

SCOPE OF WORK:

TO INSTALL A ROOF MOUNTED SOLAR PHOTOVOLTAIC SYSTEM AT THE OWNER RESIDENCE LOCATED AT 66 QUAIL HOLLOW , CAMERON, NC 28326, USA. THE POWER GENERATED BY THE PV SYSTEM WILL BE INTERCONNECTED WITH THE UTILITY GRID THROUGH THE EXISTING ELECTRICAL SERVICE EQUIPMENT. THE PV SYSTEM DOES NOT INCLUDE STORAGE BATTERIES

EQUIPMENT SUMMARY

18 JINKO JKM425N-54HL4-B MODULES
18 ENPHASE IQ8PLUS-72-2-US (240V) MICROINVERTERS

GENERAL NOTES:

- THESE CONSTRUCTION DOCUMENTS HAVE BEEN BASED ON FIELD INSPECTIONS AND OTHER INFORMATION AVAILABLE AT THE TIME. ACTUAL FIELD CONDITIONS MAY REQUIRE MODIFICATIONS IN CONSTRUCTION DETAILS.
- ARCHITECT HAS NOT BEEN RETAINED TO SUPERVISE ANY CONSTRUCTION OR INSTALLATION OF ANY EQUIPMENT AT SITE.
- CONTRACTOR SHALL FURNISH ALL LABOR, MATERIAL, EQUIPMENT, TOOLS, OBTAINS ALL PERMITS, LICENSES AND PAY ALL REQUIRED FEES AND COMPLETE INSTALLATION.
- CONTRACTOR HAS THE FULL RESPONSIBILITY TO CHECK AND VERIFY ALL DIMENSIONS AND EXISTING CONDITIONS. ANY DISCREPANCIES SHALL BE REPORTED TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK. ANY WORK STARTED BEFORE CONSULTATION AND ACCEPTANCE BY THE ENGINEER SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR AND SHALL BE SUBJECT TO CORRECTION BY THEM WITHOUT ADDITIONAL COMPENSATION.
- DAMAGE CAUSED TO THE EXISTING STRUCTURE, PIPES, DUCTS, WINDOWS, WALL, FLOORS, ETC. SHALL BE REPAIRED TO THE ORIGINAL CONDITION OR REPLACED BY THE CONTRACTOR AT NO ADDITIONAL COST.
- THE CONTRACTOR SHALL BE HELD RESPONSIBLE FOR THE PROPER INSTALLATION AND COMPLETION OF THE WORK WITH APPROVED MATERIALS.
- NO CHANGES ARE TO BE MADE WITHOUT THE CONSULTATION AND APPROVAL OF THE ARCHITECT.
- CONTRACTOR SHALL OBTAIN BULDING PERMIT. NO WORK TO START UNLESS BUILDING PERMIT IS PROPERLY DISPLAYED.
- ALL WORKMANSHIP AND MATERIALS SHALL BE OF FIRST QUALITY AND IN COMPLIANCE WITH THE REQUIREMENTS OF THE NC BUILDING CODE, THE DEPARTMENT OF ENVIRONMENTAL PROTECTION AND ALL PERTINENT AGENCIES.
- IT IS ESSENTIAL THAT ALL WORK PROCEED WITH THE MAXIMUM COOPERATION OF ALL PARTIES AND WITH MINIMUM INTERFERENCE TO THE OCCUPANTS WITHIN THE BUILDING. THE OWNER'S DIRECTIONS IN THIS REGARD SHALL BE FULLY COMPLIED WITH.
- ALL EXPOSED PLUMBING, HVAC, ELECTRICAL DUCTWORK, PIPING AND CONDUITS ARE TO BE PAINTED BY GENERAL CONTRACTOR.
- THE CONTRACTOR SHALL PERFORM THE WORK IN STRICT CONFORMANCE WITH THE LOCAL LAWS, REGULATIONS AND THE NATIONAL ELECTRIC CODE.
- THE CONTRACTOR SHALL OBTAIN ALL PERMITS, APPROVALS, AFFIDAVITS, CERTIFICATIONS, ETC. AND PAY ALL FEES AS REQUIRED BY THE LOCAL AUTHORITIES.
- CONTRACTORS SHALL OBTAIN FIRE CERTIF. UPON COMPLETION OF WORK.

ELECTRICAL NOTES:

- THE EQUIPMENT AND ALL ASSOCIATED WIRING AND INTERCONNECTION SHALL BE INSTALLED ONLY BY QUALIFIED PEOPLE. A QUALIFIED PERSON IS ONE WHO HAS SKILLS AND KNOWLEDGE RELATED TO THE CONSTRUCTION AND OPERATION OF THE ELECTRICAL EQUIPMENT AND INSTALLATIONS AND HAS RECIEVED SAFETY TRAINING TO RECOGNIZE AND AVOID THE HAZARDS INVOLVED. (NEC 690.4(E) AND 705.6)
- LOCAL UTILITY PROVIDER SHALL BE NOTIFIED PRIOR TO USE AND ACTIVATION OF ANY SOLAR PHOTOVOLTAIC INSTALLATION. FOR A LINE SIDE TAP CONNECTION, UTILITY NEEDS TO BE NOTIFIED WELL IN ADVANCE TO COORDINATE BUILDING ELECTRICAL SHUT OFF.
- NEW CONDUIT ROUTING SHOWN IS ESSENTIALLY SCHEMATIC. SUBCONTRACTOR SHALL LAY OUT RUNS TO SUIT FIELD CONDITIONS AND THE COORDINATION REQUIREMENTS OF OTHER TRADES.
- ARRAY WIRING SHOULD NOT BE READILY ACCESSIBLE EXCEPT TO QUALIFIED PERSONNEL.
- ALL EXTERIOR CONDUIT, FITTINGS, AND BOXES SHALL BE WATERTIGHT AND APPROVED FOR USE IN WET LOCATIONS. (NEC 314.15A).
- WIRING METHODS FOR PV SYSTEM CONDUCTORS AREN'T PERMITTED WITHIN 10 IN. OF THE ROOF DECKING OR SHEATHING EXCEPT WHERE LOCATED DIRECTLY BELOW THE ROOF SURFACE THAT'S COVERED BY PV MODULES AND ASSOCIATED EQUIPMENT WIRING
- BACK-FED BREAKER MUST BE AT THE OPPOSITE END OF BUS BAR FROM THE MAIN BREAKER OR MAIN LUG SUPPLYING CURRENT FROM THE UTILITIES.
- ALL CONDUCTORS AND WIRE TIES EXPOSED TO SUNLIGHT ARE LISTED AS UV RESISTANT.
- CONTRACTOR SHALL FOLLOW ALL ELECTRICAL EQUIPMENT LABELING REQUIREMENTS IN NEC 690 AND IFC 2018
- MEASURE THE LINE-TO-LINE AND LINE-TO-NEUTRAL VOLTAGE OF ALL SERVICE ENTRANCE CONDUCTORS PROIR TO INSTALLING ANY SOLAR EQUIPMENT. THE VOLTAGES FOR THE 240VAC RATED.

GOVERNING CODES

2018 NORTH CAROLINA FIRE CODE
2018 NORTH CAROLINA BUILDING CODE
2018 NORTH CAROLINA RESIDENTIAL CODE
2018 NORTH CAROLINA ENERGY CONSERVATION CODE
2018 NORTH CAROLINA EXISTING BUILDING CODE
2018 NORTH CAROLINA SWIMMING POOL AND SPA CODE
2017 NATIONAL ELECTRICAL CODE

AUTHORITY HAVING JURISDICTION: HARNETT COUNTY
UTILITY NAME: CEMC

WIRING AND CONDUIT NOTES:

- ALL CONDUIT SIZES AND TYPES, SHALL BE LISTED FOR ITS PURPOSE AND APPROVED FOR THE SITE APPLICATIONS
- ALL PV CABLES AND HOMERUN WIRES BE #10AWG *USE-2, PV WIRE, OR PROPRIETARY SOLAR CABLING SPECIFIED BY MFR, OR EQUIVALENT; ROUTED TO SOURCE CIRCUIT COMBINER BOXES AS REQUIRED
- ALL CONDUCTORS AND OCPD SIZES AND TYPES SPECIFIED ACCORDING TO [NEC 690.8 (A)(1) & (B)(1)], [NEC 240] [NEC 690.7] FOR MULTIPLE CONDUCTORS
- ALL PV DC CONDUCTORS IN CONDUIT EXPOSED TO SUNLIGHT SHALL BE DERATED ACCORDING TO [NEC TABLE 310.15 (B)(2)(C)] BLACK ONLY**
- EXPOSED ROOF PV DC CONDUCTORS SHALL BE USE-2, 90°C RATED, WET AND UV RESISTANT, AND UL LISTED RATED FOR 600V, UV RATED SPIRAL WRAP SHALL BE USED TO PROTECT WIRE FROM SHARP EDGES
- PHASE AND NEUTRAL CONDUCTORS SHALL BE DUAL RATED THHN/THWN-2 INSULATED, 90°C RATED, WET AND UV RESISTANT, RATED FOR 600V PER NEC 2008 OR 1000V PER NEC 2017
- 4-WIRE DELTA CONNECTED SYSTEMS HAVE THE PHASE WITH THE HIGHER VOLTAGE TO GROUND MARKED ORANGE OR IDENTIFIED BY OTHER EFFECTIVE MEANS
- ALL SOURCE CIRCUITS SHALL HAVE INDIVIDUAL SOURCE CIRCUIT PROTECTION
- VOLTAGE DROP LIMITED TO 2% FOR DC CIRCUITS AND 1% FOR AC CIRCUITS
- AC CONDUCTORS >4AWG COLOR CODED OR MARKED: PHASE A OR L1- BLACK, PHASE B OR L2- RED, PHASE C OR L3- BLUE, NEUTRAL- WHITE/GRAY

