

PROJECT INFORMATION

PROPERTY OWNER

NAME: GREGORY SCOTT
PHONE: -

CONTRACTOR

NAME: CLEAN ENERGY

DESIGN SPECIFICATIONS

OCCUPANCY: R-3
CONSTRUCTION TYPE: SINGLE FAMILY RESIDENCE
ZONING: RESIDENTIAL
GROUND SNOW LOAD: 15 PSF
WIND EXPOSURE: B
WIND SPEED: 116 MPH

APPLICABLE CODES & STANDARDS

2023 NATIONAL ELECTRICAL CODE
2015 NATIONAL RESIDENTIAL CODE
2024 NATIONAL FIRE CODE
2024 NORTH CAROLINA BUILDING CODE

TYPE OF

INTERCONNECTION: BACKFEED BREAKER IN THE MMC

SCOPE OF WORK

SYSTEM SIZE:
STC: 20 X 435W = 8.700 kW
PTC: 20 X 407.3W = 8.146 kW
(20) HD HYUNDAI ENERGY SOLUTIONS CO. LTD HIN-T435NF(BK) (435W) SOLAR MODULES
(20) ENPHASE IQ8MC-72-M-US [240V] MICROINVERTERS
(1) 125A ENPHASE IQ COMBINER 5/5C BOX (X-IQ-AM1-240-5/5C) [240V]

MSP UPGRADE: NO
MAIN BREAKER DERATE: NO

RACKING & MOUNTING

PV ATTACHMENT TYPE: IRONRIDGE HALO ULTRA GRIP FOR COMP SHINGLE ROOF

RACKING TYPE: IRONRIDGE XR10 - ROOF
MOUNT RACKING HARDWARE

SCOTT RESIDENCE
NEW PHOTOVOLTAIC SYSTEM
PROJECT - 8.700 kW DC/
6.400 kW AC & 7.902 KW CEC-AC

SHEET #	SHEET NAME
T-1	COVER SHEET
T-2	PLAN NOTES
PV-1	SITE PLAN LAYOUT
PV-2	ATTACHMENT DETAILS
PV-3	MOUNTING DETAILS
E-1,1.1	ELECTRICAL DIAGRAM
E-2	WARNING LABELS
S-1 TO 5	SPEC SHEET



