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PROJECT DETAILS	
PROPERTY OWNER	SAMPLE OWNER
PROPERTY ADDRESS	123 SAMPLE STREET SAMPLE CITY, USA
PARCEL NO.	SAMPLE-PARCEL
AHJ	CITY OF SAMPLE CITY
ZONING	RESIDENTIAL
CONST. TYPE	ROOF-MOUNTED PHOTOVOLTAIC ARRAY
OBSERVED CODES	2023 NATIONAL ELECTRICAL CODE (NEC) 2021 WASHINGTON ADMINISTRATIVE CODE (WAC) 2021 WASHINGTON STATE ENERGY CODE - RESIDENTIAL 2021 INTERNATIONAL CODES REVISED CODE OF WASHINGTON (RCW) WASHINGTON BUILDING CODE & STATE AMENDMENTS APPLICABLE CITY CODE WHEN PRESENT OSHA 29 CFR 1910.269 UNDERWRITERS LABORATORIES (UL) STANDARDS
STRUCT. METHOD	ASCE7-16

CONTRACTOR INFORMATION	
CONTRACTOR	SAMPLE SOLAR CONTRACTOR, LLC.
LICENSE NO.	SAMPLE-000000
ADDRESS	100 BUSINESS PARKWAY SAMPLE CITY, USA
PHONE	(000) 000-0000
CONTRACTOR SIGNATURE	

PLAN DESIGNER INFORMATION	
COMPANY	GEMINI SOLAR DESIGN, LLC.
NAME	GSD DESIGN TEAM
ADDRESS	GEMINISOLARDESIGN.COM NATIONWIDE DESIGN SERVICES
PHONE	(000) 000-0000
PLAN DESIGNER SIGNATURE	Sanjay Mallapragada

SYSTEM DETAILS	
DC RATING OF SYSTEM	8,100W
AC OUTPUT CURRENT	28.44A @ 240VAC
PV MODULE	(18) AUXIN SOLAR AXN10M450B
MICROINVERTER	(18) ENPHASE IQ8HC-72-M-US
BRANCH CONFIGURATION	2 BRANCHES OF 9 MICROINVERTERS
BATTERY	(1) FRANKLINWH aPOWER 2

SITE SPECIFICATIONS	
UTILITY SERVICE	120 / 240VAC, 1-Ø, 3-WIRE
MAIN SERVICE PANEL	200A RATED BUSBAR 200A / 2P MAIN BREAKER
ASHRAE EXTREME ANNUAL MEAN MINIMUM DENSITY DRY BULB TEMP.	-7°C
ASHRAE 2% ANNUAL DRY DENSITY BULB TEMP.	29°C
DESIGN WIND SPEED	110 MPH
DESIGN SNOW LOAD	25 PSF
WIND EXPOSURE CATEGORY	B
RISK CATEGORY	II

PROJECT LOCATION MAP
WITHHELD IN PUBLIC SAMPLE

VICINITY MAP
WITHHELD IN PUBLIC SAMPLE

CONSTRUCTION NOTES

1	CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS PRIOR TO INITIATING CONSTRUCTION.
2	CONTRACTOR SHALL REVIEW ALL MANUFACTURER INSTALLATION DOCUMENTS PRIOR TO INITIATING CONSTRUCTION.
3	ALL EQUIPMENT SHALL BE LISTED BY THE U.L. (OR EQUAL) AND LISTED FOR ITS SPECIFIC APPLICATION.
4	ALL EQUIPMENT SHALL BE RATED FOR THE ENVIRONMENT IN WHICH IT IS INSTALLED.
5	ALL EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION INSTRUCTIONS.
6	ACCESS TO ELECTRICAL COMPONENTS OVER 150 VOLTS TO GROUND SHALL BE RESTRICTED TO QUALIFIED PERSONNEL.
7	ALL CONDUCTORS SHALL BE COPPER, RATED FOR 600 VOLTS AND 90°C WET ENVIRONMENT, UNLESS OTHERWISE NOTED.
8	WHERE SIZES OF JUNCTION BOXES, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, CONTRACTOR SHALL SIZE THEM ACCORDING TO APPLICABLE CODES.
9	PV MODULES FRAMES SHALL BE BONDED TO RACKING RAIL OR BARE COPPER G.E.C. PER THE MODULE MANUFACTURER'S LISTED INSTRUCTION SHEET.
10	PV MODULES RACKING RAIL SHALL BE BONDED TO BARE COPPER G.E.C VIA WEEB LUG, ILSCO GBL-4DBT LAY-IN LUG, OR EQUIVALENT LISTED LUG.
11	GROUNDING ELECTRODE CONDUCTOR (G.E.C) SHALL BE CONTINUOUS AND/OR IRREVERSIBLY SPLICED
12	ALL JUNCTION BOXES, COMBINER BOXES, AND DISCONNECTS SHALL BE INSTALLED IN AN ACCESSIBLE LOCATION.
13	WORKING SPACE AROUND ELECTRICAL EQUIPMENT SHALL COMPLY WITH NEC SECTION 110.26.

SCOPE OF WORK DESCRIPTION

THE **PROPOSED SYSTEM** IS A FLUSH ROOF MOUNTED PHOTOVOLTAIC ARRAY UTILIZING ENPHASE MICROINVERTERS. THE PHOTOVOLTAIC (PV) SYSTEM IS TO BE INSTALLED ON THE RESIDENTIAL ZONED PROPERTY IN THE CITY OF SAMPLE CITY KING COUNTY, WASHINGTON.

THE SCOPE OF WORK AT THIS TIME WILL ALSO INCLUDE ADDING AN AC-COUPLED STORAGE BATTERY IN A WHOLE HOME BATTERY-BACKUP APPLICATION. THE COMBINED AC OUTPUT OF THE PROPOSED MICROINVERTER SYSTEM WILL BE AC-COUPLED TO THE NEW FRANKLINWH aGATE X.

THE ENERGY PRODUCED BY THE PV SYSTEM SHALL BE INTERCONNECTED WITH THE UTILITY GRID THROUGH THE EXISTING ON-SITE ELECTRICAL EQUIPMENT.

GEMINI SOLAR DESIGN

SAMPLE PROJECT
CONTACT: ON FILE
PROJECT INFO WITHHELD
CONFIDENTIAL: THE INFORMATION CONTAINED IN THIS DRAWING SET IS CONFIDENTIAL AND SHALL NOT BE DISCLOSED IN FULL OR IN PART TO ANYONE EXCEPT THOSE INVOLVED IN THE DESIGN AND INSTALLATION OF THE PV SYSTEM REPRESENTED IN THIS PLAN.

NEW GRID-TIED SYSTEM 8.10kW

SAMPLE RESIDENCE
PROJECT ADDRESS WITHHELD
UNITED STATES

PROJECT INFO

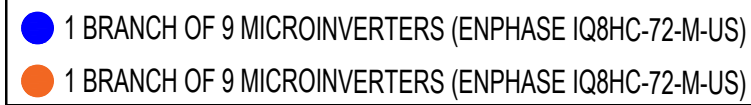
PROJECT NO: GSD-SAMPLE
DRAWN BY: GSD
DATE: SAMPLE

PV-1



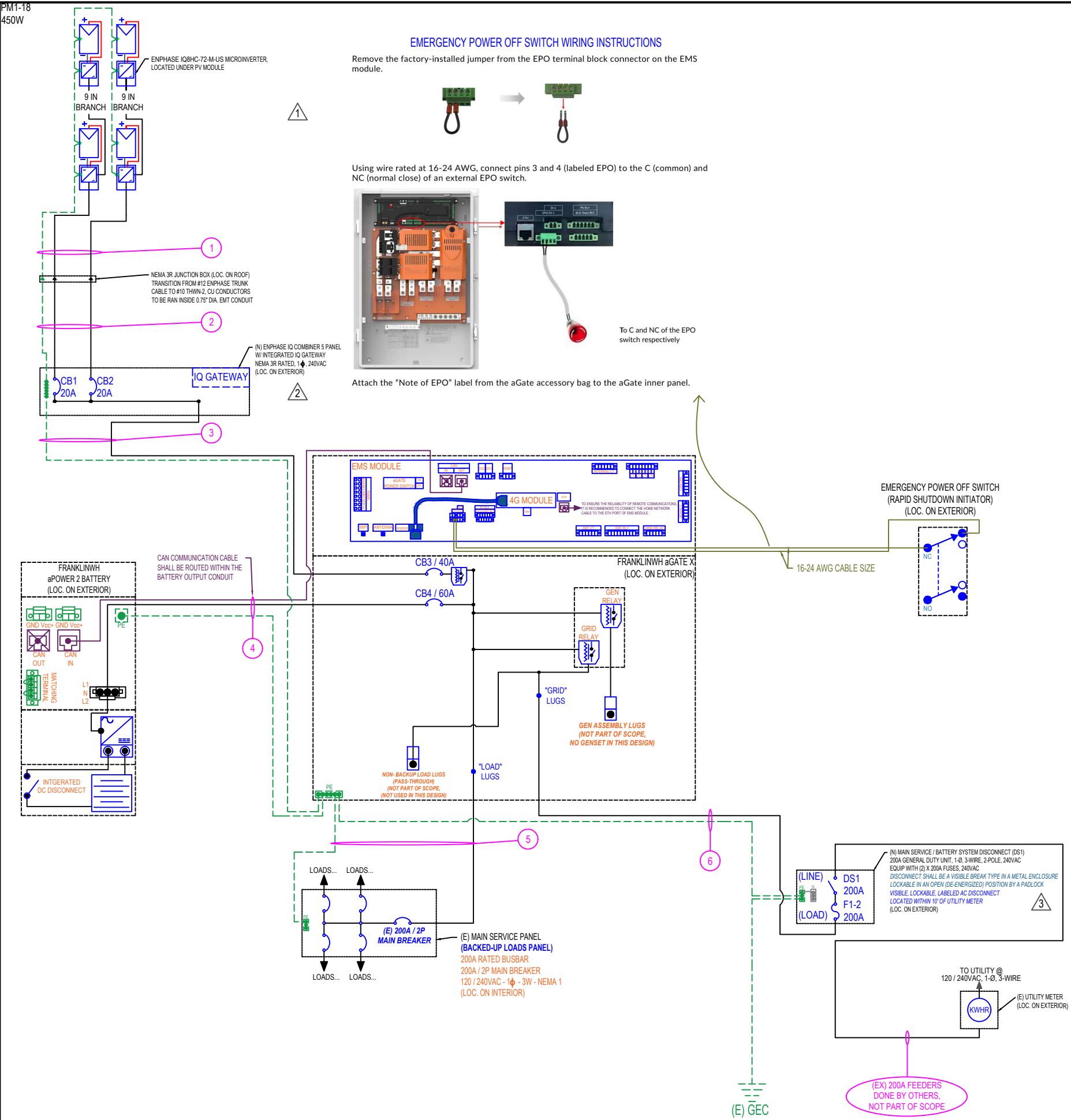
GEMINI SOLAR DESIGN
SAMPLE PROJECT
CONTACT: ON FILE
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PV-2



A SITE PLAN
PV-2 SCALE: 1" = 13'

PM1-18
450W



PLEASE FIND ALL RELEVANT TABLES,
SYSTEM DETAILS, AND DISCONNECT /
OCPD SCHEDULES ON SHEET PV-3B.

PLEASE FIND THE CORRESPONDING WIRE
& CONDUCTOR SCHEDULE ON SHEET PV-3C.

SEPARATE SHEETS WERE CREATED
DUE TO SPACE LIMITATIONS.