**SYSTEM RATING**

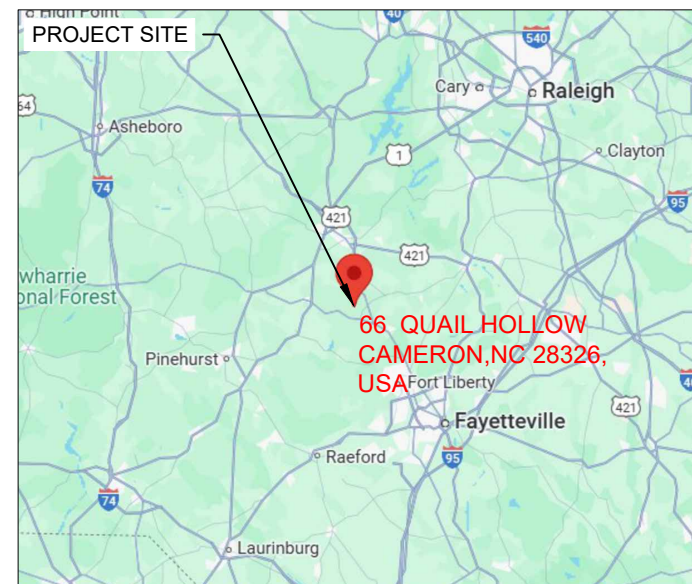
7.65 KWDC
5.22 KWAC

SHEET INDEX

PV-0	COVER PAGE
PV-1	SITE PLAN
PV-2	ROOF PLAN & MODULES
PV-2A	STRING LAYOUT & BOM
PV-3	ATTACHMENT DETAIL
PV-4	ELECTRICAL LINE & CALCS
PV-4A	SPECIFICATIONS & NOTES
PV-5	SIGNAGE
PV-6+	EQUIPMENT SPECIFICATIONS



1 PV-0 HOUSE PHOTO SCALE: NTS



2 PV-0 VICINITY MAP SCALE: NTS



5709 GARDENDALE DR.
HOUSTON TX 77092

REVISIONS

DESCRIPTION	DATE	REV
REVISION	11-15-2024	A

Signature with Seal

Signed 11/19/2024



PROJECT NAME & ADDRESS

GEORGE WILLIAMS
RESIDENCE
66 QUAIL HOLLOW
CAMERON, NC 28326, USA
METER NO #:159 385 417

DATE: 11/03/2024

DESIGNER DETAILS:

SHEET NAME

COVER PAGE

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

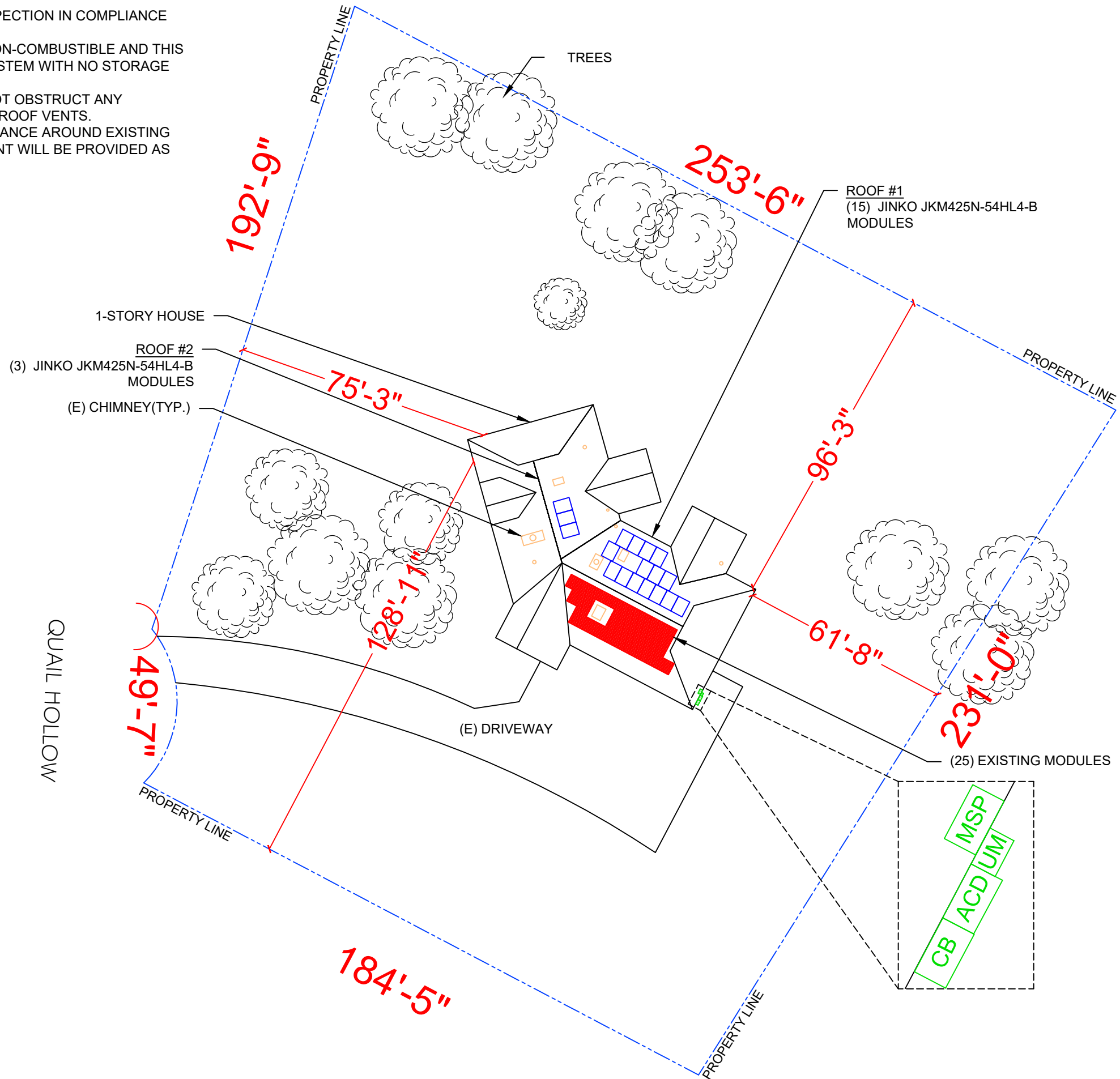
PV-0

SITE NOTES

- A LADDER SHALL BE IN PLACE FOR INSPECTION IN COMPLIANCE WITH OSHA REGULATIONS.
- THE PV MODULES ARE CONSIDERED NON-COMBUSTIBLE AND THIS SYSTEM IS AN UTILITY INTERACTIVE SYSTEM WITH NO STORAGE BATTERIES.
- THE SOLAR PV INSTALLATION SHALL NOT OBSTRUCT ANY PLUMBING, MECHANICAL, OR BUILDING ROOF VENTS.
- PROPER ACCESS AND WORKING CLEARANCE AROUND EXISTING AND PROPOSED ELECTRICAL EQUIPMENT WILL BE PROVIDED AS PER SECTION [NEC 110.26]

LEGEND

- (E) UTILITY METER
- (E) MAIN SERVICE PANEL
- (N) NON FUSED AC DISCONNECT (EATON DG221URB)
- (N) ENPHASE IQ COMBINER 5
- VENT, ATTIC FAN (ROOF OBSTRUCTION)
- (43) HALO ULTRAGRIP - BLACK (QM-HUG-01-B1) ATTACHMENT @ 48°O.C
- CONDUIT
- (18) ENPHASE IQ8PLUS-72-2-US (240V) MICROINVERTERS
- (18) JINKO JKM425N-54HL4-B MODULES
- IRONRIDGE XR-10 RAIL 14 FEET 168"



5709 GARDENDALE DR.
HOUSTON TX 77092

REVISIONS		
DESCRIPTION	DATE	REV
REVISION	11-15-2024	A

Signature with Seal

Signed 11/19/2024

PROJECT NAME & ADDRESS

**GEORGE WILLIAMS
RESIDENCE**
66 QUAIL HOLLOW
CAMERON, NC 28326, USA
METER NO #:159 385 417

DATE: 11/03/2024

DESIGNER DETAILS:

SHEET NAME
SITE PLAN

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

SHEET NUMBER
PV-1



MODULE TYPE, DIMENSIONS & WEIGHT	
NUMBER OF MODULES:	18 MODULES
MODULE TYPE:	JINKO JKM425N-54HL4-B MODULES
MODULE WEIGHT:	48.5 LBS
MODULE DIMENSIONS:	67.79" X 44.65" = 21.02 SF
UNIT WEIGHT OF AREA:	2.30 PSF

ROOF DESCRIPTION					
ROOF	ROOF TILT	AZIMUTH	RAFTER SIZE	RAFTER SPACING	ROOF MATERIAL
#1	30°	62°	2"X6"	24" O.C.	COMP. SHINGLE
#2	30°	74°	2"X6"	24" O.C.	COMP. SHINGLE

NOTE : ATTACHMENT SPACING @ 48" O.C.

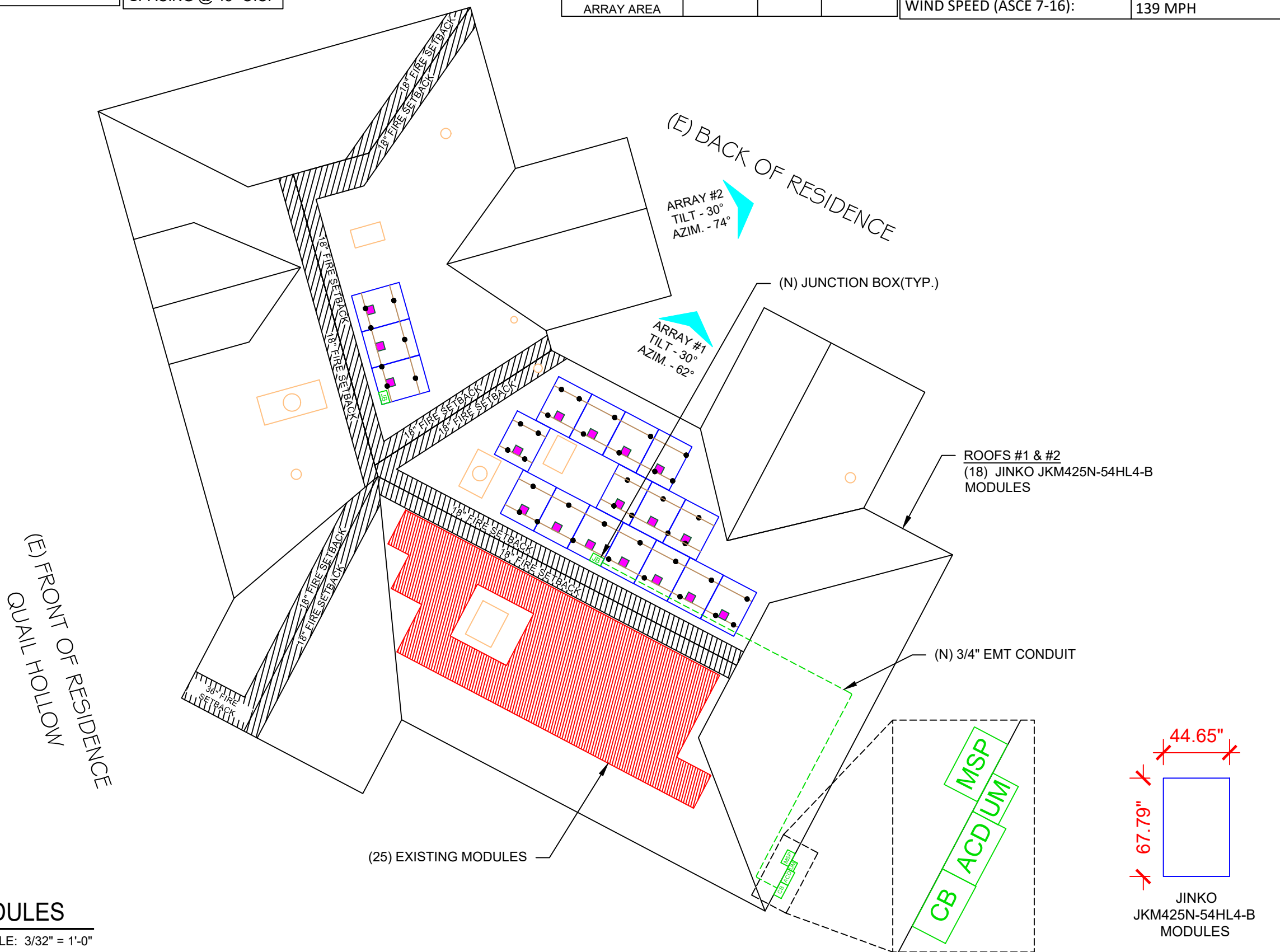
ARRAY AREA & ROOF AREA CALC'S				
ROOF	# OF MODULES	ARRAY AREA (Sq. Ft.)	ROOF AREA (SQ. FT.)	ROOF AREA COVERED BY ARRAY (%)
#1	15	273	701.50	39
#2	3	55	184.72	30
TOTAL ROOF AREA COVERED BY ARRAY AREA		328	4333.34	8

