

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 25760

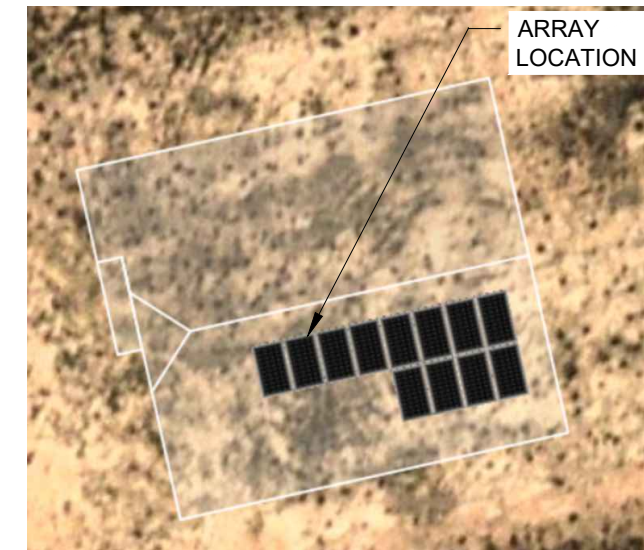
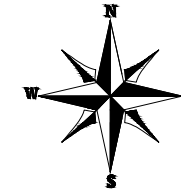
PROJECT DESCRIPTION:

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

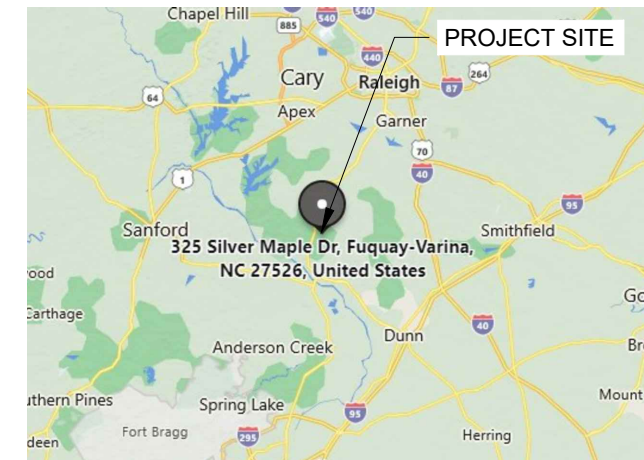
12 HYUNDAI HIS-S400YH(BK) (400W) MODULES
 12 ENPHASE IQ8PLUS-72-2-US MICROINVERTERS



ARRAY LOCATION

2 | HOUSE PHOTO

PV-1 | SCALE: NTS



3 | VICINITY MAP

PV-1 | SCALE: NTS

SHEET INDEX

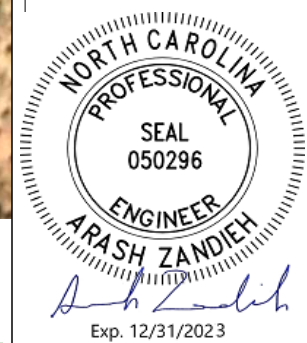
- PV-1 SITE PLAN WITH VICINITY MAP
- PV-2 ROOF PLAN & MODULES
- PV-3 STRING LAYOUT
- PV-4 ATTACHMENT DETAIL
- PV-5 ELECTRICAL LINE DIAGRAM
- PV-6 WIRING CALCULATIONS
- PV-7 PLACARDS
- PV-8 + EQUIPMENT SPECIFICATIONS

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

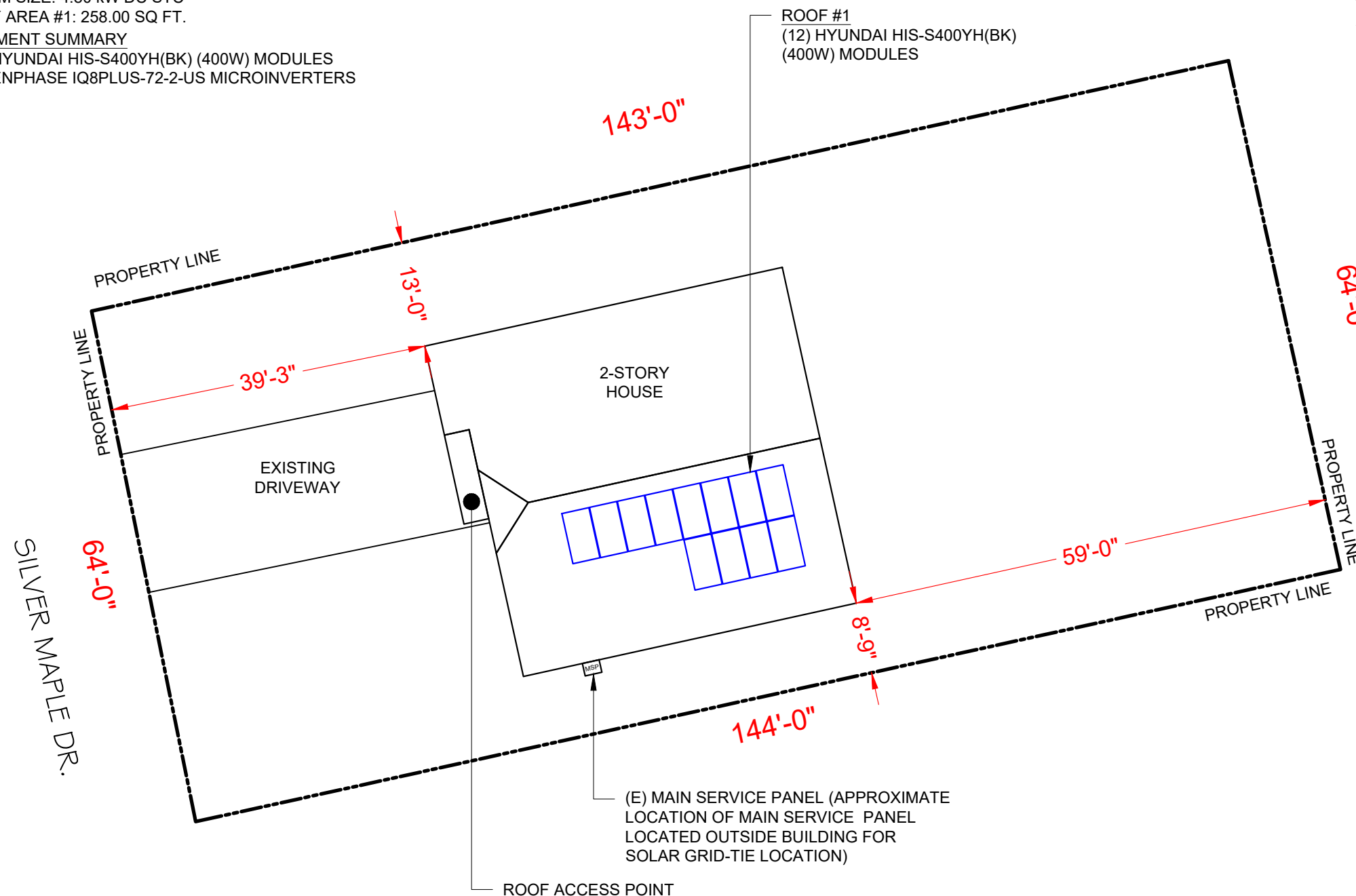
ANSI B
 11" X 17"

