WYSSLING CONSULTING
CORPORATE EXPERIENCE WITH SMALL BUSINESS VALUE
Scott E. Wyssling, PE
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76 North Meadowbrook Drive
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swyssling@wysslingconsulting.com

January 12, 2023

Lighting Electric, LLC
230 Blacksnake Road
Stanley, NC 28164

Scott Wyssling, PE

Digitally signed by Scott Wyssling, PE
DN: C=US, S=Utah, L=Alpine, O=Wyssling Consulting, OU=Engineering, CN="Scott Wyssling, PE", E=swyssling@wysslingconsulting.com
Reason: I am the author of this document
Location: your signing location here
Date: 2023.01.12 09:49:41-07'00'
Foxit PDF Editor Version: 11.1.0

Re: Engineering Services
Barreto Residence
89 Caldwell Street, Spring Lake NC
4.400 kW System

To Whom It May Concern:

We have received information regarding solar panel installation on the roof of the above referenced structure. Our evaluation of the structure is to verify the existing capacity of the roof system and its ability to support the additional loads imposed by the proposed solar system.

A. Site Assessment Information

1. Site visit documentation identifying attic information including size and spacing of framing for the existing roof structure.
2. Design drawings of the proposed system including a site plan, roof plan and connection details for the solar panels. This information will be utilized for approval and construction of the proposed system.

B. Description of Structure:

Roof Framing: 2x6 dimensional lumber at 24" on center.
Roof Material: Composite Asphalt Shingles
Roof Slope: 33 degrees
Attic Access: Accessible
Foundation: Permanent

C. Loading Criteria Used

- **Dead Load**
  - Existing Roofing and framing = 7 psf
  - New Solar Panels and Racking = 3 psf
  - TOTAL = 10 PSF
- **Live Load** = 20 psf (reducible) – 0 psf at locations of solar panels
- **Ground Snow Load** = 10 psf
- **Wind Load** based on ASCE 7-10
  - Ultimate Wind Speed = 118 mph (based on Risk Category II)
  - Exposure Category C

Analysis performed of the existing roof structure utilizing the above loading criteria is in accordance with the 2018 NCRC (2015 IRC). including provisions allowing existing structures to not require strengthening if the new loads do not exceed existing design loads by 105% for gravity elements and 110% for seismic elements. This analysis indicates that the existing framing will support the additional panel loading without damage, if installed correctly.

D. Solar Panel Anchorage

1. The solar panels shall be mounted in accordance with the most recent Unirac manual. If during solar panel installation, the roof framing members appear unstable or deflect non-uniformly, our office should be notified before proceeding with the installation.
2. The maximum allowable withdrawal force for a $^{5}/_{16}$" lag screw is 235 lbs per inch of penetration as identified in the National Design Standards (NDS) of timber construction specifications. Based on a minimum penetration depth of 2½", the allowable capacity per connection is greater than the design withdrawal force (demand). Considering the variable factors for the existing roof framing and installation tolerances, the connection using one $^{5}/_{16}$" diameter lag screw with a minimum of 2½" embedment will be adequate and will include a sufficient factor of safety.
3. Considering the wind speed, roof slopes, size and spacing of framing members, and condition of the roof, the panel supports shall be placed no greater than 48" on center.
4. Panel supports connections shall be staggered to distribute load to adjacent framing members.

Based on the above evaluation, this office certifies that with the racking and mounting specified, the existing roof system will adequately support the additional loading imposed by the solar system. This evaluation is in conformance with the 2018 NCRC (2015 IRC), current industry standards, and is based on information supplied to us at the time of this report.

Should you have any questions regarding the above or if you require further information do not hesitate to contact me.

Very truly yours,

Scott E. Wyssling, PE
North Carolina License No. 46546

THIS PLAN HAS BEEN ELECTRONICALLY SIGNED AND SEALED BY SCOTT WYSSLING, PE USING A DIGITAL SIGNATURE AND DATE. PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES

NORTH CAROLINA PROFESSIONAL SEAL 046546 ENGINEER SCOTT E. WYSSLING

Wyssling Consulting, PLLC
76 N Meadowbrook Drive Alpine UT 84004
North Carolina COA # P-2308

Signed *1/12/2023*

SCOPE OF WORK

TO INSTALL A ROOF MOUNTED SOLAR PHOTOVOLTAIC SYSTEM AT THE OWNER RESIDENCE LOCATED AT 89 CALDWELL ST, SPRING LAKE, NC 28390, 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
11 Q CELLS Q.PEAK DUO BLK ML-G10.A+ (400W) MODULES
11 ENPHASE IQ8-60-2-US 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 FLORIDA BUILDING CODE, THE DEPARTMENT OF ENVIRONMENTAL PROTECTION AND ALL PERTINENT AGENCIES.
- IT 1S 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

- 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 CLIPS TO BE INSTALLED BETWEEN MODULE FRAME AND MODULE SUPPORT RAIL, PER THE GROUNDING CLIP MANUFACTURERS INSTRUCTION.
- MODULE SUPPORT RAIL SHALL BE BONDED TO THE MODULE

GOVERNING CODES
2018 NORTH CAROLINA BUILDING CODE
2018 NORTH CAROLINA RESIDENTIAL CODE
2018 NORTH CAROLINA EXISTING BUILDING CODE
2018 NORTH CAROLINA FIRE PREVENTION CODE
2018 NORTH CAROLINA PLUMBING CODE
2018 NORTH CAROLINA MECHANICAL CODE
2018 NORTH CAROLINA FUAL GAS CODE
2018 NORTH CAROLINA ENERGY CONSERVATION CODE
2020 NORTH CAROLINA ELECTRICAL CODE

WIRING AND CONDUIT NOTES

- ALL CONDUIT SIZES AND TYPES SHALL BE LISTED FOR ITS PURPOSE AND APPROVAL 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 PV DC CONDUCTORS IN CONDUIT EXPOSED TO SUNLIGHT SHALL BE DERATED ACCORDING TO AS PER LATEST NCEC CODE.
- 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 1000V AS PER APPLICABLE NEC
- 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

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NORTH CAROLINA PROFESSIONAL SEAL 040546 ENGINEER SCOTT E. WYSSLING

Wyssling Consulting, PLLC
76 N Meadowbrook Drive Alpine UT 84004
North Carolina COA # P-2308

Signed 1/12/2023

SYSTEM RATING
4.400 kWDC
2.695 kWAC

PHOTOVOLTAIC SYSTEM FIRE CLASSIFICATION LISTING IN ACCORDANCE WITH UL 1703 STANDARD.

SHEET INDEX	
PV1	COVER PAGE
PV2	SITE PLAN
PV3	ROOF PLAN
PV4	STRING LAYOUT & BOM
PV5-PV6	ATTACHMENT DETAILS
PV7	ELECTRICAL LINE & CALCS.
PV8	SPECIFICATIONS & NOTES
PV9-PV10	SIGNAGE
PV11-PV19	EQUIPMENT SPECIFICATIONS

HOUSE PHOTO SCALE: NTS

VICINITY MAP SCALE: NTS

LIGHTING ELECTRIC
LIGHTING ELECTRIC LLC
230 BLACKSNAKE RD,
STANLEY, NC 28164, USA
PH# : (910) 356-1521
LICENSE NUMBER :- 29517

SYSTEM INFO
(11) Q CELLS Q.PEAK DUO BLK ML-G10.A+ (400W)
(11) ENPHASE IQ8-60-2-US
DC SYSTEM SIZE: 4.400 kWDC
AC SYSTEM SIZE: 2.695 kWAC

REVISIONS		
DESCRIPTION	DATE	REV
REVISION	01/11/2023	A

PROJECT NAME & ADDRESS

RICHARD BARRETO
RESIDENCE
89 CALDWELL ST, SPRING LAKE, NC 28390, USA
EMAIL ID: RICHARDARRETO@GMAIL.COM
PHONE NO. (910) 225-2262

DATE: 1/11/2023

SHEET NAME
COVER PAGE

SHEET SIZE
ANSI B
11" X 17"

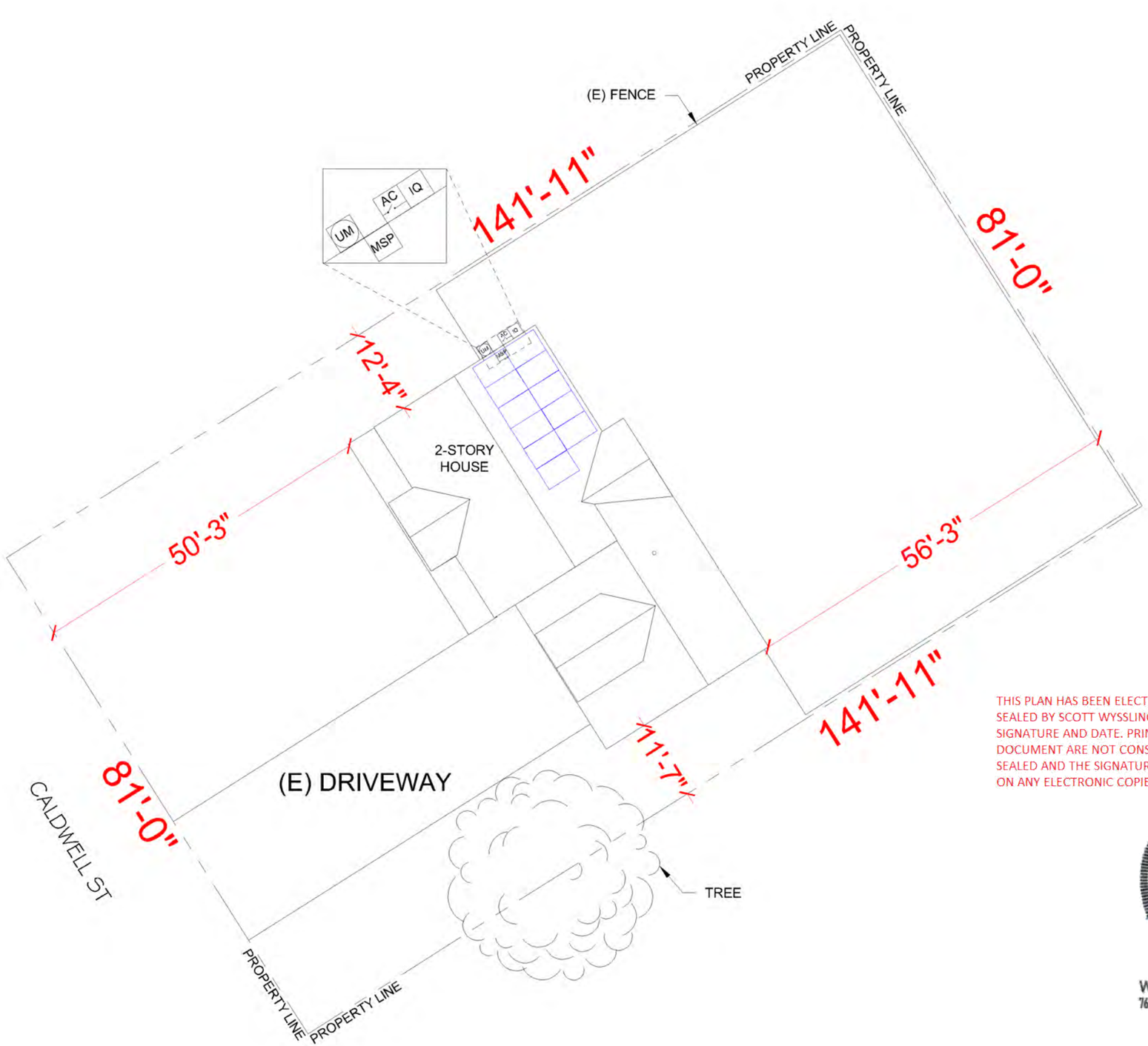
SHEET NUMBER
PV-1

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.
- INSTALLER TO ENSURE MINIMUM CLEARANCES HAVE BEEN MET PER MANUFACTURERS RECOMMENDATION FOR ALL ROOF VENTING.
- PROPER ACCESS AND WORKING CLEARANCE AROUND EXISTING AND PROPOSED ELECTRICAL EQUIPMENT WILL BE PROVIDED AS PER SECTION [NCEC 110.26]