COORDINATES:
35.52463, -78.917547

AERIAL VIEW



CONTRACTOR

CLEAN ENERGY SYSTEM

ADDRESS:
1224 DELHAM RDKNIGHTDALE
NC 27545

License#: 26486

DESIGNER: OAN


DATE: 11/21/2025

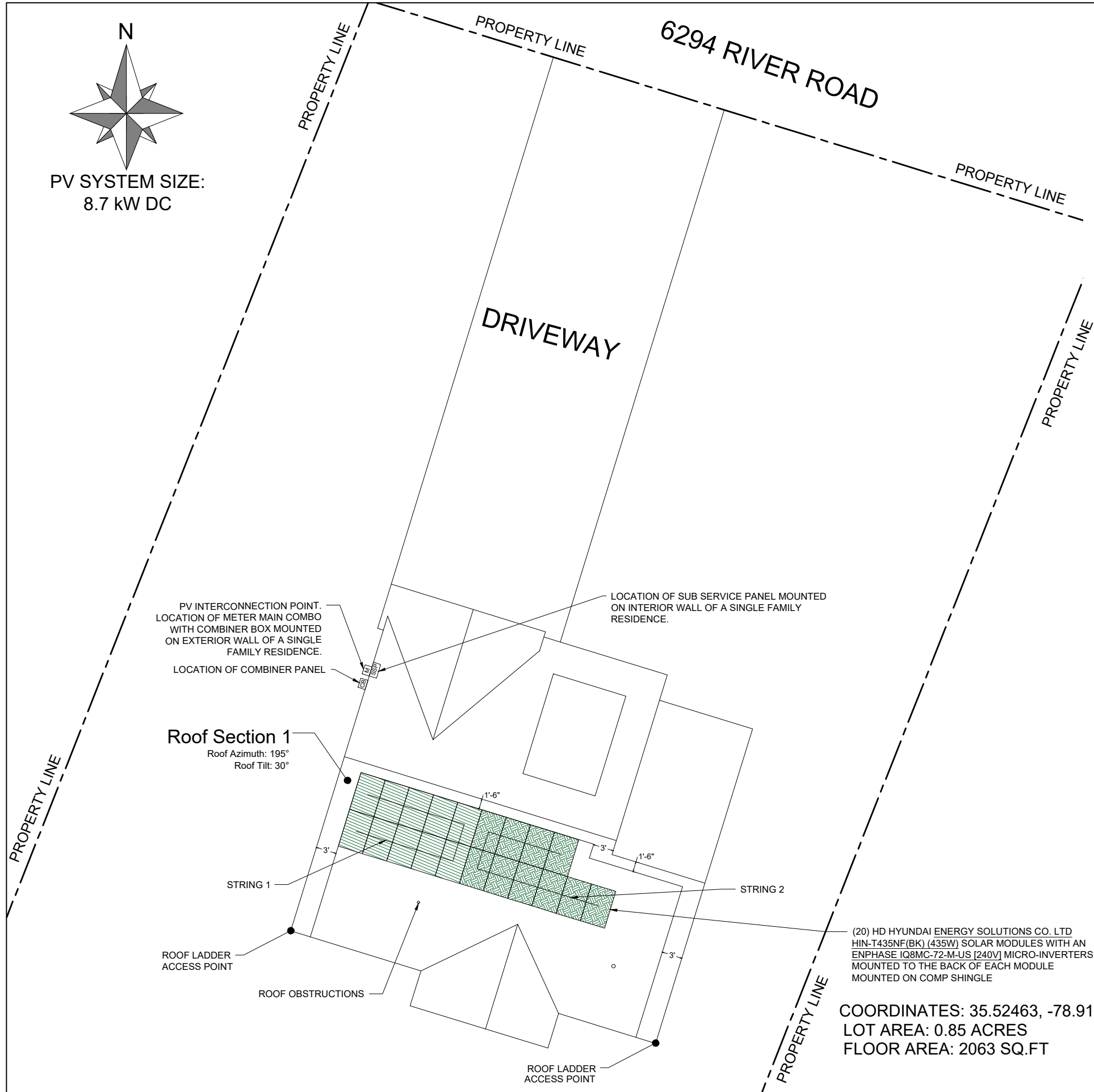
SCOTT
RESIDENCE

6294 RIVER ROAD,
FUQUAY-VARINA,
NC 27526

APN:0624454698.000
DATE:11/21/2025

SHEET
T-1

<div><div><div><div><div><div>1.1. PROJECT NOTES:</div><div>1.2. THIS PHOTOVOLTAIC (PV) SYSTEM SHALL COMPLY WITH THE NATIONAL ELECTRICAL CODE (NEC) ARTICLE 690, ALL MANUFACTURERS'S LISTING AND INSTALLATION INSTRUCTIONS, AND THE RELEVANT CODES AS SPECIFIED BY THE AUTHORITY HAVING JURISDICTION'S (AHJ) APPLICABLE CODES.</div><div>1.3. THE UTILITY INTERCONNECTION APPLICATION MUST BE APPROVED AND PV SYSTEM INSPECTED PRIOR TO PARALLEL OPERATION</div><div>1.4. FOR SYSTEMS USING MICROINVERTERS, GROUND FAULT DETECTION AND INTERRUPTION (GFDI) DEVICE IS INTEGRATED WITH THE MICROINVERTER IN ACCORDANCE WITH 2020 NEC 690.41(B) FOR SYSTEMS USING TESLA INVERTERS THE REQUIREMENTS IN 690.41 ARE MET THROUGH THE UL1741 LISTING. SEE SECTION 34 OF UL1741.</div><div>1.5. PV SYSTEM COMPONENTS; MODULES, UTILITY-INTERACTIVE INVERTERS, AND SOURCE CIRCUIT COMBINER BOXES ARE IDENTIFIED AND LISTED FOR USE IN PHOTOVOLTAIC SYSTEMS AS REQUIRED BY NEC 690.4 & NEC 690.60: PV MODULES: UL1703, IEC61730, AND IEC61215, AND NFPA 70 CLASS C FIRE INVERTERS: UL 1741 CERTIFIED, IEEE 1547, 929, 519 COMBINER BOX(ES): UL 1703 OR UL 1741 ACCESSORY</div><div>1.6. MAX DC VOLTAGE CALCULATED USING MANUFACTURER PROVIDED TEMP COEFFICIENT FOR VOC. IF UNAVAILABLE, MAX DC VOLTAGE CALCULATED ACCORDING TO NEC 690.7.</div><div>1.7. ALL INVERTERS, PHOTOVOLTAIC MODULES, PHOTOVOLTAIC PANELS, AND SOURCE CIRCUIT COMBINERS INTENDED FOR USE IN A PHOTOVOLTAIC POWER SYSTEM WILL BE IDENTIFIED AND LISTED FOR THE APPLICATION PER 690.4 (D). SHALL BE INSTALLED ACCORDING TO ANY INSTRUCTIONS FROM LISTING OR LABELING [NEC 110.3].</div><div>1.8. ALL SIGNAGE TO BE PLACED IN ACCORDANCE WITH LOCAL BUILDING CODE. IF EXPOSED TO SUNLIGHT, IT SHALL BE UV RESISTANT. ALL PLAQUES AND SIGNAGE WILL BE INSTALLED AS REQUIRED BY THE NEC AND AHJ.</div></div><div><div>1.9. SCOPE OF WORK:</div><div>1.10. PRIME CONTRACTOR IS RESPONSIBLE FOR THE DESIGN AND SPECIFICATIONS OF THE GRID-TIED PHOTOVOLTAIC SYSTEM RETROFIT. PRIME CONTRACTOR WILL BE RESPONSIBLE FOR COLLECTING EXISTING ONSITE REQUIREMENTS TO DESIGN, SPECIFY, AND INSTALL THE EXTERIOR ROOF-MOUNTED PORTION OF THE PHOTOVOLTAIC SYSTEMS DETAILED IN THIS DOCUMENT.</div></div><div><div>1.11. WORK INCLUDES:</div><div>1.12. PV ROOF ATTACHMENTS - IRONRIDGE HALO ULTRA GRIP FOR COMP SHINGLE ROOF</div><div>1.13. PV RACKING SYSTEM INSTALLATION - IRONRIDGE XR10 ROOF MOUNT RACKING HARDWARE</div><div>1.14. PV MODULE AND INVERTER INSTALLATION - HD HYUNDAI ENERGY SOLUTIONS CO. LTD HIN-T435NF(BK) (435W) SOLAR MODULES / ENPHASE IQ8MC-72-M-US [240V]</div><div>1.15. PV EQUIPMENT GROUNDING</div><div>1.16. PV SYSTEM WIRING TO A ROOF-MOUNTED JUNCTION BOX</div><div>1.17. PV LOAD CENTERS (IF INCLUDED)</div><div>1.18. PV METERING/MONITORING (IF INCLUDED)</div><div>1.19. PV DISCONNECTS</div><div>1.20. PV GROUNDING ELECTRODE & BONDING TO (E) GEC</div><div>1.21. PV FINAL COMMISSIONING</div><div>1.22. (E) ELECTRICAL EQUIPMENT RETROFIT FOR PV</div><div>1.23. SIGNAGE PLACED IN ACCORDANCE WITH LOCAL BUILDING CODE</div><div>1.24. SITE NOTES:</div><div>1.25. A LADDER WILL BE IN PLACE FOR INSPECTION IN COMPLIANCE WITH OSHA REGULATIONS.</div><div>1.26. THE PV MODULES ARE CONSIDERED NON-COMBUSTIBLE AND THIS SYSTEM IS A UTILITY INTERACTIVE SYSTEM WITH NO STORAGE BATTERIES.</div><div>1.27. THE SOLAR PV INSTALLATION WILL NOT OBSTRUCT ANY PLUMBING, MECHANICAL, OR BUILDING ROOF VENTS.</div><div>1.28. PROPER ACCESS AND WORKING CLEARANCE AROUND EXISTING AND PROPOSED ELECTRICAL EQUIPMENT WILL BE PROVIDED AS PER SECTION NEC 110.26.</div><div>1.29. ROOF COVERINGS SHALL BE DESIGNED, INSTALLED, AND MAINTAINED IN ACCORDANCE WITH THIS CODE AND THE APPROVED MANUFACTURER'S INSTRUCTIONS SUCH THAT THE ROOF COVERING SERVES TO PROTECT THE BUILDING OR STRUCTURE.</div></div><div><div>1.30. EQUIPMENT LOCATIONS:</div><div>1.31. ALL EQUIPMENT SHALL MEET MINIMUM SETBACKS AS REQUIRED BY 2022 NEC 110.26.</div><div>1.32. WIRING SYSTEMS INSTALLED IN DIRECT SUNLIGHT MUST BE RATED FOR EXPECTED OPERATING TEMPERATURE AS SPECIFIED BY 2022 NEC 690.31 (A),(C) AND NEC TABLES 310.15 (B)(2)(A) AND 310.15 (B)(3)(C)</div><div>1.33. JUNCTION AND PULL BOXES PERMITTED INSTALLED UNDER PV MODULES ACCORDING TO 2022 NEC 690.34.</div><div>1.34. ADDITIONAL AC DISCONNECT(S) SHALL BE PROVIDED WHERE THE INVERTER IS NOT WITHIN SIGHT OF THE AC SERVICING DISCONNECT .</div><div>1.35. ALL EQUIPMENT SHALL BE INSTALLED ACCESSIBLE TO QUALIFIED PERSONNEL ACCORDING TO 2020 NEC APPLICABLE CODES.</div><div>1.36. ALL COMPONENTS ARE LISTED FOR THEIR PURPOSE AND RATED FOR OUTDOOR USAGE WHEN APPROPRIATE.</div></div><div><div>1.37. STRUCTURAL NOTES:</div><div>1.38. RACKING SYSTEM</div><div>1.39. PV ARRAY WILL BE INSTALLED ACCORDING TO CODE-COMPLIANT INSTALLATION MANUAL. TOP CLAMPS REQUIRE A DESIGNATED SPACE BETWEEN MODULES, AND RAILS MUST ALSO EXTEND</div><div>1.40. A MINIMUM DISTANCE BEYOND EITHER EDGE OF THE ARRAY/SUBARRAY, ACCORDING TO RAIL MANUFACTURER'S INSTRUCTIONS.</div><div>1.41. JUNCTION BOX WILL BE INSTALLED PER MANUFACTURER'S SPECIFICATIONS. IF ROOF-PENETRATING TYPE, IT SHALL BE FLASHED SEALED PER LOCAL REQUIREMENTS.</div><div>1.42. ROOFTOP PENETRATIONS FOR PV RACEWAY WILL BE COMPLETED AND SEALED WITH APPROVED CHEMICAL SEALANT PER CODE BY A LICENSED CONTRACTOR.</div><div>1.43. ALL PV RELATED ROOF ATTACHMENTS TO BE SPACED NO GREATER THAN THE SPAN DISTANCE SPECIFIED BY THE RACKING MANUFACTURER.</div><div>1.44. WHEN POSSIBLE, ALL PV RELATED RACKING ATTACHMENTS WILL BE STAGGERED AMONGST THE ROOF FRAMING MEMBERS.</div></div><div><div>1.45. WIRING & CONDUIT NOTES:</div><div>1.46. ALL CONDUIT AND WIRE WILL BE LISTED AND APPROVED FOR THEIR PURPOSE. CONDUIT AND WIRE SPECIFICATIONS ARE BASED ON MINIMUM CODE REQUIREMENTS AND ARE NOT MEANT TO LIMIT UP-SIZING.</div><div>1.47. CONDUCTORS SIZED ACCORDING TO 2020 NEC 690.8, 2020 NEC 690.7.</div><div>1.48. VOLTAGE DROP LIMITED TO 2%.</div><div>1.49. DC WIRING LIMITED TO MODULE FOOTPRINT. MCI WIRING SYSTEMS SHALL BE LOCATED AND SECURED UNDER THE ARRAY WITH SUITABLE WIRING CLIPS.</div><div>1.50. AC CONDUCTORS COLORED OR MARKED AS FOLLOWS: PHASE A OR L1- BLACK PHASE B OR L2- RED, OR OTHER CONVENTION IF THREE PHASE PHASE C OR L3- BLUE, YELLOW, ORANGE**, OR OTHER CONVENTION NEUTRAL- WHITE OR GREY IN 4-WIRE DELTA CONNECTED SYSTEMS THE PHASE WITH HIGHER VOLTAGE TO BE MARKED ORANGE [2020 NEC 110.15</div><div>1.51. GROUNDING NOTES:</div><div>1.52. GROUNDING SYSTEM COMPONENTS SHALL BE LISTED FOR THEIR PURPOSE, AND GROUNDING DEVICES EXPOSED TO THE ELEMENTS SHALL BE RATED FOR SUCH USE.</div><div>1.53. PV EQUIPMENT SHALL BE GROUNDED ACCORDING TO 2020 NEC 690.43 AND MINIMUM 2020 NEC TABLE 250.122.</div><div>1.54. METAL PARTS OF MODULE FRAMES, MODULE RACKING, AND ENCLOSURES CONSIDERED GROUNDED IN ACCORDING WITH 2020 NEC 250.134 AND 2020 250.136(A).</div><div>1.55. EQUIPMENT GROUNDING CONDUCTORS SHALL BE SIZED ACCORDING TO NEC 690.45 AND INVERTER MANUFACTURER'S INSTRUCTIONS.</div></div><div><div>1.56. EACH MODULE WILL BE GROUNDED USING WEEB GROUNDING CLIPS AS SHOWN IN MANUFACTURER DOCUMENTATION AND APPROVED BY THE AHJ. IF WEEBS ARE NOT USED, MODULE GROUNDING LUGS MUST BE INSTALLED AT THE SPECIFIED GROUNDING LUG HOLES PER THE MANUFACTURERS' INSTALLATION REQUIREMENTS.</div><div>1.57. THE GROUNDING CONNECTION TO A MODULE SHALL BE ARRANGED SUCH THAT THE REMOVAL OF A MODULE DOES NOT INTERRUPT A GROUNDING CONDUCTOR TO ANOTHER MODULE.</div><div>1.58. GROUNDING AND BONDING CONDUCTORS, IF INSULATED, SHALL BE COLORED GREEN OR MARKED GREEN IF #4 AWG OR LARGER [2020 NEC 250.119]</div><div>1.59. THE GROUNDING ELECTRODE SYSTEM COMPLIES WITH NEC 690.47 AND NEC 250.50 THROUGH 250.106. IF EXISTING SYSTEM IS INACCESSIBLE, OR INADEQUATE, A GROUNDING ELECTRODE SYSTEM PROVIDED ACCORDING TO NEC 250, NEC 690.47 AND AHJ.</div><div>1.60. GROUND-FAULT DETECTION SHALL COMPLY WITH NEC 690.41 IN GENERAL AND NEC 690.41 (A)(1) SPECIFICALLY.</div></div><div><div>1.61. DISCONNECTION AND OVER-CURRENT PROTECTION NOTES:</div><div>1.62. DISCONNECTING SWITCHES SHALL BE WIRED SUCH THAT WHEN THE SWITCH IS OPENED THE CONDUCTORS REMAINING ENERGIZED ARE CONNECTED TO THE TERMINALS MARKED "LINE SIDE" (TYPICALLY THE UPPER TERMINALS).</div><div>1.63. DISCONNECTS TO BE ACCESSIBLE TO QUALIFIED UTILITY PERSONNEL, BE LOCKABLE, AND BE A VISIBLE-BREAK SWITCH</div><div>1.64. RAPID SHUTDOWN OF ENERGIZED CONDUCTORS BEYOND 1 FT OF PV ARRAY OR 5 FT INSIDE A BUILDING WITHIN 10 SECONDS. CONTROLLED CONDUCTORS ≤30V AND ≤240VA [NEC 690.12(B)]. LOCATION OF LABEL ACCORDING TO AHJ</div><div>1.65. ALL OCPD RATINGS AND TYPES SPECIFIED ACCORDING TO NEC 690.8, 690.9, AND 240.</div><div>1.66. EQUIPMENT THAT IS LISTED, LABELED, OR BOTH SHALL BE INSTALLED AND USED IN ACCORDANCE WITH ANY INSTRUCTIONS INCLUDED IN THE LISTING OR LABELING. NEC 110.3(B).</div><div>1.67. IF REQUIRED BY AHJ, SYSTEM WILL INCLUDE ARC-FAULT CIRCUIT PROTECTION ACCORDING TO NEC 690.11 AND UL1699B.</div></div><div><div>1.68. ELECTRICAL INTERCONNECTION NOTES:</div><div>1.69. THE SUM OF THE UTILITY OCPD AND INVERTER CONTINUOUS OUTPUT MAY NOT EXCEED 120% OF THE BUSBAR RATING.</div><div>1.70. WHEN THE SUM OF THE PV SOURCES EQUALS >100% OF THE BUSBAR RATING, PV DEDICATED BACKFEED BREAKERS MUST BE LOCATED OPPOSITE END OF THE BUS FROM THE UTILITY SOURCE OCPD.</div><div>1.71. AT MULTIPLE PV OUTPUT COMBINER PANEL, THE TOTAL RATING OF ALL OVERCURRENT DEVICES SHALL NOT EXCEED THE AMPACITY OF THE BUSBAR. HOWEVER, THE COMBINED OVERCURRENT DEVICE MAY BE EXCLUDED.</div><div>1.72. SUPPLY-SIDE TAP INTERCONNECTION SHOULD BE WITH SERVICE ENTRANCE CONDUCTORS.</div><div>1.73. BACKFEEDING BREAKER FOR UTILITY-INTERACTIVE INVERTER OUTPUT IS EXEMPT FROM ADDITIONAL FASTENING.</div></div></div></div></div></div>	
	
