SCOPE OF WORK:
TO INSTALL A ROOF MOUNTED SOLAR PHOTOVOLTAIC SYSTEM AT THE OWNER RESIDENCE LOCATED AT 15, PAPER BIRCH WAY, FUQUAY VARINA, NC 27526 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
26 LONGI SOLAR LR5-54HABB-400M MODULES
13 DURACELL POWER CENTER SOLAR PV DUAL D700-M2 (240V) MICROINVERTERS

SYSTEM RATING
10.400 KWDC
9.048 KWAC

GOVERNING CODES
2018 INTERNATIONAL FIRE CODE 2018 INTERNATIONAL BUILDING CODE 2018 INTERNATIONAL RESIDENTIAL CODE 2018 NORTH CAROLINA STATE BUILDING CODE 2017 NATIONAL ELECTRICAL CODE
AUTHORITY HAVING JURISDICTION (AHJ) : HARNETT COUNTY

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.

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 HOME RUN 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 2011.
- 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%
- 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.

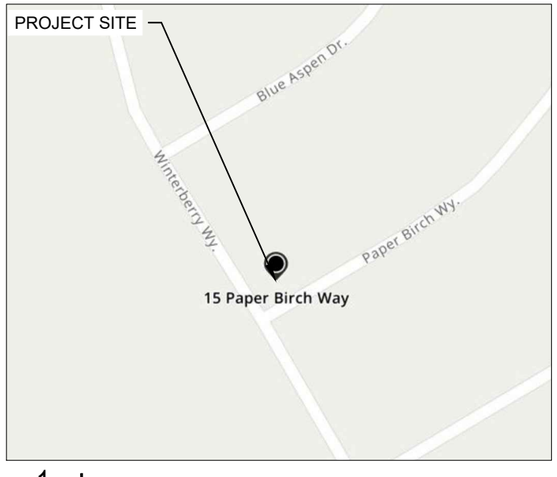
ELECTRICAL NOTES:
- ALL EQUIPMENT TO BE LISTED BY UL OR OTHER NRTL, AND LABELED FOR ITS APPLICATION.
- ALL CONDUCTORS SHALL BE COPPER, RATED FOR 600 V AND 90 DEGREE C WET ENVIRONMENT.
- WIRING, CONDUIT, AND RACEWAYS MOUNTED ON ROOFTOPS SHALL BE ROUTED DIRECTLY TO, AND LOCATED AS CLOSE AS POSSIBLE TO THE NEAREST RIDGE, HIP, OR VALLEY.
- WORKING CLEARANCES AROUND ALL NEW AND EXISTING ELECTRICAL EQUIPMENT SHALL COMPLY WITH NEC 110.26.
- WHERE SIZES OF JUNCTION BOXES, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, THE CONTRACTOR SHALL SIZE THEM ACCORDINGLY.
- ALL WIRE TERMINATIONS SHALL BE APPROPRIATELY LABELED AND READILY VISIBLE.
- MODULE GROUNDING (UFO) FASTENER TO BE INSTALLED BETWEEN MODULE FRAME AND MODULE SUPPORT RAIL, PER THE (UFO) FASTENER MANUFACTURE'S INSTRUCTION.

SHEET INDEX

NOTICE TO CONTRACTOR
All construction must comply with current NC Building Codes and is subject to field inspection and verification.
APPROVED
Limited building only review
Permit holder responsible for full compliance with the code
05/12/2025
Harnett COUNTY NORTH CAROLINA

PROJECT SITE

1 PV-0 HOUSE PHOTO SCALE: NTS



1 PV-0 VICINITY MAP SCALE: NTS

CAROLINA CONNECTIONS
Est. 1991
CAROLINA CONNECTIONS
422 HUFFMAN MILL ROAD, SUITE 105, BURLINGTON, NC 27215, UNITED STATES
PHONE: (336) 585-1314

SYSTEM INFO.
(26) LONGI SOLAR LR5-54HABB-400M
(13) DURACELL POWER CENTER SOLAR PV DUAL D700-M2 (240V)
DC SYSTEM SIZE: 10.400 KWDC
AC SYSTEM SIZE: 9.048 KWAC

REVISIONS

DESCRIPTION	DATE	REV
REVISION	05/05/2025	A
REVISION	05/07/2025	B

Signature with Seal

NORTH CAROLINA PROFESSIONAL SEAL 047345 Exp. 12/31/2025 ENGINEER METHODE MANIRAGUHA

Digitally signed by Methode Maniraguha, PE
Date: 2025.05.07 04:39:25 -07'00'

PROJECT NAME & ADDRESS

MARK CIOLEK RESIDENCE
15 PAPER BIRCH WAY,
FUQUAY VARINA, NC 27526
PH.# : (716) 307-0539
Email: mciolek2@gmail.com