LEGEND

- JB — (N) JUNCTION BOX
- UM — (E) UTILITY METER
- MSP — (E) MAIN SERVICE PANEL
- IQ — (N) ENPHASE IQ COMBINER
- AC — (N) NON FUSED AC DISCONNECT
- VENT, ATTIC FAN (ROOF OBSTRUCTION)
- ROOF ATTACHMENT
- CONDUIT
- ENPHASE IQ8-60-2-US MICROINVERTER
- Q CELLS Q.PEAK DUO BLK ML-G10.A+ (400W) MODULES
- UNIRAC SOLARMOUNT LIGHT RAIL 168" MILL
- TRENCH



SCALE: 1/16"= 1'-0

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Signed 1/12/2023

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PHONE NO. (910) 225-2262

DATE: 1/11/2023

SHEET NAME
SITE PLAN

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-2

DESIGN SPECIFICATION	
RISK CATEGORY:	II
CONSTRUCTION:	SFD
ZONING:	RESIDENTIAL
SNOW LOAD (ASCE7-10):	10 PSF
EXPOSURE CATEGORY:	C
WIND SPEED (ASCE7-10):	118 MPH

MODULE TYPE, DIMENSIONS & WEIGHT	
NUMBER OF MODULES:	11 MODULES
MODULE TYPE:	Q CELLS Q.PEAK DUO BLK ML-G10.A+ (400W)
MODULE WEIGHT:	48.5 LBS
MODULE DIMENSIONS:	74" X 41.1" = 21.12 SF
UNIT WEIGHT OF AREA:	2.3 PSF

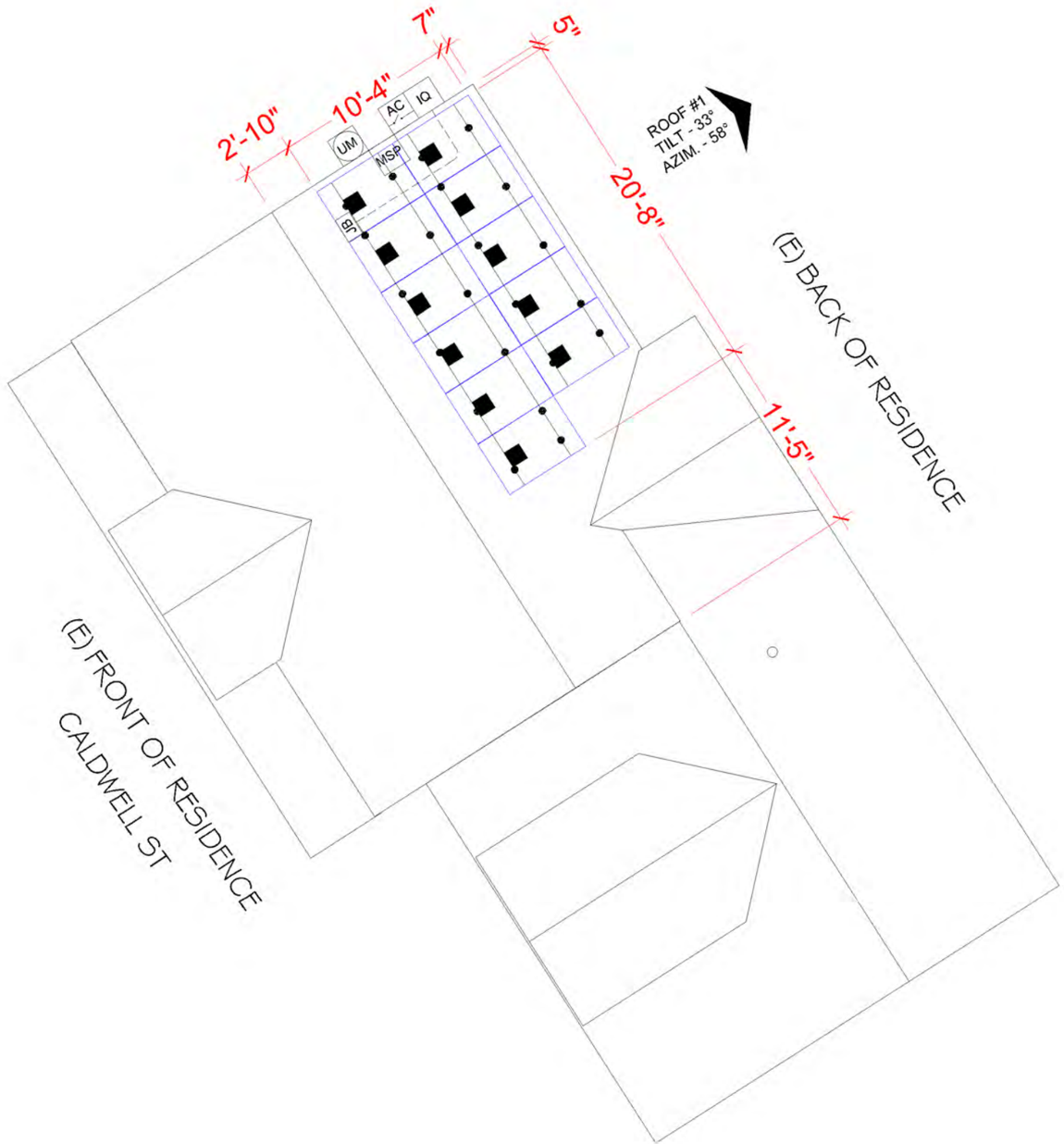
ROOF DESCRIPTION					
ROOF	ROOF TILT	AZIMUTH	RAFTER SIZE	RAFTER SPACING	ROOF MATERIAL
#1	33°	58°	2" x 6"	24" o.c.	COMP SHINGLE

ARRAY AREA & ROOF AREA CALC'S		
ROOF	# OF MODULES	ARRAY AREA (Sq. Ft.)
#1	11	232.33
(TOTAL ARRAY AREA/TOTAL ROOF AREA) X 100%		
= (232.33/1761.64) X 100% = 13.19%		

LEGEND

- JB — (N) JUNCTION BOX
- UM — (E) UTILITY METER
- MSP — (E) MAIN SERVICE PANEL
- IQ — (N) ENPHASE IQ COMBINER
- AC — (N) NON FUSED AC DISCONNECT
- VENT, ATTIC FAN (ROOF OBSTRUCTION)
- ROOF ATTACHMENT
- CONDUIT
- ENPHASE IQ8-60-2-US MICROINVERTER
- Q CELLS Q.PEAK DUO BLK ML-G10.A+ (400W) MODULES
- UNIRAC SOLARMOUNT LIGHT RAIL 168" MILL
- TRENCH

PANEL HEIGHT OFF ROOF	4"



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

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PHONE NO. (910) 225-2262

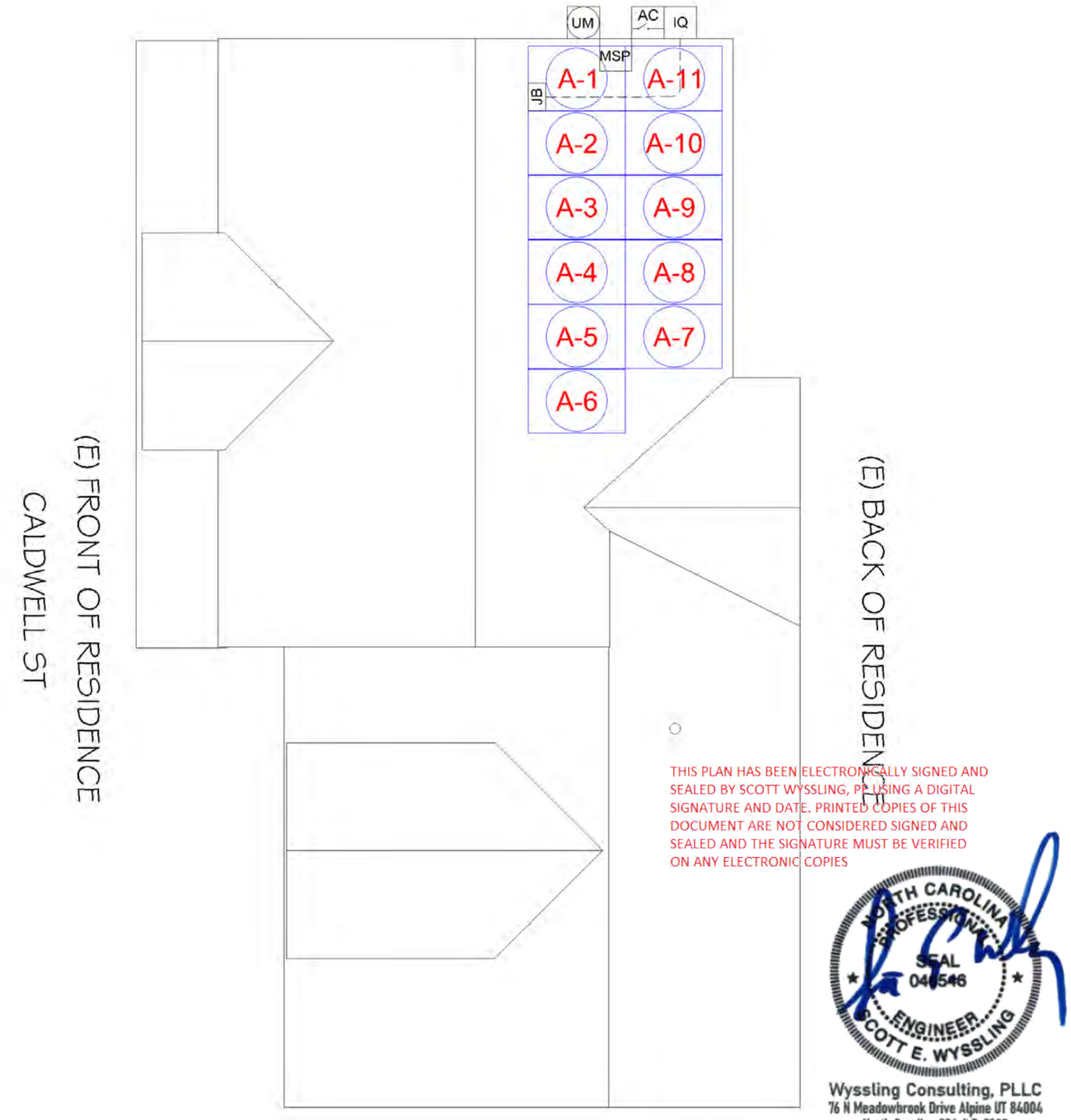
DATE: 1/11/2023

SHEET NAME
ROOF PLAN

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-3

BILL OF MATERIALS		
EQUIPMENT	QTY	DESCRIPTION
SOLAR PV MODULE	11	Q CELLS Q.PEAK DUO BLK ML-G10.A+ (400W)
INVERTER	11	ENPHASE IQ8-60-2-US MICROINVERTERS
JUNCTION BOX	1	JUNCTION BOX, NEMA 3R, UL LISTED
IQ COMBINER BOX	1	ENPHASE IQ COMBINER 4 W/IQ ENVOY (X-IQ-AM1-240-4)
NON FUSED AC DISCONNECT	1	60A NON FUSED AC DISCONNECT, 240V, NEMA 3R, UL LISTED
ATTACHMENT	22	FLASHLOC BASE MILL OR DARK
ATTACHMENT	22	5/16" X 4" SS AG BOLT W/S EPD BONDED WASHER
ATTACHMENT	22	SS SERRATED FLANGE NUT
ENPHASE Q CABLE	13	ENPHASE Q CABLE 204V (PER CONNECTOR)
BRANCH TERMINATOR	1	BRANCH TERMINATOR
IQ WATER TIGHT CAP	2	IQ WATER TIGHT CAPS
RAILS	6	UNIRAC SOLARMOUNT LIGHT RAIL 168" MILL
BONDED SPLICE	4	SPLICE KIT
MID CLAMP	18	MODULE CLAMP(MID CLAMP)
END CLAMP	8	MODULE CLAMP(END CLAMP)
GROUNDING LUG	2	GROUNDING LUG



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

A - **MODULE STRINGING**

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LIGHTING ELECTRIC

LIGHTING ELECTRIC LLC
230 BLACKSNAKE RD,
STANLEY, NC 28164, USA
PH# : (910) 356-1521
LICENSE NUMBER :- 29517

SYSTEM INFO

(11) Q CELLS
Q.PEAK DUO BLK ML-G10.A+
(400W)

