better light trapping effect, lower series resistance and improved current.
- Reduce installation cost with higher power bin and efficiency.
- Boost performance in warm weather with lower temperature coefficient (-0.34%) and operating temperature.

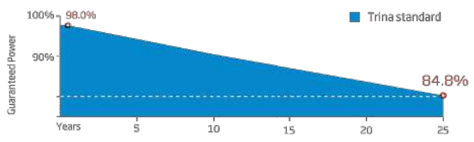
Universal solution for residential and C&I rooftops

- Designed for compatibility with existing mainstream optimizers, inverters and mounting systems.
- Perfect size and low weight makes handling and transportation easier and more cost-effective.
- Diverse installation solutions for flexibility in system deployment

High Reliability

- 25 year product warranty.
- 25 year performance warranty with lowest degradation.
- Minimized micro-cracks with innovative non-destructive cutting technology.
- Ensured PID resistance through cell process and module material control.
- Mechanical performance up to +6000 Pa and-4000 Pa negative load

Trina Solar's Backsheet Performance Warranty



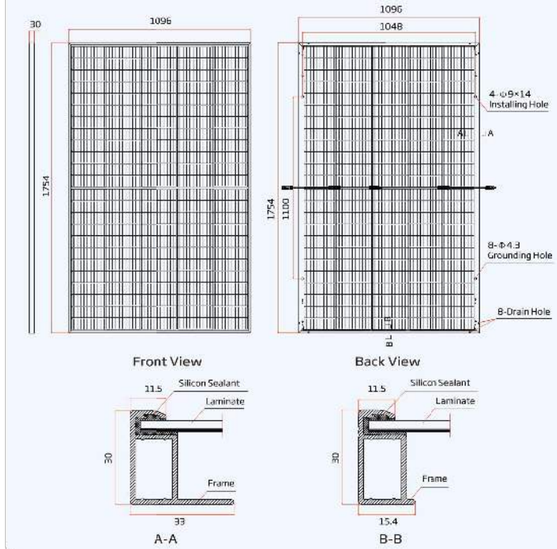
Comprehensive Products and System Certificates

IEC61215/IEC61730/IEC61701/IEC62716/UL61730
ISO 9001: Quality Management System
ISO 14001: Environmental Management System
ISO14064: Greenhouse Gases Emissions Verification
ISO45001: Occupational Health and Safety Management System

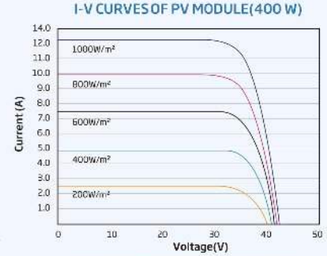
Trinasolar

Vertex S BACKSHEET MONOCRYSTALLINE MODULE

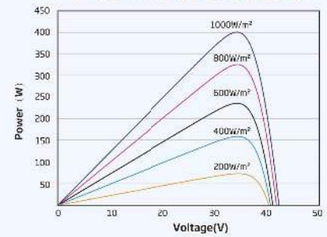
DIMENSIONS OF PV MODULE(mm)



I-V CURVES OF PV MODULE(400 W)



P-V CURVES OF PV MODULE(400W)



ELECTRICAL DATA (STC)

Peak Power Watts-PMAX (Wp)*	380	385	390	395	400	405
Power Tolerance-PMAX (W)	0~+5					
Maximum Power Voltage-VMPP (V)	33.4	33.6	33.8	34.0	34.2	34.4
Maximum Power Current-IMPP (A)	11.38	11.46	11.54	11.62	11.70	11.77
Open Circuit Voltage-VOC (V)	40.4	40.6	40.8	41.0	41.2	41.4
Short Circuit Current-ISC (A)	12.00	12.07	12.14	12.21	12.28	12.34
Module Efficiency η m (%)	19.8	20.0	20.3	20.5	20.8	21.1

STC: Irradiance 1000W/m2, Cell Temperature 25°C, Air Mass AM1.5. *Measuring tolerance: ±3%.

