

# PHOTOVOLTAIC ROOF MOUNT SYSTEM

12 MODULES-ROOF MOUNTED - 4.80 kW DC, 3.48 kW AC  
 325 SILVER MAPLE DR, FUQUAY-VARINA, NC 27526 USA



PE SOLAR  
 ATTN KIM JONES  
 400 DOMINION DRIVE STE 105  
 MORRISVILLE, NC 27560

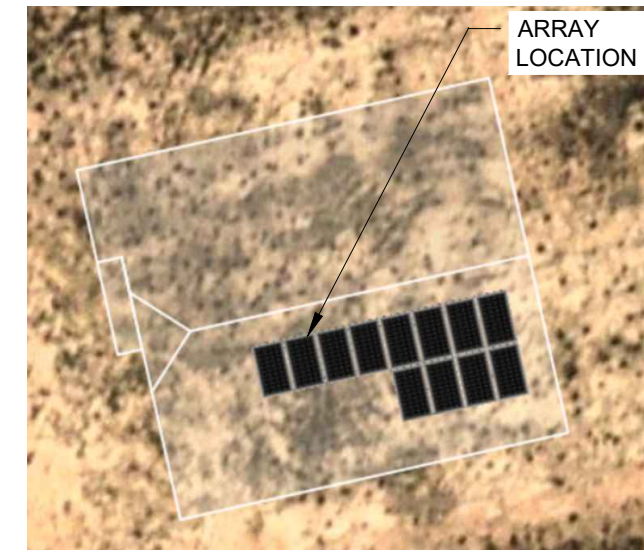
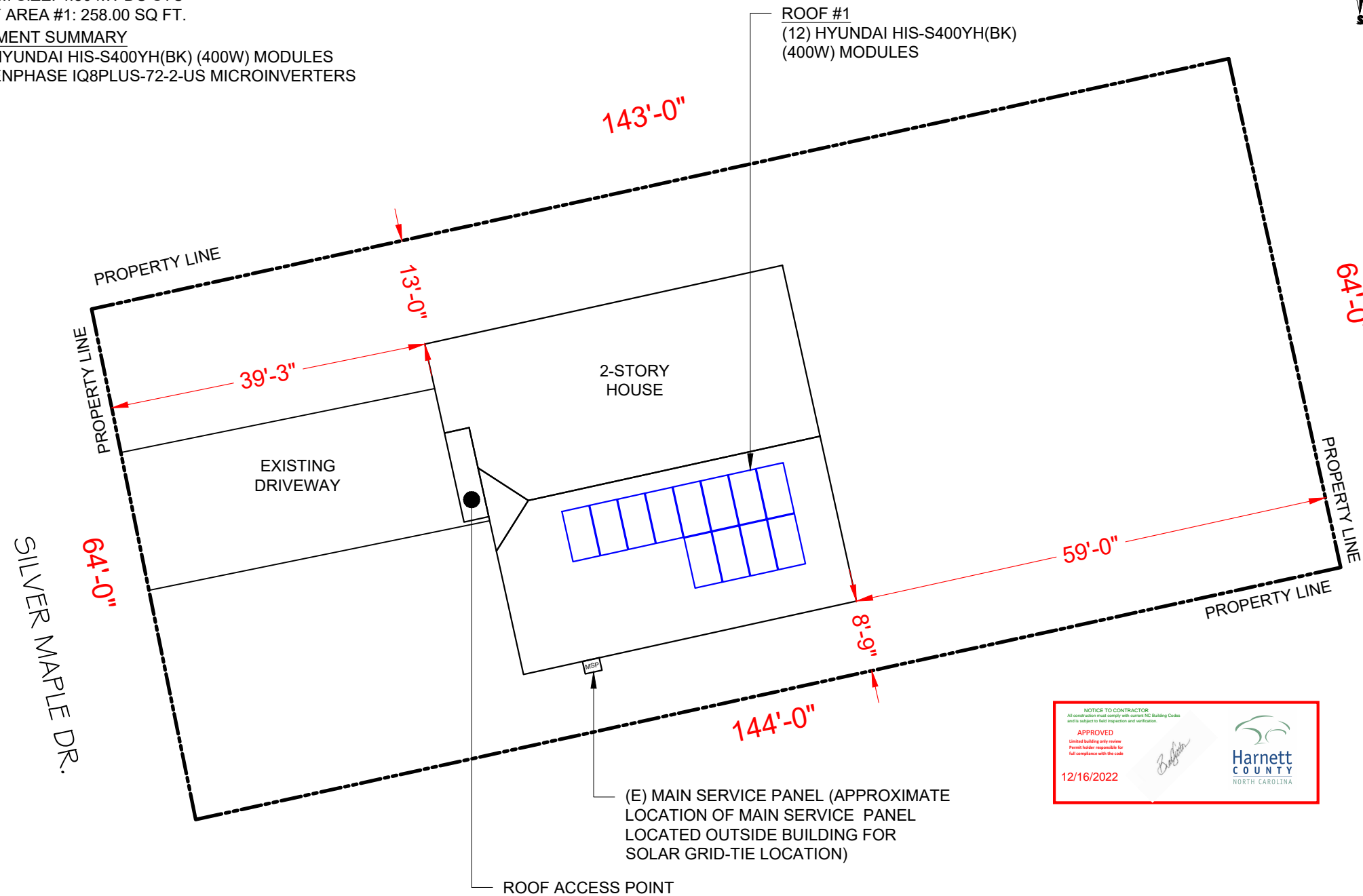
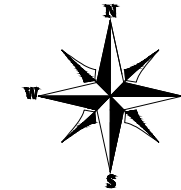
## PROJECT DESCRIPTION:

12 x 400 HYUNDAI HIS-S400YH(BK) (400W) MODULES  
 ROOF MOUNTED SOLAR PHOTOVOLTAIC MODULES

SYSTEM SIZE: 4.80 kW DC STC  
 ARRAY AREA #1: 258.00 SQ FT.

### EQUIPMENT SUMMARY

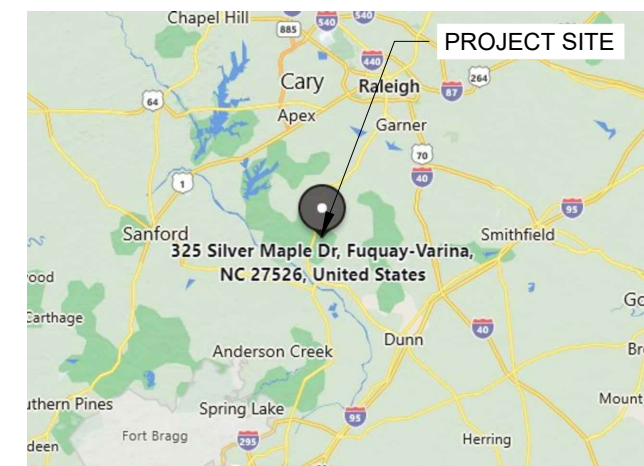
12 HYUNDAI HIS-S400YH(BK) (400W) MODULES  
 12 ENPHASE IQ8PLUS-72-2-US MICROINVERTERS



ARRAY LOCATION

2 HOUSE PHOTO

PV-1 SCALE: NTS



3 VICINITY MAP

PV-1 SCALE: NTS

**SHEET INDEX**

PV-1	SITE PLAN WITH VICINITY MAP
PV-2	ROOF PLAN & MODULES
PV-3	STRING LAYOUT
PV-4	ATTACHMENT DETAIL
PV-5	ELECTRICAL LINE DIAGRAM
PV-6	WIRING CALCULATIONS
PV-7	PLACARDS
PV-8 +	EQUIPMENT SPECIFICATIONS

**GOVERNING CODES:**  
 NORTH CAROLINA BUILDING CODE (NCBC 2018)  
 NORTH CAROLINA RESIDENTIAL CODE (NCRC 2018)  
 NORTH CAROLINA PLUMBING CODE (NCPC 2018)  
 NORTH CAROLINA MECHANICAL CODE (NMC 2018)  
 NATIONAL ELECTRICAL CODE (2017)

**REVISIONS**

DESCRIPTION	DATE	REV
INITIAL DESIGN	12/06/2022	00

Signature with Seal



PROJECT NAME

KATHRYN AND JOSEPH GILL  
 RESIDENCE  
 325 SILVER MAPLE DR,  
 FUQUAY-VARINA, NC 27526 USA

SHEET NAME  
**SITE PLAN &  
 VICINITY MAP**

SHEET SIZE  
**ANSI B  
 11" X 17"**

SHEET NUMBER  
**PV-1**

1 SITE PLAN WITH VICINITY MAP

PV-1 SCALE: 1/16" = 1'-0"



### MODULE TYPE, DIMENSIONS & WEIGHT

NUMBER OF MODULES = 12 MODULES  
 MODULE TYPE = HYUNDAI HIS-S400YH(BK) (400W) MODULES  
 MODULE WEIGHT = 46.52 LBS / 21.1 KG.  
 MODULE DIMENSIONS = 75.75" x 40.87" = 21.50 SF  
 UNIT WEIGHT OF ARRAY = 2.16 PSF

ARRAY AREA & ROOF AREA CALC'S				
ROOF	# OF MODULES	ARRAY AREA (Sq. Ft.)	ROOF AREA (Sq. Ft.)	ROOF AREA COVERED BY ARRAY (%)
#1	12	258.00	854.80	30


ROOF DESCRIPTION				
ROOF TYPE		ASPHALT SHINGLE ROOF		
ROOF	ROOF TILT	AZIMUTH	TRUSS SIZE	TRUSS SPACING
#1	27°	168°	2"X4"	24" O.C.