CONTRACTOR	
CLEAN ENERGY SYSTEM	
ADDRESS: 1224 DELHAM RDKNIGHTDALE NC 27545	
License#: 26486	
DESIGNER: OAN	
DATE: 11/21/2025	
SCOTT RESIDENCE	
6294 RIVER ROAD, FUQUAY-VARINA, NC 27526	
APN:0624454698.000 DATE:11/21/2025	
SHEET T-2	



N

PV SYSTEM SIZE:
8.7 kW DC

CONSTRUCTION NOTES

1. SOLAR PHOTOVOLTAIC SYSTEM TO BE INSTALLED ON RESIDENTIAL STRUCTURE.
2. THIS PROJECT HAS BEEN DESIGNED IN COMPLIANCE WITH THE CBC SECTION 1609 TO WITHSTAND A BASIC WIND SPEED OF 116 MPH (3 SECOND GUST), WIND EXPOSURE B.
3. THE ROOF MEMBERS ARE 2"X 4" TRUSSES AT 24" ON CENTER. CONNECTION TO STRUCTURE SHALL NOT BE WITHIN 11" OF NAILING PLATES.
4. THE SOLAR PHOTOVOLTAIC INSTALLATION SHALL NOT OBSTRUCT ANY PLUMBING, MECHANICAL, OR BUILDING ROOF VENTS.
5. ALL CONDUCTORS AND CONDUITS MOUNTED ON ROOF SHALL BE MINIMUM 7/8" ABOVE ROOF SURFACE (INCLUDING CABLES UNDERNEATH MODULES AND RACKING).
6. ROOF ACCESS POINTS SHALL BE PROVIDED PER THE FOLLOWING (NRC R324.7.1, NBC 3111.2.1)
 - 6.1. LOCATED IN AREAS NOT REQUIRING PLACEMENT OF GROUND LADDERS OVER OPENINGS SUCH AS DOORS OR WINDOWS.
 - 6.2. LOCATED AT STRONG POINTS OF CONSTRUCTION IN LOCATIONS WHERE ACCESS POINT DOES NOT CONFLICT WITH OVERHEAD OBSTRUCTIONS SUCH AS: TREES, WIRES, OR SIGNS.
7. SETBACKS AT RIDGES CAN BE REDUCED TO 18 INCHES IN COMPLIANCE WITH 2022 NFC/2018 IFC 1204.2.1.2
TOTAL PLAN VIEW AREA = 3002.8 SQFT
TOTAL PV AREA = 20(67.8 IN)(44.6 IN)/(144 IN^2) = 419.98 SQFT
(419.98 SQFT/ 3002.8 SQFT)100 = 13.99%
TOTAL PV AREA POPULATES 13.99% OF TOTAL PLAN VIEW AREA AND IS NOT WITHIN THE 33% REQUIREMENT.