DESIGN SPECIFICATION	
RISK CATEGORY:	II
CONSTRUCTION:	SFD
ZONING:	RESIDENTIAL
SNOW LOAD (ASCE 7-16):	10
EXPOSURE CATEGORY:	C
WIND SPEED (ASCE 7-16):	139 MPH

PANEL HEIGHT OFF ROOF 4"

LEGEND

- JB (N) JUNCTION BOX
- UM (E) UTILITY METER
- MSP (E) MAIN SERVICE PANEL
- ACD (N) NON FUSED AC DISCONNECT (EATON DG221URB)
- CB (N) ENPHASE IQ COMBINER 5
- - VENT, ATTIC FAN (ROOF OBSTRUCTION)
- - (43) HALO ULTRAGRIP - BLACK (QM-HUG-01-B1) ATTACHMENT @ 48" O.C
- CONDUIT
- (18) ENPHASE IQ8PLUS-72-2-US (240V) MICROINVERTERS
- (18) JINKO JKM425N-54HL4-B MODULES
- IRONRIDGE XR-10 RAIL 14 FEET 168"




brightsun energy

5709 GARDENDALE DR.
HOUSTON TX 77092

REVISIONS		
DESCRIPTION	DATE	REV
REVISION	11-15-2024	A

Signature with Seal

Signed 11/19/2024

NORTH CAROLINA
PROFESSIONAL
SEAL
048371
ENGINEER
VINCENT MWUMVANEZA

PROJECT NAME & ADDRESS

**GEORGE WILLIAMS
RESIDENCE**
66 QUAIL HOLLOW
CAMERON, NC 28326, USA
METER NO #: 159 385 417

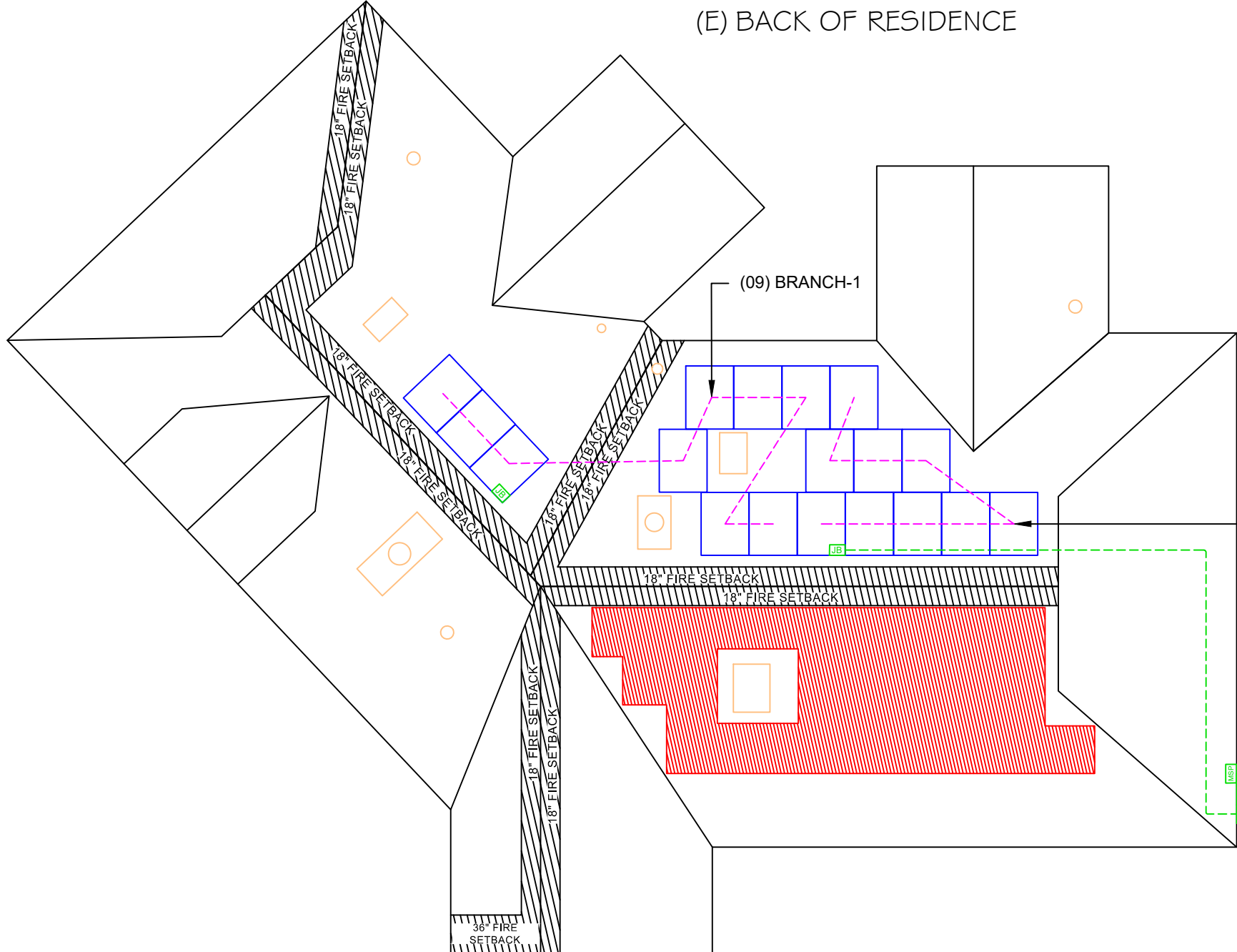
DATE: 11/03/2024

DESIGNER DETAILS:

SHEET NAME
ROOF PLAN & MODULES
SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-2





(E) BACK OF RESIDENCE

(E) FRONT OF RESIDENCE
QUAIL HOLLOW

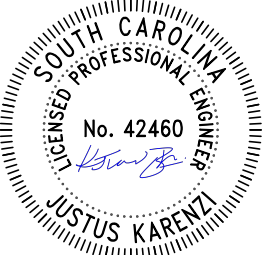
BILL OF MATERIALS		
EQUIPMENT	QTY	DESCRIPTION
SOLAR PV MODULE	18	JINKO JKM425N-54HL4-B MODULES
MICROINVERTER	18	ENPHASE IQ8PLUS-72-2-US (240V) MICROINVERTERS
COMBINER BOX	1	ENPHASE IQ COMBINER 5 W/ IQ GATEWAY (X-IQ-AM1-240-5)
AC DISCONNECT	1	30A NON FUSED AC DISCONNECT, 240V NEMA ,3R UL LISTED(EATON DG221URB)
JUNCTION BOX	2	JUNCTION BOX, NEMA 3R, UL LISTED
ENPHASE Q CABLE	27	ENPHASE Q CABLE 240V (PER CONNECTOR)
BRANCH TERMINATOR	2	BRANCH TERMINATOR
IQ WATER TIGHT CAP	9	IQ WATER TIGHT CAP
ATTACHMENT	43	QM HALO ULTRAGRIP(MILL OR BLACK)
ATTACHMENT	43	SELF DRILLING SCREW, #14, WOOD TIP
ATTACHMENT	86	WASHER, EPDM BACKED
RAILS	11	IRONRIDGE XR-10 RAIL 14 FEET (168")
SPLICE	2	RAIL SPLICE
CLAMPS	46	UNIVERSAL FASTENING OBJECT(UFO)
CLAMPS	20	STOPPER SLEEVES
GROUNDING LUG	5	GROUNDING LUG