GEMINI SOLAR DESIGN

SAMPLE PROJECT

CONTACT: ON FILE

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NEW GRID-TIED SYSTEM 8.10kW

SAMPLE RESIDENCE
PROJECT ADDRESS WITHHELD
UNITED STATES

SINGLE-LINE DIAGRAM

PROJECT NO: GSD-SAMPLE

DRAWN BY: GSD

DATE: SAMPLE

PV-3A

A
PV-3A

SINGLE-LINE DIAGRAM
SCALE: N/A

PV MODULE								
REF.	TYP.	MODULE	STC POWER	ISC	IMP	VOC	VMP	SERIES FUSE RATING
PM1-18	18	AUXIN SOLAR AXN10M450B	450W	14.14A	13.44A	39.75V	33.51V	30A

MICROINVERTER										
REF.	TYP.	MICROINVERTER	GROUND	AC VOLTAGE	MAX OCPD SIZE	MAX OUTPUT POWER (CONTINUOUS)	MAX AC CURRENT	MAX. CONTINUOUS INPUT DC CURRENT	MAX INPUT VOLTAGE	CEC WEIGHTED EFFICIENCY
11-18	18	ENPHASE IQ8HC-72-M-US	INTEGRATED	240VAC	20A	380W	1.58A	14A	60VDC	97%

SYSTEM SUMMARY		
	BRANCH #1	BRANCH #2
INVERTERS PER BRANCH	9	9
MAX AC CURRENT	14.22A	14.22A
MAX AC OUTPUT POWER	3,420W	3,420W
ARRAY STC POWER	8,100W	
TOTAL MAX AC CURRENT	28.44A	
TOTAL MAX AC POWER	6,840W	

SCHEMATIC NOTES	
	THE FIRST AC CONNECTOR IN EACH MICROINVERTER BRANCH CIRCUIT IS SUITABLE AS A DISCONNECTING MEANS.
	OUTPUT OF (2) TWO MICROINVERTER BRANCH CIRCUITS SHALL BE BACKFED INTO A ENPHASE IQ COMBINER 5 PANEL FOR COMBINATION PURPOSES. PLEASE SEE THE OCPD SCHEDULE FOR THE BREAKER SIZES FOR EACH BRANCH CIRCUIT, RESPECTIVELY.
	THE AC DISCONNECT SHALL BE A VISIBLE, LOCKABLE, KNIFE SWITCH DISCONNECT AS PER THE UTILITY.

OTHER DESIGN NOTES	
1	LARGEST BACKED UP BREAKER IS < OR = TO 60A / 240VAC
2	ALL BATTERY BREAKERS TO BE SECURED UTILIZING APPROVED HOLD DOWNS

AC DISCONNECT SCHEDULE			
REF.	POLES	CURRENT RATING	MAX. VOLTAGE
MAIN SERVICE / BATTERY SYSTEM DISCONNECT (DS1) 2-POLE KNIFE TYPE (FUSIBLE), GENERAL DUTY UNIT	2	200A	240VAC

OCPD SCHEDULE				
REF.	TYP.	POLES	CURRENT RATING	MAX. VOLTAGE
CB1 (ENPHASE BRANCH CIRCUIT)	1	2	20A	240VAC
CB2 (ENPHASE BRANCH CIRCUIT)	1	2	20A	240VAC
CB3 (CIRCUIT BREAKER, AC-COUPLED SOLAR)	1	2	40A	240VAC
CB4 (CIRCUIT BREAKER, AC-COUPLED BATTERY)	1	2	60A	240VAC
F1-2 (FUSES FOR BATTERY SYSTEM DISCONNECT, DS1)	2	N/A	200A	240VAC

GEMINI SOLAR DESIGN

SAMPLE PROJECT

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NEW GRID-TIED SYSTEM 8.10kW

SAMPLE RESIDENCE
PROJECT ADDRESS WITHHELD
UNITED STATES

SINGLE-LINE DIAGRAM

PROJECT NO: GSD-SAMPLE

DRAWN BY: GSD

DATE: SAMPLE

PV-3B

OVERALL SYSTEM
RATED AC CURRENT

PHOTOVOLTAIC SYSTEM
AC DISCONNECT

OPERATING CURRENT 28.44 AMPS
OPERATING VOLTAGE 240 VOLTS

NEC 690.14(C)(2) & NEC 690.54

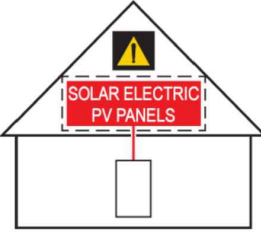
NET METER

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03-364

SOLAR PV SYSTEM EQUIPPED
WITH RAPID SHUTDOWN

TURN RAPID SHUTDOWN SWITCH
TO THE "OFF" POSITION
TO SHUT DOWN CONDUCTORS
OUTSIDE THE ARRAY
CONDUCTORS WITHIN
THE ARRAY REMAIN
ENERGIZED IN SUNLIGHT



pvlabeis.com

05-113

SITE OVERVIEW

⚡

CAUTION

⚡

POWER TO THIS SERVICE IS ALSO SUPPLIED FROM
THE FOLLOWING SOURCES WITH DISCONNECTS
LOCATED AS SHOWN

FRANKLINWH aPOWER 2 BATTERY
(LOC. ON EXTERIOR)

ENPHASE IQ COMBINER 5
(LOC. ON EXTERIOR)

aGATE X SWITCH
(LOC. ON EXTERIOR)

MAIN SERVICE / BATTERY
SYSTEM DISCONNECT (DS1)
(LOC. ON EXTERIOR)

EMERGENCY STOP SWITCH
(LOC. ON EXTERIOR)

UTILITY METER
(LOC. ON EXTERIOR)

200A MAIN SERVICE PANEL
(BACKED UP LOADS PANEL)
(LOC. ON INTERIOR)

PV ARRAY

N

NEC 690.56(B)

RAPID SHUTDOWN
SWITCH FOR
SOLAR PV SYSTEM

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07-316

⚡

WARNING

⚡

TRIPLE POWER SUPPLY
SOURCES: UTILITY GRID AND
PV SOLAR ELECTRIC SYSTEM AND
ENERGY STORAGE SYSTEM (ESS)

CURRENT OF BATTERY SYSTEM 48A
VOLTAGE OF BATTERY SYSTEM 240VAC

⚡

WARNING

⚡

BATTERY SYSTEM RAPID
SHUTDOWN SWITCH. TURN
DIAL TO OFF POSITION TO
SHUTDOWN ESS

⚡

WARNING

⚡

SOLAR / BATTERY SYSTEM DISCONNECT
PULL HANDLE DOWN TO MANUALLY
DISCONNECT FROM GRID POWER

GEMINI SOLAR DESIGN

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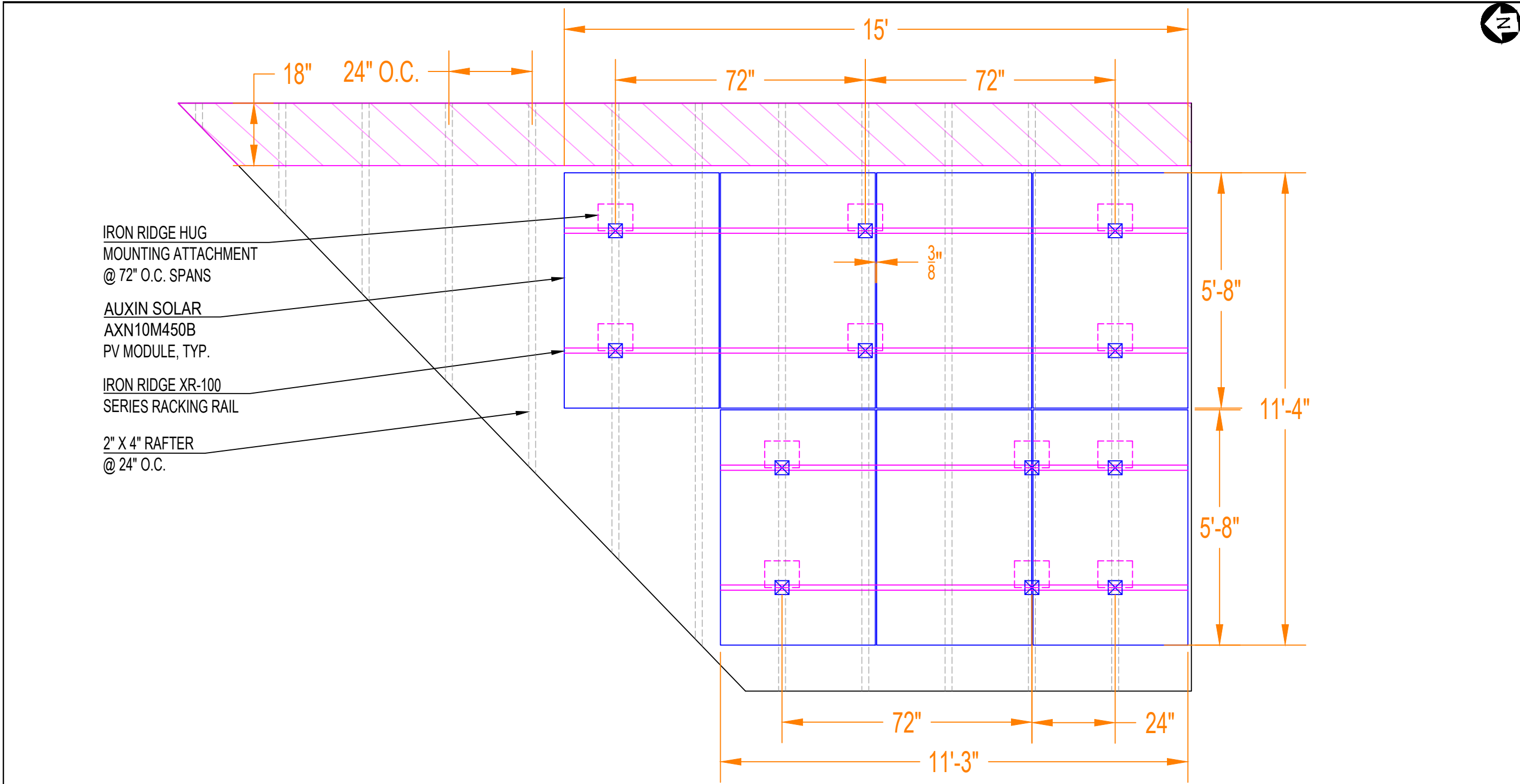
NEW GRID-TIED SYSTEM 8.10kW

