2.87 kW ROOF MOUNTED PHOTOVOLTAIC SYSTEM
SHINGLER RESIDENCE

SCOPE OF WORK:

INSTALLING A ROOF MOUNTED 2.87 kW PHOTOVOLTAIC SYSTEM CONSISTING OF 7 MODULES.

ALL APPLICABLE GOVERNING CODES:

1. 2025 CALIFORNIA ELECTRIC CODE
2. 2025 CALIFORNIA BUILDING CODE
3. 2025 CALIFORNIA FIRE CODE
4. 2025 CALIFORNIA RESIDENTIAL CODE
5. 2025 CALIFORNIA GREEN CODE
6. 2025 CALIFORNIA PLUMBING CODE
7. 2025 CALIFORNIA MECHANICAL CODE
8. 2025 CALIFORNIA ENERGY CODE
9. ANY OTHER LOCAL AMENDMENTS AS REQUIRED

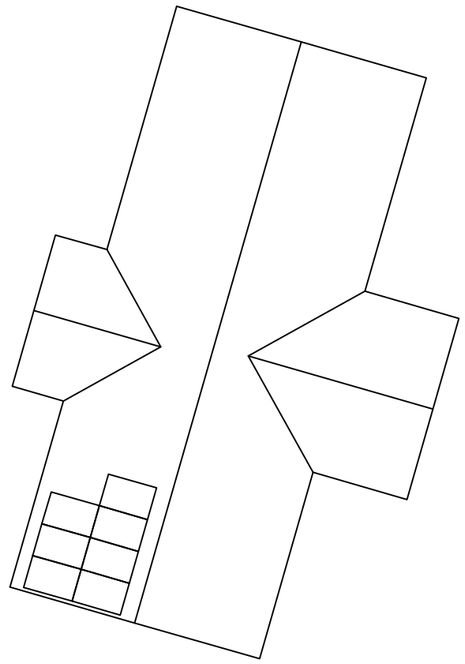
SYSTEM SPECIFICATIONS:

MODULE MANUFACTURER:	LONGI
MODULE TYPE:	LR5-54HABB-400M
MODULE COUNT:	7
INVERTER MANUFACTURER:	ENPHASE
INVERTER MODEL:	IQ8+
BATTERY BACKUP:	0
AZIMUTH:	286°
PITCH:	20°
MOUNTING SYSTEM:	SNAPNRACK UR-45
SYSTEM FIRE RATING:	CLASS A

GENERAL NOTES:

- SOLAR PHOTOVOLTAIC SYSTEM SHALL BE INSTALLED IN ACCORDANCE WITH CEC ARTICLE 690, AND ALL OTHER APPLICABLE CODES WHERE NECESSARY.
- PROPER ACCESS AND WORKING CLEARANCE AROUND EXISTING AND PROPOSED ELECTRICAL EQUIPMENT WILL COMPLY WITH CEC ARTICLE 110.
- ALL CONDUCTORS, INCLUDING THE GROUND ELECTRODE CONDUCTOR, SHALL BE PROTECTED FROM PHYSICAL DAMAGE IN ACCORDANCE WITH CEC ARTICLE 250
- ALL DC WIRES SHALL BE SIZED ACCORDING TO CEC 690.8
- DC CONDUCTORS SHALL BE WITHIN PROTECTED RACEWAYS IN ACCORDANCE WITH CEC 690.8
- ALL EQUIPMENT TO BE CERTIFIED BY A NATIONALLY RECOGNIZED TESTING LABORATORY.

SYSTEM PREVIEW:



VICINITY MAP:

UNAVAILABLE DUE TO NEW CONSTRUCTION

SATELLITE VIEW:

UNAVAILABLE DUE TO NEW CONSTRUCTION

INDEX:

PV 1:	COVER SHEET
PV 2:	PLOT PLAN
PV 3:	SITE PLAN
PV 4:	MOUNTING DETAILS
PV 5:	ELECTRICAL DIAGRAM
PV 6:	NOTES
PV 7:	STICKER CATALOG
PV 8:	SITE PLACARD
SP 1+:	EQUIPMENT SPEC SHEETS

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APN: 052-170-006-000

REVISIONS:

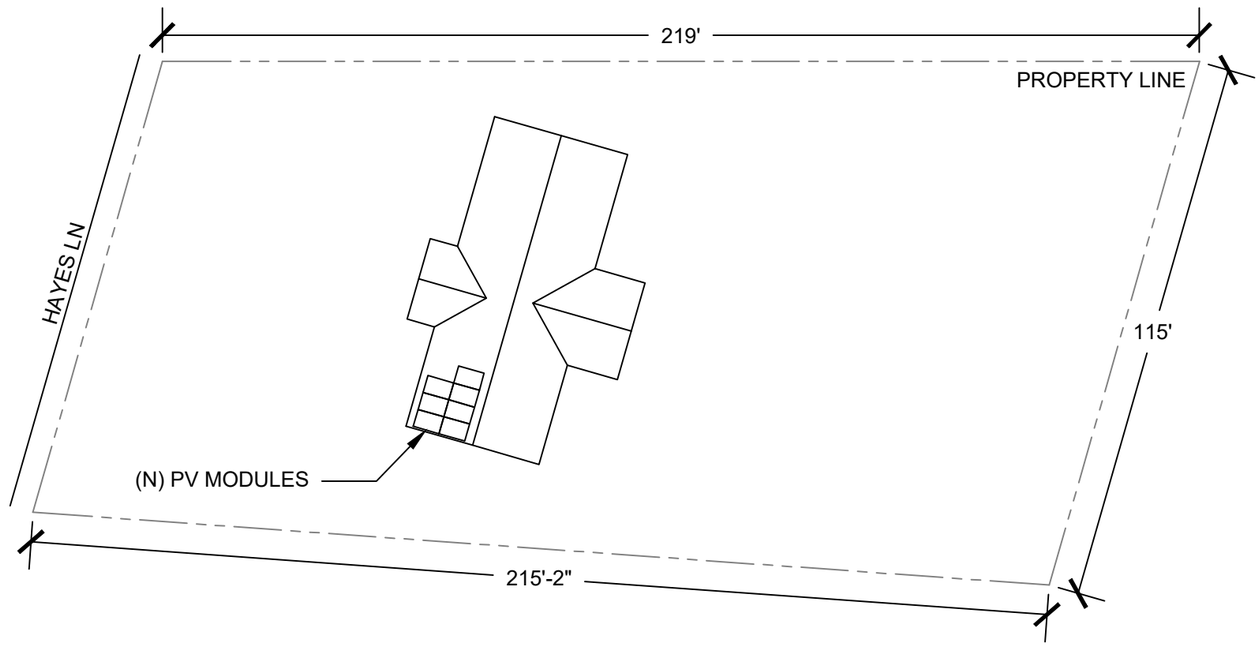
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SHEET TITLE:

COVER SHEET

SHEET NUMBER:

PV 1



NORTH

PLOT PLAN | SCALE 1/32" = 1'

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SHEET TITLE:

PLOT PLAN

SHEET NUMBER:

PV 2

MODULE INFORMATION

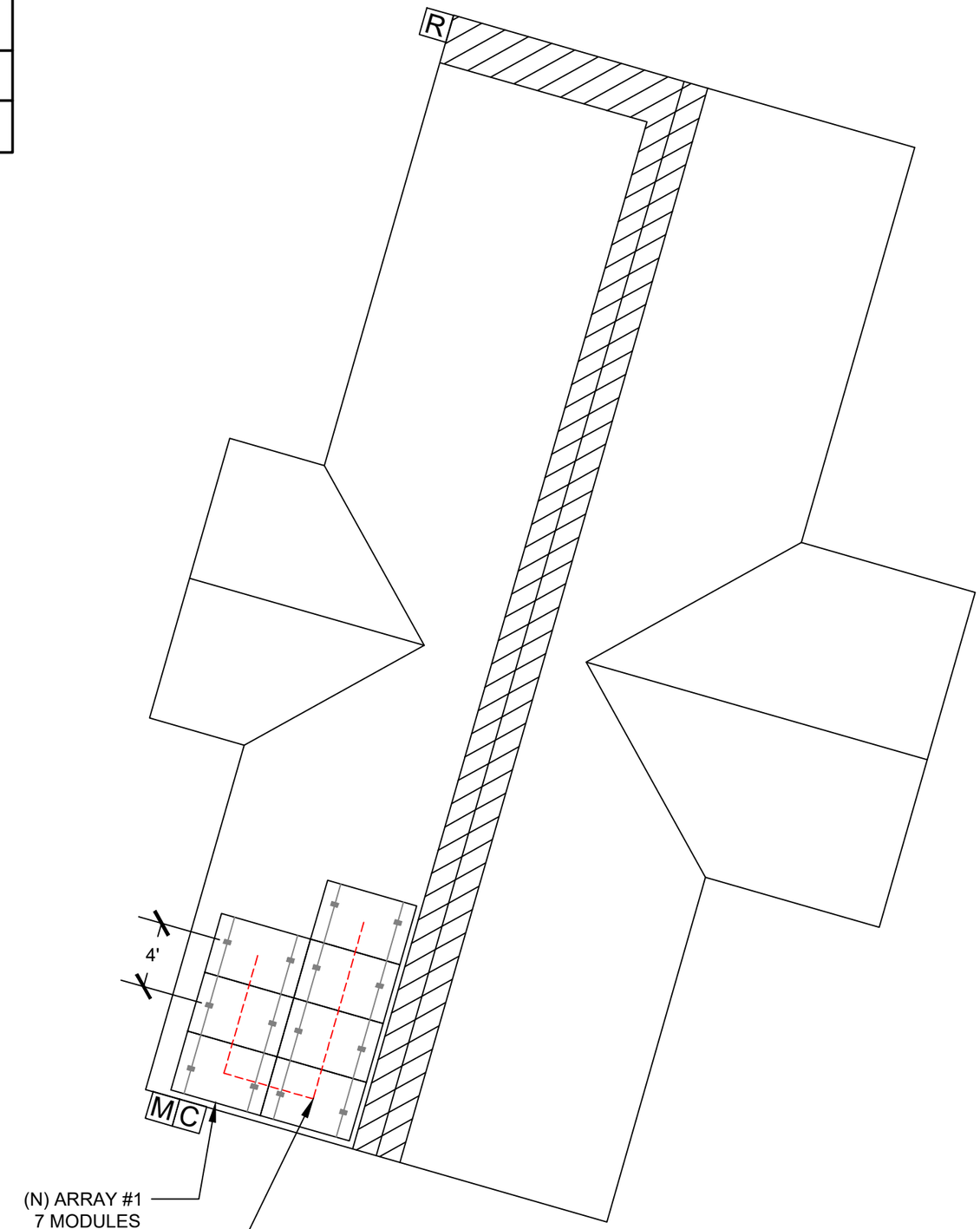
MODULE TYPE:	LR5-54HABB-400M
MODULE COUNT:	7
SYSTEM SIZE:	2.87

ARRAY INFORMATION

ARRAY 1	AZIMUTH:	286°
	PITCH:	20°

NOTES

1. CONTRACTOR TO VERIFY ALL DIMENSIONS AND OBSTRUCTIONS IN THE FIELD.
2. WHERE INDICATED ON PLAN, MIN. DIMENSIONS REQUIRED PER THE "SOLAR PV INSTALLATION GUIDELINE."
3. CONTRACTOR TO PROVIDE RAIL SPLICES AS REQUIRED BY MANUFACTURE'S GUIDELINES.
4. PV MODULE NOT TO BE INSTALLED OVER OR BLOCKING ATTIC VENTS, PLUMING VENTS, FURNACE VENTS, WATER HEATER VENTS, OR ANY OTHER OBSTRUCTION.
5. ALL CONDUIT SHALL BE RUN THROUGH THE ATTIC IF AVAILABLE.



NORTH

SITE PLAN | SCALE 1/8" = 1'

LEGEND

	3'-0" FIRE CODE OFFSET
	ATTACHMENT POINT
M	EXTERIOR MAIN SERVICE PANEL & POINT OF INTERCONNECTION
C	PHOTOVOLTAIC SYSTEM COMBINER BOX
R	ROOF ACCESS POINT

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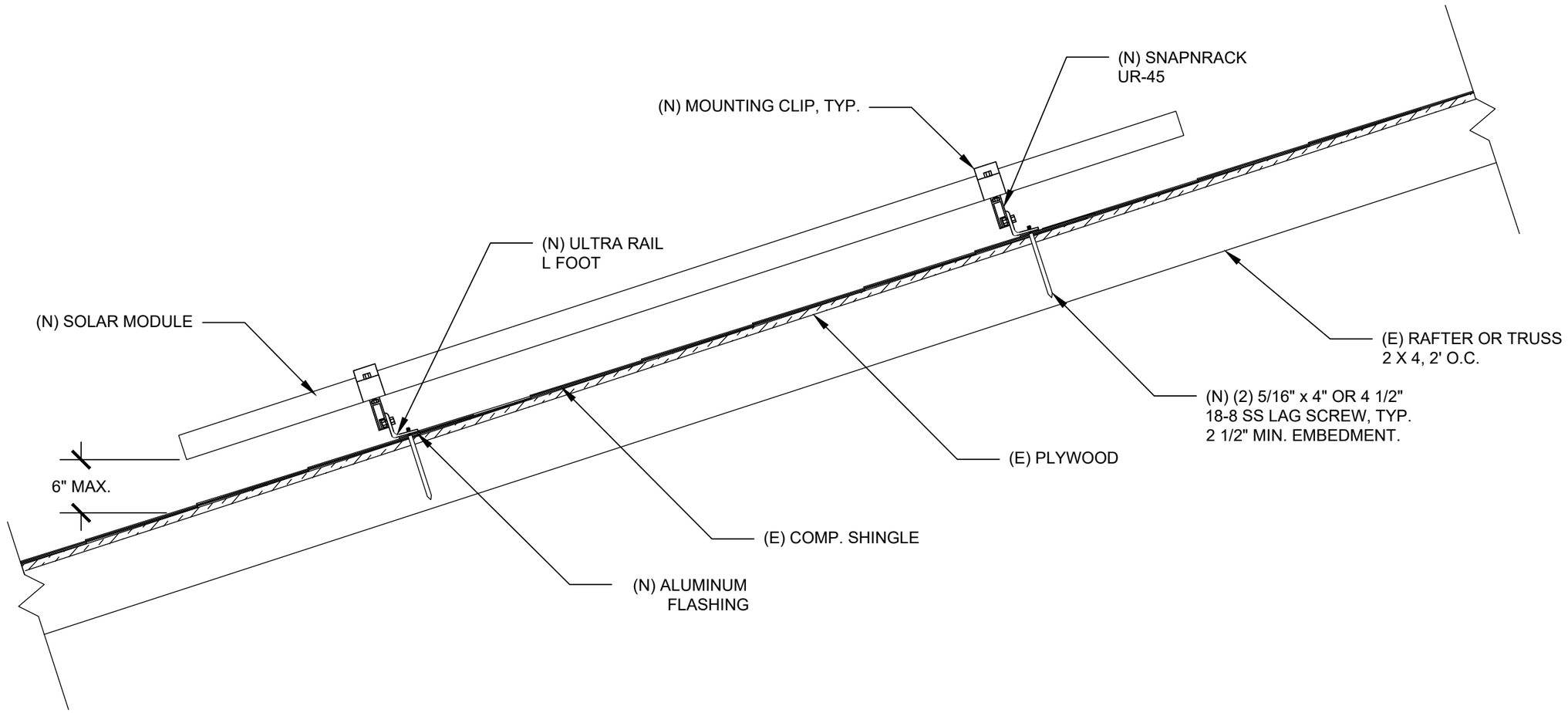
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SHEET TITLE:

SITE PLAN

SHEET NUMBER:

PV 3



ATTACHMENT INFO

RAILING:	SNAPNRACK UR-45
MOUNTING:	ULTRA RAIL L-FOOT

WEATHER LOADING

GROUND SNOW:	30 PSF
WIND SPEED:	95 MPH
PV ARRAY:	2.75 PSF
EXPOSURE CATEGORY:	C

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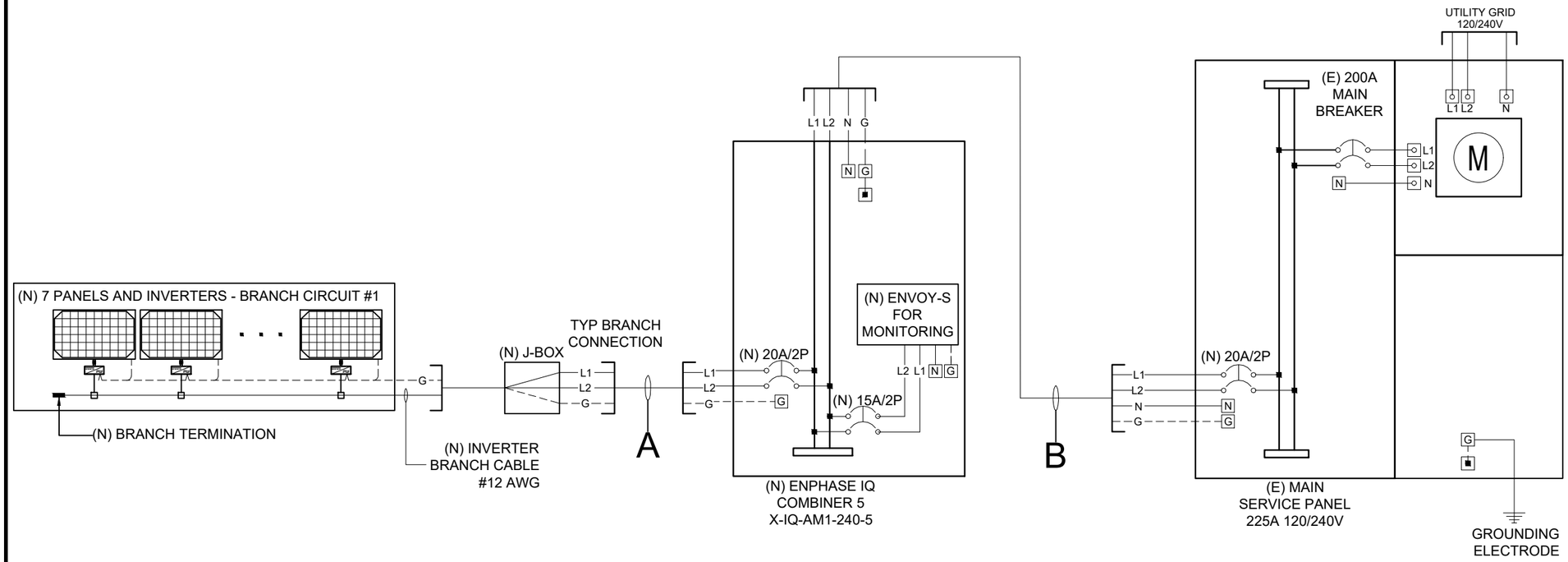
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SHEET TITLE:

MOUNTING DETAILS

SHEET NUMBER:

PV 4



PV MODULES

MANUFACTURER	LONGI
MODEL	LR5-54HABB-400M

ELECTRICAL SPECIFICATIONS @ STC	
NOMINAL MAX. POWER (Pmax)	400W
OPEN CIRCUIT VOLTAGE (Voc)	37.05V
MAX POWER VOLTAGE (Vmp)	30.94V
SHORT CIRCUIT CURRENT (Isc)	13.72A
MAX POWER CURRENT (Imp)	12.93A
CORRECTION FACTOR Voc (%/°C)	-0.265%
CORRECTION FACTOR Pmax (%/°C)	-0.340%

INVERTER

MANUFACTURER	ENPHASE
MODEL	IQ8PLUS-72-2-US [240V][SI1-SB]

ELECTRICAL SPECIFICATIONS @ STC	
RATED AC VOLTAGE	240V
CEC EFFICIENCY	97%
MAX POWER OUTPUT	290W
MAX INPUT VOLTAGE	60V
MAX INPUT CURRENT	15A
MPPT VOLTAGE RANGE	211V-264V
MAX OUTPUT CURRENT	1.21A

LOAD CALCULATIONS

7 MODULES x 1.21 (MAX OUTPUT CURRENT) = 8.47A
8.47A x 1.25 (SAFETY FACTOR) = 10.5875A
225A (BUS) x 1.2 (120 RULE) = 270A
270A - 200A (MAIN BREAKER) = 70A
70A > 10.5875A
THEREFORE THE EQUIPMENT CAN WITHSTAND THE LOAD OF THE PV SYSTEM

COMPONENT CONNECTION SCHEDULE

A	(2) #10 CU THWN (1) #8 CU GROUND IN EXTERIOR 3/4" EMT AC CONDUIT OR INTERIOR 10-3 ROMEX	B	(3) #10 CU THWN (1) #8 CU GROUND IN EXTERIOR 3/4" EMT AC CONDUIT OR INTERIOR 10-3 ROMEX	C	NOT IN USE

SYSTEM OVERVIEW

# OF MODULES IN SERIES (CIRCUIT SIZE)	7
# OF MODULES IN PARALLEL (CIRCUIT COUNT)	1
MODULES PER INVERTER	1
POWER STORAGE / BATTERY BACKUP	0
ARRAY RATED DC POWER OUTPUT @ STC	2.87 kW

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SHEET TITLE:

ELECTRICAL DIAGRAM

SHEET NUMBER:

PV 5

NOTES

- EACH MODULE TO BE GROUNDED USING THE SUPPLIED CONNECTION POINT PER MANUFACTURE'S REQUIREMENTS. ALL SOLAR MODULES EQUIPMENT, AND THE METALLIC COMPONENTS ARE TO BE BONDED. IF THE EXISTING GROUNDING ELECTRODE SYSTEM CAN NOT BE VERIFIED OR IS ONLY METALLIC WATER PIPING, IT IS THE CONTRACTOR'S RESPONSIBILITY TO INSTALL A SUPPLEMENTAL GROUNDING ELECTRODE.

- ALL PLAQUES AND SIGNAGE REQUIRED BY THE LATEST EDITION OF THE NATIONAL ELECTRICAL CODE. REFER TO SHEET 7 (STICKERS AND PLACARDS). LABEL SHALL BE METALLIC OR PLASTIC, ENGRAVED OR MACHINE PRINTED IN A CONTRASTING COLOR TO THE PLAQUE. PLAQUE SHALL BE UV RESISTANT IF EXPOSED TO SUNLIGHT.

- DC CONDUCTORS SHALL BE RUN IN EMT AND/OR MC (METAL CALD CABLE) AND SHALL BE LABELED, "CAUTION DC CIRCUIT" OR EQUIV. EVERY 5 FT.

- EXPOSED NON-CURRENT CARRYING METAL PARTS OF ELECTRICAL EQUIPMENT SHALL BE GROUNDED IN ACCORDANCE WITH 250.134 OR 250.136 (A)

- CONFIRM LINE SIDE VOLTAGE AT ELECTRICAL UTILITY SERVICE PRIOR TO CONNECTING INVERTER. VERIFY SERVICE VOLTAGE IS WITHIN INVERTER VOLTAGE OPERATIONAL RANGE.

- OUTDOOR EQUIPMENT SHALL BE NEMA-3R RATED OR BETTER

- ELECTRICAL CONTRACTOR TO PROVIDE CONDUIT EXPANSION JOINTS AND ANCHOR CONDUIT RUNS AS REQUIRED PER CALIFORNIA ELECTRIC CODE.

