

Inverter Type: (46)Enphase IQ8PLUS-72-2-US  
PV Panel: (46) TSM-390DE09C.07  
Racking: Iron Ridge XR-100  
Total Wattage: 17,940W DC  
Roof Type: Composition Shingle  
Wind Load: 27 to 45 Deg  
Fastener Type: Use (2) #14 x 3" SS Screws

Sheet Index	
S-1	Cover Sheet / Site Plan
S-2	Detail
E-1	One - Line
E-2	Electrical Code
S-1A	Mounting Plan

General Notes:  
-Enphase IQ8PLUS-72-2-US Micro Inverters are located on roof behind each module.  
-First responder access maintained and from adjacent roof.  
-Wire run from array to connection is 40 feet.



Legend

3'

1'-6"

Ground Access

Utility Meter

PV Disconnect

Chimney

Satellite

Vent Pipe

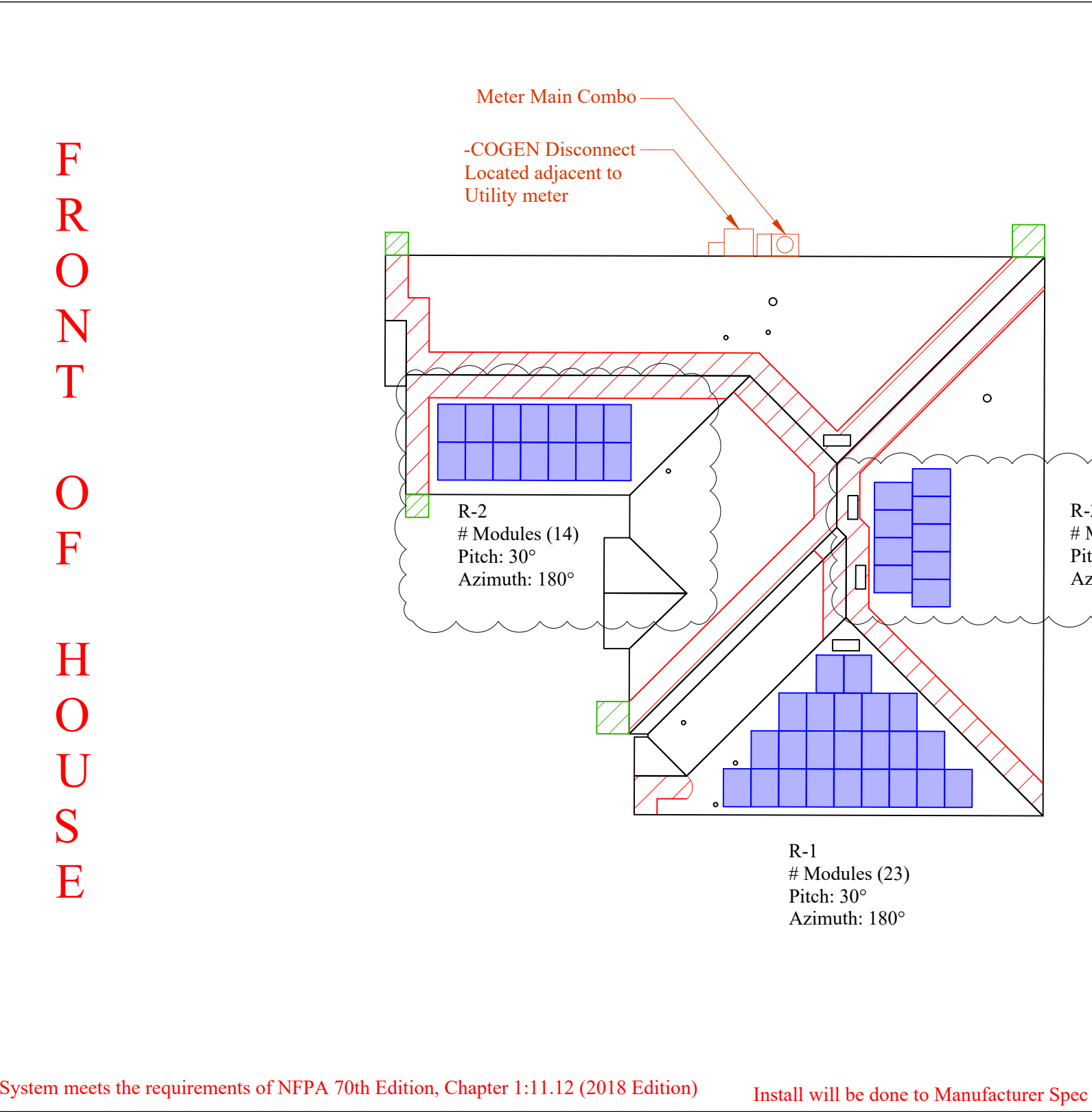
Meets All Editions of Florida Fire Prevention Code 2020 7th Edition  
Meets all requirements of 2018 Editions of NFPA-1 and NFPA-101

3' Access Pathway

Represents all Fire Clearance including Alternative methods

1st Responder Access minimum of 36" unobstructed as per Section R324 of the 2020 IRC

Meets the requirements of the following- (2020 FL Residential Code & FBC, 7th Edition (2018 International Residential Code) - 2nd Printing modified by the FL Building Standards, 2020 Florida Building Energy Conservation Code 7th edition, County of Columbia Code, 2017 National Electric Code.)



Columbia County Building Department

Plans Reviewed for Code Compliance

State of Florida

Layout Subject to Change Based on Site Conditions

Godwin Engineering and Design, LLC

8378 Foxtail Loop

Pensacola, FL 32526

D. Chad Godwin, PE

Chad@godwineng.com

CHAD GODWIN

LICENSE

No. 81360

STATE OF FLORIDA

PROFESSIONAL ENGINEER

Digitally signed by Donnie C Godwin  
Date: 2023.11.09 11:40:04 -06'00'