PE SOLAR  
 ATTN KIM JONES  
 400 DOMINION DRIVE STE 105  
 MORRISVILLE, NC 25760

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	12/06/2022	00

Signature with Seal

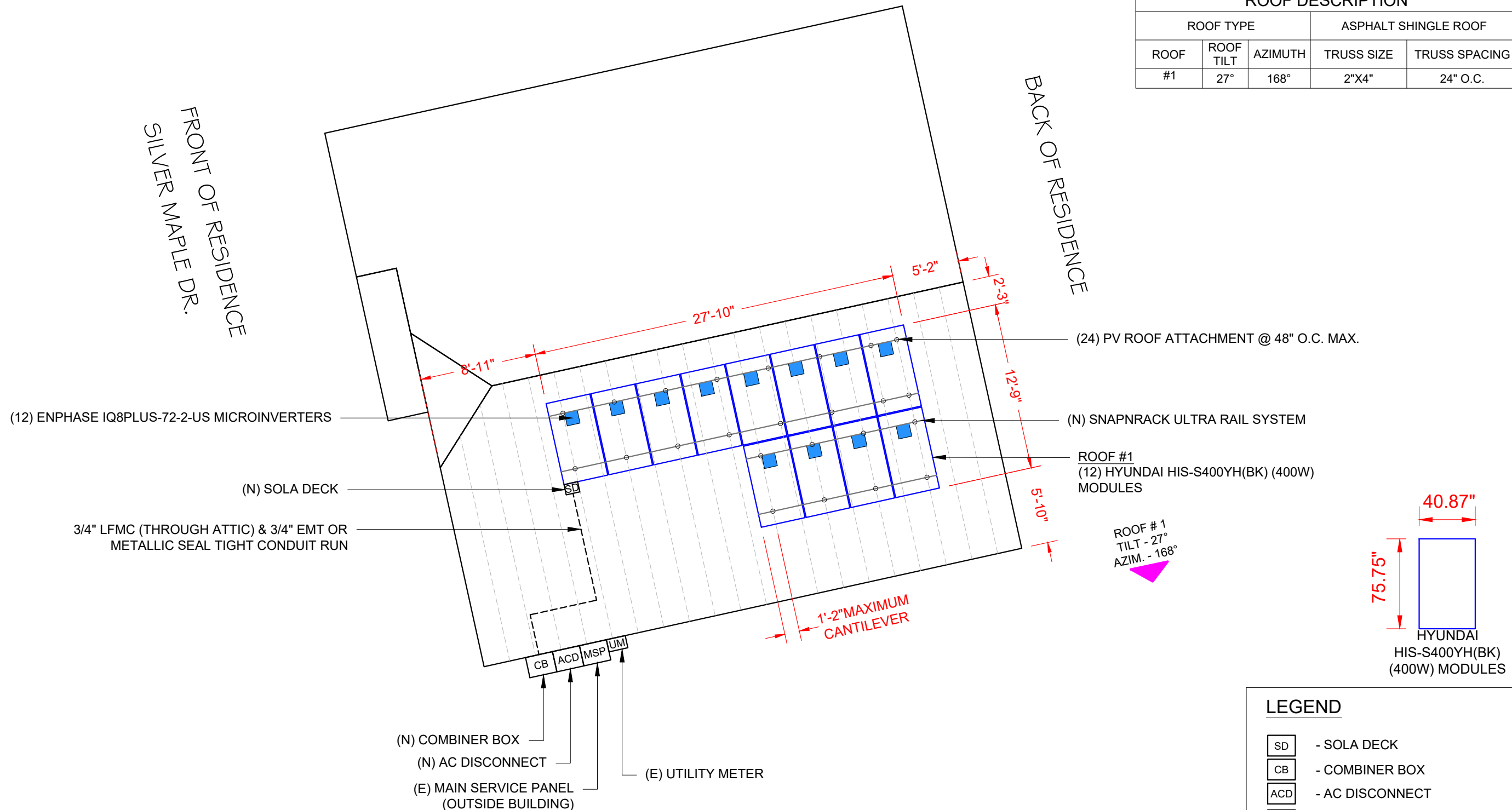


PROJECT NAME  
**KATHRYN AND JOSEPH GILL RESIDENCE**  
 325 SILVER MAPLE DR,  
 FUQUAY-VARINA, NC 27526 USA

SHEET NAME  
**ROOF PLAN & MODULES**

SHEET SIZE  
**ANSI B  
 11" X 17"**

SHEET NUMBER  
**PV-2**





PE SOLAR  
 ATTN KIM JONES  
 400 DOMINION DRIVE STE 105  
 MORRISVILLE, NC 25760

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	12/06/2022	00

Signature with Seal

PROJECT NAME

KATHRYN AND JOSEPH GILL  
 RESIDENCE  
 325 SILVER MAPLE DR,  
 FUQUAY-VARINA, NC 27526 USA

SHEET NAME

STRING  
 LAYOUT

SHEET SIZE

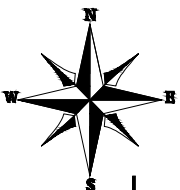
ANSI B  
 11" X 17"

SHEET NUMBER

PV-3

BILL OF MATERIALS		
EQUIPMENT	QTY	DESCRIPTION
SOLAR PV MODULE	12	HYUNDAI HIS-S400YH(BK) (400W) MODULES
INVERTER	12	ENPHASE IQ8PLUS-72-2-US MICROINVERTERS
AC DISCONNECT	1	60A NON-FUSED, 240V NEMA 3R, UL LISTED
ATTACHMENT	24	SNAPRACK, ULTRA RAIL COMP KIT
RAILS	6	SNAPRACK, UR-60 RAIL, 172IN, MILL (232-02539)
RAIL SPLICE	2	SNAPRACK, UR-60 SPLICE, SILVER (242-01270)
MID CLAMPS	20	SNAPRACK, ULTRA RAIL MID CLAM , BLACK (242-02071)
END CLAMPS	8	UNIVERSAL END CLAM (242-02215)
GROUNDING LUG	2	GROUNDING LUG R, 6-12 AWG (242-02101)

DISCLAIMER: MATERIALS REQUIRED LIST FOR CONCEPTUAL USE ONLY THE INTENT IS TO AID CONTRACTOR FOR ORDERING REQUIRED MATERIALS FOR THE PROJECT. CONTRACTOR RESPONSIBLE TO VERIFY PRIOR TO SOLAR EQUIPMENT ORDERING



1  
 PV-3  
**STRING LAYOUT**  
 SCALE: 3/16" = 1'-0"

LEGEND	
○ □	- VENT (ROOF OBSTRUCTION)
---	- STRINGS



PE SOLAR  
 ATTN KIM JONES  
 400 DOMINION DRIVE STE 105  
 MORRISVILLE, NC 25760

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	12/06/2022	00

Signature with Seal



SNAPNRACK ULTRA RAIL UMBRELLA L FOOT WITH UMBRELLA FLASHING FOR COMPOSTION ROOF MOUNTING

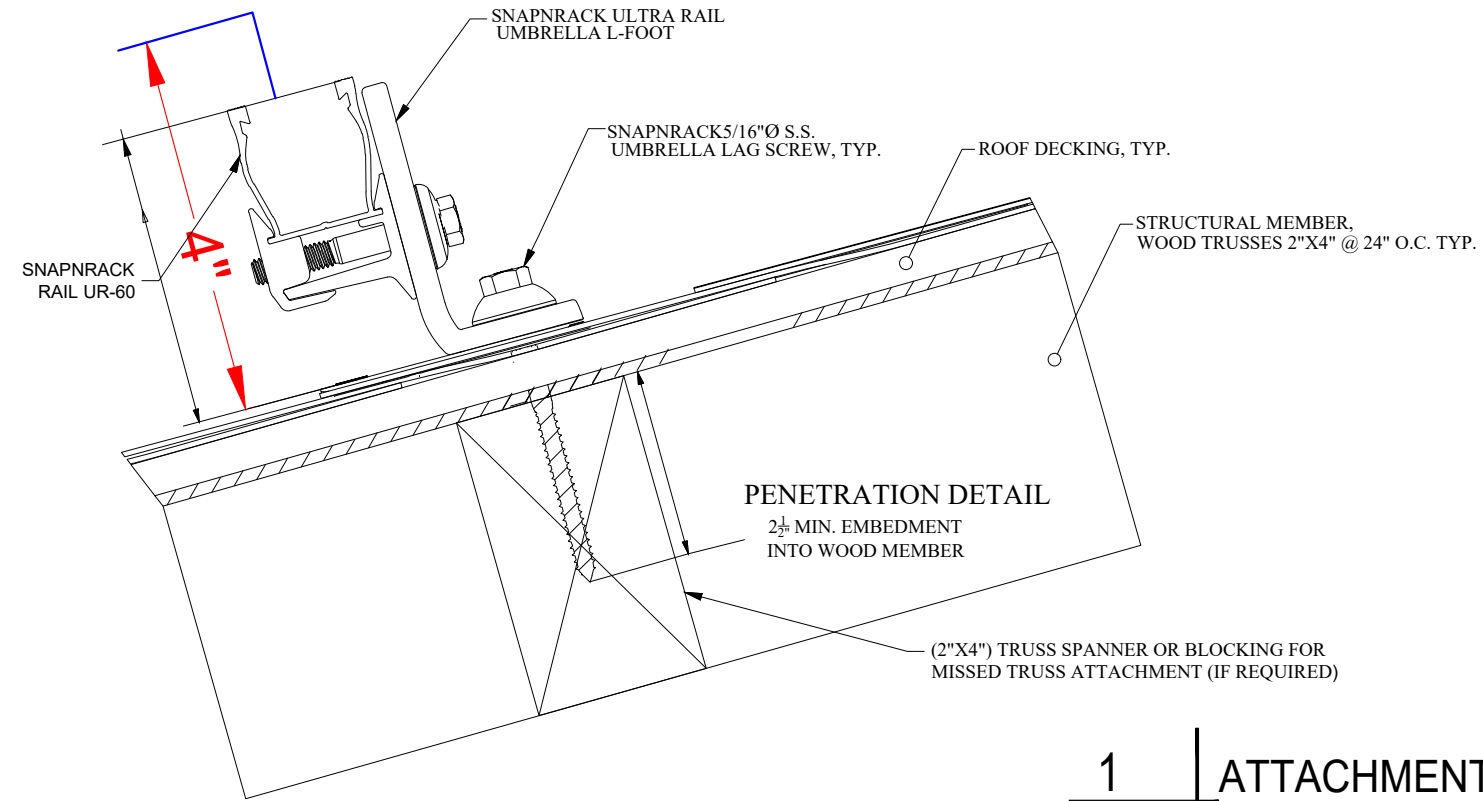
REFER TO SNAPNRACK ENGINEERING CHARTS FOR APPLICABLE RAIL SPANS. "BIN" NUMBER ON CHART SHOULD MATCH "BIN" NUMBER ON THIS DRAWING