(11) ENPHASE
IQ8-60-2-US

DC SYSTEM SIZE: 4.400 kWDC

AC SYSTEM SIZE: 2.695 kWAC

REVISIONS

DESCRIPTION	DATE	REV
REVISION	01/11/2023	A

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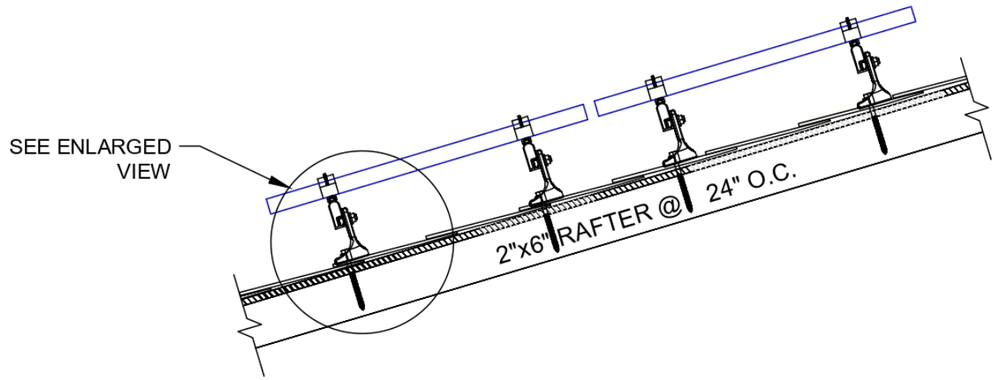
EMAIL ID: RICHARDARRETO@GMAIL.COM
PHONE NO. (910) 225-2262

DATE: 1/11/2023

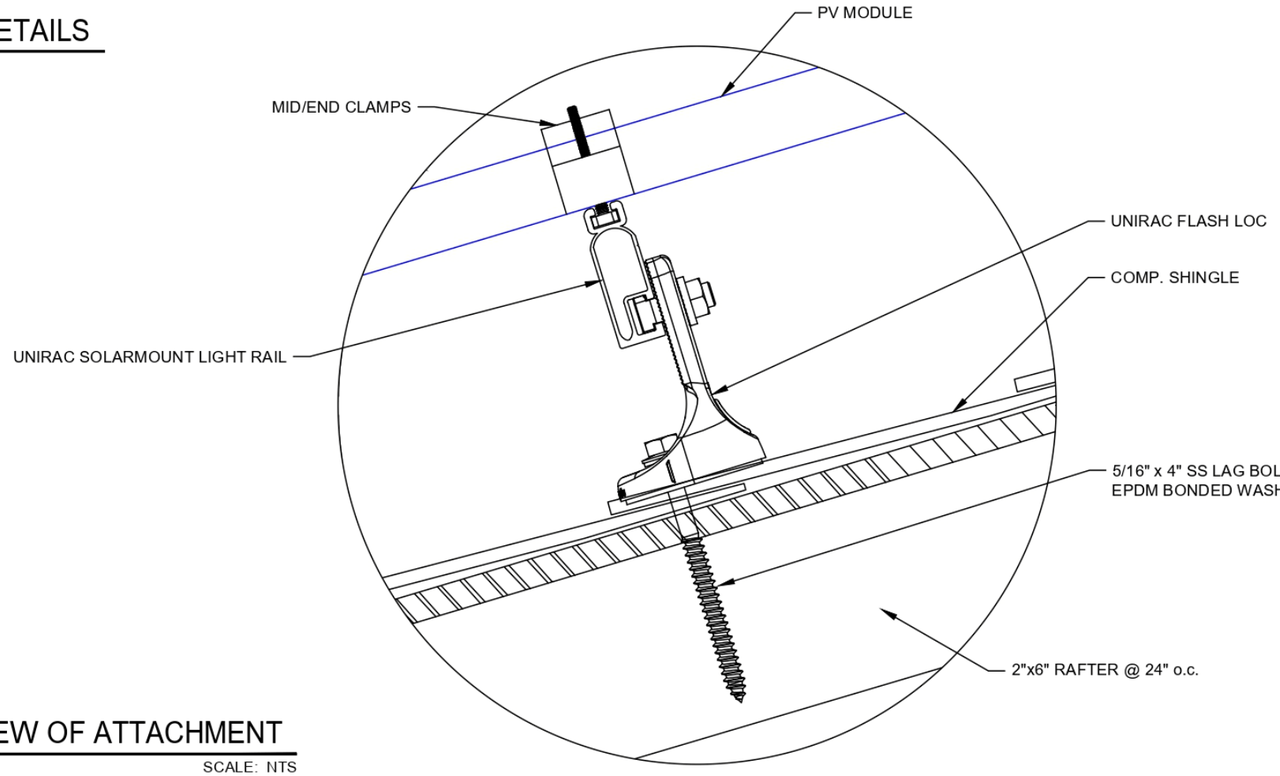
SHEET NAME
STRING LAYOUT & BOM

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-4



1 ATTACHMENT DETAILS



2 ENLARGED VIEW OF ATTACHMENT

SCALE: NTS

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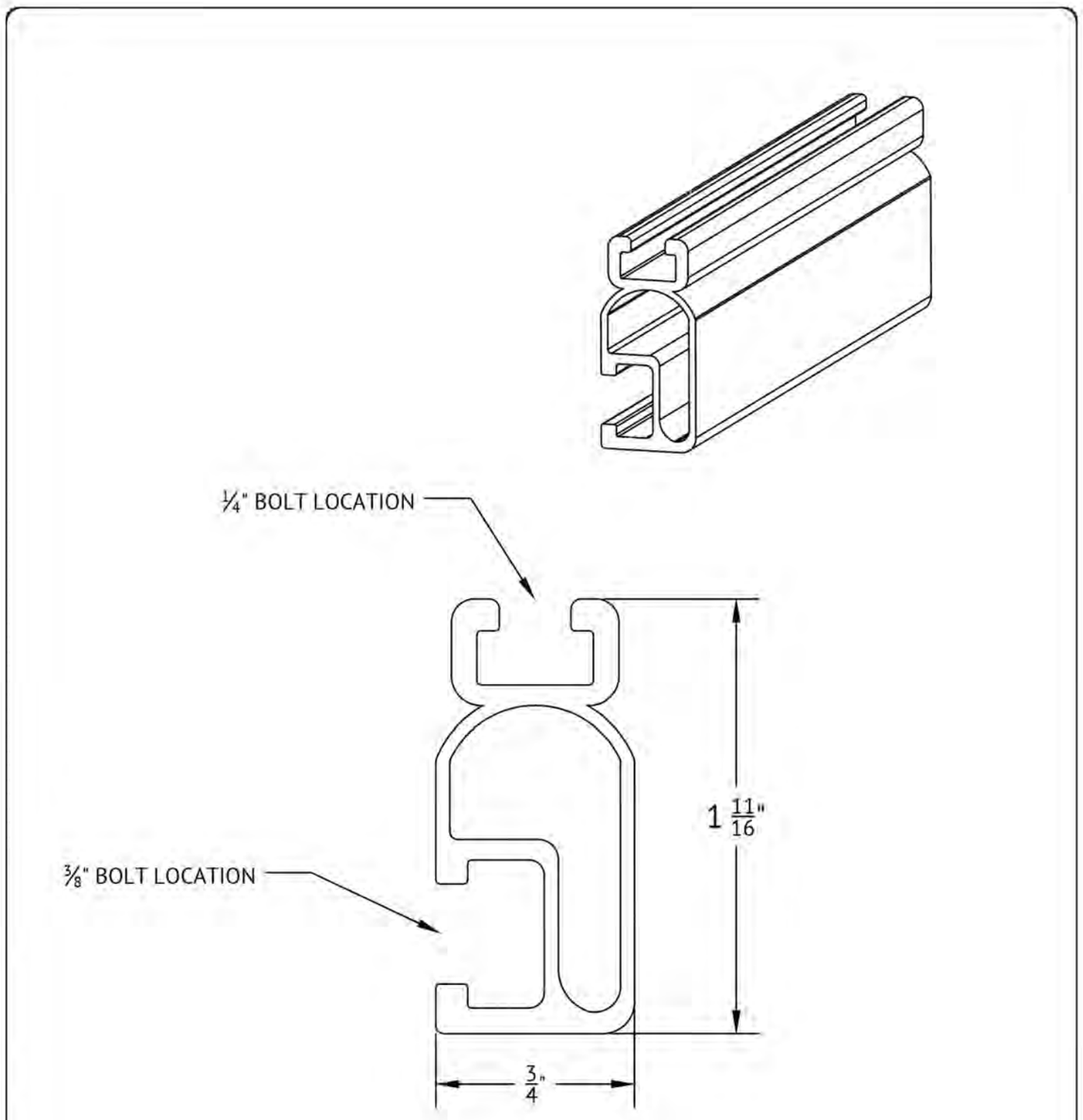
DATE: 1/11/2023

SHEET NAME
ATTACHMENT DETAILS

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-5



UNIRAC	
1411 BROADWAY BLVD NE ALBUQUERQUE, NM 87102 USA	
WWW.UNIRAC.COM	
PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	PART DETAIL
DESCRIPTION:	LIGHT RAIL
REVISION DATE:	APRIL 2016

DRAWING NOT TO SCALE
ALL DIMENSIONS ARE NOMINAL

PRODUCT PROTECTED BY ONE OR MORE US PATENTS

LEGAL NOTICE

SM-P02

SHEET

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(11) ENPHASE IQ8-60-2-US
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EMAIL ID: RICHARDARRETO@GMAIL.COM
PHONE NO. (910) 225-2262

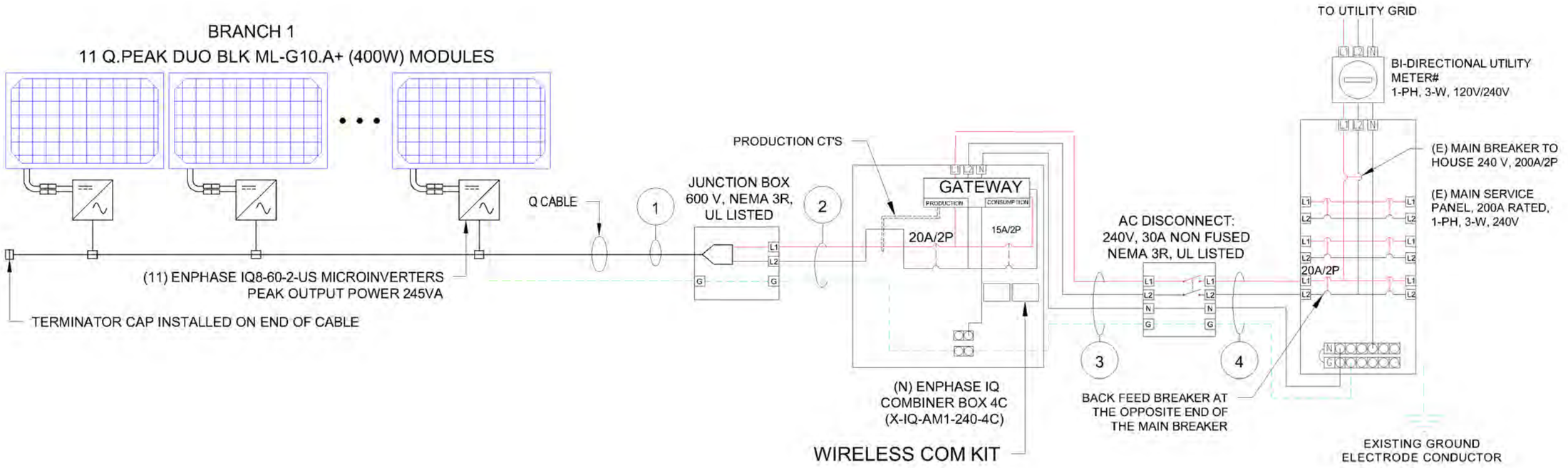
DATE: 1/11/2023

SHEET NAME
ATTACHMENT DETAILS

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-6

ID	TYPICAL	INITIAL CONDUCTOR LOCATION	FINAL CONDUCTOR LOCATION	CONDUCTOR			CONDUIT	# OF PARALLEL CIRCUITS	CURRENT-CARRYING CONDUCTORS IN CIRCUIT	CONDUIT FILL PERCENT	OCPD	EGC		TEMP. CORR. FACTOR		CONDUIT FILL FACTOR	CONT. CURRENT	MAX. CURRENT	BASE AMP.	DERATED AMP.	TERM. TEMP. RATING	LENGTH	VOTAGE DROP
1	1	ARRAY	JUNCTION BOX	12 AWG	Q CABLE	COPPER	-	1	2	N/A	N/A	6 AWG	BARE COPPER	0.71	(58°C)	N/A	11.00A	13.75A	N/A	N/A	75°C	40FT	0.46%
2	1	JUNCTION BOX	IQ COMBINER BOX	10 AWG	THWN 2	COPPER	MIN 0.75" DIA EMT	1	2	7.50%	20A	8 AWG	THWN-2 COPPER	0.91	(36°C)	1	11.00A	13.75A	40A	36.40A	75°C	31FT	0.37%
3	1	IQ COMBINER BOX	NON FUSED AC DISCONNECT	10 AWG	THWN 2	COPPER	MIN 0.75" DIA EMT	1	3	11.26%	N/A	8 AWG	THWN-2 COPPER	0.91	(36°C)	1	11.00A	13.75A	40A	36.40A	75°C	5FT	0.06%
4	1	NON FUSED AC DISCONNECT	MSP	10 AWG	THWN 2	COPPER	MIN 0.75" DIA EMT	1	3	11.26%	20A	8 AWG	THWN-2 COPPER	0.91	(36°C)	1	11.00A	13.75A	40A	36.40A	75°C	5FT	0.06%



