

PHOTOVOLTAIC ROOF MOUNT SYSTEM

25 MODULES-ROOF MOUNTED - 9.88 kWDC, 7.25 kWAC

110 VALLEY VIEW CT, SANFORD, NC 27332



DEL MAR, CA 92014, USA

SYSTEM SUMMARY:

- (N) 25 - CANADIAN SOLAR CS3N-395MS (395W) MODULES
- (N) 25 - ENPHASE ENERGY IQ8 PLUS-72-2-US MICRO-INVERTERS
- (N) JUNCTION BOX
- (E) 200A MAIN SERVICE PANEL WITH (E) 200A MAIN BREAKER
- (N) 60A NON FUSED AC DISCONNECT
- (N) ENPHASE IQ COMBINER BOX 4

DESIGN CRITERIA:

- ROOF TYPE: - ASPHALT SHINGLE
- NUMBER OF LAYERS: - 01
- ROOF FRAME: - 2"x4" TRUSSES @24" O.C.
- STORY: - TWO STORY
- SNOW LOAD : - 10 PSF
- WIND SPEED :- 117 MPH
- WIND EXPOSURE:- C
- EXPOSURE CATEGORY:- II

GOVERNING CODES:

- THIS PROJECT SHALL COMPLY WITH THE FOLLOWING CODE
- 2018 NORTH CAROLINA BUILDING CODE (NCBC)
- 2018 NORTH CAROLINA RESIDENTIAL CODE (NCRC)
- 2018 NORTH CAROLINA FIRE CODE (NCFC)
- 2018 NORTH CAROLINA PLUMBING CODE (NCPC)
- 2018 NORTH CAROLINA MECHANICAL CODE (NCMC)
- 2018 NORTH CAROLINA FUEL GAS CODE (NCFGC)
- 2018 NORTH CAROLINA ENERGY CONSERVATION CODE (NCECC)
- 2017 NORTH CAROLINA ELECTRICAL CODE (NCEC)
- 2015 INTERNATIONAL BUILDING CODE (IBC)
- 2015 INTERNATIONAL RESIDENTIAL CODE (IRC)
- 2015 INTERNATIONAL EXISTING BUILDING CODE (IEBC)
- 2015 INTERNATIONAL FUEL GAS CODE (IFGC)
- 2015 INTERNATIONAL FIRE CODE (IFC)
- 2015 INTERNATIONAL MECHANICAL CODE (IMC)
- 2015 INTERNATIONAL ENERGY CONSERVATION CODE (IECC)

INTERCONNECTION METHOD: BACKFEED BREAKER

SHEET INDEX

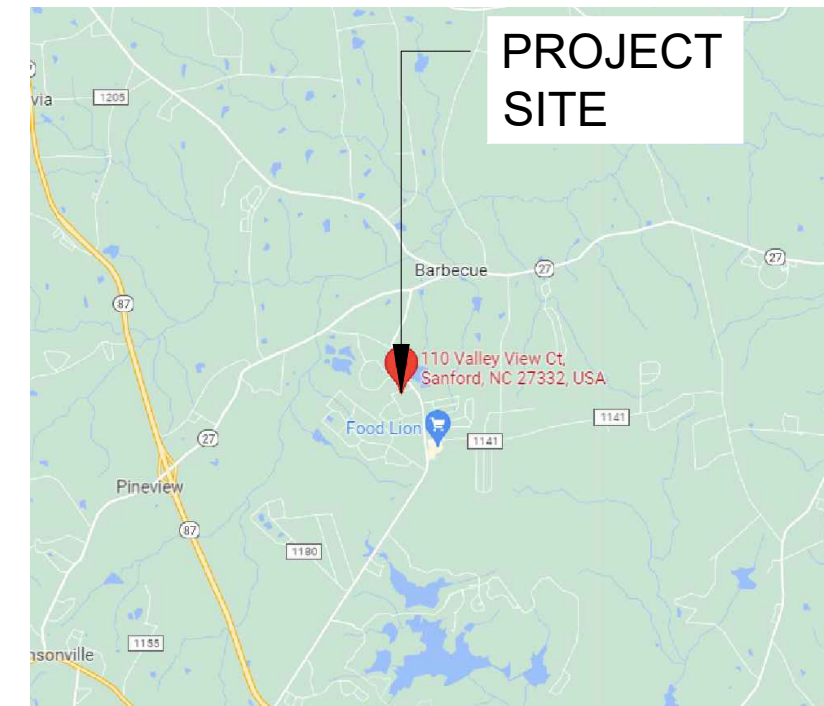
PV-0	COVER SHEET
PV-1	SITE PLAN WITH ROOF PLAN
PV-2	ROOF PLAN WITH MODULES
PV-3	ATTACHMENT DETAILS
PV-4	BRANCH LAYOUT
PV-5	ELECTRICAL LINE DIAGRAM
PV-6	ELECTRICAL CALCULATION
PV-7	PLACARDS & WARNING LABELS
PV-8	ADDITIONAL NOTES
PV-9+	EQUIPMENT SPEC SHEETS

GENERAL NOTES

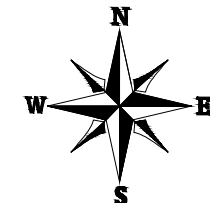
- THE CONTRACTOR/INSTALLER OF THE SOLAR PV SYSTEM OVER EXISTING ROOF SHALL CONFORM TO OSHA REQUIREMENTS DURING THE CONSTRUCTION PHASE. JOB SAFETY AND CONSTRUCTION PROCEDURES ARE THE SOLE RESPONSIBILITY OF THE CONTRACTOR/INSTALLER.
- REFER TO ELECTRICAL DRAWING PV-5 FOR PANEL DETAILED INFORMATION.
- IN CASE OF CONFLICT BETWEEN STRUCTURAL DRAWINGS AND ELECTRICAL DRAWINGS, THE MOST RIGID REQUIREMENTS SHALL GOVERN.
- THE CONTRACTOR/INSTALLER SHALL VERIFY ALL EXISTING BUILDING INFORMATION SHOWN (DIMENSIONS, ROOF TOP PROJECTIONS, ETC.) AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES PRIOR TO INSTALLATIONS OF PV SYSTEM.
- THE CONTRACTOR/INSTALLER SHALL VERIFY AND COORDINATE EXISTING OPENINGS, ROOF TOP UNITS, VENT PIPES, ETC. SHOWN ON DRAWINGS. IF THERE IS A DISCREPANCY BETWEEN DRAWINGS, IT IS THE CONTRACTORS/INSTALLER'S RESPONSIBILITY TO NOTIFY ENGINEER PRIOR TO PERFORMING THE WORK.
- ALL CONSTRUCTION IS TO BE PERFORMED IN STRICT CONFORMANCE WITH ALL APPLICABLE TOWN, COUNTY & STATE REGULATIONS AND/OR ANY OTHER GOVERNING BODIES.
- DO NOT SCALE THESE DRAWINGS, USE DIMENSIONS. CONTRACTOR MUST CONDUCT ROOF SURVEY TO VERIFY DIMENSIONS SHOWN ON PLAN PRIOR TO INSTALLATION. IF THERE IS A DISCREPANCY IT IS CONTRACTOR/INSTALLER'S RESPONSIBILITY TO NOTIFY THE ENGINEER IMMEDIATELY.