5709 GARDENDALE DR.
HOUSTON TX 77092

REVISIONS		
DESCRIPTION	DATE	REV
REVISION	11-15-2024	A

Signature with Seal



Signed 11/19/2024

PROJECT NAME & ADDRESS

**GEORGE WILLIAMS
RESIDENCE**
66 QUAIL HOLLOW
CAMERON, NC 28326, USA
METER NO #:159 385 417

DATE: 11/03/2024

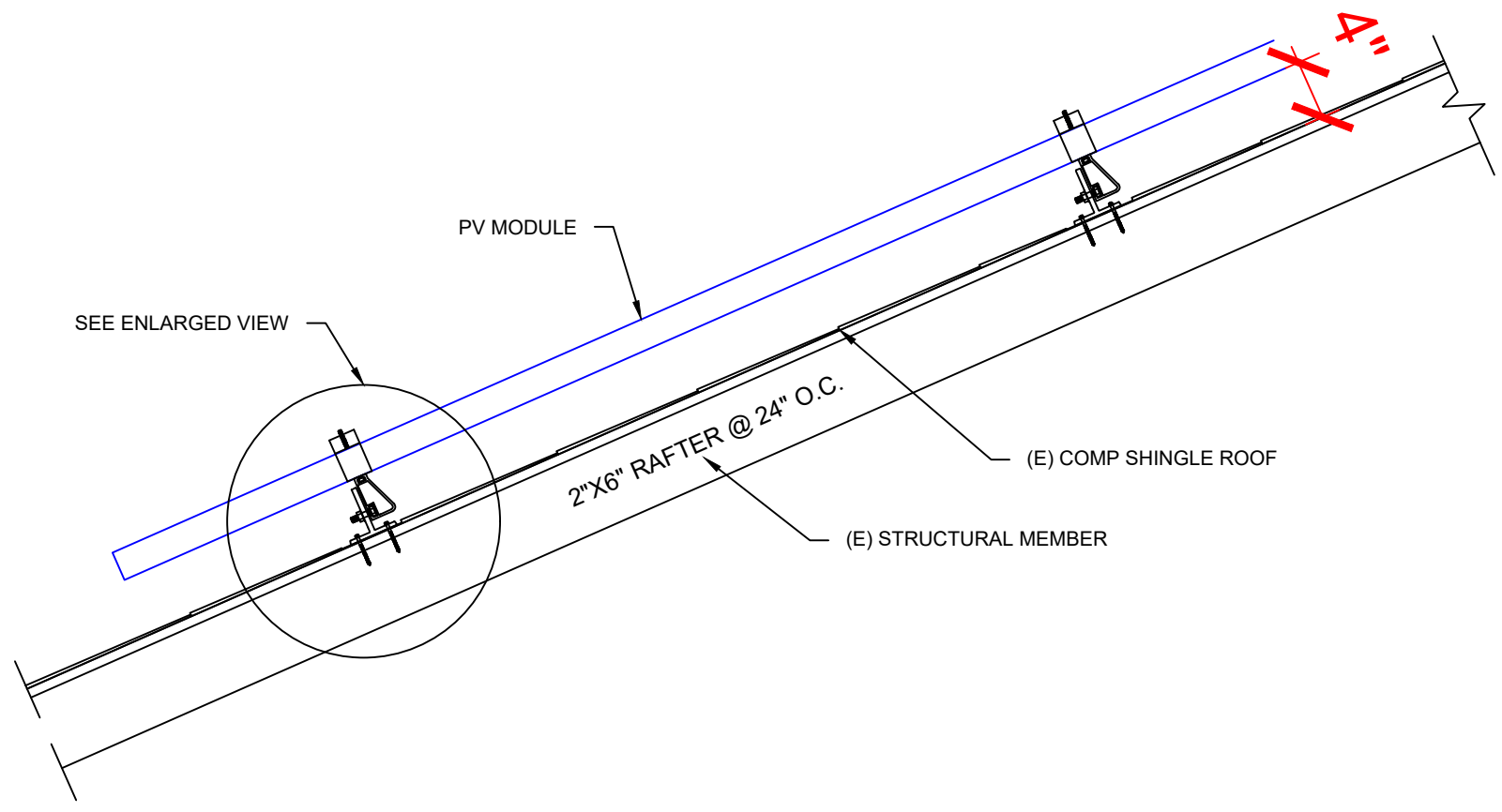
DESIGNER DETAILS:

SHEET NAME
**STRING
LAYOUT & BOM**

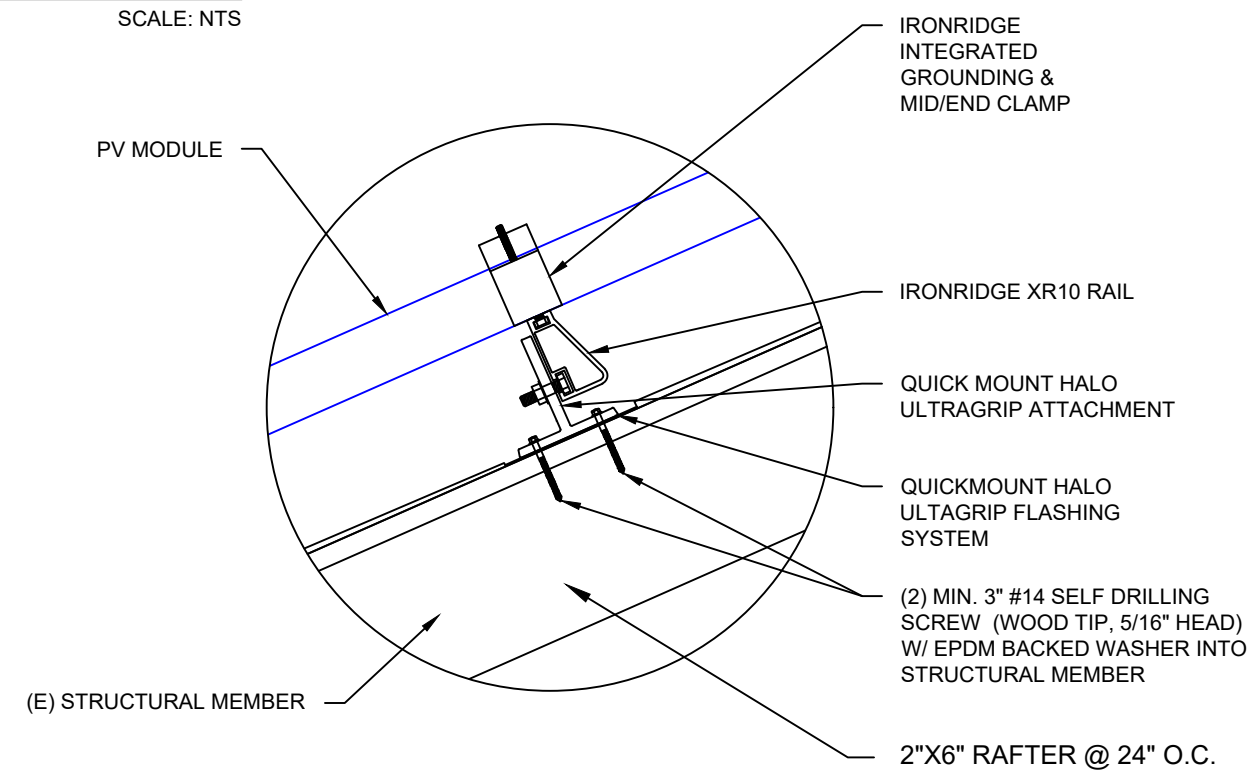
SHEET SIZE
**ANSI B
11" X 17"**

SHEET NUMBER
PV-2A





1 ATTACHMENT DETAIL (SIDE VIEW)
 PV-3 SCALE: NTS



1 ATTACHMENT DETAIL ENLARGED VIEW
 PV-3 SCALE: NTS

NOTE:
 1. PRIOR TO COMMENCEMENT OF WORK, THE CONTRACTOR SHALL VERIFY THE FRAMING SIZES, SPACINGS, AND SPANS NOTED IN THE STAMPED PLANS AND ACCOMPANYING CALCULATIONS AND NOTIFY THE ENGINEER OF RECORD OF ANY DISCREPANCIES PRIOR TO STARTING CONSTRUCTION.
 2. THESE PLANS ARE STAMPED FOR STRUCTURAL CODE COMPLIANCE OF THE ROOF FRAMING SUPPORTING THE PROPOSED PV INSTALLATION REFERENCED ONLY. THESE PLANS ARE NOT STAMPED FOR WATER LEAKAGE. PV MODULES, RACKING, AND ATTACHMENT COMPONENTS MUST FOLLOW MANUFACTURER GUIDELINES AND REQUIREMENTS.
 3. PLEASE SEE THE ACCOMPANYING STRUCTURAL CALCULATIONS REPORT FOR DETAILS REGARDING CALCULATIONS AS WELL AS LIMITS OF SCOPE OF WORK AND LIABILITY.



5709 GARDENDALE DR.
 HOUSTON TX 77092

REVISIONS		
DESCRIPTION	DATE	REV
REVISION	11-15-2024	A

Signature with Seal
 Signed 11/19/2024

PROJECT NAME & ADDRESS
**GEORGE WILLIAMS
 RESIDENCE**
 66 QUAIL HOLLOW
 CAMERON, NC 28326, USA
 METER NO #: 159 385 417

DATE: 11/03/2024


DESIGNER DETAILS:

SHEET NAME
**ATTACHMENT
 DETAILS**

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

SHEET NUMBER
PV-3

ID	TYPICAL	INITIAL CONDUCTOR LOCATION	FINAL CONDUCTOR LOCATION	CONDUCTOR			CONDUIT	# OF PARALLEL CIRCUITS	CURRENT-CARRYING CONDUCTORS IN CONDUIT	CONDUIT FILL PERCENT	OCPD	EGC		TEMP. CORR. FACTOR		CONDUIT FILL FACTOR	CONT. CURRENT	MAX. CURRENT	BASE AMP.	DERATED AMP.	TERM. TEMP. RATING	LENGTH	VOLTAGE DROP
1	2	STRING	JUNCTION BOX	12 AWG	Q CABLE	-	-	1	2	N/A	N/A	6 AWG	BARE COPPER	0.76	(55°C)	N/A	10.89A	13.61A	N/A	N/A	75°C	48FT	0.38%
2	1	JUNCTION BOX	COMBINER BOX	10 AWG	THWN-2	COPPER	MIN 0.75" Dia EMT	2	4	19.09%	20A	8 AWG	THWN-2 COPPER	0.96	(33°C)	0.8	10.89A	13.61A	40A	30.7A	75°C	60FT	0.70%
3	1	COMBINER BOX	NON FUSED AC DISCONNECT	10 AWG	THWN-2	COPPER	MIN 0.75" Dia EMT	1	3	15.27%	N/A	8 AWG	THWN-2 COPPER	0.96	(33°C)	1.0	21.78A	27.22A	40A	38.4A	75°C	5FT	0.12%
4	1	NON FUSED AC DISCONNECT	MSP	10 AWG	THWN-2	COPPER	MIN 0.75" Dia EMT	1	3	15.27%	30A	8 AWG	THWN-2 COPPER	0.96	(33°C)	1.0	21.78A	27.22A	40A	38.4A	75°C	5FT	0.12%




