ROOF MOUNT INSTALLATION OF 1.68 KW DC PHOTOVOLTAIC SYSTEM

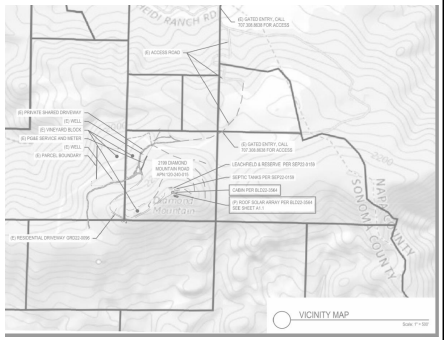
PROJECT DATA

OWNER	Babu Residence 2199 Diamond Mountain, Calistoga
SCOPE OF WORK	RESIDENTIAL GRID INTERACTIVE SOLAR INSTALLATION REC SOLAR REC420AA PURE 2 SOLAR MODULES (4) X 420W= 1.68 KWdc @ STC (4) IQ8A-72-2-US ENPHASE MICRO INVERTER
BUILDING	RESIDENTIAL
CODES & STANDARDS	2022 CEC, 2022 CBC, 2022 CFC, 2022 CPC, CA RULE 21
MODULE SPECS	REC Solar [REC420AA PURE 2] (L) 73.4 X (W) 40.9 X (H) 1.2 WEIGHT = 47.6 LBS. COMBINED WEIGHT OF MODULE AND RACKING: 2.65 PSF < 4.5 PSF
AHJ	COUNTY OF SONOMA
APN	120-240-015

PROJECT NOTES

1. PV SYSTEMS AND SUPPORTING STRUCTURE SHALL COMPLY WITH REQUIREMENTS OF 2022 CEC, 2022 CBC, 2022 CFC, 2022 CPC, CA RULE 21
2. PV RACKING AND ATTACHMENTS SHALE BE UL 1703
3. PV SYSTEM SHALL HAVE A FIRE CLASSIFICATION THAT IS EQUAL TO OR GREATER THAN THE ROOF ASSEMBLY REQUIRED BY 2022 CEC.
4. PV LAYOUT SHALL NOT RESTRICT EGRESS, LIGHT VENTILATION, OR ROOF DRAINAGE REQUIREMENTS
5. GENERAL PATHWAY RQUIREMENTS SHALL COMPLY WITH 2022 CFC AND 2022 CRC.
6. DISCONNECTS, J-BOXES, COMBINER BOXES OR GUTTER BOXES SHALL NOT BE PLACED IN ANY REQUIRED PATHWAY OR CUTOUT.
7. TOTAL SYSTEM WEIGHT SHALL NOT EXCEED 4.5 PSF. PV MODULES AND RACKING SHALL BE DIRECTLY ATTACHED TO THE ROOF FRAMING AS SHOWN IN THIS PERMIT. ATTACHMENTS SPACING WILL BE 72" O.C. MAX.
8. MAX MODULE HEIGHT <18" OFF ROOF SURFACE FOR FLUSH MOUNTED SYSTEMS. TILTED SYSTEMS MAY EXCEED THIS.
9. CONTRACTOR SHALL OBTAIN ELECTICAL PERMITS PRIOR TO INSTALLATION AND SHALL COORDINATE ALL INSPECTIONS, TESTING COMMISSIONING AND ACCPTANCE WITH THE CLIENT, UTILITY CO. AND CITY/COUNTY INSPECTORS AS NEEDED.
10. THE ELECTRICAL CONTRACTOR SHALL VERIFY THE EXACT LOCATIION OF SERVICE POINTS AND SERVICE SIZES WITH THE SERVING UTILITY COMPANY AND COMPLY WITH ALL UTILITY COMPANIES EQUIREMENTS. IF THE SOLAR BACK FED BREAKER IS OVER THE BUS SIZE 20% LIMIT, CONTRACTOR SHALL INCLUDE INCLUDE THE COST TO REPLACE MAIN BREAKR OR ENLARGE MAIN BUS CAPACITY.
11. DRAWINGS ARE DIAGRAMMATIC ONLY, ROUTING OF RACEWAYS SHALL BE OPTION OF THE CONTRACTOR UNLESS OTHERWISE NOTED AND SHALL BE COORDINATED WITH WITH OTHER TRADES.
12. ALL BROCHURES, OPERATION MANUALS, CATALOGS, SHOP DRAWINGS, ETC. SHALL BE PROVIDED TO OWNER'S REPRESENTATIVE AT THE COMPLETION OF THE PROJECT.
13. ALL METALLIC EQUIPMENT SHALL BE GROUNDED
14. SOLAR SYSTEM SHALL NOT COVER ANY PLUMBING OR MECHANICAL VENTS.
15. SOLAR INVERTER MUST HAVE A MANUFACTURE INSTALLED DISCONNECTING MEANS THAT PREVENTS PARALLEL FEEDING UTILITY LINES DURING POWER OUTAGE.

VICINITY MAP



SHEET INDEX

INDEX SHEET

MSP	MAIN SERVICE PANEL		3' WALKWAY ACCESS		MAIN SERVICE PANEL
INV	INVERTER(S)				
SSP	SERVICE SUB PANEL		18" CLEARANCE		ENPHASE COMBINER BOX
IQ	IQ COMBINER BOX				
J/B	JUNCTION BOX		CONDUIT (FLEX/EMT)		
DP	DISTRIBUTION PANEL				
N	NEW COMPONENT				
E	EXISTING COMPONENT				

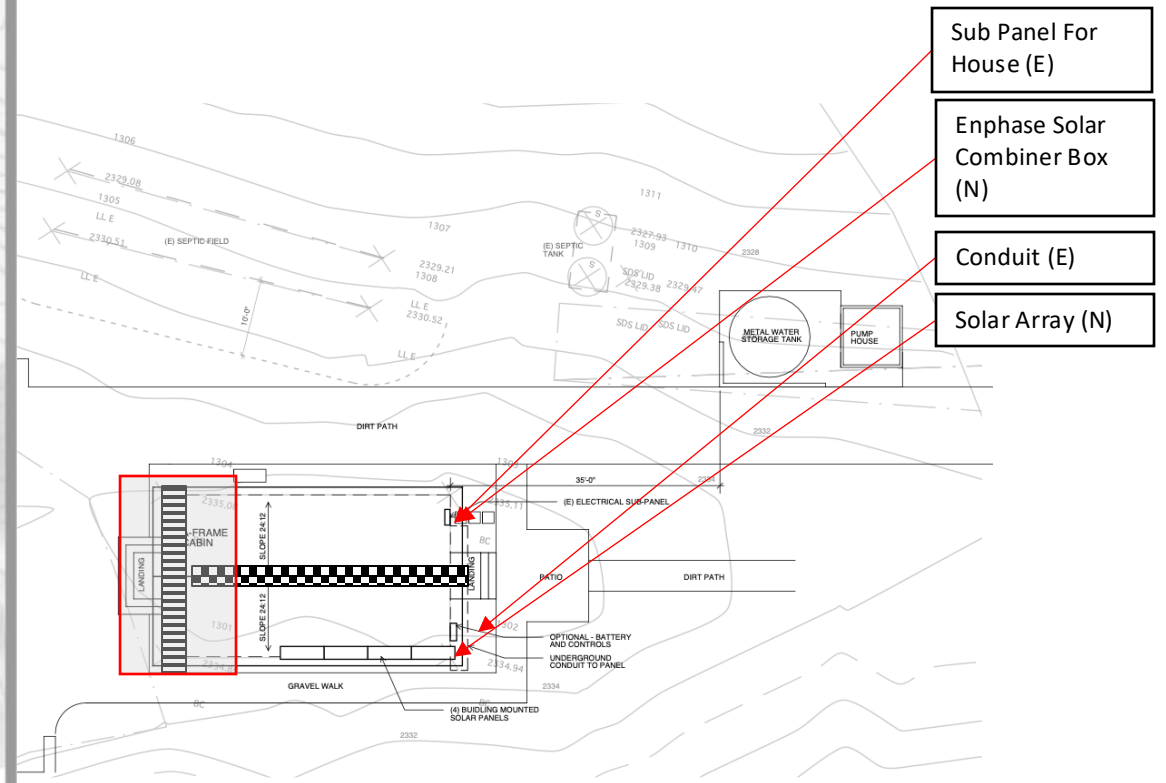
CONTRACTOR:
FIRST RESPONSE SOLAR INC.
708 GRAVENSTEIN HWY N 428
SEBASTOPOL, CA 95472
PH: 707-861-0388
Info@firstresponsesolar.com
LICENSE #: 1039876

FIRST RESPONSE SOLAR

Babu Residence
2199 Diamond Mountain Rd
Calistoga, CA, 94515

JULY 30, 2024	0
AS INDICATED	
PV SYSTEM	

SITE PLAN



CONTRACTOR:
FIRST RESPONSE SOLAR INC.
708 GRAVENSTEIN HWY N 428
SEBASTOPOL, CA 95472
PH: 707-861-0388
Info@firstresponsesolar.com
LICENSE #: 1039876

