

SHEET CATALOG:
INDEX NO. DESCRIPTION

T-1	COVER PAGE
M-1	MOUNTING DETAILS
M-2	STRUCTURAL DETAILS
E-1	SINGLE LINE DIAGRAM
PL-1	WARNING PLACARDS
SS-1	MODULE SPEC SHEET
SS-2	INVERTER SPEC SHEET
SS-3	RACKING SPEC SHEET
SS-4	RAIL SPEC SHEET
SS-5	RESOURCE DETAIL SHEET
SS-6	ENPHASE RSD SHEET

SCOPE OF WORK

HOME OWNER:
XXX
RANCHO CORDOVA, CA 95670

GENERAL SYSTEM INFORMATION
SYSTEM SIZE: 9.90kW DC, 7.90kW AC

MODULES:
(33) LG MONOX LG300S1C-A5

INVERTER:
(33) ENPHASE M250-60-2LL-S22

BRANCH DETAILS:
3x11 ENPHASES BRANCHES

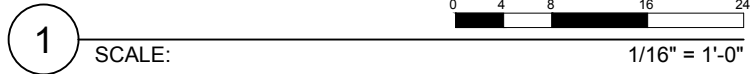
STRUCTURAL DETAILS
MAX.RAIL SPAN:6'-0"
MAX.POINT LOAD:32.64LBS
MAX DISTRIBUTED LOAD:2.58PSF

GENERAL NOTES

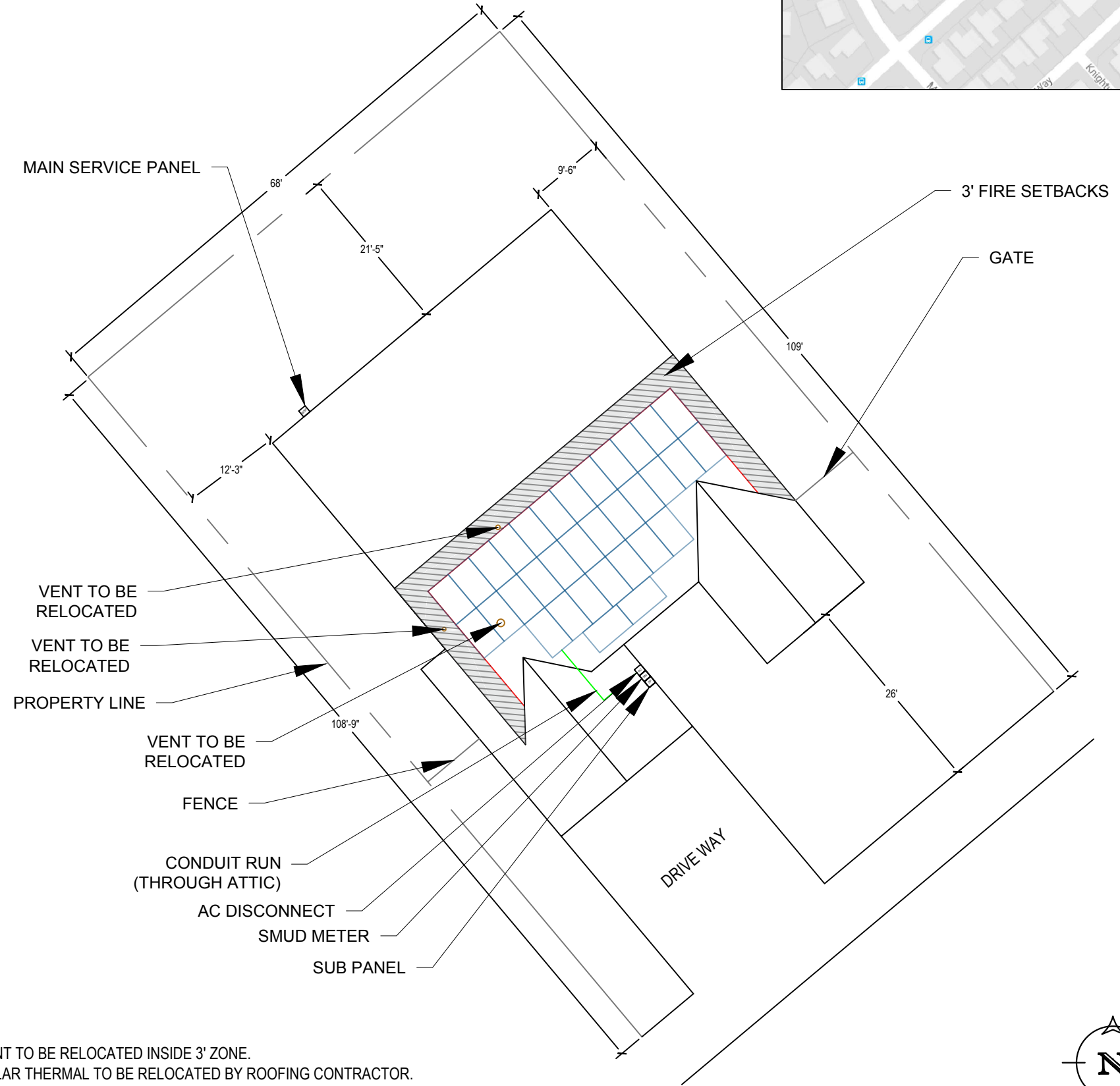
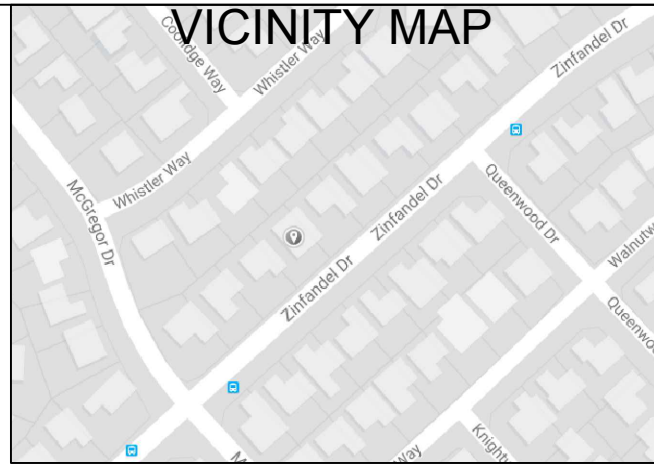
1. THE PHOTOVOLTAIC (PV) SYSTEM WILL BE INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS OF THE 2016 CALIFORNIA ELECTRIC CODE (CEC) AND 2016 CALIFORNIA BUILDING CODE(CBC) ARTICLE, ALL MANUFACTURERS'S LISTING AND INSTALLATION INSTRUCTIONS AND THE RELEVANT CODES AS SPECIFIED BY THE AUTHORITY HAVING JURISDICTION'S (AHJ) APPLICABLE CODES.
2. CONSTRUCTION FOREMAN TO PLACE CONDUIT RUN PER 690.31(E).
3. THIS SYSTEM WILL NOT BE INTERCONNECTED UNTIL APPROVAL FROM THE LOCAL JURISDICTION AND THE AUTHORITY AND THE UTILITY COMPANY ARE OBTAINED.
4. ALL PV SYSTEM COMPONENTS ARE IDENTIFIED AND LISTED FOR USE IN PHOTOVOLTAIC SYSTEMS AND REQUIRED BY CEC 690.4 & CEC 690.60: PV MODULES:UL1703,IEC61730 AND IEC61215 & NFPA 70 CLASS C FIRE INVERTERS: UL 1741 CERTIFIED,IEEE 1547,929,519.
5. INVERTER(S) USED IN UNGROUNDED SYSTEM SHALL BE LISTED FOR THIS USE [CEC 690.35(G)].
6. AS SPECIFIED BY THE AHJ, EQUIPMENT USED IN UNGROUNDED SYSTEMS LABELED ACCORDING TO CEC 690.35(F).
7. ARRAY DC CONDUCTORS ARE SIZED FOR DERATE CURRENT.
8. ALL INVERTERS, PHOTOVOLTAIC MODULES, PHOTOVOLTAIC PANELS, AND SOURCE CIRCUIT COMBINERS INTENDED FOR USE IN A PHOTOVOLTAIC POWER SYSTEM WILL BE IDENTIFIED AND LISTED FOR THE APPLICATION PER 690.4(D).SHALL BE INSTALLED ACCORDING TO ANY INSTRUCTIONS FROM LISTING OR LABELING [CEC 110.3].

NOTES:

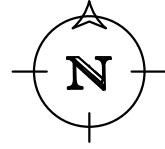
1. VENT TO BE RELOCATED INSIDE 3' ZONE.
2. SOLAR THERMAL TO BE RELOCATED BY ROOFING CONTRACTOR.