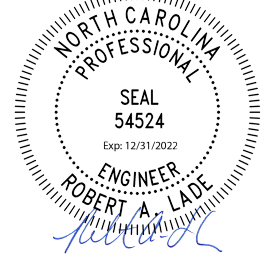
ARRAY LOCATIONS



PROJECT SITE



VERSION		
DESCRIPTION	DATE	REV
INITIAL RELEASE	07/27/2022	UR
	08-15-2022	



PROJECT NAME

SONIA COLLINS
 110 VALLEY VIEW CT,
 SANFORD, NC 27332
 APN# 03958708002063
 UTILITY: CENTRAL EMC
 AHJ: HARNETT COUNTY

SHEET NAME

COVER SHEET

SHEET SIZE

ANSI B
 11" X 17"

SHEET NUMBER

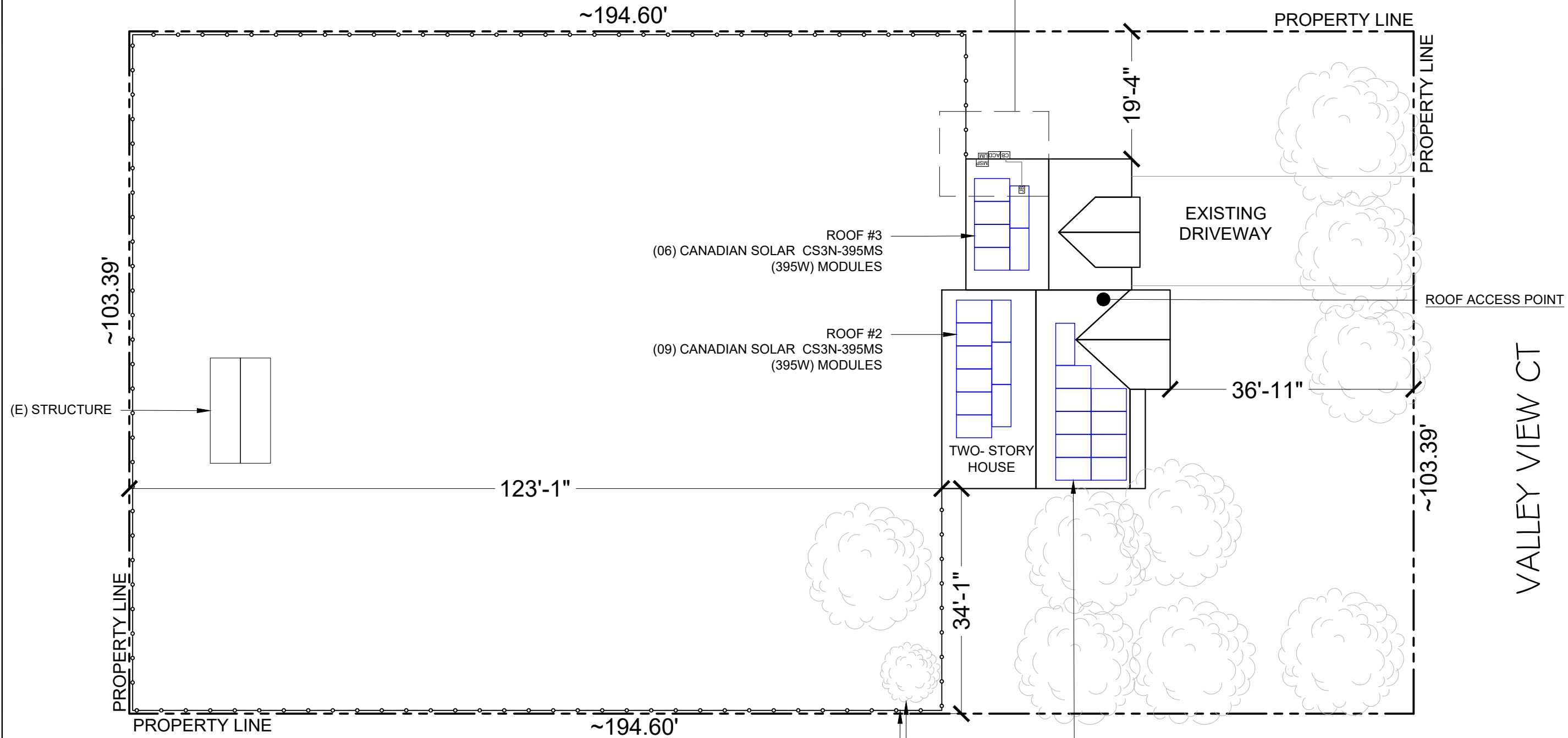
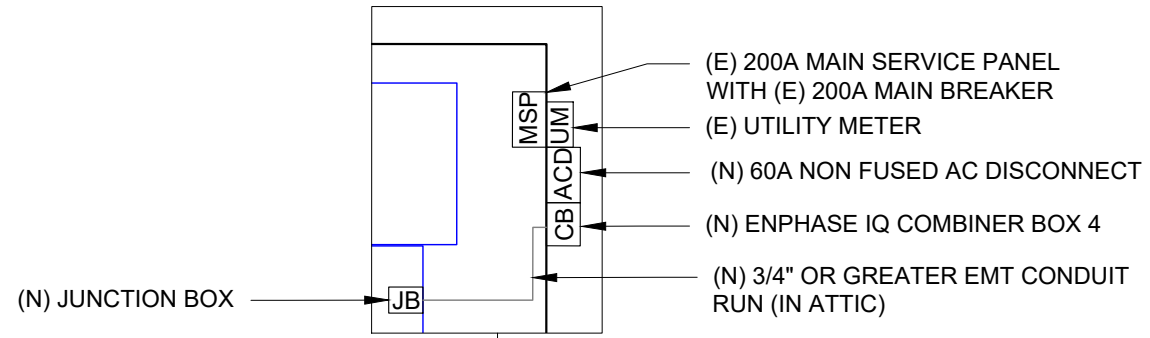
PV-0