DATE: 05/07/2025

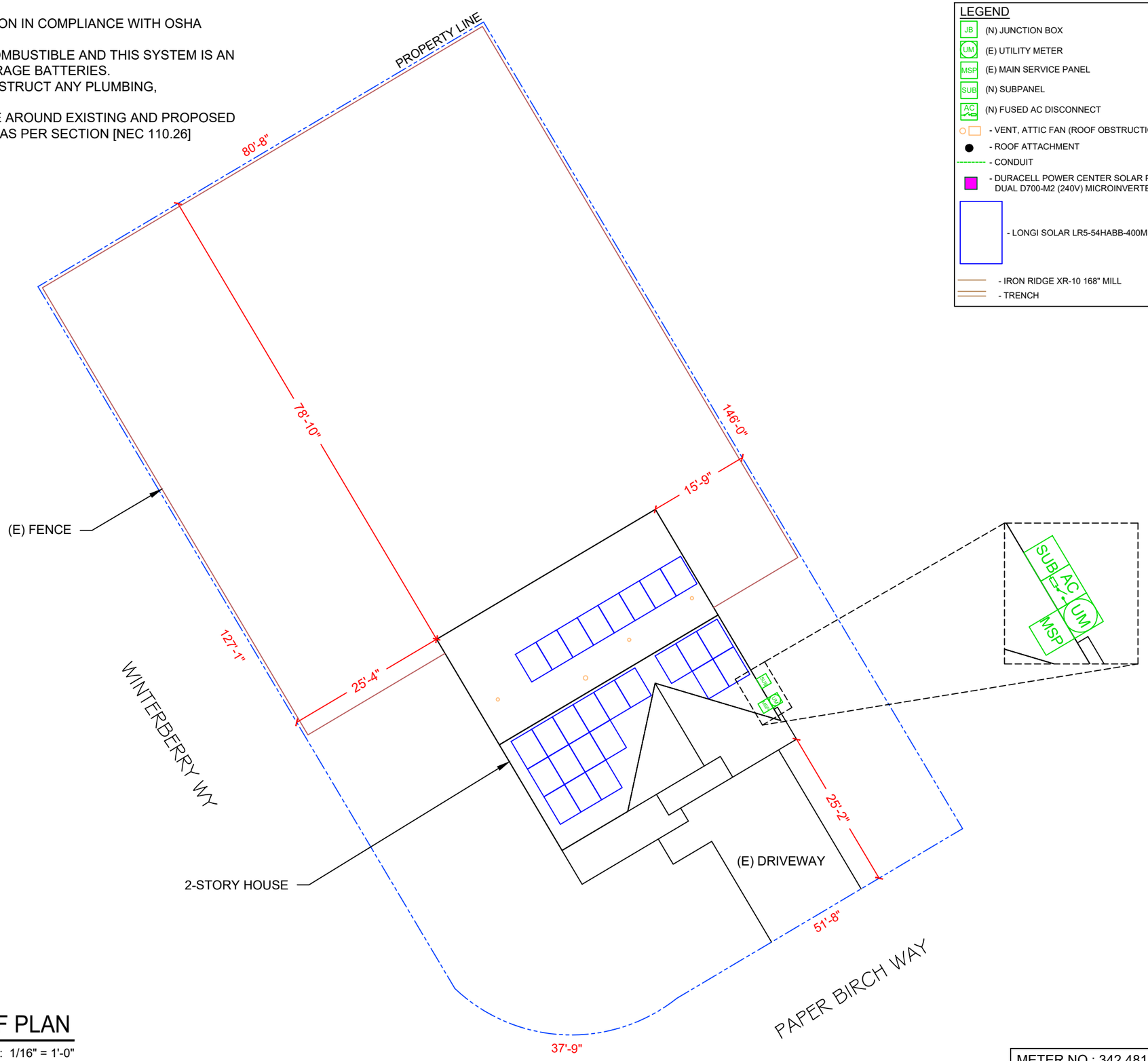
SHEET NAME
COVER PAGE

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

- JB — (N) JUNCTION BOX
- UM — (E) UTILITY METER
- MSP — (E) MAIN SERVICE PANEL
- SUB — (N) SUBPANEL
- AC — (N) FUSED AC DISCONNECT
- - VENT, ATTIC FAN (ROOF OBSTRUCTION)
- - ROOF ATTACHMENT
- - CONDUIT
- - DURACELL POWER CENTER SOLAR PV DUAL D700-M2 (240V) MICROINVERTER
- - LONGI SOLAR LR5-54HABB-400M MODULE
- - IRON RIDGE XR-10 168" MILL
- - TRENCH

1 PLOT PLAN WITH ROOF PLAN

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

METER NO : 342 481 325

CAROLINA CONNECTIONS

CAROLINA CONNECTIONS
422 HUFFMAN MILL ROAD,
SUITE 105, BURLINGTON,
NC 27215, UNITED STATES
PHONE: (336) 585-1314

SYSTEM INFO.
(26) LONGI SOLAR LR5-54HABB-400M
(13) DURACELL POWER CENTER SOLAR PV DUAL D700-M2 (240V)
DC SYSTEM SIZE: 10.400 KWDC
AC SYSTEM SIZE: 9.048 KWAC

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REVISION	05/07/2025	B

Signature with Seal

PROJECT NAME & ADDRESS

MARK CIOLEK RESIDENCE
15 PAPER BIRCH WAY,
FUQUAY VARINA, NC 27526
PH.# : (716) 307-0539
Email: mciolek2@gmail.com

DATE: 05/07/2025

SHEET NAME
SITE PLAN

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-1

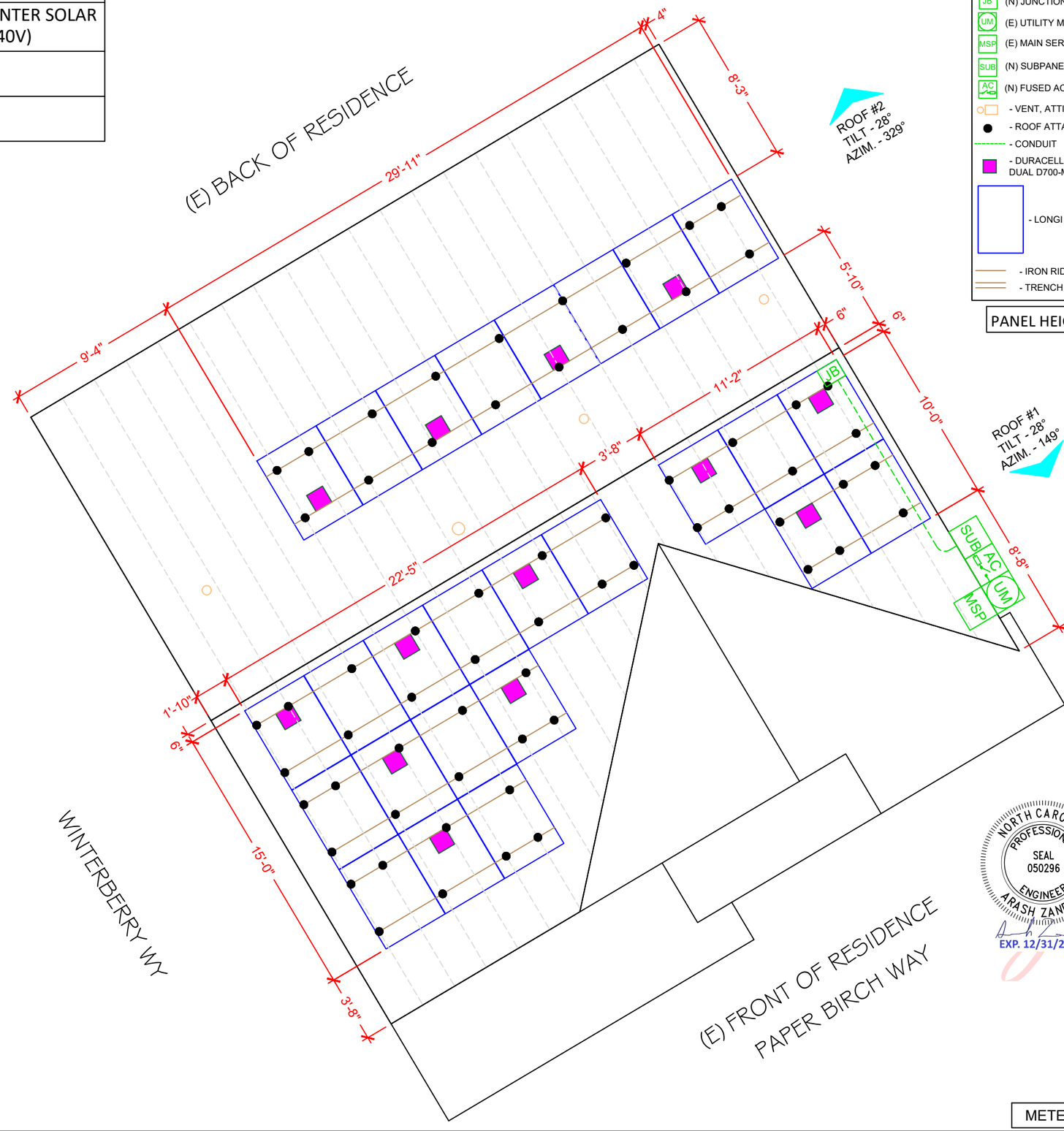
INVERTER SPECIFICATIONS	
MANUFACTURER / MODEL	DURACELL POWER CENTER SOLAR PV DUAL D700-M2 (240V)
MAX DC SHORT CIRCUIT CURRENT	11.5 A
CONTINUOUS OUTPUT CURRENT	2.9A (240V)