SHEET NUMBER

PV-1

1 | SITE PLAN WITH VICINITY MAP

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



ROOF #1
 (12) HYUNDAI HIS-S400YH(BK)
 (400W) MODULES

143'-0"

13'-0"

39'-3"

2-STORY HOUSE

EXISTING DRIVEWAY

59'-0"

8'-9"

144'-0"

(E) MAIN SERVICE PANEL (APPROXIMATE LOCATION OF MAIN SERVICE PANEL LOCATED OUTSIDE BUILDING FOR SOLAR GRID-TIE LOCATION)

ROOF ACCESS POINT

SILVER MAPLE DR.

PROPERTY LINE

PROPERTY LINE

64'-0"

PROPERTY LINE

PROPERTY LINE

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.



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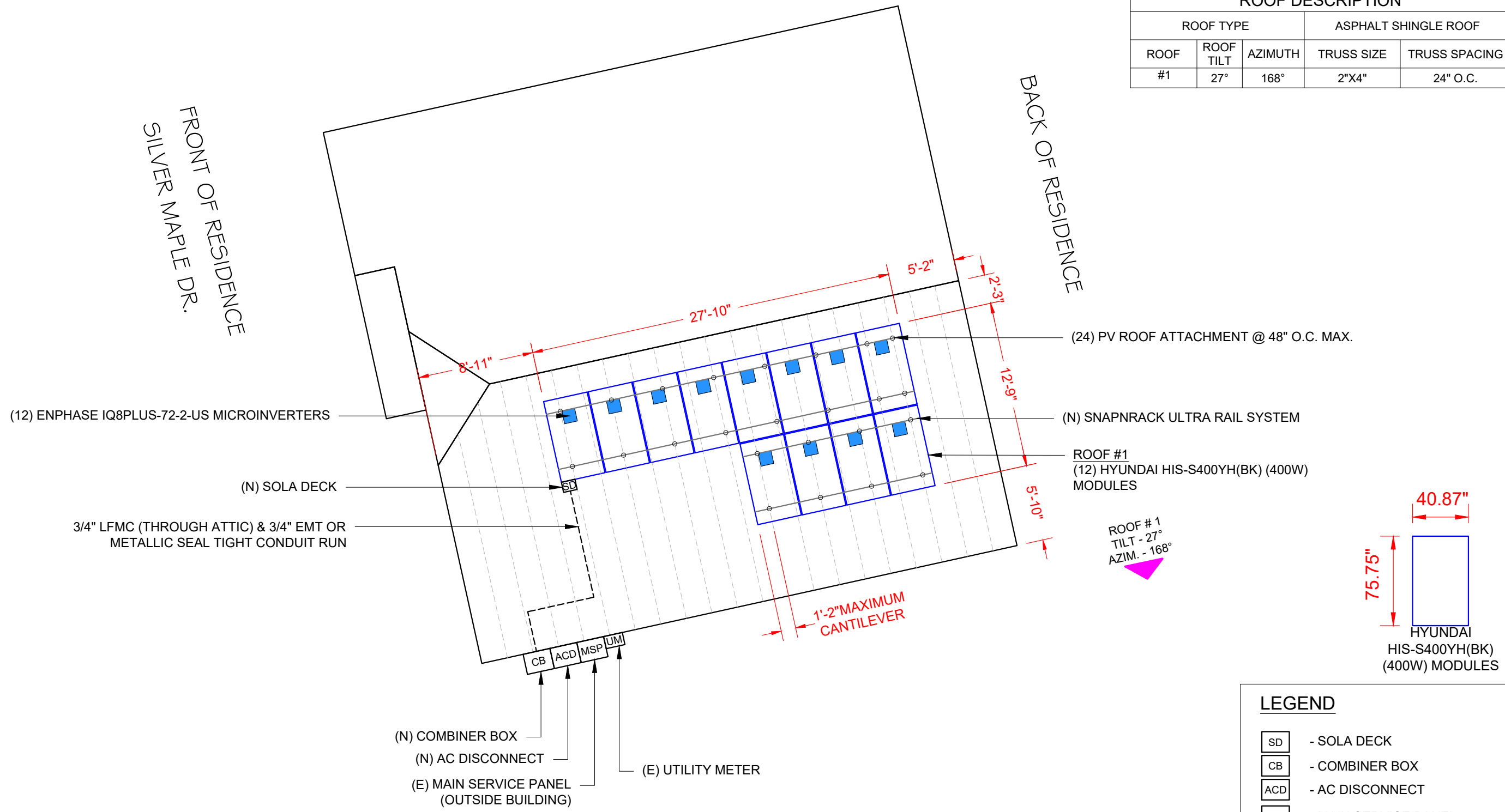


PROJECT NAME
KATHRYN AND JOSEPH GILL RESIDENCE
 325 SILVER MAPLE DR,
 FUQUAY-VARINA, NC 27526 USA

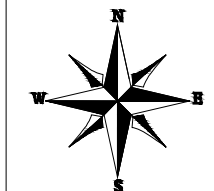
SHEET NAME
ROOF PLAN & MODULES

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

SHEET NUMBER
PV-2



LEGEND	
	- SOLA DECK
	- COMBINER BOX
	- AC DISCONNECT
	- MAIN SERVICE PANEL
	- UTILITY METER
	- MICROINVERTER
	- TRUSS
	- CONDUIT
	- VENT (ROOF OBSTRUCTIONS)





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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



BACK OF RESIDENCE

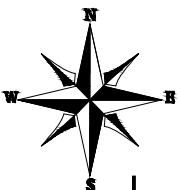
FRONT OF RESIDENCE
 SILVER MAPLE DR.