● **ROOF ACCESS POINT** SHALL BE LOCATED IN AREAS THAT DO NOT REQUIRE THE PLACEMENT OF GROUND LADDERS OVER OPENINGS SUCH AS WINDOWS OR DOORS, AND LOCATED AT STRONG POINTS OF BUILDING CONSTRUCTION IN LOCATIONS WHERE THE ACCESS POINT DOES NOT CONFLICT WITH OVERHEAD OBSTRUCTIONS SUCH AS TREE LIMBS, WIRES OR SIGNS.

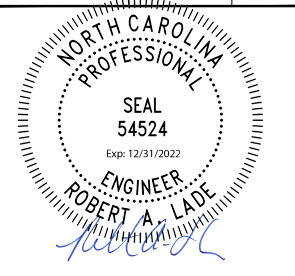
NOTE:

- ALL ELECTRICAL EQUIPMENT, INVERTERS, DISCONNECTS, MAIN SERVICE PANELS, ETC. SHALL NOT BE INSTALLED WITHIN 3' OF THE GAS METERS' SUPPLY OR DEMAND PIPING.

ENLARGE VIEW



VERSION		
DESCRIPTION	DATE	REV
INITIAL RELEASE	07/27/2022	UR
08-15-2022		



PROJECT NAME
SONIA COLLINS
110 VALLEY VIEW CT,
SANFORD, NC 27332
APN# 03958708002063
UTILITY: CENTRAL EMC
AHJ: HARNETT COUNTY

SHEET NAME
SITE PLAN WITH ROOF PLAN

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-1

MODULE TYPE, DIMENSIONS & WEIGHT

NUMBER OF MODULES = 25 MODULES
 MODULE TYPE = CANADIAN SOLAR CS3N-395MS (395W) MODULES
 MODULE WEIGHT = 49.6 LBS / 22.5 KG.
 MODULE DIMENSIONS = 76.4"X 41.3" = 21.91 SF
 UNIT WEIGHT OF ARRAY = 2.26 PSF

BILL OF MATERIALS		
EQUIPMENT	QTY	DESCRIPTION
RAIL	16	UNIRAC SM LIGHT RAIL 168" MILL
SPLICE	06	BND SPLICE BAR PRO SERIES MILL
MID CLAMP	36	UNIVERSAL AF SERIES MID CLAMP
END CLAMP	28	UNIVERSAL AF SERIES END CLAMP
ATTACHMENT	66	UNIRAC FLASHLOC
GROUNDING LUG	07	GROUND LUG

ARRAY AREA & ROOF AREA CALC'S				
ROOF	# OF MODULES	ARRAY AREA (Sq. Ft.)	ROOF AREA (Sq. Ft.)	ROOF AREA COVERED BY ARRAY (%)
#1	10	219.12	367.66	59.60
#2	09	197.21	429.25	45.94
#3	06	131.47	249.26	52.74

R324.6.2 - PROVING ARRAYS TAKE LESS THAN 33% OF TOTAL ROOF AREA. WHEN THE ARRAYS TAKE LESS THAN 33% WE CAN JUSTIFY AN 18" SETBACK ON BOTH SIDES OF THE RIDGE. WHEN IT TAKES MORE THAN 33% OF THE ROOF AREA WE MUST USE A 3' SETBACKS AT THE RIDGE.
 TOTAL ROOF AREA: 1496.71 sqft

AREA OF ARRAYS:
 76.4"X 41.3" (PANEL DIMENSIONS)
 76.4"X 41.3" = 21.91 sqft (PER PANEL)
 21.91 sqft/panel X 25 panels = 547.80 sqft (TOTAL PANEL AREA)

PERCENTAGE OF TOTAL ROOF AREA:
 (547.80 sqft / 1496.71 sqft)(100)= 36.60%

THE PANELS USE 36.60% OF THE TOTAL ROOF AREA

ROOF DESCRIPTION				
ROOF	ROOF TILT	AZIMUTH	TRUSSES SIZE	TRUSSES SPACING
#1	33°	164°	2"x4"	24" O.C.
#2	33°	344°	2"x4"	24" O.C.
#3	22°	344°	2"x4"	24" O.C.