XXX RESIDENCE
ROOF HEIGHT: SINGLE STORY
JURISDICTION: CA- SACRAMENTO COUNTY



LOCATION OF CONDUIT MAY BE CHANGED AT POINT OF INSTALLATION DEPENDING ON ATTIC ACCESSIBILITY



CLIENT INFO

XXX
RANCHO CORDOVA, CA 95670

PRN NO: YHI-000462

ENGINEER OF RECORD

REVISIONS		
ID	DATE	REV

COVER PAGE

DESIGNER: PC
CHECKED BY: RR
DATE: 09/15/17
SCALE: AS NOTED

CLIENT INFO

XXX
RANCHO CORDOVA, CA 95670

PRN NO: YHI-000462

ENGINEER OF RECORD

REVISIONS

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MOUNTING DETAILS

DESIGNER: PC
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SCALE: AS NOTED

M-1

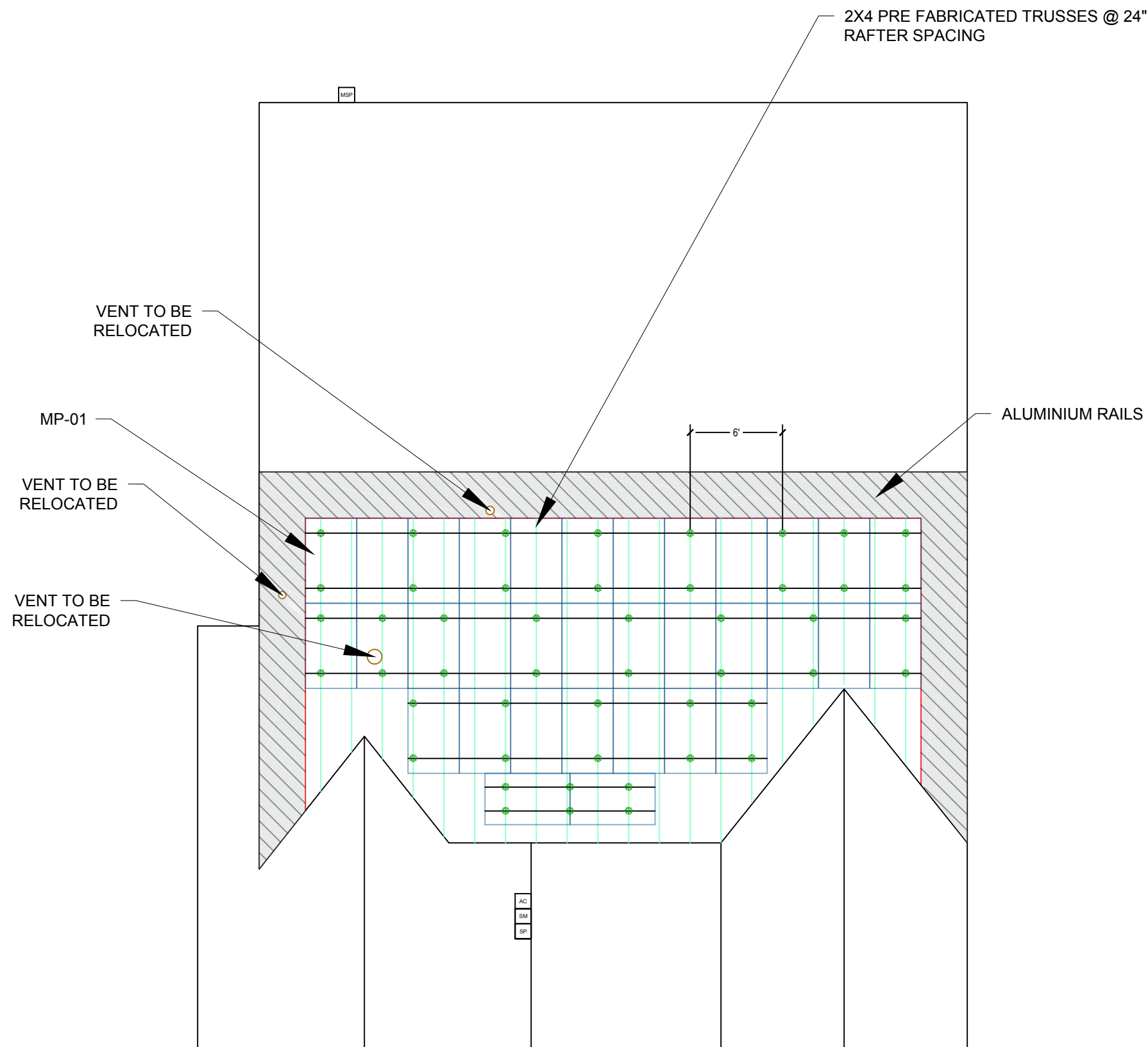
INSTALLATION NOTES:

- SOLAR PHOTOVOLTAIC SYSTEM TO BE INSTALLED ON RESIDENTIAL STRUCTURE.
- THIS PROJECT HAS BEEN DESIGNED IN COMPLIANCE WITH THE 2016 CBC TO WITHSTAND A BASIC WIND SPEED OF 110 MPH (3 SECOND GUST), WIND EXPOSURE B.
- THE SOLAR PHOTOVOLTAIC INSTALLATION SHALL NOT OBSTRUCT ANY PLUMBING, MECHANICAL OR BUILDING ROOF VENTS.
- ALL CONDUCTORS AND CONDUITS MOUNTED ON ROOF SHALL BE MINIMUM 2.5" ABOVE ROOF SURFACE (INCLUDING CABLES UNDERNEATH MODULES AND RACKING).
- LAG SCREWS SHALL BE AT LEAST 6" FROM ANY NAILING PLATES.
- LAG LENGTH MUST HAVE A MINIMUM 2.5" THREAD DEPTH INTO THE STRUCTURAL BEAM.
- ROOF ACCESS POINTS SHALL BE PROVIDED PER THE FOLLOWING (IRC R324.7.1):
 - LOCATED IN AREAS NOT REQUIRING PLACEMENT OF GROUND LADDERS OVER OPENINGS SUCH AS DOORS OR WINDOWS.
 - LOCATED AT STRONG POINTS OF BUILDING CONSTRUCTION IN LOCATIONS WHERE ACCESS POINT DOES NOT CONFLICT WITH OVERHEAD OBSTRUCTIONS SUCH AS: TREE LIMBS, WIRES, OR SIGNS.

SITE INFORMATION

MP-01	MP-01
AZIMUTH	140°
PITCH	18°
NO. OF MODULES	33
ARRAY AREA	608sq.ft

WIND SPEED	110 MPH
SNOW LOAD	0 PSF

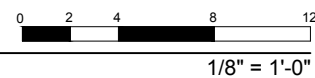


NOTES:

- VENT TO BE RELOCATED INSIDE 3' ZONE.

2

SCALE:



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ENGINEER OF RECORD

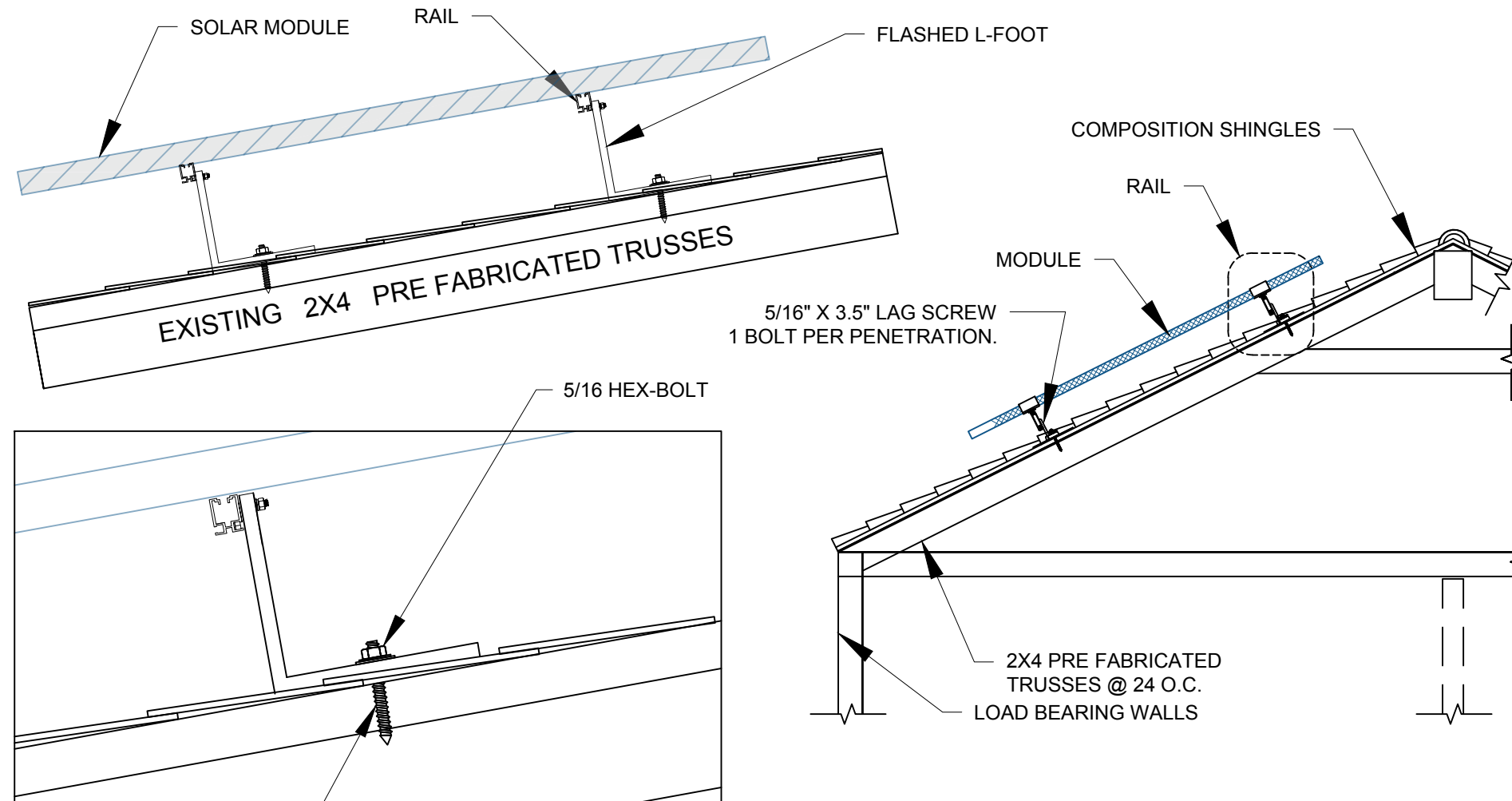
REVISIONS

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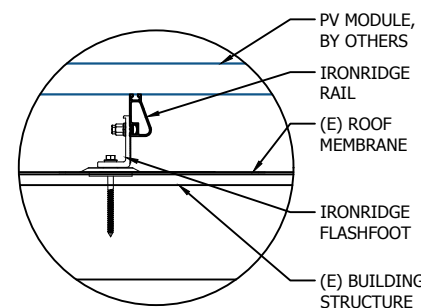
STRUCTURAL DETAILS

DESIGNER: PC
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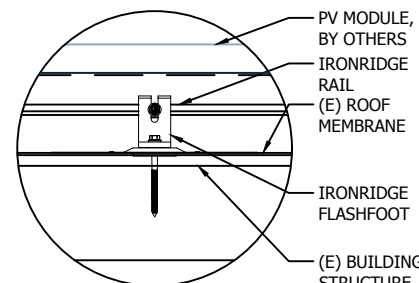
NOTE: ROOF-MP-01: ROOF TYPE-COMPOSITION SHINGLES: ATTACHMENT-FLASHED L-FOOT: ROOF EXPOSURE-ATTIC
FRAME TYPE-PREFABRICATED TRUSS: FRAME SIZE-2X4: RAFTER SPACING-2'-0": MAX.RAIL SPAN-6'-0"



STAINLESS STEEL 5/16" HANGER BOLT 2-1/2" EMBEDMENT PILOT HOLE REQUIRED



FLASHFOOT DETAIL-1



FLASHFOOT DETAIL-2

DEAD LOAD CALCULATION			
BOM	QUANTITY	LBS/ UNIT	TOTAL WEIGHT(LBS)
MODULES	33	39.70	1310.10
MIDCLAMP	58	0.05	2.90
ENDCLAMP	16	0.050	0.80
FLASHED L-FOOT	48	1.88	90.36
RAIL LENGTH	234.00	0.68	159.12
SPLICE BAR	10	0.36	3.60
TOTAL WEIGHT OF THE SYSTEM(LBS)			1,566.9
TOTAL AREA ON ROOF(SQ.FT)			608.39
WEIGHT PER SQ.FT(LBS)			2.58
WEIGHT PER PENETRATION(LBS)			32.64

INSTALLATION NOTES:

1. RACKING SYSTEM AND PV ARRAY SHALL BE INSTALLED ACCORDING TO CODE-COMPLIANT INSTALLATION MANUAL.
2. ROOF MOUNTED STANDARD RAIL REQUIRED ONE THERMAL EXPANSION GAP FOR EVERY RUN OF RAIL GREATER THAN 40°.
3. JUNCTION BOX SHALL BE INSTALLED PER MANUFACTURER'S SPECIFICATIONS. IT SHALL BE FLASHED AND SEALED PER LOCAL REQUIREMENTS.
4. ROOF TOP PENETRATIONS PERTAINING TO SOLAR RACKING WILL BE COMPLETED AND SEALED WITH APPROVED CHEMICAL SEALANT PER CODE BY A LICENSED CONTRACTOR.
5. ALL PV RELATED RACKING ATTACHMENTS WILL BE SPACED NO GREATER THAN THE SPAN DISTANCE SPECIFIED BY THE RACKING MANUFACTURER O.C. FINAL ATTACHMENTS LOCATION MAY BE ADJUSTED IN THE FIELD AS NECESSARY.
6. ALL PV RELATED RACKING ATTACHMENTS SHALL BE STAGGERED BY ROW AMONGST THE ROOF FRAMING MEMBERS.

MINIMUM FIRE ACCESS PATHWAYS PER IFC 2012 605.11.3.2.1-5

RIDGE TO ARRAY: 3'-0"
EAVE TO ARRAY: 3'-0"
HIP/VALLEY W/ ADJACENT ARRAY: 1'-6"
EACH SIDE
HIP/VALLEY W/O ADJACENT ARRAY: 0'-0"

MODULES:

LG MONOX :LG300S1C-A5

MODULE DIMS:

66.37"x40"x1.57"

LAG SCREWS:

5/16" x 3.5": 2.5" MIN EMBEDMENT

NOTE:

INSTALLER TO VERIFY RAFTER SIZE, SPACING AND SLOPED SPANS, AND NOTIFY ANY DISCREPANCIES BEFORE PROCEEDING.

PV MODULE SPECIFICATIONS			PV INVERTER SPECIFICATIONS		
MODEL NUMBER	LG300S1C-A5		MODEL NUMBER	M250-60-2LL-S22	
MODULE POWER @ STC	300	Watts	POWER RATING	250	W AC
Voc(Open Circuit Voltage)	38.9	Volts DC	MAX OUTPUT CURRENT	1	Amps
Vmp(Max Power Voltage)	31.7	Volts DC	CEC WEIGHTED EFFICIENCY	96.50%	
Isc(Short Circuit Current)	10.07	Amps	MAX # OF MICRO-INVERTER PER BRANCH	16	
Imp(Max Power Current)	9.47	Amps	MAX DC VOLTAGE	48	Volts

ALLOWABLE BACKFEED

INVERTER OVERCURRENT PROTECTION = INVERTER OUTPUT x CONTINUOUS LOAD x #NO OF INVERTER

= 1Ax1.25x33

= 41.3A

PV BREAKER = 50A

MAIN CIRCUIT BREAKER = 175A

MAIN PANEL RATING = 200A

120% X MAIN PANEL RATING -MAIN CIRCUIT BREAKER = 65A

TOTAL REQUIRED PV BREAKER SIZE = 50A

65A >= 50A

THE DESIGNED INTERCONNECTION MEETS THE 705.12(D)(2) REQUIREMENTS



CONDUIT SCHEDULE				
TAG ID	CONDUIT SIZE	CONDUCTOR	NEUTRAL	GROUND
1	FREE AIR	(2) 12AWG ENGAGE CABLE PER BRANCH CIRCUIT	(1) 12AWG ENGAGE CABLE PER BRANCH CIRCUIT	(1) 12AWG ENGAGE CABLE
2	3/4" EMT OR EQUIV	(6) 10AWG THHN/THWN-2	(3) 10AWG THHN/THWN-2	(1) 10AWG THHN/THWN-2
3	3/4" EMT OR EQUIV	(2) 6AWG THHN/THWN-2	(1) 6AWG THHN/THWN-2	(1) 8AWG THHN/THWN-2