Electrical characteristics with different power bin (reference to 10% Irradiance ratio)

Total Equivalent power -PMAX (Wp)	407	412	417	423	428	433
Maximum Power Voltage-VMPP (V)	33.4	33.6	33.8	34.0	34.2	34.4
Maximum Power Current-IMPP (A)	12.19	12.26	12.34	12.44	12.51	12.59
Open Circuit Voltage-VOC (V)	40.4	40.6	40.8	41.0	41.2	41.4
Short Circuit Current-ISC (A)	12.02	13.00	13.08	13.20	13.25	13.36
Irradiance ratio (rear/front)	10%					

Power Bifocality:70±5%.

ELECTRICAL DATA (NOCT)

Maximum Power-PMAX (Wp)	286	290	294	298	302	305
Maximum Power Voltage-VMPP (V)	31.4	31.6	31.8	31.9	32.1	32.4
Maximum Power Current-IMPP (A)	9.12	9.18	9.24	9.32	9.38	9.42
Open Circuit Voltage-VOC (V)	38.0	38.2	38.4	38.6	38.8	38.9
Short Circuit Current-ISC (A)	9.67	9.73	9.78	9.84	9.90	9.94

NOCT: Irradiance at 800W/m², Ambient Temperature 20°C, Wind Speed 1m/s.

MECHANICAL DATA

Solar Cells	Monocrystalline
No. of cells	120 cells
Module Dimensions	1754×1096×30 mm (69.06×43.15×1.18 inches)
Weight	21.0 kg (46.3 lb)
Glass	3.2 mm (0.13 inches), High Transmission, AR Coated Heat Strengthened Glass
Encapsulant material	EVA/POE
Backsheet	Transparent backsheet
Frame	30mm(1.18 inches) Anodized Aluminium Alloy
J Box	IP 68 rated
Cables	Photovoltaic Technology Cable 4.0mm² (0.006 inches²), Portrait: 350/280mm(13.78/11.02 inches) Landscape: N 1100 mm /P 1100 mm (43.31/43.31 inches)
Connector	MC4 EVO2 / TS4*

*Please refer to regional datasheet for specified connector.

TEMPERATURE RATINGS

NOCT (Nominal Operating Cell Temperature)	43°C (±2°C)
Temperature Coefficient of PMAX	- 0.34%/°C
Temperature Coefficient of Voc	- 0.25%/°C
Temperature Coefficient of Isc	0.04%/°C

MAXIMUMRATINGS

Operational Temperature	-40~+85°C
Maximum System Voltage	1500V DC (IEC)
	1500V DC (UL)
Max Series Fuse Rating	25A

WARRANTY

25 year Product Workmanship Warranty
25 year Power Warranty
2% first year degradation
0.55% Annual Power Attenuation
(Please refer to product warranty for details)

PACKAGING CONFIGUREATION

Modules per box: 36 pieces
Modules per 40' container: 828 pieces

Trinasolar

Version number: TSM_NA_2022_A

www.trinasolar.com

EnLight Energy

978 SW 2ND AVE GAINESVILLE , FL 32601
CONTACT:-(800) 798-0315

ENGINEER OF RECORD

ANDY BUERGO

241 NW POMPANO CT, LAKE CITY, FL 32055, USA

REVISIONS	DATE	DESCRIPTION	ENGG.	REV

PERMIT DEVELOPER	
DATE	12/05/2023
DESIGNER	OKD
REVIEWER	

SHEET NAME: MODULE DATASHEET

SHEET NUMBER: DS-01

ENPHASE.

DATA SHEET

IQ8 Series 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 super-fast 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 Enphase IQ Battery, Enphase 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 Shut Down Equipment and conform with various regulations, when installed according to manufacturer's instructions.