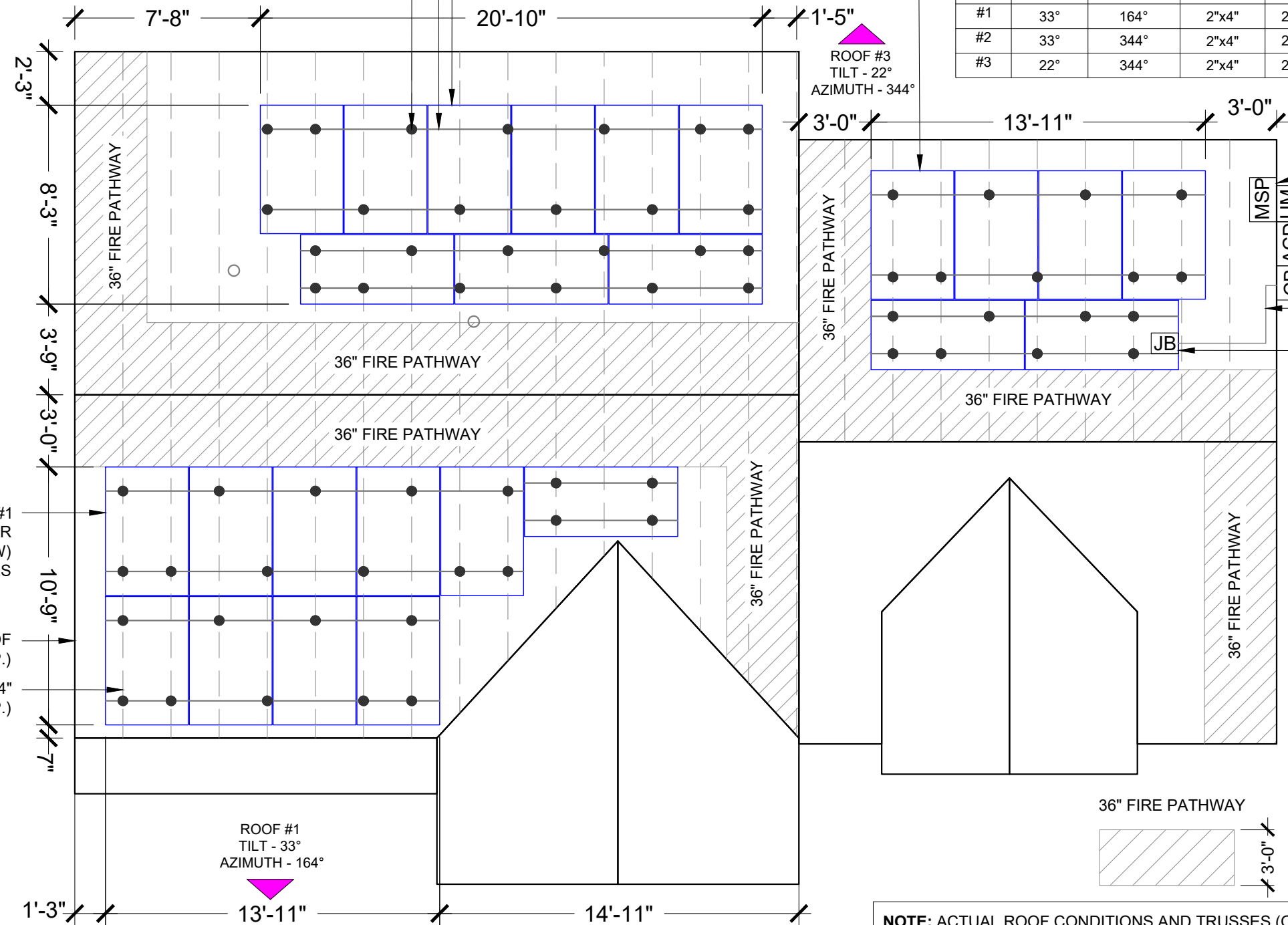
REAR YARD

ROOF #2
 (09) CANADIAN SOLAR CS3N-395MS (395W) MODULES
 (N) UNIRAC SM LIGHT RAIL (TYP.)
 (N) (66) UNIRAC FLASHLOC ATTACHMENTS SPACED AT 48" O.C. (TYP.)

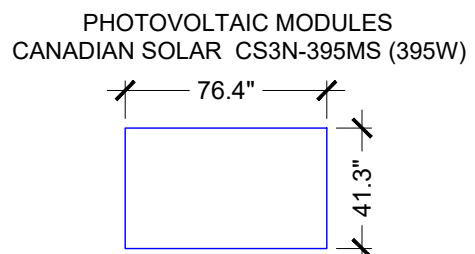
ROOF #2
 TILT - 33°
 AZIMUTH - 344°

ROOF #3
 (06) CANADIAN SOLAR CS3N-395MS (395W) MODULES

ROOF #3
 TILT - 22°
 AZIMUTH - 344°



- (E) 200A MAIN SERVICE PANEL WITH (E) 200A MAIN BREAKER
- (E) UTILITY METER
- (N) 60A NON FUSED AC DISCONNECT
- (N) ENPHASE IQ COMBINER BOX 4
- (N) 3/4" OR GREATER EMT CONDUIT RUN (IN ATTIC)
- (N) JUNCTION BOX



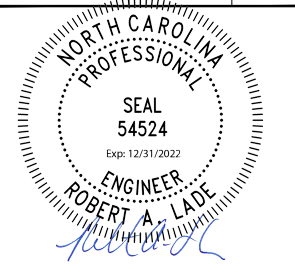
LEGEND	
UM	- UTILITY METER
MSP	- MAIN SERVICE PANEL
ACD	- AC DISCONNECT
CB	- IQ COMBINER BOX 4
JB	- JUNCTION BOX
○ □	- VENT, ATTIC FAN (ROOF OBSTRUCTION)
●	- ROOF ATTACHMENT
- - -	- TRUSSES
- - -	- CONDUIT
▨	- FIRE PATHWAY

NOTE: ACTUAL ROOF CONDITIONS AND TRUSSES (OR SEAM) LOCATIONS MAY VARY. INSTALL PER MANUFACTURER(S) INSTALLATION GUIDELINES AND ENGINEERED SPANS FOR ATTACHMENTS

• PLUMBING VENTS, SKYLIGHTS AND MECHANICAL VENTS SHALL NOT BE COVERED, MOVED, RE-ROUTED OR RE-LOCATED.



VERSION		
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PROJECT NAME

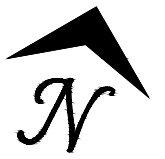
SONIA COLLINS
 110 VALLEY VIEW CT,
 SANFORD, NC 27332
 APN# 03958708002063
 UTILITY: CENTRAL EMC
 AHJ: HARNETT COUNTY