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ENGINEER OF RECORD

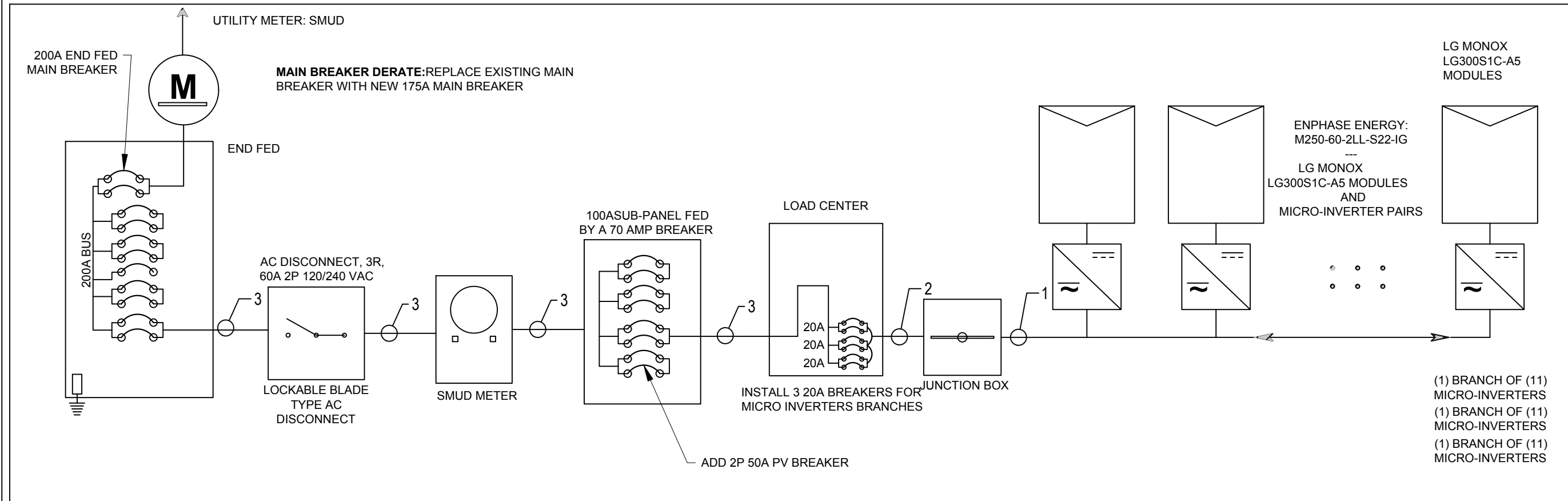
REVISIONS

ID	DATE	REV

SINGLE LINE DIAGRAM

DESIGNER: PC
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SCALE: AS NOTED

SINGLE LINE DIAGRAM



AC WIRE CALCULATIONS

TAG ID	CIRCUIT ORIGIN	CIRCUIT DESTINATION	CONDUCTOR SPECIFICATIONS				REQUIRED CONDUCTOR AMPACITY				TERMINAL RATING CHECK		CORRECTED AMPACITY CALCULATION				DERATED CONDUCTOR AMPACITY CHECK											
			MATERIAL	TEMP. RATING	TRADE SIZE	AMPACITY @ 30°C PER 310.15(B)(16)	INVERTER OUTPUT CURRENT	x	NUMBER OF INVERTER	=	MAX CURRENT PER 690.8(A)(3)	x	125% PER 690.8(B)(2)(a)	=	MAX CURRENT PER 690.8(B)(2)(a)	MAX CURRENT PER 690.8(B)(2)(a)	<	TERMINAL RATING @ 60°C	AMPACITY	x	TEMP DERATE	x	CONDUIT FILL DERATE	=	DERATED CONDUCTOR AMPACITY	MAX CURRENT PER 690.8(B)(2)(a)	<	DERATED CONDUCTOR AMPACITY
1	MICRO-INVERTER	JUNCTION BOX	COPPER	90°C	12	30	1	x	11	=	11.0A	x	1.25	=	13.8A	13.8A	<	20	30	x	0.87	x	0.8	=	20.9A	13.8A	<	20.9A
2	JUNCTION BOX	COMBINER BOX	COPPER	90°C	10	40	1	x	11	=	11.0A	x	1.25	=	13.8A	13.8A	<	30	40	x	0.87	x	0.5	=	17.4A	13.8A	<	17.4A
3	COMBINER BOX	PV BREAKER	COPPER	90°C	6	75	1	x	33	=	33.0A	x	1.25	=	41.3A	41.3A	<	55	75	x	0.87	x	0.8	=	52.2A	41.3A	<	52.2A

PHOTOVOLTAIC SYSTEM AC DISCONNECT
 RATED AC OPERATING CURRENT 41.3 AMPS
 AC NOMINAL OPERATING VOLTAGE 240 VOLTS

LABEL LOCATION
 AC DISCONNECT , POINT OF INTERCONNECTION
 [PER CODE: CEC 690.54]

WARNING
 INVERTER OUTPUT CONNECTION
 DO NOT RELOCATE THIS
 OVER-CURRENT DEVICE

LABEL LOCATION
 POINT OF INTERCONNECTION
 (PER CODE: CEC 705.12(D)(7))
 [Not Required if Panel board is rated not less than sum of
 ampere ratings of all overcurrent devices supplying it]

SOLAR DISCONNECT

LABEL LOCATION
 DISCONNECT, POINT OF INTERCONNECTION
 [PER CODE: CEC690.13(B)]

**PHOTOVOLTAIC SYSTEM
 EQUIPPED WITH RAPID
 SHUTDOWN**

LABEL LOCATION
 AC DISCONNECT , DC DISCONNECT, POINT OF
 INTERCONNECTION
 (PER CODE: CEC690.56(C))

WARNING-Electric Shock Hazard
 No User Serviceable Parts inside
 Contact authorized service provide for
 assistance

LABEL LOCATION
 INVERTER, JUNCTION BOXES(ROOF),
 AC DISCONNECT
 [PER CODE: CEC 690.13.G.3 & CEC 690.13.G.4]

**WARNING:PHOTOVOLTAIC
 POWER SOURCE**

LABEL LOCATION
 CONDUIT, COMBINER BOX
 [PER CODE: CEC690.31(G)(3)(4) & CEC 690.13(G)(4)]

**BREAKER HAS BEEN DE-RATED
 PER NEC 690.64(B) (2)**

LABEL LOCATION
 MAIN PANEL
 (PER CODE: NEC 690.64(B)(2))

WARNING
ELECTRIC SHOCK HAZARD
 THE DC CONDUCTORS OF THIS PHOTOVOLTAIC
 SYSTEM ARE UNGROUNDED AND MAY BE
 ENERGIZED

LABEL LOCATION
 DC DISCONNECT, INVERTER
 [PER CODE: CEC 690.35(F)]
 [To be used when inverter is ungrounded]

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

DC VOLTAGE IS ALWAYS PRESENT WHEN SOLAR
 MODULES ARE EXPOSED TO SUNLIGHT

LABEL LOCATION
 AC DISCONNECT, POINT OF INTERCONNECTION
 [PER CODE: CEC 690.17(E)]

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

LABEL LOCATION
 AC DISCONNECT, POINT OF INTERCONNECTION
 [PER CODE: CEC 690.17(E)]