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) requirements

IQ8 Series Microinverters

INPUT DATA (DC)		IQ8-60-2-US	IQ8PLUS-72-2-US	IQ8M-72-2-US	IQ8A-72-2-US	IQ8H-240-72-2-US	IQ8H-208-72-2-US[1]
Commonly used module pairings[2]	W	235 – 350	235 – 440	260 – 460	295 – 500	320 – 540+	295 – 500+
Module compatibility		60-cell/120 half-cell	60-cell/120 half-cell and 72-cell/144 half-cell				
MPPT voltage range	V	27 – 37	29 – 45	33 – 45	36 – 45	38 – 45	38 – 45
Operating range	V	25 – 48	25 – 58				
Min/max start voltage	V	30 / 48	30 / 58				
Max input DC voltage	V	50	60				
Max DC current[3] [module Isc]	A	15					
Overvoltage class DC port		II					
DC port backfeed current	mA	0					
PV array configuration		1x1 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**	**IQ8M-72-2-US**	**IQ8A-72-2-US**	**IQ8H-240-72-2-US**	**IQ8H-208-72-2-US**
Peak output power	VA	245	300	330	366	384	366
Max continuous output power	VA	240	290	325	349	380	360
Nominal (L-L) voltage/range[4]	V	240 / 211 – 264					208 / 183 – 250
Max continuous output current	A	1.0	1.21	1.35	1.45	1.58	1.73
Nominal frequency	Hz	60					
Extended frequency range	Hz	50 – 68					
Max units per 20 A (L-L) branch circuit[5]		16	13	11	11	10	9
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	%	97.5	97.6	97.6	97.6	97.6	97.4
CEC weighted efficiency	%	97	97	97	97.5	97	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 (HxWxD)		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					
Acoustic noise at 1 m		<60 dBA					
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, UL1741/IEEE1547, 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 Shut Down 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) The IQ8H-208 variant will be operating in grid-tied mode only at 208V AC. (2) No enforced DC/AC ratio. See the compatibility calculator at https://link.enphase.com/module-compatibility (3) Maximum continuous input DC current is 10.6A (4) Nominal voltage range can be extended beyond nominal if required by the utility. (5) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

EnLightEnergy

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ENGINEER OF RECORD

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REVISIONS	DATE	DESCRIPTION	ENGG.
REV			

PERMIT DEVELOPER	
DATE	12/05/2023
DESIGNER	OKD
REVIEWER	

SHEET NAME

INVERTER DATASHEET

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-SP-IT)	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**

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REVISIONS	DATE	DESCRIPTION	ENGG.	REV

PERMIT DEVELOPER	
DATE	12/05/2023
DESIGNER	OKD
REVIEWER	

SHEET NAME
COMBINER DATASHEET

SHEET NUMBER
DS-03

AHJ CONDENSED PERMIT PACKAGE
2023

Version 4

17620

17621, 17622, 17623, 17624, 17625

STONE COATED STEEL ROOF HOOK

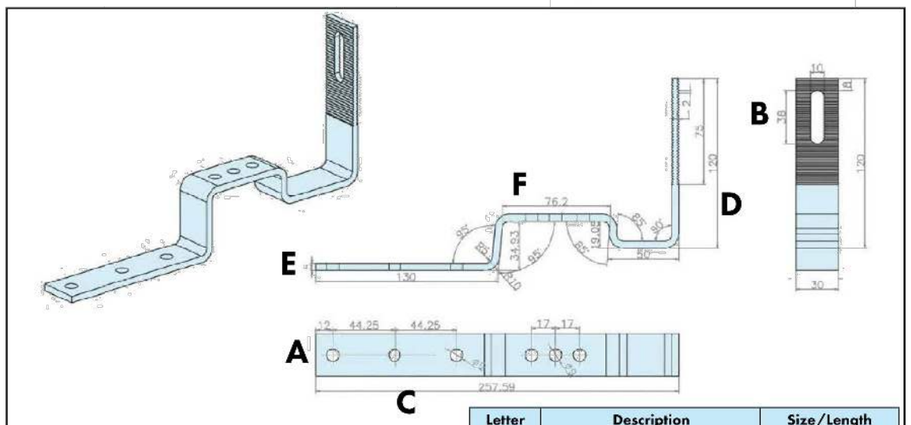
FOR SIDE MOUNT RAILS

QuickBOLT

A DIVISION OF QUICKSCREWS INTERNATIONAL CORP

SPEC SHEET

Part #	Box Quantity	Screw Size
17620	20 Hooks	N/A
17621	1 Hook	N/A
17622	20 Hooks; 40 Screws	#14 x 3"
17623	1 Hook; 2 Screws	#14 x 3"
17624	20 Hooks; 40 Screws	5/16" x 3"
17625	1 Hook; 2 Screws	5/16" x 3"