MODULE TYPE, DIMENSIONS & WEIGHT	
NUMBER OF MODULES:	26 MODULES
MODULE TYPE:	LONGI SOLAR LR5-54HABB-400M
MODULE WEIGHT:	49.60 LBS/22.5 KG
MODULE DIMENSIONS:	67.80" x 44.65" = 21.02SF
UNIT WEIGHT OF ARRAY:	2.36 PSF

ARRAY AREA & ROOF AREA CALC'S		
ROOF	# OF MODULES	ARRAY AREA (Sq. Ft.)
#1	18	336.14
#2	8	149.21
(TOTAL ARRAY AREA/TOTAL ROOF AREA) X 100%		
(485.36/1711.22) X 100% = 28.36%		

DESIGN SPECIFICATION	
RISK CATEGORY:	II
CONSTRUCTION:	SFD
ZONING:	RESIDENTIAL
SNOW LOAD (ASCE 7-10):	15 PSF
EXPOSURE CATEGORY:	B
WIND SPEED (ASCE 7-10):	116 MPH

ROOF DESCRIPTION					
ROOF	ROOF TILT	AZIMUTH	TRUSS SIZE	TRUSS SPACING	ROOF MATERIAL
#1	28°	149°	2" X 4"	24" O.C.	COMP. SHINGLE
#2	28°	329°	2" X 4"	24" O.C.	COMP. SHINGLE



LEGEND

- JB — (N) JUNCTION BOX
- UM — (E) UTILITY METER
- MSP — (E) MAIN SERVICE PANEL
- SUB — (N) SUBPANEL
- AC — (N) FUSED AC DISCONNECT
- - VENT, ATTIC FAN (ROOF OBSTRUCTION)
- - ROOF ATTACHMENT
- - CONDUIT
- - DURACELL POWER CENTER SOLAR PV DUAL D700-M2 (240V) MICROINVERTER
- - LONGI SOLAR LR5-54HABB-400M MODULE
- - IRON RIDGE XR-10 168" MILL
- - TRENCH

PANEL HEIGHT OFF ROOF	6"

Digitally signed by Arash Zandieh
Date: 2025.05.07 09:46:02 -07'00'

NORTH CAROLINA PROFESSIONAL SEAL 050296 ENGINEER ARASH ZANDIEH
EXP. 12/31/2025

METER NO : 342 481 325

1 ROOF PLAN & MODULES
PV-2
SCALE: 1/6" = 1'-0"

CAROLINA CONNECTIONS
CAROLINA CONNECTIONS
422 HUFFMAN MILL ROAD, SUITE 105, BURLINGTON, NC 27215, UNITED STATES
PHONE: (336) 585-1314

SYSTEM INFO.
(26) LONGI SOLAR LR5-54HABB-400M
(13) DURACELL POWER CENTER SOLAR PV DUAL D700-M2 (240V)
DC SYSTEM SIZE: 10.400 KWDC
AC SYSTEM SIZE: 9.048 KWAC

REVISIONS

DESCRIPTION	DATE	REV
REVISION	05/05/2025	A
REVISION	05/07/2025	B

Signature with Seal

PROJECT NAME & ADDRESS

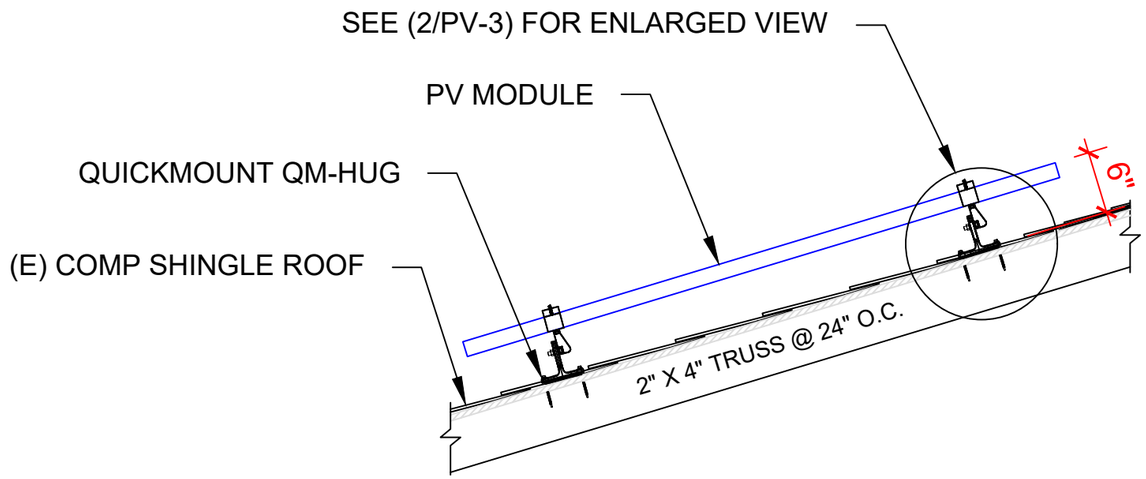
MARK CIOLEK RESIDENCE
15 PAPER BIRCH WAY,
FUQUAY VARINA, NC 27526
PH.# : (716) 307-0539
Email: mciolek2@gmail.com