brightsun
energy

5709 GARDENDALE DR.
HOUSTON TX 77092

REVISIONS		
DESCRIPTION	DATE	REV
REVISION	11-15-2024	A

Signature with Seal



Signed 11/19/2024

PROJECT NAME & ADDRESS

**GEORGE WILLIAMS
RESIDENCE**
66 QUAIL HOLLOW
CAMERON, NC 28326, USA
METER NO #: 159 385 417

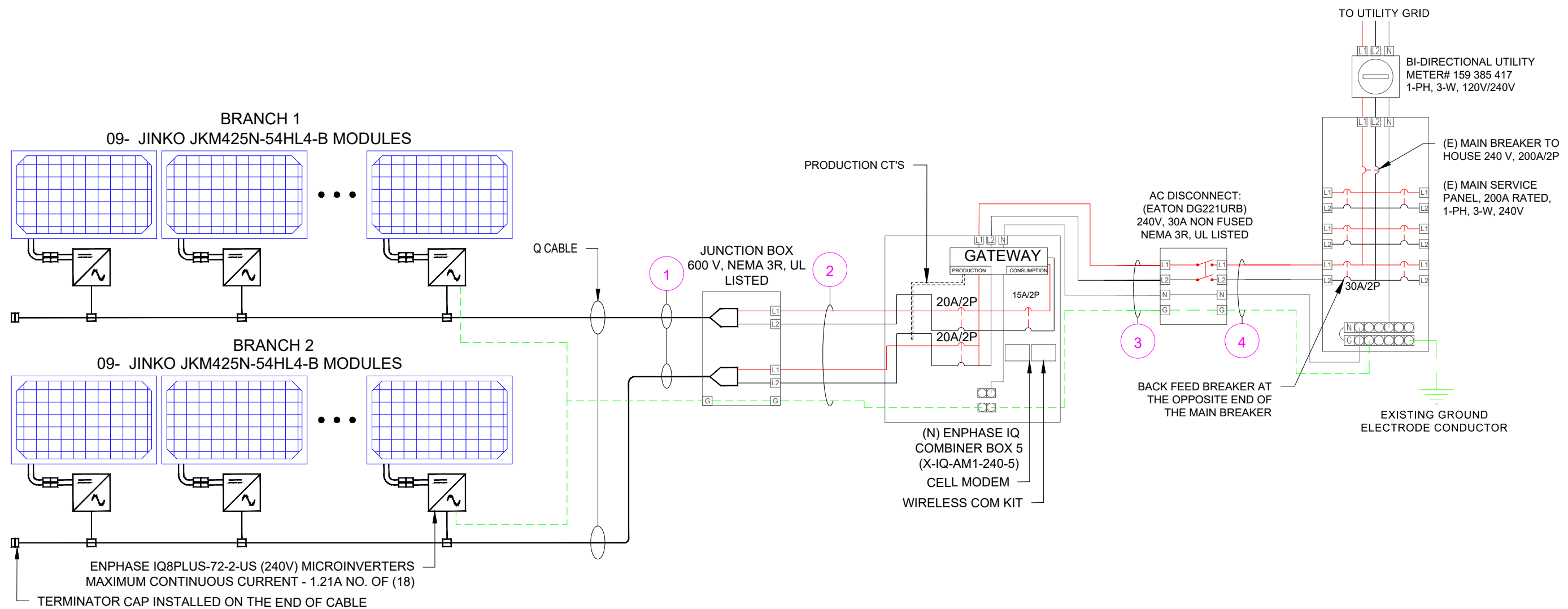
DATE: 11/03/2024

DESIGNER DETAILS:

SHEET NAME
ELECTRICAL LINE & CALCS

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

SHEET NUMBER
PV-4



INTERCONNECTION
120% RULE - NEC 705.12(B)(2)(3)(b)

UTILITY FEED + SOLAR BACKFEED
200 A + 30A = 230A

BUSS RATING x 120%
200 A x 120% = 240A

SERVICE INFO

AHJ NAME: HARNETT COUNTY

MAIN SERVICE VOLTAGE: 240V

MAIN SERVICE PANEL: 200A

MAIN CIRCUIT BREAKER RATING: 200A

MAIN SERVICE LOCATION: EAST

SERVICE FEED SOURCE: UNDERGROUND

UTILITY PROVIDER: CEMC

SOLAR MODULE SPECIFICATIONS

MANUFACTURER / MODEL	JINKO JKM425N-54HL4-B MODULES
VMP	32.37 V
IMP	13.13 A
VOC	38.95 V
ISC	13.58 A
TEMP. COEFF. VOC	-0.25%/°C
MODULE DIMENSION	67.79"(L) x 44.65"(W)
PANEL WATTAGE	425W
PTC RATING	398.1W

INVERTER SPECIFICATION

MANUFACTURER / MODEL	ENPHASE IQ8PLUS-72-2-US (240V) MICROINVERTERS
MAX DC SHORT CIRCUIT CURRENT	25 A
CONTINUOUS OUTPUT CURRENT	1.21 (240 V)

AMBIENT TEMPERATURE SPECS

RECORD LOW TEMP	-9°C
AMBIENT TEMP (HIGH TEMP 2%)	33°C
CONDUIT HEIGHT	0.5"
ROOF TOP TEMP	75°C
CONDUCTOR TEMPERATURE RATE	55°C
MODULE TEMPERATURE COEFFICIENT OF VOC	-0.25%/°C

PERCENT OF VALUES	NUMBER OF CURRENT CARRYING CONDUCTORS IN EMT
1	1-3
0.80	4-6
0.70	7-9
0.50	10-20

Voltage rise in Q Cable from the Microinverters to the Junction Box

For branch circuit #1 of 9 IQ 8+ Micros, the voltage rise on the 240 VAC Q Cable is 0.38%
 For branch circuit #2 of 9 IQ 8+ Micros, the voltage rise on the 240 VAC Q Cable is 0.38%

Voltage rise from the Junction Box to the IQ Combiner box

VRise = (amps/inverter × number of inverters) × (resistance in Ω/ft) × (2-way wire length in ft.)
 = (1.21 amp × 9) × (0.00129 Ω/ft) × (60 ft × 2)
 = 10.89 amps × 0.00129 Ω/ft × 120 ft
 = 1.68 volts

%VRise = 1.68 volts ÷ 240 volts = 0.70%

The voltage rise from the Junction Box to the IQ Combiner Box is 0.70%

Voltage rise from the IQ Combiner box to Non Fused AC Disconnect

VRise = (amps/inverter × number of inverters) × (resistance in Ω/ft.) × (2-way wire length in ft.)
 = (1.21 amp × 18) × (0.00129 Ω/ft) × (5 ft. × 2)
 = 21.78 amps × 0.00129 Ω/ft × 10 ft.
 = 0.28volts

%VRise = 0.28 volts ÷ 240 volts =0.12%

The voltage rise from the IQ Combiner box to the Non Fused AC Disconnect is 0.12%

Voltage rise from the Non Fused AC Disconnect to Main Service Panel

VRise = (amps/inverter × number of inverters) × (resistance in Ω/ft.) × (2-way wire length in ft.)
 = (1.21 amp × 18) × (0.00129 Ω/ft) × (5 ft. × 2)
 = 21.78 amps × 0.00129 Ω/ft × 10 ft.
 = 0.28volts

%VRise = 0.28 volts ÷ 240 volts =0.12%

The voltage rise from the Non Fused AC Disconnect to the Main Service Panel is 0.12%

Total system voltage rise for all three wire sections

0.38% + 0.70% + 0.12% + 0.12% = 1.32%



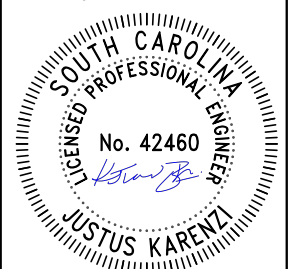
brightsun energy

5709 GARDENDALE DR.
HOUSTON TX 77092

REVISIONS

DESCRIPTION	DATE	REV
REVISION	11-15-2024	A

Signature with Seal



Signed 11/19/2024

PROJECT NAME & ADDRESS

GEORGE WILLIAMS
RESIDENCE
66 QUAIL HOLLOW
CAMERON, NC 28326, USA
METER NO #:159 385 417

DATE: 11/03/2024

DESIGNER DETAILS:

SHEET NAME
SPECIFICATIONS & NOTES

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER

PV-4A

1

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

LABEL LOCATION:
POINT OF INTERCONNECTION,
(PER CODE: NEC 690.17(E))

2

⚠ WARNING - Electric Shock Hazard
No user serviceable parts inside
Contact authorized service provider for assistance

LABEL LOCATION:
INVERTER, JUNCTION BOXES (ROOF),
(PER CODE: NEC690.13.G.3 & NEC 690.13.G.4)

3

⚠ WARNING: DUAL POWER SOURCE
SECOND SOURCE IS PHOTOVOLTAIC SYSTEM

LABEL LOCATION:
POINT OF INTERCONNECTION
(PER CODE: NEC 705.12(D)(4))

4

**⚠ WARNING: PHOTOVOLTAIC
POWER SOURCE**

LABEL LOCATION:
CONDUIT, COMBINER BOX
(PER CODE: NEC690.31(G)(3)(4) & NEC 690.13(G)(4))

5

PHOTOVOLTAIC SYSTEM AC DISCONNECT
RATED AC OUTPUT CURRENT 21.78 AMPS
NOMINAL OPERATING AC VOLTAGE 240 VOLTS

LABEL LOCATION:
POINT OF INTERCONNECTION,
(PER CODE: NEC 690.54)

6

WARNING
INVERTER OUTPUT CONNECTION DO NOT
RELOCATE THIS OVERCURRENT DEVICE

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

7

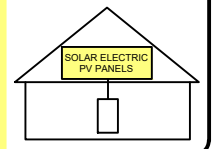
**CAUTION: SOLAR ELECTRIC
SYSTEM CONNECTED**