SHEET NAME
ROOF PLAN WITH MODULES

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

SHEET NUMBER
PV-2

1 ROOF PLAN WITH MODULES
 SCALE: 3/16" = 1'-0"

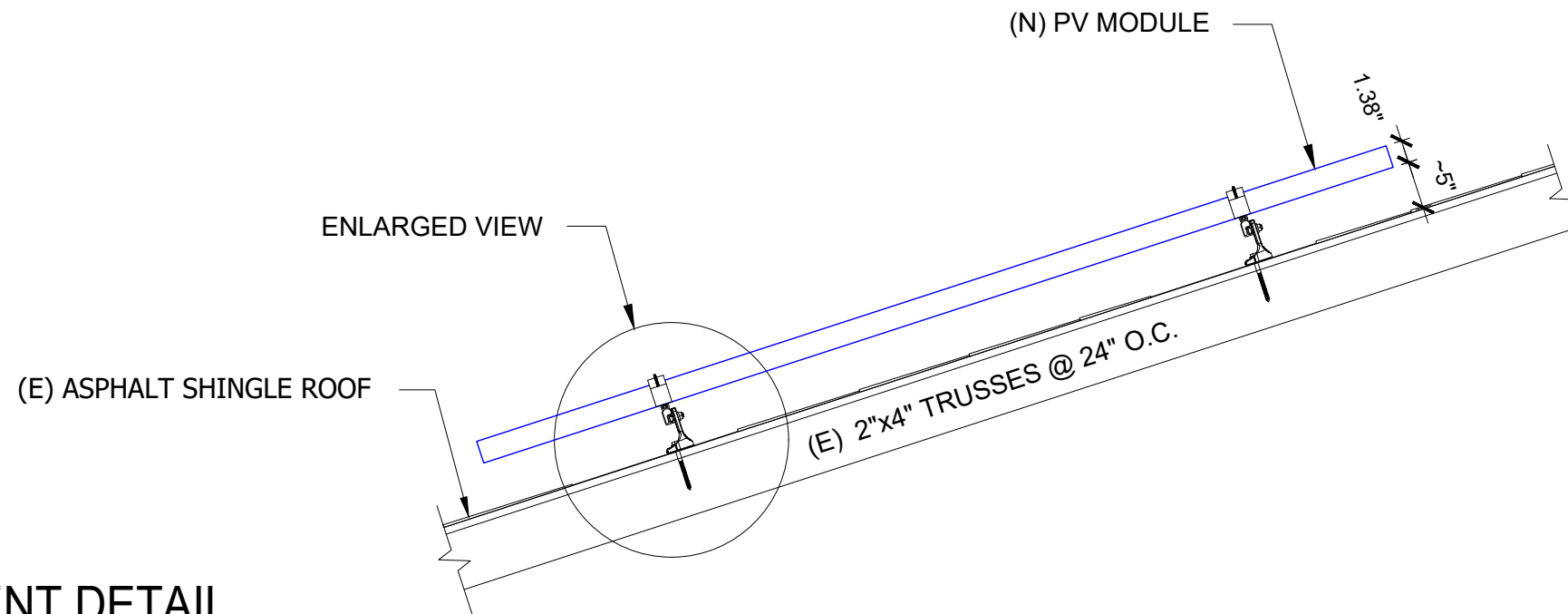


FRONT YARD
 VALLEY VIEW CT

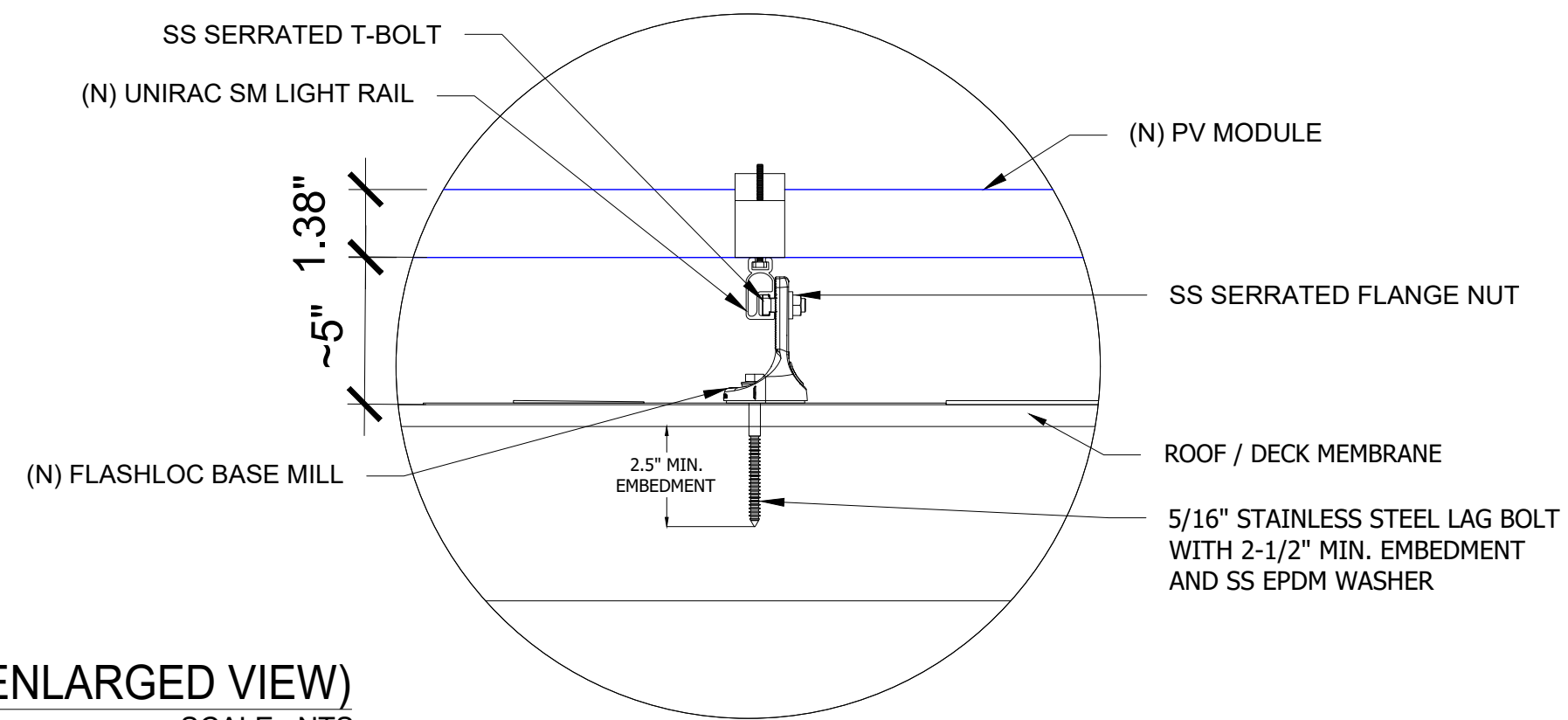
NOTE: ACTUAL ROOF CONDITIONS AND RAFTERS (OR SEAM) LOCATIONS MAY VARY. INSTALL PER MANUFACTURER(S) INSTALLATION GUIDELINES AND ENGINEERED SPANS FOR ATTACHMENTS