Date: 10/06/2023

Drawn by: JM

Revised by: DMB

Rev #: 01

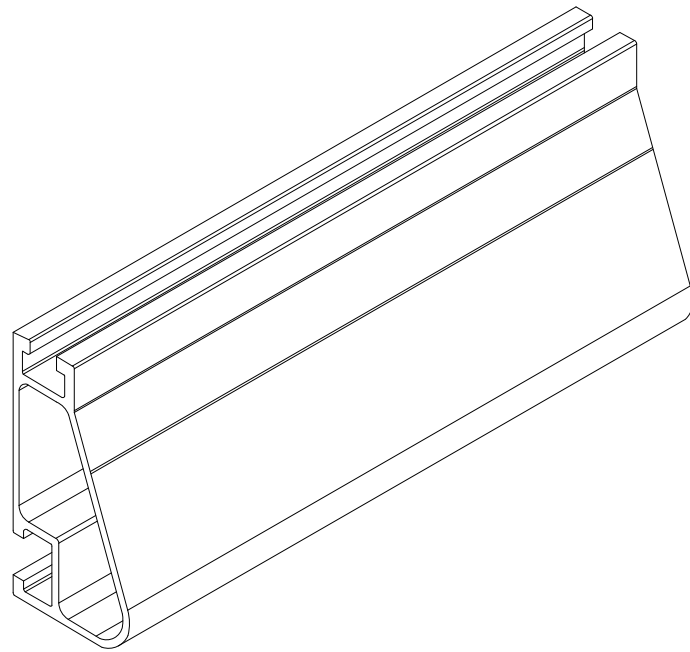
Rev Date: 10/31/2023

Page: 11"x17" S-1

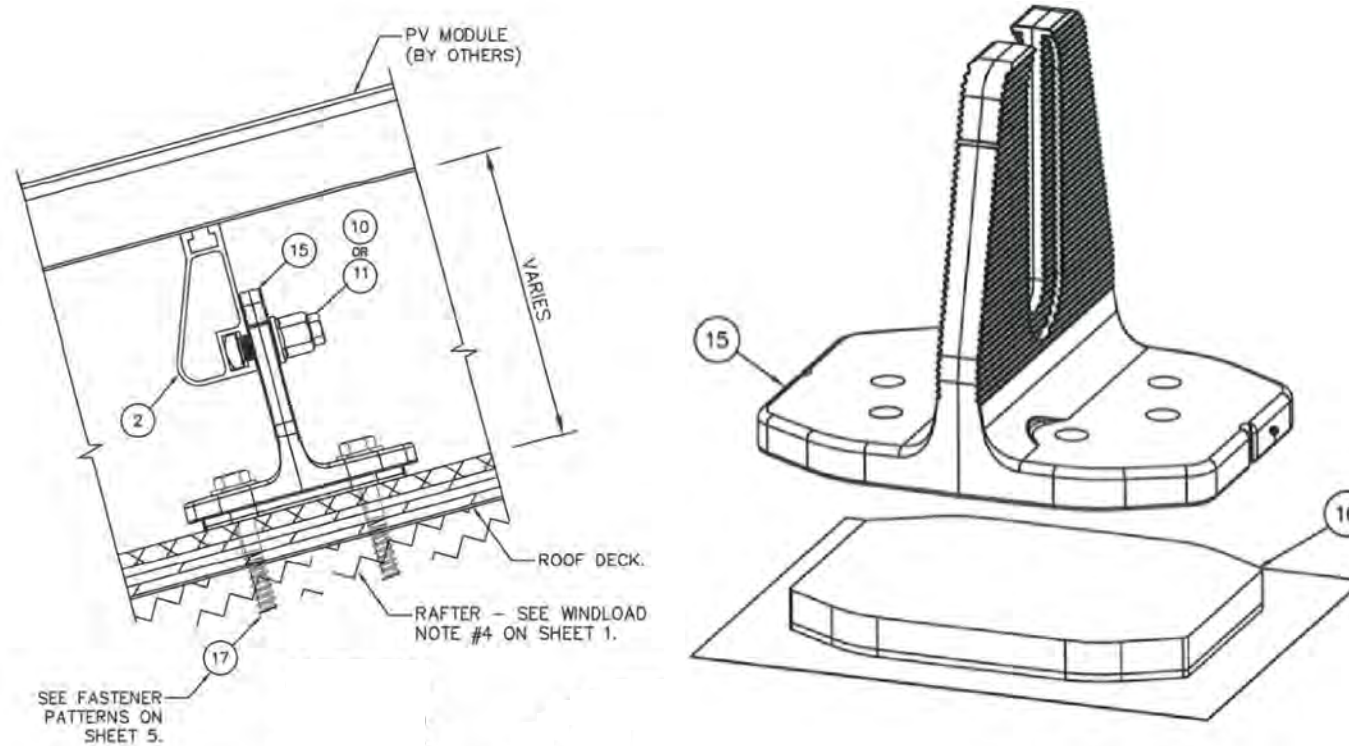
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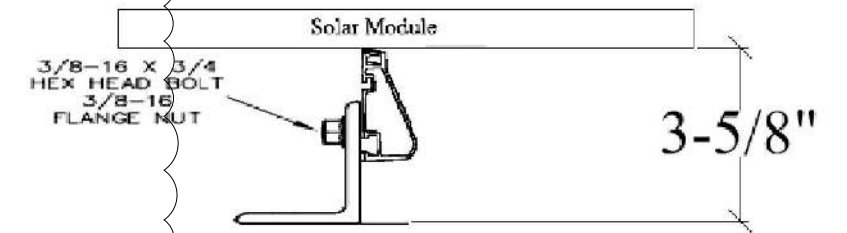
ANDREW BUERGO  
241 NW POMPANO CT  
LAKE CITY, FL  
32055



Ironridge XR-100



BILL OF MATERIALS- QuickMount Halo Ultra Grip (HUG)		
#	DESCRIPTION	MATERIALS/NOTES
15	HALO ULTRAGRIP BASE, MILL OR BLACK	300 SERIES ALUMINUM
16	ULTRAGRIP FLASHING SYSTEM	PRESSURE SENSITIVE ADHESIVE
17	SCREW, #14 X 3" WITH EPDM BACKED WASHER	300 SERIES SS & EPDM



R1-R3

Roof Type:	Composition Shingle
Roof Pitch & Overhang:	7/12; 12" Overhang
Mount Type:	Halo UltraGrip
Fastener: No Substitutions	(2) #14 x 3" SS Self-drilling Screws into Roof Rafters
Structure:	2"x4" Wood Trusses @ 24" O.C.
Sealing/Flashing:	All penetrations are sealed and flashed with Ultragrip Flashing System
Extra Notes:	(HW-RD1430-01-M1 screw)

Rafter Spans	Zone 1	Zone 2e	Zone 2r	Zone 3
Exposed	24"	24"	24"	24"
Non-Exposed	48"	48"	24"	24"

**-Roof Height 15'**  
**-Per 2020 FBC, the Roof Mounted PV System will be subject to the following design criteria:**  
**Design Wind Speed(Vult) - 120mph 3 sec gust,**  
**Exposure Category - C**  
**-Designed as per ASCE7-16**

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32055

Install will be done to Manufacturer Spec

Godwin Engineering and Design, LLC  
8378 Foxtail Loop  
Pensacola, FL 32526  
D. Chad Godwin, PE  
Chad@godwineng.com



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Donnie C Godwin  
Date: 2023.11.09  
11:40:19 -06'00'