- ALL WIRING MUST BE PROPERLY SUPPORTED BY DEVICES OR MECHANICAL MEANS DESIGNED AND LISTED FOR SUCH USE, AND FOR ROOF-MOUNTED SYSTEMS, WIRING MUST BE PERMANENTLY AND COMPLETELY HELD OFF OF THE ROOF SURFACE. CEC 110.2 - 110.4 / 300.4

- ALL PV METERS TO BE WITHIN 5 FT OF ANOTHER.

- PV METERS TO BE INSTALLED CORRECTLY, SUPPLIED FROM THE TOP JAWS.

- ALL ROOF PENETRATIONS MUST BE FLASHED. SIMPLY CAULKING DOES NOT SUFFICE.

- THIS SOLAR PHOTOVOLTAIC SYSTEM SHALL BE INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS SPECIFIED IN ARTICLE 690 AND ARTICLE 705 OF THE 2025 CEC AND ALL APPLICABLE BUILDING CODES.

- ACCESS TO THE ELECTRICAL WIRE SHALL BE RESTRICTED TO QUALIFIED PERSONNEL ONLY AS REQUIRED BY ARTICLE 690 OF THE 2025 CEC.

- ALL EXPOSED PHOTOVOLTAIC SYSTEM CONDUCTORS SHALL BE TYPE USE-2 OR PV WIRE. (CEC 690.31C)

- THE INSTALLATION OF EQUIPMENT AND ALL ASSOCIATED WIRING AND INTERCONNECTIONS SHALL BE PERFORMED ONLY BY QUALIFIED PERSONS (CEC 690.4)

- THE GROUNDING ELECTRODE SYSTEM SHALL BE PROVIDED IN ACCORDANCE WITH 250.50 THROUGH 250.60. THE GROUNDING ELECTRODE CONDUCTOR SHALL BE INSTALLED IN ACCORDANCE WITH 250.64 (CEC 2025 690.47)

- THE NEW SOLAR BREAKER IS TO BE INSTALLED AT THE OPPOSITE END OF THE BUSBAR FROM THE UTILITY SOURCE AS REQUIRED BY 705.12(B)(2)

- ALL WIRING SYSTEMS WILL BE CORRECTLY LABELED IN ALL THE LOCATIONS NECESSARY AS REQUIRED BY CEC 690.31(B)

- SYSTEM WILL BE GROUNDED IN ACCORDANCE WITH CEC 250.20

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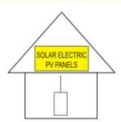
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SHEET TITLE:

NOTES

SHEET NUMBER:

PV 6

1	⚠ WARNING ⚠ ELECTRIC SHOCK HAZARD DO NOT TOUCH TERMINALS TERMINALS ON BOTH THE LINE AND LOAD MAY BE ENERGIZED IN THE OPEN POSITION 1	PLACED ON THE MAIN SERVICE PANEL COVER
2	⚠ WARNING ⚠ ELECTRIC SHOCK HAZARD IF GROUND FAULT IS INDICATED ALL NORMALLY GROUNDED CONDUCTORS MAY BE UNGROUNDED AND ENERGIZED 2	PLACED ON THE COMBINER BOX COVER
3	PHOTOVOLTAIC SYSTEM COMBINER PANEL DO NOT ADD LOADS 3	PLACED ON THE COMBINER BOX COVER AND THE GENERATION PANEL
4	PHOTOVOLTAIC SYSTEM ⚠ AC DISCONNECT ⚠ OPERATING VOLTAGE 240 VOLTS OPERATING CURRENT 10.5875 AMPS 4	PLACED ON THE MAIN SERVICE PANEL COVER AND THE DISCONNECT
5	CAUTION SOLAR CIRCUIT 5	PLACED ON PV CONDUIT, MAX 6' APART
6	SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN TURN RAPID SHUTDOWN SWITCH TO THE "OFF" POSITION TO SHUT DOWN PV SYSTEM AND REDUCE SHOCK HAZARD IN THE ARRAY 	PLACED ON THE MAIN SERVICE PANEL COVER
7	⚠ WARNING ⚠ SOLAR ELECTRIC CIRCUIT BREAKER IS BACKFED 7	PLACED ADJACENT TO PV BREAKER
8	PHOTOVOLTAIC SOLAR BREAKER 8	PLACED ADJACENT TO PV BREAKER
9	PV SOLAR BREAKER DO NOT RELOCATE THIS OVERCURRENT DEVICE 9 DO NOT RELOCATE OVERCURRNET DEVICE 9	PLACED ADJACENT TO PV BREAKER
10	RAPID SHUTDOWN	PLACED ON THE DISCONNECT
11	⚠ WARNING ⚠ DUAL POWER SUPPLY SOURCES: UTILITY GRID AND PV SOLAR ELECTRIC SYSTEM	PLACED ON MAIN SERVICE PANEL COVER
12	PHOTOVOLTAIC SYSTEM ⚠ AC DISCONNECT ⚠	PLACED ON THE DISCONNECT
13	ENERGY STORAGE SYSTEM DISCONNECT	PLACED ON THE ENERGY SYSTEM DISCONNECTS
14	PCS Controlled Current Setting: ____ A The maximum output current from this system towards the main panel is controlled electronically. Refer to the manufacturer's instructions for more information.	PLACED ON MAIN SERVICE PANEL WHEN APPLICABLE

NOTES:

- STICKERS ARE WHITE LETTERING ON RED BACKGROUND
- MINIMUM 3/8" IN SIZE
- ALL CAPITAL LETTERS
- FONT: ARIAL
- REFLECTIVE SURFACE WITH THE MATERIAL SUITABLE FOR EXTERIOR USE

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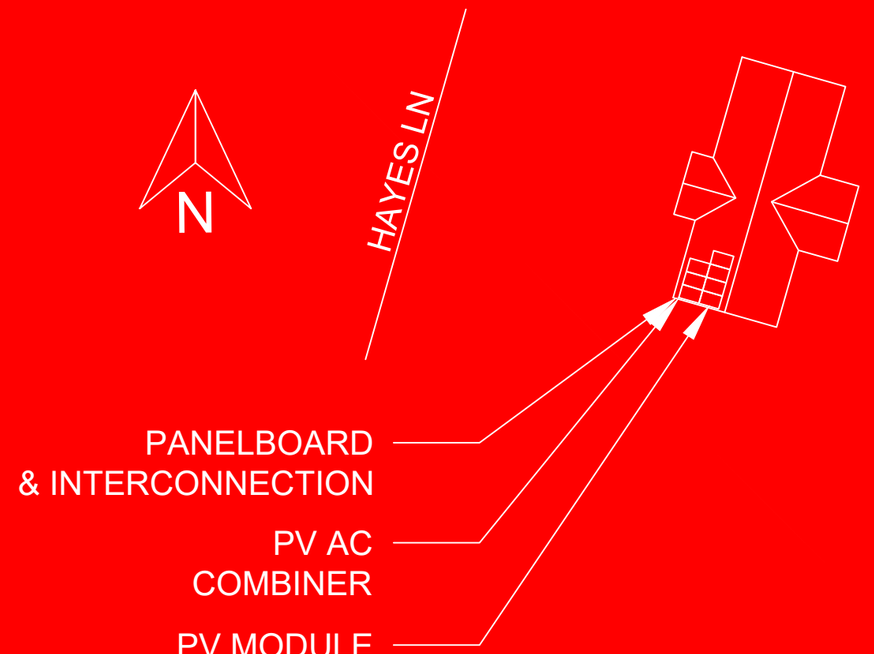
STICKER CATALOG

SHEET NUMBER:

PV 7

CAUTION

DUAL POWER SOURCE WITH DISCONNECTS LOCATED AS SHOWN



SITE PLACARD

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SITE PLACARD

SHEET NUMBER:

PV 8

Hi-MO 5

LR5-54HABB
390~415M

- Suitable for distributed projects
- Advanced module technology delivers superior module efficiency
  - M10 Gallium-doped Wafer
  - Integrated Segmented Ribbons
  - 9-busbar Half-cut Cell
- Globally validated bifacial energy yield
- High module quality ensures long-term reliability