5/16"Ø S.S. UMBRELLA LAG SCREW MUST EMBED A MIN. OF 2½" INTO STRUCTURAL MEMBER

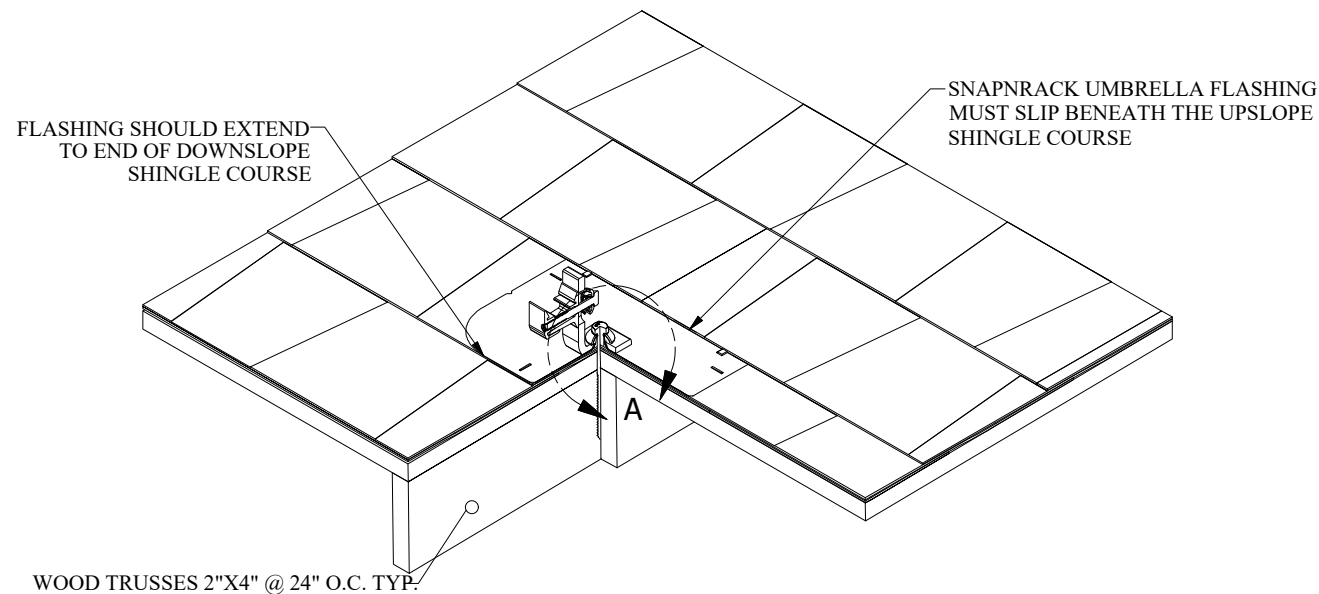
REFER TO SNAPNRACK INSTALLATION MANUAL FOR 5/16"Ø HARDWARE TORQUE SPECIFICATIONS

RAIL CAN BE MOUNTED ON EITHER SIDE OF THE L-FOOT

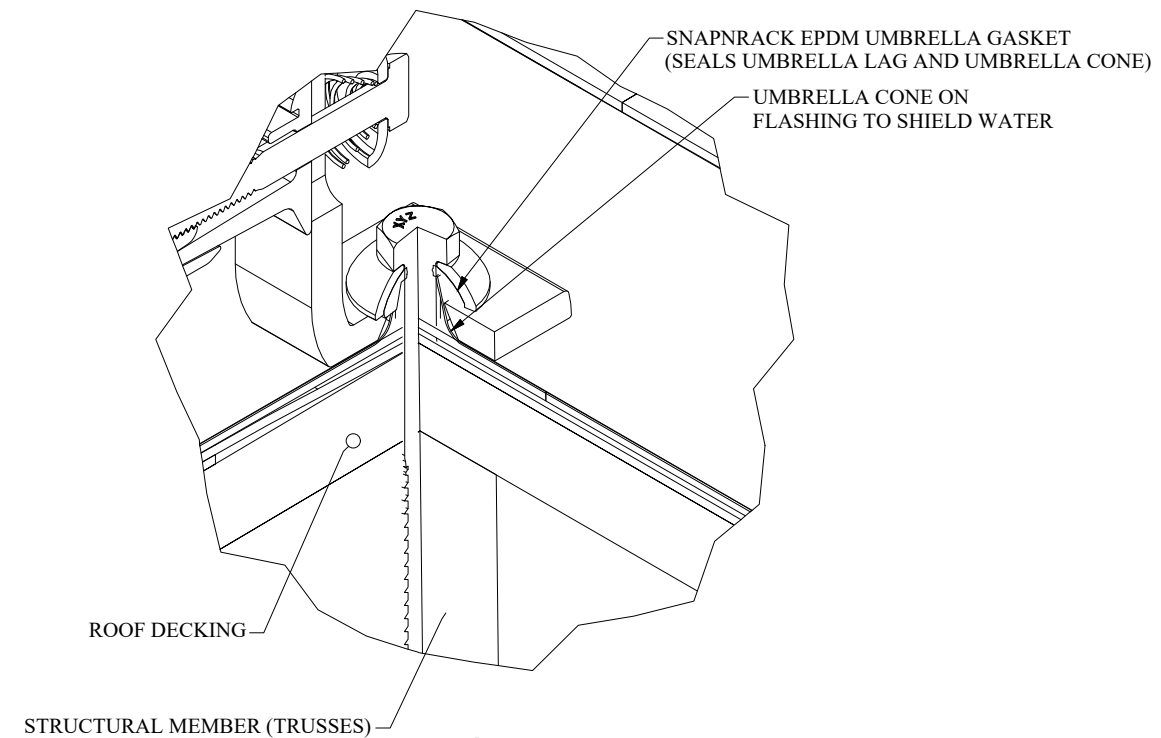
FOR LEVELING DETAILS, REFER TO SNAPNRACK DETAIL DRAWING "SNR-DC-00332 ULTRA RAIL, COMPONENT DETAIL, LEVELING EXTENSION KIT"



**1** | ATTACHMENT DETAIL  
 PV-4 | SCALE: NTS



**2** | ENLARGED DETAIL A  
 PV-4 | SCALE: NTS



**3** | SECTION VIEW DETAIL  
 PV-4 | SCALE: NTS

PROJECT NAME

KATHRYN AND JOSEPH GILL  
 RESIDENCE  
 325 SILVER MAPLE DR,  
 FUQUAY-VARINA, NC 27526 USA

SHEET NAME

ATTACHMENT  
 DETAILS

SHEET SIZE

ANSI B  
 11" X 17"

SHEET NUMBER


PV-4



- (12) HYUNDAI HIS-S400YH(BK) (400W) MODULES
- (12) ENPHASE IQ8PLUS-72-2-US MICROINVERTERS
- (1) BRANCH CIRCUIT OF 12 MODULES WITH MICROINVERTERS (CONNECTED IN SERIES PER BRANCH CIRCUIT)

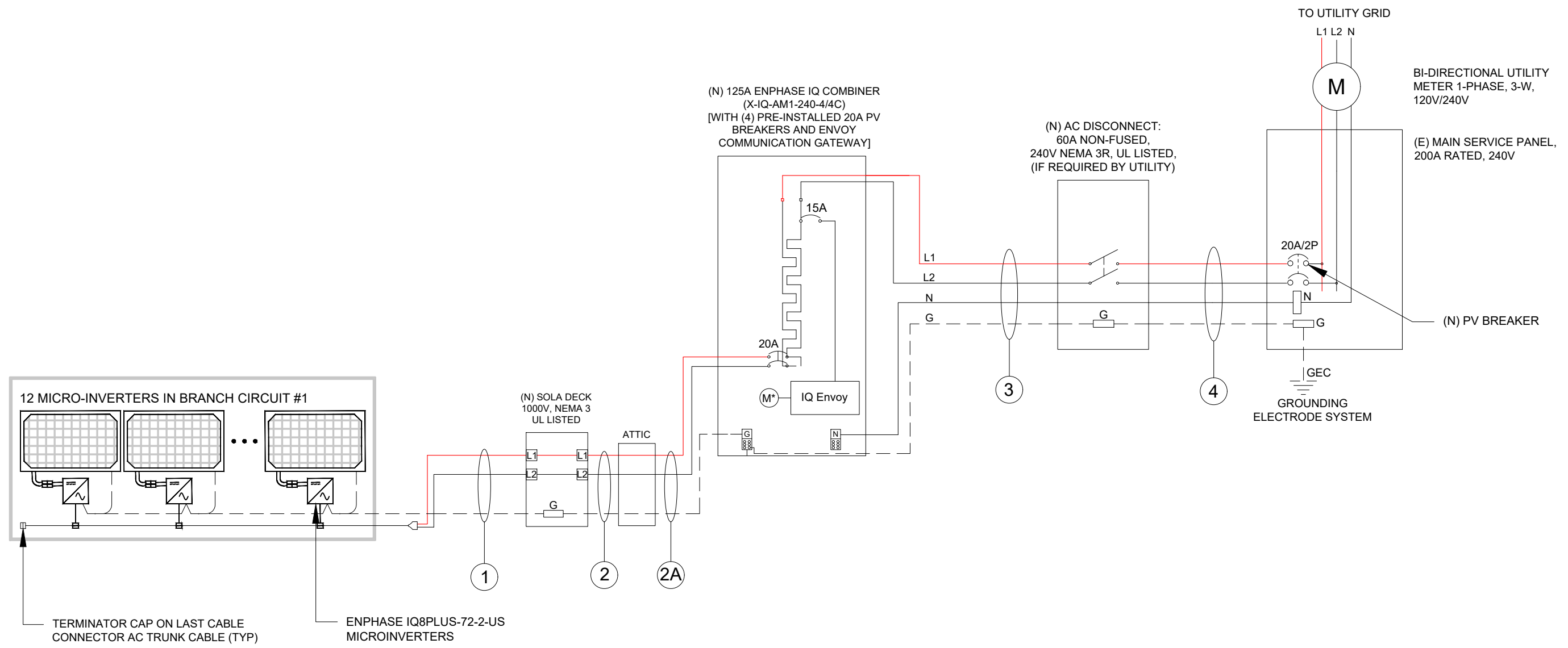
INVERTER SPECIFICATIONS	
MANUFACTURER / MODEL #	ENPHASE IQ8PLUS-72-2-US
NOMINAL OUTPUT VOLTAGE	240V
NOMINAL OUTPUT CURRENT	1.21A