CB ACD MSP UM

STRING #1

LEGEND

- □ - VENT (ROOF OBSTRUCTION)
- - STRINGS



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

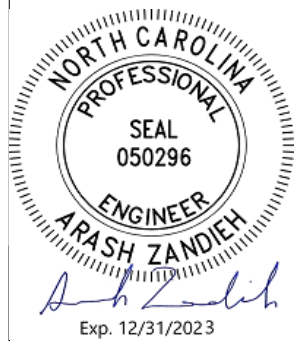


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SNAPNRACK ULTRA RAIL UMBRELLA L FOOT WITH UMBRELLA FLASHING FOR COMPOSTION ROOF MOUNTING

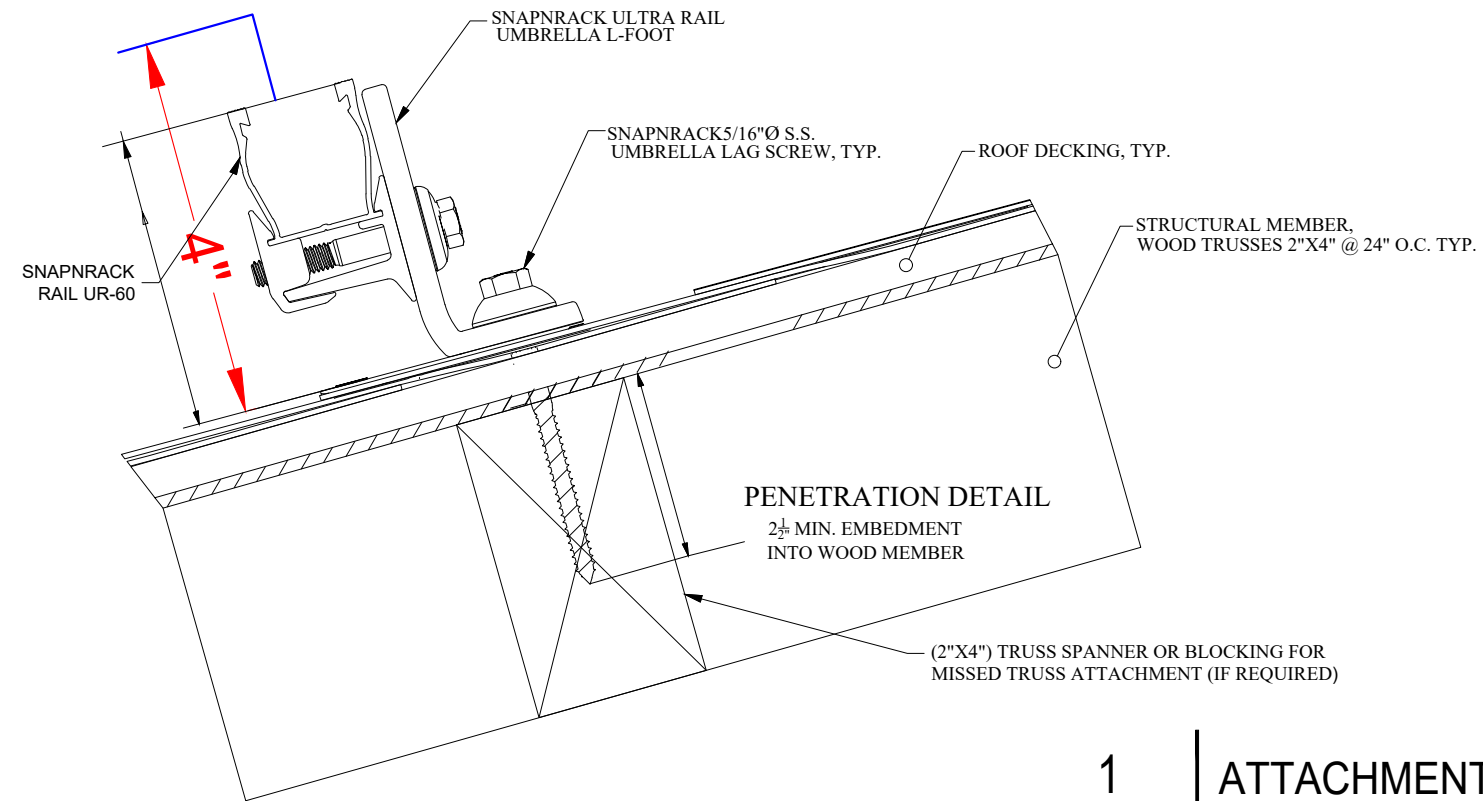
REFER TO SNAPNRACK ENGINEERING CHARTS FOR APPLICABLE RAIL SPANS. "BIN" NUMBER ON CHART SHOULD MATCH "BIN" NUMBER ON THIS DRAWING