FIRST RESPONSE SOLAR

Babu Residence
2199 Diamond Mountain Rd
Calistoga, CA, 94515

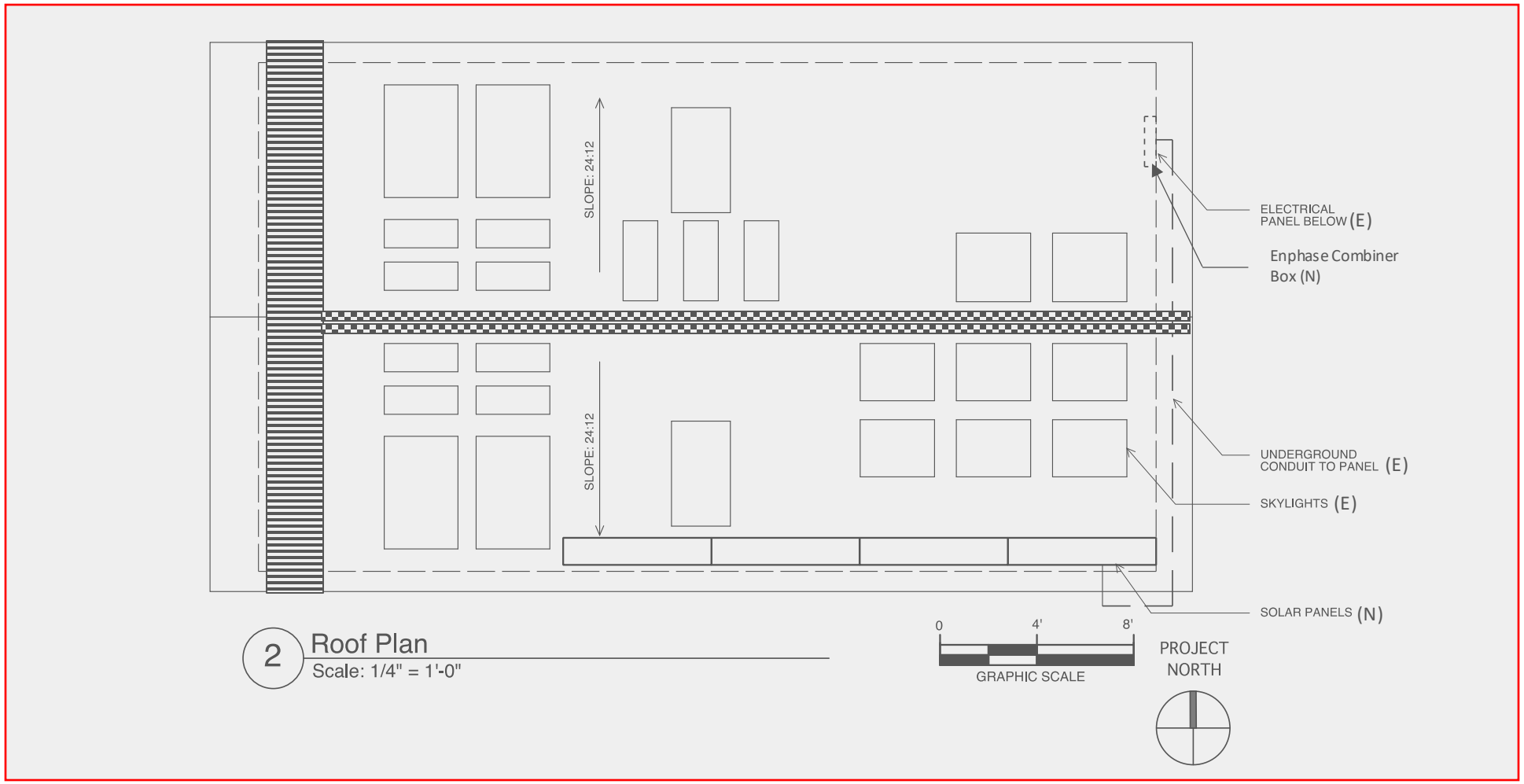
N

JULY 30, 2024

AS INDICATED

PV SYSTEM

ROOF PLAN



CONTRACTOR:
FIRST RESPONSE SOLAR INC.
708 GRAVENSTEIN HWY N 428
SEBASTOPOL, CA 95472
PH: 707-861-0388
Info@firstresponsesolar.com
LICENSE #: 1039876

FIRST RESPONSE SOLAR

Babu Residence
2199 Diamond Mountain Rd
Calistoga, CA, 94515

N

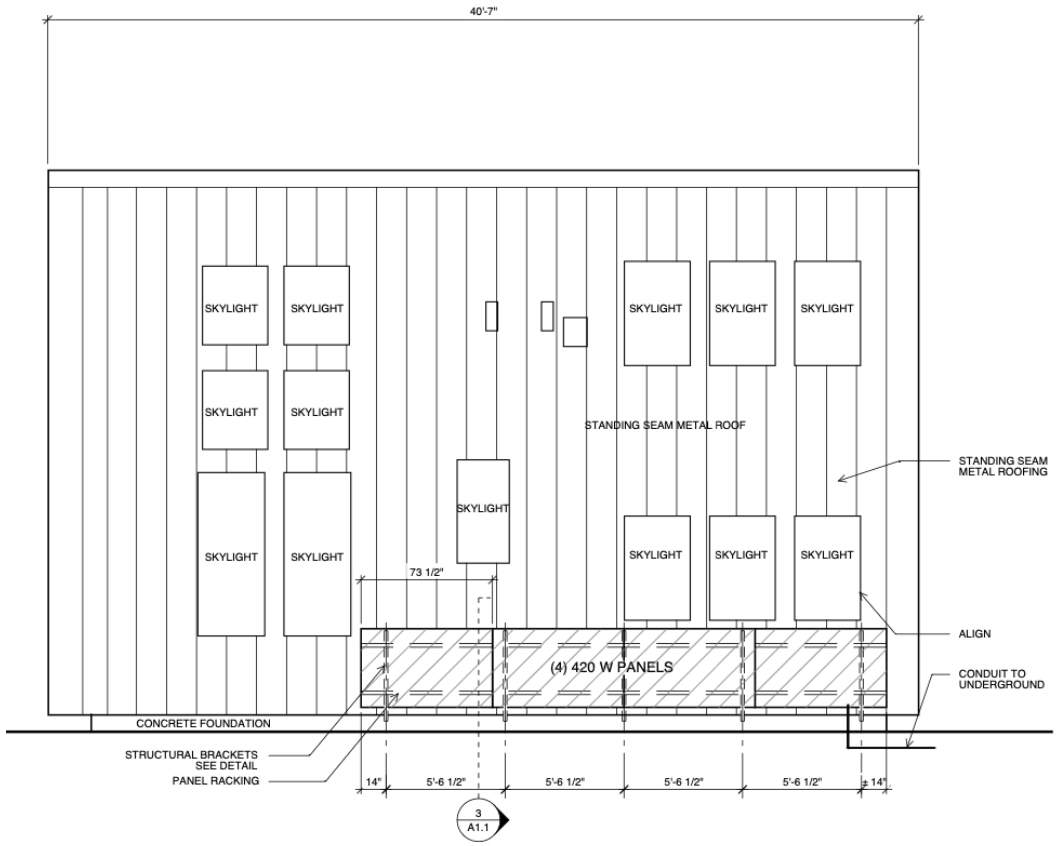
JULY 30, 2024

AS INDICATED

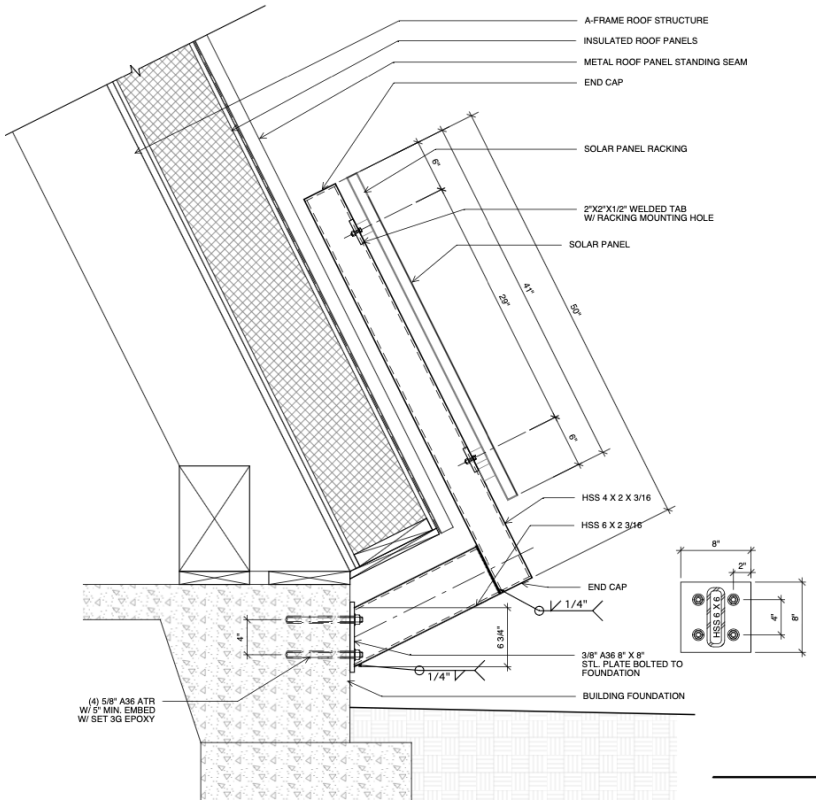
PV SYSTEM

2

ATTACHMENT LAYOUT



1 South Roof Elevation
Scale: 1/4" = 1'-0"



Structural brackets have been designed and secured into the foundation of the building. The solar racking will be attached to these engineered structural brackets