**SYSTEM SIZE:**  
 TOTAL DC SYSTEM SIZE: 4.80 kW DC  
 TOTAL AC SYSTEM SIZE: 3.48 kW AC  
 MAXIMUM AC POWER: 290 VA  
 MAXIMUM AC CURRENT: 1.21 A



PE SOLAR  
 ATTN KIM JONES  
 400 DOMINION DRIVE STE 105  
 MORRISVILLE, NC 25760

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	12/06/2022	00



Signature with Seal

PROJECT NAME  
**KATHRYN AND JOSEPH GILL  
 RESIDENCE**  
 325 SILVER MAPLE DR,  
 FUQUAY-VARINA, NC 27526 USA

Conduit Conductor Schedule (ALL CONDUCTORS MUST BE COPPER)					
Tag #	Description	Wire Gauge	# of Conductors/Color	Conduit Type	Conduit Size
1	PV WIRE	10 AWG	2 (1V+, 1V-)	N/A-Free Air	N/A-Free Air
1	Bare Copper Ground (EGC/GEC)	6 AWG	1 BARE	N/A-Free Air	N/A-Free Air
2	THHN-2	10 AWG	2 (1V+, 1V-) B/R	LFMC	3/4"
2	THHN-2 - Ground (EGC/GEC)	10 AWG	1 (GRN)	LFMC	3/4"
2A	THHN-2	10 AWG	2 (1V+, 1V-) B/R	EMT OR METALLIC SEAL TIGHT	3/4"
2A	THHN-2 - Ground (EGC/GEC)	10 AWG	1 (GRN)	EMT OR METALLIC SEAL TIGHT	3/4"
3	THHN-2	8 AWG	3 (1L1, 1L2, 1N) B/R/W	LFNC	3/4"
3	THHN-2 - Ground (GEC)	10 AWG	1 (GRN)	LFNC	3/4"
4	THHN-2	10 AWG	3 (1L1, 1L2, 1N) B/R/W	EMT	3/4"
4	THHN-2 - Ground (GEC)	10 AWG	1 (GRN)	EMT	3/4"

SOLAR MODULE SPECIFICATIONS	
MANUFACTURER	HYUNDAI
MODEL #	HiS-S400YH
P <sub>MAX</sub>	400W
V <sub>MP</sub>	37.7V
I <sub>MP</sub>	10.61A
V <sub>OC</sub>	45.3V
I <sub>SC</sub>	11.25A
MODULE DIMENSION	75.75"L x 40.87"W x 1.38"D (In Inch)

INVERTER SPECIFICATIONS	
MANUFACTURER / MODEL #	ENPHASE IQ8PLUS-72-2-US
NOMINAL OUTPUT VOLTAGE	240V
NOMINAL OUTPUT CURRENT	1.21A

PERCENT OF VALUES	NUMBER OF CURRENT CARRYING CONDUCTORS IN CONDUIT
0.80	4-6
0.70	7-9
0.50	10-20

### OCPD Calculations

Breakers sized according to continuous duty output current. PV circuit nominal current based off # of modules per Circuit X (1.25[art. 210.19(A)(1)(a)]X (1.21 Max AC current per micro-inverter)  
 Circuit # 1 = 12 modules, Output Current w/ continuous duty = 18.15 <= 20A Breaker  
 System output current w/ continuous duty = 18.15 <= 20A (System OCPD)

### Conductor Calculations

Wire gauge calculated from art. code 310.15(B)(16) with ambient temperature calculations from art. 310.15(2)(a).  
 For "On Roof" conductors we use the 90°C column ampacity, 0.5"-3.5" off-the-roof temperature adjustment from 310.15(B)(3)(c), and raceway fill adjustments from 310.15(B)(16).  
 For "Off Roof" conductors we use the 75°C column ampacity, or the 90°C column ampacity with the relevant ambient temperature and raceway fill adjustments, whichever is less.  
 The rating of the conductor after adjustments MUST be greater than, or equal to, the continuous duty uprated output current.  
 Calculation Example - Wire Rating (90°C) x Ambient Temperature Adjustment x Conduit Fill Adjustment  
 >= Continuous Duty Output Current  
 (On Roof): 10 gauge wire rated for 40A, 40A x 0.96 x 1.0 (2 Conductors) = 38.4 > 18.15 A  
 (Off Roof): 10 gauge wire rated for 35A, 35A > 20A

### ELECTRICAL NOTES

- 1.) ALL EQUIPMENT TO BE LISTED BY UL OR OTHER NRTL, AND LABELED FOR ITS APPLICATION.
- 2.) ALL CONDUCTORS SHALL BE COPPER, RATED FOR 600 V AND 90 DEGREE C WET ENVIRONMENT.
- 3.) WIRING, CONDUIT, AND RACEWAYS MOUNTED ON ROOFTOPS SHALL BE ROUTED DIRECTLY TO, AND LOCATED AS CLOSE AS POSSIBLE TO THE NEAREST RIDGE, HIP, OR VALLEY.
- 4.) WORKING CLEARANCES AROUND ALL NEW AND EXISTING ELECTRICAL EQUIPMENT SHALL COMPLY WITH NEC 110.26.
- 5.) DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS. CONTRACTOR SHALL FURNISH ALL NECESSARY OUTLETS, SUPPORTS, FITTINGS AND ACCESSORIES TO FULFILL APPLICABLE CODES AND STANDARDS.
- 6.) WHERE SIZES OF JUNCTION BOXES, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, THE CONTRACTOR SHALL SIZE THEM ACCORDINGLY.
- 7.) ALL WIRE TERMINATIONS SHALL BE APPROPRIATELY LABELED AND READILY VISIBLE.
- 8.) MODULE GROUNDING CLIPS TO BE INSTALLED BETWEEN MODULE FRAME AND MODULE SUPPORT RAIL, PER THE GROUNDING CLIP MANUFACTURER'S INSTRUCTION.
- 9.) MODULE SUPPORT RAIL TO BE BONDED TO CONTINUOUS COPPER G.E.C. VIA WEEB LUG OR ILSCO GBL-4DBT LAY-IN LUG.



PE SOLAR  
 ATTN KIM JONES  
 400 DOMINION DRIVE STE 105  
 MORRISVILLE, NC 25760

### REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	12/06/2022	00

Signature with Seal

### PROJECT NAME

KATHRYN AND JOSEPH GILL  
 RESIDENCE  
 325 SILVER MAPLE DR,  
 FUQUAY-VARINA, NC 27526 USA

### SHEET NAME

WIRING  
 CALCULATIONS

### SHEET SIZE

ANSI B  
 11" X 17"

### SHEET NUMBER

PV-6

**⚠ WARNING**  
**ELECTRIC SHOCK HAZARD**  
 IF A GROUND FAULT IS INDICATED  
 NORMALLY GROUNDED CONDUCTORS  
 MAY BE UNGROUNDED AND ENERGIZED

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

**WARNING: PHOTOVOLTAIC  
 POWER SOURCE**

LABEL LOCATION:  
 CONDUIT, COMBINER BOX  
 (PER CODE: NEC690.31(G)(E)(4) 10 FT  
 MAX SPACING OF LABELS

**⚠ WARNING DUAL POWER SOURCE**  
**SECOND SOURCE IS PHOTOVOLTAIC SYSTEM**

LABEL LOCATION:  
 POINT OF INTERCONNECTION  
 (PER CODE: NEC 690.59)

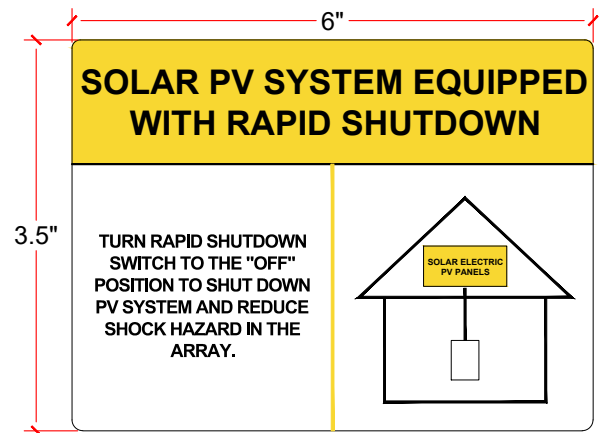
- ADHESIVE FASTENED SIGNS:
- THE LABEL SHALL BE SUITABLE FOR THE ENVIRONMENT WHERE IT IS INSTALLED.
  - WHERE REQUIRED ELSEWHERE IN THIS CODE, ALL FIELD APPLIED LABELS, WARNINGS, AND MARKINGS SHOULD COMPLY WITH ANSI Z535.4 [NEC 110.21(B) FIELD MARKING].
  - ADHESIVE FASTENED SIGNS MAY BE ACCEPTABLE IF PROPERLY ADHERED. VINYL SIGNS SHALL BE WEATHER RESISTANT [IFC 605.11.1.3]

**PHOTOVOLTAIC SYSTEM AC DISCONNECT**  
**RATED AC OPERATING CURRENT 14.52 AMPS**  
**AC NOMINAL OPERATING VOLTAGE 240 VOLTS**

LABEL LOCATION:  
 AC DISCONNECT, POINT OF INTERCONNECTION  
 (PER CODE: NEC690.54)

**WARNING**  
**INVERTER OUTPUT CONNECTION DO NOT**  
**RELOCATE THIS OVERCURRENT DEVICE**

LABEL LOCATION:  
 POINT OF INTERCONNECTION  
 (PER CODE: NEC 705.12(B)(2)(c))  
 [Not required if panelboard is rated not less than sum of ampere ratings  
 of all overcurrent devices supplying it]




LABEL LOCATION:  
 MAIN SERVICE PANEL  
 (PER CODE: NEC 690.56(C)(1)(a))