DATE: 05/07/2025

SHEET NAME
ROOF PLAN & MODULES

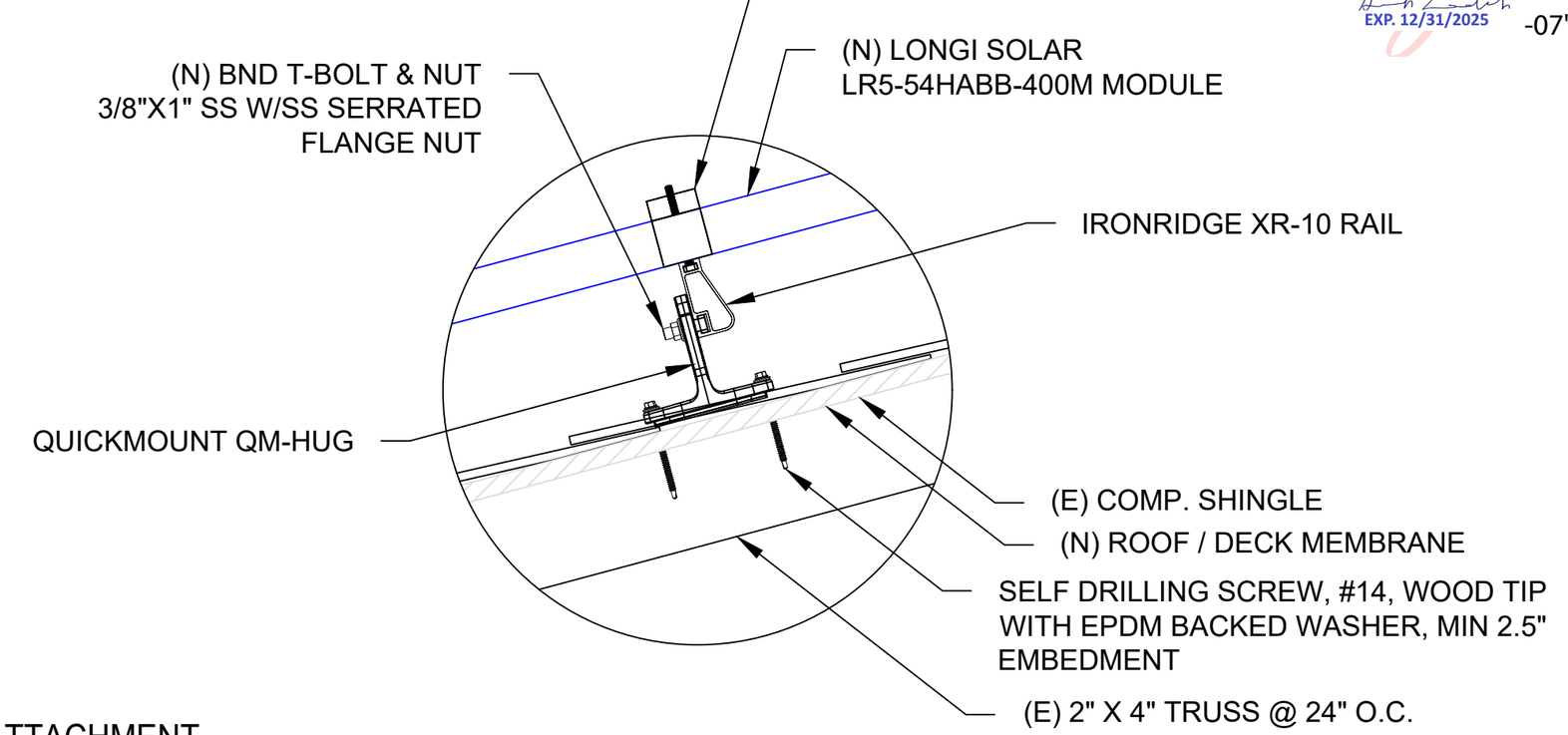
SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-2



1 ATTACHMENT DETAILS

PV-3



2 ENLARGED VIEW OF ATTACHMENT

PV-3

SCALE: NTS

NORTH CAROLINA PROFESSIONAL SEAL 050296 ENGINEER ARASH ZANDIEH
EXP. 12/31/2025

Digitally signed by Arash Zandieh
Date: 2025.05.07 09:46:22 -07'00'

CAROLINA CONNECTIONS
422 HUFFMAN MILL ROAD, SUITE 105, BURLINGTON, NC 27215, UNITED STATES
PHONE: (336) 585-1314

SYSTEM INFO.
(26) LONGI SOLAR LR5-54HABB-400M
(13) DURACELL POWER CENTER SOLAR PV DUAL D700-M2 (240V)
DC SYSTEM SIZE: 10.400 KWDC
AC SYSTEM SIZE: 9.048 KWAC

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REVISION	05/07/2025	B

Signature with Seal

PROJECT NAME & ADDRESS

MARK CIOLEK RESIDENCE
15 PAPER BIRCH WAY,
FUQUAY VARINA, NC 27526
PH.# : (716) 307-0539
Email: mciolek2@gmail.com