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

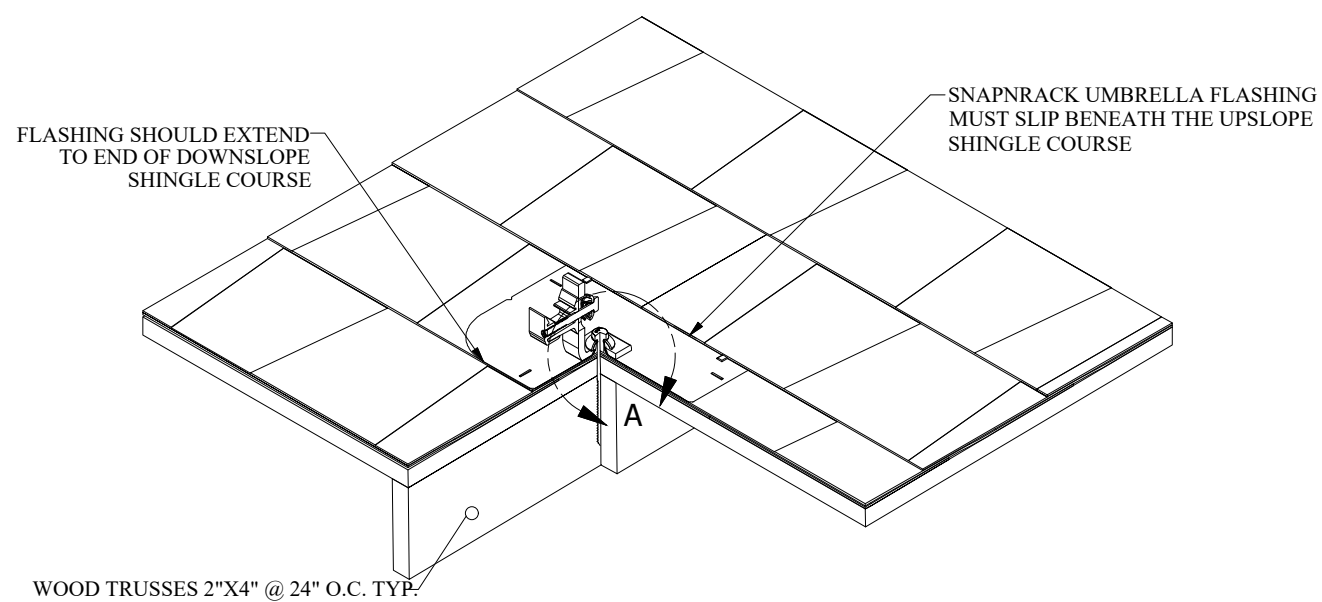
REFER TO SNAPNRACK INSTALLATION MANUAL FOR 5/16"Ø HARDWARE TORQUE SPECIFICATIONS

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

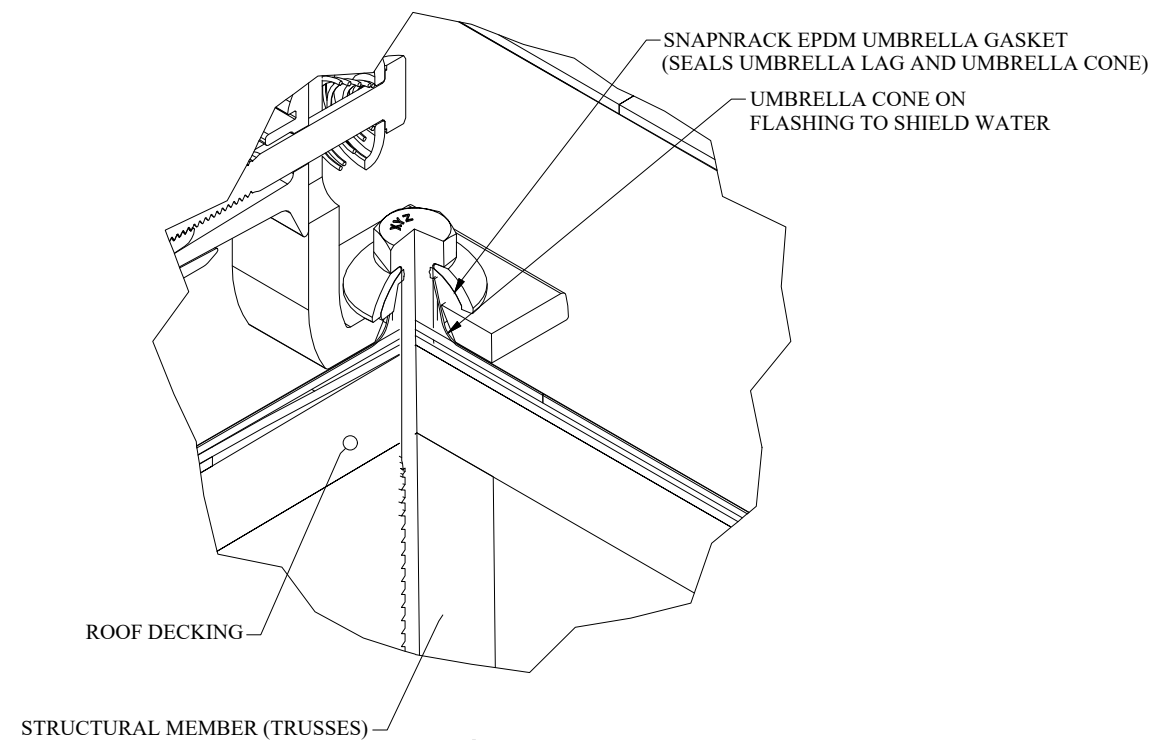
FOR LEVELING DETAILS, REFER TO SNAPNRACK DETAIL DRAWING "SNR-DC-00332 ULTRA RAIL, COMPONENT DETAIL, LEVELING EXTENSION KIT"