DEL MAR, CA 92014, USA

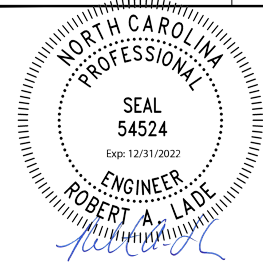


1 ATTACHMENT DETAIL
SCALE: NTS



2 ATTACHMENT DETAIL (ENLARGED VIEW)
SCALE: NTS

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	08-15-2022	



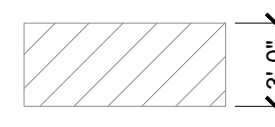
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SONIA COLLINS
110 VALLEY VIEW CT,
SANFORD, NC 27332
APN# 03958708002063
UTILITY: CENTRAL EMC
AHJ: HARNETT COUNTY

SHEET NAME	ATTACHMENT DETAIL
SHEET SIZE	ANSI B 11" X 17"
SHEET NUMBER	PV-3

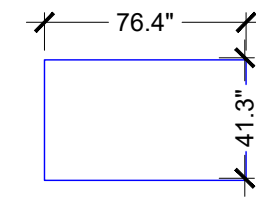
(25) CANADIAN SOLAR CS3N-395MS (395W) MODULES
 (25) ENPHASE ENERGY IQ8 PLUS-72-2-US MICRO-INVERTERS
 (01) BRANCH OF 13 MODULES &
 (01) BRANCH OF 12 MODULES CONNECTED IN PARALLEL PER BRANCH

REAR YARD

36" FIRE PATHWAY

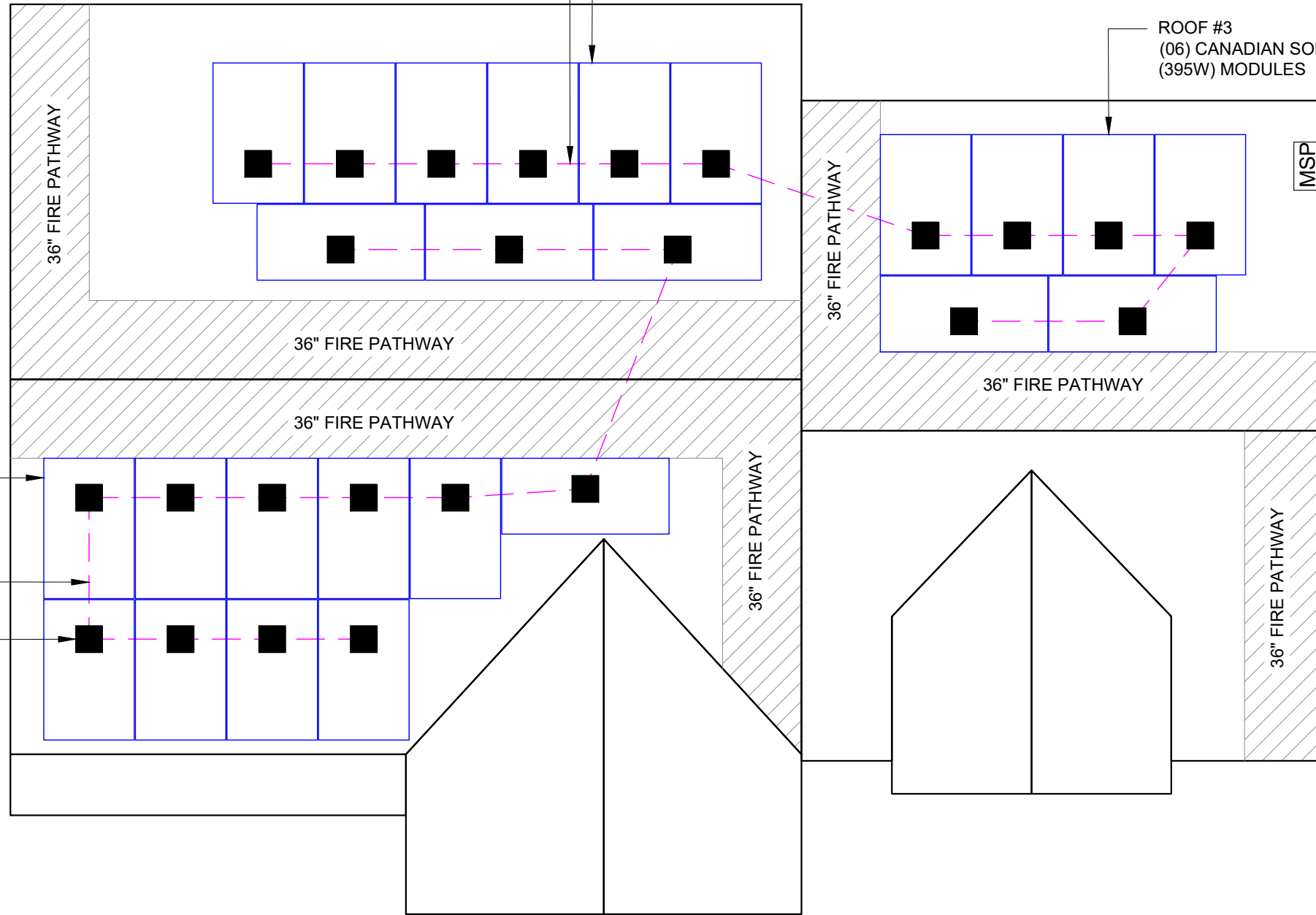


PHOTOVOLTAIC MODULES
 CANADIAN SOLAR CS3N-395MS (395W)



ROOF #2
 (09) CANADIAN SOLAR CS3N-395MS
 (395W) MODULES
 BRANCH #2

ROOF #3
 (06) CANADIAN SOLAR CS3N-395MS
 (395W) MODULES



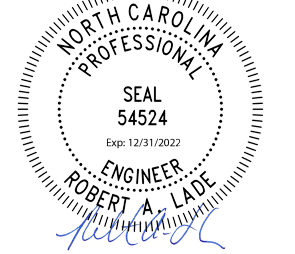
- (E) 200A MAIN SERVICE PANEL WITH (E) 200A MAIN BREAKER
- (E) UTILITY METER
- (N) 60A NON FUSED AC DISCONNECT
- (N) ENPHASE IQ COMBINER BOX 4