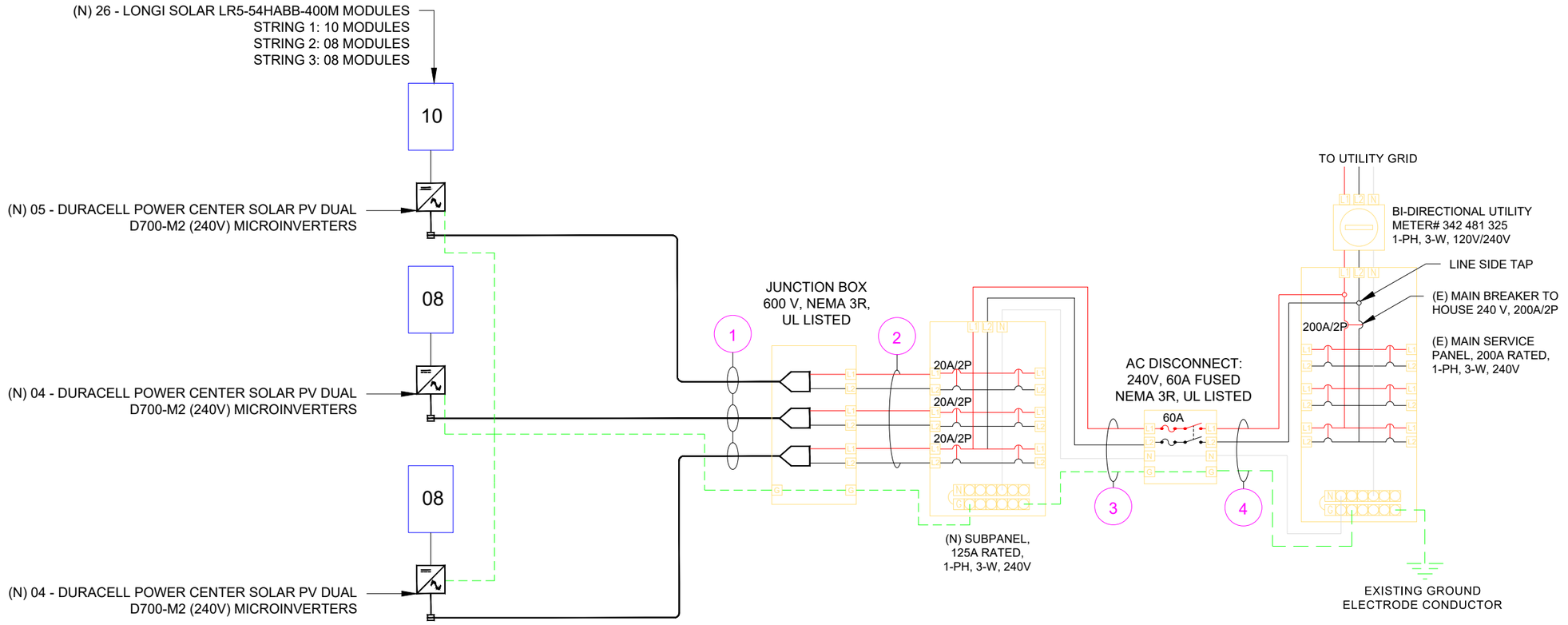
DATE: 05/07/2025

SHEET NAME
ATTACHMENT DETAIL

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	3	ARRAY	JUNCTION BOX	10 AWG	AC CABLE	-	-	1	2	N/A	N/A	6 AWG	BARE COPPER	0.71	(56°C)	N/A	14.50A	18.13A	N/A	N/A	90°C	44FT	0.66%
2	1	JUNCTION BOX	SUBPANEL	10 AWG	THWN-2	COPPER	MIN 0.75" Dia	3	6	26.72%	20A	10 AWG	THWN-2, COPPER	0.96	(34°C)	0.8	14.50A	18.13A	40A	30.7A	75°C	32FT	0.50%
3	1	SUBPANEL	FUSED AC DISCONNECT	6 AWG	THWN-2	COPPER	MIN 0.75" Dia	1	3	31.21%	60A	10 AWG	THWN-2, COPPER	0.96	(34°C)	1	37.70A	47.13A	75A	72.0A	75°C	5FT	0.08%
4	1	FUSED AC DISCONNECT	MAIN SERVICE PANEL	6 AWG	THWN-2	COPPER	MIN 0.75" Dia	1	3	31.21%	N/A	10 AWG	THWN-2, COPPER	0.96	(34°C)	1	37.70A	47.13A	75A	72.0A	75°C	5FT	0.08%



INVERTER SPECIFICATIONS	
MANUFACTURER / MODEL	DURACELL POWER CENTER SOLAR PV DUAL D700-M2 (240V)
MAX DC SHORT CIRCUIT CURRENT	15 A
CONTINUOUS OUTPUT CURRENT	2.9A (240V)
MAX CONTINUOUS OUTPUT POWER	696W

SERVICE INFO	
UTILITY PROVIDER:	DUKE ENERGY
AHJ NAME:	HARNETT COUNTY
MAIN PANEL BRAND:	SQUARE D
MAIN SERVICE PANEL:	200A
MAIN PANEL LOCATION:	NORTH EAST
SERVICE FEED SOURCE:	UNDERGROUND

SOLAR MODULE SPECIFICATIONS	
MANUFACTURER / MODEL	LONGI SOLAR LR5-54HABB-400M
VMP	30.94 V
IMP	12.93 A
VOC	37.05 V
ISC	13.72 A
TEMP. COEFF. VOC	-0.265 %/C
MODULE DIMENSION	67.80" (L) x 44.65" (W)
PANEL WATTAGE	400W

1 ELECTRICAL LINE DIAGRAM
PV-4 SCALE: NTS

CAROLINA CONNECTIONS
422 HUFFMAN MILL ROAD, SUITE 105, BURLINGTON, NC 27215, UNITED STATES
PHONE: (336) 585-1314

SYSTEM INFO.
(26) LONGI SOLAR LR5-54HABB-400M
(13) DURACELL POWER CENTER SOLAR PV DUAL D700-M2 (240V)
DC SYSTEM SIZE: 10.400 KWDC
AC SYSTEM SIZE: 9.048 KWAC

REVISIONS

DESCRIPTION	DATE	REV
REVISION	05/05/2025	A
REVISION	05/07/2025	B

Signature with Seal

NORTH CAROLINA PROFESSIONAL SEAL 047345 Exp. 12/31/2025 ENGINEER METHODE MANIRAGUHA

Digitally signed by Methode Maniraguha, PE
Date: 2025.05.07 04:39:12 -07'00'

PROJECT NAME & ADDRESS

MARK CIOLEK RESIDENCE
15 PAPER BIRCH WAY,
FUQUAY VARINA, NC 27526
PH.# : (716) 307-0539
Email: mciolek2@gmail.com

DATE: 05/07/2025

SHEET NAME
ELECTRICAL LINE & CALCS.