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**

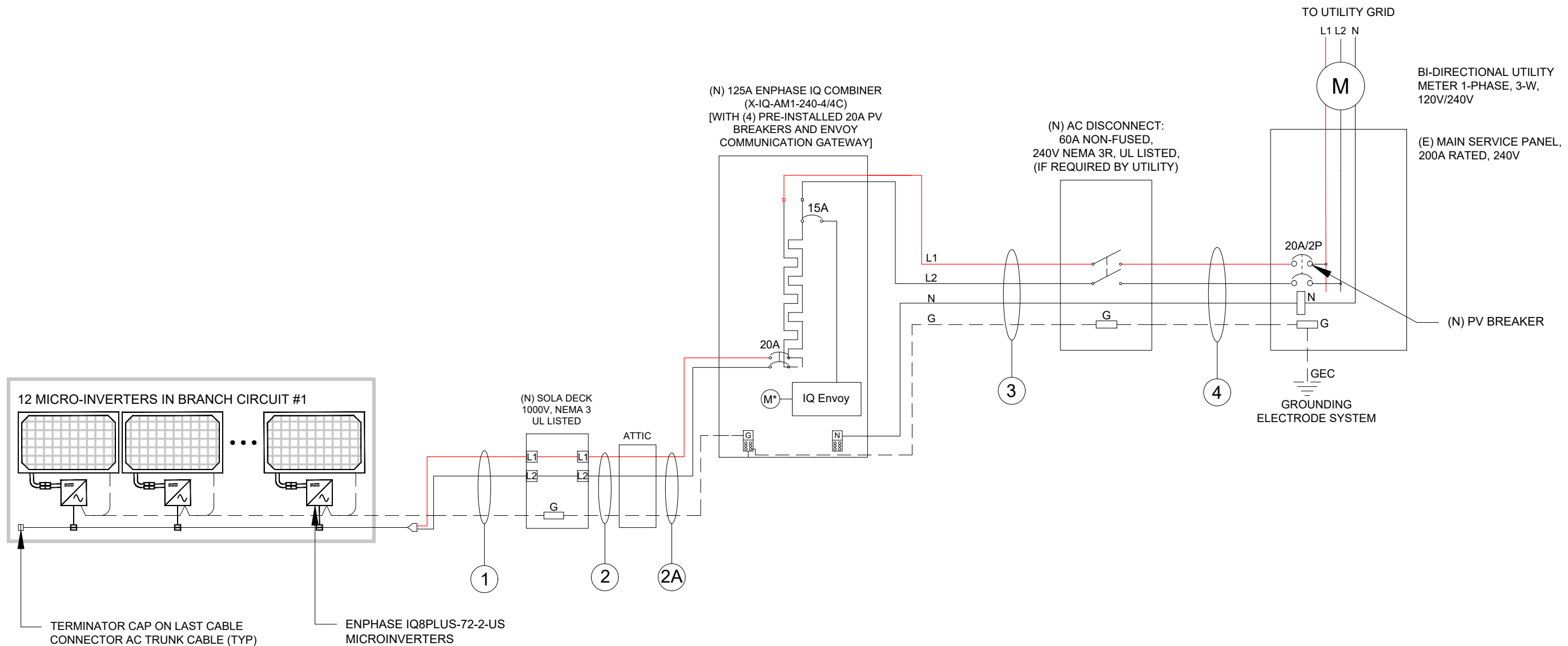
SHEET SIZE
**ANSI B
 11" X 17"**

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



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"

1 ELECTRICAL LINE DIAGRAM

PV-5

SCALE: NTS



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SHEET NAME

ELECTRICAL
 LINE DIAGRAM

SHEET SIZE

ANSI B
 11" X 17"

SHEET NUMBER

PV-5

SOLAR MODULE SPECIFICATIONS	
MANUFACTURER	HYUNDAI
MODEL #	HiS-S400YH
P _{MAX}	400W
V _{MP}	37.7V
I _{MP}	10.61A
V _{OC}	45.3V
I _{SC}	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.



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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)

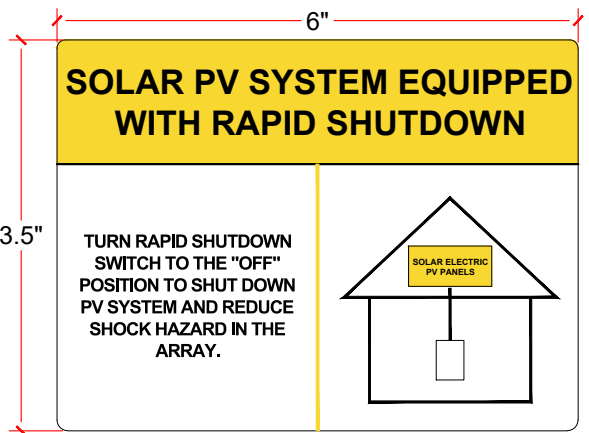
- ADHESIVE FASTENED SIGNS:**
- THE LABEL SHALL BE SUITABLE FOR THE ENVIRONMENT WHERE IT IS INSTALLED.
 - WHERE REQUIRED ELSEWHERE IN THIS CODE, ALL FIELD APPLIED LABELS, WARNINGS, AND MARKINGS SHOULD COMPLY WITH ANSI Z535.4 [NEC 110.21(B) FIELD MARKING].
 - ADHESIVE FASTENED SIGNS MAY BE ACCEPTABLE IF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

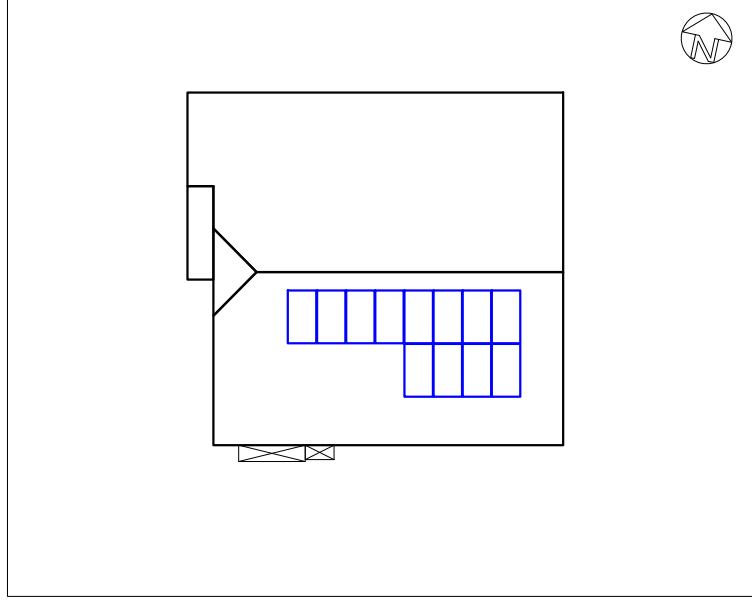
**PHOTOVOLTAIC SYSTEM EQUIPPED
 WITH RAPID SHUTDOWN**

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).