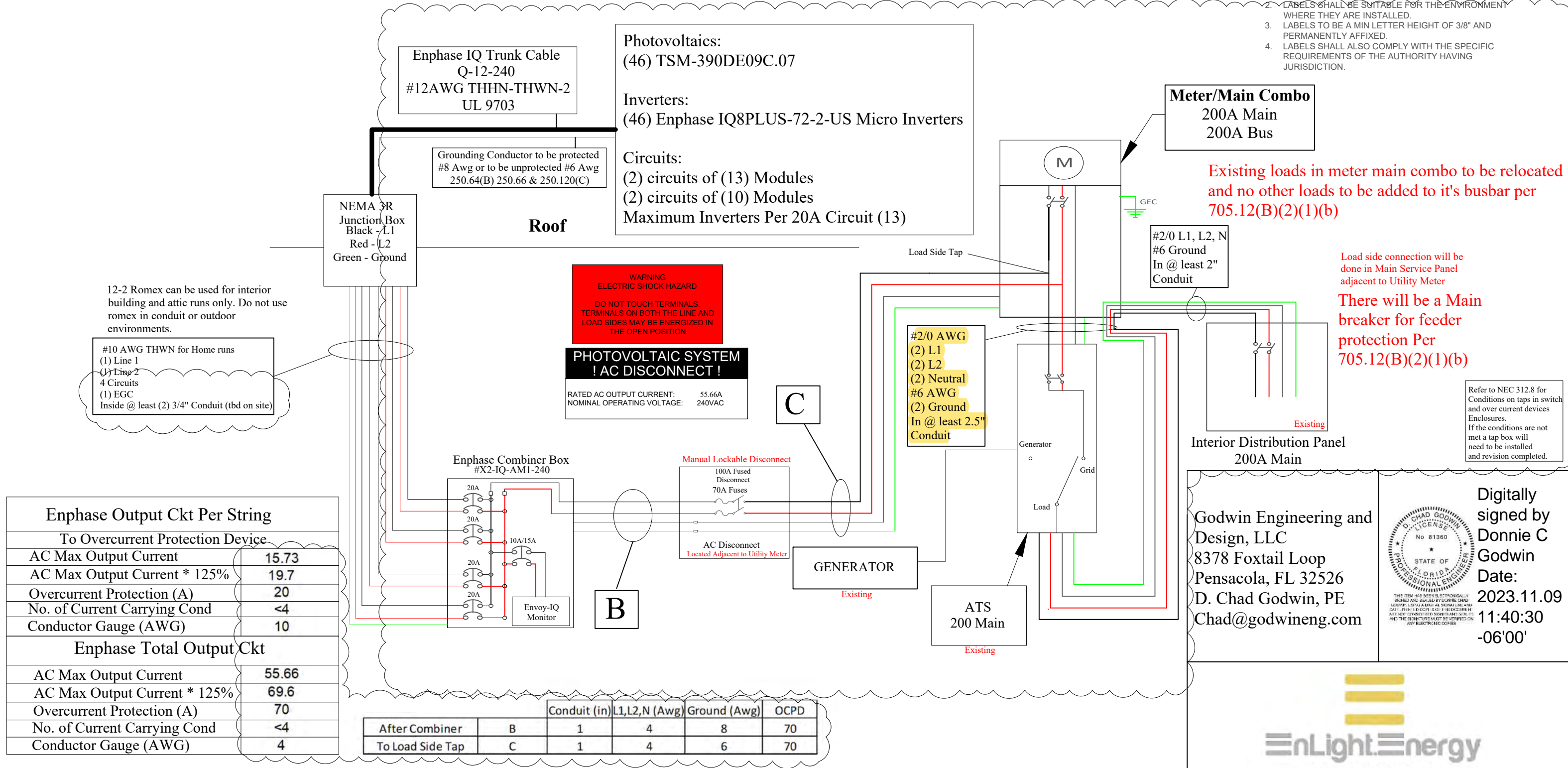


978 SW 2nd Ave  
Gainesville, FL 32601

Date:	10/06/2023
Drawn by:	JM
Revised by:	DMB
Rev #: 01	
Rev Date:	10/31/2023
Page:	11"X17" S-2



- NEC LABEL NOTES:
1. THE WARNING SIGN(S) OR LABEL(S) SHALL COMPLY WITH NEC 110.21(B)
  2. LABELS SHALL BE SUITABLE FOR THE ENVIRONMENT WHERE THEY ARE INSTALLED.
  3. LABELS TO BE A MIN LETTER HEIGHT OF 3/8" AND PERMANENTLY AFFIXED.
  4. LABELS SHALL ALSO COMPLY WITH THE SPECIFIC REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION.



Including the label below

**In Case of Emergency Call**  
**Enlight Energy**  
at 352-222-0795

Meets 11.12.2.1.5

Note:  
-All wiring to meet the 2017 NEC and Florida electric codes.  
100A Disconnect  
Type of conduit to be determined on site by contractor.

Install will be done to Manufacturer Spec

GEC NOTES

- Ungrounded system per 690.41(A)(4)
- GEC must be installed per 250.64
- GEC must be continuous un-spliced or irreversibly spliced from inverter to existing service ground system or continuous from the arrays to the existing service ground system.
- GEC must be min #8 AWG and installed in conduit
- If GEC is not in conduit, it must be #6 min

Disconnects will be Visible, lockable, adjacent to and within 10' of utility meter

All Labels & Markings for photovoltaic system will be reflective and meet all requirements for NFPA 1:11:12

**Customer Info:**

**ANDREW BUERGO**  
241 NW POMPARNO CT  
LAKE CITY, FL  
32055

**Date:** 10/06/2023  
**Drawn by:** JM  
**Revised by:** DMB  
**Rev #: 01**  
**Rev Date:** 10/31/2023  
**Page:** 11"x17" E-1

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Enphase IQ8PLUS-72-2-US  
**PV Panel:**  
(46)  
TSM-390DE09C.07  
Total Wattage:  
17,940W DC

**EnLight Energy**

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Gainesville, FL 32601

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8378 Foxtail Loop  
Pensacola, FL 32526  
D. Chad Godwin, PE  
Chad@godwineng.com

**Digitally signed by Donnie C Godwin**  
Date: 2023.11.09 11:40:30 -06'00'

THIS ITEM HAS BEEN ELECTRONICALLY SIGNED AND SEALED BY DONNIE C. GODWIN, LICENSED PROFESSIONAL ENGINEER, NO. 81360, STATE OF FLORIDA. ANY ELECTRONIC COPIES AND THE SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

# Disconnect

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NEC 225

- Disconnect means shall be provided for disconnecting all ungrounded conductors that supply or pass through the building or structure Per Code 2017 NEC Section 225.31 & Section 225.32

NEC 230

- If multiple service disconnects are present, grouping of disconnects will be done per NEC 230.72

NEC 690

- Rapid Shutdown Built in Per Code NEC 690.12
- E04. Construction documents specify PV system circuits installed on or in buildings include a rapid shutdown function that controls specific conductors in accordance with NEC article 690.12.
- E05. These construction documents specify that a label is provided with the method to initiate rapid shut down per 690.12(4).
- E06. Construction drawings specify buildings or structures with both utility service and a PV system, complying with NEC article 690.12 shall have a permanent plaque or directory including the following wording: “PHOTO VOLTAIC SYSTEM EQUIPPED WITH RAPID SHUTDOWN” as per NEC article 690.56 (C).
- E07. Construction documents specify PV power circuit labels shall appear on every section of the wiring system that is separated by enclosures, walls, partitions, ceilings, or floors.
- E08. Construction documents specify all warning sign(s) or label(s) shall comply with NEC article 110.21 (B). Label warnings shall adequately warn of the hazard. Labels shall be permanently affixed to the equipment, and Labels required shall be suitable for the environment.

NEC 705

- PV AC disconnect is lockable in the open position per code NEC 705.22(7)
- Photovoltaic AC disconnect shall be capable of being locked in the open position per NEC article 705.22(6).
- Photovoltaic AC Overcurrent protection shall be located within 10 feet of the point where conductors are connected to the service per NEC 705.31.

<h2 style="text-align: center;">Grounding</h2> <ul style="list-style-type: none"> <li>- In compliance with NEC 250.58, NEC 690.8, NEC 250.24, NEC250.24(D)</li> <li>- System meets the grounding requirements of NEC 690.43</li> </ul> <p>Grounding Electrode:</p> <ul style="list-style-type: none"> <li>- All grounding Electrodes will be at meter or MDP</li> <li>- Ground Rods to be at least 8' long and 5/8" in diameter per NEC 250.52(A)(5)</li> <li>- Add supplemental electrode as required</li> <li>- System meets requirements of NEC250.50</li> </ul>
<h2 style="text-align: center;">Fire</h2>

- All Exterior equipment is a minimum of Nema-R3 Rated
- Smoke Alarms per F.S. 553.883
- All Electrical Service Equipment shall be located at or above BFE+1' or 8.00' NAVD

- Install will be done to Manufacturer Spec
- Service Conductors are Parallel
- No interconnections to be performed on inside panels unless stated by the contractor.
- The Contractor shall Be responsible for verifying all existing conditions, and for conforming with these drawings in the event of any unforeseen circumstances.
- Plans Satisfy NEC 250.94 & NEC250.53(A)(2)

Note:

- Subject PV Systems has been designed to meet the requirements of the NEC 2017, and those set forth by the Florida Solar Energy Center Certification, 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.

## Labeling

- Markings shall be placed on all DC Conduits, DC Combiners, Raceways, Enclosures, Junction Boxes, and Cable Assemblies at every 10', turns, and above and below penetrations in compliance with NFPA
- All Interactive System(S) Points of interconnection with other sources shall be marked at an accessible location at the disconnecting means as a power source and with the rated ac output current and the nominal operating AC voltage. Per NEC 690.54
- Labels will be placed in the correct location Per Code NEC 690.56(B), 690.56(C), & 690.53
- Include required label for metallic raceways and conduits per NEC article 690.31(G)(3).
- Add required label per NEC article 705.10.
- Markings Shall Be reflective, Weather Resistant and suitable for the environment.
- Markings Shall be red with white lettering with minimum 3/8" Capital Letters
- NEC 705.10 A permanent plaque or directory, denoting the location of all electric power source disconnecting means on or in the premises, shall be installed at each service equipment location and at the location(s) of the system disconnect(s) for all electric power production sources capable of being interconnected. One sign required for each PV system.