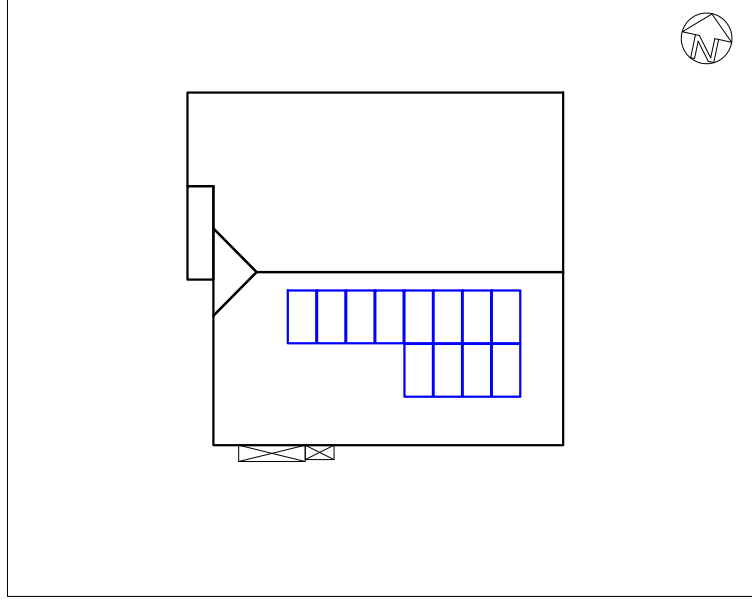
**PHOTOVOLTAIC SYSTEM EQUIPPED  
 WITH RAPID SHUTDOWN**

LABEL PER NEC 690.56(C)- PROVIDE AT NEW  
 SUB PANEL OR SERVICE PANEL FOR RAPID  
 SHUTDOWN COMPLIANT SYSTEM

**CAUTION:**

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

AT:  METER AND MAIN SERVICE PANEL  
 AC DISCONNECT  
 ENPHASE COMBINER BOX




MARKING CONTENT AND FORMAT

NOTE : LABELS MAY COME IN DIFFERENT COLORS

ELECTRICAL NOTES :

- 1). UTILITY HAS 24-HR UNRESTRICTED ACCESS TO ALL PHOTOVOLTAIC SYSTEM COMPONENTS LOCATED AT THE SERVICE ENTRANCE.
- 2). WORKING CLEARANCES AROUND THE EXISTING AND NEW ELECTRICAL EQUIPMENT WILL BE MAINTAINED IN ACCORDANCE WITH NEC ARTICLE 110.26.
- 3). ALL EQUIPMENT INSTALLED SHALL BE LISTED BY A NATIONALLY RECOGNIZED TESTING LABORATORY (NRTL) PER NEC ARTICLE 110.3.
- 4). RACKING CONFORMS TO AND IS LISTED UNDER UL 2703.
- 5). ALL LABELS OR MARKINGS SHALL BE VISIBLE AFTER INSTALLATION. THE LABELS SHALL BE REFLECTIVE, AND ALL LETTERS SHALL BE CAPITALIZED AND SHALL BE A MINIMUM HEIGHT OF 9.5 MM (3/8 IN) IN WHITE ON A RED BACKGROUND.
- 6). CONDUCTORS EXPOSED TO SUNLIGHT SHALL BE LISTED AS SUNLIGHT RESISTANT PER NEC ARTICLE 300.6 (C) (1) AND ARTICLE 310.8 (D).
- 7). CONDUCTORS EXPOSED TO WET LOCATIONS SHALL BE SUITABLE FOR USE IN WET LOCATIONS PER NEC ARTICLE 310.8 (C).



PE SOLAR  
 ATTN KIM JONES  
 400 DOMINION DRIVE STE 105  
 MORRISVILLE, NC 25760

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	12/06/2022	00

Signature with Seal

PROJECT NAME  
**KATHRYN AND JOSEPH GILL  
 RESIDENCE**  
**325 SILVER MAPLE DR,  
 FUQUAY-VARINA, NC 27526 USA**

SHEET NAME  
**PLACARD**

SHEET SIZE  
**ANSI B  
 11" X 17"**

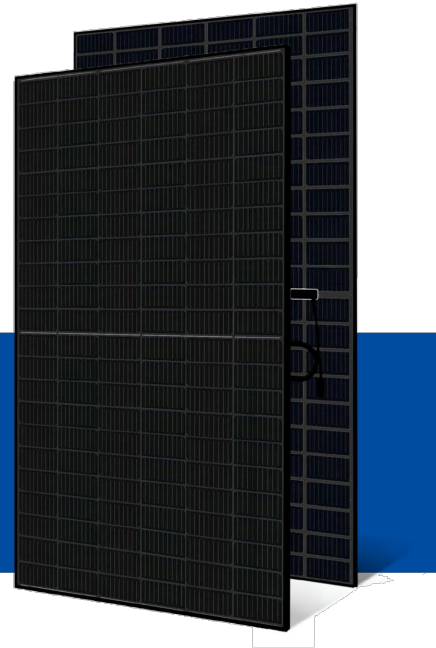
SHEET NUMBER  
**PV-7**

# HYUNDAI SOLAR MODULE

**YH**  
SERIES

## Dual Black Max

HiS-S385YH(BK) HiS-S390YH(BK) HiS-S395YH(BK)  
HiS-S400YH(BK) HiS-S405YH(BK) HiS-S410YH(BK)



### Electrical Characteristics

		Mono-Crystalline Type(HiS-S___YH(BK))					
		385	390	395	400	405	410
Nominal Output (P <sub>mpp</sub> )	W	385	390	395	400	405	410
Open Circuit Voltage (V <sub>oc</sub> )	V	44.5	44.8	45.0	45.3	45.6	45.9
Short Circuit Current (I <sub>sc</sub> )	A	11.04	11.11	11.18	11.25	11.33	11.40
Voltage at P <sub>max</sub> (V <sub>mpp</sub> )	V	37.1	37.3	37.5	37.7	37.9	38.1
Current at P <sub>max</sub> (I <sub>mpp</sub> )	A	10.40	10.47	10.54	10.61	10.69	10.76
Module Efficiency	%	19.3	19.5	19.8	20.0	20.3	20.5
Cell Type	-	Mono crystalline, 9busbar					
Maximum System Voltage	V	1,500					
Temperature Coefficient of P <sub>max</sub>	%/K	-0.347					
Temperature Coefficient of V <sub>oc</sub>	%/K	-0.268					
Temperature Coefficient of I <sub>sc</sub>	%/K	+0.032					

\*All data at STC (Measurement tolerances P<sub>mpp</sub> ±3%; I<sub>sc</sub>; V<sub>oc</sub> ±3%). Above data may be changed without prior notice.

Additional Power Gain from rear side		385	390	395	400	405	410
5%	W	399	404	410	415	425	431
15%	W	437	443	449	454	466	472
25%	W	475	482	488	494	506	513

### Mechanical Characteristics

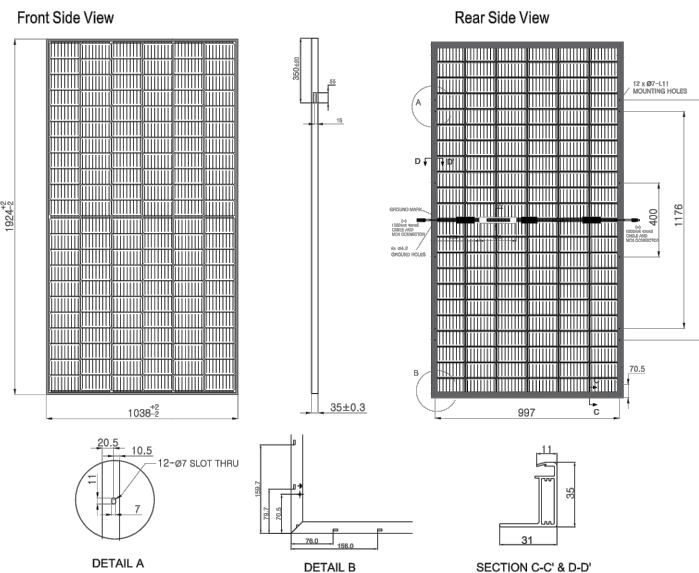
Dimensions	1,038 mm (W) x 1,924 mm (L) x 35 mm(H)
Weight	Approx. 21.1 kg
Solar Cells	132 half cut bifacial cells (2 parallel x 66 half cells in series)
Output Cables	Cable : 1,200mm / 4mm <sup>2</sup> Connector : MC4 genuine connector
Junction Box	IP68, weatherproof, IEC certified (UL listed)
Bypass Diodes	3 bypass diodes to prevent power decrease by partial shade
Construction	Front : 3.2mm, High Transmission, AR Coated Tempered Glass Encapsulant : EVA   Back Sheet : Black Meshed Transparent Backsheet
Frame	Anodized aluminum alloy type 6063

### Installation Safety Guide

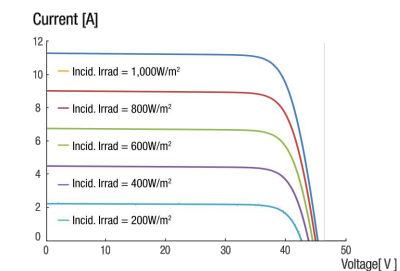
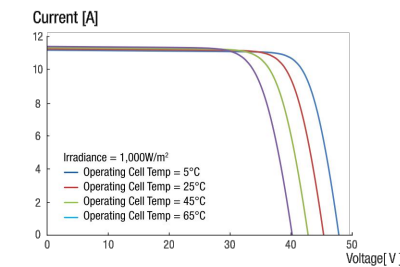
- Only qualified personnel should install or perform maintenance.
- Be aware of dangerous high DC voltage.
- Do not damage or scratch the rear surface of the module.
- Do not handle or install modules when they are wet.

Nominal Operating Cell Temperature	45.5°C ± 2
Operating Temperature	-40°C ~ +85°C
Maximum System Voltage	DC 1,500V
Maximum Reverse Current	20A
Maximum Test Load	Front 5,400 Pa (113psf) Rear 4,000 Pa (84psf)

### Module Diagram (unit : mm)



### I-V Curves



Bifacial Cells  
**132**

More Power Generation  
In Low Light

UL 1,500V  
IEC 1,500V  
Saves BOS Costs

All black Module  
For Sleek Design  
(Black Meshed  
T-Back sheet)

**Maximized Power Generation**

Increased total power output through capturing light from both the front and back of Bifacial solar modules. Back side power gain up to 25% of the front output depending on PV system design.