LABEL LOCATION:
POINT OF INTERCONNECTION
(PER CODE: NEC690.15, 690.13(B))
INVERTER

8

**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

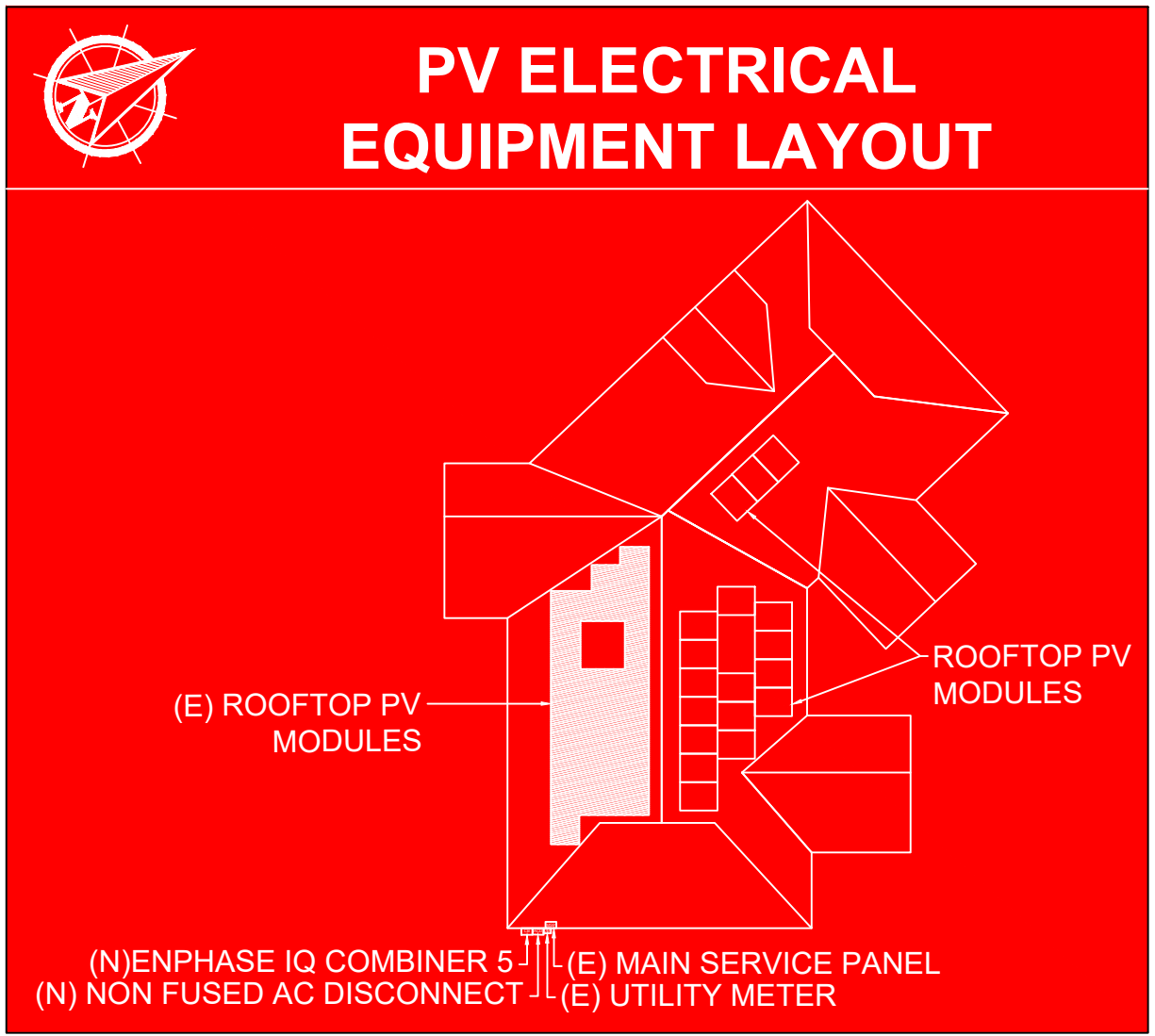


LABEL PER NEC 690.56(C)- PROVIDE AT
AC DISCONNECT FOR RAPID
SHUTDOWN COMPLIANT SYSTEM

9

CAUTION: SOLAR CIRCUIT


LABEL LOCATION:
MARKINGS PLACED ON ALL INTERIOR AND EXTERIOR DC CONDUIT, RACEWAYS,
ENCLOSURES, AND CABLE ASSEMBLIES AT LEAST EVERY 10 FT, AT TURNS AND
ABOVE/BELOW PENETRATIONS AND ALL COMBINER/JUNCTION BOXES. (PER CODE:
IFC 605.11.1.4)



5709 GARDENDALE DR.
HOUSTON TX 77092

REVISIONS		
DESCRIPTION	DATE	REV
REVISION	11-15-2024	A

Signature with Seal



Signed 11/19/2024

PROJECT NAME & ADDRESS

GEORGE WILLIAMS
RESIDENCE
66 QUAIL HOLLOW
CAMERON, NC 28326, USA
METER NO #:159 385 417

DATE: 11/03/2024

DESIGNER DETAILS:

SHEET NAME
SIGNAGE

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-5

www.jinkosolar.com

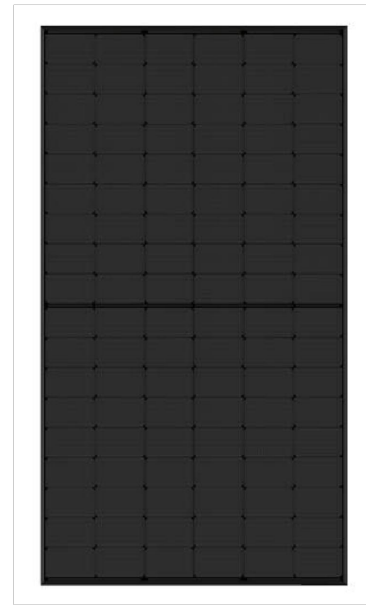


Tiger Neo N-type 54HL4-B 425 Watt ALL-BLACK MODULE

N-Type

Positive power tolerance of 0~+3%

- IEC61215 (2016), IEC61730 (2016)
- ISO9001:2015: Quality Management System
- ISO14001:2015: Environment Management System
- ISO45001:2018 Occupational health and safety management systems



Key Features



SMBB Technology
Better light trapping and current collection to improve module power output and reliability.



Hot 2.0 Technology
The N-type module with Hot 2.0 technology has better reliability and lower LID/LETID.



PID Resistance
Excellent Anti-PID performance guarantee via optimized mass-production process and materials control.



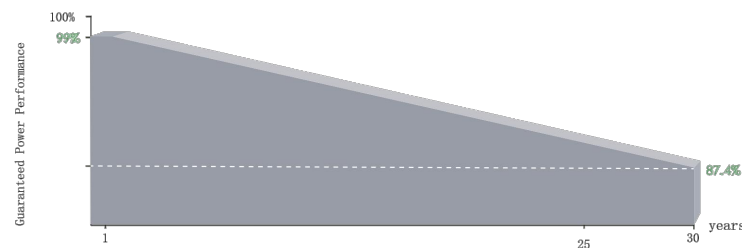
Enhanced Mechanical Load
Certified to withstand: wind load (2400 Pascal) and snow load (5400 Pascal).



Durability Against Extreme Environmental Conditions
High salt mist and ammonia resistance.



LINEAR PERFORMANCE WARRANTY

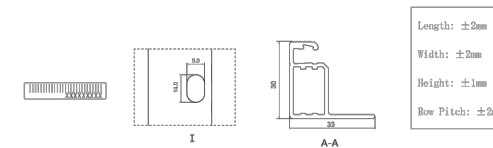
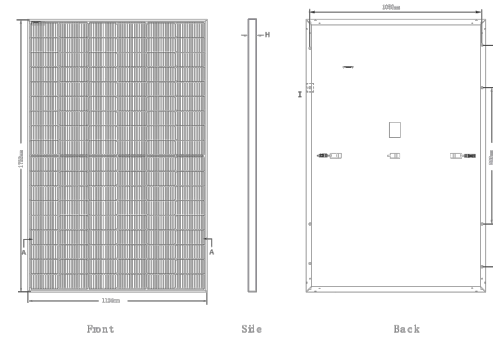


25 Year Product Warranty

30 Year Linear Power Warranty

0.40% Annual Degradation Over 30 years

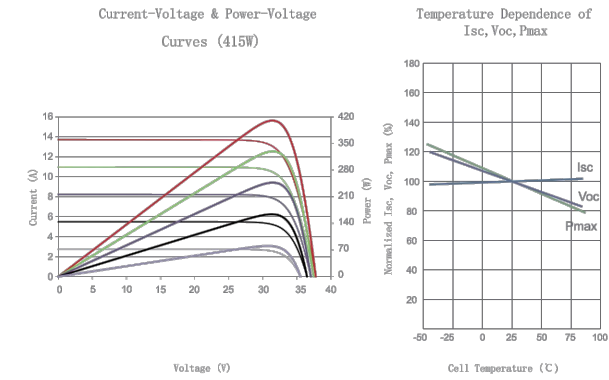
Engineering Drawings



Packaging Configuration

(Two pallets = One stack)
36pcs/pallets, 72pcs/stack, 936pcs/ 40' HQ Container

Electrical Performance & Temperature Dependence



Mechanical Characteristics

Cell Type	N type Mono-crystalline
No. of cells	108 (6×18)
Dimensions	1722×1134×30mm (67.79×44.65×1.18 inch)
Weight	22 kg (48.50 lbs)
Front Glass	3.2mm, Anti-Reflection Coating, High Transmission, Low Iron, Tempered Glass
Frame	Anodized Aluminium Alloy
Junction Box	IP68 Rated
Output Cables	TUV 1×4.0mm ² (+): 400mm, (-): 200mm or Customized Length

SPECIFICATIONS

Module Type	JKM425N-54HL4-B	
	STC	NOCT
Maximum Power (P _{max})	425W _p	320W _p
Maximum Power Voltage (V _{mp})	32.37V	30.19V
Maximum Power Current (I _{mp})	13.13A	10.60A
Open-circuit Voltage (V _{oc})	38.95V	37.00V
Short-circuit Current (I _{sc})	13.58A	10.96A
Module Efficiency STC (%)	21.76%	
Operating Temperature (°C)	-40°C~+85°C	
Maximum system voltage	1000VDC (IEC)	
Maximum series fuse rating	25A	
Power tolerance	0~+3%	
Temperature coefficients of P _{max}	-0.29%/°C	
Temperature coefficients of V _{oc}	-0.25%/°C	
Temperature coefficients of I _{sc}	0.045%/°C	
Nominal operating cell temperature (NOCT)	45±2°C	

*STC: ☀ Irradiance 1000W/m² 📱 Cell Temperature 25° C ☁ AM=1.5
NOCT: ☀ Irradiance 800W/m² 📱 Ambient Temperature 20° C ☁ AM=1.5 🌪 Wind Speed 1m/s

©2021 Jinko Solar Co., Ltd. All rights reserved.
Specifications included in this datasheet are subject to change without notice.

JKM425N-54HL4-B-F3C2-EN (IEC 2016)



5709 GARDENDALE DR.
HOUSTON TX 77092

REVISIONS

DESCRIPTION	DATE	REV
REVISION	11-15-2024	A

Signature with Seal

PROJECT NAME & ADDRESS

GEORGE WILLIAMS
RESIDENCE
66 QUAIL HOLLOW
CAMERON, NC 28326, USA
METER NO #: 159 385 417

DATE: 11/03/2024

DESIGNER DETAILS:

SHEET NAME
EQUIPMENT
SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER

PV-6



DATA SHEET



IQ8 and IQ8+ Microinverters

Our newest IQ8 Microinverters are the industry's first microgrid-forming, software-defined microinverters with split-phase power conversion capability to convert DC power to AC power efficiently. The brain of the semiconductor-based microinverter is our proprietary application-specific integrated circuit (ASIC), which enables the microinverter to operate in grid-tied or off-grid modes. This chip is built using 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.