SCALE: NTS

INTERCONNECTION
120% RULE - NCEC 705.12(B)(2)(3)(b)
UTILITY FEED + SOLAR BACKFEED 200A + 20A = 220A
BUSS RATING X 120% 200A x 120% = 240A

SYSTEM RATING
4.400 kWDC
2.695 kWAC

SERVICE INFO	
UTILITY PROVIDER:	DOMINION ENERGY
AHJ NAME:	HARNETT COUNTY
MAIN SERVICE VOLTAGE:	240V
MAIN SERVICE PANEL:	200 A
MAIN BREAKER RATING:	200 A
MAIN SERVICE LOCATION:	NORTH
SERVICE FEED SOURCE:	UNDERGROUND

LIGHTING ELECTRIC

LIGHTING ELECTRIC LLC
230 BLACKSNAKE RD,
STANLEY, NC 28164, USA
PH# : (910) 356-1521
LICENSE NUMBER :- 29517

SYSTEM INFO
(11) Q CELLS Q.PEAK DUO BLK ML-G10.A+ (400W)
(11) ENPHASE IQ8-60-2-US
DC SYSTEM SIZE: 4.400 kWDC
AC SYSTEM SIZE: 2.695 kWAC

REVISIONS		
DESCRIPTION	DATE	REV
REVISION	01/11/2023	A

PROJECT NAME & ADDRESS

RICHARD BARRETO
RESIDENCE
89 CALDWELL ST, SPRING LAKE, NC 28390, USA
EMAIL ID: RICHARDARRETO@GMAIL.COM
PHONE NO. (910) 225-2262

DATE: 1/11/2023

SHEET NAME
ELECTRICAL
LINE & CALCS.

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-7

SOLAR MODULE SPECIFICATIONS	
MANUFACTURER / MODEL	Q CELLS Q.PEAK DUO BLK ML-G10.A+ (400W)
VMP	37.13 V
IMP	10.77 A
VOC	45.3 V
ISC	11.14 A
TEMP. COEFF. VOC	-0.27%/K
PTC RATING	376.55 W
MODULE DIMENSION	74"(L) x 41.1"(W)
PANEL WATTAGE	400 W

INVERTER SPECIFICATIONS	
MANUFACTURER / MODEL	ENPHASE IQ8-60-2-US
MAX DC SHORT CIRCUIT CURRENT	15 A
CONTINUOUS OUTPUT CURRENT	1 A

AMBIENT TEMPERATURE SPECS	
RECORD LOW TEMP	-10°C
AMBIENT TEMP (HIGH TEMP 2%)	36°C
CONDUIT HEIGHT	7/8"
ROOF TOP TEMP	90°C
CONDUCTOR TEMPERATURE RATE	58°C
MODULE TEMPERATURE COEFFICIENT OF VOC	-0.27%/K

PERCENT OF VALUES	NUMBER OF CURRENT CARRYING CONDUCTORS IN EMT
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 11 IQ8 MICROS, THE VOLTAGE RISE ON THE 240 VAC Q CABLE IS 0.46%

VOLTAGE RISE FROM THE JUNCTION BOX TO THE IQ COMBINER BOX 4C

VRISE = (AMPS/INVERTER X NUMBER OF INVERTERS) X (RESISTANCE IN OHMS/FT.) X (2-WAY WIRE LENGTH IN FT.)
= (1 AMP X 11) X (0.00129 OHMS/FT) X (31 FT X 2)
= 11.00 AMPS X 0.00129 OHMS/FT) X 62 FT
= 0.88 VOLTS
%VRISE = 0.88 VOLTS ÷ 240 VOLTS = 0.37%
THE VOLTAGE RISE FROM THE JUNCTION BOX TO THE IQ COMBINER BOX 4C IS 0.37%

VOLTAGE RISE FROM THE IQ COMBINER BOX 4C TO THE NON FUSED AC DISCONNECT

VRISE = (AMPS/INVERTER X NUMBER OF INVERTERS) X (RESISTANCE IN OHMS/FT.) X (2-WAY WIRE LENGTH IN FT.)
= (1 AMP X 11) X (0.00129 OHMS/FT) X (5 FT X 2)
= 11.00 AMPS X 0.00129 OHMS/FT) X 10 FT
= 0.14 VOLTS
%VRISE = 0.14 VOLTS ÷ 240 VOLTS = 0.06%
THE VOLTAGE RISE FROM THE IQ COMBINER BOX 4C TO THE NON FUSED AC DISCONNECT IS 0.06%

VOLTAGE RISE FROM THE NON FUSED AC DISCONNECT TO THE MSP

VRISE = (AMPS/INVERTER X NUMBER OF INVERTERS) X (RESISTANCE IN OHMS/FT.) X (2-WAY WIRE LENGTH IN FT.)
= (1 AMP X 11) X (0.00129 OHMS/FT) X (5 FT X 2)
= 11.00 AMPS X 0.00129 OHMS/FT) X 10 FT
= 0.14 VOLTS
%VRISE = 0.14 VOLTS ÷ 240 VOLTS = 0.06%
THE VOLTAGE RISE FROM THE NON FUSED AC DISCONNECT TO THE MSP IS 0.06%

TOTAL SYSTEM VOLTAGE RISE FOR ALL WIRE SECTIONS

0.46% + 0.37% + 0.06% + 0.06% = 0.95%

LIGHTING ELECTRIC

LIGHTING ELECTRIC LLC
230 BLACKSNAKE RD,
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PH# : (910) 356-1521
LICENSE NUMBER :- 29517

SYSTEM INFO

(11) Q CELLS
Q.PEAK DUO BLK ML-G10.A+
(400W)

(11) ENPHASE
IQ8-60-2-US

DC SYSTEM SIZE: 4.400 kWDC

AC SYSTEM SIZE: 2.695 kWAC

REVISIONS		
DESCRIPTION	DATE	REV
REVISION	01/11/2023	A

PROJECT NAME & ADDRESS

RICHARD BARRETO
RESIDENCE
89 CALDWELL ST, SPRING LAKE, NC 28390, USA
EMAIL ID: RICHARDARRETO@GMAIL.COM
PHONE NO. (910) 225-2262

DATE: 1/11/2023

SHEET NAME
SPECIFICATIONS & NOTES

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-8

1

⚠ WARNING

ELECTRIC SHOCK HAZARD

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

LABEL LOCATION:

POINT OF INTERCONNECTION, MAIN SERVICE DISCONNECT, AC DISCONNECT, AC COMBINER, INVERTER

PER CODE: NCEC 690.13(B)

2

⚠ CAUTION

DUAL POWER SOURCE SECOND SOURCE IS PHOTOVOLTAIC

LABEL LOCATION:

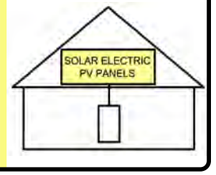
MAIN SERVICE DISCONNECT/ AC DISCONNECT/ MAIN SERVICE PANEL/ REVENUE METER/ AC COMBINER

PER CODE: NECE 705.12(C)

3

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 LOCATION:

MAIN SERVICE DISCONNECT IF MSD IS OUTSIDE PLACE IT THERE / IF MSD IS INSIDE PLACE ON THE AC DISCONNECT

PER CODE: 2020 NCEC 690.56(C)

4

PHOTOVOLTAIC SYSTEM UTILITY DISCONNECT SWITCH

LABEL LOCATION:

AC DISCONNECT

PER CODE: NCEC 690.56(C)

(2)

5

PHOTOVOLTAIC AC DISCONNECT

RATED AC OUTPUT CURRENT 11 AMPS

NOMINAL OPERATING AC VOLTAGE 240 VOLTS

LABEL LOCATION:

INTERACTIVE SYSTEM POINT OF INTERCONNECTION

PER CODE: NFPA 70, NCEC 690.54

6

WARNING

INVERTER OUTPUT CONNECTION DO NOT RELOCATE THIS OVERCURRENT DEVICE

LABEL LOCATION:

PLACE THIS LABEL AT P.O.C. TO SERVICE DISTRIBUTION EQUIPMENT (I.E. MAIN PANEL (AND SUBPANEL IF APPLICABLE))

PER CODE: NCEC 705.12(B)(3)(2)

7

WARNING:

PHOTOVOLTAIC POWER SOURCE

LABEL LOCATION:

CONDUIT

PER CODE: NCEC 690.31(D)(2)

8

CAUTION : SOLAR CIRCUIT

LABEL LOCATION:

MARKINGS PLACED ON ALL INTERIOR AND EXTERIOR CONDUIT, RACEWAYS, ENCLOSURES, AND CABLE ASSEMBLIES AT LEAST EVERY 1O FT, AT TURNS AND ABOVE/BELOW PENETRATIONS AND ALL COMBINER/JUNCTION BOXES

PER CODE: IFC 606.11.1.4

9

WARNING - Electric Shock Hazard

No user serviceable parts inside

Contact authorized service provider for assistance

LABEL LOCATION:

INVERTER & JUNCTION BOXES (ROOF) PER CODE: NCEC 690.13 (G)(3) & 690.13 (G)(4)

ADHESIVE FASTENED SIGNS

- THE LABEL SHALL BE SUITABLE FOR THE ENVIRONMENT WHERE IT IS INSTALLED.
- WHERE REQUIRED ELSEWHERE IN THIS CODE, ALL FIELD APPLIED LABELS, WARNING AND MARKINGS SHOULD COMPLY WITH ANSI 2535.4 [NEC 110.21(B) FIELD MARKING].
- ADHESIVE FASTENED SIGNS MAY BE ACCEPTABLE IF PROPERLY ADHERED. VINYL SIGNS SHALL BE WEATHER RESISTANT [IFC 605.11.1.3]

LIGHTING ELECTRIC

LIGHTING ELECTRIC LLC
230 BLACKSNAKE RD,
STANLEY, NC 28164, USA
PH# : (910) 356-1521
LICENSE NUMBER :- 29517

SYSTEM INFO
(11) Q CELLS Q.PEAK DUO BLK ML-G10.A+ (400W)
(11) ENPHASE IQ8-60-2-US
DC SYSTEM SIZE: 4.400 kWDC
AC SYSTEM SIZE: 2.695 kWAC

REVISIONS		
DESCRIPTION	DATE	REV
REVISION	01/11/2023	A

PROJECT NAME & ADDRESS

RICHARD BARRETO
RESIDENCE
89 CALDWELL ST, SPRING LAKE, NC 28390, USA
EMAIL ID: RICHARDARRETO@GMAIL.COM
PHONE NO. (910) 225-2262