The diagram illustrates a solar PV system with a rapid shutdown switch. It includes a yellow label for the switch, a warning label, and a diagram of the switch mechanism. The labels are as follows:

- 3/8 IN MIN. TEXT** (top left)
- 3/16 IN MIN. TEXT** (middle left)
- SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN** (yellow label on the switch)
- TURN RAPID SHUTDOWN SWITCH TO THE "OFF" POSITION TO SHUT DOWN PV SYSTEM AND REDUCE SHOCK HAZARD IN THE ARRAY.** (text below the switch)
- SOLAR ELECTRIC PV PANELS** (yellow label on the switch mechanism)
- PHOTOVOLTAIC** (top right, in a cloud shape)
- RATED AC OUTPUT NOMINAL OPERATING VOLTAGE** (middle right, in a cloud shape)
- RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEMS** (red label on the right)
- PHOTOVOLTAIC** (bottom right, in a red box)
- DO NOT TOUCH** (bottom right, in a red box)

The diagram also includes a large warning label on the left side:

**⚠ WARNING**  
**ELECTRICAL SHOCK HAZARD**  
**TERMINALS ON THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION**

NEC 690.13

**⚠ WARNING**

**POWER SOURCE OUT OF  
CONNECTION. DO NOT  
RELOCATE THIS  
OVERCURRENT DEVICE**

Apply to

In Case of  
Enl  
at 3

Permanent stic

Install will be done to Manufacturer Spec

The diagram shows a PV system layout. On the left, a box labeled 'PV system.' is connected to a 'PHOTOVOLTAIC AC DISCONNECT' box. This disconnect box has two output terminals: 'RATED AC OUTPUT CURRENT: 55.66A' and 'NOMINAL OPERATING AC VOLTAGE 240VAC'. These terminals connect to a 'Combiner box in compliance Per Code NEC 705.12'. Inside the combiner box, the calculation  $4 \times 20A < 125A$  is shown, followed by the instruction '\*No other loads to be added'.

**RAPID SHUTDOWN SWITCH  
FOR SOLAR PV SYSTEM**

PHOTOVOLTAIC POWER SOURCE

**DO NOT DISCONNECT  
UNDER LOAD**

**⚠ WARNING**  
**POWER SOURCE OUTPUT CONNECTION. DO NOT RELOCATE THIS OVERCURRENT DEVICE.**

A yellow rectangular warning label with a black border. At the top left is a black triangle containing a yellow exclamation mark. To the right of the triangle, the word "WARNING" is written in large, bold, black capital letters. Below "WARNING", the text "DUAL POWER SUPPLY" is written in bold, black capital letters. Below that, the text "SOURCES: UTILITY GRID AND PV SOLAR ELECTRIC SYSTEM" is written in bold, black capital letters, spanning two lines.

Apply to Main Disconnect

In Case of Emergency Call  
Enlight Energy  
at 352-222-0795

Permanent sticker added to disconnect

**Customer Info:**

ANDREW BUERGO  
241 NW POMPANO CT  
LAKE CITY, FL  
32055

# Electrical Calculations

Inverter Output Ckt		
To Overcurrent Protection Device with Copper		
Design Temperature(F)	94°F	
Max Amb Temp Range(F)	87-95	310.15(B)(2)(a)
Temp Rating of Conductors (C)	75°C	
Current Carrying	<4	310.15(B)(3)(a)
AC Max Output Current	56A	690.8(A)(3)
AC Max Output Current * 1.25%	70A	690.8(B)
Overcurrent Protection(A)	70A	
Amp Temp Correction Factor	0.94	310.15(B)(2)(a)
Raceway Fill adjustment Factor	100%	310.15(B)(3)(a)
Wire Size(Awg)	4	310.15(B)(16)
Cond. Allowable Ampacity(A)	85A	
Cond Adjusted Ampacity(A)	80A	$85A * 1 * 0.94 = 79.9A$
Ampacity Check 1 Per 690.8(B)(1)	Pass	$55.66A * 1.25 = 70A < 85A$ Pass
Ampacity Check 2 Per 690.8(B)(2)	Pass	$85A * 0.94A * 1 = 79.9A > 55.66A$ Pass

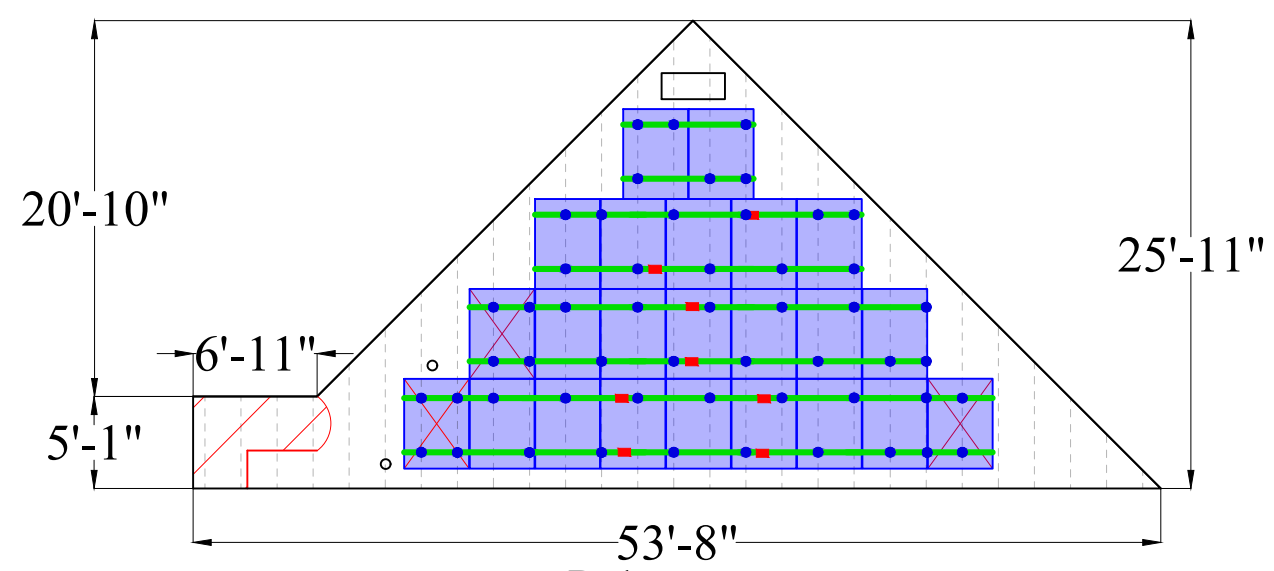
<p>Godwin Engineering and Design, LLC              8378 Foxtail Loop              Pensacola, FL 32526              D. Chad Godwin, PE              Chad@godwineng.com</p>	<p>Digitally signed by Donnie C Godwin              Date: 2023.11.0 9 11:40:41 -06'00'</p>
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 <p>978 SW 2nd Ave Gainesville, FL 32601</p>	
<b>Date:</b> 10/06/2023 <b>Drawn by:</b> JM <b>Revised by:</b> DMB <b>Rev #:</b> 01 <b>Rev Date:</b> 10/31/2023 <b>Page:</b> 11"x17" E-2	Inverter Type: Enphase IQ8PLUS-72-2-US PV Panel: (46) TSM-390DE09C.07 Total Wattage: <u>17,940W DC</u>