	LEGEND
	STRING 1
	STRING 2
	METER MAIN COMBO
	SUB SERVICE PANEL
	AC DISCONNECT
	COMBINER BOX

COORDINATES: 35.52463, -78.917547
LOT AREA: 0.85 ACRES
FLOOR AREA: 2063 SQ.FT

PV SYSTEM SITE PLAN

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



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DESIGNER: OAN

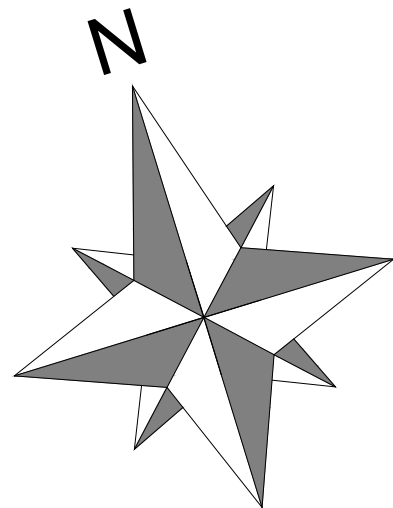
DATE: 11/21/2025

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RESIDENCE

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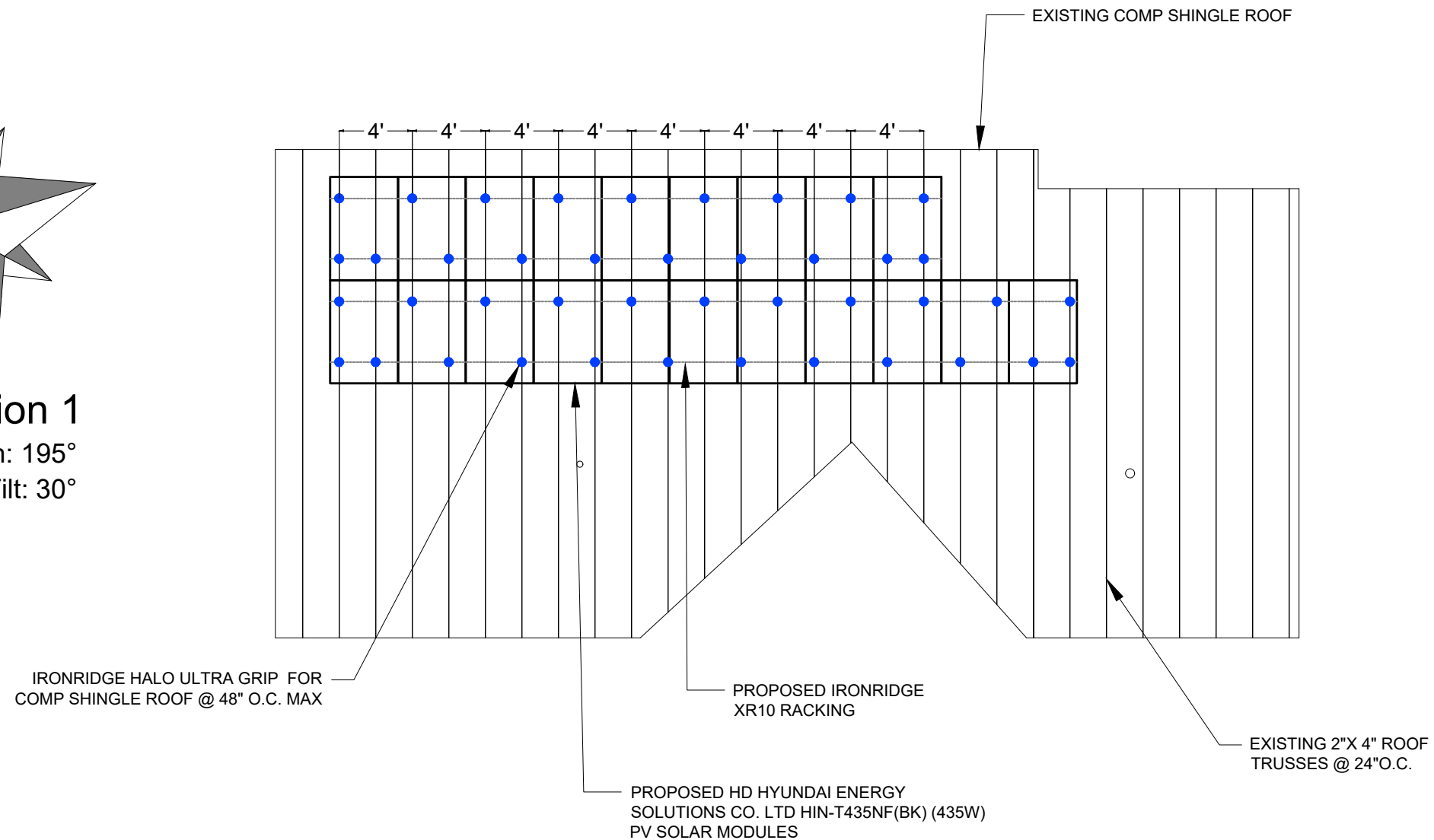
APN:0624454698.000
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SHEET
PV-1



Roof Section 1

Roof Azimuth: 195°
Roof Tilt: 30°



PV SYSTEM MOUNTING DETAILS

SCALE: 1/8" = 1'-0"



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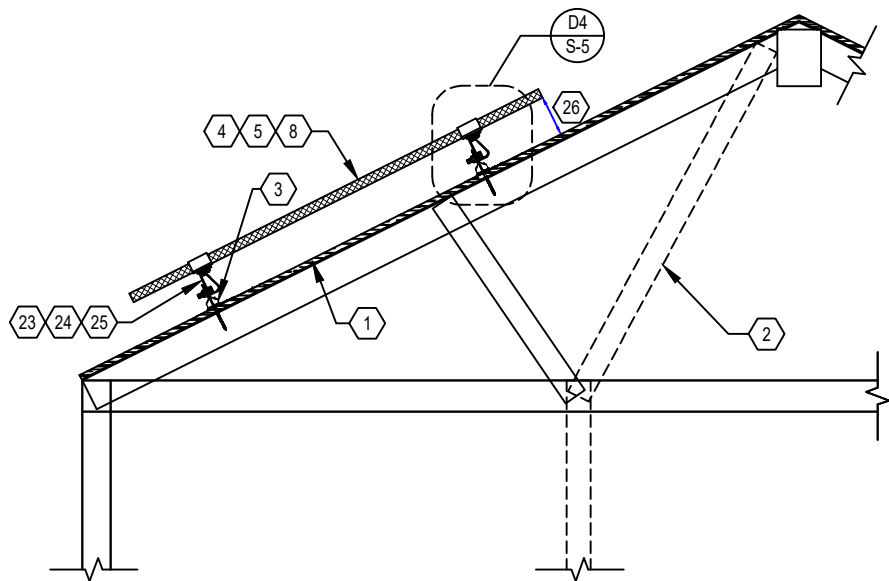
DATE: 11/21/2025

**SCOTT
RESIDENCE**

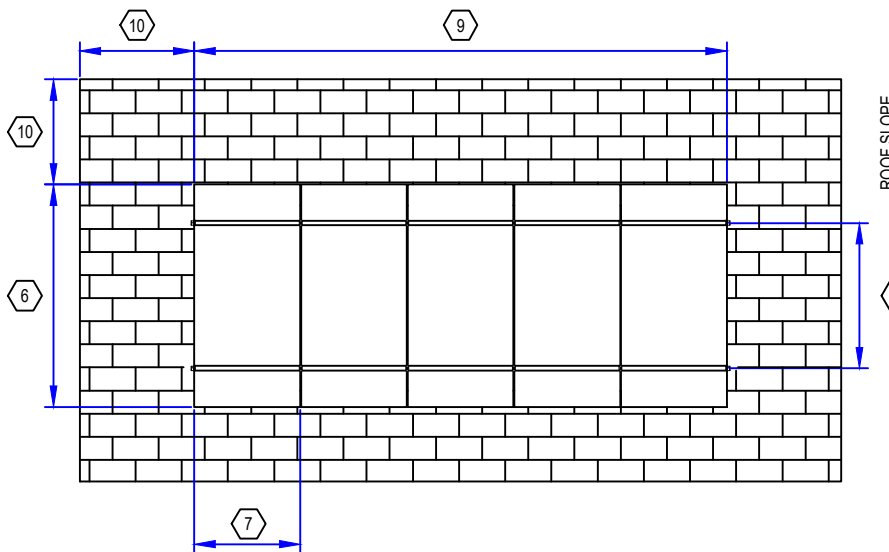
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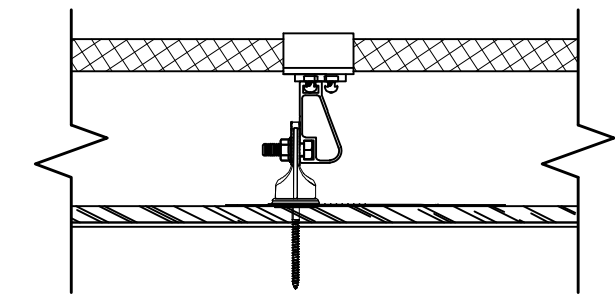
**SHEET
PV-2**



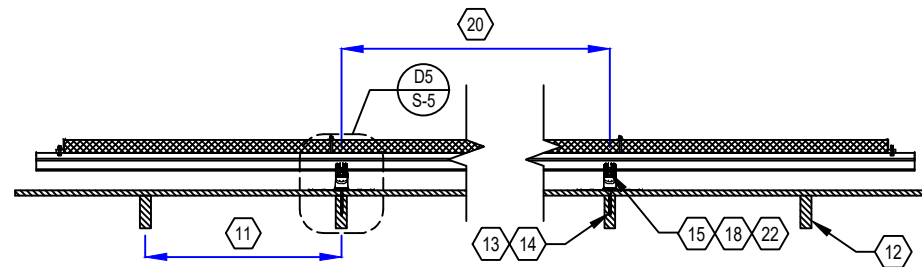
D1 RACKING DETAIL (TRANSVERSE)
NOT TO SCALE COMP SHINGLE