**Mechanical Strength**

Tempered glass and reinforced frame design withstand rigorous weather conditions such as heavy snow(5,400Pa) and strong wind(4,000Pa).

#### Hyundai's Warranty Provisions

- 25-Year Product Warranty
- Materials and workmanship
- 25-Year Performance Warranty
- Initial year : 98.0%
- Linear warranty after second year: with 0.54%p annual degradation, 85.0% is guaranteed up to 25 years

#### Certification

**UL LISTED** - UL61730 certified by UL, Type 1(for Fire Class A)

**Half-Cut & Multi-Wire Technology**

Improved current flow with half-cut technology and 9 thin wiring technology allows high module efficiency of up to 20.5%. It also reduces power generation loss due to micro-cracks.

**UL / VDE Test Labs**

Hyundai's R&D center is an accredited test laboratory of both UL and VDE.

#### About Hyundai Energy Solutions

Established in 1972, Hyundai Heavy Industries Group is one of the most trusted names in the heavy industries sector and is a Fortune 500 company. As a global leader and innovator, Hyundai Heavy Industries is committed to building a future growth engine by developing and investing heavily in the field of renewable energy.

As a core energy business entity of HHI, Hyundai Energy Solutions has strong pride in providing high-quality PV products to more than 3,000 customers worldwide.

**Anti-LID / PID**

Both LID(Light Induced Degradation) and PID(Potential Induced Degradation) are significantly reduced to ensure higher actual yield during lifetime.

**Reliable Warranty**

Global brand with powerful financial strength provide reliable 25-year warranty.

Printed Date : 03/2022(final)



PE SOLAR  
ATTN KIM JONES  
400 DOMINION DRIVE STE 105  
MORRISVILLE, NC 25760

#### REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	12/06/2022	00

Signature with Seal

#### PROJECT NAME

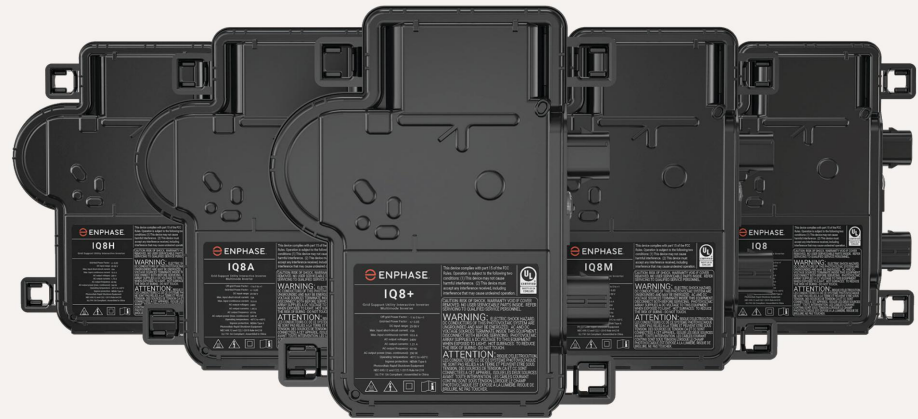
KATHRYN AND JOSEPH GILL  
RESIDENCE  
325 SILVER MAPLE DR,  
FUQUAY-VARINA, NC 27526 USA

SHEET NAME  
EQUIPMENT  
SPECIFICATIONS

SHEET SIZE  
ANSI B  
11" X 17"

SHEET NUMBER  
PV-8





## IQ8 Series Microinverters

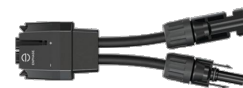
Our newest IQ8 Microinverters are the industry's first microgrid-forming, software-defined microinverters with split-phase power conversion capability to convert DC power to AC power efficiently. The brain of the semiconductor-based microinverter is our proprietary application-specific integrated circuit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



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



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



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



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

© 2021 Enphase Energy. All rights reserved. Enphase, the Enphase logo, IQ8 microinverters, and other names are trademarks of Enphase Energy, Inc. Data subject to change.

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

### 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 Series Microinverters

INPUT DATA [DC]		IQ8-60-2-US	IQ8PLUS-72-2-US	IQ8M-72-2-US	IQ8A-72-2-US	IQ8H-240-72-2-US	IQ8H-208-72-2-US <sup>(1)</sup>
Commonly used module pairings <sup>2</sup>	W	235 – 350	235 – 440	260 – 460	295 – 500	320 – 540+	295 – 500+
Module compatibility		60-cell/120 half-cell		60-cell/120 half-cell and 72-cell/144 half-cell			
MPPT voltage range	V	27 – 37	29 – 45	33 – 45	36 – 45	38 – 45	38 – 45
Operating range	V	25 – 48			25 – 58		
Min/max start voltage	V	30 / 48			30 / 58		
Max input DC voltage	V	50			60		
Max DC current <sup>3</sup> [module Isc]	A			15			
Oversoltage class DC port				II			
DC port backfeed current	mA			0			
PV array configuration		1x1 Ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit					
OUTPUT DATA [AC]		IQ8-60-2-US	IQ8PLUS-72-2-US	IQ8M-72-2-US	IQ8A-72-2-US	IQ8H-240-72-2-US	IQ8H-208-72-2-US
Peak output power	VA	245	300	330	366	384	366
Max continuous output power	VA	240	290	325	349	380	360
Nominal (L-L) voltage/range <sup>4</sup>	V			240 / 211 – 264			208 / 183 – 250
Max continuous output current	A	1.0	1.21	1.35	1.45	1.58	1.73
Nominal frequency	Hz			60			
Extended frequency range	Hz			50 – 68			
Max units per 20 A (L-L) branch circuit <sup>5</sup>		16	13	11	11	10	9
Total harmonic distortion				<5%			
Oversoltage class AC port				III			
AC port backfeed current	mA			30			
Power factor setting				1.0			
Grid-tied power factor (adjustable)				0.85 leading – 0.85 lagging			
Peak efficiency	%	97.5	97.6	97.6	97.6	97.6	97.4
CEC weighted efficiency	%	97	97	97	97.5	97	97
Night-time power consumption	mW			60			
MECHANICAL DATA							
Ambient temperature range		-40°C to +60°C (-40°F to +140°F)					
Relative humidity range		4% to 100% (condensing)					
DC Connector type		MC4					
Dimensions (HxWxD)		212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")					
Weight		1.08 kg (2.38 lbs)					
Cooling		Natural convection – no fans					
Approved for wet locations		Yes					
Acoustic noise at 1 m		<60 dBA					
Pollution degree		PD3					
Enclosure		Class II double-insulated, corrosion resistant polymeric enclosure					
Environ. category / UV exposure rating		NEMA Type 6 / outdoor					
COMPLIANCE							
Certifications		CA Rule 21 (UL 1741-SA), UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01					
		This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020 section 690.12 and C22.1-2018 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to manufacturer's instructions.					

(1) The IQ8H-208 variant will be operating in grid-tied mode only at 208V AC. (2) No enforced DC/AC ratio. See the compatibility calculator at <https://link.enphase.com/module-compatibility> (3) Maximum continuous input DC current is 10.6A (4) Nominal voltage range can be extended beyond nominal if required by the utility. (5) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

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

### REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	12/06/2022	00

Signature with Seal

### PROJECT NAME

KATHRYN AND JOSEPH GILL  
RESIDENCE  
325 SILVER MAPLE DR,  
FUQUAY-VARINA, NC 27526 USA

SHEET NAME  
EQUIPMENT  
SPECIFICATIONS

SHEET SIZE  
ANSI B  
11" X 17"

SHEET NUMBER  
PV-9

# Enphase IQ Combiner 4/4C

X-IQ-AM1-240-4  
X-IQ-AM1-240-4C



The **Enphase IQ Combiner 4/4C** with Enphase IQ Gateway and integrated LTE-M1 cell modem (included only with IQ Combiner 4C) consolidates interconnection equipment into a single enclosure and streamlines IQ microinverters and storage installations by providing a consistent, pre-wired solution for residential applications. It offers up to four 2-pole input circuits and Eaton BR series busbar assembly.

### Smart

- Includes IQ Gateway for communication and control
- Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), included only with IQ Combiner 4C
- Includes solar shield to match Enphase IQ Battery aesthetics and deflect heat
- Flexible networking supports Wi-Fi, Ethernet, or cellular
- Optional AC receptacle available for PLC bridge
- Provides production metering and consumption monitoring

### Simple

- Centered mounting brackets support single stud mounting
- Supports bottom, back and side conduit entry
- Up to four 2-pole branch circuits for 240 VAC plug-in breakers (not included)
- 80A total PV or storage branch circuits

### Reliable

- Durable NRTL-certified NEMA type 3R enclosure
- Five-year limited warranty
- Two years labor reimbursement program coverage included for both the IQ Combiner SKU's
- UL listed



To learn more about Enphase offerings, visit [enphase.com](http://enphase.com)