SAMPLE RESIDENCE
PROJECT ADDRESS WITHHELD
UNITED STATES

PLACARDS

PROJECT NO: GSD-SAMPLE
DRAWN BY: GSD
DATE: SAMPLE

PV-4



GEMINI SOLAR DESIGN

SAMPLE PROJECT

CONTACT: ON FILE

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NEW GRID-TIED SYSTEM 8.10kW

SAMPLE RESIDENCE
PROJECT ADDRESS WITHHELD
UNITED STATES

ATTACHMENT PLAN

PROJECT NO: GSD-SAMPLE

DRAWN BY: GSD

DATE: SAMPLE

PV-5A

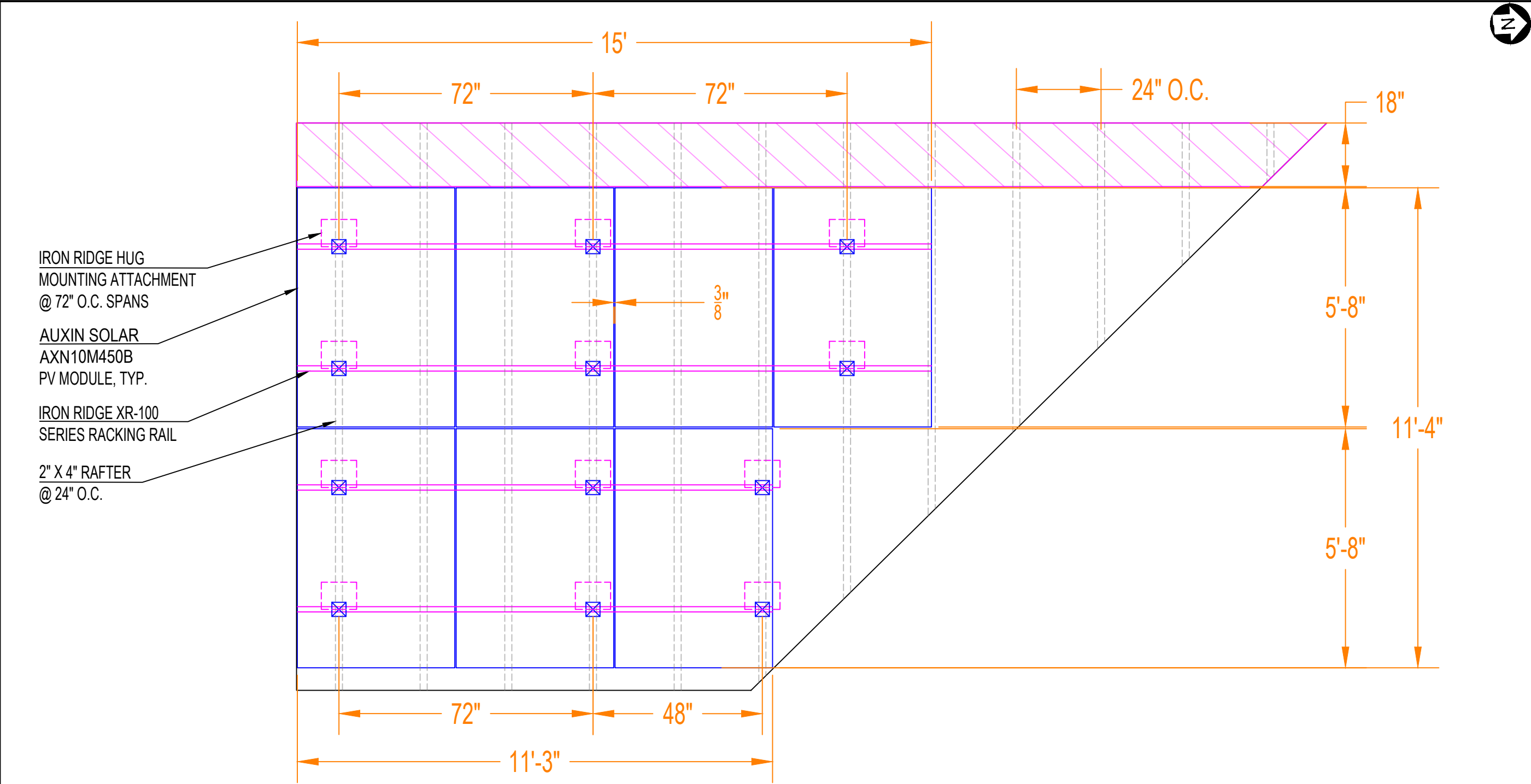
ROOF INFORMATION	
ROOF TYPE	COMPOSITE SHINGLE
PITCH	4:12
RAFTER SPACING	24" O.C.
RAFTER DIMENSIONS	2" X 4"

LAYOUT SPECIFICATIONS	
NUMBER OF MODULES	7
AREA	149.2 SQ. FT
AZIMUTH	273°
TOTAL WEIGHT OF ARRAY	382.8 LBS
DEAD LOAD	2.57 PSF

LOCAL DESIGN CRITERIA	
WIND EXPOSURE CATEGORY	B
RISK CATEGORY	II
DESIGN WIND SPEED	110 MPH
DESIGN SNOW LOAD	25 PSF

PV MODULES AND IRON RACKING SYSTEM HAVE A CLASS A FIRE RATING CLASSIFICATION.

ATTACHMENT PLAN NOTES	
1	ROOF MEMBERS AND PENETRATIONS TO BE DETERMINED IN THE FIELD.
2	THE SOLAR PHOTOVOLTAIC INSTALLATION SHALL NOT OBSTRUCT ANY PLUMBING, MECHANICAL, OR BUILDING ROOF VENTS.
3	PLEASE SEE SHEETS PV-6A AND PV-6B FOR DETAILS REGARDING THE MOUNTING ATTACHMENT TO BE USED, THE FLASHING TO BE USED, AS WELL AS THE RELEVANT CUTSHEETS.
4	PLEASE SEE SHEET PV-12 FOR A STRUCTURAL CERTIFICATION LETTER FOR THE IRON RIDGE FLUSH MOUNT SYSTEM. LETTER IS STAMPED BY A STATE OF WASHINGTON REGISTERED PROFESSIONAL ENGINEER (PE).



GEMINI SOLAR DESIGN

SAMPLE PROJECT

CONTACT: ON FILE

PROJECT INFO WITHHELD

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NEW GRID-TIED SYSTEM 8.10kW

SAMPLE RESIDENCE
PROJECT ADDRESS WITHHELD
UNITED STATES

ATTACHMENT PLAN

PROJECT NO: GSD-SAMPLE

DRAWN BY: GSD

DATE: SAMPLE

PV-5B

ROOF INFORMATION	
ROOF TYPE	COMPOSITE SHINGLE
PITCH	4:12
RAFTER SPACING	24" O.C.
RAFTER DIMENSIONS	2" X 4"

LAYOUT SPECIFICATIONS	
NUMBER OF MODULES	7
AREA	149.2 SQ. FT
AZIMUTH	93°
TOTAL WEIGHT OF ARRAY	382.8 LBS
DEAD LOAD	2.57 PSF

LOCAL DESIGN CRITERIA	
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RISK CATEGORY	II
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GEMINI SOLAR DESIGN

SAMPLE PROJECT

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NEW GRID-TIED SYSTEM 8.10kW

SAMPLE RESIDENCE
PROJECT ADDRESS WITHHELD
UNITED STATES

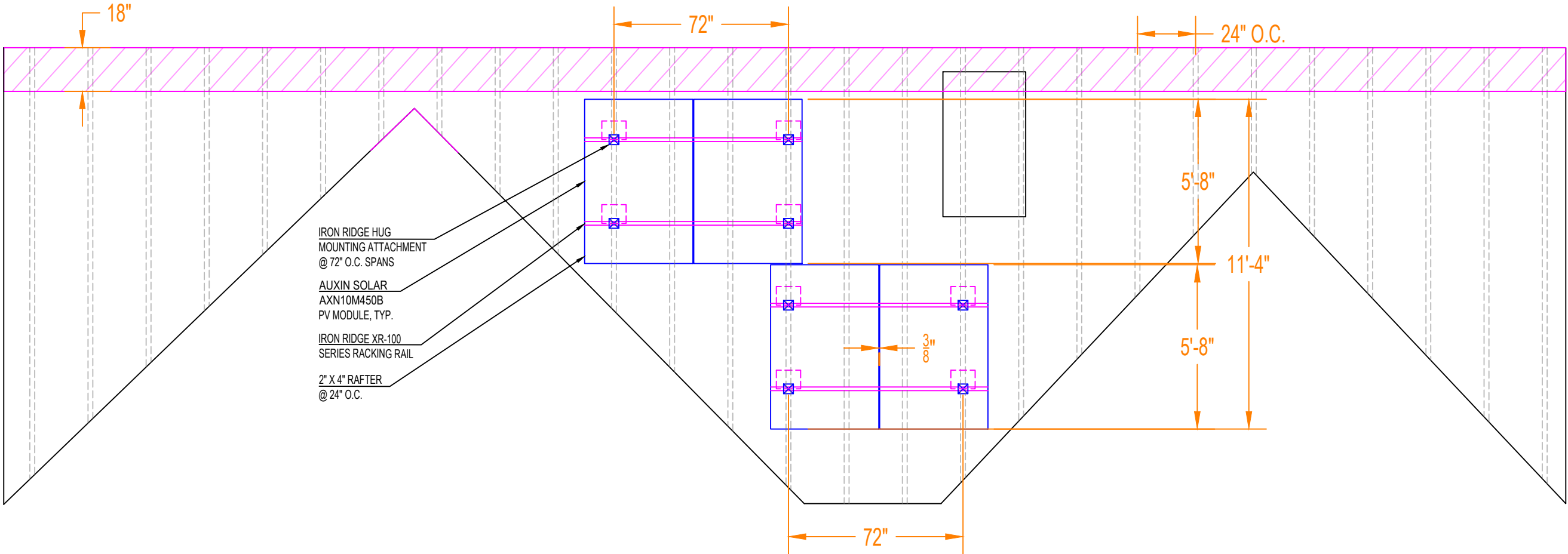
ATTACHMENT PLAN

PROJECT NO: GSD-SAMPLE

DRAWN BY: GSD

DATE: SAMPLE

PV-5C



ROOF INFORMATION

ROOF TYPE	COMPOSITE SHINGLE
PITCH	4:12
RAFTER SPACING	24" O.C.
RAFTER DIMENSIONS	2" X 4"

LAYOUT SPECIFICATIONS

NUMBER OF MODULES	7
AREA	149.2 SQ. FT
AZIMUTH	93°
TOTAL WEIGHT OF ARRAY	382.8 LBS
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1 ATTACHMENT PLAN (ARRAY #3)
PV-5C SCALE: 1" = 4'



Tech Brief



The Respect Your Roof Deserves

When integrating with a home, solar attachments must be dependable for the lifetime of the rooftop. Due to recent innovations, many asphalt shingles have bonded courses. A mount that protects without the need to pry shingles can really speed things up.

Halo UltraGrip™ (HUG™) is here to respect the roof. Its Halo is a cast-aluminum barrier that encases the UltraGrip, our industrial-grade, foam-and-mastic seal. This allows HUG to accelerate the installation process and provide the utmost in waterproofing protection. Give your roof a HUG.™

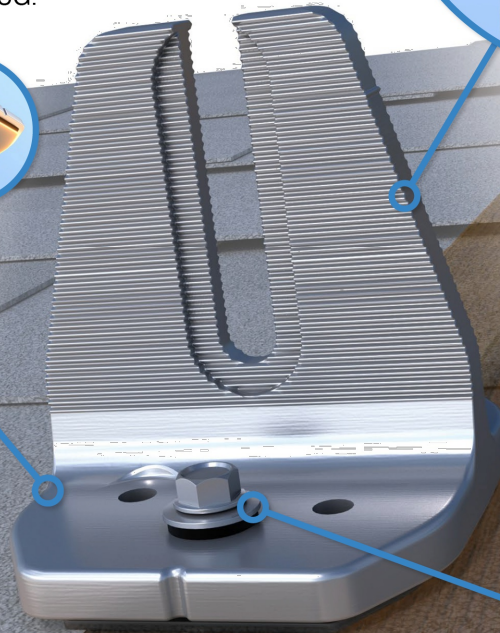


Multi-Tiered Waterproofing
HUG utilizes a multi-tiered stack of components to provide revolutionary waterproofing protection. The Halo cast-aluminum, raised-perimeter foundation surrounds the UltraGrip base—a foam-backed mastic seal combination that prevents water intrusion by adhering and sealing with the shingle surface.

Halo UltraGrip™ is part of the QuickMount® product line.

UltraGrip™ Seal Technology

HUG UltraGrip utilizes a state-of-the-art seal design that uses a unique, foam-and-mastic combination. The foam-backed adhesive provides an entirely new flashing system that conforms and adheres to every nook and cranny of composition shingles, filling gaps and shingle step-downs (up to 1/8" in height).



Rafter Mount



Deck Mount



Rafter & Deck Mounting Options

Mount HUG to the roof rafters, the roof deck, or both with our custom-engineered RD (rafter-or-deck) Structural Screw. The RD Structural Screw anchors HUG to the roof with an EPDM sealing washer, completing the stack of waterproofing barriers. See backside for more installation information.



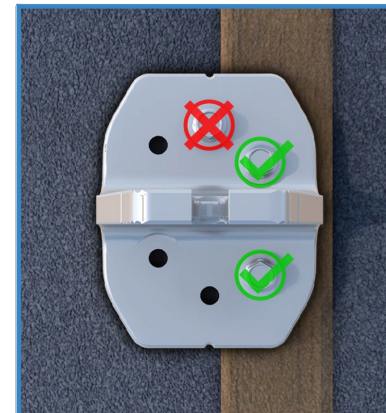
Triple Rated & Certified to Respect the Roof™
UL 2703, 441 (27)
TAS 100(A)-95

Adaptive, Rafter-Friendly Installation



Hit the rafter? Good to go!

When you find a rafter, you can move on. Only 2 RD Structural Screws are needed.



Miss the rafter? Try it again.

Place another screw to the left or right. If rafter is found, install 3rd and final screw.



Still no luck? Install the rest.

If more than 3 screws miss the rafter, secure six screws to deck mount it.

Trusted Strength & Less Hassle



25-Year Warranty
Product guaranteed free of impairing defects.

Structural capacities of HUG™ were reviewed in many load directions, with racking rail running cross-slope or up-slope in relation to roof pitch.

For further details, see the HUG certification letters for attaching to rafters and decking.