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**325 SILVER MAPLE DR,
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SHEET NAME
PLACARD

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

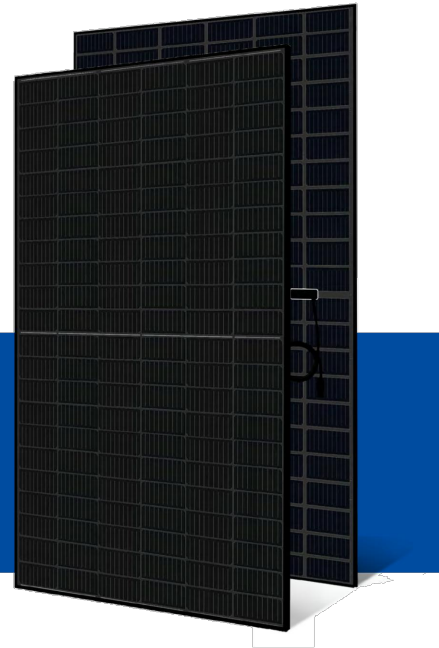
SHEET NUMBER
PV-7

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 _{mpp})	W	385	390	395	400	405	410
Open Circuit Voltage (V _{oc})	V	44.5	44.8	45.0	45.3	45.6	45.9
Short Circuit Current (I _{sc})	A	11.04	11.11	11.18	11.25	11.33	11.40
Voltage at P _{max} (V _{mpp})	V	37.1	37.3	37.5	37.7	37.9	38.1
Current at P _{max} (I _{mpp})	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 _{max}	%/K	-0.347					
Temperature Coefficient of V _{oc}	%/K	-0.268					
Temperature Coefficient of I _{sc}	%/K	+0.032					

*All data at STC (Measurement tolerances P_{mpp} ±3%; I_{sc}; V_{oc} ±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

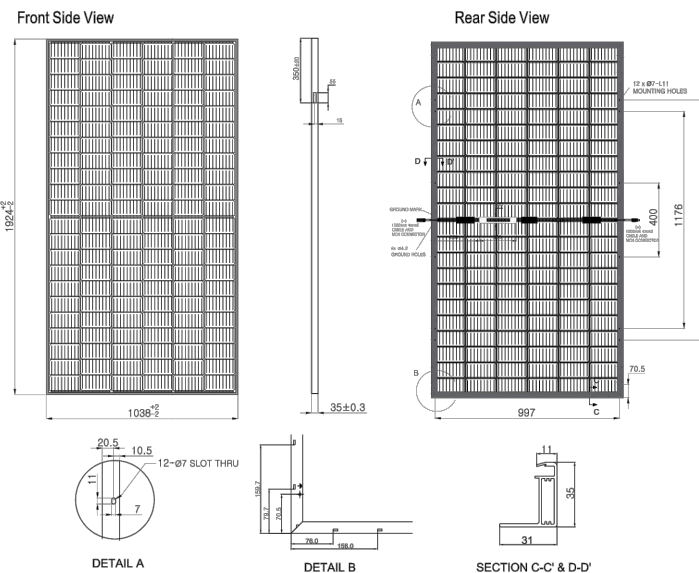
Dimensions	1,038 mm (W) x 1,924 mm (L) x 35 mm(H)
Weight	Approx. 21.1 kg
Solar Cells	132 half cut bifacial cells (2 parallel x 66 half cells in series)
Output Cables	Cable : 1,200mm / 4mm ² Connector : MC4 genuine connector
Junction Box	IP68, weatherproof, IEC certified (UL listed)
Bypass Diodes	3 bypass 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

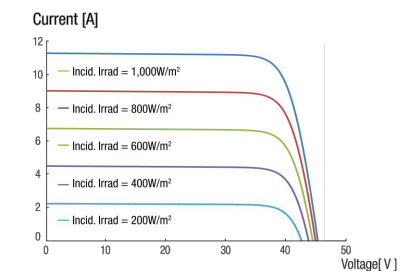
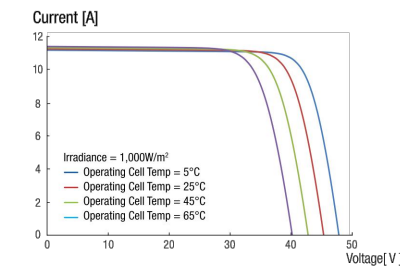
- Only qualified personnel should install or perform maintenance.
- Be aware of dangerous high DC voltage.
- Do not damage or scratch the rear surface of the module.
- Do not handle or install modules when they are wet.

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

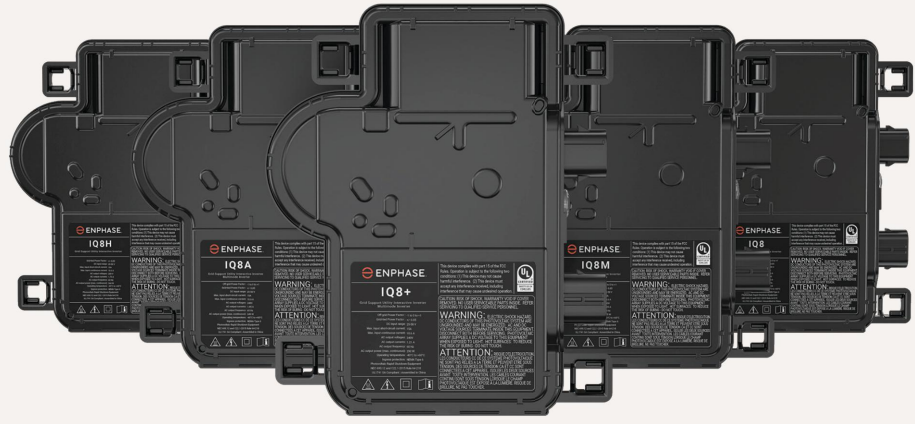
PROJECT NAME

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

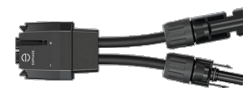
Our newest IQ8 Microinverters are the industry's first microgrid-forming, software-defined microinverters with split-phase power conversion capability to convert DC power to AC power efficiently. The brain of the semiconductor-based microinverter is our proprietary application-specific integrated circuit (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.