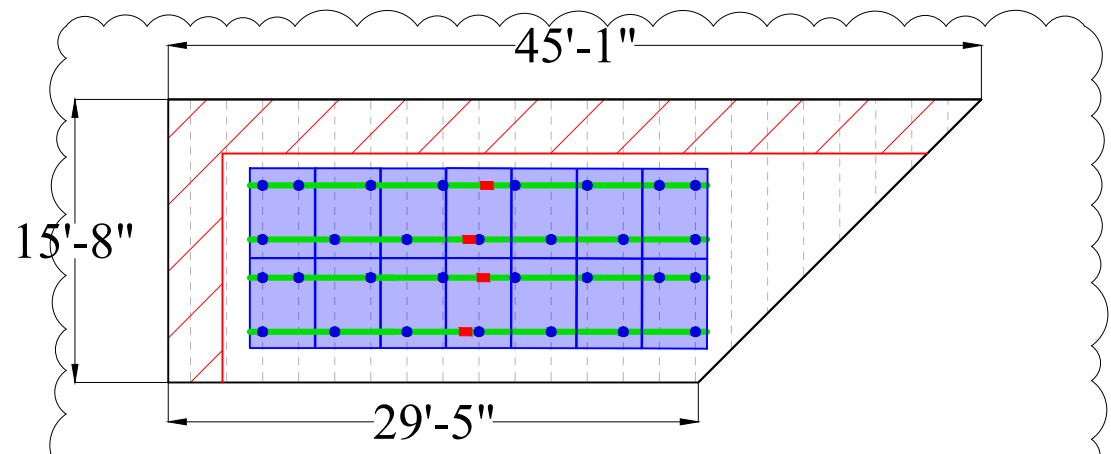
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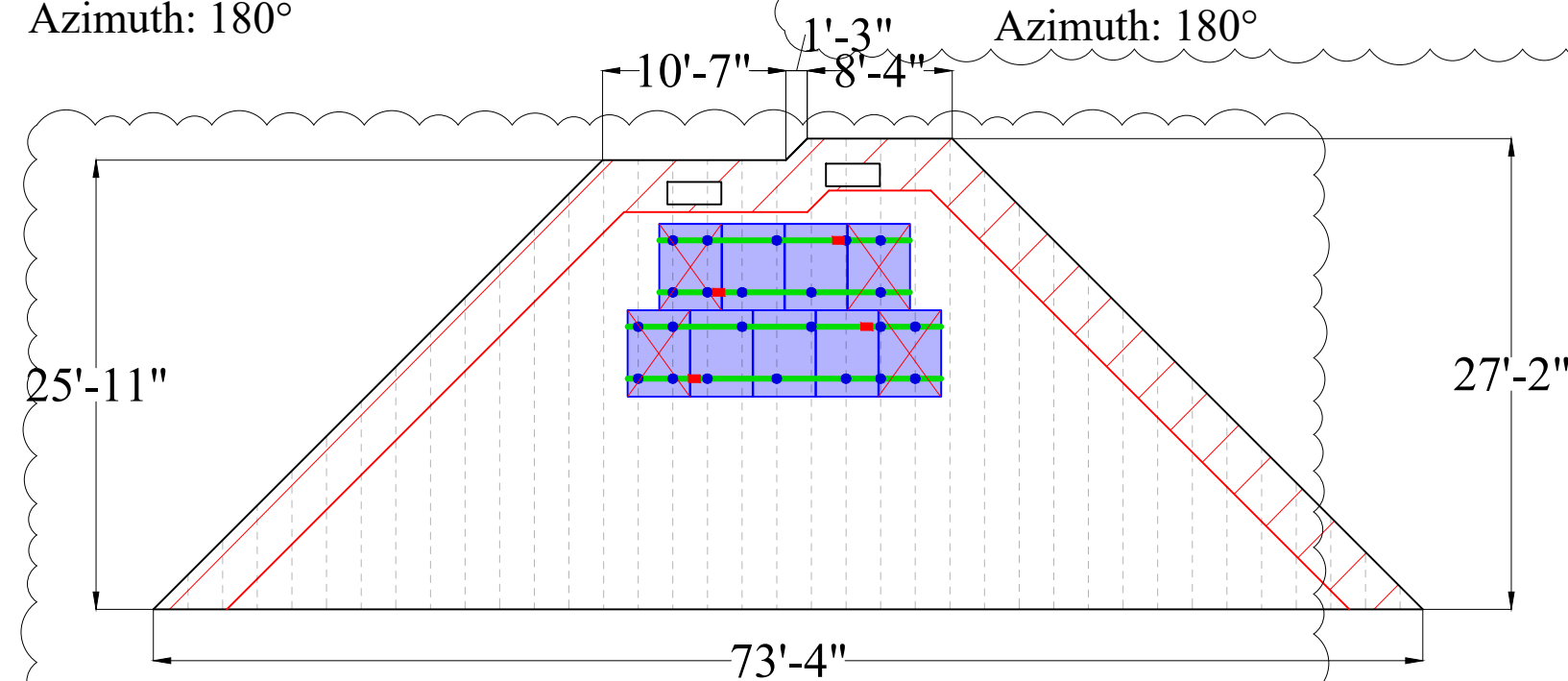
Proposed Mounting locations



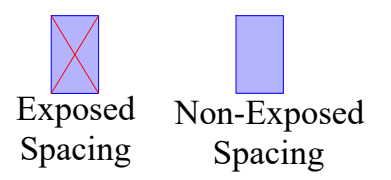
R-1  
# Modules (23)  
Pitch: 30°  
Azimuth: 180°



R-2  
# Modules (14)  
Pitch: 30°  
Azimuth: 180°



R-3  
# Modules (9)  
Pitch: 30°  
Azimuth: 270°



Plans satisfy zones FBC-1510.7.1  
Install will be done to Manufacturer Spec

- Iron Ridge XR-100 Rail
- 14' 28
- 16 Splice Bar
  - 106 IronRidge HUG
  - 108 Iron Ridge UFO's
  - 32 Iron Ridge Sleeves/End Caps
  - 3 Roof Top Combiner
  - 8 Iron Ridge Ground Lugs
  - 46 TSM-390DE09C.07
  - 46 Enphase IQ8PLUS-72-2-US
  - 1 100A Fused Disconnect
  - 2 70A Fuses
  - 4 20A 2P Breakers
  - 1 Enphase Combiner Box

Rafter Spans	Zone 1	Zone 2e	Zone 2r	Zone 3
Exposed	24"	24"	24"	24"
Non-Exposed	48"	48"	24"	24"
Max Cantilever	19.2"	19.2"	9.6"	9.6"

Max Cantilever = Max Span \* ( $\frac{2}{5}$ )

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# Vertex S

BACKSHEET MONOCRYSTALLINE MODULE

PRODUCT: TSM-DE09C.07  
PRODUCT RANGE: 380-405W

405W

MAXIMUM POWER OUTPUT

0~+5W

POSITIVE POWER TOLERANCE

21.1%

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

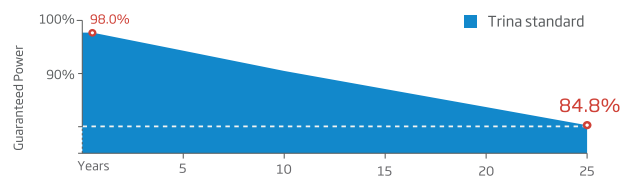
- Designed for compatibility with existing mainstream optimizers, inverters and mounting systems.
- Perfect size and low weight makes handling and transportation easier and more cost-effective.
- Diverse installation solutions for flexibility in system deployment



### 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



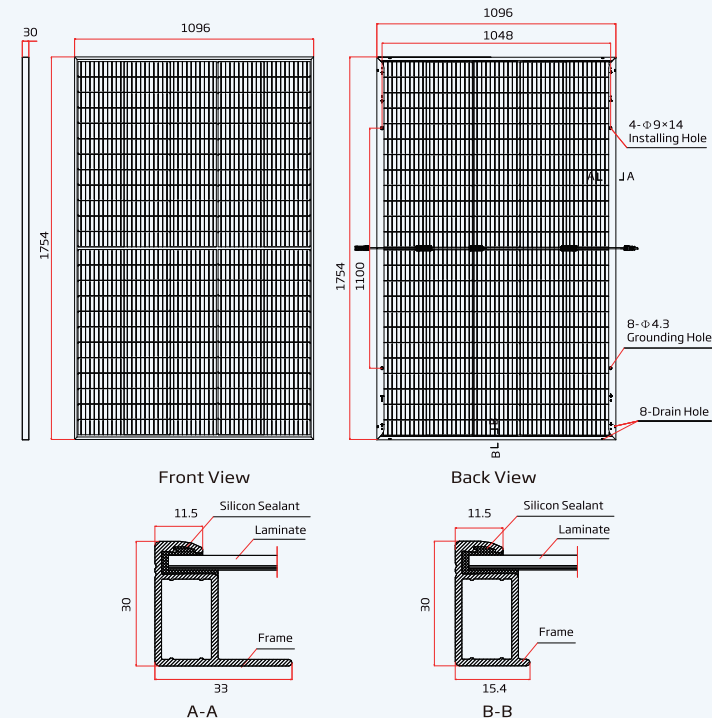
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ISO 9001: Quality Management System  
ISO 14001: Environmental Management System  
ISO14064: Greenhouse Gases Emissions Verification  
ISO45001: Occupational Health and Safety Management System