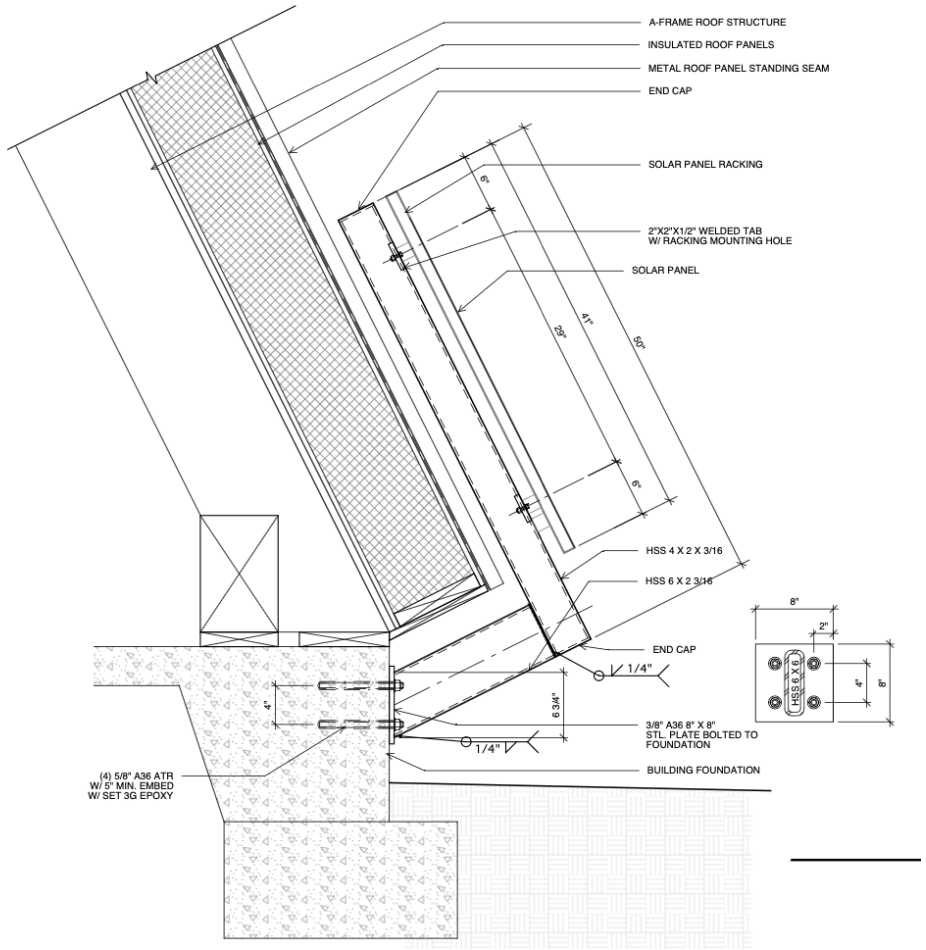
CONTRACTOR:
FIRST RESPONSE SOLAR INC.
708 GRAVENSTEIN HWY N 428
SEBASTOPOL, CA 95472
PH: 707-861-0388
Info@firstresponsesolar.com
LICENSE #: 1039876

FIRST RESPONSE SOLAR

Babu Residence
2199 Diamond Mountain Rd
Calistoga, CA, 94515

JULY 30, 2024	
AS INDICATED	
PV SYSTEM	3

STRUCTURAL SUPPORTS



CONTRACTOR:
FIRST RESPONSE SOLAR INC.
708 GRAVENSTEIN HWY N 428
SEBASTOPOL, CA 95472
PH: 707-861-0388
Info@firstresponsesolar.com
LICENSE #: 1039876

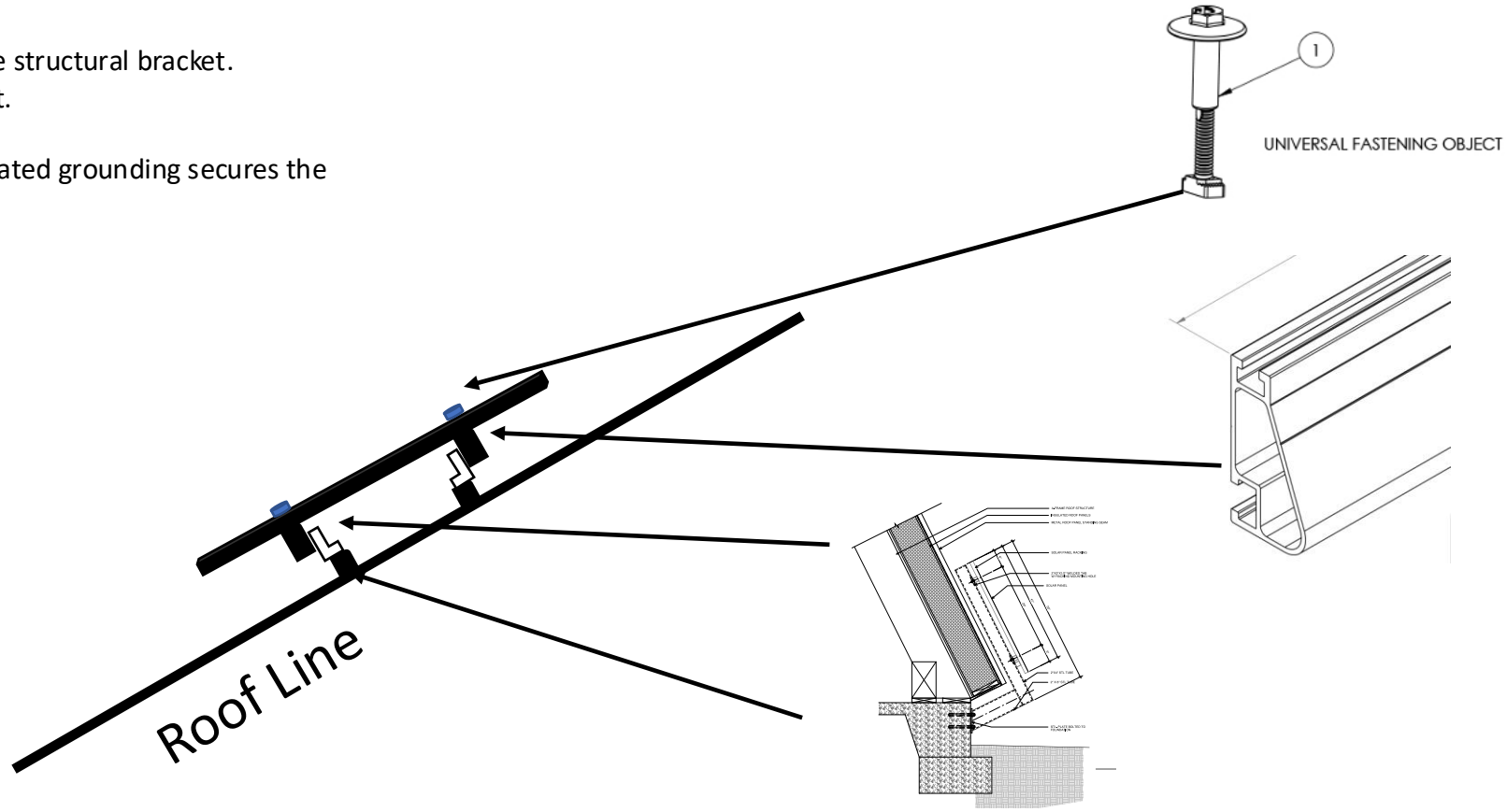
FIRST RESPONSE SOLAR

Babu Residence
2199 Diamond Mountain Rd
Calistoga, CA, 94515

JULY 30, 2024	
AS INDICATED	
PV SYSTEM	4

COMPONENT DESCRIPTION

1. Structural support brackets will be installed into the foundation of the structure.
2. An Iron Ridge L-Foot will be attached to the structural bracket.
3. Iron Ridge Racking is fastened to the L-Foot.
4. Modules is mounted to racking.
5. Iron Ridge UFO universal clamp with integrated grounding secures the panel to the racking.



CONTRACTOR:
FIRST RESPONSE SOLAR INC.
708 GRAVENSTEIN HWY N 428
SEBASTOPOL, CA 95472
PH: 707-861-0388
Info@firstresponsesolar.com
LICENSE #: 1039876

FIRST RESPONSE SOLAR

Babu Residence
2199 Diamond Mountain Rd
Calistoga, CA, 94515

JULY 30, 2024

AS INDICATED

PV SYSTEM

SINGLE LINE DRAWING (SLD)