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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 ⁽¹⁾
Commonly used module pairings ²	W	235 – 350	235 – 440	260 – 460	295 – 500	320 – 540+	295 – 500+
Module compatibility		60-cell/120 half-cell		60-cell/120 half-cell and 72-cell/144 half-cell			
MPPT voltage range	V	27 – 37	29 – 45	33 – 45	36 – 45	38 – 45	38 – 45
Operating range	V	25 – 48		25 – 58			
Min/max start voltage	V	30 / 48		30 / 58			
Max input DC voltage	V	50		60			
Max DC current ³ [module Isc]	A			15			
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 ⁴	V			240 / 211 – 264		208 / 183 – 250	
Max continuous output current	A	1.0	1.21	1.35	1.45	1.58	1.73
Nominal frequency	Hz	60					
Extended frequency range	Hz	50 – 68					
Max units per 20 A (L-L) branch circuit ⁵		16	13	11	11	10	9
Total harmonic distortion		<5%					
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

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SHEET NAME
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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



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

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

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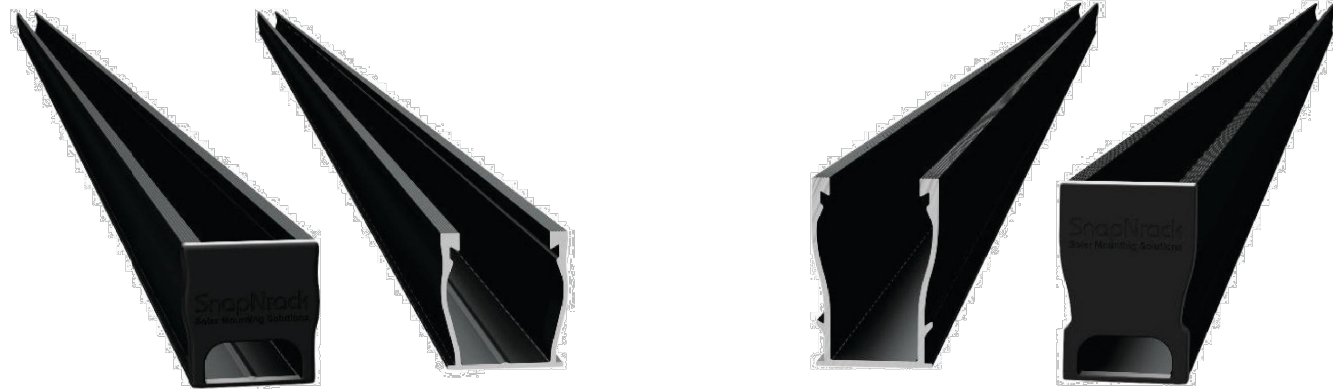
SHEET NAME
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SPECIFICATIONS

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

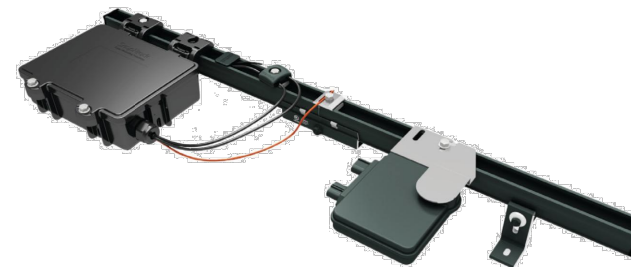
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snapnrack.com/configurator
snapnrack.com/where-to-buy

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

contact@snapnrack.com

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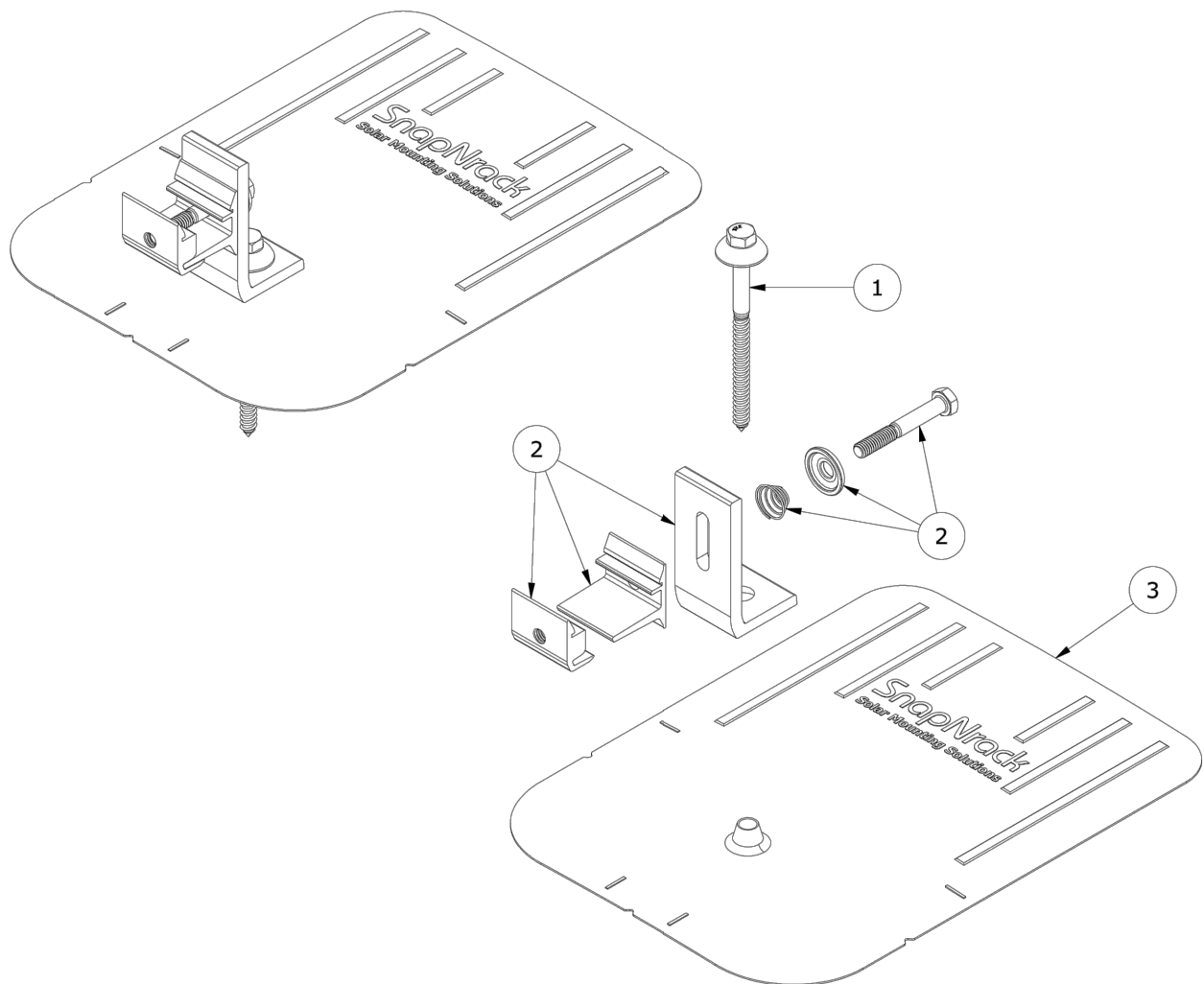
SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER


PV-11

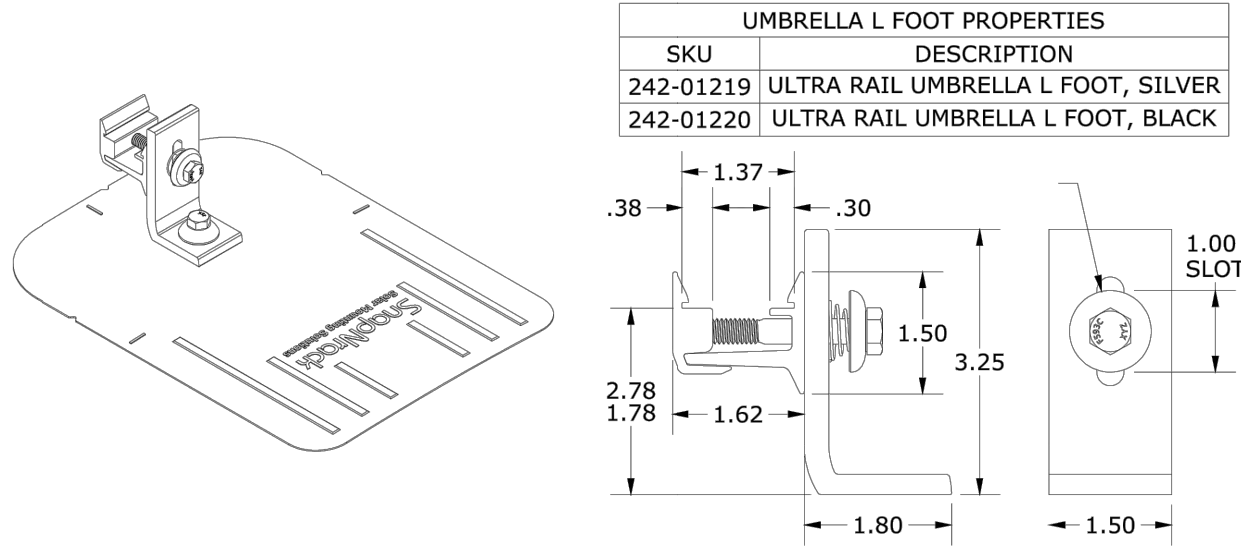
DESCRIPTION: SNAPNRACK, ULTRA RAIL COMP KIT	DRAWN BY: mwatkins	
PART NUMBER(S): SEE BELOW	REVISION: B	



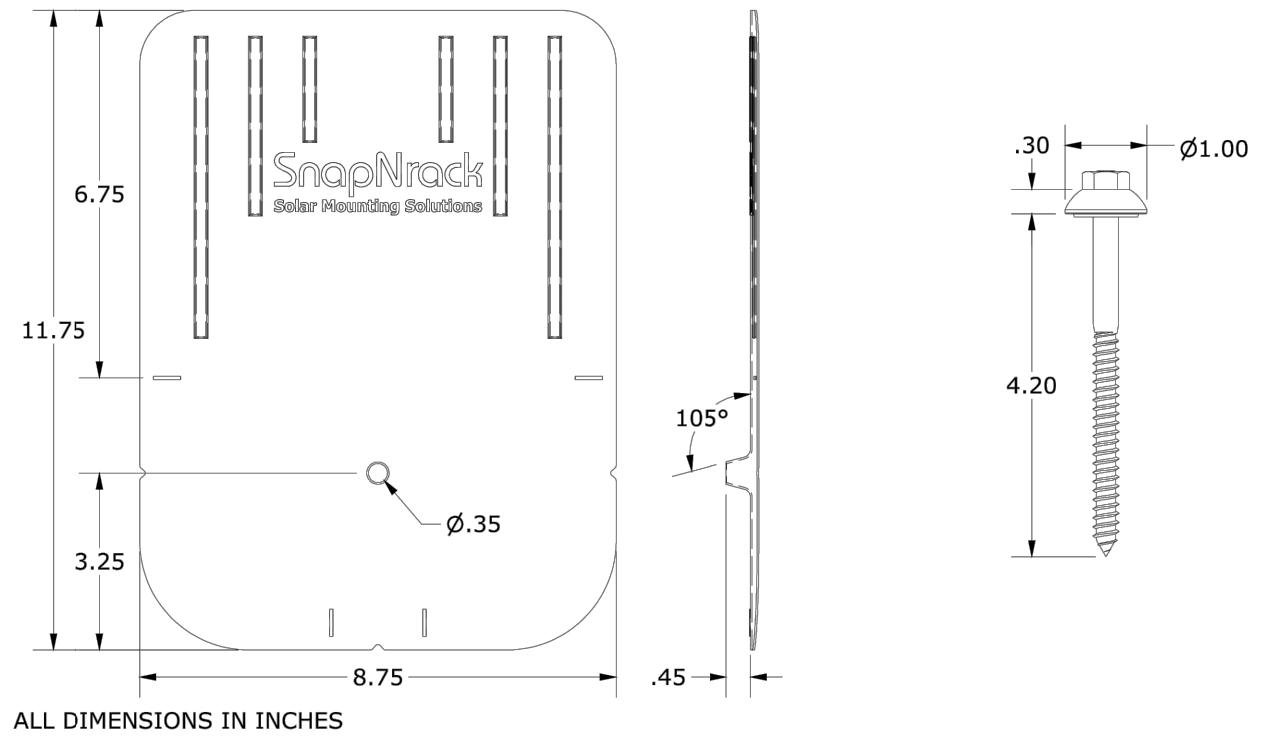
PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	242-92266	SNAPNRACK, UMBRELLA LAG, TYPE 3, 4IN, SS
2	1	242-01219, 242-01220	SNAPNRACK, ULTRA FOOT FOR U FLASHING, SILVER / BLACK
3	1	232-01375, 232-01376	SNAPNRACK, COMP FLASHING, 9IN X 12IN, SILVER / BLACK ALUM

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: SNAPNRACK, ULTRA RAIL COMP KIT	DRAWN BY: mwatkins	
PART NUMBER(S): SEE BELOW	REVISION: B	



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



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

SHEET NUMBER
PV-12