25-year Warranty for Materials and Processing

30-year Warranty for Extra Linear Power Output



Complete System and Product Certifications

IEC 61215, IEC 61730, UL 61730
ISO9001:2015: ISO Quality Management System
ISO14001: 2015: ISO Environment Management System
ISO45001: 2018: Occupational Health and Safety
IEC62941: Guideline for module design qualification and type approval

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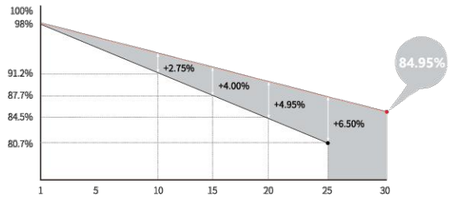
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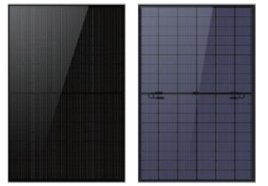
LR5-54HABB 390~415M

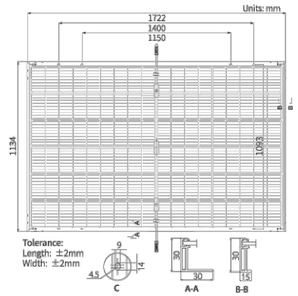
21.3%	0~3%	<2%	0.45%	HALF-CELL
MAX MODULE EFFICIENCY	POWER TOLERANCE	FIRST YEAR POWER DEGRADATION	YEAR 2-30 POWER DEGRADATION	Lower operating temperature

Additional Value

30-Year Power Warranty







Mechanical Parameters

Cell Orientation	108 (6×18)
Junction Box	IP68, three diodes
Output Cable	4mm², ±1200mm length can be customized
Glass	Dual glass, 2.0+1.6mm heat strengthened glass
Frame	Anodized aluminum alloy frame
Weight	22.5kg
Dimension	1722×1134×30mm
Packaging	36pcs per pallet / 216pcs per 20' GP / 936pcs or 792pcs(Only for USA) per 40' HC

Electrical Characteristics

STC : AM1.5 1000W/m² 25°C NOCT : AM1.5 800W/m² 20°C 1m/s Test uncertainty for Pmax: ±3%

Module Type	LR5-54HABB-390M		LR5-54HABB-395M		LR5-54HABB-400M		LR5-54HABB-405M		LR5-54HABB-410M		LR5-54HABB-415M	
Testing Condition	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT
Maximum Power (Pmax/W)	390	291.5	395	295.2	400	299.0	405	302.7	410	306.5	415	310.2
Open Circuit Voltage (Voc/V)	36.58	34.39	36.81	34.61	37.05	34.84	37.29	35.06	37.53	35.29	37.77	35.51
Short Circuit Current (Isc/A)	13.57	10.95	13.65	11.01	13.72	11.07	13.79	11.13	13.87	11.19	13.94	11.25
Voltage at Maximum Power (Vmp/V)	30.47	28.43	30.70	28.64	30.94	28.86	31.18	29.09	31.42	29.31	31.66	29.54
Current at Maximum Power (Imp/A)	12.80	10.26	12.87	10.31	12.93	10.36	12.99	10.41	13.05	10.45	13.11	10.50
Module Efficiency(%)	20.0		20.2		20.5		20.7		21.0		21.3	

Electrical characteristics with different rear side power gain (reference to 400W front)

Pmax /W	Voc/V	Isc /A	Vmp/V	Imp /A	Pmax gain
420	37.05	14.41	30.94	13.58	5%
440	37.05	15.09	30.94	14.22	10%
460	37.15	15.78	31.04	14.87	15%
480	37.15	16.46	31.04	15.52	20%
500	37.15	17.15	31.04	16.16	25%

Operating Parameters

Operational Temperature	-40°C ~ +85°C
Power Output Tolerance	0 ~ 3%
Voc and Isc Tolerance	±3%
Maximum System Voltage	DC1500V (IEC/UL)
Maximum Series Fuse Rating	30A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Bifaciality	70±5%
Fire Rating	UL Similar type 38 * IEC Class C

*Reference Standard: UL61730 Second Edition, Dated October 28, 2022

Mechanical Loading

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

Temperature Ratings (STC)

Temperature Coefficient of Isc	+0.050%/°C
Temperature Coefficient of Voc	-0.265%/°C
Temperature Coefficient of Pmax	-0.340%/°C

LONGi

No.8369 Shangyuan Road, Xi'an Economic And Technological Development Zone, Xi'an, Shaanxi, China.
Web: www.longi.com

Specifications included in this datasheet are subject to change without notice. LONGi reserves the right of final interpretation. (20230112DraftV02) Only for North America

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APN: 052-170-006-000

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SHEET TITLE:

MODULE CUT SHEET

SHEET NUMBER:

SP 1

SnapNrack
Solar Mounting Solutions

snapnrack.com

SnapNrack UL 2703 Fire Classification

March 2019

As of January 1st, 2015 many jurisdictions are now enforcing codes based upon updates to the International Building Code (IBC) and UL Standards 1703 (modules) and 2703 (mounting systems). The language included in the 2012 IBC requires that the combination of roof mounted solar modules and racking components is to be considered a system (IBC Section 1509.7.2). Additionally, it requires that this system shall meet or exceed the fire classification of the roof assembly.

The objective is to ensure that the PV system does not adversely affect the fire rating of the roof. Roof surface fire ratings are classified either A, B, or C; Class A being the most resistant to the spread of flame.



Since the physical characteristics of the PV module (material, thickness of glass, etc) also potentially affect how a fire will act, modules are now tested and assigned a "type" based upon these characteristics and spread of flame test results. There are 15 total module types, Types 1, 2 and 3 represent differences in the module composition and Types 4 – 15 are the same module compositions as Types 1 – 3 with differing fire test performance.

SnapNrack Series 100, Ultra Rail and RL systems have been Certified for a Class A fire rating with Type 1 and Type 2 modules, in accordance with the standards set forth in UL1703/2703 and IBC 2012. In order to maintain this classification, the SnapNrack mounting systems must be installed per the UL-approved Installation Manuals. Because the test was conducted with the modules at 5 inches from the roof surface (worst case scenario), there is no restriction to the standoff height.

Attachment 1 is the SnapNrack QIMS File which is accessed through the UL Online Certification Directory, or available here: SnapNrack QIMS File.

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SHEET TITLE:

SYSTEM FIRE CUT SHEET

SHEET NUMBER:

SP 2

ENPHASE.

DATA SHEET



IQ8 and IQ8+ Microinverters

Our newest IQ8 Microinverters are the industry's first microgrid-forming, software-defined microinverters with split-phase power conversion capability to convert DC power to AC power efficiently. The brain of the semiconductor-based microinverter is our proprietary application-specific integrated circuit (ASIC) which enables the microinverter to operate in grid-tied or off-grid modes. This chip is built in advanced 55nm technology with high speed digital logic and has super-fast response times to changing loads and grid events, alleviating constraints on battery sizing for home energy systems.



Part of the Enphase Energy System, IQ8 Series Microinverters integrate with the Enphase IQ Battery, Enphase IQ Gateway, and the Enphase App monitoring and analysis software.

Enphase 25 year limited warranty

IQ8 Series Microinverters redefine reliability standards with more than one million cumulative hours of power-on testing, enabling an industry-leading limited warranty of up to 25 years.



Connect PV modules quickly and easily to IQ8 Series Microinverters using the included Q-DCC-2 adapter cable with plug-n-play MC4 connectors.

UL CERTIFIED SAFETY

IQ8 Series Microinverters are UL Listed as PV Rapid Shut Down Equipment and conform with various regulations, when installed according to manufacturer's instructions.