IronRidge designed the HUG, in combination with the RD Structural Screw to streamline installs, which means the following:

- No prying shingles
- No roof nail interference
- No pilot holes necessary
- No sealant (in most cases)
- No butyl shims needed

Attachment Loading



The rafter-mounted HUG has been tested and rated to support 1004 (lbs) of uplift and 368 (lbs) of lateral load.

Structural Design



Parts are designed and certified for compliance with the International Building Code & ASCE/SEI-7.

Water Seal Ratings



HUG passed both the UL 441 Section 27 "Rain Test" and TAS 100(A)-95 "Wind Driven Rain Test" by Intertek.

UL 2703 System



Systems conform to UL 2703 mechanical and bonding requirements. See Flush Mount Manual for more info.

GEMINI SOLAR DESIGN

SAMPLE PROJECT

CONTACT: ON FILE

PROJECT INFO WITHHELD

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NEW GRID-TIED SYSTEM 8.10kW

SAMPLE RESIDENCE
PROJECT ADDRESS WITHHELD
UNITED STATES

MOUNTING DETAIL

PROJECT NO: GSD-SAMPLE

DRAWN BY: GSD

DATE: SAMPLE

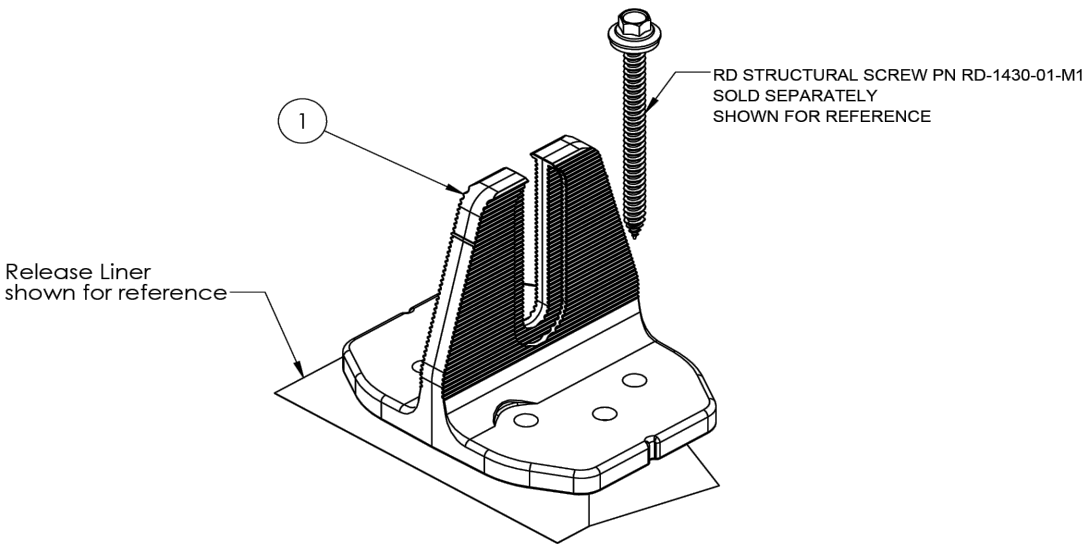
PV-6A

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QuickMount® Halo UltraGrip

Cut Sheet



ITEM NO	DESCRIPTION	QTY IN KIT
1	QM Halo UltraGrip(Mill or Black)	1

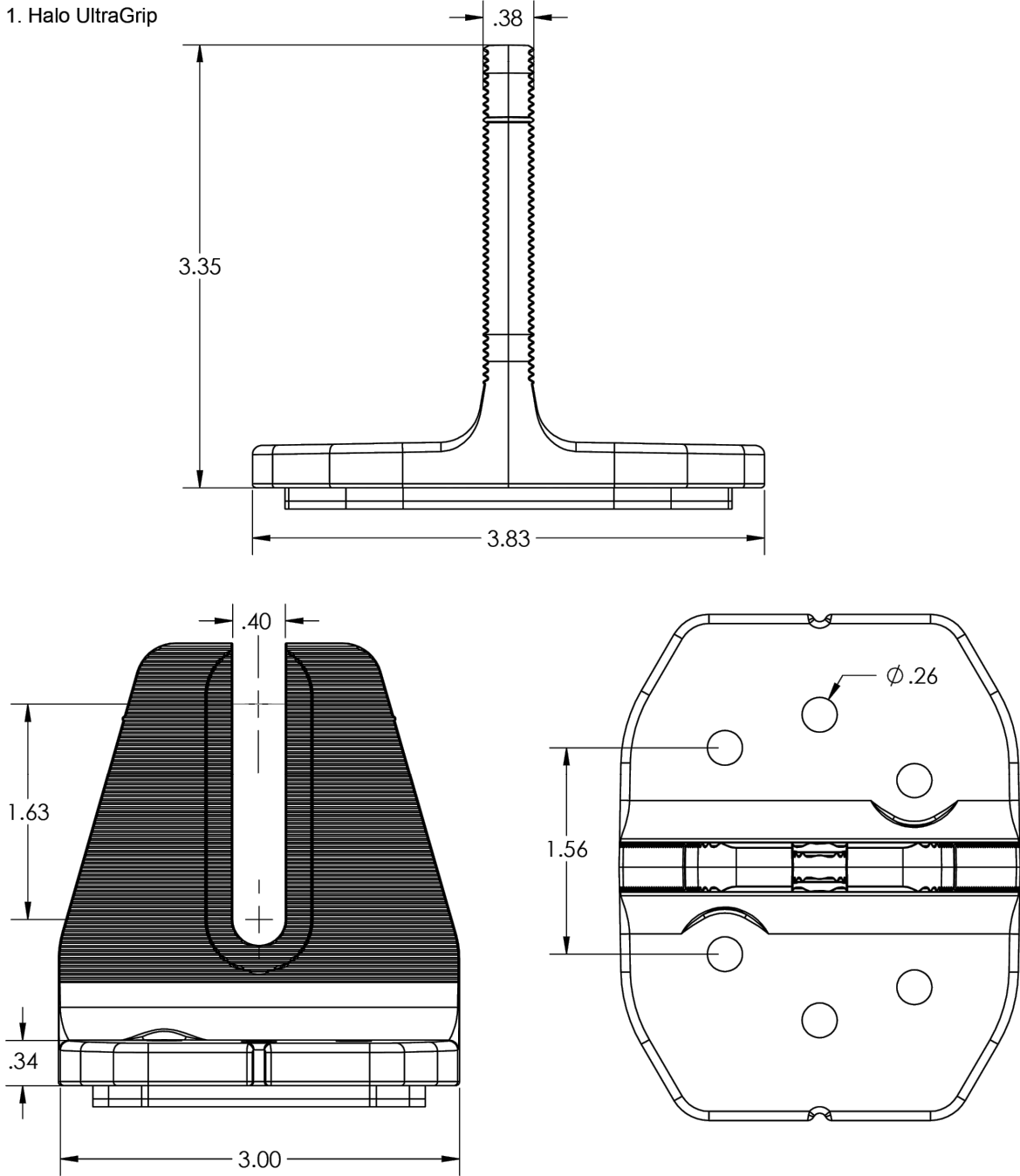
PART NUMBER	DESCRIPTION
QM-HUG-01-M1	Halo UltraGrip - Mill
QM-HUG-01-B1	Halo UltraGrip - Black



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QM-HUG-01-B1 or QM-HUG-01-M1 Cut Sheet Rev 1.0

1. Halo UltraGrip



Property	Value
Material	300 Series Aluminium
Finish	Mill or Black



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QM-HUG-01-B1 or QM-HUG-01-M1 Cut Sheet Rev 1.0

GEMINI SOLAR DESIGN

SAMPLE PROJECT
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NEW GRID-TIED SYSTEM 8.10kW

SAMPLE RESIDENCE
PROJECT ADDRESS WITHHELD
UNITED STATES

MOUNTING DETAIL

PROJECT NO: GSD-SAMPLE
DRAWN BY: GSD
DATE: SAMPLE

PV-6B



Flush Mount System

Datasheet



Built for solar's toughest roofs.

IronRidge builds the strongest mounting system for pitched roofs in solar. Every component has been tested to the limit and proven in extreme environments.

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 20-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

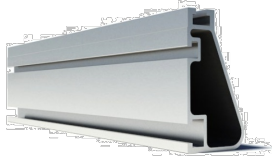
XR100 Rail



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

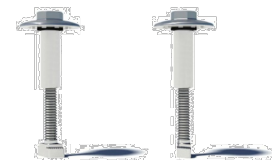


All rails use internal splices for seamless connections.

- 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

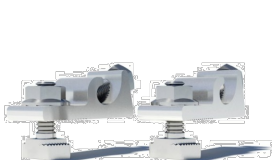
CAMO



Bond modules to rails while staying completely hidden.

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

Grounding Lugs



Connect arrays to equipment ground.

- Low profile
- Single tool installation
- Mounts in any direction

Attachments ☺

FlashFoot2



Flash and mount XR Rails with superior waterproofing.

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

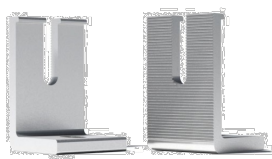
Conduit Mount



Flash and mount conduit, strut, or junction boxes.

- Twist-on Cap eases install
- Wind-driven rain tested
- Secures 3/4" or 1" conduit

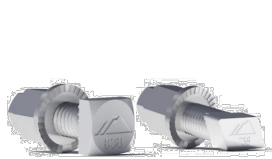
Slotted L-Feet



Drop-in design for rapid rail attachment.

- Secure rail connections
- Slot for vertical adjusting
- Clear and black finish

Bonding Hardware



Bond and attach XR Rails to roof attachments.

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

Resources



Design Assistant
Go from rough layout to fully engineered system. For free.
[Go to IronRidge.com/design](https://www.ironridge.com/design)



NABCEP Certified Training
Earn free continuing education credits, while learning more about our systems.
[Go to IronRidge.com/training](https://www.ironridge.com/training)

GEMINI SOLAR DESIGN

SAMPLE PROJECT

CONTACT: ON FILE

PROJECT INFO WITHHELD

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NEW GRID-TIED SYSTEM 8.10kW

SAMPLE RESIDENCE
PROJECT ADDRESS WITHHELD
UNITED STATES

RACKING DATASHEET

PROJECT NO: GSD-SAMPLE

DRAWN BY: GSD

DATE: SAMPLE

PV-7



AuxinTM
SOLAR MANUFACTURING

Since 2008

We are America's Original Solar Manufacturer

Auxin lives and breathes
Made-in-U.S.A. solar products

- Cloudy Day Power**
Excellent low light performance
- Moisture Lock**
2x POE for extra moisture protection
- High Wind Load**
Suitable for extreme weather applications
- Certified Reliability**
Exceptional PID resistance, Tested to UL 61730



For nearly two decades, Auxin has been fighting the good fight for American-made solar. In that time, we have become the factory that countless brands in the industry rely upon to build their products. This is not least because continuous improvement is one of our core values. Auxin regularly invests in new process technology, latest equipment, latest raw materials and R&D on new circuit design applications for solar.

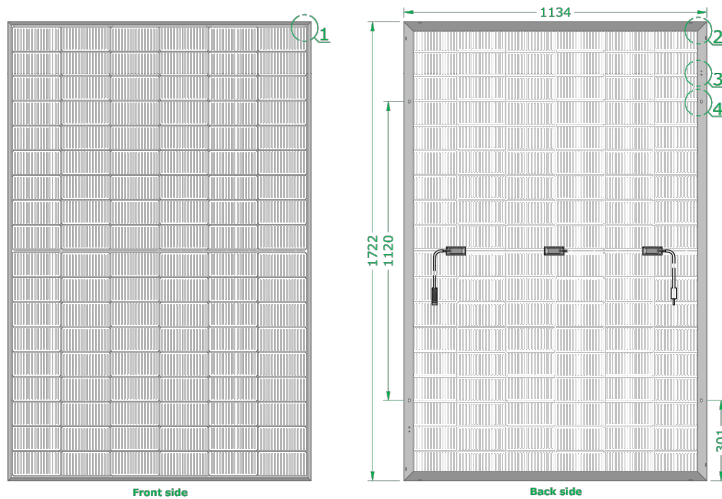
Production equipment is refreshed every 24 months on critical process steps, components are evaluated and integrated into end product annually, and new material goes through internal reliability testing as well as third-party testing. This dedication means that you can rely upon Auxin products now and in the future.