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-and-play MC4 connectors.



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

*Meets UL 1741 only when installed with IQ System Controller 2 or 3.
**IQ8 and IQ8+ support split-phase, 240 V installations only.

© 2024 Enphase Energy. All rights reserved. Enphase, the e and CC logos, IQ, and certain other marks listed at <https://enphase.com/trademark-usage-guidelines> are trademarks of Enphase Energy, Inc. in the U.S. and other countries. Data subject to change.

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

- 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

- Compliant 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 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 according to the IEEE 1547 interconnection standard. An IQ Gateway is required to make these changes during installation.

IQ8 and IQ8+ Microinverters

INPUT DATA (DC)	UNITS	IQ8-60-2-US	IQ8PLUS-72-2-US
Commonly used module pairings ¹	W	235-350	235-440
Module compatibility	–	To meet compatibility, PV modules must be within maximum input DC voltage and maximum module I_{sc} listed below. Module compatibility can be checked at https://enphase.com/installers/microinverters/calculator .	
MPPT voltage range	V	27-37	27-45
Operating range	V	16-48	16-58
Minimum/Maximum start voltage	V	22/48	22/58
Maximum input DC voltage	V	50	60
Maximum continuous input DC current	A	10	12
Maximum input DC short-circuit current	A	25	
Maximum 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 maximum 20 A per branch circuit.	
OUTPUT DATA (AC)	UNITS	IQ8-60-2-US	IQ8PLUS-72-2-US
Peak output power	VA	245	300
Maximum continuous output power	VA	240	290
Nominal grid voltage (L-L)	V	240, split-phase (L-L), 180°	
Minimum and Maximum grid voltage ²	V	211-264	
Maximum continuous output current	A	1.0	1.21
Nominal frequency	Hz	60	
Extended frequency range	Hz	47-68	
AC short-circuit fault current over three cycles	Arms	2	
Maximum units per 20 A (L-L) branch circuit ³	–	16	13
Total harmonic distortion	%	<5	
Overvoltage class AC port	–	III	
AC port backfeed current	mA	30	
Power factor setting	–	1.0	
Grid-tied power factor (adjustable)	–	0.85 leading ... 0.85 lagging	
Peak efficiency	%	97.7	
CEC weighted efficiency	%	97	
Nighttime power consumption	mW	23	25
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 (H x W x D)		212 mm (8.3 in) x 175 mm (6.9 in) x 30.2 mm (1.2 in)	
Weight		1.08 kg (2.38 lbs)	
Cooling		Natural convection—no fans	
Approved for wet locations		Yes	
Pollution degree		PD3	
Enclosure		Class II double-insulated, corrosion-resistant polymeric enclosure	
Environmental category/UV exposure rating		NEMA Type 6/Outdoor	

(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.

IQ8SP-12A-DSH-00207-3.0-EN-US-2024-02-12



5709 GARDENDALE DR.
HOUSTON TX 77092

REVISIONS

DESCRIPTION	DATE	REV
REVISION	11-15-2024	A

Signature with Seal

PROJECT NAME & ADDRESS

GEORGE WILLIAMS
RESIDENCE
66 QUAIL HOLLOW
CAMERON, NC 28326, USA
METER NO #: 159 385 417

DATE: 11/03/2024

DESIGNER DETAILS:

SHEET NAME
EQUIPMENT
SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER

PV-7

IQ Combiner 4/4C



X-IQ-AM1-240-4C
X2-IQ-AM1-240-4C (IEEE 1547:2018)

X-IQ-AM1-240-4
X2-IQ-AM1-240-4 (IEEE 1547:2018)

The **IQ Combiner 4/4C** with IQ Gateway and integrated LTE-M1 cell modem (included only with IQ Combiner 4C) consolidates interconnection equipment into a single enclosure. It 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 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
- Supports Wi-Fi, Ethernet, or cellular connectivity
- Optional AC receptacle available for PLC bridge
- Provides production metering and consumption monitoring

Simple

- Mounts on single stud with centered brackets
- Supports bottom, back and side conduit entry
- Allows up to four 2-pole branch circuits for 240VAC 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
- X2-IQ-AM1-240-4 and X2-IQ-AM1-240-4C comply with IEEE 1547:2018 (UL 1741-SB, 3rd Ed.)



To learn more about Enphase offerings, visit enphase.com
IQ-C-4-4C-DS-0103-EN-US-12-29-2022



IQ Combiner 4/4C

MODEL NUMBER	
IQ Combiner 4 X-IQ-AM1-240-4 X2-IQ-AM1-240-4 (IEEE 1547:2018)	IQ Combiner 4 with 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 and IQ System Controller 2 and to deflect heat.
IQ Combiner 4C X-IQ-AM1-240-4C X2-IQ-AM1-240-4C (IEEE 1547:2018)	IQ Combiner 4C with IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 ± 0.5%) and consumption monitoring (± 2.5%). Includes 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)	
Supported microinverters	IQ6, IQ7, and IQ8. (Do not mix IQ6/7 Microinverters with IQ8)
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 - 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
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)
X-IQ-NA-HD-125A	Hold-down kit for Eaton circuit breaker with screws
Consumption monitoring CT (CT-200-SPLIT/CT-200-CLAMP)	A pair of 200A split core current transformers
ELECTRICAL SPECIFICATIONS	
Rating	Continuous duty
System voltage	120/240VAC, 60 Hz
Eaton BR series busbar rating	125A
Max. continuous current rating	65A
Max. continuous current rating (input from PV/storage)	64A
Max. fuse/circuit rating (output)	90A
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
IQ Gateway breaker	10A or 15A rating GE/Siemens/Eaton included
Production metering CT	200A solid core pre-installed and wired to IQ Gateway
MECHANICAL DATA	
Dimensions (WxHxD)	37.5 cm x 49.5 cm x 16.8 cm (14.75 in x 19.5 in x 6.63 in). Height is 53.5 cm (21.06 in) 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	• 20A to 50A breaker inputs: 14 to 4 AWG copper conductors • 60A 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	Up to 3,000 meters (9,842 feet)
INTERNET CONNECTION OPTIONS	
Integrated Wi-Fi	IEEE 802.11b/g/n
Cellular	CELLMODEM-M1-06-SP-05, CELLMODEM-M1-06-AT-05 (4G based LTE-M1 cellular modem). Note that an Mobile Connect cellular modem is required for all Enphase Energy System installations.
Ethernet	Optional, IEEE 802.3, Cat5E (or Cat6) UTP Ethernet cable (not included)
COMPLIANCE	
Compliance, IQ Combiner	CA Rule 21 (UL 1741-SA) IEEE 1547:2018 - UL 1741-SB, 3 rd Ed. (X2-IQ-AM1-240-4 and X2-IQ-AM1-240-4C) CAN/CSA C22.2 No. 107.1, Title 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

© 2022 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.

IQ-C-4-4C-DS-0103-EN-US-12-29-2022



5709 GARDENDALE DR.
HOUSTON TX 77092

REVISIONS

DESCRIPTION	DATE	REV
REVISION	11-15-2024	A

Signature with Seal

PROJECT NAME & ADDRESS

GEORGE WILLIAMS
RESIDENCE
66 QUAIL HOLLOW
CAMERON, NC 28326, USA
METER NO #: 159 385 417

DATE: 11/03/2024

DESIGNER DETAILS:

SHEET NAME
EQUIPMENT
SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER

PV-8

Release Liner shown for reference

RD STRUCTURAL SCREW PN RD-1430-01-M1
SOLD SEPARATELY
SHOWN FOR REFERENCE

ITEM NO	DESCRIPTION	QTY IN KIT
1	QM Halo UltraGrip(Mill or Black)	1

PART NUMBER	DESCRIPTION
QM-HUG-01-M1	Halo UltraGrip - Mill
QM-HUG-01-B1	Halo UltraGrip - Black

1. Halo UltraGrip

Property	Value
Material	300 Series Aluminium
Finish	Mill or Black

REVISIONS		
DESCRIPTION	DATE	REV
REVISION	11-15-2024	A

Signature with Seal

PROJECT NAME & ADDRESS

**GEORGE WILLIAMS
RESIDENCE**
66 QUAIL HOLLOW
CAMERON, NC 28326, USA
METER NO #:159 385 417

DATE: 11/03/2024

DESIGNER DETAILS:

SHEET NAME
**EQUIPMENT
SPECIFICATION**

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

SHEET NUMBER

PV-9



Tech Brief



Tech Brief

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.™

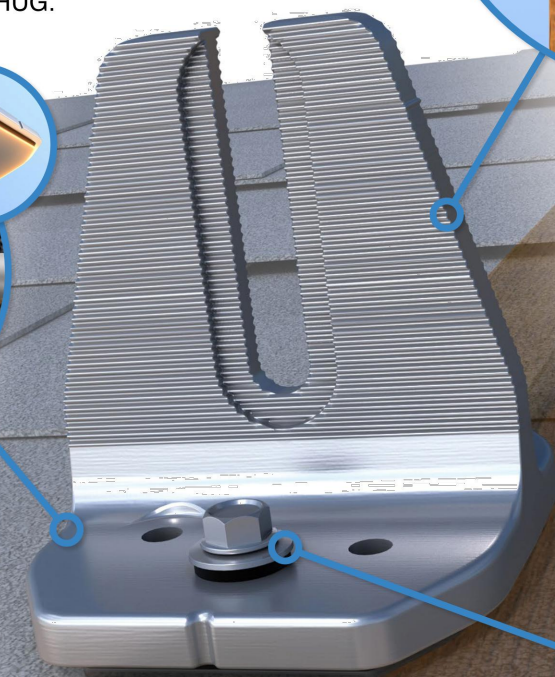


Multi-Tiered Waterproofing
HUG utilizes a multi-tiered stack of components to provide revolutionary waterproofing protection. The Halo cast-aluminum, raised-perimeter foundation surrounds the UltraGrip base—a foam-backed mastic seal combination that prevents water intrusion by adhering and sealing with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

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

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).



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



25-Year Warranty
Product guaranteed free of impairing defects.

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 System

Systems conform to UL 2703 mechanical and bonding requirements. See Flush Mount Manual for more info.