CAUTION: SOLAR CIRCUIT

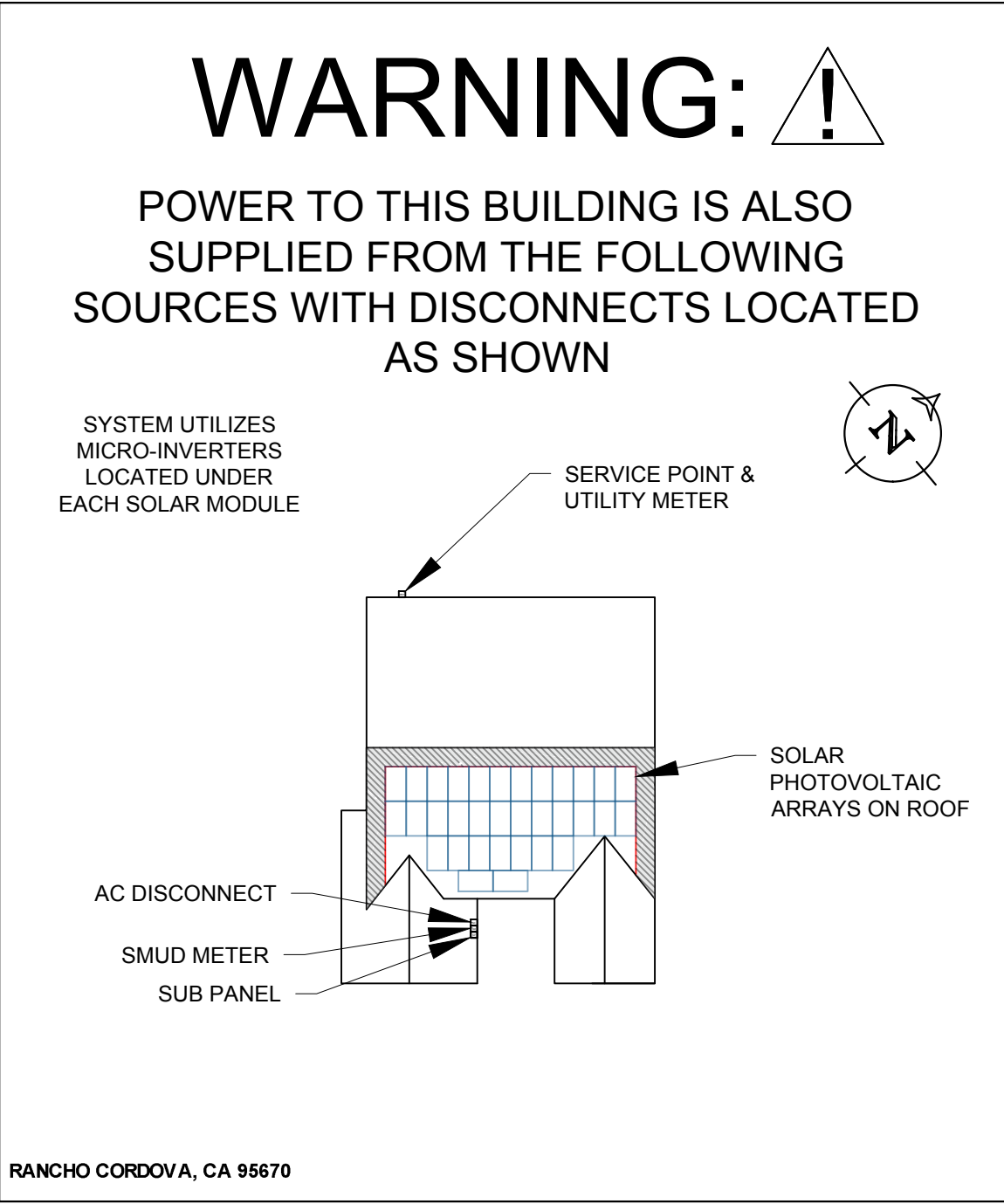
LABEL LOCATION
 MARKINGS PLACED ON ALL INTERIOR AND EXTERIOR DC CONDUIT,
 RACEWAYS, ENCLOSURES AND CABLE ASSEMBLES AT LEAST EVERY
 10 FT, AT TURNS AND ABOVE/BELOW PENETRATIONS AND ALL
 COMBINER/JUNCTION BOXES.
 (PER CODE: IFC605.11.1.4)

WARNING
 DUAL POWER SOURCE SECOND
 SOURCE IS PHOTOVOLTAIC SYSTEM

LABEL LOCATION
 POINT OF INTERCONNECTION
 [PER CODE: CEC705.12(D)(4)]

**CAUTION: SOLAR ELECTRIC
 SYSTEM CONNECTED**

LABEL LOCATION
 WEATHER RESISTANT MATERIAL, DURABLE ADHESIVE,
 UL969 AS STANDARD TO WEATHER RATING (UL LISTING
 OF MARKINGS NOT REQUIRED), MIN 3/8" LETTER HEIGHT
 ARIAL OR SIMILAR FONT NON-BOLD, PLACED WITHIN
 THE MAIN SERVICE DISCONNECT, PLACED ON THE
 OUTSIDE OF THE COVER WHEN DISCONNECT IS
 OPERATED WITH THE SERVICE PANEL CLOSED.
 (PWER CODE: CEC690.15 ,690.13(B))



ALL PLACARDS SHALL BE OF WEATHER PROOF CONSTRUCTION, BACKGROUND ON ALL PLACARDS SHALL BE RED WITH WHITE LETTERING U.O.N.
 PLACARD SHALL BE MOUNTED DIRECTLY ON THE EXISTING UTILITY ELECTRICAL SERVICE.
 FASTENERS APPROVED BY THE LOCAL JURISDICTION



CLIENT INFO

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 RANCHO CORDOVA, CA 95670

PRN NO: YHI-000462

ENGINEER OF RECORD

REVISIONS

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WARNING PLACARDS

DESIGNER: PC
 CHECKED BY: RR
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 SCALE: AS NOTED

LG MonoX[®] Plus

LG MonoX[®] Plus



LG MonoX[®] Plus

LG300S1C-A5 | LG295S1C-A5
LG290S1C-A5

60 Cells

LG MonoX[®] Plus is LG Electronics' high-quality monocrystalline module. The quality is the result of our strong commitment to developing a module to improve benefits for customers. Features of MonoX[®] Plus include durability, convenient installation, and aesthetic exterior.



KEY FEATURES

Enhanced Performance Warranty
LG Mono X[®] Plus has an enhanced performance warranty. The initial degradation of cells has been improved from -3% to -2%, and the annual rate of degradation has fallen from -0.6%/yr to -0.55%/yr.

Reduced LID
LG Mono X[®] Plus has reduced the initial degradation of solar cells by applying LG's new LiLY (LiD-improvement for Lifetime Yield) Technology, which controls the reaction of Boron and Oxygen, the main cause of LiD (Light Induced Degradation).

Improved Product Warranty
As well as the enhanced performance warranty, LG has extended the product warranty of the LG Mono X[®] Plus for an additional 2 years.

Light and Convenient
LG Mono X[®] Plus has been carefully designed. It weighs just 18kg (39.68 lb) and has better grips that allow for quick installation.

About LG Electronics
LG Electronics is a global big player, committed to expanding its operations with the solar market. The company first embarked on a solar energy source research program in 1985, supported by LG Group's vast experience in the semi-conductor, LCD, chemistry and materials industries. In 2010, LG Solar successfully released its first MonoX[®] series to the market, which is now available in 32 countries. The NeON[®] (previous MonoX[®] NeON), NeON², NeON² BiFacial won the "Intersolar AWARD" in 2013, 2015 and 2016, which demonstrates LG Solar's lead, innovation and commitment to the industry.

Mechanical Properties

Cells	6 x 10
Cell Vendor	LG
Cell Type	Monocrystalline / P-type
Cell Dimensions	161.7 x 161.7 mm
# of Busbar	4
Dimensions (L x W x H)	1.686 x 1.016 x 40 mm
Static Load	6.000Pa (snow load) 5.400Pa (wind load)
Weight	18.0 kg
Connector Type	MC4, JM601A
Junction Box	IP68 with 3 Bypass Diodes
Length of Cables	2 x 1.000 mm
Glass	High Transmission Tempered Glass
Frame	Anodized Aluminium

Certifications and Warranty

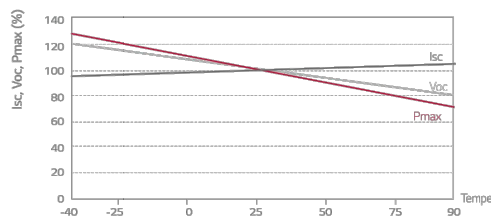
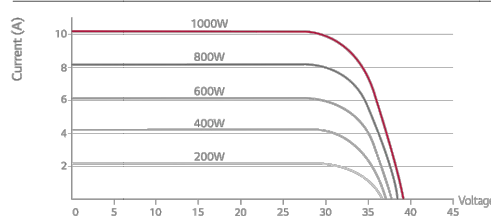
Certifications	IEC 61215, IEC 61730-1/-2
	IEC TS 62804-1 (PID)
	IEC 61701 (Salt mist corrosion test)
	IEC 62716 (Ammonia corrosion test)
ISO 9001	
Module Fire Performance	Class C, Fire Class 1 (Italy) ²
Product Warranty	12 Years
Output Warranty of Pmax (Measurement Tolerance ±3%)	Linear Warranty ³

² In progress
³ 1) 1st year: 98% 2) after 2nd year: 0.55%p annual degradation 3) 84.8% for 25 years

Temperature Characteristics

NOCT	[°C]	45 ± 3
Pmax	[%/°C]	-0.41
Voc	[%/°C]	-0.30
Isc	[%/°C]	0.03

Characteristic Curves



Electrical Properties (STC¹)

Model	LG300S1C-A5	LG295S1C-A5	LG290S1C-A5
Maximum Power (Pmax)	[W] 300	295	290
MPP Voltage (Vmpp)	[V] 31.7	31.3	31.0
MPP Current (Impp)	[A] 9.47	9.43	9.36
Open Circuit Voltage (Voc)	[V] 38.9	38.6	38.3
Short Circuit Current (Isc)	[A] 10.07	10.02	9.97
Module Efficiency	[%] 17.5	17.2	16.9
Operating Temperature	[°C]	-40 ~ +90	
Maximum System Voltage	[V]	1.000	
Maximum Series Fuse Rating	[A]	20	
Power Tolerance	[%]	0 ~ +3	

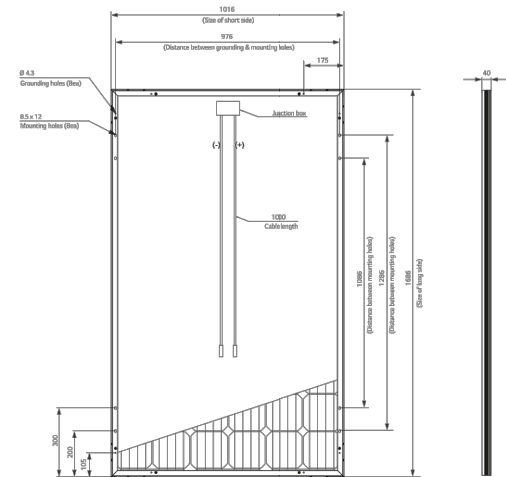
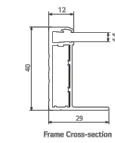
¹ STC (Standard Test Condition): Irradiance 1000 W/m², module temperature 25 °C, AM 1.5.
² The typical change in module efficiency at 200 W/m² in relation to 1000 W/m² is -4.5%.
³ Application Class: A, Safety Class: II
⁴ The nameplate power output is measured and determined by LG Electronics at its sole and absolute discretion.