DATE: 1/11/2023

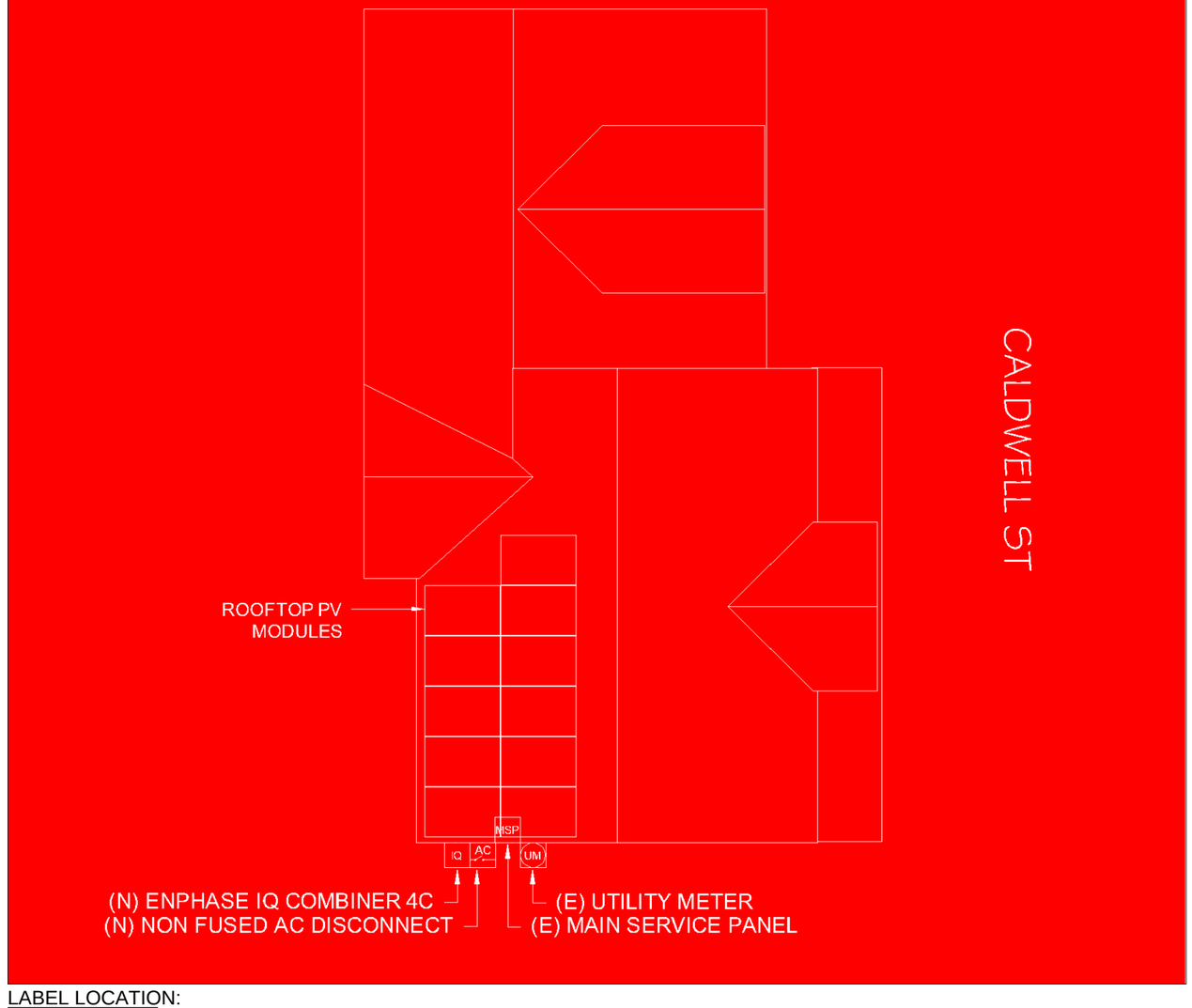
SHEET NAME
SIGNAGE

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-9

CAUTION!

POWER TO THIS SERVICE IS ALSO SUPPLIED FROM THE FOLLOWING SOURCE WITH DISCONNECTS LOCATED AS SHOWN



LABEL LOCATION:
EACH SERVICE EQUIPMENT LOCATION AND AT THE LOCATION(S) OF THE SYSTEM DISCONNECT(S) FOR ALL ELECTRIC POWER PRODUCTION SOURCES CAPABLE OF BEING INTERCONNECTED
(PER CODE: NCEC 705.10)

LIGHTING ELECTRIC

LIGHTING ELECTRIC LLC
230 BLACKSNAKE RD,
STANLEY, NC 28164, USA
PH# : (910) 356-1521
LICENSE NUMBER :- 29517

SYSTEM INFO
(11) Q CELLS Q.PEAK DUO BLK ML-G10.A+ (400W)
(11) ENPHASE IQ8-60-2-US
DC SYSTEM SIZE: 4.400 kWDC
AC SYSTEM SIZE: 2.695 kWAC

REVISIONS		
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PHONE NO. (910) 225-2262

DATE: 1/11/2023

SHEET NAME
SIGNAGE

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-10

powered by Q.ANTUM DUO Z

Q.PEAK DUO BLK ML-G10.a+

385-405

ENDURING HIGH PERFORMANCE

25 YR Warranty Product & Performance

EUPD RESEARCH TOP BRAND PV MODULES EUROPE 2021

Q CELLS Yield Security

BREAKING THE 20% EFFICIENCY BARRIER

Q.ANTUM DUO Z Technology with zero gap cell layout boosts module efficiency up to 20.9%.

THE MOST THOROUGH TESTING PROGRAMME IN THE INDUSTRY

Q CELLS is the first solar module manufacturer to pass the most comprehensive quality programme in the industry: The new "Quality Controlled PV" of the independent certification institute TÜV Rheinland.

INNOVATIVE ALL-WEATHER TECHNOLOGY

Optimal yields, whatever the weather with excellent low-light and temperature behavior.

ENDURING HIGH PERFORMANCE

Long-term yield security with Anti LID Technology, Anti PID Technology[1], Hot-Spot Protect and Traceable Quality Tra.Q™.

EXTREME WEATHER RATING

High-tech aluminum alloy frame, certified for high snow (5400 Pa) and wind loads (4000 Pa).

A RELIABLE INVESTMENT

Inclusive 25-year product warranty and 25-year linear performance warranty[2].

[1] APT test conditions according to IEC / TS 62804-1:2015, method A (−1500 V, 96 h)

[2] See data sheet on rear for further information.

THE IDEAL SOLUTION FOR:

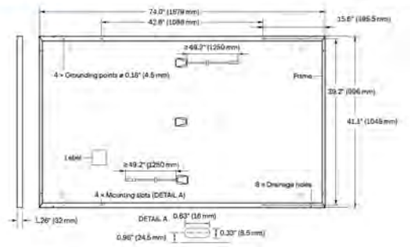
Rooftop arrays on residential buildings

Engineered in Germany

Q CELLS

MECHANICAL SPECIFICATION

Format	74.0 in × 41.1 in × 1.26 in (including frame) (1879 mm × 1045 mm × 32 mm)
Weight	48.5 lbs (22.0 kg)
Front Cover	0.13 in (3.2 mm) thermally pre-stressed glass with anti-reflection technology
Back Cover	Composite film
Frame	Black anodized aluminum
Cell	6 × 22 monocrystalline Q.ANTUM solar half cells
Junction Box	2.09-3.98 in × 1.26-2.36 in × 0.59-0.71 in (53-101 mm × 32-60 mm × 15-18 mm), IP67, with bypass diodes
Cable	4 mm² Solar cable; (+) ≥ 49.2 in (1250 mm), (−) ≥ 49.2 in (1250 mm)
Connector	Stäubli MC4; IP68

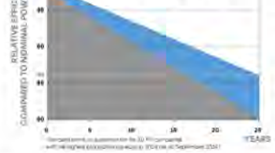


ELECTRICAL CHARACTERISTICS

POWER CLASS			385	390	395	400	405
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC[1] (POWER TOLERANCE +5 W / −0 W)							
Minimum	Power at MPP[1]	P_{MPP} [W]	385	390	395	400	405
	Short Circuit Current[1]	I_{SC} [A]	11.04	11.07	11.10	11.14	11.17
	Open Circuit Voltage[1]	V_{OC} [V]	45.19	45.23	45.27	45.30	45.34
	Current at MPP	I_{MPP} [A]	10.59	10.65	10.71	10.77	10.83
	Voltage at MPP	V_{MPP} [V]	36.36	36.62	36.88	37.13	37.39
	Efficiency[1]	η [%]	≥19.6	≥19.9	≥20.1	≥20.4	≥20.6
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT[2]							
Minimum	Power at MPP	P_{MPP} [W]	288.8	292.6	296.3	300.1	303.8
	Short Circuit Current	I_{SC} [A]	8.90	8.92	8.95	8.97	9.00
	Open Circuit Voltage	V_{OC} [V]	42.62	42.65	42.69	42.72	42.76
	Current at MPP	I_{MPP} [A]	8.35	8.41	8.46	8.51	8.57
	Voltage at MPP	V_{MPP} [V]	34.59	34.81	35.03	35.25	35.46

[1] Measurement tolerances P_{MPP} ±3%; I_{SC}; V_{OC} ±5% at STC: 1000 W/m², 25±2°C, AM 1.5 according to IEC 60904-3 • [2] 800 W/m², NMOT, spectrum AM 1.5

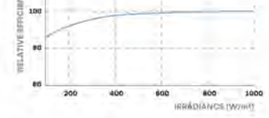
Q CELLS PERFORMANCE WARRANTY



At least 98% of nominal power during first year. Thereafter max. 0.5% degradation per year. At least 93.5% of nominal power up to 10 years. At least 86% of nominal power up to 25 years.

All data within measurement tolerances. Full warranties in accordance with the warranty terms of the Q CELLS sales organisation of your respective country.

PERFORMANCE AT LOW IRRADIANCE



Typical module performance under low irradiance conditions in comparison to STC conditions (25 °C, 1000 W/m²)

TEMPERATURE COEFFICIENTS

Temperature Coefficient of I_{SC}	α	[%/K]	+0.04	Temperature Coefficient of V_{OC}	β	[%/K]	−0.27
Temperature Coefficient of P_{MPP}	γ	[%/K]	−0.34	Nominal Module Operating Temperature	NMOT	[°F]	109±5.4 (43±3°C)

PROPERTIES FOR SYSTEM DESIGN

Maximum System Voltage V_{SYS}	[V]	1000 (IEC) / 1000 (UL)	PV module classification	Class II
Maximum Series Fuse Rating	[A DC]	20	Fire Rating based on ANSI / UL 61730	TYPE 2
Max. Design Load, Push / Pull[3]	[lbs/ft²]	75 (3600 Pa) / 55 (2660 Pa)	Permitted Module Temperature on Continuous Duty	−40 °F up to +185 °F (−40 °C up to +85 °C)
Max. Test Load, Push / Pull[3]	[lbs/ft²]	113 (5400 Pa) / 84 (4000 Pa)		

[3] See Installation Manual

QUALIFICATIONS AND CERTIFICATES

UL 61730, CE-compliant, Quality Controlled PV - TÜV Rheinland, IEC 61215:2016, IEC 61730:2016, U.S. Patent No. 9,893,215 (solar cells), QCPV Certification ongoing.

C SP us Certified US UL 61730 | CE | TÜVRheinland CERTIFIED www.tuv.com ID 111122027

PACKAGING INFORMATION

Horizontal packaging	76.4 in 1940 mm	43.3 in 1100 mm	48.0 in 1220 mm	1656 lbs 751 kg	24 pallets	24 pallets	32 modules

Note: Installation instructions must be followed. See the installation and operating manual or contact our technical service department for further information on approved installation and use of this product.

Hanwha Q CELLS America Inc.
400 Spectrum Center Drive, Suite 1400, Irvine, CA 92618, USA | TEL +1 949 748 59 96 | EMAIL inquiry@us.q-cells.com | WEB www.q-cells.us

LIGHTING ELECTRIC

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PH# : (910) 356-1521
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SYSTEM INFO
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(11) ENPHASE IQ8-60-2-US
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DESCRIPTION	DATE	REV
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PHONE NO. (910) 225-2262

DATE: 1/11/2023

SHEET NAME
EQUIPMENT SPECIFICATIONS

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-11

ENPHASE

DATA SHEET

IQ8 Series Microinverters

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

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

Enphase 25 year limited warranty

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

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

UL CERTIFIED SAFETY

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

Easy to install

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

High productivity and reliability

- Produce power even when the grid is down*
- More than one million cumulative hours of testing
- Class II double-insulated enclosure
- Optimized for the latest high-powered PV modules

Microgrid-forming

- Complies with the latest advanced grid support**
- Remote automatic updates for the latest grid requirements
- Configurable to support a wide range of grid profiles
- Meets CA Rule 21 (UL 1741-SA) requirements

IQ8SE-DS-0001-01-EN-US-2022-03-17

* Only when installed with IQ System Controller 2, meets UL 1741. IQ8H-208V operates only in grid-tied mode.
** IQ8 Series Microinverters supports split phase, 240V. IQ8H-208 supports split phase, 208V only.