Rafter Mount



Deck Mount



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.

Triple Rated & Certified to Respect the Roof™
UL 2703, 441 (27)
TAS 100(A)-95



5709 GARDENDALE DR.
HOUSTON TX 77092

REVISIONS

DESCRIPTION	DATE	REV
REVISION	11-15-2024	A

Signature with Seal

PROJECT NAME & ADDRESS

**GEORGE WILLIAMS
RESIDENCE**
66 QUAIL HOLLOW
CAMERON, NC 28326, USA
METER NO #:159 385 417

DATE: 11/03/2024

DESIGNER DETAILS:

SHEET NAME
**EQUIPMENT
SPECIFICATION**

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

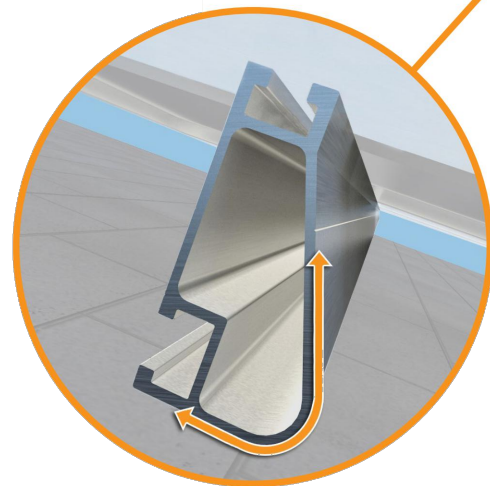
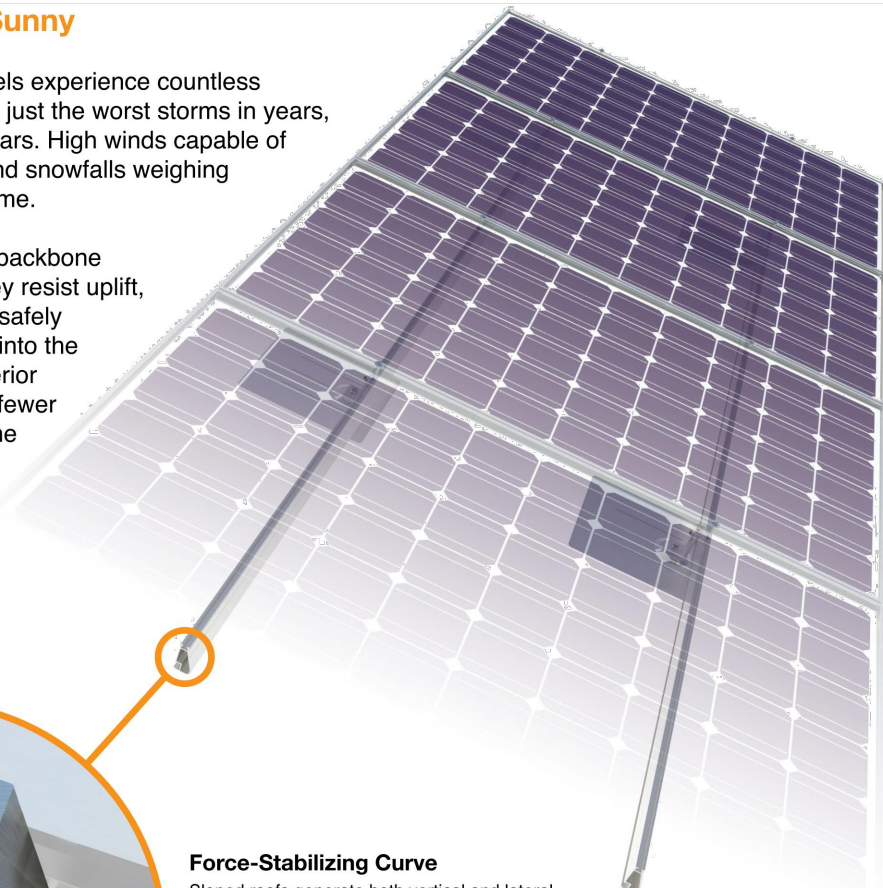
SHEET NUMBER

PV-10

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



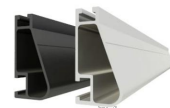
XR Rails® are compatible with FlashFoot® and other pitched roof attachments.



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						
	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.

REVISIONS

DESCRIPTION	DATE	REV
REVISION	11-15-2024	A

Signature with Seal

PROJECT NAME & ADDRESS

GEORGE WILLIAMS
RESIDENCE
66 QUAIL HOLLOW
CAMERON, NC 28326, USA
METER NO #: 159 385 417

DATE: 11/03/2024

DESIGNER DETAILS:

SHEET NAME
EQUIPMENT
SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

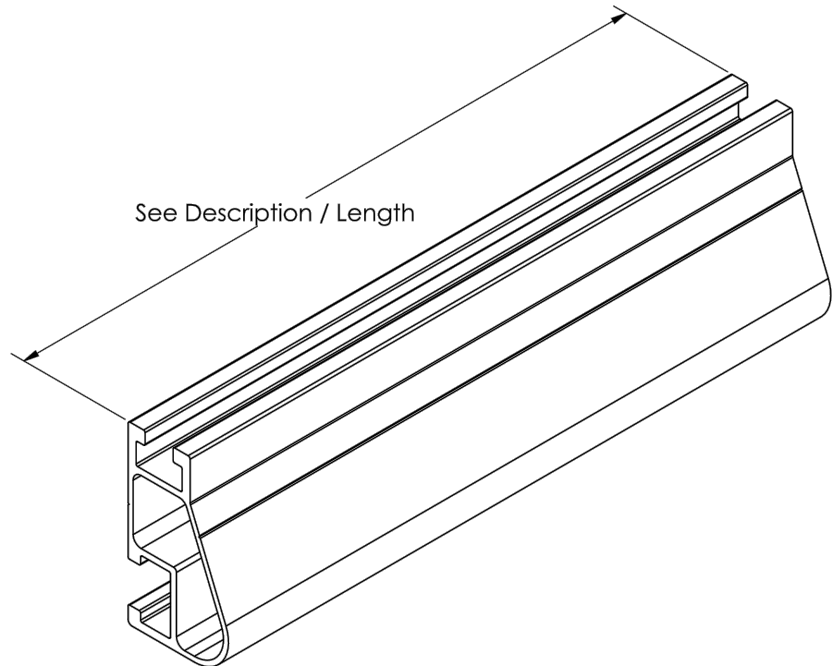
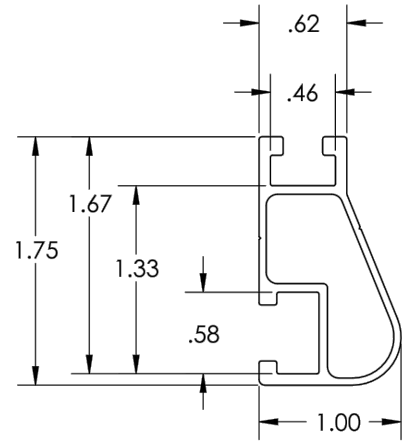
SHEET NUMBER

PV-11



Cut Sheet

XR10® Rail

Rail Section Properties	
Property	Value
Total Cross-Sectional Area	0.363 in ²
Section Modulus (X-axis)	0.136 in ³
Moment of Inertia (X-axis)	0.124 in ⁴
Moment of Inertia (Y-axis)	0.032 in ⁴
Torsional Constant	0.076 in ³
Polar Moment of Inertia	0.033 in ⁴

Clear Part Number	Black Part Number	Description / Length	Material	Weight
XR-10-132A	XR-10-132B	XR10, Rail 132" (11 Feet)	6000-Series Aluminum	4.67 lbs.
XR-10-168A	XR-10-168B	XR10, Rail 168" (14 Feet)		5.95 lbs.
XR-10-204A	XR-10-204B	XR10, Rail 204" (17 Feet)		7.22 lbs.

v1.01



5709 GARDENDALE DR.
HOUSTON TX 77092

REVISIONS		
DESCRIPTION	DATE	REV
REVISION	11-15-2024	A

Signature with Seal

PROJECT NAME & ADDRESS

**GEORGE WILLIAMS
RESIDENCE**
66 QUAIL HOLLOW
CAMERON, NC 28326, USA
METER NO #:159 385 417

DATE: 11/03/2024

DESIGNER DETAILS:

SHEET NAME
**EQUIPMENT
SPECIFICATION**

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

SHEET NUMBER

PV-11A

Product specifications

Eaton DG221URB

Catalog Number: DG221URB

Eaton General duty non-fusible safety switch, single-throw, 30 A, 240 V, NEMA 3R, Rainproof, Painted galvanized steel, Two-pole, Two-wire



General specifications

Product Name	Catalog Number
Eaton general duty non-fusible safety switch	DG221URB
	UPC
	782113120232
Product Length/Depth	Product Height
6.88 in	10.81 in
Product Width	Product Weight
6.38 in	6 lb
Warranty	Compliances
Eaton Selling Policy 25-000, one (1) year from the date of installation of the Product or eighteen (18) months from the date of shipment of the Product, whichever occurs first.	NEC 230.62 (C) Compliant Barrier
	Certifications
	UL Listed
	Catalog Notes
	WARNING! Switch is not approved for service entrance unless a neutral kit is installed.

Physical Attributes

Enclosure
NEMA 3R

Enclosure material
Painted galvanized steel

Fuse configuration
Non-fusible

Number Of Poles
Two-pole

Number of wires
2

Type
Non-fusible, single-throw

Performance Ratings

Amperage Rating
30A

Voltage rating
240V

Miscellaneous

Product Category
General duty safety switch

Resources

- Catalogs**
Eaton's Volume 2—Commercial Distribution
- Multimedia**
Switching Devices Flex Center
Double Up on Safety
- Specifications and datasheets**
Eaton Specification Sheet - DG221URB



Eaton Corporation plc
Eaton House
30 Pembroke Road
Dublin 4, Ireland
Eaton.com
© 2024 Eaton. All Rights Reserved.

Eaton is a registered trademark.
All other trademarks are property of their respective owners.



Eaton.com/socialmedia



5709 GARDENDALE DR.
HOUSTON TX 77092

REVISIONS		
DESCRIPTION	DATE	REV
REVISION	11-15-2024	A

Signature with Seal

PROJECT NAME & ADDRESS

GEORGE WILLIAMS
RESIDENCE
66 QUAIL HOLLOW
CAMERON, NC 28326, USA
METER NO #:159 385 417

DATE: 11/03/2024

DESIGNER DETAILS:

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-12