Electrical Properties (NOCT⁵)

Model	LG300S1C-A5	LG295S1C-A5	LG290S1C-A5
Maximum Power (Pmax)	[W] 220	216	212
MPP Voltage (Vmpp)	[V] 29.1	28.7	28.4
MPP Current (Impp)	[A] 7.56	7.53	7.47
Open Circuit Voltage (Voc)	[V] 36.0	35.7	35.4
Short Circuit Current (Isc)	[A] 8.10	8.06	8.02

⁵ NOCT (Nominal Operating Cell Temperature): Irradiance 800 W/m², ambient temperature 20°C, wind speed 1 m/s

Dimensions (mm)



* The distance between the center of the mounting/grounding holes.



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www.lg-solar.com/uk

All details in this data sheet comply with DIN EN 50380.
Subject to errors and alterations.
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CLIENT INFO

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RANCHO CORDOVA, CA 95670

PRN NO: YHI-000462

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REVISIONS

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MODULE SPEC SHEET

DESIGNER: PC
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SS-1

Enphase M250

The versatile **Enphase M250 Microinverter™** performs in both residential and commercial solar PV installations and is compatible with both 60-cell and 72-cell modules. With its all-AC approach and integrated grounding, the M250 delivers increased energy harvest and reduces design and installation complexity.

The Enphase M250 Microinverter integrates seamlessly with the Enphase Engage™ Cable, the Enphase Envoy™ communications gateway, and Enphase Enlighten™ monitoring and analysis software.

Productive

- Designed for a wide range of modules
- Maximizes energy production
- Minimizes impact of shading, dust, and debris

Simple

- No DC design or string calculation required
- No GEC needed for microinverter
- Easy installation with Engage cable

Reliable

- 4th-generation product
- More than 1 million hours of testing and millions of units shipped
- Industry-leading warranty, up to 25 years



Enphase M250 Microinverter

INPUT DATA (DC)	MODELS: M250-60-2LL-S22, M250-60-2LL-S25	MODELS: M250-72-2LL-S22, M250-72-2LL-S25
Commonly used module pairings ¹	210 - 350+ W	210 - 350+ W
Compatibility	60-cell PV modules	60-cell and 72-cell PV modules
Maximum input DC voltage	48 V	62 V
Peak power tracking voltage	27 V - 39 V	27 V - 48 V
Operating range	16 V - 48 V	16 V - 60V
Min/Max start voltage	22 V / 48 V	22 V / 48 V
Max DC short circuit current	15 A	15 A
OUTPUT DATA (AC)		
Peak output power	250 W	
Maximum continuous output power	240 W	
Nominal output current	1.15 A @ 208 VAC 1.0 A @ 240 VAC	
Nominal voltage/range	208 V / 183-229 V @ 208 VAC 240 V / 211-264 V @ 240 VAC	
Nominal frequency/range	60.0 / 57-61 Hz	
Extended frequency range ²	57-62.5 Hz	
Power factor	>0.95	
Maximum units per 20 A branch circuit	24 (three-phase 208 VAC) 16 (single phase 240 VAC)	
Maximum output fault current	850 mA rms for 6 cycles	
EFFICIENCY		
CEC weighted efficiency	96.5%	
Peak inverter efficiency	96.5%	
Static MPPT efficiency (weighted, reference EN50530)	99.4%	
Night time power consumption	65 mW max	
MECHANICAL DATA		
Ambient temperature range	-40°C to +65°C	
Dimensions (WxHxD)	171 mm x 173 mm x 30 mm (without mounting bracket)	
Weight	1.5 kg (3.4 lbs)	
Cooling	Natural convection - No fans	
Enclosure environmental rating	Outdoor - NEMA 6	
Connector type	MC4: M250-60-2LL-S22 and M250-72-2LL-S22 Amphenol H4: M250-60-2LL-S25 and M250-72-2LL-S25	
FEATURES		
Communication	Power line	
Integrated ground	The DC circuit meets the requirements for ungrounded PV arrays in NEC 690.35. Equipment ground is provided in the Engage Cable. No additional GEC or ground is required. Ground fault protection (GFP) is integrated into the microinverter.	
Monitoring	Enlighten Manager and MyEnlighten monitoring options	
Transformer design	High frequency transformers, galvanically isolated	
Compliance	UL 2703 recognized, UL1741/IEEE1547, FCC Part 15 Class B, CAN/CSA-C22.2 NO. 0-M91, 0.4-04, and 107.1-01 This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC-2014 and NEC-2017 section 690.12 and C22.1-2015 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according manufacturer's instructions.	

1. No enforced DC/AC ratio. See the compatibility calculator at enphase.com/en-us/support/module-compatibility.
2. Frequency ranges can be extended beyond nominal if required by the utility.

To learn more about Enphase offerings, visit enphase.com

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CLIENT INFO

XXX
RANCHO CORDOVA, CA 95670

PRN NO: YHI-000462

ENGINEER OF RECORD

REVISIONS

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INVERTER SPEC SHEET

DESIGNER: PC
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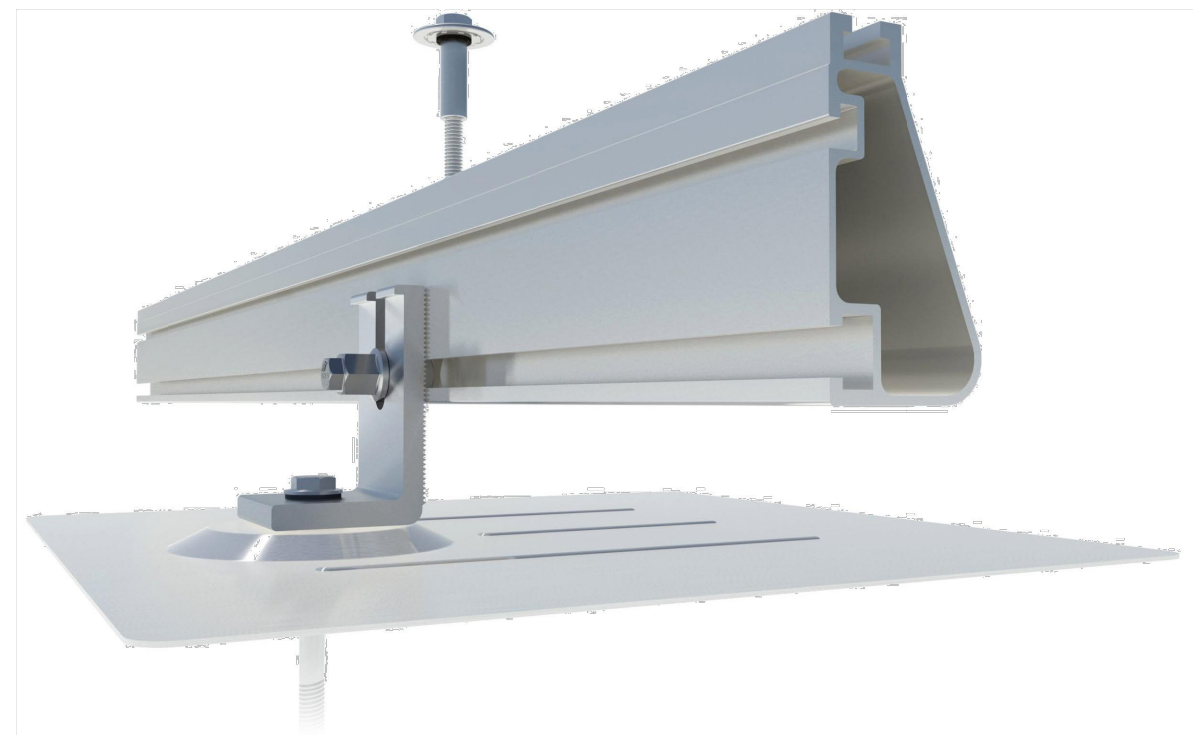
SS-2





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
 Meets newest effective UL 2703 standard.