## Enphase IQ Combiner 4/4C

MODEL NUMBER	
IQ Combiner 4 (X-IQ-AM1-240-4)	IQ Combiner 4 with Enphase IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes a silver solar shield to match the IQ Battery system and IQ System Controller 2 and to deflect heat.
IQ Combiner 4C (X-IQ-AM1-240-4C)	IQ Combiner 4C with Enphase IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), a plug-and-play industrial-grade cell modem for systems up to 60 microinverters. (Available in the US, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.) Includes a silver solar shield to match the IQ Battery and IQ System Controller and to deflect heat.
ACCESSORIES AND REPLACEMENT PARTS (not included, order separately)	
Ensemble Communications Kit COMMS-CELLMODEM-M1-06 CELLMODEM-M1-06-SP-05 CELLMODEM-M1-06-AT-05	- Includes COMMS-KIT-01 and CELLMODEM-M1-06-SP-05 with 5-year Sprint data plan for Ensemble sites - 4G based LTE-M1 cellular modem with 5-year Sprint data plan - 4G based LTE-M1 cellular modem with 5-year AT&T data plan
Circuit Breakers BRK-10A-2-240V BRK-15A-2-240V BRK-20A-2P-240V BRK-15A-2P-240V-B BRK-20A-2P-240V-B	Supports Eaton BR210, BR215, BR220, BR230, BR240, BR250, and BR260 circuit breakers. Circuit breaker, 2 pole, 10A, Eaton BR210 Circuit breaker, 2 pole, 15A, Eaton BR215 Circuit breaker, 2 pole, 20A, Eaton BR220 Circuit breaker, 2 pole, 15A, Eaton BR215B with hold down kit support Circuit breaker, 2 pole, 20A, Eaton BR220B with hold down kit support
EPLC-01	Power line carrier (communication bridge pair), quantity - one pair
XA-SOLARSHIELD-ES	Replacement solar shield for IQ Combiner 4/4C
XA-PLUG-120-3	Accessory receptacle for Power Line Carrier in IQ Combiner 4/4C (required for EPLC-01)
XA-ENV-PCBA-3	Replacement IQ Gateway printed circuit board (PCB) for Combiner 4/4C
X-IQ-NA-HD-125A	Hold down kit for Eaton circuit breaker with screws.
ELECTRICAL SPECIFICATIONS	
Rating	Continuous duty
System voltage	120/240 VAC, 60 Hz
Eaton BR series busbar rating	125 A
Max. continuous current rating	65 A
Max. continuous current rating (input from PV/storage)	64 A
Max. fuse/circuit rating (output)	90 A
Branch circuits (solar and/or storage)	Up to four 2-pole Eaton BR series Distributed Generation (DG) breakers only (not included)
Max. total branch circuit breaker rating (input)	80A of distributed generation / 95A with IQ Gateway breaker included
Production metering CT	200 A solid core pre-installed and wired to IQ Gateway
Consumption monitoring CT (CT-200-SPLIT)	A pair of 200 A split core current transformers
MECHANICAL DATA	
Dimensions (WxHxD)	37.5 x 49.5 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° 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.
Altitude	To 2000 meters (6,560 feet)
INTERNET CONNECTION OPTIONS	
Integrated Wi-Fi	802.11b/g/n
Cellular	CELLMODEM-M1-06-SP-05, CELLMODEM-M1-06-AT-05 (4G based LTE-M1 cellular modem). Note that an Enphase Mobile Connect cellular modem is required for all Ensemble installations.
Ethernet	Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included)
COMPLIANCE	
Compliance, IQ Combiner	UL 1741, CAN/CSA C22.2 No. 107.1, 47 CFR, Part 15, Class B, ICES 003 Production metering: ANSI C12.20 accuracy class 0.5 (PV production) Consumption metering: accuracy class 2.5
Compliance, IQ Gateway	UL 60601-1/CANCSA 22.2 No. 61010-1

To learn more about Enphase offerings, visit [enphase.com](http://enphase.com)

© 2021 Enphase Energy. All rights reserved. Enphase, the Enphase logo, IQ Combiner 4/4C, and other names are trademarks of Enphase Energy, Inc. Data subject to change. 10-21-2021



PE SOLAR  
ATTN KIM JONES  
400 DOMINION DRIVE STE 105  
MORRISVILLE, NC 25760

### REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	12/06/2022	00

Signature with Seal

### PROJECT NAME

KATHRYN AND JOSEPH GILL  
RESIDENCE  
325 SILVER MAPLE DR,  
FUQUAY-VARINA, NC 27526 USA

SHEET NAME  
EQUIPMENT  
SPECIFICATIONS

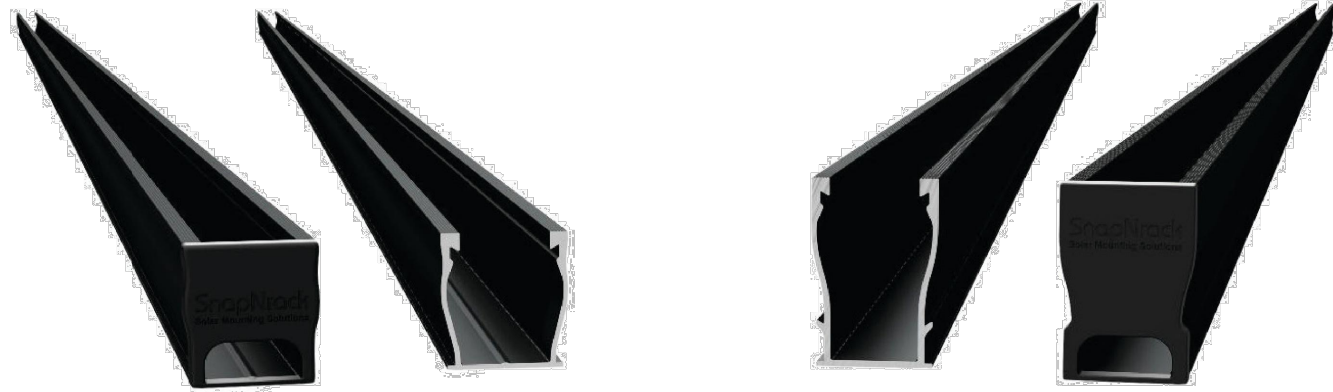
SHEET SIZE  
ANSI B  
11" X 17"

SHEET NUMBER  
PV-10



# Ultra Rail

UR-40  
UR-60



## The Ultimate Value in Rooftop Solar



Industry leading Wire Management Solutions



Mounts available for all roof types



Single Tool Installation



All SnapNrack Module Clamps & Accessories are compatible with both rail profiles

**Start Installing Ultra Rail Today**

**RESOURCES**  
**DESIGN**  
**WHERE TO BUY**

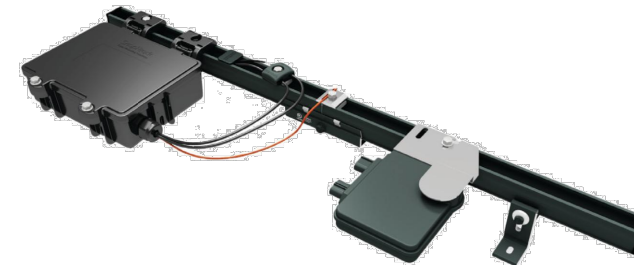
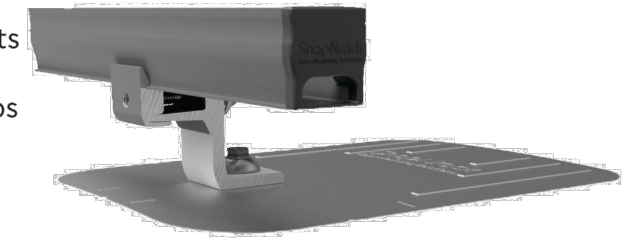
[snapnrack.com/resources](http://snapnrack.com/resources)  
[snapnrack.com/configurator](http://snapnrack.com/configurator)  
[snapnrack.com/where-to-buy](http://snapnrack.com/where-to-buy)

## SnapNrack Ultra Rail System

A sleek, straightforward rail solution for mounting solar modules on all roof types. Ultra Rail features two rail profiles; UR-40 is a lightweight rail profile that is suitable for most geographic regions and maintains all the great features of SnapNrack rail, while UR-60 is a heavier duty rail profile that provides a larger rail channel and increased span capabilities. Both are compatible with all existing mounts, module clamps, and accessories for ease of install.

### The Entire System is a Snap to Install

- New Ultra Rail Mounts include snap-in brackets for attaching rail
- Compatible with all the SnapNrack Mid Clamps and End Clamps customers love
- Universal End Clamps and snap-in End Caps provide a clean look to the array edge



### Unparalleled Wire Management

- Open rail channel provides room for running wires resulting in a long-lasting quality install
- Industry best wire management offering includes Junction Boxes, Universal Wire Clamps, MLPE Attachment Kits, and Conduit Clamps
- System is fully bonded and listed to UL 2703 Standard

### Heavy Duty UR-60 Rail

- UR-60 rail profile provides increased span capabilities for high wind speeds and snow loads
- Taller, stronger rail profile includes profile-specific rail splice and end cap
- All existing mounts, module clamps, and accessories are retained for the same great install experience



# Quality. Innovative. Superior.

SnapNrack Solar Mounting Solutions are engineered to optimize material use and labor resources and improve overall installation quality and safety.

877-732-2860

[www.snapnrack.com](http://www.snapnrack.com)

[contact@snapnrack.com](mailto:contact@snapnrack.com)

© 2019 by SnapNrack Solar Mounting Solutions. All rights reserved.

#### REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	12/06/2022	00

Signature with Seal

#### PROJECT NAME

KATHRYN AND JOSEPH GILL  
RESIDENCE

325 SILVER MAPLE DR,  
FUQUAY-VARINA, NC 27526 USA

#### SHEET NAME


EQUIPMENT  
SPECIFICATIONS

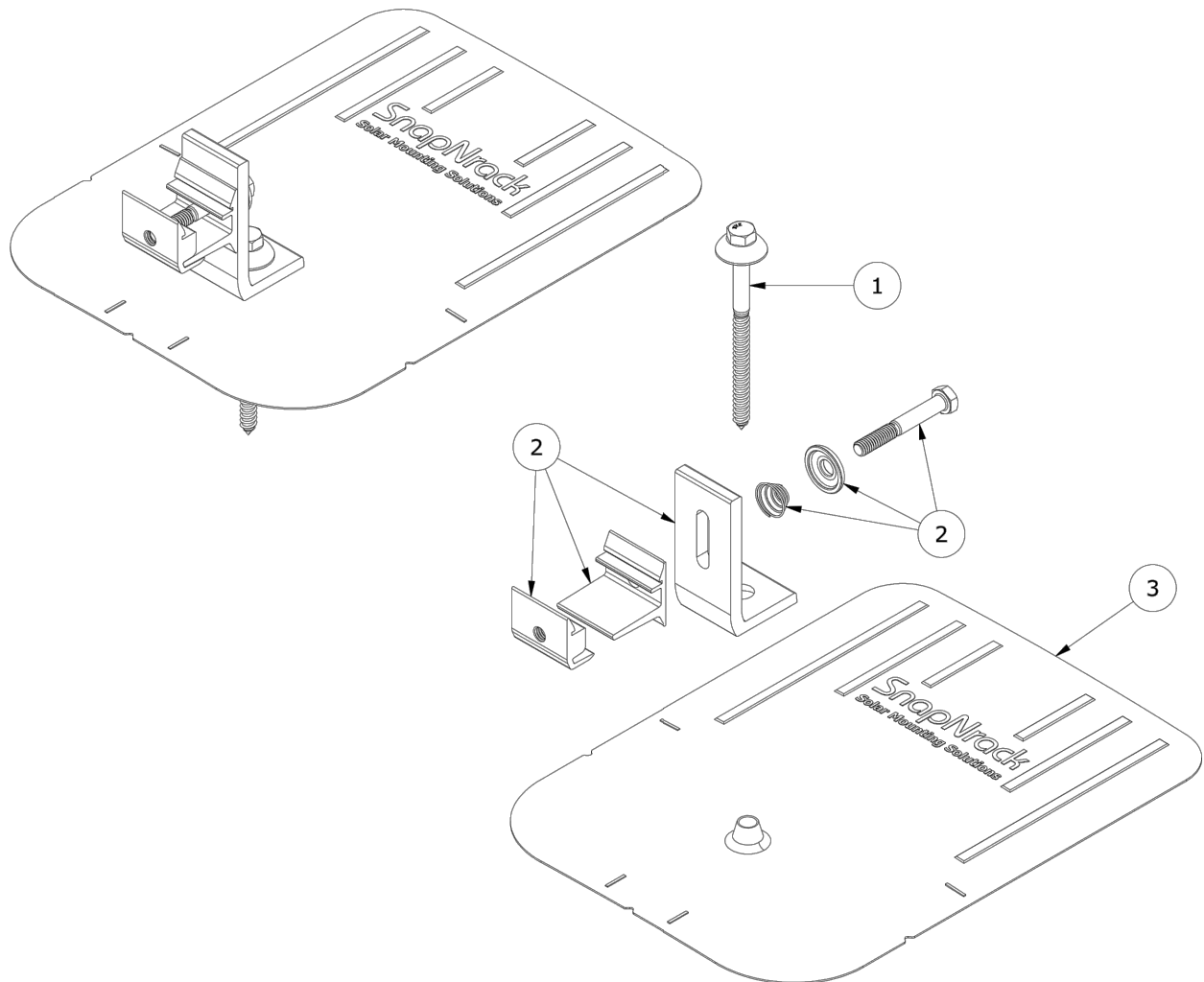
#### SHEET SIZE

ANSI B  
11" X 17"

#### SHEET NUMBER

PV-11

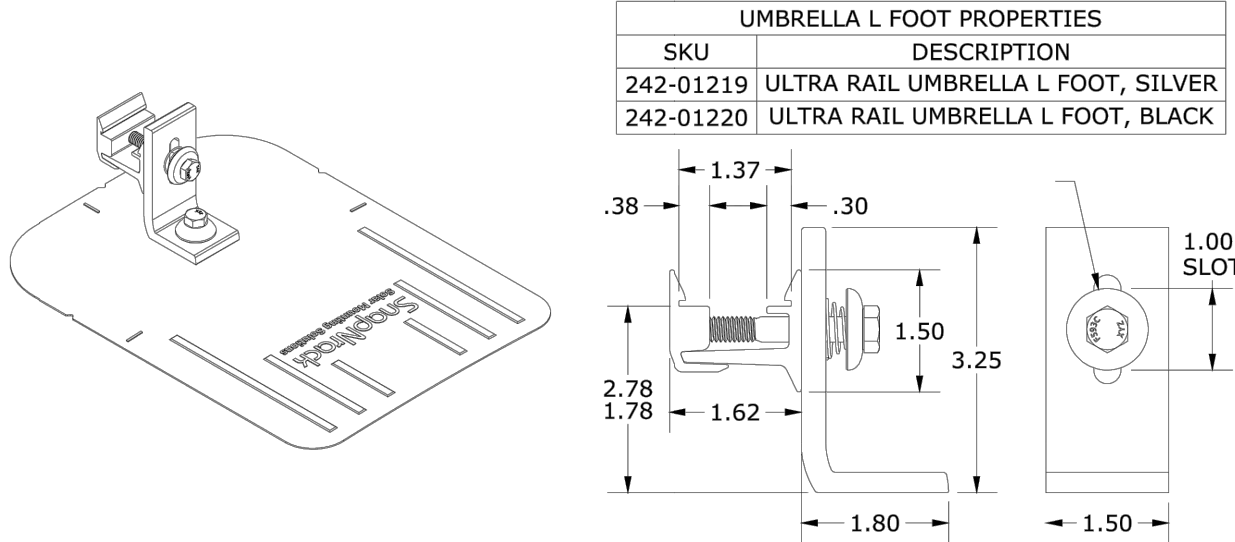
DESCRIPTION: <b>SNAPNRACK, ULTRA RAIL COMP KIT</b>	DRAWN BY: mwatkins	
PART NUMBER(S): <b>SEE BELOW</b>	REVISION: <b>B</b>	



PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	242-92266	SNAPNRACK, UMBRELLA LAG, TYPE 3, 4IN, SS
2	1	242-01219, 242-01220	SNAPNRACK, ULTRA FOOT FOR U FLASHING, SILVER / BLACK
3	1	232-01375, 232-01376	SNAPNRACK, COMP FLASHING, 9IN X 12IN, SILVER / BLACK ALUM

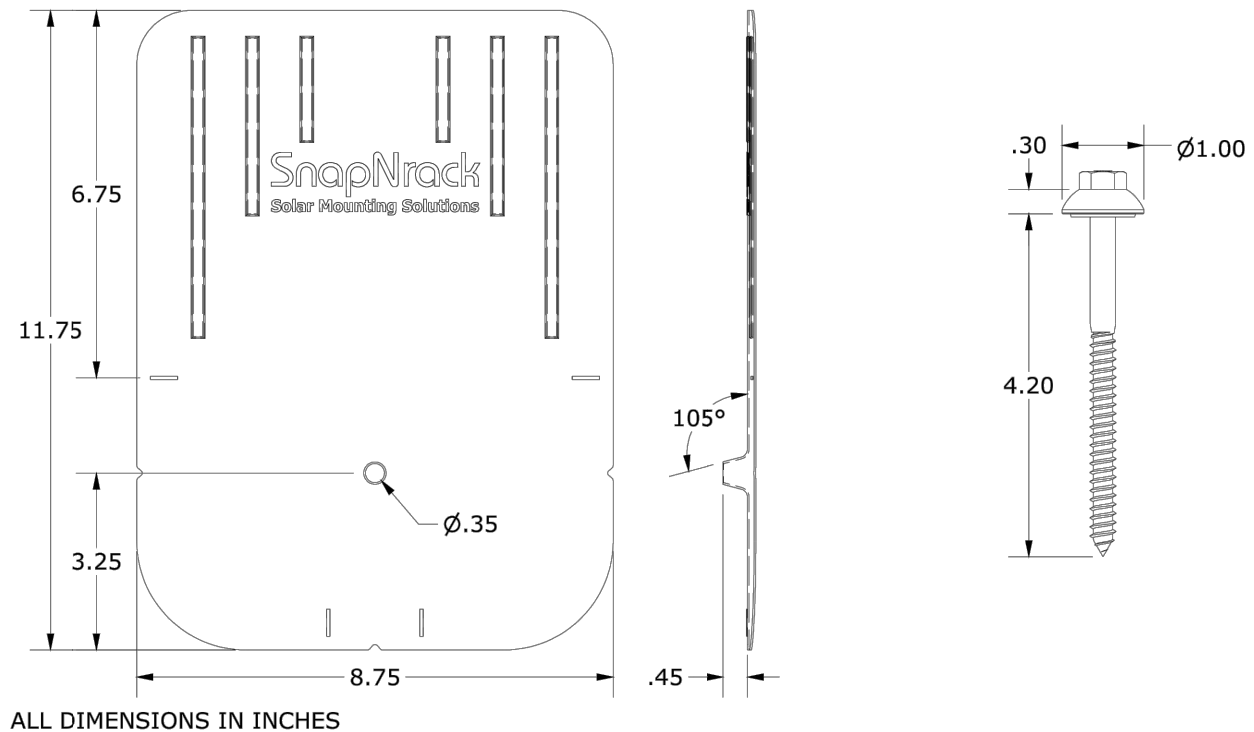
MATERIALS:	6000 SERIES ALUMINUM, STAINLESS STEEL, RUBBER
DESIGN LOAD (LBS):	802 UP, 1333 DOWN, 356 SIDE
ULTIMATE LOAD (LBS):	2005 UP, 4000 DOWN, 1070 SIDE
TORQUE SPECIFICATION:	12 LB-FT
CERTIFICATION:	UL 2703, FILE E359313; WIND-DRIVEN RAIN TEST FROM UL SUBJECT 2582
WEIGHT (LBS):	0.80

DESCRIPTION: <b>SNAPNRACK, ULTRA RAIL COMP KIT</b>	DRAWN BY: mwatkins	
PART NUMBER(S): <b>SEE BELOW</b>	REVISION: <b>B</b>	



UMBRELLA L FOOT PROPERTIES	
SKU	DESCRIPTION
242-01219	ULTRA RAIL UMBRELLA L FOOT, SILVER
242-01220	ULTRA RAIL UMBRELLA L FOOT, BLACK

COMP FLASHING PROPERTIES	
SKU	DESCRIPTION
232-01375	COMP FLASHING, 9" X 12", BLACK ALUM
232-01376	COMP FLASHING, 9" X 12", SILVER ALUM



ALL DIMENSIONS IN INCHES



PE SOLAR  
ATTN KIM JONES  
400 DOMINION DRIVE STE 105  
MORRISVILLE, NC 25760

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	12/06/2022	00

Signature with Seal

PROJECT NAME  
**KATHRYN AND JOSEPH GILL  
RESIDENCE  
325 SILVER MAPLE DR,  
FUQUAY-VARINA, NC 27526 USA**

SHEET NAME  
**EQUIPMENT  
SPECIFICATIONS**

SHEET SIZE  
**ANSI B  
11" X 17"**

SHEET NUMBER  
**PV-12**