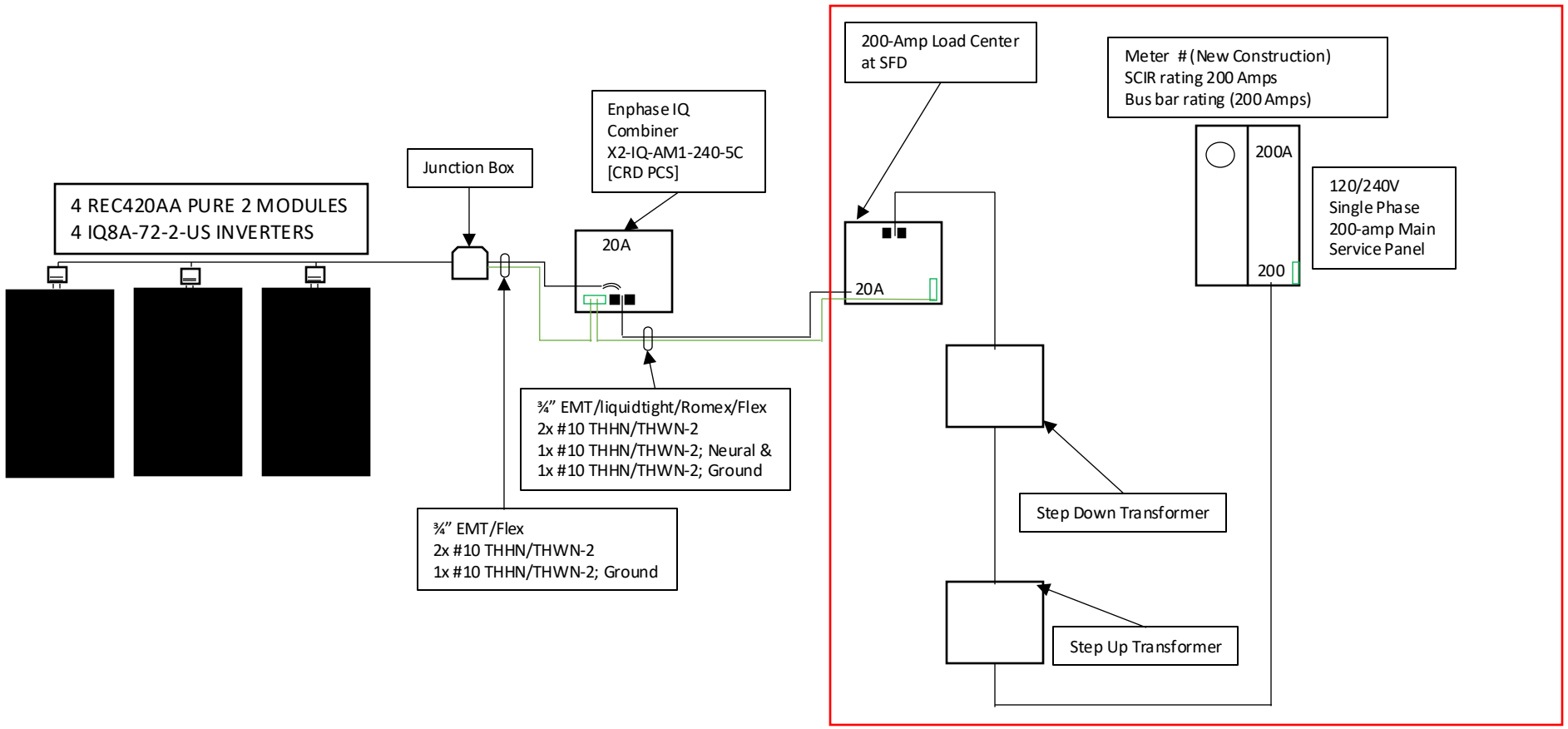
Bond module frames and all racking to #8 solid copper bare ground wire with IronRidge UFO Family of Components. Ground is protected within structure or under panels.

4 REC420AA PURE 2 Modules
4 Enphase Energy IQ8A-72-2-US Microinverters
1 AC Branch Circuit of 4 modules

Electrical Single Line Diagram
1.565 kW (CEC-AC)
Roof Mounted, Grid Tied PV System

Module Specs:
REC Solar Energy
REC420AA PURE 2
Pmax=420 W
Voc=46 V
Vmp=39.9 V
Isc=10.74 A
Imp=8.05 A

Microinverter Specs:
Enphase Energy
IQ8A-72-2-US [240V] (SI1-SB)
Max input DC voltage = 60 VDC
Peak power tracking voltage = 36-45
VDC Max DC short circuit current = 15
ADC Peak output power = 366 VA
Max continuous output power = 349 VA
Max continuous output current = 1.45 A
Nominal voltage/range = 240 V/ 211-264 V
CEC weighted efficiency = 97.5%



CONTRACTOR:
FIRST RESPONSE SOLAR INC.
708 GRAVENSTEIN HWY N 428
SEBASTOPOL, CA 95472
PH: 707-861-0388
Info@firstresponsesolar.com
LICENSE #: 1039876

FIRST RESPONSE SOLAR

Babu Residence
2199 Diamond Mountain Rd
Calistoga, CA, 94515

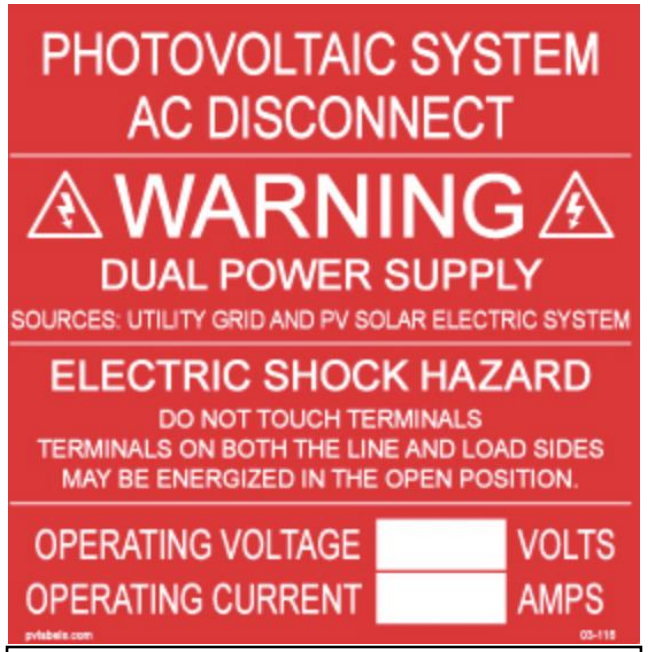
JULY 30, 2024

AS INDICATED

PV SYSTEM

SAFETY LABELS

A

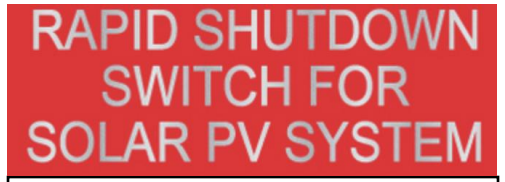


Located at Main Service Disconnect

B

Located at Main Service Disconnect

C

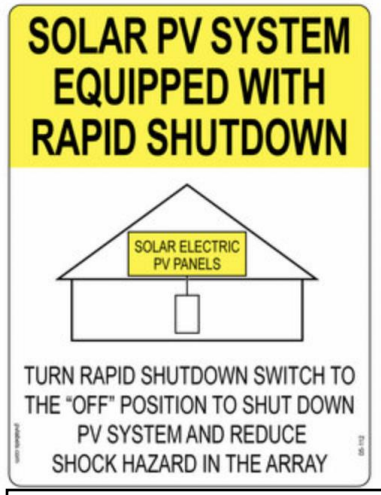


Located at Main Service Disconnect

D

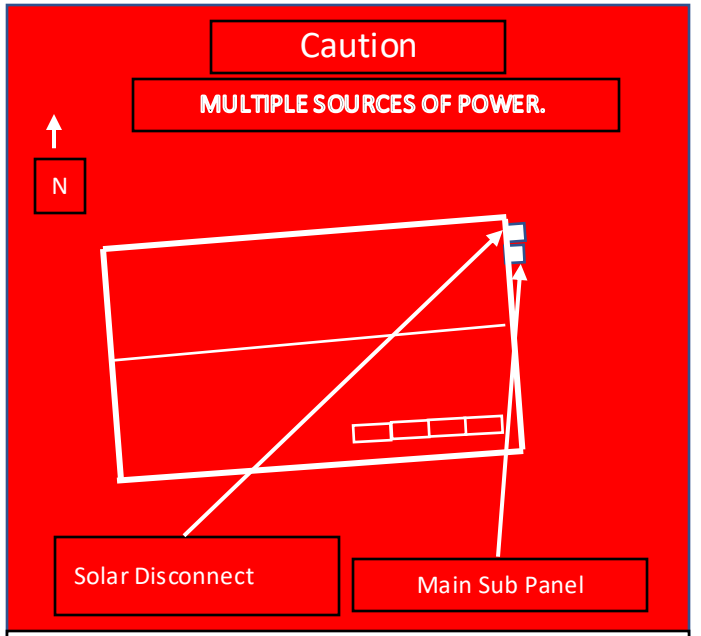
Located Inside Main Service Disconnect

E



Located Inside Main Service Disconnect

F



Located at Main Service Disconnect

CONTRACTOR:
FIRST RESPONSE SOLAR INC.
708 GRAVENSTEIN HWY N 428
SEBASTOPOL, CA 95472
PH: 707-861-0388
Info@firstresponsesolar.com
LICENSE #: 1039876