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-4

CAROLINA CONNECTIONS
422 HUFFMAN MILL ROAD, SUITE 105, BURLINGTON, NC 27215, UNITED STATES
PHONE: (336) 585-1314

SYSTEM INFO.
(26) LONGI SOLAR LR5-54HABB-400M
(13) DURACELL POWER CENTER SOLAR PV DUAL D700-M2 (240V)
DC SYSTEM SIZE: 10.400 KWDC
AC SYSTEM SIZE: 9.048 KWAC

REVISIONS		
DESCRIPTION	DATE	REV
REVISION	05/05/2025	A
REVISION	05/07/2025	B

Signature with Seal

NORTH CAROLINA PROFESSIONAL SEAL 047345 ENGINEER METHODE MANIRAGUHA

Digitally signed by Methode Maniraguha, PE
Date: 2025.05.07 04:39:00 -07'00'

PROJECT NAME & ADDRESS

MARK CIOLEK RESIDENCE
15 PAPER BIRCH WAY,
FUQUAY VARINA, NC 27526
PH.# : (716) 307-0539
Email: mciolek2@gmail.com

DATE: 05/07/2025

SHEET NAME
ELECTRICAL PHOTOS

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-5

SOLAR MODULE SPECIFICATIONS	
MANUFACTURER / MODEL	LONGI SOLAR LR5-54HABB-400M
VMP	30.94 V
IMP	12.93 A
VOC	37.05 V
ISC	13.72 A
TEMP. COEFF. VOC	-0.265 %/C
MODULE DIMENSION	67.80" (L) x 44.65" (W)
PANEL WATTAGE	400W

INVERTER SPECIFICATIONS	
MANUFACTURER / MODEL	DURACELL POWER CENTER SOLAR PV DUAL D700-M2 (240V)
MAX DC SHORT CIRCUIT CURRENT	15A
CONTINUOUS OUTPUT CURRENT	2.9A (240V)

AMBIENT TEMPERATURE SPECS	
RECORD LOW TEMP	-12°C
AMBIENT TEMP (HIGH TEMP 2%)	34°C
CONDUIT HEIGHT	7/8"
ROOF TOP TEMP	90°C
CONDUCTOR TEMPERATURE RATE	56°C
MODULE TEMPERATURE COEFFICIENT OF VOC	-0.265 %/C

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

Voltage rise from the Microinverters to the Junction Box

For branch circuit #1 of 05 D700-M2 Micros, the voltage rise on the 240 VAC AC Cable is 0.66%
For branch circuit #2 of 04 D700-M2 Micros, the voltage rise on the 240 VAC AC Cable is 0.47%
For branch circuit #3 of 04 D700-M2 Micros, the voltage rise on the 240 VAC AC Cable is 0.35%

Voltage rise from the Junction Box to the Subpanel

VRise = (amps/inverter × number of inverters) × (resistance in Ω/ft) × (2-way wire length in ft)
= (2.9 amp × 5) × (0.00129 Ω/ft) × (32 ft × 2)
= 14.50 amps × 0.00129 Ω/ft × 64 ft
= 1.20 volts
%VRise = 1.20 volts ÷ 240 volts = 0.50%
The voltage rise from the Junction Box to the Subpanel is 0.50%

Voltage rise from the Subpanel to Fused AC Disconnect

VRise = (amps/inverter × number of inverters) × (resistance in Ω/ft.) × (2-way wire length in ft.)
= (2.9 amp × 13) × (0.000491 Ω/ft) × (5 ft. × 2)
= 37.70 amps × 0.000491 Ω/ft × 10 ft.
= 0.19 volts
%VRise = 0.19 volts ÷ 240 volts = 0.08%
The voltage rise from the Subpanel to the Fused AC Disconnect is 0.08%

Voltage rise from the Fused AC Disconnect to Main Service Panel

VRise = (amps/inverter × number of inverters) × (resistance in Ω/ft.) × (2-way wire length in ft.)
= (2.9 amp × 13) × (0.000491 Ω/ft) × (5 ft. × 2)
= 37.70 amps × 0.000491 Ω/ft × 10 ft.
= 0.19 volts
%VRise = 0.19 volts ÷ 240 volts = 0.08%
The voltage rise from the Fused AC Disconnect to the Main Service Panel is 0.08%

Total system voltage rise for all wire sections

0.66% + 0.50% + 0.08% + 0.08% = 1.32%

CAROLINA CONNECTIONS
422 HUFFMAN MILL ROAD, SUITE 105, BURLINGTON, NC 27215, UNITED STATES
PHONE: (336) 585-1314

SYSTEM INFO.
(26) LONGI SOLAR LR5-54HABB-400M
(13) DURACELL POWER CENTER SOLAR PV DUAL D700-M2 (240V)
DC SYSTEM SIZE: 10.400 KWDC
AC SYSTEM SIZE: 9.048 KWAC

REVISIONS

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REVISION	05/07/2025	B

Signature with Seal

NORTH CAROLINA PROFESSIONAL SEAL 047345 Exp. 12/31/2025 ENGINEER METHODE MANIRAGUHA

Digitally signed by Methode Maniraguha, PE
Date: 2025.05.07 04:38:36 -07'00'

PROJECT NAME & ADDRESS

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15 PAPER BIRCH WAY,
FUQUAY VARINA, NC 27526
PH.# : (716) 307-0539
Email: mciolek2@gmail.com

DATE: 05/07/2025

SHEET NAME
SPECIFICATIONS & CALC.

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-6

1

⚠ WARNING

ELECTRIC SHOCK HAZARD

TERMINALS ON BOTH LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

LABEL LOCATION:
MAIN SERVICE PANEL/AC DISCONNECT/AC COMBINER
(PER CODE: NEC 2017 690.13(B))

2

WARNING: PHOTOVOLTAIC POWER SOURCE

LABEL LOCATION:
DC CONDUIT
EVERY 10' AND ON CONDUIT BODIES WHEN EXPOSED
(PER CODE: NEC2017 690.31(G)(3)(4))

3

PHOTOVOLTAIC SYSTEM AC DISCONNECT
RATED AC OUTPUT CURRENT 37.70 AMPS
NOMINAL OPERATING AC VOLTAGE 240 VOLTS

LABEL LOCATION:
MAIN SERVICE PANEL/AC DISCONNECT
NEC2017, 690.53

4

RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

LABEL LOCATION:
INVERTER
AT OR WITHIN 3' OF THE AC/DC COMBINER SWITCH
PER CODE: NEC 690.58(C)(3)

5

⚠ CAUTION

DUAL POWER SOURCE SECOND SOURCE IS PHOTOVOLTAIC SYSTEM

LABEL LOCATION:
MAIN SERVICE PANEL/AC DISCONNECT/AC COMBINER/REVENUE METER
2017 NEC 705.12(B)(3)