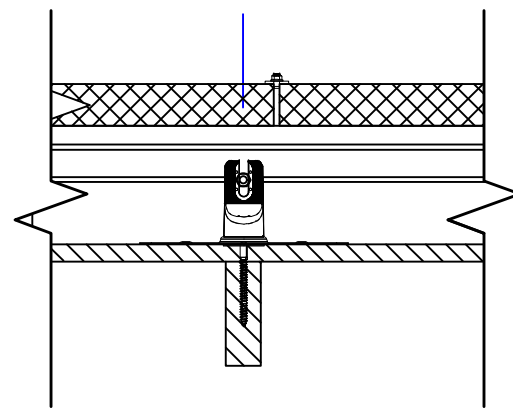
D3 RACKING DETAIL (TOP)
NOT TO SCALE



D4 DETAIL (TRANSVERSE)
NOT TO SCALE



D2 RACKING DETAIL (LONGITUDINAL)
NOT TO SCALE



D5 DETAIL (LONGITUDINAL)
NOT TO SCALE

1. ROOF MATERIAL: COMP SHINGLE
2. ROOF STRUCTURE: TRUSSES
3. ATTACHMENT TYPE: IRONRIDGE HALO ULTRA GRIP
4. MODULE MANUFACTURER: HD HYUNDAI
5. MODULE MODEL: ENERGY SOLUTIONS CO. LTD HIN-T435NF(BK) (435W)
6. MODULE LENGTH: 67.8"
7. MODULE WIDTH: 44.6"
8. MODULE WEIGHT: 50.01 LBS.
9. SEE SHEET PV-2 FOR DIMENSION(S)
10. MIN. FIRE OFFSET: 36"
11. TRUSSES SPACING: 24" O.C.
12. TRUSSES SIZE: 2"X 4" NOMINAL
13. LAG BOLT DIAMETER: 5/16" IN.
14. LAG BOLT EMBEDMENT: 2.5 IN.
15. TOTAL # OF ATTACHMENTS: 42
16. TOTAL AREA: 419.98 SQ. FT.
17. TOTAL WEIGHT: 1000.20 LBS.
18. WEIGHT PER ATTACHMENT: 23.81 LBS.
19. DISTRIBUTED LOAD: 2.38 PSF
20. MAX. HORIZONTAL STANDOFF: 48 IN.
21. MAX. VERTICAL STANDOFF:
LANDSCAPE: 23 IN., PORTRAIT: 46 IN.
22. STANDOFF STAGGERING: YES
23. RAIL MANUFACTURER AND MODEL
(OR EQUIV.):IRONRIDGE XR10
24. RAIL WEIGHT: 0.436 PLF.
25. MAX. TRUSSES SPAN: 12 FT.
26. MODULE CLEARANCE: 3 IN. MIN., 6 IN. MAX.



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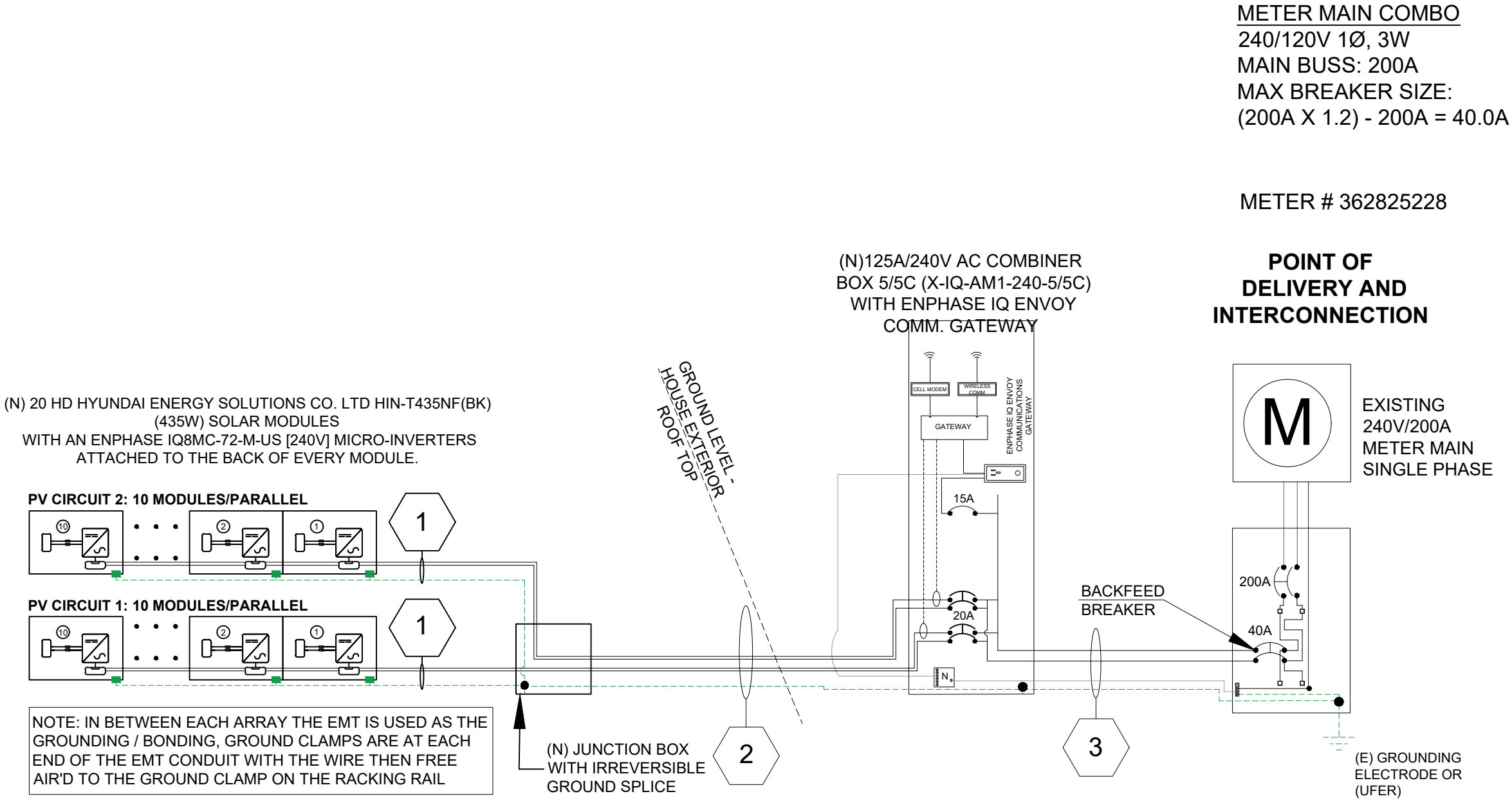
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**SHEET
PV-3**



METER MAIN COMBO
240/120V 1Ø, 3W
MAIN BUSS: 200A
MAX BREAKER SIZE:
(200A X 1.2) - 200A = 40.0A

METER # 362825228



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NC 27526

APN:0624454698.000
DATE:11/21/2025

SHEET
E-1

PV Module Ratings @ STC				SYSTEM SUMMARY			Inverter Ratings		<div></div> <div>CONTRACTOR</div> <div>CLEAN ENERGY SYSTEM</div> <div>ADDRESS: 1224 DELHAM RDKNIGHTDALE NC 27545</div> <div>License#: 26486</div> <div>DESIGNER: OAN</div> <div>DATE: 11/21/2025</div> <div>SCOTT RESIDENCE</div> <div>6294 RIVER ROAD, FUQUAY-VARINA, NC 27526</div> <div>APN:0624454698.000 DATE:11/21/2025</div> <div>SHEET E-1.1</div>				
MANUFACTURER	HD HYUNDAI SOLAR						BRANCH #1			BRANCH #2		MANUFACTURER	ENPHASE ENERGY
MODEL	ENERGY SOLUTIONS CO., LTD HYUNDAI HIT-H435MF-FB (435W)						INVERTERS PER BRANCH			10		MODEL	IQ8MC-72-M-US [240V]
							MAX AC CURRENT			13.3A		13.3A	
							MAX AC OUTPUT POWER			3200W		3200W	
							ARRAY STC POWER					8700W	
							ARRAY PTC POWER					8146W	
Max Power-Point Current (Imp)	13.56A						MAX AC CURRENT			26.60A		Max DC Volt Rating	60V
Max Power-Point Voltage (Vmp)	32.1V						MAX AC POWER			6400W		Max con output Power	320W
Open-Circuit Voltage (Voc)	38.6V						DERATED (CEC) AC POWER			7902W		Max Nominal Voltage	240V
Short-Circuit Current (Isc)	14.32A											Max AC Current	1.33A
Max Series Fuse (OCPD)	30A						Max OCPD Rating						20A
				DESIGN TEMPERATURES									
				ASHRAE EXTREME LOW				-12°C					
				ASHRAE 2% HIGH				34°C					

Conduit and Conductor Schedule					
Tag	Description	Wire Gauge	# of Conductors	Conduit Type	Conduit Size
1	Enphase Q cable - THWN-2	12 AWG	2	N/A - Free Air	N/A - Free Air
1	Bare Copper Ground (EGC/GEC)	6 AWG	1	N/A - Free Air	N/A - Free Air
2	THWN-2	10 AWG	4	EMT	3/4"
2	THWN-2 - Ground	10 AWG	1	EMT	3/4"
3	THWN-2	8 AWG	3	EMT	3/4"
3	THWN-2 - Ground	10 AWG	1	EMT	3/4"

A yellow warning label with a black border. At the top left is a black triangle containing a white exclamation mark. To its right, the word "WARNING" is written in large, bold, black capital letters. Below this, the text "ELECTRICAL SHOCK HAZARD" is written in bold, black capital letters. At the bottom, the text "TERMINALS ON LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION" is written in bold, black capital letters.