FIRST RESPONSE SOLAR

Babu Residence
2199 Diamond Mountain Rd
Calistoga, CA, 94515

JULY 30, 2024	
AS INDICATED	
PV SYSTEM	7

SOLAR'S MOST TRUSTED

REC

REC ALPHα®
PURE 2 SERIES
PRODUCT SPECIFICATIONS

COMPACT PANEL SIZE

420 WP

20.1 W/FT²

21.7% EFFICIENCY

PRODUCT REC 25 YEAR ProTrust WARRANTY PERFORMANCE LABOR

ELIGIBLE

LEAD-FREE
ROHS COMPLIANT

EXPERIENCE
α
PERFORMANCE

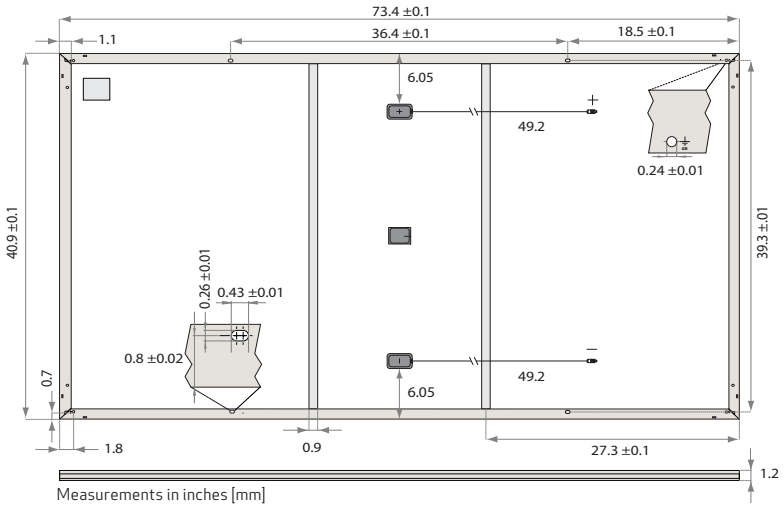
REC ALPHA PURE 2 SERIES

PRODUCT SPECIFICATIONS

REC
SOLAR'S MOST TRUSTED

GENERAL DATA

Cell type:	132 half-cut REC heterojunction cells with lead-free, gapless technology, 6 strings of 22 cells in series
Glass:	0.12 in solar glass with anti-reflective surface treatment in accordance with EN 12150
Backsheet:	Highly resistant polymer (black)
Frame:	Anodized aluminum (black)
Junction box:	3-part, 3 bypass diodes, lead-free IP68 rated, in accordance with IEC 62790
Connectors:	Stäubli MC4 PV-KBT4/KST4 (12 AWG) in accordance with IEC 62852, IP68 only when connected
Cable:	12 AWG solar cable, 49.2 + 49.2 in in accordance with EN 50618
Dimensions:	73.4 x 40.9 x 1.2 in (20.88 sq-ft)
Weight:	47.6 lbs (21.6 kg)
Origin:	Made in Singapore



Measurements in inches [mm]

ELECTRICAL DATA — Product Code*: RECxxxAA PURE 2

STC Power Output - P_{MAX} (Wp)	400	410	420	430
STC Watt Class Sorting - (W)	0/+10	0/+10	0/+10	0/+10
STC Nominal Power Voltage - V_{MPP} (V)	41.1	41.6	42.2	42.8
STC Nominal Power Current - I_{MPP} (A)	9.74	9.86	9.96	10.05
STC Open Circuit Voltage - V_{OC} (V)	48.5	48.8	49.1	49.3
STC Short Circuit Current - I_{SC} (A)	10.60	10.67	10.74	10.81
STC Power Density (W/ft²)	19.2	19.6	20.1	20.6
STC Panel Efficiency (%)	20.6	21.1	21.7	22.2
NMOT Power Output - P_{MAX} (Wp)	304	312	320	327
NMOT Nominal Power Voltage - V_{MPP} (V)	38.7	39.2	39.8	40.3
NMOT Nominal Power Current - I_{MPP} (A)	7.86	7.96	8.05	8.12
NMOT Open Circuit Voltage - V_{OC} (V)	45.7	45.8	46.0	46.2
NMOT Short Circuit Current - I_{SC} (A)	8.50	8.62	8.68	8.73

Values at standard test conditions (STC: air mass AM 1.5, irradiance 10.75 W/sq ft (1000 W/m²), temperature 77°F (25°C), based on a production spread with a tolerance of P_{MAX}, V_{OC} & I_{SC} ±3% within one watt class. Nominal module operating temperature (NMOT: air mass AM 1.5, irradiance 800 W/m², temperature 68°F (20°C), windspeed 3.3 ft/s (1 m/s). * Where xxx indicates the nominal power class (P_{MAX}) at STC above.

CERTIFICATIONS

IEC 61215:2016, IEC 61730:2016, UL 61730	
IEC 62804	PID
IEC 61701	Salt Mist
IEC 62716	Ammonia Resistance
UL 61730	Fire Type 2
IEC 62782	Dynamic Mechanical Load
IEC 61215-2:2016	Hailstone (35mm)
IEC 62321	Lead-free acc. to RoHS EU 863/2015
ISO 14001, ISO 9001, IEC 45001, IEC 62941	

Intertek Lead-Free

TEMPERATURE RATINGS*

Nominal Module Operating Temperature:	44°C (±2°C)
Temperature coefficient of P_{MAX}:	-0.24 %/°C
Temperature coefficient of V_{OC}:	-0.24 %/°C
Temperature coefficient of I_{SC}:	0.04 %/°C

*The temperature coefficients stated are linear values

MAXIMUM RATINGS

Operational temperature:	-40 ... +85°C
System voltage:	1000 V
Test load (front):	+ 7000 Pa (146 lbs/ft²)*
Test load (rear):	- 4000 Pa (83.5 lbs/ft²)*
Series fuse rating:	25 A
Reverse current:	25 A

* See installation manual for mounting instructions. Design load = Test load / 1.5 (safety factor)

WARRANTY

	Standard	REC ProTrust	
Installed by an REC Certified Solar Professional	No	Yes	Yes
System Size	All	≤25 kW	25-500 kW
Product Warranty (yrs)	20	25	25
Power Warranty (yrs)	25	25	25
Labor Warranty (yrs)	0	25	10
Power in Year 1	98%	98%	98%
Annual Degradation	0.25%	0.25%	0.25%
Power in Year 25	92%	92%	92%

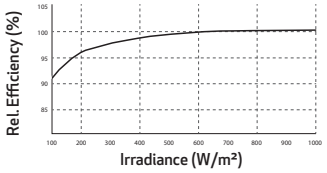
See warranty documents for details. Conditions apply

DELIVERY INFORMATION

Panels per pallet:	33
Panels per 40 ft GP/high cube container:	792 (24 pallets)
Panels per 53 ft truck:	858 (26 pallets)

LOW LIGHT BEHAVIOUR

Typical low irradiance performance of module at STC:



Available from:

Founded in 1996, REC Group is an international pioneering solar energy company dedicated to empowering consumers with clean, affordable solar power. As Solar's Most Trusted, REC is committed to high quality, innovation, and a low carbon footprint in the solar materials and solar panels it manufactures. Headquartered in Norway with operational headquarters in Singapore, REC also has regional hubs in North America, Europe, and Asia-Pacific.

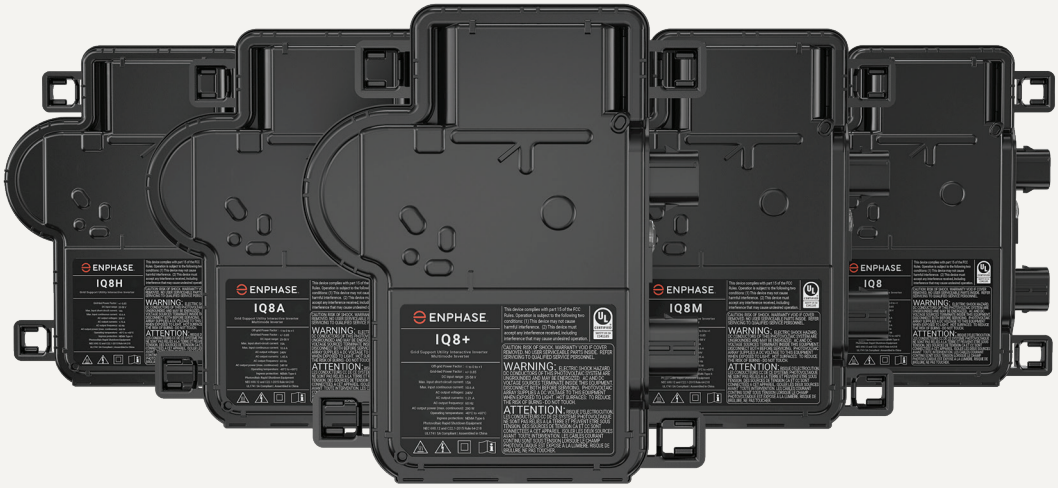
REC Solar PTE. LTD.
20 Tuas South Ave. 14
Singapore 637312
post@recgroup.com
www.recgroup.com

REC

Ref: PD-DS-AAPR Rev 1.4 08.23

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

IQ8SE-DS-0001-01-EN-US-2021-10-19

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.

ENPHASE

DATASHEET

X-IQ-AM1-240-5
X-IQ-AM1-240-5C

IQ Combiner 5/5C

The IQ Combiner 5/5C consolidates interconnection equipment into a single enclosure and streamlines IQ Series Microinverters and IQ Gateway installation by providing a consistent, pre-wired solution for residential applications. IQ Combiner 5/5C uses wired control communication and is compatible with IQ System Controller 3/3G and IQ Battery 5P.

The IQ Combiner 5/5C, along with IQ Series Microinverters, IQ System Controller 3/3G, and IQ Battery 5P provides you with a complete grid-agnostic Enphase Energy System.