6

SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN

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

MAIN SERVICE PANEL
IF MSD IS OUTSIDE PLACE IT THERE / IF MSD IS INSIDE PLACE ON THE AC DISCONNECT
PER CODE: NEC 690.56(C)(1)

7

PHOTOVOLTAIC SYSTEM UTILITY DISCONNECT SWITCH

LABEL LOCATION:
AC DISCONNECT
2017 NEC 690.56(C)(3)

8

SERVICE DISCONNECT

SECTIONNEUR PRINCIPALE

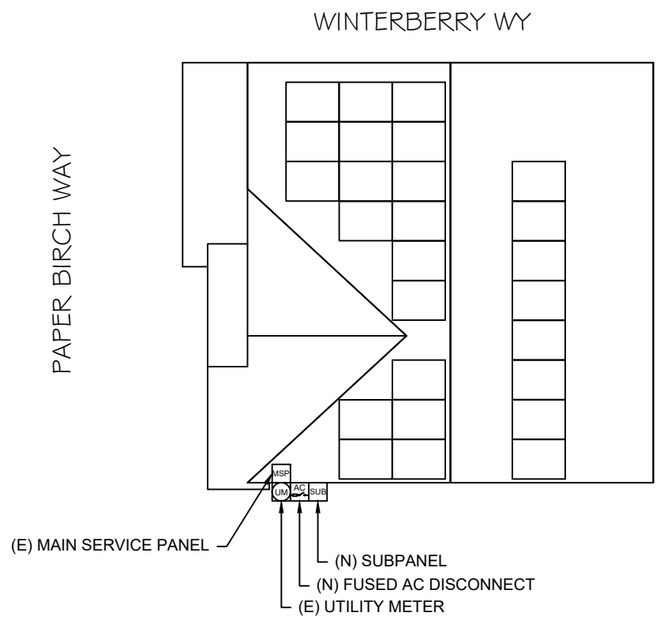
SERVICIO DE DESCONEXION

LABEL LOCATION:
AC DISCONNECT
2017 NEC 230.66

ADHESIVE FASTENED SIGNS:
- ANSI Z535.4-2011 PRODUCT SAFETY SIGNS AND LABELS, PROVIDES GUIDELINES FOR SUITABLE FONT SIZES, WORDS, COLORS, SYMBOLS, AND LOCATION REQUIREMENTS FOR LABELS. NEC 110.21(B)(1).
- THE LABEL SHALL BE OF SUFFICIENT DURABILITY TO WITHSTAND THE ENVIRONMENT INVOLVED. NEC 110.21(B)(3).
- ADHESIVE FASTENED SIGNS MAY BE ACCEPTABLE IF PROPERLY ADHERED. VINYL SIGNS SHALL BE WEATHER RESISTANT.

CAUTION

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



CAROLINA CONNECTIONS
422 HUFFMAN MILL ROAD, SUITE 105, BURLINGTON, NC 27215, UNITED STATES
PHONE: (336) 585-1314

SYSTEM INFO.
(26) LONGI SOLAR LR5-54HABB-400M
(13) DURACELL POWER CENTER SOLAR PV DUAL D700-M2 (240V)
DC SYSTEM SIZE: 10.400 KWDC
AC SYSTEM SIZE: 9.048 KWAC

REVISIONS

DESCRIPTION	DATE	REV
REVISION	05/05/2025	A
REVISION	05/07/2025	B

Signature with Seal

NORTH CAROLINA PROFESSIONAL SEAL 047345 ENGINEER METHODE MANIRAGUHA

Digitally signed by Methode Maniraguha, PE
Date: 2025.05.07 04:38:49 -07'00'

PROJECT NAME & ADDRESS

MARK CIOLEK RESIDENCE
15 PAPER BIRCH WAY,
FUQUAY VARINA, NC 27526
PH.# : (716) 307-0539
Email: mciolek2@gmail.com

DATE: 05/07/2025

SHEET NAME
SIGNAGE

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-7

Hi-MO 5

LR5-54HABB
390~415M

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

25-year Warranty for Materials and Processing

30-year Warranty for Extra Linear Power Output

Complete System and Product Certifications

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

LONGi

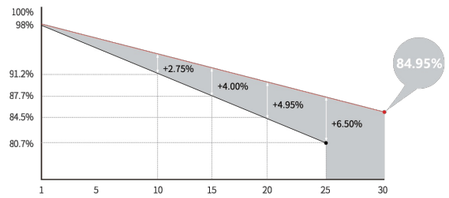
Hi-MO 5

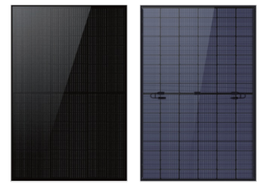
LR5-54HABB 390~415M

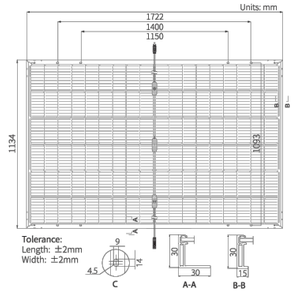
21.3%	0~3%	<2%	0.45%	HALF-CELL
MAX MODULE EFFICIENCY	POWER TOLERANCE	FIRST YEAR POWER DEGRADATION	YEAR 2-30 POWER DEGRADATION	Lower operating temperature

Additional Value

30-Year Power Warranty







Mechanical Parameters

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

Electrical Characteristics

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

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

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

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

Operating Parameters

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

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

Mechanical Loading

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

Temperature Ratings (STC)

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

LONGi

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

CAROLINA CONNECTIONS
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MARK CIOLEK RESIDENCE
15 PAPER BIRCH WAY,
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PH.# : (716) 307-0539
Email: mciolek2@gmail.com

DATE: 05/07/2025

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-8

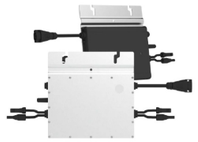
DURACELL® HOME ECOSYSTEM

Microinverters

Single

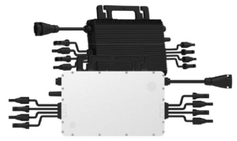
D350-M1
PV module input: 1
Output Power: 350 W
Module input: 470+ W

Dual



D700-M2
PV input: 2
Output Power: 700 W
Module input: 470 + W

Quad



D1500-M4
PV input: 4
Output Power: 1500 W
Module input: 505+ W

Duracell Home Ecosystem microinverters support fast, easy, and flexible installation with the highest power output yield per PV module.