IQ8 Series Microinverters

INPUT DATA (DC)		IQ8-60-2-US	IQ8PLUS-72-2-US	IQ8M-72-2-US	IQ8A-72-2-US	IQ8H-240-72-2-US	IQ8H-208-72-2-US[1]
Commonly used module pairings[2]	W	235 – 350	235 – 440	260 – 460	295 – 500	320 – 540+	295 – 500+
Module compatibility		60-cell/120 half-cell		60-cell/120 half-cell, 66-cell/132 half-cell and 72-cell/144 half-cell			
MPPT voltage range	V	27 – 37	29 – 45	33 – 45	36 – 45	38 – 45	38 – 45
Operating range	V	25 – 48			25 – 58		
Min/max start voltage	V	30 / 48			30 / 58		
Max input DC voltage	V	50			60		
Max DC current[3] [module Isc]	A			15			
Overvoltage class DC port				II			
DC port backfeed current	mA			0			
PV array configuration		1x1 Ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit					
OUTPUT DATA (AC)		**IQ8-60-2-US**	**IQ8PLUS-72-2-US**	**IQ8M-72-2-US**	**IQ8A-72-2-US**	**IQ8H-240-72-2-US**	**IQ8H-208-72-2-US[1]**
Peak output power	VA	245	300	330	366	384	366
Max continuous output power	VA	240	290	325	349	380	360
Nominal (L-L) voltage/range[4]	V			240 / 211 – 264			208 / 183 – 250
Max continuous output current	A	1.0	1.21	1.35	1.45	1.58	1.73
Nominal frequency	Hz			60			
Extended frequency range	Hz			50 – 68			
AC short circuit fault current over 3 cycles	Arms			2			4.4
Max units per 20 A (L-L) branch circuit[5]		16	13	11	11	10	9
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	%	97.5	97.6	97.6	97.6	97.6	97.4
CEC weighted efficiency	%	97	97	97	97.5	97	97
Night-time power consumption	mW			60			
MECHANICAL DATA							
Ambient temperature range		-40°C to +60°C (-40°F to +140°F)					
Relative humidity range		4% to 100% (condensing)					
DC Connector type		MC4					
Dimensions (HxWxD)		212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")					
Weight		1.08 kg (2.38 lbs)					
Cooling		Natural convection – no fans					
Approved for wet locations		Yes					
Pollution degree		PD3					
Enclosure		Class II double-insulated, corrosion resistant polymeric enclosure					
Environ. category / UV exposure rating		NEMA Type 6 / outdoor					
COMPLIANCE							
Certifications		CA Rule 21 (UL 1741-SA), UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01 This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020 section 690.12 and C22.1-2018 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to manufacturer's instructions.					

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

IQ8SE-DS-0001-01-EN-US-2022-03-17

LIGHTING ELECTRIC

LIGHTING ELECTRIC LLC
230 BLACKSNAKE RD,
STANLEY, NC 28164, USA
PH# : (910) 356-1521
LICENSE NUMBER :- 29517

SYSTEM INFO
(11) Q CELLS Q.PEAK DUO BLK ML-G10.A+ (400W)
(11) ENPHASE IQ8-60-2-US
DC SYSTEM SIZE: 4.400 kWDC
AC SYSTEM SIZE: 2.695 kWAC

REVISIONS

DESCRIPTION	DATE	REV
REVISION	01/11/2023	A

PROJECT NAME & ADDRESS

RICHARD BARRETO
RESIDENCE
89 CALDWELL ST, SPRING LAKE, NC 28390, USA
EMAIL ID: RICHARDARRETO@GMAIL.COM
PHONE NO. (910) 225-2262

DATE: 1/11/2023

SHEET NAME
EQUIPMENT SPECIFICATIONS

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-12

Data Sheet
Enphase Networking

Enphase IQ Combiner 4/4C

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

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

Smart

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

Simple

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

Reliable

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

LISTED

To learn more about Enphase offerings, visit **enphase.com**

ENPHASE

Enphase IQ Combiner 4/4C

MODEL NUMBER	
IQ Combiner 4 (X-IQ-AM1-240-4)	IQ Combiner 4 with Enphase IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes a silver solar shield to match the IQ Battery system and IQ System Controller 2 and to deflect heat.
IQ Combiner 4C (X-IQ-AM1-240-4C)	IQ Combiner 4C with Enphase IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), a plug-and-play industrial-grade cell modem for systems up to 60 microinverters. (Available in the US, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.) Includes a silver solar shield to match the IQ Battery and IQ System Controller and to deflect heat.
ACCESSORIES AND REPLACEMENT PARTS	(not included, order separately)
Ensemble Communications Kit COMMS-CELLMODEM-M1-06 CELLMODEM-M1-06-SP-05 CELLMODEM-M1-06-AT-05	- Includes COMMS-KIT-01 and CELLMODEM-M1-06-SP-05 with 5-year Sprint data plan for Ensemble sites - 4G based LTE-M1 cellular modem with 5-year Sprint data plan - 4G based LTE-M1 cellular modem with 5-year AT&T data plan
Circuit Breakers BRK-10A-2-240V BRK-15A-2-240V BRK-20A-2P-240V BRK-15A-2P-240V-B BRK-20A-2P-240V-B	Supports Eaton BR210, BR215, BR220, BR230, BR240, BR250, and BR260 circuit breakers. Circuit breaker, 2 pole, 10A, Eaton BR210 Circuit breaker, 2 pole, 15A, Eaton BR215 Circuit breaker, 2 pole, 20A, Eaton BR220 Circuit breaker, 2 pole, 15A, Eaton BR215B with hold down kit support Circuit breaker, 2 pole, 20A, Eaton BR220B with hold down kit support
EPLC-01	Power line carrier (communication bridge pair), quantity - one pair
XA-SOLARSHIELD-ES	Replacement solar shield for IQ Combiner 4/4C
XA-PLUG-120-3	Accessory receptacle for Power Line Carrier in IQ Combiner 4/4C (required for EPLC-01)
XA-ENV-PCBA-3	Replacement IQ Gateway printed circuit board (PCB) for Combiner 4/4C
X-IQ-NA-HD-125A	Hold down kit for Eaton circuit breaker with screws.
ELECTRICAL SPECIFICATIONS	
Rating	Continuous duty
System voltage	120/240 VAC, 60 Hz
Eaton BR series busbar rating	125 A
Max. continuous current rating	65 A
Max. continuous current rating (input from PV/storage)	64 A
Max. fuse/circuit rating (output)	90 A
Branch circuits (solar and/or storage)	Up to four 2-pole Eaton BR series Distributed Generation (DG) breakers only (not included)
Max. total branch circuit breaker rating (input)	80A of distributed generation / 95A with IQ Gateway breaker included
Production metering CT	200 A solid core pre-installed and wired to IQ Gateway
Consumption monitoring CT (CT-200-SPLIT)	A pair of 200 A split core current transformers
MECHANICAL DATA	
Dimensions (WxHxD)	37.5 x 49.5 x 16.8 cm (14.75" x 19.5" x 6.63"). Height is 21.06" (53.5 cm) with mounting brackets.
Weight	7.5 kg (16.5 lbs)
Ambient temperature range	-40° C to +46° C (-40° to 115° F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction
Wire sizes	• 20 A to 50 A breaker inputs: 14 to 4 AWG copper conductors • 60 A breaker branch input: 4 to 1/0 AWG copper conductors • Main lug combined output: 10 to 2/0 AWG copper conductors • Neutral and ground: 14 to 1/0 copper conductors Always follow local code requirements for conductor sizing.
Altitude	To 2000 meters (6,560 feet)
INTERNET CONNECTION OPTIONS	
Integrated Wi-Fi	802.11b/g/n
Cellular	CELLMODEM-M1-06-SP-05, CELLMODEM-M1-06-AT-05 (4G based LTE-M1 cellular modem). Note that an Enphase Mobile Connect cellular modem is required for all Ensemble installations.
Ethernet	Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included)
COMPLIANCE	
Compliance, IQ Combiner	UL 1741, CAN/CSA C22.2 No. 107.1, 47 CFR, Part 15, Class B, ICES 003 Production metering: ANSI C12.20 accuracy class 0.5 (PV production) Consumption metering: accuracy class 2.5
Compliance, IQ Gateway	UL 60601-1/CANCSA 22.2 No. 61010-1

To learn more about Enphase offerings, visit **enphase.com**

ENPHASE

LIGHTING ELECTRIC
LIGHTING ELECTRIC LLC
230 BLACKSNAKE RD,
STANLEY, NC 28164, USA
PH# : (910) 356-1521
LICENSE NUMBER :- 29517

SYSTEM INFO
(11) Q CELLS Q.PEAK DUO BLK ML-G10.A+ (400W)
(11) ENPHASE IQ8-60-2-US
DC SYSTEM SIZE: 4.400 kWDC
AC SYSTEM SIZE: 2.695 kWAC

REVISIONS		
DESCRIPTION	DATE	REV
REVISION	01/11/2023	A

PROJECT NAME & ADDRESS

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RESIDENCE
89 CALDWELL ST, SPRING LAKE, NC 28390, USA
EMAIL ID: RICHARDARRETO@GMAIL.COM
PHONE NO. (910) 225-2262

DATE: 1/11/2023

SHEET NAME
EQUIPMENT SPECIFICATIONS

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-13

FLASH LOC

UNIRAC
BETTER SOLAR STARTS HERE

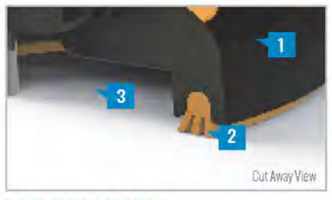
FLASHLOC is the ultimate attachment for composition shingle and rolled comp roofs. The all-in-one mount installs fast — no kneeling on hot roofs to install flashing, no prying or cutting shingles, no pulling nails. Simply drive the lag bolt and inject sealant into the base. **FLASH**LOC's patented TRIPLE SEAL technology preserves the roof and protects the penetration with a permanent pressure seal. Kitted with lag bolts, sealant, and hardware for maximum convenience. Don't just divert water, **LOC it out!**

UNIRAC 25 YEAR FULL-SYSTEM WARRANTY

TESTED TO TAS-100
WIND DRIVEN RAIN TEST
AND UL441 RAIN TEST

PROTECT THE ROOF

Install a high-strength waterproof attachment without lifting, prying or damaging shingles.



LOC OUT WATER

With an outer shield 1 contour-conforming gasket 2 and pressurized sealant chamber 3 the Triple Seal technology delivers a 100% waterproof connection.

HIGH-SPEED INSTALL

Simply drive lag bolt and inject sealant into the port 4 to create a permanent pressure seal.

FASTER INSTALLATION. 25-YEAR WARRANTY.

FOR QUESTIONS OR CUSTOMER SERVICE VISIT UNIRAC.COM OR CALL (505) 248-2702

FLASH LOC

INSTALLATION GUIDE

UNIRAC
BETTER SOLAR STARTS HERE

PRE-INSTALL

Snap chalk lines for attachment rows. On shingle roofs, snap lines 1-3/4" below upslope edge of shingle course. Locate rafters and mark attachment locations.

At each location, drill a 7/32" pilot hole. Clean roof surface of dirt, debris, snow, and ice. Next, BACKFILL ALL PILOT HOLES WITH SEALANT.

NOTE: Space mounts per racking system install specifications.

STEP 1: SECURE

Place **FLASH**LOC over pilot hole with lag on down-slope side. Align indicator marks on sides of mount with chalk line. Pass included lag bolt and sealing washer through **FLASH**LOC into pilot hole. Drive lag bolt until mount is held firmly in place.

NOTE: The EPDM in the sealing washer will expand beyond the edge of the metal washer when proper torque is applied.

STEP 2: SEAL

Insert tip of UNIRAC provided sealant into port. Inject until sealant exits both vents.

Continue array installation, attaching rails to mounts with provided T-bolts.