20-Year Warranty
 Twice the protection offered by competitors.

Datasheet

XR Rails

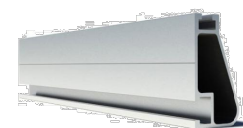
XR10 Rail



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

- 6' spanning capability
- Moderate load capability
- Clear & black anod. finish

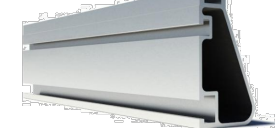
XR100 Rail



The ultimate residential solar mounting rail.

- 8' spanning capability
- Heavy load capability
- Clear & black anod. 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 & black finish

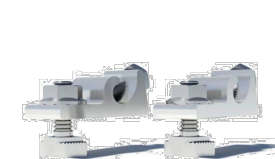
Stopper Sleeves ⊕



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

- Bonds modules to rails
- 6 different sizes
- Clear & black anod. finish

Grounding Lugs ⊕



Connects array to equipment ground.

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

Microinverter Kit ⊕



Mount MIs or POs to XR Rails.

- Bonds devices to rails
- Kit comes assembled
- Listed to UL 2703

Attachments

FlashFoot



Anchor, flash, and mount with all-in-one attachments.

- Ships with all hardware
- IBC & IRC compliant
- Certified with XR Rails

Bonded L-Feet ⊕



Drop-in design for rapid rail attachment.

- Bonding hardware included
- Forms secure rail connection
- Clear & black anod. finish

Standoffs



Raise Flush Mount System to various heights.

- Works with vent flashing
- Ships assembled
- 4" and 7" Lengths

Resources



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



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

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SS-3



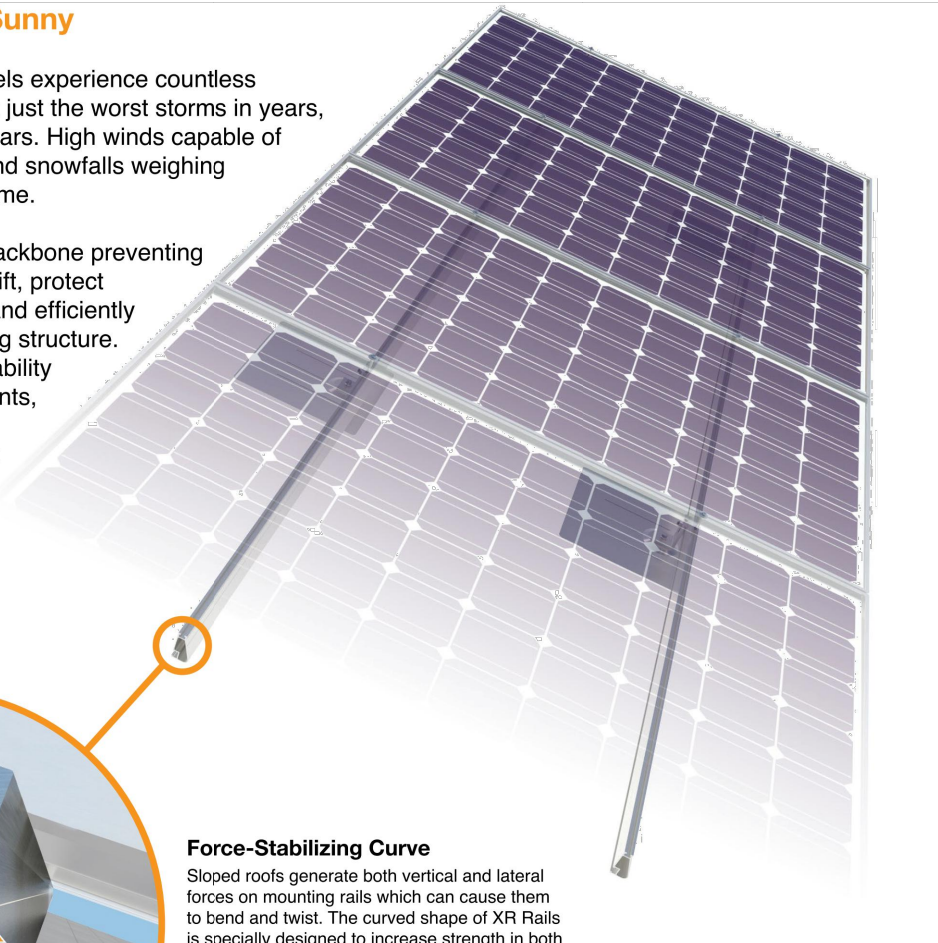
Tech Brief

XR Rail Family

Solar Is Not Always Sunny

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

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



Force-Stabilizing Curve

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

Compatible with Flat & Pitched Roofs



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



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

Corrosion-Resistant Materials

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



XR Rail Family

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

Tech Brief



XR10

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

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



XR100

XR100 is the ultimate residential mounting rail. It supports a range of wind and snow conditions, while also maximizing spans up to 8 feet.

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



XR1000

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

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

Rail Selection

The following table was prepared in compliance with applicable engineering codes and standards. Values are based on the following criteria: ASCE 7-10, Roof Zone 1, Exposure B, Roof Slope of 7 to 27 degrees and Mean Building Height of 30 ft. Visit IronRidge.com for detailed span tables and certifications.

Load		Rail Span					
Snow (PSF)	Wind (MPH)	4'	5' 4"	6'	8'	10'	12'
None	100						
	120						
	140	XR10		XR100		XR1000	
	160						
10-20	100						
	120						
	140						
30	100						
	160						
40	100						
	160						
50-70	160						
80-90	160						

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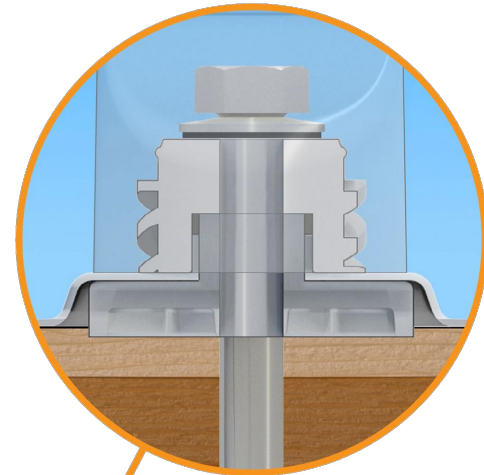
Tech Brief



FlashFoot2

The Strongest Attachment in Solar

IronRidge FlashFoot2 raises the bar in solar roof protection. The unique water seal design is both elevated and encapsulated, delivering redundant layers of protection against water intrusion. In addition, the twist-on Cap perfectly aligns the rail attachment with the lag bolt to maximize mechanical strength.