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Easy to install

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

High productivity and reliability

- Produce power even when the grid is down
- More than one million cumulative hours of testing
- Class II double-insulated enclosure
- Optimized for the latest high-powered PV modules

Microgrid-forming

- Complies with the latest advanced grid support
- Remote automatic updates for the latest grid requirements
- Configurable to support a wide range of grid profiles
- Meets CA Rule 21 (UL 1741-SA) requirements

IQ8 and IQ8+ Microinverters

INPUT DATA (DC)		IQ8-60-2-US	IQ8PLUS-72-2-US
Commonly used module pairings[1]	W	235 – 350	235 – 440
Module compatibility		60-cell/120 half-cell	60-cell/120 half-cell and 72-cell/144 half-cell
MPPT voltage range	V	27 – 37	29 – 45
Operating range	V	25 – 48	25 – 58
Min/max start voltage	V	30 / 48	30 / 58
Max input DC voltage	V	50	60
Max DC current[2] [module Isc]	A	15	
Overvoltage class DC port		II	
DC port backfeed current	mA	0	
PV array configuration		1x1 Ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit	
OUTPUT DATA (AC)		**IQ8-60-2-US**	**IQ8PLUS-72-2-US**
Peak output power	VA	245	300
Max continuous output power	VA	240	290
Nominal (L-L) voltage/range[3]	V	240 / 211 – 264	
Max continuous output current	A	1.0	1.21
Nominal frequency	Hz	60	
Extended frequency range	Hz	50 – 68	
Max units per 20 A (L-L) branch circuit[4]		16	13
Total harmonic distortion		<5%	
Overvoltage class AC port		III	
AC port backfeed current	mA	30	
Power factor setting		1.0	
Grid-tied power factor (adjustable)		0.85 leading – 0.85 lagging	
Peak efficiency	%	97.5	97.6
CEC weighted efficiency	%	97	97
Night-time power consumption	mW	60	
MECHANICAL DATA			
Ambient temperature range		-40°C to +60°C (-40°F to +140°F)	
Relative humidity range		4% to 100% (condensing)	
DC Connector type		MC4	
Dimensions (HxWxD)		212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")	
Weight		1.08 kg (2.38 lbs)	
Cooling		Natural convection – no fans	
Approved for wet locations		Yes	
Acoustic noise at 1 m		<60 dBA	
Pollution degree		PD3	
Enclosure		Class II double-insulated, corrosion resistant polymeric enclosure	
Environ. category / UV exposure rating		NEMA Type 6 / outdoor	
COMPLIANCE			
Certifications		CA Rule 21 (UL 1741-SA), UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01 This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020 section 690.12 and C22.1-2018 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to manufacturer's instructions.	

(1) No enforced DC/AC ratio. See the compatibility calculator at https://link.enphase.com/module-compatibility (2) Maximum continuous input DC current is 10.6A (3) Nominal voltage range can be extended beyond nominal if required by the utility. (4) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

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INVERTER CUT SHEET

SHEET NUMBER:

SP 3

Data Sheet
Enphase Q Cable Accessories

Enphase Q Aggregator and Q Cable Accessories

The **Enphase Q Aggregator™** and **Enphase Q Cable™** are part of the sixth generation Enphase IQ System™. These accessories provide simplicity, reliability, and faster installation times.



Enphase Q Aggregator

- Reduces electrical labor and eliminates wire nuts for safer, faster installations
- Aggregates up to three fully populated 20A branch circuits
- Supports solar arrays of up to 11.5 kW with a single rooftop aggregator



Enphase Q Cable

- Two-wire Enphase Q Cable is 50% lighter than the previous generation Enphase cable
- New cable numbering and plug and play connectors speed up installation and simplify wire management
- Link connectors eliminate cable waste



Field-Wireable Connectors

- Easily connect Q cables on the roof without complex wiring
- Make connections from any open connector and center feed any section of cable within branch limits
- Available in male and female connector types

c UL us

To learn more about Enphase offerings, visit **enphase.com**

ENPHASE.

Enphase Q Cable Accessories

Q AGGREGATOR SPECIFICATIONS	
Model number	Q-BA-3-1P-60
Dimensions	190 mm (W) x 227 mm (D) x 80 mm (H) (7.5 in (W) x 9 in (D) x 3.2 in (H))
Enclosure rating	NEMA3 (up to 45° from horizontal)
Temperature range	-40° C to +55° C (-40° F to +122° F)
Compliance	UL1703, EN62109, UL6703A
Q CABLE SPECIFICATIONS	
Voltage rating	600V (connector rating 250 V)
Cable temperature rating	90° C (194° F)
Certification	UL3003, DG cable
Flame test rating	FT4
Compliance	RoHS, OIL RES I, CE, UV resistant, combined UL for Canada and United States
Cable insulator rating	THHN/THWN-2 dry/wet

Q CABLE TYPES / ORDERING OPTIONS

Model Number	Voltage	Connector Spacing	PV Module Orientation	Connector Count per Box
Q-12-10-240	240 (max rating 250 VAC)	1.3 m (4.2 ft)	Portrait	240
Q-12-17-240	240 (max rating 250 VAC)	2.0 m (6.5 ft)	Landscape (60-cell)	240
Q-12-20-200	240 (max rating 250 VAC)	2.3 m (7.5 ft)	Landscape (72-cell)	200

ENPHASE Q CABLE ACCESSORIES

Name	Model Number	Description
Enphase Q Aggregator	Q-BA-3-1P-60	Combines up to three microinverter branches into one home run.
Field-wireable connector (male)	Q-CONN-10M	Make connections from any Q Aggregator open connector
Field-wireable connector (female)	Q-CONN-10F	Make connections from any Q Cable open connector
Cable clip	Q-CLIP-100	Used to fasten cabling to the racking or to secure looped cabling
Disconnect tool	Q-DISC-10	Disconnect tool for Q Cable connectors, DC connectors, and AC module mount
Q Aggregator sealing caps (male)	Q-BA-CAP-10	Sealing cap for unused aggregator connections
Q Cable sealing caps (female)	Q-SEAL-10	One needed to cover each unused connector on the cabling
Terminator	Q-TERM-10	Terminator cap for unused cable ends
Replacement DC Adaptor (MC4)	Q-DCC-2	DC adaptor to MC4 (max voltage 100 VDC)
Replacement DC Adaptor (UTX)	Q-DCC-5	DC adaptor to UTX (max voltage 100 VDC)



TERMINATOR

Terminator cap for unused cable ends, sold in packs of ten
Q-TERM-10



SEALING CAPS

Sealing caps for unused aggregator and cable connections (Q-BA-CAP-10 and Q-SEAL-10)



DISCONNECT TOOL

Plan to use at least one per installation, sold in packs of ten (Q-DISC-10)



CABLE CLIP

Used to fasten cabling to the racking or to secure looped cabling, sold in packs of ten (Q-CLIP-100)

To learn more about Enphase offerings, visit **enphase.com**

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2017-03-09

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SHEET TITLE:
Q AGGREGATOR CUT SHEET

SHEET NUMBER:
SP 4

CERTIFICATE OF COMPLIANCE

Certificate Number	20220223-E341165
Report Reference	E341165-20210317
Issue Date	2022-02-23
Issued to:	Enphase Energy Inc. 1420 N. McDowell Blvd. Petaluma, CA 94954-6515
This is to certify that representative samples of	Grid Support, Utility Interactive Supporting Energy Storage, Multimode, Bi-directional Microinverters Models IQ8-60, IQ8PLUS-72, IQ8M-72, IQ8A-72, IQ8H-208-72, IQ8H-240-72, may be f/b -2, -5, -E, or -M, may be f/b -ACM, f/b -US, may be f/b -NM, may be f/b -RMA, may be f/b -&, where "&" designates additional characters. Has been investigated by UL in accordance with the Standard(s) indicated on this Certificate.
Standard(s) for Safety:	See Page 2
Additional Information:	See the UL Online Certifications Directory at www.ul.com/database for additional information

This *Certificate of Compliance* is provided as a courtesy to help our customers communicate product compliance information, as documented in our UL Follow-Up Services procedure. This Certificate of Compliance does not provide authorization to apply the UL Mark. Only the UL Follow-Up Services Procedure provides authorization to apply the UL Mark.

Only those products bearing the UL Mark shall be considered as being UL Certified and covered under UL's Follow-Up Services. Look for the UL Certification Mark on the product.