Trust Auxin expertise and build the most reliable systems for your customers.

Toward the sun
auxinsolar.com



Basic Dimensions [UNITS: MM]



Electrical Specifications

Product Type: AXN10Mxxx (xxx= PMAX)

Power Output (-0/+3%)	P _{max}	W _p	435	440	450
Module Efficiency	%		22.3	22.5	23.1
Open Circuit Voltage	V _{oc}	V	39.56	39.62	39.75
Short Circuit Current	I _{sc}	A	13.79	13.90	14.14
Rated Voltage	V _{mp}	V	33.31	33.37	33.51
Rated Current	I _{mp}	A	13.07	13.19	13.44

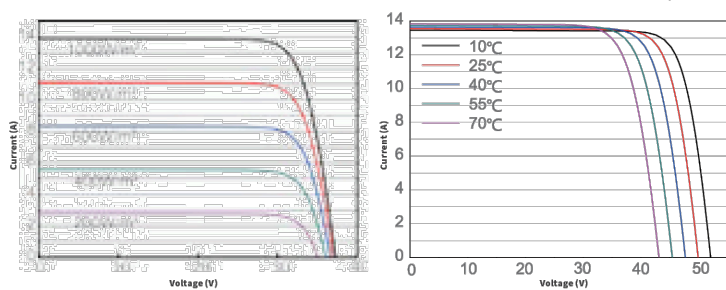
Mechanical Data

Solar Cells	n-type mono-crystalline silicon
Cell Orientation	108 half-cut cells
Module Dimension	67.8" x 44.65" x 1.38" 1,722mm x 1,134mm x 35mm
Weight	46.96 lbs. (21.30 kg)
Front Glass	3.2mm tempered, low-iron, anti-reflective
Frame	35mm Anodized*
Encapsulant	Polyolefin elastomer (POE)
Junction Box	Protection class IP68 with 3 bypass-diodes
Cable	12AWG 1200mm*
Connector	Staubli MC4*

*Frame, glass, cables and other components may be customized, ask your sales representative for available options.

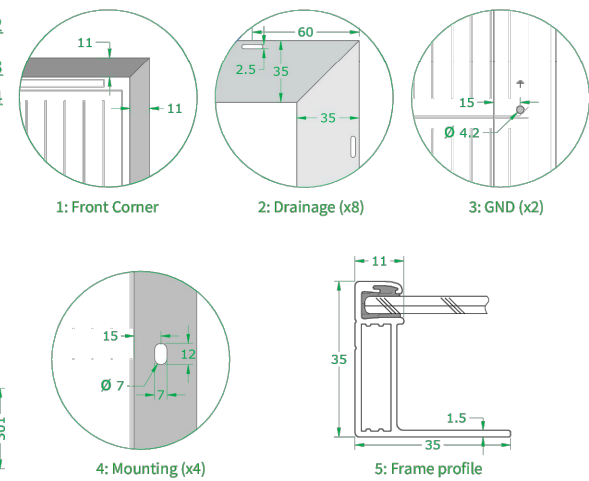
Current-Voltage Curves

AXN10M435: 435W, 108 Half-Cut Cell Module



Current-voltage characteristics with dependence on irradiance and module temperature

AXN10M450B Class Leading 435-450W



Temperature Coefficients

Normal Operating Cell Temperature (NOCT)	45 °C
Temperature Coefficient of P _{max}	-0.29%/ °C
Temperature Coefficient of V _{oc}	-0.25%/ °C
Temperature Coefficient of I _{sc}	+0.05%/ °C

Operating Conditions

Maximum System Voltage	VDC 1500
Operating Temperature Range	-40°F to 185°F (-40°C to +85°C)
Maximum Series Fuse Rating	30A
Fire Safety Classification	Type 1
Front & Back Load	Up to 5,400 Pa snow and 5,400 Pa wind
Hail Safety Impact Velocity	25mm at 23 m/s

Certifications & Tests

UL61730; UL1703



Transport info

53' Double Stack

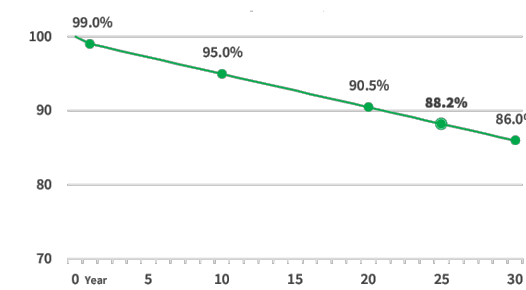
Pallets	Panels	435W Bin	382.50 kW
30	840		

Single Pallet [28 solar modules]

Weight	Width	Height	Length
1,360 lbs. (617 kg)	47.25 in (1,200mm)	44.25 in (1,124mm)	70.00 in (1,778mm)

Power Performance Warranty

0.45 % linear degradation after year one (1%)



sales@auxinsolar.com

Auxin Solar, 6835 Via Del Oro, San Jose, CA 95119 Auxin Solar Inc. reserves the right to make specification changes without notice.

108 DC073125 v5.4
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PV MODULE DATASHEET
SCALE: NTS

GEMINI SOLAR DESIGN

SAMPLE PROJECT

CONTACT: ON FILE

PROJECT INFO WITHHELD

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NEW GRID-TIED SYSTEM 8.10kW

SAMPLE RESIDENCE
PROJECT ADDRESS WITHHELD
UNITED STATES

MODULE DATASHEET

PROJECT NO: GSD-SAMPLE

DRAWN BY: GSD

DATE: SAMPLE

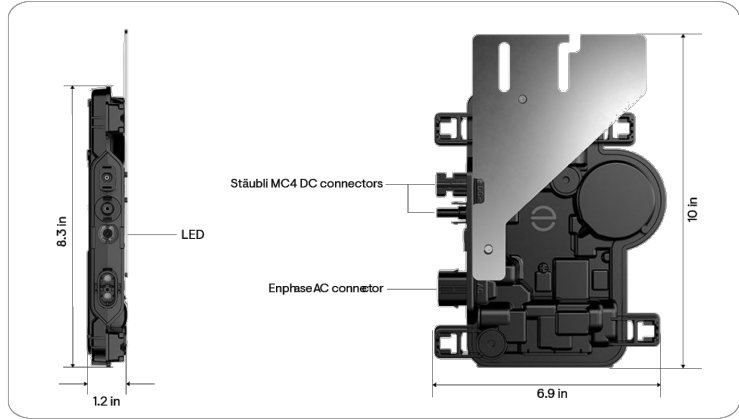
PV-8

IQ8HC Microinverter

Our newest IQ8 Series Microinverters^{1,2} are the industry’s first microgrid-forming³, software-defined microinverters with split-phase power conversion capability to convert DC power to AC power efficiently.



Key specifications	IQ8HC-72-M-US@240 VAC IQ8HC-72-M-DOM-US @240 VAC	IQ8HC-72-M-US@208 VAC IQ8HC-72-M-DOM-US @208 VAC
Peak output power	384 VA	366 VA
Nominal grid voltage (L-L)	240 V, split-phase (L-L), 180°	208 V, single-phase (L-L), 120°
Nominal frequency	60 Hz	
CEC weighted efficiency	97.0%	96.5%
Maximum input DC voltage	60 V	
MPPT voltage range	29.5–45 V	
Maximum module I _{sc}	20 A	
Ambient temperature range	–40°C to 65°C (–40°F to 149°F)	



¹ For details, see the “Compatibility with IQ7 Series Microinverters” section.
² IQ Microinverters ship with default settings that meet North America’s IEEE 1547 interconnection standard requirements. Region-specific adjustments may be requested by an Authority Having Jurisdiction (AHJ) or utility representative, according to the IEEE 1547 interconnection standard. Use an IQ Gateway to make these changes during installation.
³ Meets UL 1741 only when installed with IQ System Controller 2 or 3.

Simple

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

Reliable

- Produces power even when the grid is down³
- More than one million cumulative hours of testing
- Industry-leading limited warranty of up to 25 years
- Class II double-insulated enclosure
- Optimized for the latest high-powered PV modules

Microgrid-forming

- Complies with the latest advanced grid support
- Remote automatic updates for the latest grid requirements
- Configurable to support a wide range of grid profiles
- Meets CA Rule 21 (UL 1741-SA) and IEEE 1547:2018 (UL 1741-SB 3rd Ed.)

Input data (DC)	Units	IQ8HC-72-M-US @240 VAC IQ8HC-72-M-DOM-US @240 VAC	IQ8HC-72-M-US @208 VAC IQ8HC-72-M-DOM-US ⁴ @208 VAC
Commonly used module pairings ⁵	W	320–540	
Module compatibility	—	To meet compatibility, PV modules must be within the maximum input DC voltage and maximum module I _{sc} listed below. Module compatibility can be checked at https://enphase.com/installers/microinverters/calculator .	
MPPT voltage range	V	29.5–45	
Operating range	V	18–58	
Minimum/Maximum start voltage	V	22/58	
Maximum input DC voltage	V	60	
Maximum continuous operating DC current	A	14	
Maximum input DC short-circuit current	A	25	
Maximum module I _{sc}	A	20	
Overvoltage class DC port	—	II	
DC port backfeed current	mA	0	
PV array configuration	—	Ungrounded array; no additional DC side protection required; AC side protection requires a maximum of 20 A per branch circuit	

Output data (AC)	Units	IQ8HC-72-M-US @240 VAC IQ8HC-72-M-DOM-US @240 VAC	IQ8HC-72-M-US @208 VAC IQ8HC-72-M-DOM-US ⁴ @208 VAC
Peak output power	VA	384	366
Maximum continuous output power	VA	380	360
Nominal grid voltage (L-L)	V	240, split-phase (L-L), 180°	208, single-phase (L-L), 120°
Minimum and maximum grid voltage ⁶	V	211–264	183–229
Maximum continuous output current	A	1.58	1.73
Nominal frequency	Hz	60	
Extended frequency range	Hz	47–68	
AC short-circuit fault current over three cycles	A _{rms}	2.7	
Maximum units per 20 A (L-L) branch circuit ⁷	—	10	9
Total harmonic distortion	%	<5	
Overvoltage class AC port	—	III	
AC port backfeed current	mA	18	
Power factor setting	—	1	
Grid-tied power factor (adjustable)	—	0.85 leading ... 0.85 lagging	
Peak efficiency	%	97.3	97.2
CEC weighted efficiency	%	97.0	96.5
Nighttime power consumption	mW	22	26

⁴ IQ8HC-72-M-DOM-US (240 VAC and 208 VAC) is made in the U.S., and the PCBA, electrical parts, and enclosure are domestically manufactured to meet the requirements of eligibility to be considered for the ITC domestic content bonus adder.
⁵ No enforced DC/AC ratio.
⁶ Nominal voltage range can be extended beyond nominal if required by the utility.
⁷ Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

GEMINI SOLAR DESIGN

SAMPLE PROJECT

CONTACT: ON FILE

PROJECT INFO WITHHELD

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NEW GRID-TIED SYSTEM 8.10kW

SAMPLE RESIDENCE
PROJECT ADDRESS WITHHELD
UNITED STATES

INVERTER DATASHEET

PROJECT NO: GSD-SAMPLE

DRAWN BY: GSD

DATE: SAMPLE

PV-9



X-IQ-AM1-240-5-HDK
X-IQ-AM1-240-5C-HDK
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, IQ Series Microinverters, IQ System Controller 3/3G, and IQ Battery 5P provide a complete grid-agnostic Enphase Energy System.



IQ Series Microinverters
The high-powered smart grid-ready IQ Series Microinverters (IQ6, IQ7, and IQ8 Series) 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.



5-year limited warranty



*For country-specific warranty information, see the <https://enphase.com/installers/resources/warranty> page.