NOTE: When **FLASH**LOC is installed over gap between shingle tabs or vertical joints, fill gap/joint with sealant between mount and upslope edge of shingle course.

USE ONLY UNIRAC APPROVED SEALANTS: Chemlink Duralink 50, Chemlink M-1, Geocel 4500, or Geocel S-4

FASTER INSTALLATION. 25-YEAR WARRANTY.

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LIGHTING ELECTRIC

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230 BLACKSNAKE RD,
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AC SYSTEM SIZE: 2.695 kWAC

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PHONE NO. (910) 225-2262

DATE: 1/11/2023

SHEET NAME
EQUIPMENT SPECIFICATIONS

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-14

SOLARMOUNT

UNIRAC

SOLARMOUNT defined the standard in solar racking. Features are designed to get installers off the roof faster. Our grounding & bonding process eliminates copper wire and grounding straps to reduce costs. Systems can be configured with standard or light rail to meet your design requirements at the lowest cost possible. The superior aesthetics package provides a streamlined clean edge for enhanced curb appeal, with no special brackets required for installation.

Now Featuring:

THE NEW FACE OF SOLAR RACKING

Superior Aesthetics Package

LOSE ALL OF THE COPPER & LUGS
System grounding through Enphase microinverters and trunk cables

SMALL IS THE NEW NEW BIG THING
Light Rail is Fully Compatible with all SM Components

ENHANCED DESIGN & LAYOUT TOOLS
Featuring Google Map Capabilities within U-Builder

FAST INSTALLATION. SUPERIOR AESTHETICS

OPTIMIZED COMPONENTS • VERSATILITY • DESIGN TOOLS • QUALITY PROVIDER

SOLARMOUNT

UNIRAC

OPTIMIZED COMPONENTS

INTEGRATED BONDING & PRE-ASSEMBLED PARTS

Components are pre-assembled and optimized to reduce installation steps and save labor time. Our new grounding & bonding process eliminates copper wire and grounding straps or bonding jumpers to reduce costs. Utilize the microinverter mount with a wire management clip for an easier installation.

VERSATILITY

ONE PRODUCT - MANY APPLICATIONS

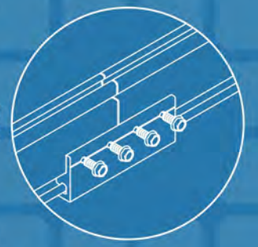
Quickly set modules flush to the roof or at a desired tilt angle. Change module orientation to portrait or landscape while securing a large variety of framed modules on flat, low slope or steep pitched roofs. Available in mill, clear and dark anodized finishes to outperform your projects financial and aesthetic aspirations.

AUTOMATED DESIGN TOOL

DESIGN PLATFORM AT YOUR SERVICE

Creating a bill of materials is just a few clicks away with U-Builder, a powerful online tool that streamlines the process of designing a code compliant solar mounting system. Save time by creating a user profile, and recall preferences and projects automatically when you log in. You will enjoy the ability to share projects with customers; there's no need to print results and send to a distributor, just click and share.

INTEGRATED BONDING MIDCLAMP



INTEGRATED BONDING SPLICE BAR

INTEGRATED BONDING L-FOOT w/ T-BOLT

INTEGRATED BONDING MICROINVERTER MOUNT w/ WIRE MANAGEMENT

LISTED **UL2703** BONDING & GROUNDING MECHANICAL LOADING SYSTEM FIRE CLASSIFICATION

UNIRAC CUSTOMER SERVICE MEANS THE HIGHEST LEVEL OF PRODUCT SUPPORT

UNMATCHED EXPERIENCE | CERTIFIED QUALITY | ENGINEERING EXCELLENCE | BANKABLE WARRANTY | DESIGN TOOLS | PERMIT DOCUMENTATION

TECHNICAL SUPPORT

Unirac's technical support team is dedicated to answering questions & addressing issues in real time. An online library of documents including engineering reports, stamped letters and technical data sheets greatly simplifies your permitting and project planning process.

CERTIFIED QUALITY PROVIDER

Unirac is the only PV mounting vendor with ISO certifications for 9001:2015, 14001:2015 and OHSAS 18001:2007, which means we deliver the highest standards for fit, form, and function. These certifications demonstrate our excellence and commitment to first class business practices.

BANKABLE WARRANTY

Don't leave your project to chance, Unirac has the financial strength to back our products and reduce your risk. Have peace of mind knowing you are receiving products of exceptional quality. SOLARMOUNT is covered by a twenty five (25) year limited product warranty and a five (5) year limited finish warranty.

PROTECT YOUR REPUTATION WITH QUALITY RACKING SOLUTIONS BACKED BY ENGINEERING EXCELLENCE AND A SUPERIOR SUPPLY CHAIN

PUB2017FEB28 · PRINTED

LIGHTING ELECTRIC

LIGHTING ELECTRIC LLC
230 BLACKSNAKE RD,
STANLEY, NC 28164, USA
PH# : (910) 356-1521
LICENSE NUMBER :- 29517

SYSTEM INFO
(11) Q CELLS Q.PEAK DUO BLK ML-G10.A+ (400W)
(11) ENPHASE IQ8-60-2-US
DC SYSTEM SIZE: 4.400 kWDC
AC SYSTEM SIZE: 2.695 kWAC

REVISIONS		
DESCRIPTION	DATE	REV
REVISION	01/11/2023	A

PROJECT NAME & ADDRESS

RICHARD BARRETO
RESIDENCE
89 CALDWELL ST, SPRING LAKE, NC 28390, USA
EMAIL ID: RICHARDARRETO@GMAIL.COM
PHONE NO. (910) 225-2262

DATE: 1/11/2023

SHEET NAME
EQUIPMENT SPECIFICATIONS

SHEET SIZE
ANSI B
11" X 17"

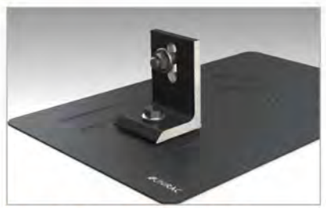
SHEET NUMBER
PV-15

SOLARMOUNT

UNIRAC

SOLARMOUNT is the professionals' choice for residential PV mounting applications. Every aspect of the system is designed for an easier, faster installation experience. **SOLAR**MOUNT is a complete solution with revolutionary universal clamps, **FLASHKIT** PRO, full system UL 2703 certification and 25-year warranty. Not only is **SOLAR**MOUNT easy to install, but best-in-class aesthetics make it the most attractive on any block!

New & Improved:
THE PROFESSIONALS' CHOICE
With Superior Aesthetics



NOW FEATURING FLASHKIT PRO
The Complete Roof Attachment Solution
FEATURING SHED & SEAL TECHNOLOGY

NOW WITH UNIVERSAL MIDCLAMPS
Accommodates 30mm-51mm module frames
One tool, one-person installs are here!

REVOLUTIONARY NEW ENDCLAMPS
Concealed design and included End Caps

THE PROFESSIONALS' CHOICE FOR RESIDENTIAL RACKING

BEST INSTALLATION EXPERIENCE • CURB APPEAL • COMPLETE SOLUTION • UNIRAC SUPPORT

FOR QUESTIONS OR CUSTOMER SERVICE VISIT UNIRAC.COM OR CALL (505) 248-2702

SOLARMOUNT

UNIRAC

BETTER DESIGNS

TRUST THE INDUSTRY'S BEST DESIGN TOOL
Start the design process for every project in our U-Builder on-line design tool. It's a great way to save time and money.

BETTER SYSTEMS

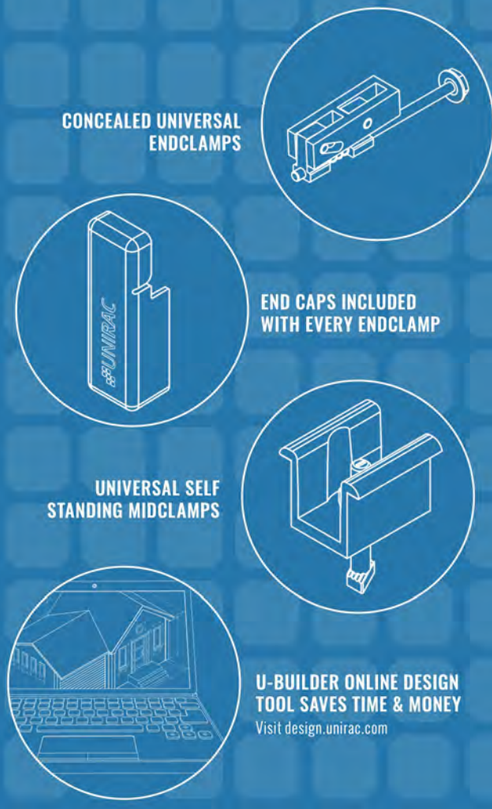
ONE SYSTEM - MANY APPLICATIONS
Quickly set modules flush to the roof on steep pitched roofs. Orient a large variety of modules in Portrait or Landscape. Tilt the system up on flat or low slow roofs. Components available in mill, clear, and dark finishes to optimize your design financials and aesthetics.

BETTER RESULTS

MAXIMIZE PROFITABILITY ON EVERY JOB
Trust Unirac to help you minimize both system and labor costs from the time the job is quoted to the time your teams get off the roof. Faster installs. Less Waste. More Profits.

BETTER SUPPORT

WORK WITH THE INDUSTRIES MOST EXPERIENCED TEAM
Professional support for professional installers and designers. You have access to our technical support and training groups. Whatever your support needs, we've got you covered. Visit Unirac.com/solarmount for more information.



LISTED **UL2703** BONDING & GROUNDING
MECHANICAL LOADING
SYSTEM FIRE CLASSIFICATION

UNIRAC CUSTOMER SERVICE MEANS THE HIGHEST LEVEL OF PRODUCT SUPPORT

UNMATCHED EXPERIENCE | CERTIFIED QUALITY | ENGINEERING EXCELLENCE | BANKABLE WARRANTY | DESIGN TOOLS | PERMIT DOCUMENTATION

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ENHANCE YOUR REPUTATION WITH QUALITY RACKING SOLUTIONS BACKED BY ENGINEERING EXCELLENCE AND A SUPERIOR SUPPLY CHAIN

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LIGHTING ELECTRIC

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(11) ENPHASE IQ8-60-2-US
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AC SYSTEM SIZE: 2.695 kWAC

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EMAIL ID: RICHARDARRETO@GMAIL.COM
PHONE NO. (910) 225-2262

DATE: 1/11/2023

SHEET NAME
EQUIPMENT SPECIFICATIONS

SHEET SIZE
ANSI B
11" X 17"

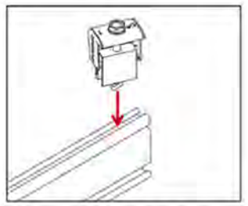
SHEET NUMBER
PV-16

SM SOLAR MOUNT

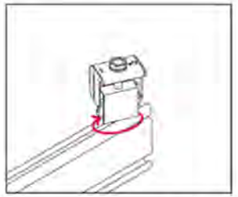
APPENDIX C

UNIRAC AF ENDCLAMP INSTALLATION GUIDE

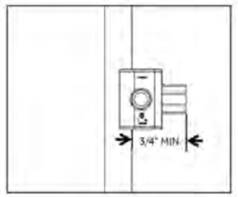
A PAGE



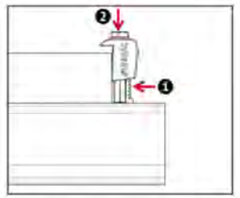
1. Position clamp to align T-bolt with rail slot. Lower clamp and Insert T-bolt into rail slot.



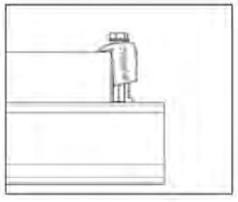
2. Rotate clamp clockwise 2/3 of a turn to engage T-bolt inside rail slot.



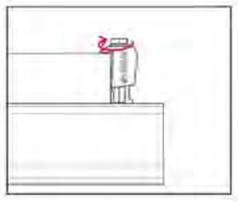
3. Place module at least 3/4" from end of rail and position clamp against module frame.



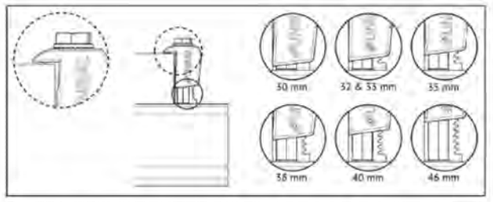
4. While applying pressure to hold the clamp against the module, push down on the module side of the clamp cap.