Baiting tolerance	± 2 mm	Material:	SS304
Hole tolerance	± 0.5 mm		
Hole distance tolerance	± 0.5 mm	Date:	2016. 06. 10
Form tolerance	± 2 mm		
Thicknessness tolerance	± 0.1 mm		
Angle tolerance	± 1° mm		

Letter	Description	Size/Length
A	Mounting Screw Holes	9mm
B	Rail Slot Size	10mm x 38mm
C	Length of Roof Hook	257.59mm
D	Bottom End to Top End	120mm
E	Thickness	5mm
F	Batten Bridge	76.2mm

5830 Las Positas Road, Livermore CA 94551 | 3948 Airway Drive, Rock Hill SC 29732
Phone: (844) 671-6045 Fax: (800) 689-7975 | www.quickbolt.com
QuickBOLT is a division of Quickscrews International Corp.

EnLight Energy

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ENGINEER OF RECORD

VINCENT MWUMVANEZA LICENSE No. 86894 STATE OF FLORIDA PROFESSIONAL ENGINEER
Exp:02/28/2025
STRUCTURAL ONLY

This item has been digitally signed and sealed by Vincent Mwumvaneza on the date adjacent to the seal.
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REVISIONS

REV	ENGG	DESCRIPTION	DATE

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DATE	12/05/2023
DESIGNER	OKD
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SHEET NAME

ATTACHMENT DATASHEET

SHEET NUMBER

DS-04

Tech Brief

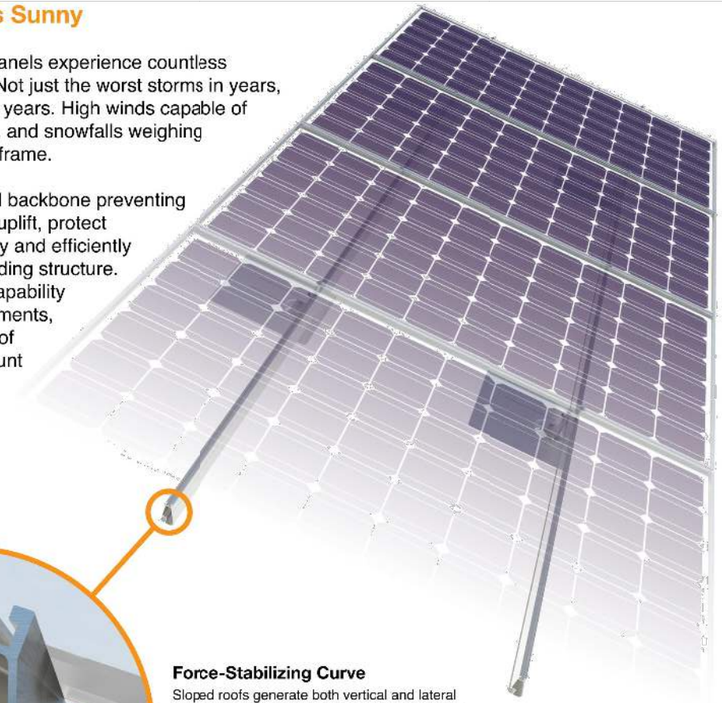
IRONRIDGE

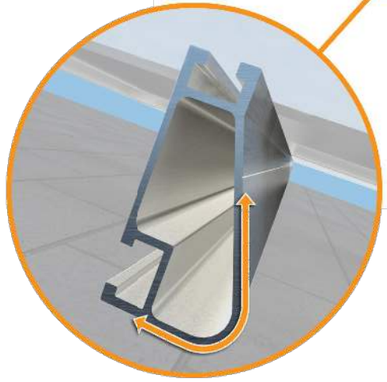
XR Rail Family

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 preverts 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 solices 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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This item has been digitally signed and sealed by Vincent Mwumvaneza on the date adjacent to the seal.
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DATE	12/05/2023
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REVIEWER	

SHEET NAME
RACKING DATASHEET

SHEET NUMBER
DS-05