LABEL LOCATION:
INVERTER(S), AC DISCONNECT(S), AC
COMBINER PANEL (IF APPLICABLE).
PER CODE(S): NEC 2022: 705.15(C)(4)&
690.13(B)

A yellow rectangular warning label with a black border. It features a black exclamation mark inside a yellow triangle on the left. To the right of the triangle, the word "WARNING" is written in large, bold, black capital letters. Below "WARNING", the text "PHOTOVOLTAIC SYSTEM COMBINER PANEL" is written in smaller, bold, black capital letters. At the bottom of the label, the text "DO NOT ADD LOADS" is written in bold, black capital letters.

LABEL LOCATION:
PHOTOVOLTAIC AC COMBINER (IF
APPLICABLE).
PER CODE(S): CEC 2022: 705.12(B)(3)(3)

RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

LABEL LOCATION:
UTILITY SERVICE ENTRANCE/METER, INVERTER/DC
DISCONNECT IF REQUIRED BY LOCAL AHJ, OR
OTHER LOCATIONS AS REQUIRED BY LOCAL AHJ.
PER CODE(S): NEC 2022:690.56(C)(2),
CFC 2022: 1204.5.3

A yellow rectangular warning label with a black border. At the top left is a black triangle containing a yellow exclamation mark. To its right, the word "WARNING" is written in large, bold, black capital letters. Below this, the text "POWER SOURCE OUTPUT CONNECTION" is written in smaller, bold, black capital letters. At the bottom, the text "DO NOT RELOCATE THIS OVERCURRENT DEVICE" is written in bold, black capital letters.

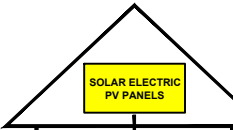
LABEL LOCATION:
ADJACENT TO PV BREAKER (IF APPLICABLE).
PER CODE(S): NEC 2022: 705.12(B)(3)(2)

PHOTOVOLTAIC AC DISCONNECT
 MAXIMUM AC OPERATING CURRENT: 26.60 AMPS
 NOMINAL OPERATING AC VOLTAGE: 240.0 VAC

LABEL LOCATION:
AC DISCONNECT(S), PHOTOVOLTAIC SYSTEM POINT OF
INTERCONNECTION.
PER CODE(S): NEC 2022: 690.54

SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN

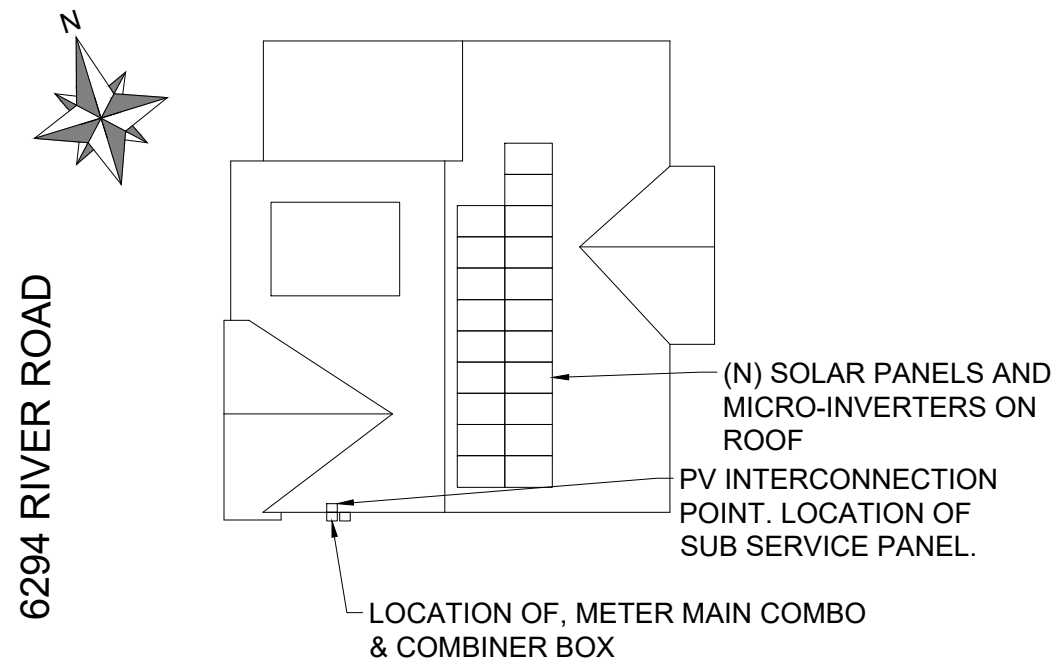
TURN RAPID SHUTDOWN SWITCH TO THE "OFF" POSITION TO SHUT DOWN PV SYSTEM AND REDUCE SHOCK HAZARD IN THE ARRAY.



The diagram shows a simple line drawing of a house. On the roof, there is a yellow rectangular box labeled "SOLAR ELECTRIC PV PANELS". A vertical line extends from the bottom of this box down to a smaller, empty rectangular box located inside the house, representing the rapid shutdown switch.

LABEL LOCATION:
ON OR NO MORE THAN 3 M (10 FT) FROM THE SERVICE
DISCONNECTING MEANS TO WHICH THE PV SYSTEMS
ARE CONNECTED.

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



- PERMANENT SIGNAGE NOTES:

1. NOT ALL PLACARDS SHOWN MAY BE REQUIRED BY LOCAL AHJ. CONTRACTOR TO VERIFY PLACARD REQUIREMENTS WITH LOCAL AHJ BEFORE INSTALLATION.
2. ALL PLAQUES AND SIGNAGE REQUIRED BY THE LATEST EDITION OF THE CALIFORNIA ELECTRICAL CODE
3. ALTERNATE POWER SOURCE PLACARD SHALL BE METALLIC OR PLASTIC, ENGRAVED OR MACHINE PRINTED LETTERS IN A CONTRASTING COLOR TO THE PLAQUE. THIS PLAQUE WILL BE ATTCHED BY POP RIVETS OR SCREWS OR OTHER APPROVED METHOD.
4. DIRECTORY PLACARD MARKING CONTENT AND FORMAT: RED BACKGROUND, WHITE LETTERING, MINIMUM 3/8" LETTER HIEGHT, ALL CAPITAL LETTERS, ARIAL OR SIMILAR FONT, NON BOLD, REFLECTIVE WEATHER RESISTANT MATERIAL SUITABLE FOR THE ENVIRONMENT.

**CONTRACTOR**

CLEAN ENERGY SYSTEM

ADDRESS:
1224 DELHAM RDKNIGHTDALE
NC 27545

License#: 26486

DESIGNER: OAN

DATE: 11/21/2025

SCOTT RESIDENCE

6294 RIVER ROAD,
FUQUAY-VARINA,
NC 27526

APN:0624454698.000
DATE:11/21/2025

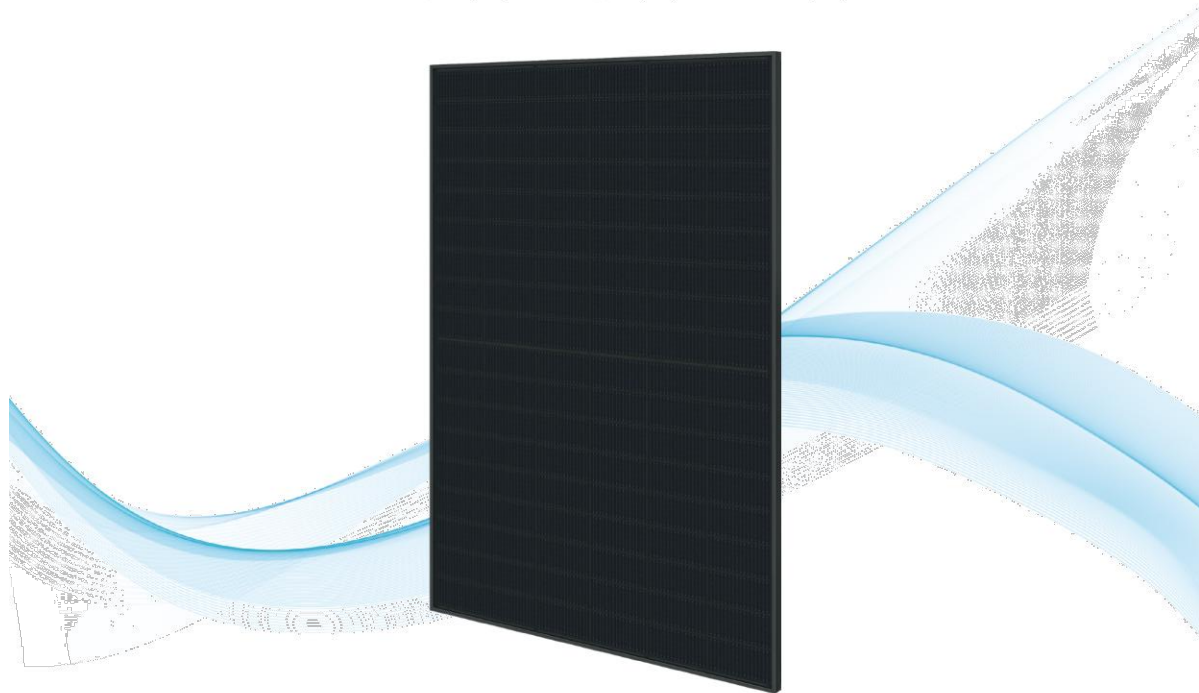
SHEET
E-2

HD HYUNDAI SOLAR MODULE

NF(BK) Series

Premium N-Type TOPCon Module

HiN-T430NF(BK) | HiN-T435NF(BK) | HiN-T440NF(BK)