Trina solar

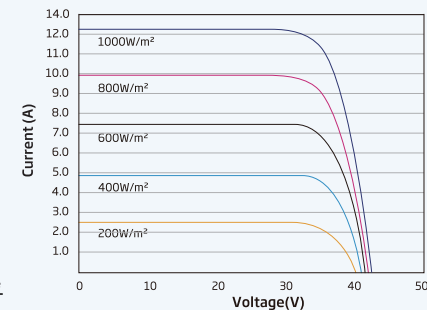
## Vertex S

BACKSHEET MONOCRYSTALLINE MODULE

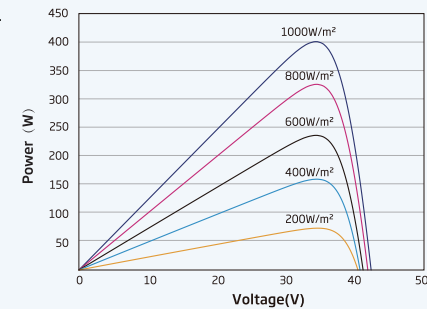
### DIMENSIONS OF PV MODULE(mm)



### I-V CURVES OF PV MODULE(400 W)



### P-V CURVES OF PV MODULE(400W)



### ELECTRICAL DATA (STC)

Peak Power Watts -P <sub>MAX</sub> (Wp) *	380	385	390	395	400	405
Power Tolerance -P <sub>MAX</sub> (W)	0 ~ +5					
Maximum Power Voltage -V <sub>MPP</sub> (V)	33.4	33.6	33.8	34.0	34.2	34.4
Maximum Power Current -I <sub>MPP</sub> (A)	11.38	11.46	11.54	11.62	11.70	11.77
Open Circuit Voltage -V <sub>OC</sub> (V)	40.4	40.6	40.8	41.0	41.2	41.4
Short Circuit Current -I <sub>SC</sub> (A)	12.00	12.07	12.14	12.21	12.28	12.34
Module Efficiency $\eta_m$ (%)	19.8	20.0	20.3	20.5	20.8	21.1

STC: Irradiance 1000W/m<sup>2</sup>, 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 -P <sub>MAX</sub> (Wp)	407	412	417	423	428	433
Maximum Power Voltage -V <sub>MPP</sub> (V)	33.4	33.6	33.8	34.0	34.2	34.4
Maximum Power Current -I <sub>MPP</sub> (A)	12.19	12.26	12.34	12.44	12.51	12.59
Open Circuit Voltage -V <sub>OC</sub> (V)	40.4	40.6	40.8	41.0	41.2	41.4
Short Circuit Current -I <sub>SC</sub> (A)	12.92	13.00	13.08	13.20	13.25	13.36
Irradiance ratio (rear/front)	10%					

Power Bifaciality:70±5%.

### ELECTRICAL DATA (NOCT)

Maximum Power -P <sub>MAX</sub> (Wp)	286	290	294	298	302	305
Maximum Power Voltage -V <sub>MPP</sub> (V)	31.4	31.6	31.8	31.9	32.1	32.4
Maximum Power Current -I <sub>MPP</sub> (A)	9.12	9.18	9.24	9.32	9.38	9.42
Open Circuit Voltage -V <sub>OC</sub> (V)	38.0	38.2	38.4	38.6	38.8	38.9
Short Circuit Current -I <sub>SC</sub> (A)	9.67	9.73	9.78	9.84	9.90	9.94

NOCT: irradiance at 800W/m<sup>2</sup>, 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 4.0mm <sup>2</sup> (0.006 inches <sup>2</sup> ), Portrait: 350/280 mm(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 P <sub>MAX</sub>	- 0.34%/°C
Temperature Coefficient of V <sub>OC</sub>	- 0.25%/°C
Temperature Coefficient of I <sub>SC</sub>	0.04%/°C

### MAXIMUM RATINGS

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

### PACKAGING CONFIGURATION

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

(Please refer to product warranty for details)

CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.

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Version number: TSM\_NA\_2022\_A

www.trinasolar.com

Trina solar



# 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 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.



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.



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 and IQ8+ Microinverters

INPUT DATA (DC)		I08-60-2-US	I08PLUS-72-2-US
Commonly used module pairings¹	W	235 – 350	235 – 440
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
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 current² [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)		I08-60-2-US	I08PLUS-72-2-US
Peak output power	VA	245	300
Max continuous output power	VA	240	290
Nominal (L-L) voltage/range³	V	240 / 211 – 264	
Max continuous output current	A	1.0	1.21
Nominal frequency	Hz	60	
Extended frequency range	Hz	50 – 68	
Max units per 20 A (L-L) branch circuit⁴		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	%	97.5	97.6
CEC weighted efficiency	%	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			
		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	
Certifications		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) No enforced DC/AC ratio. See the compatibility calculator at <https://link.enphase.com/module-compatibility> (2) Maximum continuous input DC current is 10.6A (3) Nominal voltage range can be extended beyond nominal if required by the utility. (4) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.



IQ Combiner 4/4C



X-IQ-AM1-240-4C  
X2-IQ-AM1-240-4C (IEEE 1547:2018)

X-IQ-AM1-240-4  
X2-IQ-AM1-240-4 (IEEE 1547:2018)

The **IQ Combiner 4/4C** with IQ Gateway and integrated LTE-M1 cell modem (included only with IQ Combiner 4C) consolidates interconnection equipment into a single enclosure. It 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 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
- Supports Wi-Fi, Ethernet, or cellular connectivity
- Optional AC receptacle available for PLC bridge
- Provides production metering and consumption monitoring

Simple

- Mounts on single stud with centered brackets
- Supports bottom, back and side conduit entry
- Allows up to four 2-pole branch circuits for 240VAC 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
- X2-IQ-AM1-240-4 and X2-IQ-AM1-240-4C comply with IEEE 1547:2018 (UL 1741-SB, 3<sup>rd</sup> Ed.)