IQ Series Microinverters
The high-powered smart grid-ready IQ Series Microinverters (IQ6, IQ7, and IQ8 Series) dramatically simplify the installation process

IQ System Controller 3/3G
Provides microgrid interconnection device (MID) functionality by automatically detecting grid failures and seamlessly transitioning the home energy system from grid power to backup power

IQ Battery 5P
Fully integrated AC battery system. Includes six field-replaceable IQ8D-BAT Microinverters

IQ Load Controller
Helps prioritize essential appliances during a grid outage to optimize energy consumption and prolong battery life

Smart

- Includes IQ Gateway for communication and control
- Includes Enphase Mobile Connect (CELLMODEM-M1-06-SP-05), only with IQ Combiner 5C
- Supports flexible networking: Wi-Fi, Ethernet, or cellular
- Provides production metering (revenue grade) and consumption monitoring

Easy to install

- Mounts to one stud with centered brackets
- Supports bottom, back, and side conduit entry
- Supports up to four 2-pole branch circuits for 240 VAC plug-in breakers (not included)
- 80 A total PV branch circuits

Reliable

- Durable NRTL-certified NEMA type 3R enclosure
- 5-year limited warranty
- Two years labor reimbursement program coverage included for both the IQ Combiner SKUs
- UL1741 listed

Enphase 5 year limited warranty

5-year limited warranty

UL LISTED

IQ Combiner 5/5C

MODEL NUMBER	
IQ Combiner 5 (X-IQ-AM1-240-5)	IQ Combiner 5 with IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSIC12.20 ±0.5%), consumption monitoring (± 2.5%) and IQ Battery monitoring (±2.5%). Includes a silver solar shield to deflect heat
IQ Combiner 5C (X-IQ-AM1-240-5C)	IQ Combiner 5C with IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 ±0.5%), consumption monitoring (±2.5%) and IQ Battery monitoring (±2.5%). Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05)[1]. Includes a silver solar shield to deflect heat
WHAT'S IN THE BOX	
IQ Gateway printed circuit board	IQ Gateway is the platform for total energy management for comprehensive, remote maintenance and management of the Enphase IQ System
Busbar	125A busbar with support for 1 x IQ Gateway breaker and 4 x 20A breaker for installing IQ Series Microinverters and IQ Battery 5P
IQ Gateway breaker	Circuit breaker, 2-pole, 10 A/15 A
Production CT	Prewired revenue-grade solid core CT, accurate up to 0.5%
Consumption CT	Two consumption metering clamp CTs, shipped with the box, accurate up to 2.5%
IQ Battery CT	One battery metering clamp CT, shipped with the box, accurate up to 2.5%
CTRL board	Control board for wired communication with IQ System Controller 3/3G and the IQ Battery 5P
Enphase Mobile Connect (only with IQ Combiner 5C)	4G-based LTE-M1 cellular modem (CELLMODEM-M1-06-SP-05) with a 5-year T-Mobile data plan
Accessories kit	Spare control headers for CTRL board
ACCESSORIES AND REPLACEMENT PARTS (NOT INCLUDED, ORDER SEPARATELY)	
CELLMODEM-M1-06-SP-05	4G-based LTE-M1 cellular modem with a 5-year T-Mobile data plan
CELLMODEM-M1-06-AT-05	4G-based LTE-M1 cellular modem with a 5-year AT&T data plan
Circuit breakers (off-the-shelf)	Supports Eaton BR210, BR215, BR220, BR230, BR240, BR250, and BR260 circuit breakers Supports Eaton BR220B, BR230B, and BR240B circuit breakers compatible with hold-down kit
Circuit breakers (provided by Enphase)	BRK-10A-2-240V, BRK-15A-2-240V, BRK-20A-2P-240V, BRK-15A-2P-240V-B, and BRK-20A-2P-240V-B (More details in "Accessories" section)
XA-SOLARSHIELD-ES	Replacement solar shield for IQ Combiner 5/5C
XA-ENV2-PCBA-5	IQ Gateway replacement printed circuit board (PCB) for Combiner 5/5C
X-IQ-NA-HD-125A	Hold-down kit compatible with Eaton BR-B series circuit breakers (with screws)
ELECTRICAL SPECIFICATIONS	
Rating	80 A
System voltage	120/240 VAC, 60 Hz
Busbar rating	125 A
Fault curent rating	10 kAIC
Maximum continuous current rating (input from PV/storage)	64 A
Branch circuits (solar and/or storage)	Up to four 2-pole Eaton BR series distributed generation (DG) breakers only (not included)
Maximum total branch circuit breaker rating (input)	80 A of distributed generation/95 A with IQ Gateway breaker included
IQ Gateway breaker	10 A or 15 A rating GE/Siemens/Eaton included
Production metering CT	200 A solid core pre-installed and wired to IQ Gateway
Consumption monitoring CT (CT-200-CLAMP)	A pair of 200 A clamp-style current transformers is included with the box
IQ Battery metering CT	200 A clamp-style current transformer for IQ Battery metering, included with the box

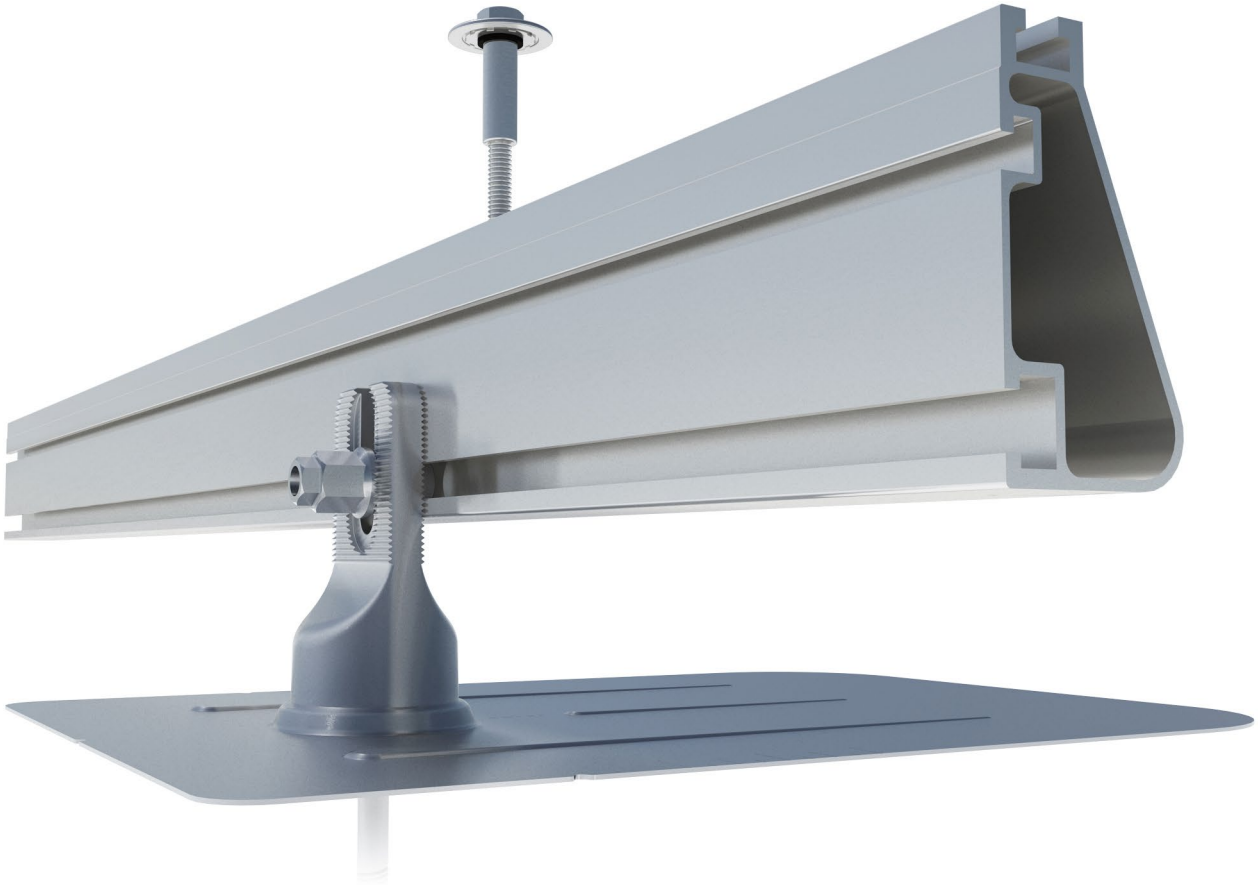
[1] A plug-and-play industrial-grade cell modem for systems up to 60 microinverters. (Available in the US, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.)

MECHANICAL DATA	
Dimensions (WxHxD)	37.5 cm x 49.5 cm 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°F 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
Communication (In-premise connectivity)	Built-in CTRL board for wired communication with IQ Battery 5P and IQ System Controller 3/3G. Integrated Power Line Communication for IQ Series Microinverters
Altitude	Up to 2,600 meters (8,530 feet)
COMMUNICATION INTERFACES	
Integrated Wi-Fi	802.11b/g/n (dual band 2.4 GHz/5 GHz), for connecting the Enphase cloud via the internet
Wi-Fi range (recommended)	10 m
Ethernet	Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included), for connecting to the Enphase Cloud via the internet
Mobile Connect	CELLMODEM-M1-06-SP-05 or CELLMODEM-M1-06-AT-05 (included with IQ Combiner 5C)
Digital I/O	Digital input/output for grid operator control
USB 2.0	For Mobile Connect
Access point (AP) mode	For connection between the IQ Gateway and a mobile device running the Enphase Installer App
Metering ports	Up to two Consumption CTs, one IQ Battery CT, and one Production CT
Power line communication	90–110 kHz
Web API	Refer to https://developer-v4.enphase.com
Local API	Refer to guide for local API
COMPLIANCE	
IQ Combiner	UL 1741, CAN/CSA C22.2 No. 107.1, Title 47 CFR, Part 15, Class B, ICES 003
IQ Gateway	UL 60601-1/CANCSA 22.2 No. 61010-1, IEEE 1547: 2018 (UL 1741-SB, 3rd Ed.) IEEE 2030.5/CSIP Compliant Production metering: ANSI C12.20 accuracy class 0.5 (PV production)
COMPATIBILITY	
IQ System Controller 3/3G	SC200D111C240US01, SC200G111C240US01
IQ Battery 5P	IQBATTERY-5P-1P-NA
Microinverter	IQ6, IQ7, and IQ8 Series Microinverters

Datasheet

IRONRIDGE

Flush Mount System



Built for solar's toughest roofs.