22.53%
High Efficiency



High-End
TOPCon
Technology



Higher
Bifaciality



Long-Term
Reliability



Compatible
with Carport
Applications

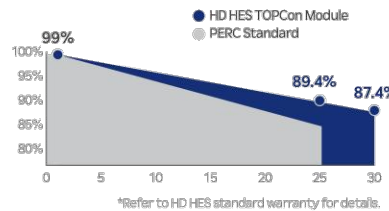


For Residential
(Full Black Design)

HD Hyundai's Warranty Provisions



- 25-Year Product Warranty
 - Materials and workmanship
- 30-Year Performance Warranty
 - First year degradation: 1%
 - Linear warranty after initial year:
with 0.4%p annual degradation,
87.4% is guaranteed up to 30years



Certification



- ISO 9001 : Quality management systems
- ISO 14001 : Environmental management systems
- ISO 45001 : Occupational health and safety management systems
- UL 61730 : Photovoltaic (PV) module safety qualification (CSA)
- IEC 61701: Salt mist corrosion testing
- IEC 62716: Ammonia corrosion testing
- IEC 62804: Potential Induced Degradation (PID) testing
- IEC 60068-2-68: Sand and dust testing for environmental durability

Electrical Characteristics

HiN-TxxxNF(BK)		HiN-T430NF(BK)		HiN-T435NF(BK)		HiN-T440NF(BK)	
Item	Unit	BNPI		BNPI		BNPI	
Nominal output (Pmax)	W	430	476	435	482	440	488
Open circuit voltage (Voc)	V	38.4	38.4	38.6	38.6	38.8	38.8
Short circuit current (Isc)	A	14.25	15.79	14.32	15.87	14.39	15.94
Voltage at Pmax (Vmpp)	V	31.9	31.9	32.1	32.1	32.3	32.3
Current at Pmax (Impp)	A	13.48	14.94	13.56	15.02	13.63	15.10
Module efficiency	%	22.02		22.28		22.53	
Power Class Sorting	W	0 ~ +5					
Temperature coefficient of Pmax	%/K	-0.30					
Temperature coefficient of Voc	%/K	-0.25					
Temperature coefficient of Isc	%/K	0.046					
Bifaciality	%	80%±10%					

*STC : Irradiance 1,000 W/m², cell temperature 25°C, AM=1.5 / Test uncertainty for Pmax ±3%, Voc ±3%, Isc ±3%

**The electrical properties of BNPI are measured under the irradiance corresponding to 1000 W/m² on the module front and 135 W/m² on the module rear.

Additional Power Gain from rear side					
Pmpp gain	Pmpp[W]	Vmpp[V]	Impp[A]	Voc[V]	Isc[A]
5%	458	32.30	14.18	38.80	14.97
15%	493	32.30	15.27	38.80	16.12
25%	528	32.40	16.36	38.90	17.27

*Electrical characteristics with different rear power gain (reference to 440W)

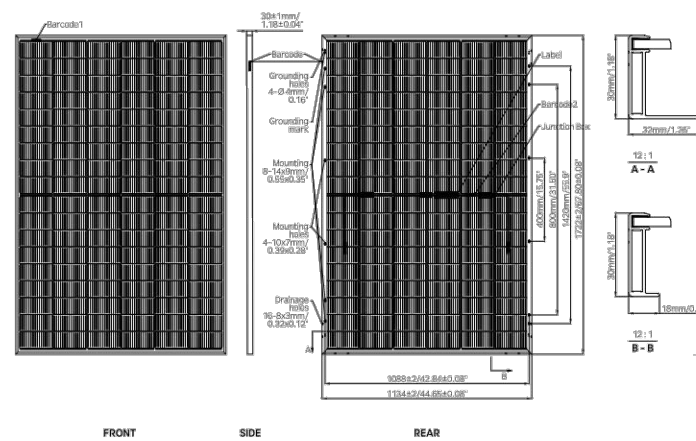
Mechanical Characteristics

Dimensions	1,722mm (L) x 1,134mm (W) x 30mm (H) (67.8in x 44.6in x 1.2in)
Weight	24.5 kg (50.0lbs)
Solar Cells	N-Type TOPCon, 108 (6x18) monocrystalline 16BB half-cut bifacial cells
Output Cables	Cable : (+)1,200mm(47.2in), (-)1,200mm(47.2in) / Customized length available Connector : Stäubli MC4 genuine Connector / Compatible, IP68
Junction Box	3-part, 3 bypass diodes, IP68 rated
Construction	Front : 2.0mm(0.08in) semi-tempered solar glass with high transmittance and anti-reflective coating Rear : 2.0mm(0.08in) semi-tempered solar glass
Frame	Anodized aluminum alloy

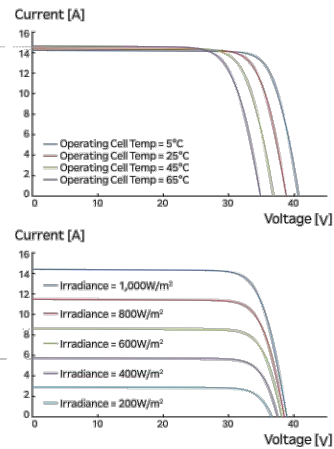
Shipping Configurations

Packing Direction	Vertical	Packing pallet weight (kg)	912
Container Size (HC)	40'	Modules Per Pallet (pcs)	36
Pallets Per Container	26	Modules Per Container (pcs)	936

Module Diagram (unit : mm)



I-V Curves (HiN-T440NF(BK))



Sales & Marketing
hes.sales@hd.com

HD Hyundai Energy Solutions reserves the right to update or modify the specifications and features listed in this datasheet without prior notice. Always check the latest version of the datasheet for accurate information. Before using the product, please refer to the Installation and Operation Manual and Warranty. We retain the right of final interpretation.



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SHEET
S-1



DATA SHEET



IQ8MC Microinverter

Our newest IQ8 Series 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 55-nm technology with high-speed digital logic and has superfast 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 IQ Battery, IQ Gateway, and the Enphase App monitoring and analysis software.



Connect PV modules quickly and easily to the IQ8 Series Microinverters that have integrated MC4 connectors.



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.



IQ8 Series Microinverters are UL Listed as PV rapid shutdown equipment and conforms with various regulations when installed according to the manufacturer's instructions.

*Meets UL 1741 only when installed with IQ System Controller 2 or 3.

Easy to install

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

High productivity and reliability

- Produces 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) and IEEE 1547:2018 (UL 1741-SB)

NOTE:

- IQ8 Microinverters cannot be mixed together with previous generations of Enphase microinverters (IQ7 Series, IQ6 Series, and so on) in the same system.
- IQ Microinverters ship with default settings that meet North America's IEEE 1547 interconnection standard requirements. Region-specific adjustments may be requested by an Authority Having Jurisdiction (AHJ) or utility representative. An IQ Gateway is required to make these changes during installation.