ROOF #1
 (10) CANADIAN SOLAR CS3N-395MS
 (395W) MODULES
 BRANCH #1
 (25) ENPHASE ENERGY IQ8
 PLUS-72-2-US MICRO-INVERTERS

FRONT YARD VALLEY VIEW CT



VERSION		
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	08-15-2022	



PROJECT NAME
 SONIA COLLINS
 110 VALLEY VIEW CT,
 SANFORD, NC 27332
 APN# 03958708002063
 UTILITY: CENTRAL EMC
 AHJ: HARNETT COUNTY

SHEET NAME	BRANCH LAYOUT
SHEET SIZE	ANSI B 11" X 17"
SHEET NUMBER	PV-4

(25) CANADIAN SOLAR CS3N-395MS (395W) MODULES
 (25) ENPHASE ENERGY IQ8 PLUS-72-2-US MICRO-INVERTERS
 (01) BRANCH OF 13 MODULES &
 (01) BRANCH OF 12 MODULES CONNECTED IN PARALLEL PER BRANCH

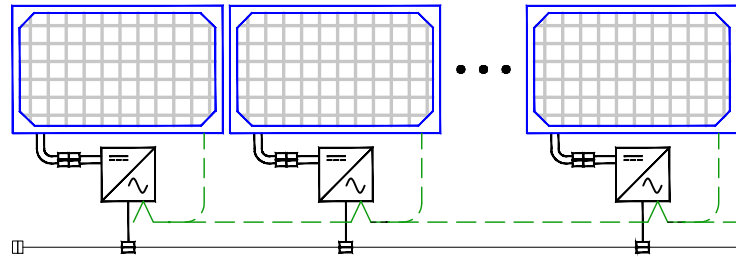
SYSTEM SIZE:- 25 x 395W = 9.88 kWDC
 SYSTEM SIZE:- 25 x 290W = 7 kWAC

INTERCONNECTION
 120% RULE - NEC 705.12(B)(2)(3)(b)
 UTILITY FEED + SOLAR BACKFEED
 200A + 40A = 240A
 BUSS RATING x 120%
 200A x 120% = 240A

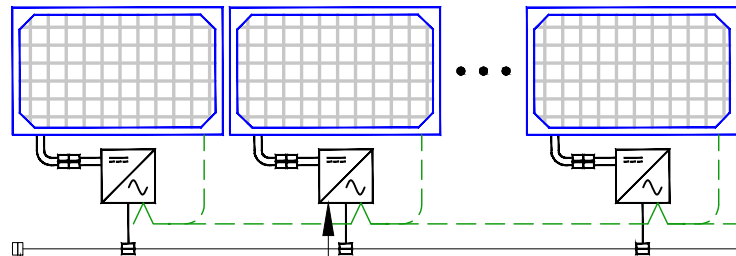
BILL OF MATERIALS		
EQUIPMENT	QTY	DESCRIPTION
SOLAR PV MODULE	25	CANADIAN SOLAR CS3N-395MS (395W) MODULES
INVERTER	25	ENPHASE ENERGY IQ8 PLUS-72-2-US MICRO-INVERTERS
JUNCTION BOX	01	600V, 55A MAX, 4 INPUTS, MOUNTED ON ROOF FOR WIRE & CONDUIT TRANSITION
COMBINER BOX	01	ENPHASE IQ COMBINER BOX 4
AC DISCONNECT	01	240VAC, 60A NON FUSED, NEMA 3R, UL LISTED



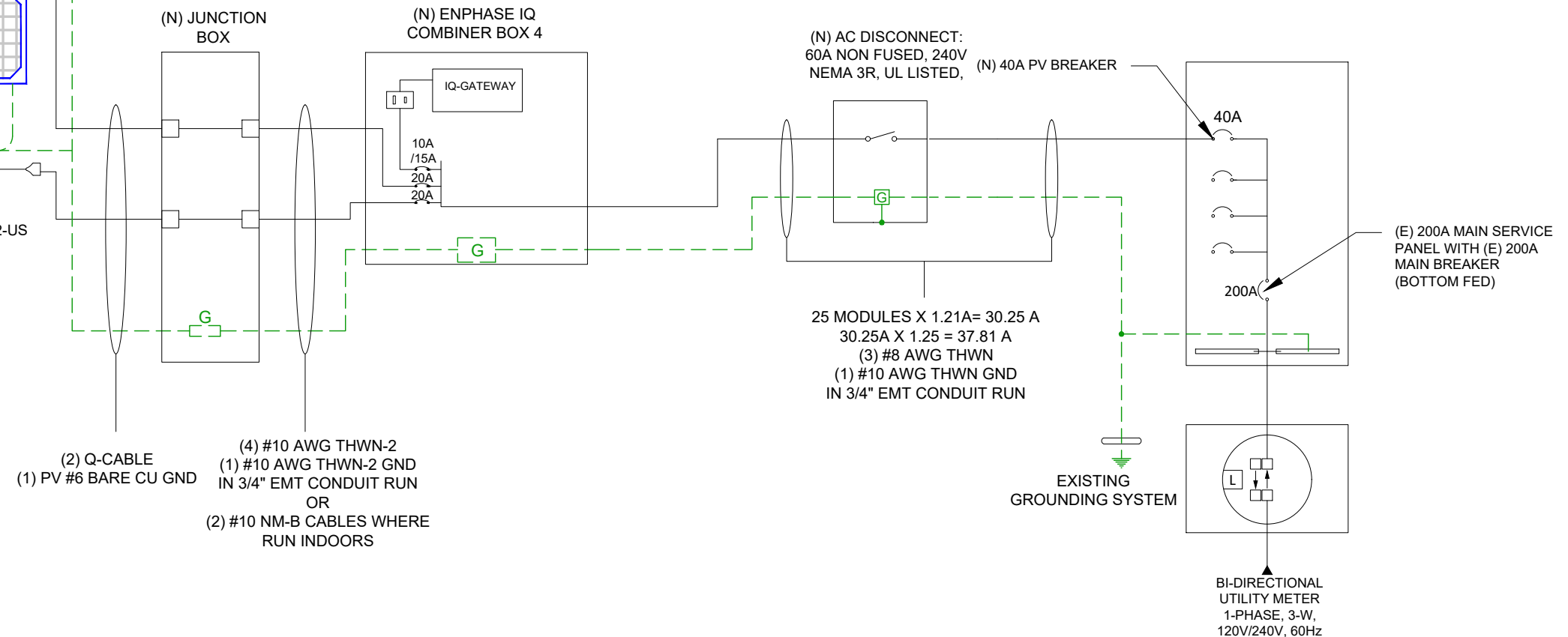
13 MICRO-INVERTERS IN BRANCH CIRCUIT #1



12 MICRO-INVERTERS IN BRANCH CIRCUIT #2



ENPHASE ENERGY IQ8 PLUS-72-2-US MICRO-INVERTERS
 TERMINATOR CAP ON LAST CABLE CONNECTOR AC TRUNK CABLE (TYP)



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SANFORD, NC 27332
APN# 03958708002063
UTILITY: CENTRAL EMC
AHJ: HARNETT COUNTY

SERVICE INFO.