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Bruce Mahrenholz, Director North American Certification Program

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CERTIFICATE OF COMPLIANCE

Certificate Number	20220223-E341165
Report Reference	E341165-20210317
Issue Date	2022-02-23

This is to certify that representative samples of the product as specified on this certificate were tested according to the current UL requirements.

Standards for Safety:

UL 62109-1, STANDARD FOR SAFETY OF POWER CONVERTERS FOR USE IN PHOTOVOLTAIC POWER SYSTEMS - PART 1: GENERAL REQUIREMENTS, Edition 1, Revision Date 04/30/2019

IEC 62109-2, SAFETY OF POWER CONVERTERS FOR USE IN PHOTOVOLTAIC POWER SYSTEMS - PART 2: PARTICULAR REQUIREMENTS FOR INVERTERS, Edition 1, Issue Date 06/2011

UL 1741, Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources, Edition 2, Revision Date 06/10/2021, including the requirements in UL 1741 Supplement SA, sections as noted in the Technical considerations.

IEEE 1547, IEEE Standard for Interconnecting Distributed Resources with Electric Power Systems.

IEEE 1547.1, IEEE Standard for Conformance Test Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems.

CSA C22.2 No. 62109-1, Safety of Power Converters for Use in Photovoltaic Power Systems - Part 1: General Requirements, Edition 1, Issue Date 07/2016

CSA C22.2 No. 62109-2, Safety of Power Converters for Use in Photovoltaic Power Systems - Part 2: Particular Requirements for Inverters, Edition 1, Issue Date 07/2016

Bruce Mahrenholz, Director North American Certification Program

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SP 5

ENPHASE.

DATASHEET



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

IQ Combiner 5/5C

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

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



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



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



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



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

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

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

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

Enphase 5 year limited warranty

5-year limited warranty

UL LISTED

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IQ Combiner 5/5C

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

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

MECHANICAL DATA	
Dimensions (WxHxD)	37.5 cm x 49.5 cm x 16.8 cm (14.75" x 19.5" x 6.63"). Height is 21.06" (53.5 cm) with mounting brackets
Weight	7.5 kg (16.5 lbs)
Ambient temperature range	-40°C to 46°C (-40°F to 115°F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction
Wire sizes	• 20 A to 50 A breaker inputs: 14 to 4 AWG copper conductors • 60 A breaker branch input: 4 to 1/0 AWG copper conductors • Main lug combined output: 10 to 2/0 AWG copper conductors • Neutral and ground: 14 to 1/0 copper conductors • Always follow local code requirements for conductor sizing
Communication (in-premise connectivity)	Built-in CTRL board for wired communication with IQ Battery 5P and IQ System Controller 3/3G. Integrated Power Line Communication for IQ Series Microinverters
Altitude	Up to 2,600 meters (8,530 feet)
COMMUNICATION INTERFACES	
Integrated Wi-Fi	802.11b/g/n (dual band 2.4 GHz/5 GHz), for connecting the Enphase cloud via the internet
Wi-Fi range (recommended)	10 m
Ethernet	Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included), for connecting to the Enphase Cloud via the internet
Mobile Connect	CELLMODEM-M1-06-SP-05 or CELLMODEM-M1-06-AT-05 (included with IQ Combiner 5C)
Digital I/O	Digital input/output for grid operator control
USB 2.0	For Mobile Connect
Access point (AP) mode	For connection between the IQ Gateway and a mobile device running the Enphase Installer App
Metering ports	Up to two Consumption CTs, one IQ Battery CT, and one Production CT
Power line communication	90–110 kHz
Web API	Refer to https://developer-v4.enphase.com
Local API	Refer to guide for local API
COMPLIANCE	
IQ Combiner	UL 1741, CAN/CSA C22.2 No. 107.1, Title 47 CFR, Part 15, Class B, ICES 003
IQ Gateway	UL 60601-1/CANCSA 22.2 No. 61010-1, IEEE 1547: 2018 (UL 1741-SB, 3rd Ed.) IEEE 2030.5/CSIP Compliant Production metering: ANSI C12.20 accuracy class 0.5 (PV production)
COMPATIBILITY	
IQ System Controller 3/3G	SC200D111C240US01, SC200G111C240US01
IQ Battery 5P	IQBATTERY-5P-1P-NA
Microinverter	IQ6, IQ7, and IQ8 Series Microinverters

URBAN DESIGN
Plumbing • Solar • Electrical
URBAN DESIGN SOLAR
4742 SKYWAY, PARADISE, CA 95969
(530) 345-0005
LIC # : 893826

DESIGN APPROVED BY:

Sean McCreary

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DESIGNED BY:

Zachary Mitus

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EMAIL:
ZACH@SERENITYDRAFTING.COM

PROJECT INFO:

SHINGLER RESIDENCE
5960 HAYES LN
PARADISE, 95969
PHONE #: 530-966-5106
AHJ: TOWN OF PARADISE
APN: 052-170-006-000

REVISIONS:

DESCRIPTION	DATE	REVISION
INITIAL DESIGN	4/21/2026	A
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SHEET TITLE:

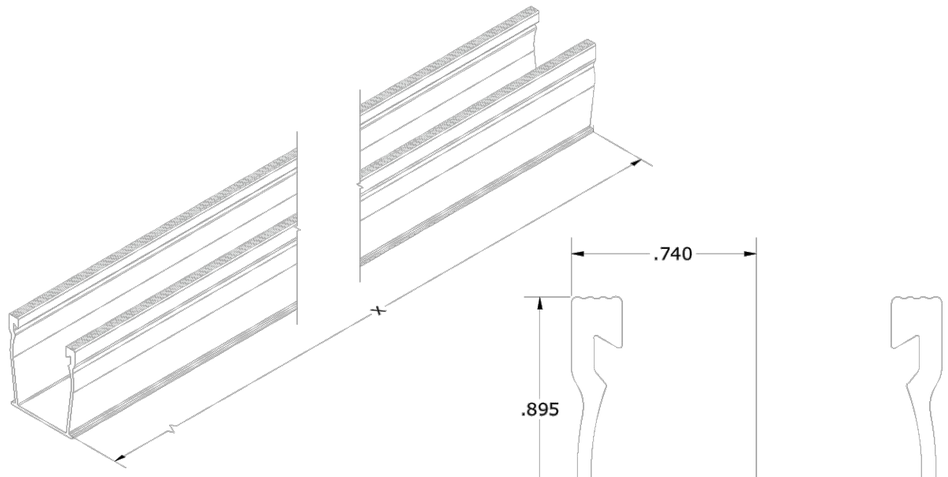
AC COMBINER CUT SHEET

SHEET NUMBER:

SP 6

DESCRIPTION: SNAPNRACK, TDS, UR-45 RAIL (USA)		DOC NUMBER: SNR-DC-01451	SnapNrack
PART NUMBER(S): 232-10095-USA, 232-10096-USA		DRAWN BY: H.WULFEKOETTER	
UNITS: IN, LB, DEG [MM, KG, DEG]	SHEET: 1:1	REV: A / DATE: 11/15/2024	SNR SOLAR LLC 775 FIERO LANE, SUITE 200 SAN LUIS OBISPO, CA 93401 USA EMAIL: CONTACT@SNAPNRACK.COM THE INFORMATION IN THIS DRAWING IS CONFIDENTIAL AND PROPRIETARY. ANY REPRODUCTION, DISCLOSURE, OR USE THEREOF IS PROHIBITED WITHOUT THE WRITTEN CONSENT OF SNR SOLAR LLC.