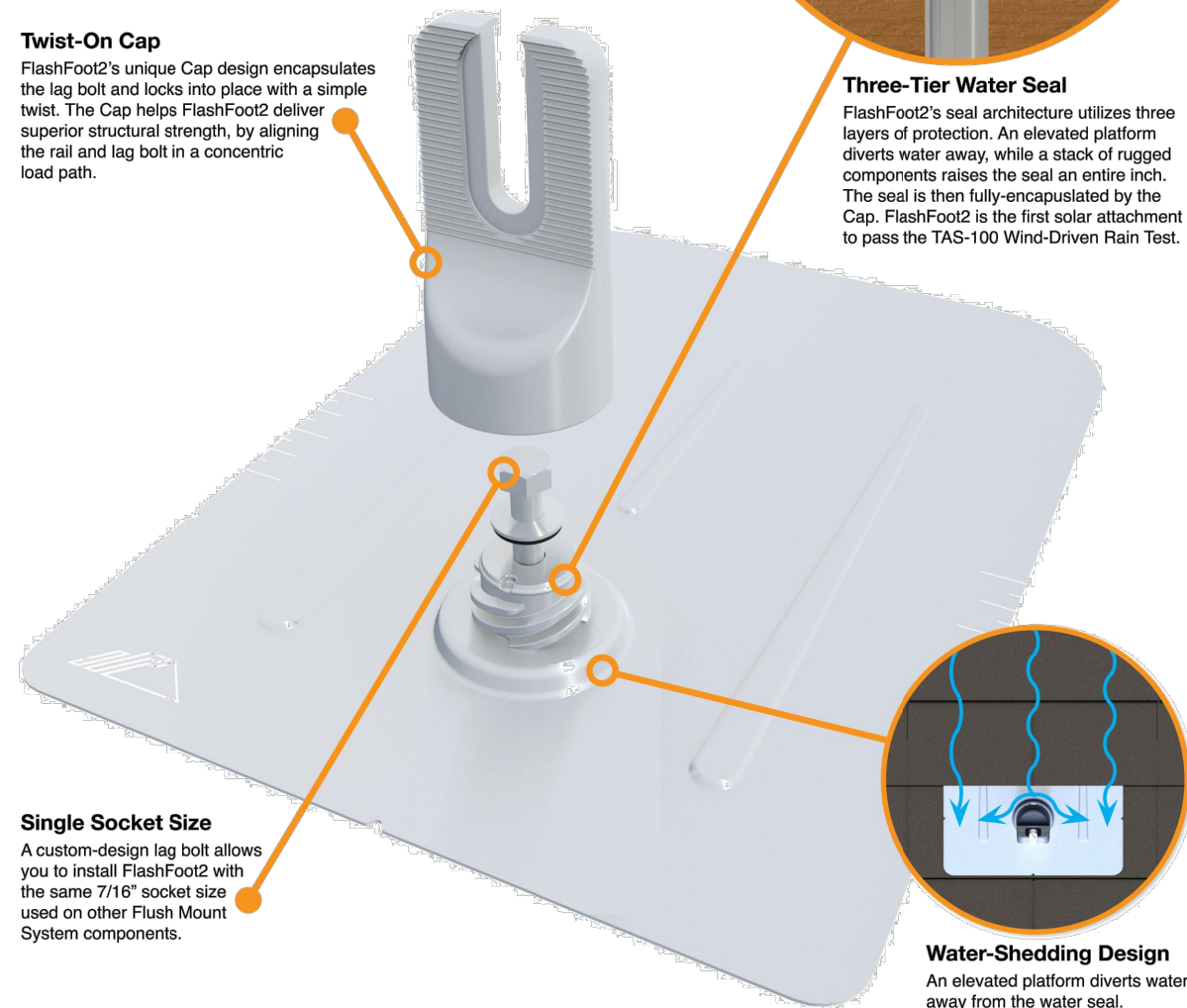


Twist-On Cap

FlashFoot2's unique Cap design encapsulates the lag bolt and locks into place with a simple twist. The Cap helps FlashFoot2 deliver superior structural strength, by aligning the rail and lag bolt in a concentric load path.

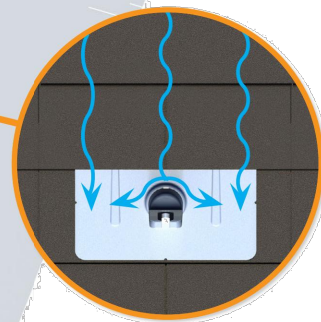
Three-Tier Water Seal

FlashFoot2's seal architecture utilizes three layers of protection. An elevated platform diverts water away, while a stack of rugged components raises the seal an entire inch. The seal is then fully-encapsulated by the Cap. FlashFoot2 is the first solar attachment to pass the TAS-100 Wind-Driven Rain Test.



Single Socket Size

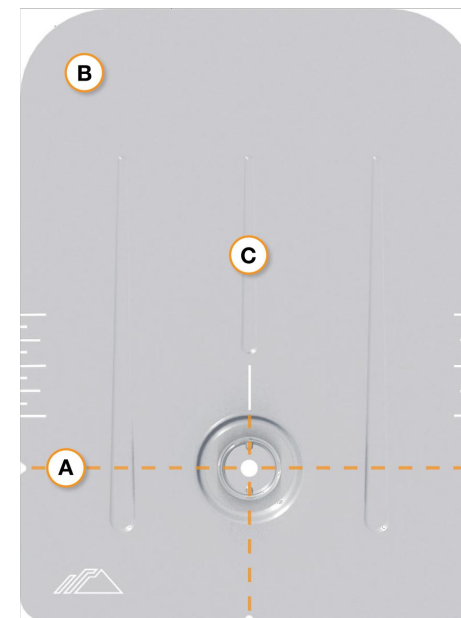
A custom-design lag bolt allows you to install FlashFoot2 with the same 7/16" socket size used on other Flush Mount System components.



Water-Shedding Design

An elevated platform diverts water away from the water seal.

Installation Features



A Alignment Markers

Quickly align the flashing with chalk lines to find pilot holes.

B Rounded Corners

Makes it easier to handle and insert under the roof shingles.

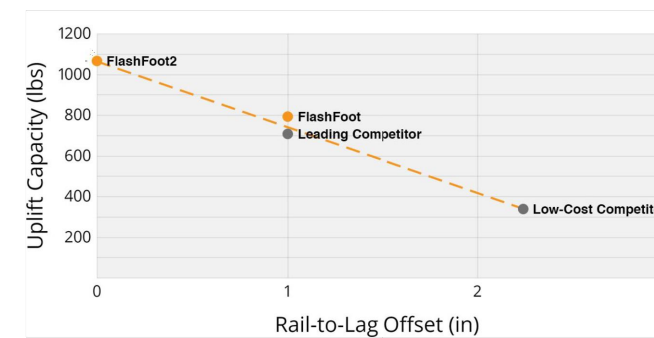
C Reinforcement Ribs

Help to stiffen the flashing and prevent any bending or crinkling during installation.

Benefits of Concentric Loading

Traditional solar attachments have a horizontal offset between the rail and lag bolt, which introduces leverage on the lag bolt and decreases uplift capacity.

FlashFoot2 is the only product to align the rail and lag bolt. This concentric loading design results in a stronger attachment for the system.



Testing & Certification

Structural Certification

Designed and Certified for Compliance with the International Building Code & ASCE/SEI-7.

Water Seal Ratings

Water Sealing Tested to UL 441 Section 27 "Rain Test" and TAS 100-95 "Wind Driven Rain Test" by Intertek. Ratings applicable for composition shingle roofs having slopes between 2:12 and 12:12.

UL 2703

Conforms to UL 2703 Mechanical and Bonding Requirements. See Flush Mount Install Manual for full ratings.

Tech Brief

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SS-5

Rapid shutdown is built-in

The 2014 edition of the National Electrical Code (NEC 2014) 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.

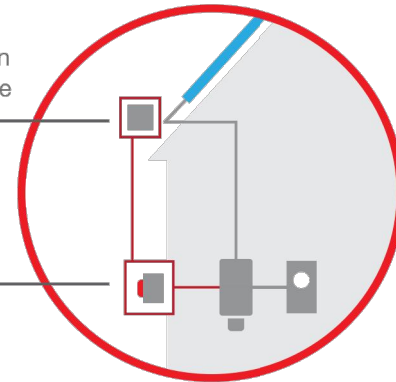
What's new in NEC 2014?
NEC 2014, Section 690.12 applies to PV conductors over 10 feet from the PV array and requires that the conductors power down to 30 volts and 240 volt-amperes within 10 seconds of rapid shutdown initiation.

String inverters require work arounds for rapid shutdown

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

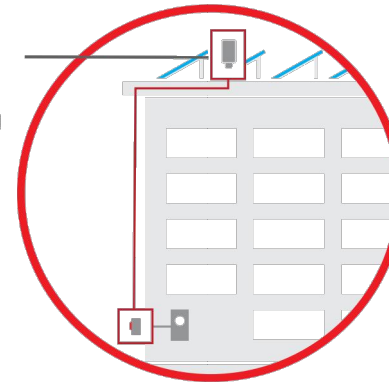
Work around.
Shutoff switch that is easily accessible to first responders on the ground.

Work around.
Extra conduit in installation.



Residential String Inverter

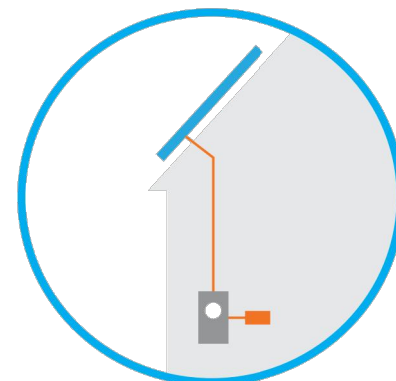
Work around.
String inverter installed on roof, a hostile environment that string inverters are not built to live in.



Commercial String Inverter

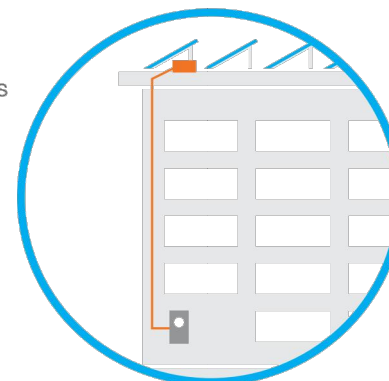
Enphase comes standard with rapid shutdown capability

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



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