IQ Combiner 4/4C

MODEL NUMBER	
IQ Combiner 4 X-IQ-AM1-240-4 X2-IQ-AM1-240-4 (IEEE 1547:2018)	IQ Combiner 4 with 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 and IQ System Controller 2 and to deflect heat.
IQ Combiner 4C X-IQ-AM1-240-4C X2-IQ-AM1-240-4C (IEEE 1547:2018)	IQ Combiner 4C with IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 ± 0.5%) and consumption monitoring (± 2.5%). Includes 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)	
Supported microinverters	IQ6, IQ7, and IQ8. (Do not mix IQ6/7 Microinverters with IQ8)
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 - 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
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)
X-IQ-NA-HD-125A	Hold-down kit for Eaton circuit breaker with screws
Consumption monitoring CT (CT-200-SPLIT/CT-200-CLAMP)	A pair of 200A split core current transformers
ELECTRICAL SPECIFICATIONS	
Rating	Continuous duty
System voltage	120/240VAC, 60 Hz
Eaton BR series busbar rating	125A
Max. continuous current rating	65A
Max. continuous current rating (input from PV/storage)	64A
Max. fuse/circuit rating (output)	90A
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
IQ Gateway breaker	10A or 15A rating GE/Siemens/Eaton included
Production metering CT	200A solid core pre-installed and wired to IQ Gateway
MECHANICAL DATA	
Dimensions (WxHxD)	37.5 cm x 49.5 cm x 16.8 cm (14.75 in x 19.5 in x 6.63 in). Height is 53.5 cm (21.06 in) with mounting brackets.
Weight	7.5 kg (16.5 lbs)
Ambient temperature range	-40°C to +46°C (-40°F to 115°F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction
Wire sizes	• 20A to 50A breaker inputs: 14 to 4 AWG copper conductors • 60A 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	Up to 3,000 meters (9,842 feet)
INTERNET CONNECTION OPTIONS	
Integrated Wi-Fi	IEEE 802.11b/g/n
Cellular	CELLMODEM-M1-06-SP-05, CELLMODEM-M1-06-AT-05 (4G based LTE-M1 cellular modem). Note that an Mobile Connect cellular modem is required for all Enphase Energy System installations.
Ethernet	Optional, IEEE 802.3, Cat5E (or Cat6) UTP Ethernet cable (not included)
COMPLIANCE	
Compliance, IQ Combiner	CA Rule 21 (UL 1741-SA) IEEE 1547:2018 - UL 1741-SB, 3 <sup>rd</sup> Ed. (X2-IQ-AM1-240-4 and X2-IQ-AM1-240-4C) CAN/CSA C22.2 No. 107.1, Title 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



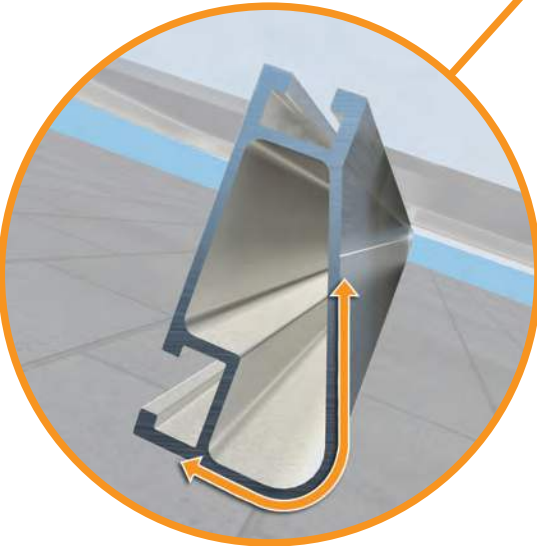
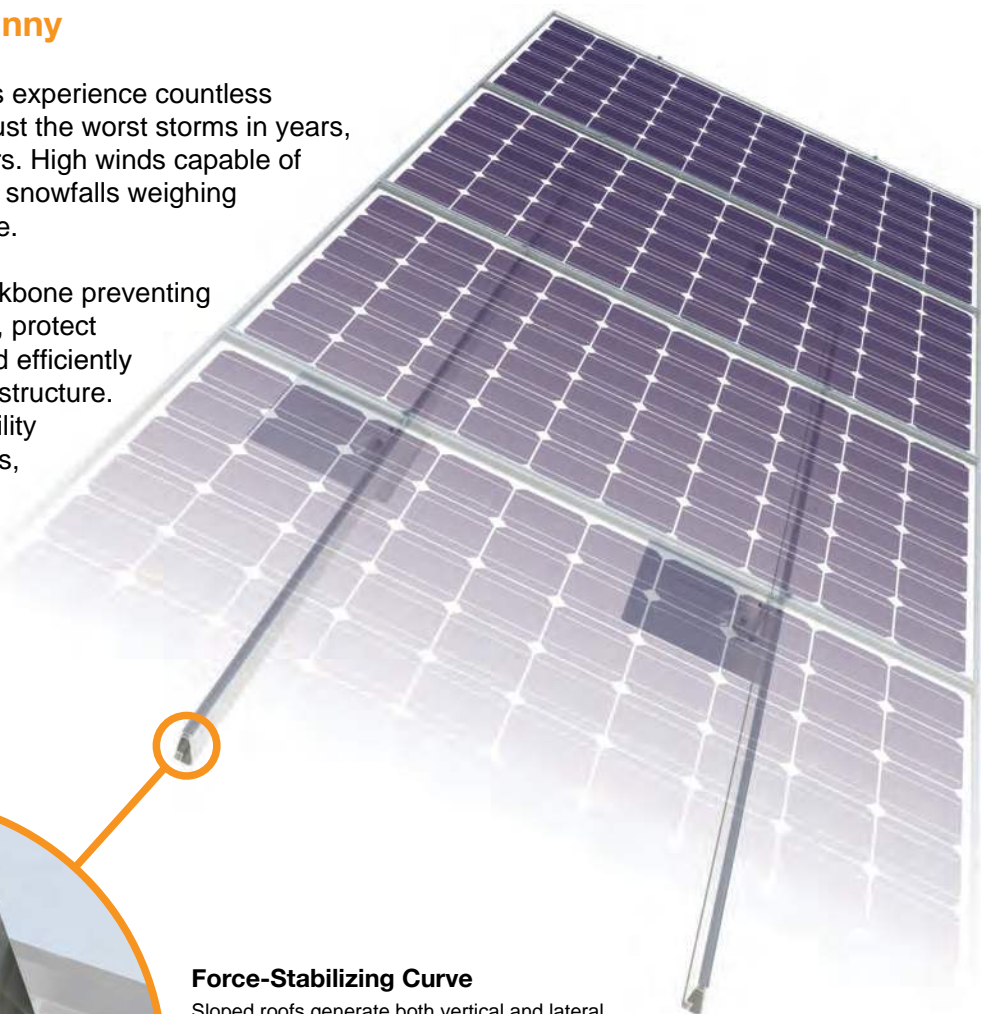


# XR Rail Family

## 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.



# 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](http://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.



# GODWIN ENGINEERING AND DESIGN, LLC

8378 Foxtail Loop, Pensacola, FL 32526 | (850)712-4219 | [chad@godwineng.com](mailto:chad@godwineng.com)

November 9, 2023

To: Columbia County Building Department  
135 NE Hernando Ave  
Lake City, FL 32055

Subject: Buergo - Residential PV Roof Mount Installation  
241 NW Pompano Ct  
Lake City, FL 32055

To whom it may concern,

This letter is regarding the proposed installation of a rooftop-mounted Solar PV system on the existing residential structure at the subject address. I have reviewed the attachment plan and have determined that the rooftop-mounted PV system is in compliance with the applicable sections of the following Codes as amended and adopted by the jurisdiction when installed in accordance with the manufacturer's installation instructions:

2020 Florida Building Code 7<sup>th</sup> Edition, FBC  
ASCE 7 Min. Design Loads for Buildings & Other Structures  
Design Criteria: Design Wind Speed(Vult) - 120 mph 3sec gust, Exposure Category - C, Risk Category II

The rooftop-mounted photovoltaic panel system has been designed in accordance with FRC R324.4. When roof penetrations are necessary, they shall be flashed and sealed in accordance with the manufacture's installation instructions, R905.17.3. The PV system consist of the modules, railing, and connection hardware. Refer to the specific roof type calculation pages for PV dead loads. The portions of the existing structure covered with solar panels will be adequate for supporting the roof loads per R324.4.1.1.

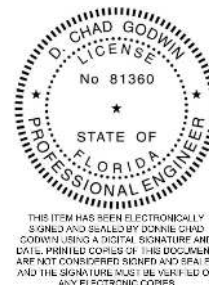
The securement method of the the PV system is to be mounted parallel to the structure with the site specific railing and attachments according to the designed plans. The site specific wind load calculations for the module and their supports are attached with this document. Fasteners shall be installed to the designated roof member with the proper torque from the manufactures installation instructions.