UR-45 RAIL PROPERTIES		
SKU	FINISH	RAIL LENGTH (X)
232-10095-USA	MILL	172 in
232-10096-USA	BLACK	172 in



SECTION PROPERTIES	
A	0.319 in²
Ixx	0.134 in⁴
Iyy	0.121 in⁴
Sx (TOP)	0.152 in³
Sx (BOT)	0.156 in³
Sy (LEFT)	0.164 in³
Sy (RIGHT)	0.164 in³

MATERIALS:	6005-T5 ALUMINUM
DESIGN LOAD (LBS):	N/A
ULTIMATE LOAD (LBS):	N/A
TORQUE SPECIFICATION:	N/A FT-LBS
CERTIFICATION:	UL 2703, FILE E359313, DOMESTIC CONTENT COMPLIANT
WEIGHT (LBS):	5.55

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SHEET TITLE:

RAILING SYSTEM CUT SHEET

SHEET NUMBER:

SP 7

L Foot Mount

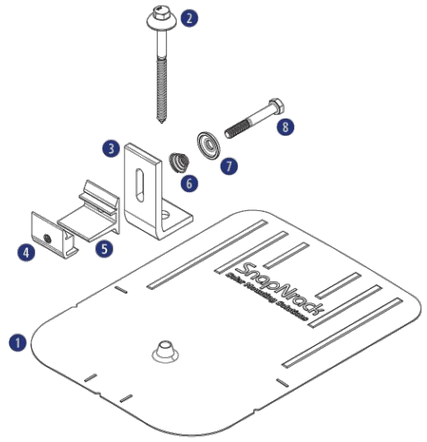
snapnrack.com

Required Tools

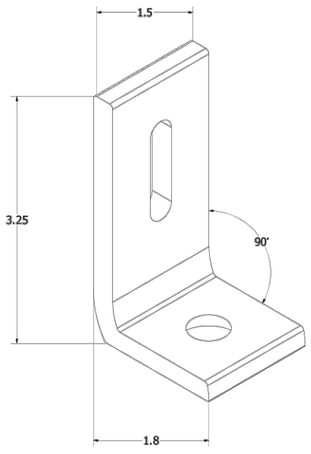
- Hammer or Stud Finder
- Roof Marking Crayon
- Drill with 3/16" Pilot Drill Bit
- Roof Sealant
- Torque Wrench
- Socket Wrench
- 1/2" Socket

Materials Included - L Foot Mount

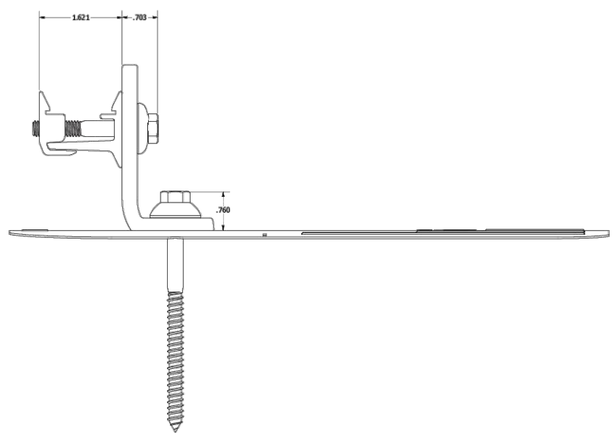
1. (1) SnapNrack Comp Umbrella Flashing
2. (1) SnapNrack Umbrella Lag Screw
3. (1) SnapNrack Umbrella L Foot
4. (1) SnapNrack Ultra Mount (Tapped)
5. (1) SnapNrack Ultra Mount (Thru-Hole)
6. (1) SnapNrack Ultra Mount Spring
7. (1) SnapNrack Ultra Mount Spring Cage
8. (1) 5/16"-18 X 2-1/4" SS HCS Bolt



Application Note:
Install on composition shingle roofs.



Dimensioned L Foot



Dimensioned L Foot Assembly

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REVISIONS:

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SHEET TITLE:

SYSTEM FLASHING CUT SHEET

SHEET NUMBER:

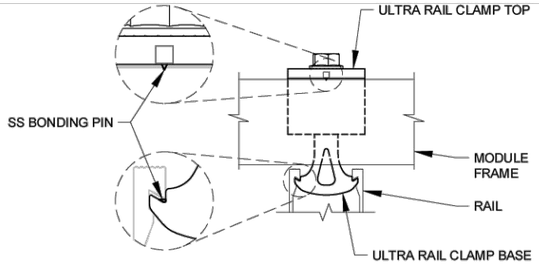
SP 8

Grounding Specifications

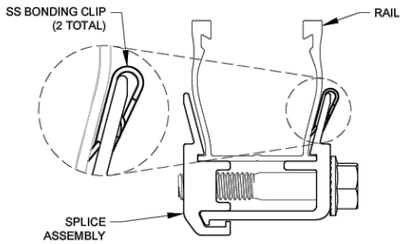
snapnrack.com

System Bonding Methods

1. SnapNrack Ultra Rail Mid Clamp
2. SnapNrack Ultra Rail End Clamp
3. SnapNrack Mid Clamp
4. SnapNrack Adjustable End Clamp
5. SnapNrack UR-40 & UR-45 Rail Splice
6. SnapNrack UR-60 Rail Splice

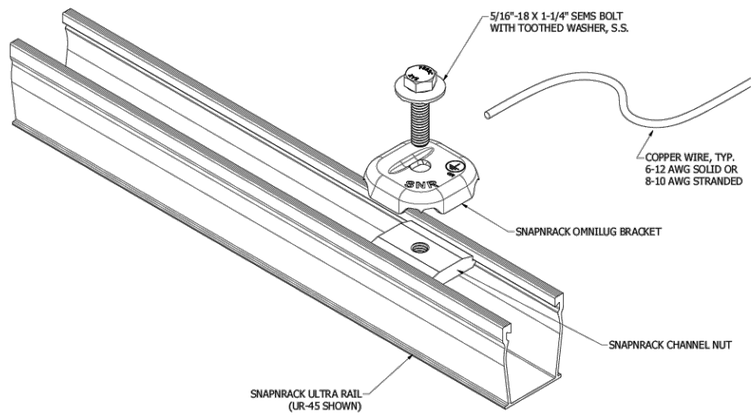


Note:
SnapNrack module clamps contain a SnapNrack Channel Nut with integral bonding clips or pins in assembly to properly bond the system (except Universal End Clamps).



Note:
SnapNrack Ultra Rail Splices contain integral bonding clips in assembly to properly bond the system.

SnapNrack OmniLug Assembly



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SHEET TITLE:

SYSTEM BONDING AND GROUNDING

SHEET NUMBER:

SP 9

April 30, 2025

SnapNrack
775 Fiero Lane, Ste. 200
San Luis Obispo, CA 93401
TEL: (877) 732-2860

Attn.: SnapNrack - Engineering Department

Re: SnapNrack pre-engineered PV racking systems:

- UR45 Railed System (Report # 2025-00538)
- TopSpeed Original Rail-less System (Report # 2022-02141.08)
- Topspeed Universal Rail-less System (Report # 2025-02168)

Subject: Engineering certification for the State of California.

PZSE, Inc. - Structural Engineers has provided engineering and span tables as presented in the above referenced reports. All information, data, and analysis therein are based on, and comply with, the following building codes and typical specifications:

Building Codes:

1. ASCE/SEI 7-10 & 7-16, Minimum Design Loads for Buildings and Other Structures, by American Society of Civil Engineers
2. 2016, 2019 & 2022 California Building Code, by California Building Standards Commission
3. 2016, 2019 & 2022 California Residential Code, by California Building Standards Commission
4. AC428 Acceptance Criteria for Modular Framing Systems Used to Support Photovoltaic (PV) Panels, November 1, 2012, by ICC-ES
5. Aluminum Design manual 2015 & 2020, by The Aluminum Association, Inc.
6. ANSI/AWC NDS-2018, National Design Specification for Wood Construction, by the American Wood Council

This letter certifies that the design criteria and design methodology for the SnapNrack product span tables are in compliance with the above codes. Please refer to the system specific Engineering Certification Reports (listed above) for system specific design criteria and limitations.

If you have any questions on the above, do not hesitate to call.

REGISTERED PROFESSIONAL ENGINEER
KENNETH ZACHER
No. S3878
Exp. 3-31-27
STRUCTURAL
STATE OF CALIFORNIA

Prepared by:
PZSE, Inc. – Structural Engineers
Roseville, CA

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SHEET TITLE:
RACKING SYSTEM CA CERTIFICATION

SHEET NUMBER:
SP 10