IQ8MC Microinverter

INPUT DATA [DC]		UNITS		IQ8MC-72-M-US			
Commonly used module pairings ¹		W		260–460			
Module compatibility		—		To meet compatibility, PV modules must be within the following max. input DC voltage and max. module I _{sc} . Module compatibility can be checked at https://enphase.com/installers/microinverters/calculator .			
MPPT voltage range		V		25–45			
Operating range		V		18–58			
Min./Max. start voltage		V		22/58			
Max. input DC voltage		V		60			
Max. continuous operating DC current		A		14			
Max. input DC short-circuit current		A		25			
Max. module I _{sc}		A		20			
Overvoltage class DC port		—		II			
DC port backfeed current		mA		0			
PV array configuration		—		Ungrounded array; no additional DC side protection required; AC side protection requires max 20 A per branch circuit			
OUTPUT DATA [AC]		UNITS		IQ8MC-72-M-US @240 VAC		IQ8MC-72-M-US @208 VAC	
Peak output power		VA		330		315	
Max. continuous output power		VA		320		310	
Nominal grid voltage (L-L)		V		240, split-phase (L-L), 180°		208, single-phase (L-L), 120°	
Min./Max. grid voltage ²		V		211–264		183–229	
Max. continuous output current		A		1.33		1.49	
Nominal frequency		Hz		60			
Extended frequency range		Hz		47–68			
AC short circuit fault current over three cycles		Arms		2.70			
Max. units per 20 A (L-L) branch circuit ³		—		12		10	
Total harmonic distortion		%		<5			
Overvoltage class AC port		—		III			
AC port backfeed current		mA		18			
Power factor setting		—		1.0			
Grid-tied power factor (adjustable)		—		0.85 leading ... 0.85 lagging			
Peak efficiency		%		97.4		97.2	
CEC weighted efficiency		%		97.0		96.5	
Nighttime power consumption		mW		33		25	
MECHANICAL DATA				UNITS			
Ambient temperature range				–40°C to 65°C (–40°F to 149°F)			
Relative humidity range				4% to 100% (condensing)			
DC connector type				Stäubli MC4			
Dimensions (H × W × D); Weight				212 mm (8.3") × 175 mm (6.9") × 30.2 mm (1.2"); 1.1 kg (2.43 lbs)			
Cooling				Natural convection – no fans			
Approved for wet locations; Pollution degree				Yes; 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, IEEE 1547:2018 (UL 1741-SB), 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 shutdown equipment and conforms with NEC 2014, NEC 2017, NEC 2020, and NEC 2023 section 690.12 and C22.1-2018 Rule 64-218 rapid shutdown of PV systems for AC and DC conductors when installed according to the manufacturer's instructions.					

(1) No enforced DC/AC ratio.

(2) Nominal voltage range can be extended beyond nominal if required by the utility.

(3) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.



CONTRACTOR

CLEAN ENERGY SYSTEM

ADDRESS:
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License#: 26486

DESIGNER: OAN

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APN:0624454698.000
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SHEET
S-2



DATASHEET

PRELIMINARY



X-IQ-AMI-240-5
X-IQ-AMI-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.



5-year
limited
warranty



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IOC-S-SC-DSH-00007-10-EN-US-2023-05-22

IQ Combiner 5/5C

MODEL NUMBER	
IQ Combiner 5 (X-IQ-AMI-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-AMI-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-MI-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 1x 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-MI-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-MI-06-SP-05	4G-based LTE-M1 cellular modem with a 5-year T-Mobile data plan.
CELLMODEM-MI-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-SOLARSHELD-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 current rating	10 kAIC
Maximum continuous current rating (input from PV/storage)	64 A
Branch circuits (solar and/or storage)	Up to four 2-pole Eaton BR 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.)

IOC-S-SC-DSH-00007-10-EN-US-2023-05-22

MECHANICAL DATA

Dimensions (WxHxD)	37.5 cm x 49.5 cm x 18.8 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	<ul style="list-style-type: none">20 A to 50 A breaker inputs: 14 to 4 AWG copper conductors60 A breaker branch input: 4 to 1/0 AWG copper conductorsMain lug combined output: 10 to 2/0 AWG copper conductorsNeutral and ground: 14 to 1/0 copper conductorsAlways 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-MI-06-SP-05 or CELLMODEM-MI-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/CAN/CSA 22.2 No. 61010-1, IEEE 1547: 2018 (UL 1741-SB, 3 rd Ed.) IEEE 2030.5/CISIP Compliant Production metering: ANSI C12.20 accuracy class 0.5 (PV production).
COMPATIBILITY	
IQ System Controller 3/3G	SC200D111C240US01, SC200G111C240US01
IQ Battery 5P	IOBATTERY-SP-3P-NA
Microinverter	IQ6, IQ7, and IQ8 Series Microinverters

IOC-S-SC-DSH-00007-10-EN-US-2023-05-22



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SHEET
S-3



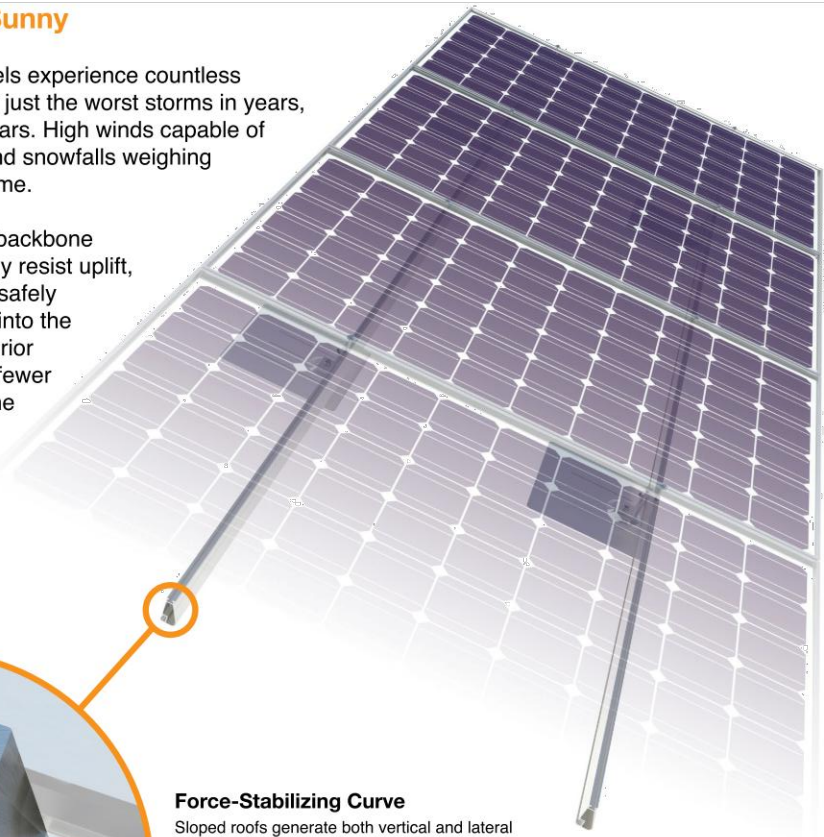
Tech Brief

XR Rail® Family

Solar Is Not Always Sunny

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

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



Force-Stabilizing Curve

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

Compatible with Flat & Pitched Roofs



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



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

Corrosion-Resistant Materials

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



XR Rail® Family

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



XR10

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

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



XR100

XR100 is a residential and commercial mounting rail. It supports a range of wind and snow conditions, while also maximizing spans up to 10 feet.

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



XR1000

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

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

Rail Selection

The table below was prepared in compliance with applicable engineering codes and standards.* Values are based on the following criteria: ASCE 7-16, Gable Roof Flush Mount, Roof Zones 1 & 2e, Exposure B, Roof Slope of 8 to 20 degrees and Mean Building Height of 30 ft. Visit IronRidge.com for detailed certification letters.

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

*Table is meant to be a simplified span chart for conveying general rail capabilities. Use approved certification letters for actual design guidance.

Tech Brief



CONTRACTOR

CLEAN ENERGY SYSTEM

ADDRESS:
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The Respect Your Roof Deserves

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

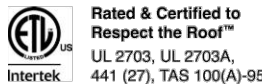
Halo UltraGrip™(HUG®) is here to respect the roof. Its Halo is a cast-aluminum barrier that encases the UltraGrip, our industrial-grade, foam-and-mastic seal. This allows HUG to accelerate the installation process and provide the utmost in waterproofing protection. Give your roof a HUG®.



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

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

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



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

Tech Brief



Adaptive, Rafter-Friendly Installation



Hit the rafter? Good to go!
When you find a rafter, you can move on. Only 2 RD Structural Screws are needed.

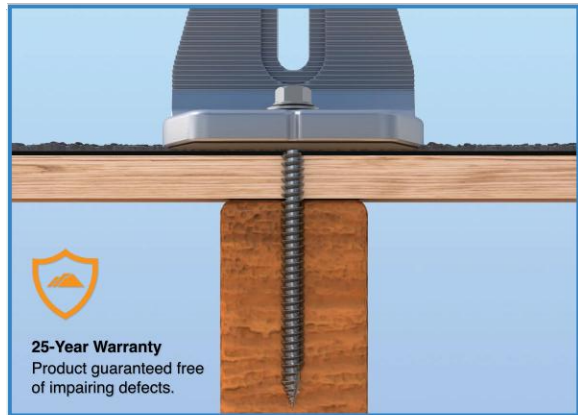


Miss the rafter? Try it again.
Place another screw to the left or right. If rafter is found, install 3rd and final screw.



Still no luck? Install the rest.
If more than 3 screws miss the rafter, secure six screws to deck mount it.

Trusted Strength & Less Hassle



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

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

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

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

Attachment Loading



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

Structural Design



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

Water Seal Ratings



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

UL 2703 & 2703A



Systems conform to UL 2703 and HUG® also conforms to UL 2703A. See Flush Mount Manual for more info.

Tech Brief



CONTRACTOR

CLEAN ENERGY SYSTEM

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NC 27545

License#: 26486

DESIGNER: OAN

DATE: 11/21/2025

SCOTT RESIDENCE

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FUQUAY-VARINA,
NC 27526

APN:0624454698.000
DATE:11/21/2025

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