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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 entries
- Supports up to four 2-pole branch circuits for 240 VAC plug-in breakers (not included)
- 80 A total PV branch circuits
- Factory installed hold-down kit
- Bluetooth-based Wi-Fi provisioning for easy Wi-Fi setup

Reliable

- Durable NRTL-certified NEMA type 3R enclosure
- 5-year limited warranty
- 2-year labor reimbursement program coverage included for IQ Combiner SKUs¹
- UL1741 Listed

IQC-5-5C-DSH-00007-6.0-EN-US-2024-09-30

MODEL NUMBER	
IQ Combiner 5 (X-IQ-AM1-240-5/ X-IQ-AM1-240-5-HDK)	IQ Combiner 5 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 a silver solar shield to deflect heat. IQ-AM1-240-5-HDK includes a factory installed hold-down kit compatible with all the circuit breakers mentioned in the Accessories and Replacement Parts section.
IQ Combiner 5C (X-IQ-AM1-240-5C / X-IQ-AM1-240-5C-HDK)	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. IQ-AM1-240-5C-HDK includes a factory installed hold-down kit compatible with all the circuit breakers mentioned in the Accessories and Replacement Parts section.
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 Energy System
Busbar	80 A busbar with support for one IQ Gateway breaker and four 20 A breakers for installing IQ Series Microinverters and IQ Battery 5P
IQ Gateway breaker	Circuit breaker, 2-pole, 10 A/15 A
Production CT	Pre-wired 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 the COMMS-KIT-2 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 BR2XX, Siemens Q2XX, and GE/ABB THQL21XX Series circuit breakers (XX represents 10, 15, 20, 30, 40, 50, or 60). Also supports Eaton BR220B, BR230B, and BR240B circuit breakers compatible with the 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 the “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 IQ Combiner 5/5C
X-IQ-NA-HD-125A	Hold-down kit compatible with Eaton BR-B Series circuit breakers (with screws). Not required for X-IQ-AM1-240-5-HDK/X-IQ-AM1-240-5C-HDK.
XA-COMMS2-PCBA-5	Replacement COMMS-KIT-2 printed circuit board (PCB) for IQ Combiner 5/5C
ELECTRICAL SPECIFICATIONS	
Rating	80 A
System voltage and frequency	120/240 VAC or 120/208 VAC, 60 Hz
Busbar rating	125 A
Fault current 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, Siemens Q, or GE/ABB THQL 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

¹ A plug-and-play Industrial-grade cell modem for systems of up to 60 microinverters. Available in the United States, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.

IQC-5-5C-DSH-00007-6.0-EN-US-2024-09-30

GEMINI SOLAR DESIGN

SAMPLE PROJECT

CONTACT: ON FILE

PROJECT INFO WITHHELD

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NEW GRID-TIED SYSTEM 8.10kW

SAMPLE RESIDENCE
PROJECT ADDRESS WITHHELD
UNITED STATES

IQ COMBINER 5

PROJECT NO: GSD-SAMPLE

DRAWN BY: GSD

DATE: SAMPLE

PV-10

Intertek

8431 Murphy Drive
Middleton, WI 53562 USA

Telephone: 608.836.4400
Facsimile: 608.831.9279
www.intertek.com

Test Verification of Conformity

In the basis of the tests undertaken, the sample(s) of the below product have been found to comply with the requirements of the referenced specifications at the time the tests were carried out.

Applicant Name & Address:

IronRidge, Inc.
1495 Zephyr Ave.
Hayward, CA 94544
USA

Product Description:

Flush Mount System with XR Rails.

Ratings & Principle Characteristics:

Fire Class Resistance Rating:
-Flush Mount (Symmetrical). Class A Fire Rated for Low Slope applications when using Type 1, 2 and 3, listed photovoltaic modules. Class A Fire Rated for Steep Slope applications with Type1, 2 and 3, listed photovoltaic modules. Tested with a 5" gap (distance between the bottom the module frame and the roof covering), per the standard this system can be installed at any gap allowed by the manufacturers installation instructions. No perimeter guarding is required. This rating is applicable with any IronRidge or 3'rd party roof anchor.

Models:

IronRidge Flush Mount with XR Rails

Brand Name:

IronRidge Flush Mount

Relevant Standards:

UL 2703 (Section 15.2 and 15.3) Standard for Safety Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels, First Edition dated Jan. 28, 2015 **Referencing** UL1703 Third Edition dated Nov. 18, 2014, (Section 31.2) Standard for Safety for Flat-Plate Photovoltaic Modules and Panels.

Verification Issuing Office:

Intertek Testing Services NA, Inc.
8431 Murphy Drive
Middleton, WI 53562

Date of Tests:

08/27/2014 to 03/17/2015

Test Report Number(s):

101769343MID-001r1, 101769343MID-001a, 101915978MID-001 & 101999492MID-001ar1-cr1.

This verification is part of the full test report(s) and should be read in conjunction with them. This report does not automatically imply product certification.

Completed by: Chris Zimbrich
Title: Technician II, Fire Resistance

Signature: 
Date: 05/25/2016

Reviewed by: Chad Naggs
Title: Technician I, Fire Resistance

Signature: 
Date: 05/25/2016

This Verification is for the exclusive use of Intertek's client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this Verification. Only the Client is authorized to permit copying or distribution of this Verification. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test/inspection results referenced in this Verification are relevant only to the sample tested/inspected. This Verification by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

GFT-OP-11a (24-MAR-2014)



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.

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.

Tech Brief

Class A Fire Rating

Fire Testing Process

Test Setup

Solar Modules

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

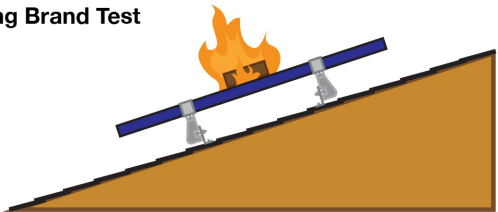
Mounting System

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

Roof Covering

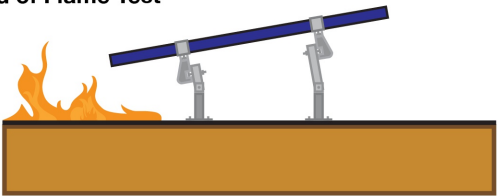
Roof covering products are given a Fire Class Rating of A, B or C based on their tested fire resistance.

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.

GEMINI SOLAR DESIGN

SAMPLE PROJECT

CONTACT: ON FILE

PROJECT INFO WITHHELD

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NEW GRID-TIED SYSTEM 8.10kW

SAMPLE RESIDENCE
PROJECT ADDRESS WITHHELD
UNITED STATES

CLASS A FIRE RATING

PROJECT NO: GSD-SAMPLE

DRAWN BY: GSD

DATE: SAMPLE

PV-11

1 CLASS A FIRE RATING DATASHEET
PV-11 SCALE: NTS



28357 Industrial Blvd.
Hayward, CA 94545
1-800-227-9523
IronRidge.com

Attn: Sean McDonald, CEO, IronRidge Inc.
Date: May 31st, 2024

Re: Structural Certification and Span Tables for the IronRidge Flush Mount System

This letter addresses the structural performance and code compliance of IronRidge's Flush Mount System. The contents of the letter shall be read in its entirety before applying to any project design. The Flush Mount System is a proprietary rooftop mounting system used to support photovoltaic (PV) modules installed in portrait or landscape orientation and set parallel to the underlying roof surface. PV modules are supported by extruded aluminum XR Rails and secured to the rails with IronRidge mounting clamps. The XR Rails are side mounted to a selected roof attachment with 3/8" stainless steel bonding hardware and then attached directly to the roof structure or to a stanchion that is fastened to the underlying roof structure. Assembly details of a typical Flush Mount installation and its core components are shown in Exhibit EX-0015.

The IronRidge Flush Mount System is designed and certified to the structural requirements of the reference standards listed below, for the load conditions and configurations tabulated in the attached span tables.

- ASCE/SEI 7-16 Minimum Design Loads for Buildings and Other Structures (ASCE 7-16)
- 2021 International Building Code (IBC-2021)
- 2021 Washington State Building Code
- 2020 Aluminum Design Manual (ADM-2020)
- Report SEAOC (Structural Engineer Association of California) PV2-2017 Wind Design for Solar Arrays

The tables included in this letter provide the maximum allowable spans of XR Rails in the Flush Mount System for the respective loads and configurations listed, covering wind exposure categories B, C, & D, roof zones provided in ASCE 7-16 for gable & hip roof profiles, and roof slopes of 8° to 45°. The tabulated spans are applicable when the following conditions are met:

- Span* is the distance between two adjacent roof attachment points (measured at the center of the attachment fastener).
- Each module shall be supported by 2 rails (2 rail system) or 3 rails (3 rail system). Spans are calculated based on 2 rail systems, and conservatively deemed acceptable for 3 rail systems.
- The underlying roof slope, measured between the roof surface and horizontal plane, is 8° to 45°.
- The *mean roof height*, defined as the average of the roof eave height and the roof ridge height measured from grade, does not exceed 30 feet.
- A clearance from the underside of the array to the roof surface of 2" minimum shall be provided and the height of the array, the distance from the module top surface to the roof surface (defined as h_2), shall not exceed 10".
- Module length and area shall not exceed the maximum values listed on the respective span tables.
- All Flush Mount components shall be installed in a professional workmanlike manner per IronRidge's *Flush Mount Installation Manual* and other applicable standards for the general roof construction practice.



The span tables provided in this letter are certified based on the structural performance of IronRidge XR Rails only with no consideration of the structural adequacy of the chosen roof attachments, PV modules, or the underlying roof supporting members. It is the responsibility of the installer or system designer to verify the structural capacity and adequacy of the aforementioned system components in regards to the applied or resultant loads of any chosen array configuration. This letter certifies the IronRidge products referenced within this document and provides no determination of the project specific conditions including site loads, building profile, & roof zones, which remain the responsibility of the installer or system designer.

Sincerely,



Matthew S Kuzila, P.E.

Digitally Sealed 05.31.2024

28357 Industrial Blvd.
Hayward, CA 94545
1-800-227-9523
IronRidge.com

GEMINI SOLAR DESIGN

SAMPLE PROJECT

CONTACT: ON FILE

PROJECT INFO WITHHELD

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NEW GRID-TIED SYSTEM 8.10kW

SAMPLE RESIDENCE
PROJECT ADDRESS WITHHELD
UNITED STATES

ENGINEERING LETTER

PROJECT NO: GSD-SAMPLE

DRAWN BY: GSD

DATE: SAMPLE

PV-12



STATE OF WASHINGTON RACKING ENGINEERING LETTER
SCALE: NTS



UFO Family of Components

Tech Brief

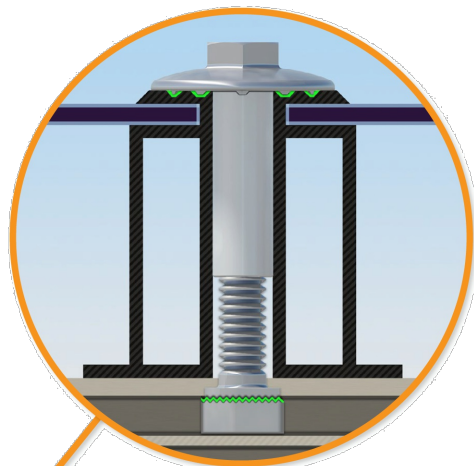
Simplified Grounding for Every Application