IronRidge builds the strongest mounting system for pitched roofs in solar. Our components have been tested to the limit and proven in extreme environments, including Florida's high-velocity hurricane zones.

Our rigorous approach has led to unique structural features, such as curved rails and reinforced flashings, and is also why our products are fully certified, code compliant and backed by a 25-year warranty.

Strength Tested

All components evaluated for superior structural performance.

PE Certified

Pre-stamped engineering letters available in most states.

Class A Fire Rating

Certified to maintain the fire resistance rating of the existing roof.

Design Assistant

Online software makes it simple to create, share, and price projects.

UL 2703 Listed System

Entire system and components meet newest effective UL 2703 standard.

25-Year Warranty

Products guaranteed to be free of impairing defects.

XR Rails

XR10 Rail

A low-profile mounting rail for regions with light snow.

- 6’ spanning capability
- Moderate load capability
- Clear and black finish

XR100 Rail

The ultimate residential solar mounting rail.

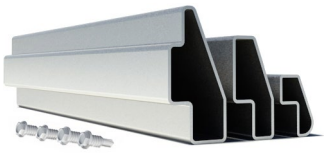
- 8’ spanning capability
- Heavy load capability
- Clear and black finish

XR1000 Rail

A heavyweight mounting rail for commercial projects.

- 12’ spanning capability
- Extreme load capability
- Clear anodized finish

Bonded Splices



All rails use internal splices for seamless connections.

- Self-drilling screws
- Varying versions for rails
- Forms secure bonding

Clamps & Grounding

UFOs

Universal Fastening Objects bond modules to rails.

- Fully assembled & lubed
- Single, universal size
- Clear and black finish

Stopper Sleeves

Snap onto the UFO to turn into a bonded end clamp.

- Bonds modules to rails
- Sized to match modules
- Clear and black finish

CAMO

Bond modules to rails while staying completely hidden.

- Universal end-cam clamp
- Tool-less installation
- Fully assembled

Bonding Hardware

Bond and attach XR Rails to roof attachments.

- T & Square Bolt options
- Nut uses 7/16” socket
- Assembled and lubricated

Attachments

FlashFoot2

Flash and mount XR Rails with superior waterproofing.

- Twist-on Cap eases install
- Wind-driven rain tested
- Mill and black finish

Conduit Mount

Flash and mount conduit, strut, or junction boxes.

- Twist-on Cap eases install
- Wind-driven rain tested
- Secures ¾” or 1” conduit

Knockout Tile

Replace tiles and ensure superior waterproofing.

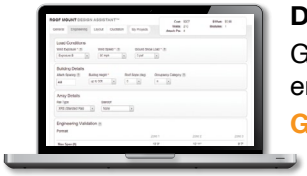
- Flat, S, & W tile profiles
- Form-fit compression seal
- Single-lag universal base

All Tile Hook

Mount on tile roofs with a simple, adjustable hook.

- Works on flat, S, & W tiles
- Single-socket installation
- Optional deck flashing

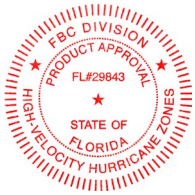
Resources



Design Assistant

Go from rough layout to fully engineered system. For free.

Go to IronRidge.com/design



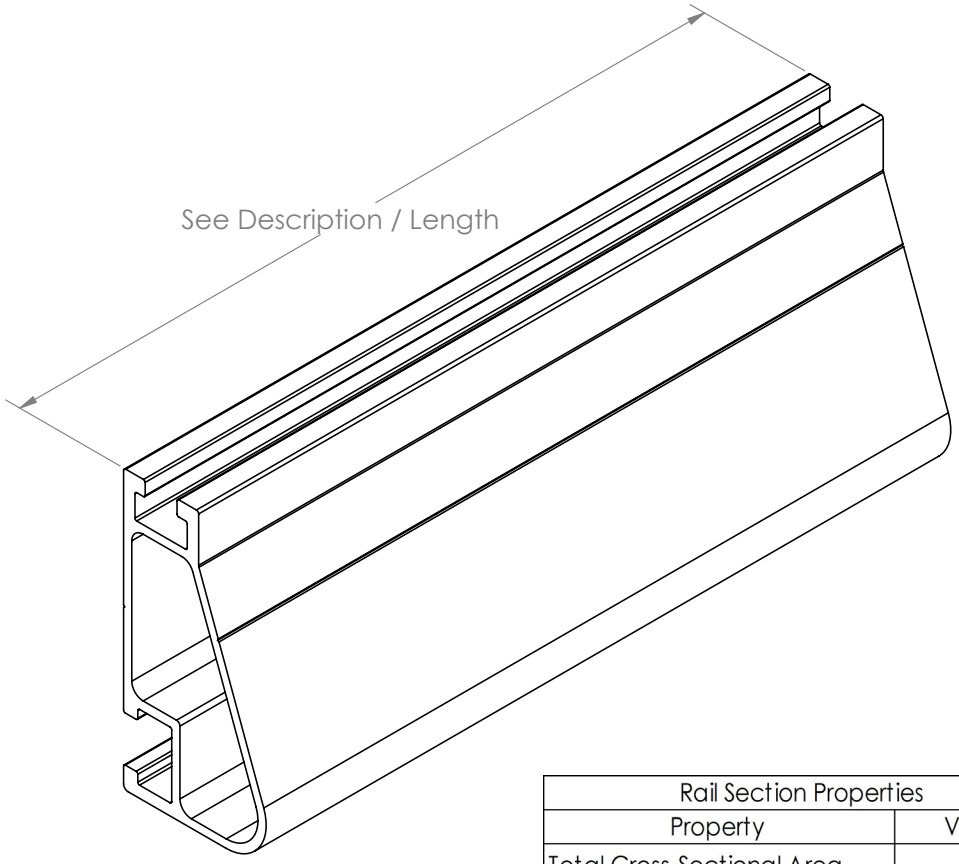
Endorsed by FL Building Commission

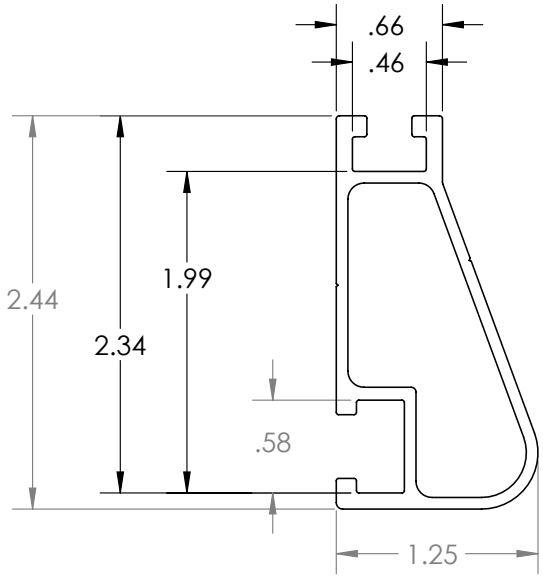
Flush Mount is the first mounting system to receive Florida Product approval for 2017 Florida Building Code compliance.

Learn More at bit.ly/floridacert

IRONRIDGE

XR100 Rail





Rail Section Properties	
Property	Value
Total Cross-Sectional Area	0.582 in^2
Section Modulus (X-axis)	0.297 in^3
Moment of Inertia (X-axis)	0.390 in^4
Moment of Inertia (Y-axis)	0.085 in^4
Torsional Constant	0.214 in^3
Polar Moment of Inertia	0.126 in^4

APPROVED MATERIALS:
6005-T6, 6005A-T61, 6105-T5, 6N01-T6
(34,000 PSI YIELD STRENGTH MINIMUM)

Clear Part Number	Black Part Number	Description / Length	Material	Weight
XR-100-132A	XR-100-132B	XR100, Rail 132" (11 Feet)	6000-Series Aluminum	7.50 lbs.
XR-100-168A	XR-100-168B	XR100, Rail 168" (14 Feet)		9.55 lbs.
XR-100-204A	XR-100-204B	XR100, Rail 204" (17 Feet)		11.60 lbs.