AC trunk cable format allows any combination of single, dual, and quad microinverters to optimize even the most complex rooftop installations, up to 16 modules per branch.

Fast and efficient commissioning process can be completed remotely. Simple termination to standard junction box, main panel, or sub panel. No specialized combiner box required.

Compliant with U.S. NEC-2017 & NEC-2020 690.12 rapid shutdown and CA Rule 21. High reliability with NEMA 6 enclosure, 6000V surge protection

DURACELL POWER CENTER

DURACELL® HOME ECOSYSTEM

Microinverters

Technical Data
Solar PV Microinverters
D350-M1 / D700-M2 / D1500-M4

Model	D350-M1		D700-M2		D1500-M4	
Input Data (DC)						
Number of PV inputs	1		2		4	
Module power range, typical (W)	280 to 470+		280 to 470+		300 to 505+	
Maximum input voltage (V)	60					
MPPT voltage range (V)	16-60					
Start-up voltage (V)	22					
Maximum input current (A)	11.5					
Maximum input short circuit current (A)	15					
Output Data (AC)						
Peak output power (VA)	350		700		1500	1350
Maximum continuous output power (VA)	349		696		1438	1246
Maximum continuous output current (A)	1.45	1.68	2.9	3.35	5.99	5.99
Nominal output voltage(V)	240	208	240	208	240	208
Nominal output voltage range1 (V)	211-264	183-228	211-264	183-228	211-264	183-228
Nominal frequency/range1 (Hz)	60/55-65					
Power factor (adjustable)	>0.99 default (0.8 lead to 0.8 lag)					
Total harmonic distortion	<3%					
Maximum units per branch2 (10 AWG)	16	14	8	7	4	4
Efficiency						
CEC peak efficiency (%)	96.7					
CEC weighted efficiency (%)	96.5					
Nominal MPPT efficiency (%)	99.8					
Nighttime power consumption (mW)	<50					
Mechanical Data						
Ambient temperature range (°C)	-40 to +65					
Dimensions (W × H × D) mm	182 x 164 x 29.5		250 x 170 x 28		280 x 176 x 33	
Weight (kg)	1.75		2.6		3.35	
Enclosure rating	Outdoor NEMA 6					
Cooling	Natural convection - no fans					
Features						
Communication	2.4 GHz proprietary RF (Nordic)					
Monitoring	Yes					
Warranty	Up to 25 years					
Compliance	UL 1741, IEEE 1547, UL 1741 SA (240 Vac), CA Rule 21 (240 Vac), CSA C22.2 No. 107.1-16, FCC Part 15B, FCC Part 15C					
PV Rapid Shutdown	Conforms with NEC-2017 and NEC-2020 Article 690.12 and CEC-2021 Sec 64-218 Rapid Shutdown of PV Systems					

*1. Nominal voltage/frequency range can vary depending on local requirements.
*2. Refer to local requirements for exact number of microinverters per branch.

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DURACELL POWER CENTER

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SHEET NAME
EQUIPMENT SPECIFICATION

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ANSI B
11" X 17"

SHEET NUMBER
PV-9

Tech Brief

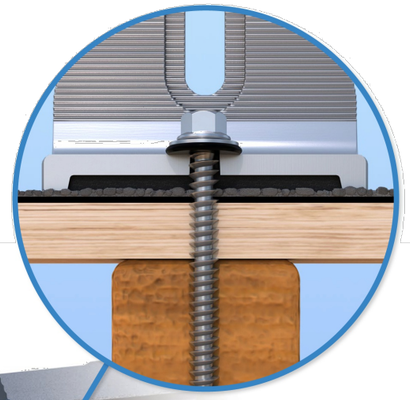
IRONRIDGE

QuickMount® HUG

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).

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

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.

Tech Brief

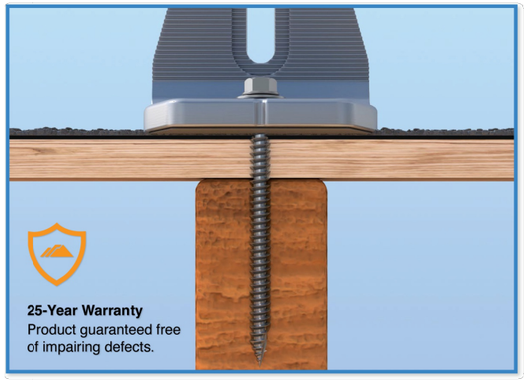
Adaptive, Rafter-Friendly Installation

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



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.

CAROLINA CONNECTIONS

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SHEET NAME
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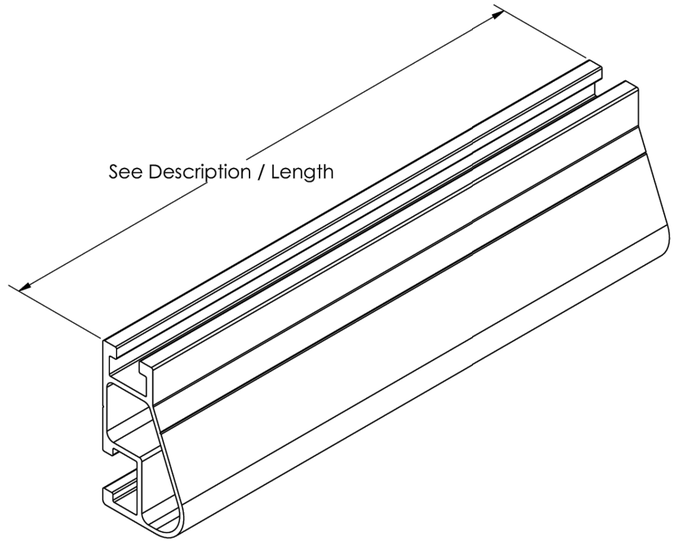
SHEET SIZE
ANSI B
11" X 17"

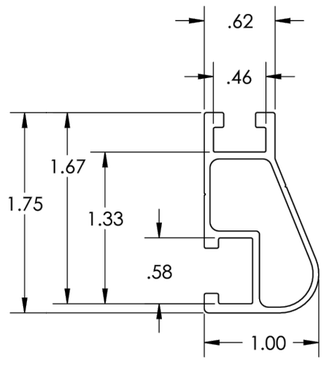
SHEET NUMBER
PV-10

Cut Sheet

IRONRIDGE

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

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