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

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



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



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



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

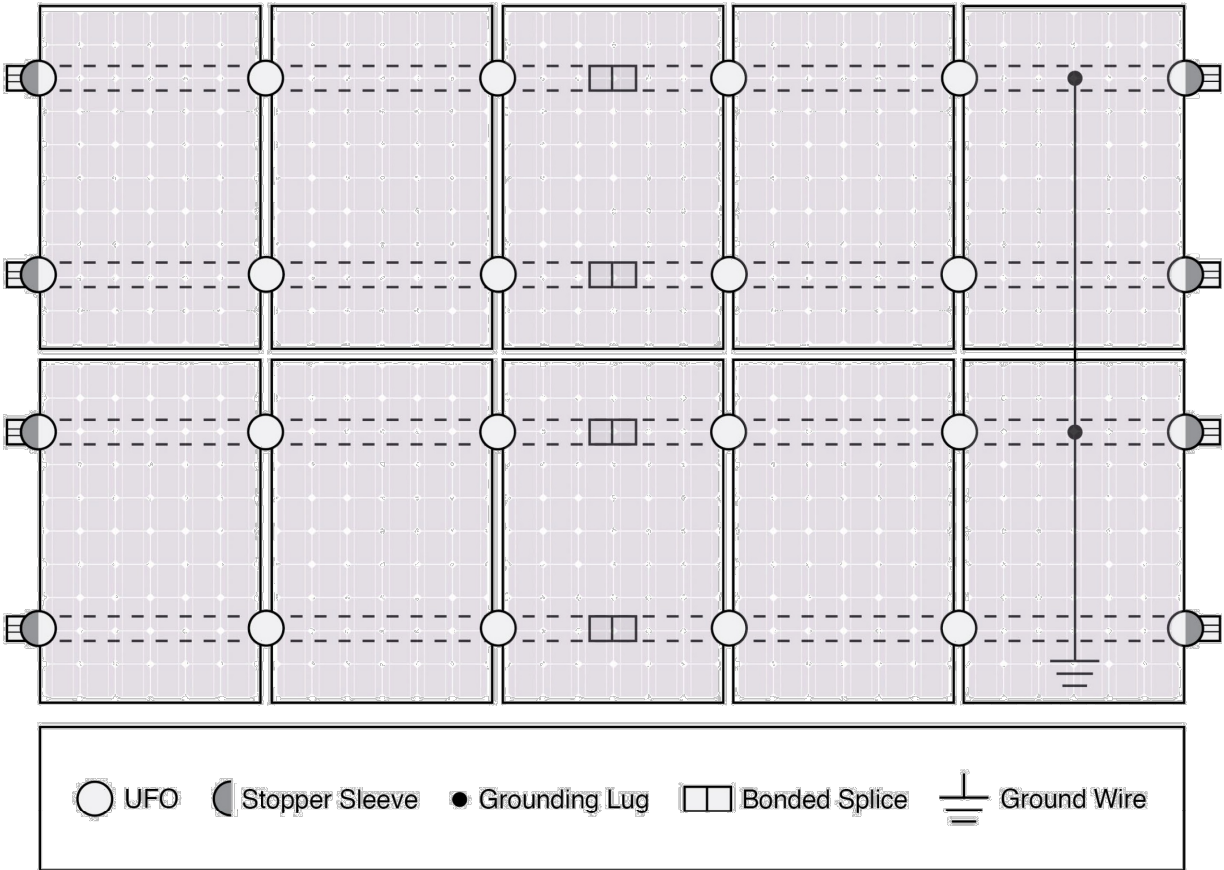


Grounding Lug
A single Grounding Lug connects an entire row of PV modules to the grounding conductor.



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.

System Diagram



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

UL Certification

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

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

[Go to IronRidge.com/UFO](https://www.ironridge.com/UFO)

Cross-System Compatibility			
Feature	Flush Mount	Tilt Mount	Ground Mount
XR Rails	✓	✓	XR1000 Only
UFO/Stopper	✓	✓	✓
Bonded Splice	✓	✓	N/A
Grounding Lugs	1 per Row	1 per Row	1 per Array
Microinverters & Power Optimizers	Enphase - M250-72, M250-60, M215-60, C250-72 Darfon - MIG240, MIG300, G320, G640 SolarEdge - P300, P320, P400, P405, P600, P700, P730		
Fire Rating	Class A	Class A	N/A
Modules	Tested or Evaluated with over 400 Framed Modules Refer to installation manuals for a detailed list.		

Tech Brief

GEMINI SOLAR DESIGN

SAMPLE PROJECT

CONTACT: ON FILE

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NEW GRID-TIED SYSTEM 8.10kW

SAMPLE RESIDENCE
PROJECT ADDRESS WITHHELD
UNITED STATES

GROUNDING DETAILS

PROJECT NO: GSD-SAMPLE

DRAWN BY: GSD

DATE: SAMPLE

PV-13

Rapid shutdown is built-in

The 2014 and 2017 editions of the National Electrical Code (NEC 2014/NEC 2017) added new rapid shutdown requirements for PV systems installed on buildings. Enphase Microinverters fully meet rapid shutdown requirements in the new code without the need to install any additional electrical equipment.

What's new in Section 690.12?
NEC 2014/2017, Section 690.12 applies to PV conductors over 10 feet from the PV array and requires that the conductors power down to 30 volts and 240 volt-amperes within 10 seconds of rapid shutdown initiation.

String inverters require work arounds for rapid shutdown

Work around.

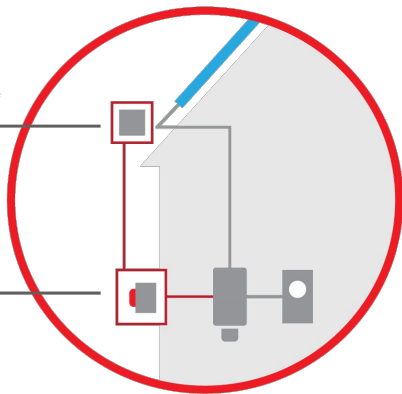
Specialized Rapid Shutdown electrical box installed on the roof within 10 feet of array.

Work around.

Shutoff switch that is easily accessible to first responders on the ground.

Work around.

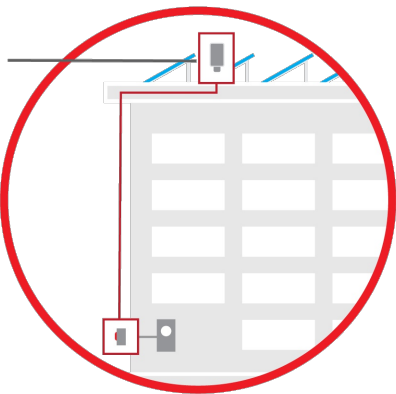
Extra conduit in installation.



Residential String Inverter

Work around.

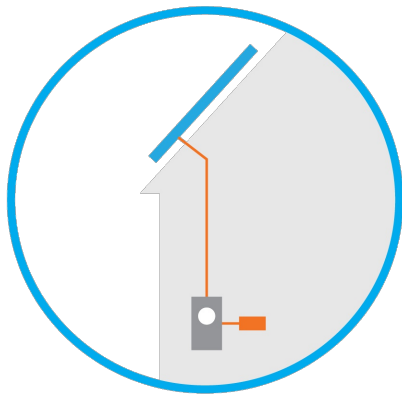
String inverter installed on roof, a hostile environment that string inverters are not built to live in.



Commercial String Inverter

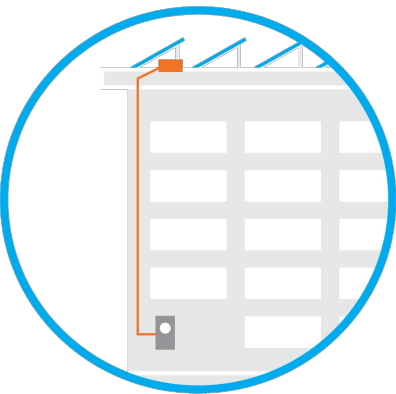
Enphase comes standard with rapid shutdown capability

All Enphase microinverters, even those that were previously installed, inherently meet rapid shutdown requirements, no additional equipment or workarounds needed



Residential Microinverter

Enphase microinverters can safely shut down automatically, leaving only low-voltage DC electricity isolated to the PV module



Commercial Microinverter

To learn more, visit enphase.com



GEMINI SOLAR DESIGN

SAMPLE PROJECT

CONTACT: ON FILE

PROJECT INFO WITHHELD

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NEW GRID-TIED SYSTEM 8.10kW

SAMPLE RESIDENCE
PROJECT ADDRESS WITHHELD
UNITED STATES

RAPID SHUTDOWN

PROJECT NO: GSD-SAMPLE

DRAWN BY: GSD

DATE: SAMPLE

PV-14

aGate

Intelligent energy management system

The aGate serves as the controller for all home power sources by interconnecting solar, grid, batteries, and a standby generator to supply electricity to the home. It seamlessly transitions the home supply from grid power to backup power so that always-on appliances, such as the refrigerator and network router, will not be affected when the grid goes down.

The aGate can be installed at the service entrance, connected to the main load center, or used as a load center.



Robust

- ✓ Micro-grid interconnect device (MID)
- ✓ EMS Integrated PV and grid metering
- ✓ UL1741 certified PCS function & 280A busbar to avoid Main Panel Upgrades
- ✓ 12-year limited warranty



Flexible

- ✓ Compatible with micro and string solar inverter
- ✓ Indoor and outdoor / wall-mounted



Hassle-free

- ✓ Precise control of electricity usage through Smart Circuits Module
- ✓ Standby generator integration via generator module
- ✓ Remarkable black start function ensures battery charge after a prolonged outage or extended trip
- ✓ Vehicle to loads (V2L) function to power essential home appliances during an emergency
- ✓ Commissioning through the aGate Wifi hotspot or Bluetooth



Easy installation

- ✓ Built-in design Smart Circuits and Generator Modules
- ✓ Conduit entry options from the bottom, left, or right



DATASHEET

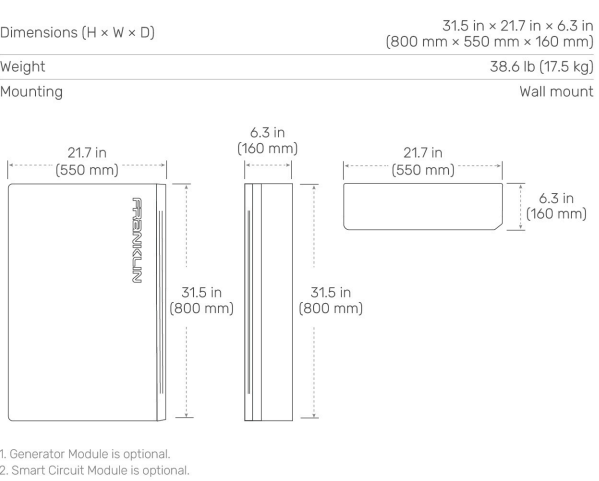
PERFORMANCE SPECIFICATIONS

Model Number	aGate X
Coupling	AC-coupled
Nominal AC Voltage	120 / 208 V, 120 / 240 V, 60 Hz
Phase	2 W+N+PE
aPower Over Current Protection Device	125 A Max
Solar Input Over Current Protection Device	80 A Max
Backup Load Port Over Current Protection Device	200 A Max
Generator Over Current Protection Device ¹	200 A Max
Smart Circuits Over Current Protection Device ²	Opt. a 1 × 80 A Max @ 208 V / 240 V & 1 × 50 A Max @ 208 V / 240 V Opt. b 1 × 80 A Max @ 208 V / 240 V & 2 × 50 A Max @ 120 V
Maximum Supply Fault Current	22 kA
Busbar Rating	280 A
Work Modes	Self-Consumption, Time of Use, Emergency Backup
Communications	Ethernet / 4G / Wifi / Bluetooth
User Interface	FranklinWH App
Warranty	12-year limited

COMPLIANCE INFORMATION

Certifications	UL 1741, UL 1741 PCS, UL 67, UL 869A, UL 916, CAN / CSA C22.2 No. 107.1-16, CSA C22.2 No. 29, CSA C22.2 No. 0.19
Seismic	AC 156, OSHPD, IEEE 693-2005 (high)
Environmental	California Proposition 65 RoHS Directive 2011 / EU
Emissions	FCC Part 15 Class B, ICES 003