Tech Brief

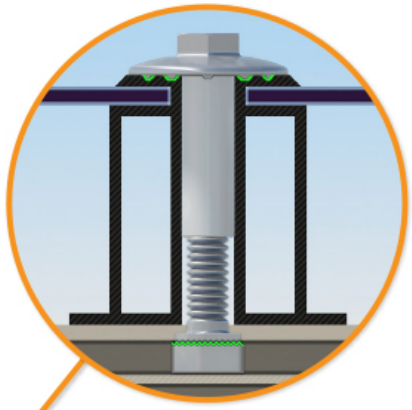
IRONRIDGE

UFO Family of Components

Simplified Grounding for Every Application

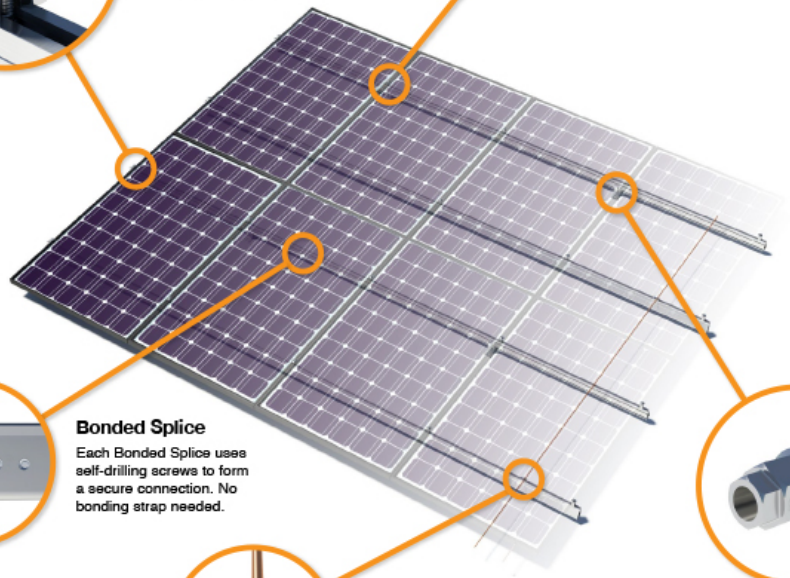
The UFO family of components eliminates the need for separate grounding hardware by bonding solar modules directly to IronRidge XR Rails. All system types that feature the UFO family—Flush Mount, Tilt Mount and Ground Mount—are fully listed to the UL 2703 standard.

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.

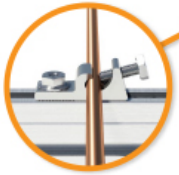


Universal Fastening Object (UFO)
The UFO securely bonds solar modules to XR Rails. It comes assembled and lubricated, and can fit a wide range of module heights.

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



Bonded Splice
Each Bonded Splice uses self-drilling screws to form a secure connection. No bonding strap needed.



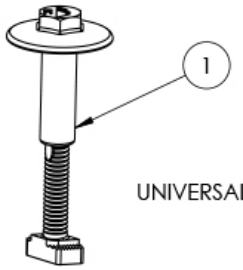
Grounding Lug
A single Grounding Lug connects an entire row of PV modules to the grounding conductor.

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.

Cut Sheet

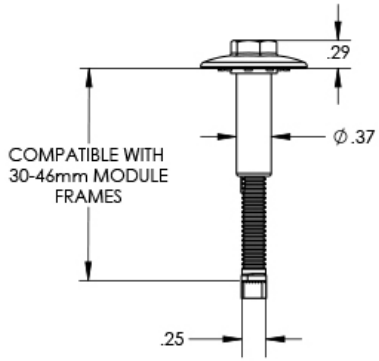
IRONRIDGE

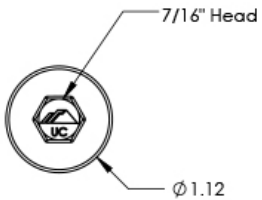
Universal Fastening Object



UNIVERSAL FASTENING OBJECT

ITEM NO.	DESCRIPTION	QTY. IN KIT
UFO-CL-001	KIT, 4PCS, UNIVERSAL MODULE CLAMP, CLEAR	4
UFO-CL-001-B	KIT, 4PCS, UNIVERSAL MODULE CLAMP, BLACK	4





Property	Value
Material	300 Series Stainless Steel
Finish	Clear and Black

v1.20

IRONRIDGE

Class A Fire Rating

Background

All roofing products are tested and classified for their ability to resist fire.

Recently, these fire resistance standards were expanded to include solar equipment as part of the roof system. Specifically, this requires the modules, mounting hardware and roof covering to be tested together as a system to ensure they achieve the same fire rating as the original roof covering.

These new requirements are being adopted throughout the country in 2016.

IronRidge Certification

IronRidge was the first company to receive a Class A Fire Rating—the highest possible rating—from Intertek Group plc., a Nationally Recognized Testing Laboratory.

IronRidge Flush Mount and Tilt Mount Systems were tested on sloped and flat roofs in accordance with the new UL 1703 & UL 2703 test standards. The testing evaluated the system's ability to resist flame spread, burning material and structural damage to the roof.

Refer to the table below to determine the requirements for achieving a Class A Fire Rating on your next project.

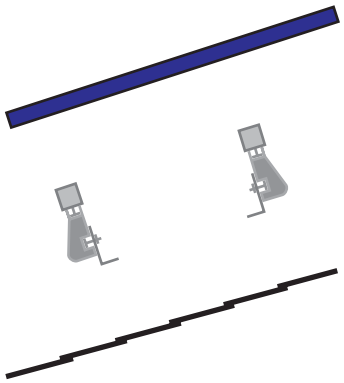
Fire Testing Process

Test Setup

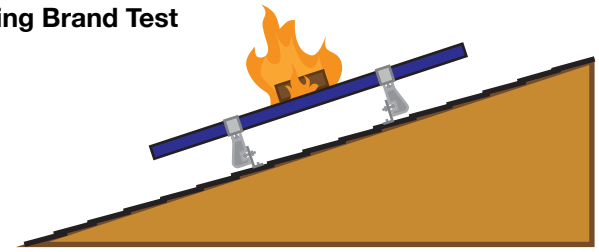
Solar Modules
Solar modules are given a Type classification based on their materials and construction.

Mounting System
Mounting is tested as part of a system that includes type-tested modules and fire-rated roof covering.

Roof Covering
Roof covering products are given a Fire Class Rating of A, B or C based on their tested fire resistance.

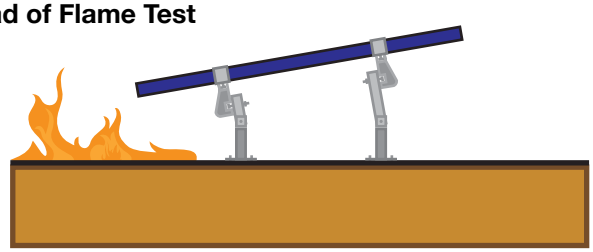


Burning Brand Test



A burning wooden block is placed on module as a fan blows at 12 mph. Flame cannot be seen on underside of roof within 90 minutes.

Spread of Flame Test



Flame at southern edge of roof is aimed up the roof as a fan blows at 12 mph. The flame cannot spread 6 feet or more in 10 minutes.

System	Roof Slope	Module	Fire Rating*
Flush Mount	Any Slope	Type 1, 2, & 3	Class A
Tilt Mount	≤ 6 Degrees	Type 1, 2, & 3	Class A

*Class A rated PV systems can be installed on Class A, B, and C roofs.

Frequently Asked Questions

What is a "module type"?

The new UL1703 standard introduces the concept of a PV module type, based on 4 construction parameters and 2 fire performance parameters. The purpose of this classification is to certify mounting systems without needing to test it with every module.

What roofing materials are covered?

All fire rated roofing materials are covered within this certification including composition shingle, clay and cement tile, metal, and membrane roofs.

What if I have a Class C roof, but the jurisdiction now requires Class A or B?

Generally, older roofs will typically be "grandfathered in", and will not require re-roofing. However, if 50% or more of the roofing material is replaced for the solar installation the code requirement will be enforced.

Where is the new fire rating requirement code listed?

2012 IBC: 1509.7.2 Fire classification. Rooftop mounted photovoltaic systems shall have the same fire classification as the roof assembly required by Section 1505.

Where is a Class A Fire Rating required?

The general requirement for roofing systems in the IBC refers to a Class C fire rating. Class A or B is required for areas such as Wildland Urban Interface areas (WUI) and for very high fire severity areas. Many of these areas are found throughout the western United States. California has the most Class A and B roof fire rating requirements, due to wild fire concerns.

Are standard mid clamps covered?

Mid clamps and end clamps are considered part of the PV "system", and are covered in the certification.

What attachments and flashings are deemed compatible with Class A?

Attachments and their respective flashings are not constituents of the rating at this time. All code-compliant flashing methods are acceptable from a fire rating standpoint.

What mounting height is acceptable?

UL fire testing was performed with a gap of 5", which is considered worst case in the standard. Therefore, the rating is applicable to any module to roof gap.

Am I required to install skirting to meet the fire code?

No, IronRidge achieved a Class A fire rating without any additional racking components.

What determines Fire Classification?

Fire Classification refers to a fire-resistance rating system for roof covering materials based on their ability to withstand fire exposure.

Class A - effective against severe fire exposure
Class B - effective against moderate fire exposure
Class C - effective against light fire exposure

What if the roof covering is not Class A rated?

The IronRidge Class A rating will not diminish the fire rating of the roof, whether Class A, B, or C.

What tilts is the tilt mount system fire rated for?

The tilt mount system is rated for 1 degrees and up and any roof to module gap, or mounting height.

More Resources

Installation Manuals
Visit our website for manuals that include UL 2703 Listing and Fire Rating Classification.
Go to IronRidge.com

Engineering Certification Letters
We offer complete engineering resources and pre-stamped certification letters.
Go to IronRidge.com