5. When the cap contacts the module frame, release and it will re-engage to the clamp base.



6. Tighten bolt and torque to 15 ft-lbs.



7. Confirm clamp is engaged in correct module height position and that the top of the cap is sitting level with the module frame.

NOTE: When installing 46mm modules, loosen bolt by 1 turn before positioning clamp against module frame. Do not force clamp onto module frame as this may damage the bonding pin.

SM SOLAR MOUNT

CODE COMPLIANCE NOTES

INSTALLATION GUIDE

C PAGE

SYSTEM LEVEL FIRE CLASSIFICATION

The system fire class rating requires installation in the manner specified in the SOLARMOUNT Installation Guide. SOLARMOUNT has been classified to the system level fire portion of UL2703. SOLARMOUNT has achieved system level performance for steep sloped roofs. The fire classification rating is only valid on roof pitches greater than 2:12 (slopes ≥ 2 inches per foot, or 9.5 degrees). The system is to be mounted over fire resistant roof covering rated for the application. There is no required minimum or maximum height limitation above the roof deck to maintain the system fire rating for SOLARMOUNT. Module Types, System Level Fire Ratings, and Mitigation Requirements are listed below:

Rail Type	Module Fire Types	System Level Fire Rating	Rail Direction	Module Orientation	Mitigation Required
Standard & HD Rails	1, 2, 3 with Metal Frame, 10 with Metal Frame, 19, 22, 25, 29, & 30	Class A, Class B & Class C	East-West	Landscape OR Portrait	None Required
			North-South	Landscape OR Portrait	None Required
Light Rail	1 & 2	Class A, Class B & Class C	East-West	Landscape OR Portrait	None Required
			North-South	Landscape OR Portrait	None Required
Standard, Light, & HD Rails	4 & 5	Class A, Class B & Class C	East-West	Landscape OR Portrait	Trim Installation per Solar Mount Installation Guide
			North-South	Landscape OR Portrait	

This racking system may be used to ground and/or mount a PV module compiying with UL1703 or UL61730 only when the specific module has been evaluated for grounding and/or mounting in compliance with the included instructions.

UL2703 CERTIFICATION MARKING LABEL

Unirac SOLARMOUNT is listed to UL 2703. Certification marking is embossed on all mid clamps as shown. Labels with additional information will be provided . After the racking system is fully assembled, a single label should be applied to the SOLARMOUNT rail at the edge of the array. **Before applying the label, the corners of the label that do not pertain to the system being installed must be removed so that only the installed system type is showing.**

Note: The sticker label should be placed such that it is visible, but not outward facing.

SM STANDARD RAIL

SM LIGHT RAIL

LIGHTING ELECTRIC

LIGHTING ELECTRIC LLC
230 BLACKSNAKE RD,
STANLEY, NC 28164, USA
PH# : (910) 356-1521
LICENSE NUMBER :- 29517

SYSTEM INFO
(11) Q CELLS Q.PEAK DUO BLK ML-G10.A+ (400W)
(11) ENPHASE IQ8-60-2-US
DC SYSTEM SIZE: 4.400 kWDC
AC SYSTEM SIZE: 2.695 kWAC

REVISIONS		
DESCRIPTION	DATE	REV
REVISION	01/11/2023	A

PROJECT NAME & ADDRESS

RICHARD BARRETO
RESIDENCE
89 CALDWELL ST, SPRING LAKE, NC 28390, USA
EMAIL ID: RICHARDARRETO@GMAIL.COM
PHONE NO. (910) 225-2262

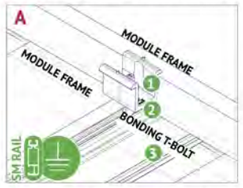
DATE: 1/11/2023

SHEET NAME
EQUIPMENT SPECIFICATIONS

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-17

SM SOLAR MOUNT BONDING CONNECTION GROUND PATHS INSTALLATION GUIDE 0 PAGE



BONDING MIDCLAMP ASSEMBLY

BONDING MIDCLAMP ASSEMBLY

1. Aluminum mid clamp with stainless steel bonding pins that pierce module frame anodization to bond module to module through clamp
2. Stainless steel nut bonds aluminum clamp to stainless steel T-bolt
3. Serrated T-bolt head penetrates rail anodization to bond T-bolt, nut, clamp, and modules to SM rail

BONDING RAIL SPLICE BAR

1. Bonding Hardware creates bond between splice bar and each rail section
2. Aluminum splice bar spans across rail gap to create rail to rail bond. Rail on at least one side of splice will be grounded.

Note: Splice bar and bolted connection are non-structural. The splice bar function is rail alignment and bonding.

RAIL TO L-FOOT w/BONDING T-BOLT

1. Serrated flange nut removes L-foot anodization to bond L-Foot to stainless steel T-bolt
2. Serrated T-bolt head penetrates rail anodization to bond T-bolt, nut, and L-foot to grounded SM rail

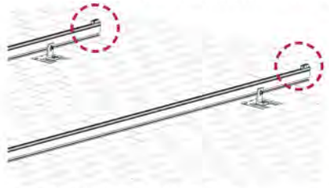
BONDING MICROINVERTER MOUNT

1. Hex nut with captive lock washer bonds metal microinverter flange to stainless steel T-bolt
2. Serrated T-bolt head penetrates rail anodization to bond T-bolt, nut, and L-foot to grounded SM rail System ground including racking and modules may be achieved through the trunk cable of approved microinverter systems. See page 1 for details

RACK SYSTEM GROUND

1. WEEB washer dimples pierce anodized rail to create bond between rail and lug
2. Solid copper wire connected to lug is routed to provide final system ground connection. NOTE: Ilsco lug can also be used when secured to the side of the rail. See page 8 for details

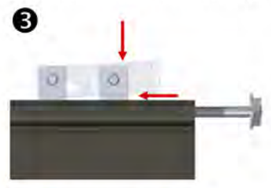
SM SOLAR MOUNT ENDCLAMP, FIRST MODULE INSTALLATION GUIDE L PAGE



INSTALL MODULE END CLAMPS: The End clamp is supplied as an assembly with a 1/2" hex head bolt that is accessible at the ends of rails. The clamp should be installed on the rails prior to installing end modules.

INSTALL END CLAMPS ON RAIL: Slide end clamp on to rail by engaging the two t-guide brackets with the top slot of the rails. Ensure bolt is extended as far as possible so that clamp is positioned at max. distance from end of rail.

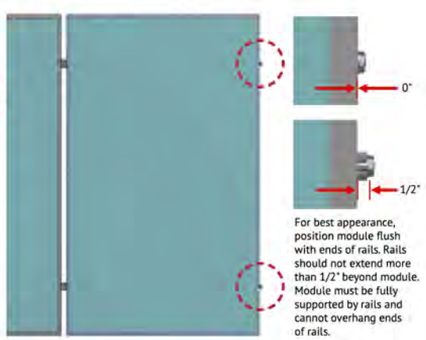
POSITION END CLAMPS: Slide end clamp assembly on to rail until bolt head engages with end of rail End clamps are positioned on rails prior to the first end module and prior to the last end module.



NOTE: To assist insertion of clamp into rail slot, Pressure may be applied to top or side of bracket as shown. Do not force clamp into rail by pushing on bolt with excessive force.

INSTALL FIRST MODULE: Install the first end module onto rails with the flange of the module frame positioned between end clamps an ends of rails.

ENGAGE CLAMP: While holding module in position and with flange in full contact with rail, rotate end clamp bolt until clamp engages with flange to provide clamp force.
To ensure bolt is not over-torqued, use low torque setting on drill or If using an impact driver, stop rotation as soon as impact action of driver begins.
TORQUE VALUE (See table and notes on PG. 6)
End clamp bolt to **5 ft-lbs**, No anti-seize



For best appearance, position module flush with ends of rails. Rails should not extend more than 1/2" beyond module. Module must be fully supported by rails and cannot overhang ends of rails.

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SHEET NAME
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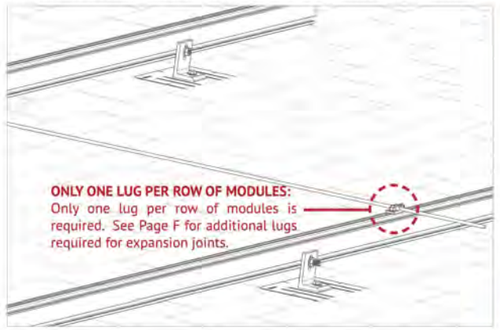
SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-18

SM SOLAR MOUNT — STANDARD SYSTEM GROUNDING INSTALLATION GUIDE — K PAGE

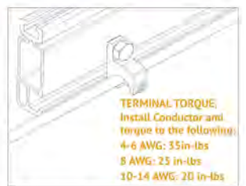


WEEBLUG CONDUCTOR - UNIRAC P/N 008002S:
Apply Anti Seize and insert a bolt in the aluminum rail and through the clearance hole in the stainless steel flat washer. Place the stainless steel flat washer on the bolt, oriented so the dimples will contact the aluminum rail. Place the lug portion on the bolt and stainless steel flat washer. Install stainless steel flat washer, lock washer and nut. Tighten the nut until the dimples are completely embedded into the rail and lug.
TORQUE VALUE 10 ft lbs. (See Note on PG. A)
See product data sheet for more details, Model No. WEEB-LUG-6.7

GROUNDING LUG MOUNTING DETAILS:
Details are provided for both the WEEB and Ilsco products. The WEEBLug has a grounding symbol located on the lug assembly. The Ilsco lug has a green colored set screw for grounding indication purposes. Installation must be in accordance with NFPA NEC 70, however the electrical designer of record should refer to the latest revision of NEC for actual grounding conductor cable size.
Required if not using approved integrated grounding microinverters

GROUNDING LUG - BOLT SIZE & DRILL SIZE		
GROUND LUG	**BOLT SIZE**	**DRILL SIZE**
WEEBLug	1/4"	N/A - Place in Top SM Rail Slot
ILSCO Lug	#10-32	7/32"

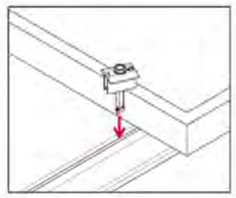
- Torque value depends on conductor size.
- See product data sheet for torque value.



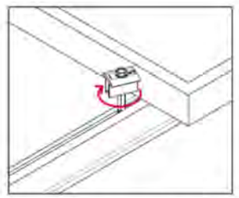
ILSCO LAY-IN LUG CONDUCTOR - UNIRAC P/N 008009P: Alternate Grounding Lug - Drill, deburr hole and bolt thru both rail walls per table.
TORQUE VALUE 5 ft lbs. (See Note on PG. A)
See ILSCO product data sheet for more details, Model No. GBL-4DBT.

NOTE: ISOLATE COPPER FROM ALUMINUM CONTACT TO PREVENT CORROSION

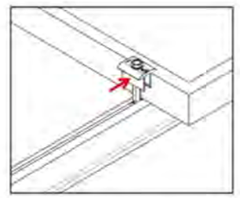
SM SOLAR MOUNT — APPENDIX C UNIVERSAL AF MIDCLAMP INSTALLATION GUIDE — B PAGE



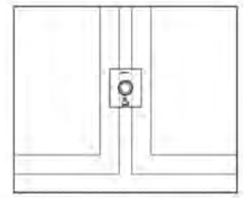
1. Position clamp to align T-bolt with rail slot. Lower clamp and insert T-bolt into rail slot



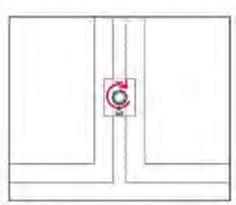
2. Rotate clamp clockwise 2/3 of a turn to engage T-bolt inside rail slot.



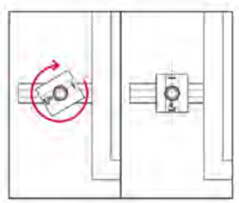
3. Slide clamp into position against module.



4. Place second module.



5. Tighten bolt and torque to 15 ft-lbs.



NOTE: If excessive force is applied in step 2, the cap may over-rotate causing it to be mis-aligned with the module frame. If this occurs, keep rotating the cap clockwise until it returns to the original position.

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