MECHANICAL SPECIFICATIONS

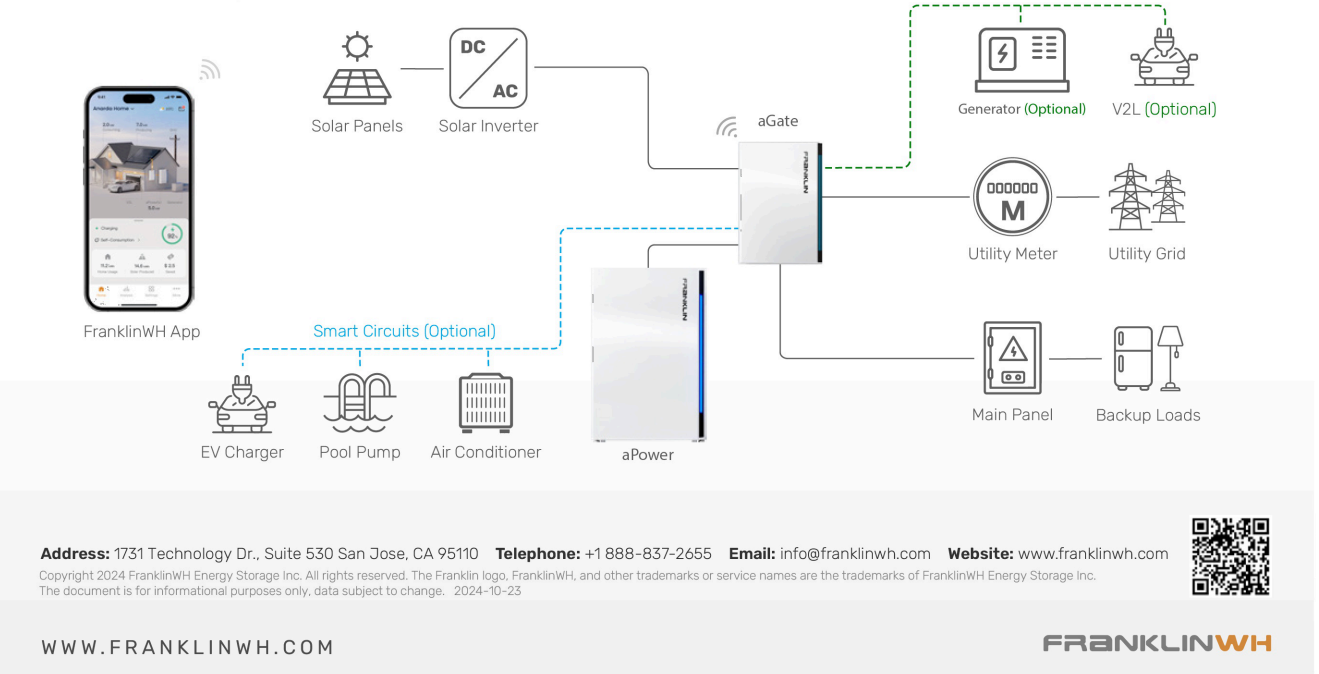


ENVIRONMENTAL SPECIFICATIONS

Enclosure Type	NEMA 3R
Operating Temperature	-4°F to 122°F (-20°C to 50°C)
Operating Humidity (RH)	Up to 100% RH, condensing
Altitude	Maximum 9,843 ft (3,000 m)
Environment	Indoor and outdoor rated

Franklin Home Power Solution

Whole Home Backup



GEMINI SOLAR DESIGN

SAMPLE PROJECT

CONTACT: ON FILE

PROJECT INFO WITHHELD

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NEW GRID-TIED SYSTEM 8.10kW

SAMPLE RESIDENCE
PROJECT ADDRESS WITHHELD
UNITED STATES

aGATE X DATASHEET

PROJECT NO: GSD-SAMPLE

DRAWN BY: GSD

DATE: SAMPLE

PV-15

aPower 2

AC-coupled battery

Store solar generated power while the sun is shining. Use the stored energy when needed to lower electric bills. Run heavy loads such as air conditioners and water heaters as usual even during grid outages. Provide homeowner peace of mind by fully charging before severe weather events.

The system is off-grid ready, designed to operate independently from the main power grid to deliver reliable energy in any situation.

- ✓ 10 kW continuous / 15 kW peak for 10s
- ✓ 8 kW charge power
- ✓ 15 kWh AC¹ per unit, up to 225 kWh (15 units) per aGate
- ✓ 60 MWh warranty throughput



PERFORMANCE SPECIFICATIONS

SKU	APR-10K15V2-US				
Model Number	aPower X-20				
Battery Chemistry	Lithium Iron Phosphate (LFP)				
Usable System Energy	15 kWh AC ¹ per unit, up to 15 units per aGate				
Aggregate Throughput	60 MWh				
Real Power (charge)	8 kW continuous				
Nominal Output Power (AC)	2.5 kW	5 kW	6.7 kW	8.4 kW	10 kW ²
Maximum Apparent Power	2.9 kVA	5.8 kVA	7.7 kVA	9.6 kVA	11.5 kVA
Maximum Continuous Current	12 A	24 A	32 A	40 A	48 A
Nominal AC Voltage	120 / 240 V, 120 / 208 V (single phase), 60 Hz				
Coupling	AC-coupled				
Phase	2 W+N+PE				
Round Trip Efficiency	90% ¹				
Maximum Short-Circuit Current Rating	10 kA				
Load Start Capability	Up to a 5-ton air conditioner				
Work Modes	Self-Consumption Time of Use Emergency Backup				
Noise Emission	30 dB(A) Typical / 40 dB(A) Maximum				
Flood Resistance	Up to 29" from the aPower 2 base				
User Interface	FranklinWH App				
Warranty	15 years ³				

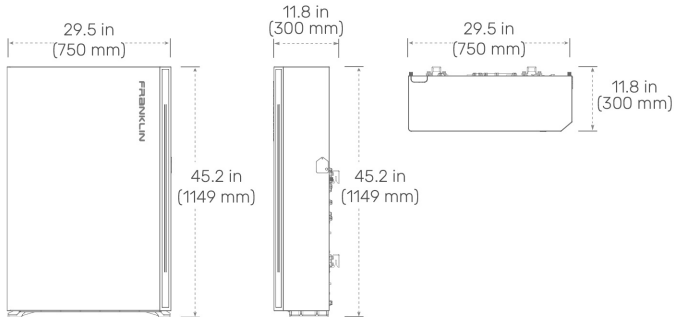
COMPLIANCE INFORMATION

Certifications	UL 9540, UL 9540A, UL 1973, UL 1741, UL1741 SB, UL 1741 PCS, UL 60730-1:2016, IEEE 1547, IEEE 1547.1, UN 38.3, CSA C22.2 No. 107.1:16
Seismic	AC 156, OSHPD, IEEE 693-2005 (high)
Environmental	California Proposition 65 RoHS Directive 2011 / EU
Emissions	FCC Part 15 Class B, ICES 003

1. At beginning of life, 3 kW charge/discharge power, 77 °F (25 °C).
2. Refer to the installation manual and commissioning guide for proper wire and OCPD sizes.
3. For more details, please refer to the FranklinWH System Limited Warranty for End Users available in the Documentation Center on the FranklinWH website.

MECHANICAL SPECIFICATIONS

Dimensions (H × W × D)	45.2 in × 29.5 in × 11.8 in (1149 mm × 750 mm × 300 mm)
Weight, aPower 2 Complete	357 lb. (162 kg)
Weight, without Cover	335 lb.(152 kg)
Weight, Cover	22 lb. (10 kg)
Mounting	Wall or floor mount
Cooling	Natural air-cooled design



ENVIRONMENTAL SPECIFICATIONS

Enclosure Type	Type 3R
Ingress Protection	IP56 (Wiring) IP67 (Battery Pack & Inverter)
Operating Temperature	-4 °F to 122 °F (-20 °C to 50 °C) Operates up to 131 °F (55 °C) at 5kW derated output
Operating Humidity (RH)	Up to 100% RH, condensing
Altitude	Maximum 9,843 ft (3,000 m)
Environment	Indoor and outdoor rated

Compatibility Notice: At launch, the aPower 2 is compatible with the aGate 1.3 only. Compatibility with earlier aGate and aPower versions is anticipated in Q2 2025.

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NEW GRID-TIED SYSTEM 8.10kW

SAMPLE RESIDENCE
PROJECT ADDRESS WITHHELD
UNITED STATES

aPOWER 2 DATASHEET

PROJECT NO: GSD-SAMPLE

DRAWN BY: GSD

DATE: SAMPLE

PV-16

UL 9540A Compliance and Installation Guidance for the Franklin Whole Home System

The purpose of this document is to demonstrate how the FranklinWH aPower 2¹ (Model: aPower X-20), the energy storage component of the FranklinWH System, fulfills the standardized testing approach and performance criteria specified in the 4th edition (2019) of UL 9540A and thereby allowed exceptions to otherwise restricted installation.

FranklinWH provides an AC-coupled home energy management and battery storage system compatible with grid-tied PV inverters. The aPower 2 employs the safer Lithium Iron Phosphate (LFP) cell chemistry from Tier 1 manufacturers, ensuring both safety and reliability. The system operates within a normal temperature range of -4° F to 131° F and incorporates superior thermal management for optimal system performance. Its design includes a low-voltage battery bus architecture, coupled with robust management systems for battery, energy conversion, energy safety, as well as cloud monitoring and control².

Key takeaways and installation guidance recommendations:

- FranklinWH has met the testing standards of UL 9540A (4th ed.) for residential use indoor and outdoor, wall- or ground-mounted ESS.
- The FranklinWH aPower 2 product passed the UL 9540A unit-level test. The surface and target unit temperatures were below the limits, and no ignition events were observed during and after the completion of the test. Explosion or deflagration hazards of vented gas were not observed.
- The FranklinWH batteries incorporates prismatic Lithium Iron Phosphate-based cell chemistry (LFP)
- The aPower 2 is suitable for indoor (non-habitable) and outdoor residential installations as defined in the 2021 IRC Section R328.4 and NFPA 2020 Chapter 15 (15.6). The aPower 2 shall not be installed in sleeping rooms, or closets or spaces opening directly into sleeping rooms.
- If a battery cell’s temperature rises beyond the threshold, the battery management system disconnects the battery from the power electronics and commands it to shut off to prevent continued energy transfer to or from the battery.
- The internal wires are 24 AWG and Teflon coated to meet UL 1332 requirements. They have a 94V-0 flame retardant rating making them high-temperature, flame, corrosion, oil, strong acid and alkali, high pressure, and strong oxidizing agent resistant.

- Based on the test results, along with the standard FranklinWH installation guidance provided in the installation manual, a few additional recommendations include:
 - The aPower 2 qualifies for reduced indoor unit clearances (the exception from code mentioned 36” spacing requirements) to at least 4” for three aPower 2 units, as tested. (Code reference: NFPA 2020 15.5)
 - Automatic sprinkler systems or other methods of automatic fire suppression may not be required for the installation of aPower 2 units per compliance with the UL 9540A unit-level performance criteria. (Code reference: NFPA 2020 4.4.4.3)
 - Ventilation requirements may not be needed since the aPower 2 does not release any toxic gases during charging, discharging or normal use conditions (Code reference: NFPA 2020 15.11)
 - Use of fire cabinets can be excluded for indoor installations (Code reference: NFPA 2020 4.1.4.3)
 - Fire suppression or ventilation systems will not be required for outdoor installations. The aPower 2 is rated for both indoors and outdoors installations. Please refer to the installation guide for more information on installation locations.

Always consult with your local Authority Having Jurisdiction (AHJ), building/fire department and ensure each FranklinWH ESS is installed in compliance with local regulations and fire codes. Please note that installation guidance for lithium energy storage systems may vary from one AHJ to another. Additionally, some installations may require fire detection equipment to be installed alongside the battery, depending on the local AHJ’s requirements. Our team is available to collaborate with local AHJs to ensure safety and compliance of FranklinWH installations, as these remain our top priorities.

For further inquiries or UL 9540A test-related information, please do not hesitate to contact the FranklinWH product team at engineering@franklinwh.com.

¹ aPower2 is a marketing name. Product model is aPower X-20 in the aPower family, following the Xyyy format, where “y” in the model name may be A-Z, 0-9, symbol “-” or blank. There is no technical difference between the models.

² This tech brief is based on the reports from UL 9540A testing performed by CSA International Certification Co., Ltd. Kunshan Branch (Project: 80226105, Master contract: 301950), UL 9540 (project: 80211057) by CSA Group and UL 1741 by CSA Group (also supplemental SA and SB, project: 80226105).

SAMPLE PROJECT
CONTACT: ON FILE
PROJECT INFO WITHHELD

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NEW GRID-TIED SYSTEM 8.10kW	SAMPLE RESIDENCE PROJECT ADDRESS WITHHELD UNITED STATES
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UL 9540A COMPLIANCE

PROJECT NO: GSD-SAMPLE
DRAWN BY: GSD
DATE: SAMPLE