The design wind pressures for rooftop solar panels located on enclosed or partially enclosed buildings of all heights, with panels parallel to the roof surface with a tolerance of 2° and with a max height above the roof surface,  $h_2$ , not exceeding 10 in. A min gap of 0.25 in shall be provided between all panels with the spacing of gaps between panels not exceeding 6.7 ft. in addition the array shall be located at least  $2h_2$  from the roof edge, a gable ridge, or a hip ridge.

It is the contractors responsibility to review all drawings for accuracy and notify the EOR of any discrepancies prior to beginning construction. To the best of my knowledge, the plans and specifications comply with the minimum requirements of the latest Florida Building code.

Please see attached documents and contact me should you have any questions.

Sincerely,  
D. Chad Godwin, PE 81360  
Exp. 02/28/2025



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# GODWIN ENGINEERING AND DESIGN, LLC

8378 Foxtail Loop, Pensacola, FL 32526 | (850)712-4219 | [chad@godwineng.com](mailto:chad@godwineng.com)

Roof Structure Details				Burgoo - Residential Calculations Sheet - R1-R3					
Roof Angle	28° to 45°			The securement method of the PV system is to be mounted parallel to the Asphalt Shingle roof with the IR-100 railing and Halo Ultragrip - HUG flashings/attachments. The mounts should be staggered, where possible, to allow distribution of the design loads evenly to the structure. The mounts shall be installed with (2) #14 Self-Dr, QM RD Structural , to Rafter					
Roof Type	Hip								
Roof Covering	Asphalt Shingle								
Mean Roof Height	15 ft								
Rafter Spacing	24 in O.C.								
Rafter/Truss Size	2 x 4								
Wind Load Parameters									
Wind Speed (asd)	93	mph	FRC R301.2.1.3	Basic Wind Speed (Ult)	120	mph			
Effective Wind Area	20.69	ft <sup>2</sup>		Exposure Cat.	C	B,C, or D			
Wind Directionality	K <sub>d</sub>	0.85	Table 26.6-1	Elevation	<1000	ft			
Topographic factor	K <sub>zt</sub>	1.00	26.8 or 26.8.2	bldg. least hori. dim (typ.)	360	in			
Ground Elevation Factor	K <sub>e</sub>	1.00	Table 26.9-1	Roof Height	15.00	ft			
Velocity Exposure Coefficient	K <sub>z</sub>	0.85	Table 26.10-1	<b>Exposed Module Definition</b> Exposed factor = 1.5 for uplift loads on panels that are exposed and within a distance 1.5(L <sub>p</sub> ) from the end of a row at an exposed edge of the array. Modules are considered Exposed if d <sub>1</sub> to the roof edge > 0.5h and one of the following applies: 1. d <sub>1</sub> to adjacent array > 4ft. 2. d <sub>2</sub> to the next adjacent mod > 4ft.					
Array Edge Factor	γ <sub>E</sub>	1.50	Exposed					29.4.4	
Array Edge Factor	γ <sub>E</sub>	1.00	Non-Exp					29.4.4	
Solar Panel Equalization Factor	γ <sub>a</sub>	0.67	Fig. 29.4-8						
Velocity Pressure	q <sub>h</sub>	15.98	psf					q <sub>h</sub> =0.00256 K <sub>z</sub> K <sub>zt</sub> K <sub>e</sub> V <sup>2</sup>	
Added Safety Factor		1.2							
Allowable Pullout per mount		1004.0	lbs						
0.4h or 0.6h		6.00	ft	Flat - 0.6h, Gab/Hip - 0.4h					
10% of least horizontal dim		3.00	ft	10% of least hor. Dim. Or 0.4h, whichever is smaller, but not less than either 4% of Least hor. Or 3ft. (flat roof - 0.6h)					
Roof Zone Set Back	a	3.00	ft						
	h <sub>2</sub>	5	in	Not > 10in(panel height above roof)					
	2h <sub>2</sub>	10	in	*min distance array shall be from the roof edge, Gable Ridge, or hip ridge					
		0.25	in	min gap between all panels but not > 6.7ft					
	d1	1.00	ft	Horizontal distance orthogonal to panel edge					
	d2	0.25	ft	Horizontal distance from edge of one panel to the nearest edge in the next row					
	0.5h	7.50	ft						
PV Attachment - Results									
R1-R3 Roof Zones - Hip 28° to 45°									
	1	2e	2r	3					
GC <sub>p</sub> - Uplift	-1.4	-1.5	-2.1	-2.1					
GC <sub>p</sub> - Down	0.7	0.7	0.7	0.7					
p = q <sub>h</sub> (GC <sub>p</sub> )(g <sub>e</sub> )(γ <sub>a</sub> )Up	-19.8	-21.4	-31.1	-31.1	psf	29.4-7	Exposed		
p = q <sub>h</sub> (GC <sub>p</sub> )(g <sub>e</sub> )(γ <sub>a</sub> )UP	-16.0	-16.0	-19.8	-19.8	psf	29.4-7	Non-Exp.		
p = q <sub>h</sub> (GC <sub>p</sub> )(g <sub>e</sub> )(γ <sub>a</sub> )Down	16.0	16.0	16.0	16.0	psf	29.4-7	Exposed		
p = q <sub>h</sub> (GC <sub>p</sub> )(g <sub>e</sub> )(γ <sub>a</sub> )Down	16.0	16.0	16.0	16.0	psf	29.4-7	Non-Exp.		
Point load (Portrait Rails)	-342	-370	-537	-537	lb	p * A <sub>eff</sub>	Exposed		
Point load (Portrait Rails)	-276.2	-276.2	-342.2	-342.2	lb	p * A <sub>eff</sub>	Non-Exp.		
Point Load (landscape Rails)	-213.8	-231.3	-335.8	-335.8	lb	p * A <sub>eff</sub>	Exposed		
Point Load (landscape Rails)	-172.6	-172.6	-213.8	-213.8	lb	p * A <sub>eff</sub>	Non-Exp.		
Max Span (Portrait)	72	72	72	72	in		Exposed		
Max Span (Portrait)	72	72	72	72	in	***	Non-Exp.		
Max Span (landscape)	72	72	72	72	in		Exposed		
Max Span (landscape)	72	72	72	72	in		Non-Exp.		
Cantilever (Portrait)	29	29	29	29	in		Exposed		
Cantilever (Portrait)	29	29	29	29	in	Span * 40%	Non-Exp.		
Cantilever (landscape)	29	29	29	29	in		Exposed		
Cantilever (landscape)	29	29	29	29	in		Non-Exp.		
*** Spans with Mark through denote allowable Module pressure rating is exceeded.									
PV Dead Load				TSM-DE09C.07 380-405 Module Specifications					
QTY of Modules (46 in Portrait, )		46							
Module Area	20.69	ft <sup>2</sup>							
Rail, Clamps, Mounts	1	lb/ft							
Total Rail Length	336	ft							
Module	W <sub>mod</sub>	46	lbs						
Array	W <sub>mods</sub>	2130	lbs						
Micro/optimizer	W <sub>mic</sub>	184	lbs						
PV Rail	W <sub>PV rail</sub>	336	lbs						
Total Weight	W <sub>total</sub>	2650	lbs						
Total Area	A <sub>T</sub>	951.85	ft <sup>2</sup>						
Dead Load	D <sub>PV</sub>	2.78	psf						
Weight/attachment		25.0	lbs						
Fastener Allowable Pullout				A (ft) B (ft) C (in) D (in) E (in) F (in)					
(2) #14 Self-Dr, QM RD Structural				5.75	3.60	9.84	13.78	0.00	7.87
				Module load ratings (psf)					
				Ultimate Allowable( Ult /1.5)					
				Load Rating - Snow		126.0	84.0	Portrait	
				Load Rating - Wind		-84.0	-56.0		
				Load Rating - Snow		50.4	33.6		
				Load Rating - Wind		-37.8	-25.2	Landscape	
				Load Rating - Wind		-37.8	-25.2		
Pullout Value (Source - FL Product Approval)				1004.0	lb <sub>f</sub>				



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