UTILITY PROVIDER: CENTRAL EMC
 MAIN SERVICE VOLTAGE: 240V
 MAIN PANEL BRAND: SQUARE-D
 MAIN SERVICE PANEL: (E) 200A
 MAIN CIRCUIT BREAKER RATING: (E) 200A
 MAIN SERVICE LOCATION: NORTH-EAST
 SERVICE FEED SOURCE: UNDERGROUND

1 ELECTRICAL LINE DIAGRAM
 SCALE: NTS

SHEET NAME
ELECTRICAL LINE DIAGRAM

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-5

VERSION		
DESCRIPTION	DATE	REV
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**SONIA COLLINS
110 VALLEY VIEW CT,
SANFORD, NC 27332
APN# 03958708002063
UTILITY: CENTRAL EMC
AHJ: HARNETT COUNTY**

SHEET NAME

**ELECTRICAL
CALCULATION**

SHEET SIZE

**ANSI B
11" X 17"**

SHEET NUMBER

PV-6

SOLAR MODULE SPECIFICATIONS

MANUFACTURER / MODEL #	CANADIAN SOLAR CS3N-395MS (395W) MODULES
VMP	37.00
IMP	10.68
VOC	44.30
ISC	11.44
MODULE DIMENSION	76.4"L x 41.3"W x 1.38"D (In Inch)

INVERTER SPECIFICATIONS

MANUFACTURER / MODEL #	ENPHASE ENERGY IQ8 PLUS-72-2-US
NOMINAL OUTPUT VOLTAGE	240 VAC
NOMINAL OUTPUT CURRENT	1.21A

AMBIENT TEMPERATURE SPECS

WEATHER STATION: POPE AFB

RECORD LOW TEMP	-10°
AMBIENT TEMP (HIGH TEMP 2%)	36°
CONDUIT HEIGHT	7/8"
ROOF TOP TEMP	36°
CONDUCTOR TEMPERATURE RATE (ON ROOF)	90°
CONDUCTOR TEMPERATURE RATE (OFF ROOF)	75°
MODULE TEMPERATURE COEFFICIENT OF Voc	-0.27%/°C

PERCENT OF VALUES	NUMBER OF CURRENT CARRYING CONDUCTORS IN EMT
.80	4-6
.70	7-9
.50	10-20

AC CONDUCTOR AMPACITY CALCULATIONS:

FROM JUNCTION BOX TO IQ COMBINER BOX 4:

AMBIENT TEMPERATURE ADJUSTMENT FOR EXPOSED CONDUIT PER NEC 310.15(B)(3)(c):
 EXPECTED WIRE TEMP (°C): 36°
 TEMP CORRECTION PER TABLE 310.15(B)(2)(a): 0.91
 # OF CURRENT CARRYING CONDUCTORS: 4
 CONDUIT FILL CORRECTION PER NEC 310.15(B)(3)(a): 0.8
 CIRCUIT CONDUCTOR SIZE: 10 AWG
 CIRCUIT CONDUCTOR AMPACITY: 40A

REQUIRED CIRCUIT CONDUCTOR AMPACITY PER NEC 690.8(A&B):
 # MICRO-INVERTERS (MAX. BRANCH LENGTH) X MAX OUTPUT CURRENT
 13 X 1.21A = 15.73A

DERATED AMPACITY OF CIRCUIT CONDUCTOR PER NEC TABLE 310.15(B)(2)(a)
 TEMP CORR. PER NEC TABLE 310.15(B)(2)(a) X
 CONDUIT FILL CORR. PER NEC 310.15(B)(3)(a) X
 CIRCUIT CONDUCTOR AMPACITY =
 0.91 X 0.80 X 40 = 29.12A

RESULT SHOULD BE GREATER THAN (15.73A) OTHERWISE LESS THE ENTRY FOR CIRCUIT CONDUCTOR SIZE AND AMPACITY

AC CONDUCTOR AMPACITY CALCULATIONS:

FROM IQ COMBINER BOX 4 TO INTERCONNECTION:

OF INVERTERS: 25
 EXPECTED WIRE TEMP (°C): 36°
 TEMP CORRECTION PER TABLE 310.15(B)(2)(a): 0.88
 # OF CURRENT CARRYING CONDUCTORS: 3
 CONDUIT FILL PER NEC 310.15(B)(3)(a): 1.0
 CIRCUIT CONDUCTOR SIZE: 8 AWG
 CIRCUIT CONDUCTOR AMPACITY: 50 A

REQUIRED CIRCUIT CONDUCTOR AMPACITY PER NEC 690.8(B):
 # MICRO-INVERTERS X MAX OUTPUT CURRENT =
 1.21 X 25 = 30.25A

DERATED AMPACITY OF CIRCUIT CONDUCTORS PER NEC TABLE 310.16:
 TEMP CORR. PER NEC TABLE 310.15(B)(2)(a) X
 CONDUIT FILL CORR. PER NEC 310.15(B)(3)(a) X
 CIRCUIT CONDUCTOR AMPACITY =
 0.88 X 1 X 50 = 44.0A

RESULT SHOULD BE GREATER THAN (30.25A) OTHERWISE LESS THE ENTRY FOR CIRCUIT CONDUCTOR SIZE AND AMPACITY

ELECTRICAL NOTES

- 1.) ALL EQUIPMENT TO BE LISTED BY UL OR OTHER NRTL, AND LABELED FOR ITS APPLICATION.
- 2.) ALL CONDUCTORS SHALL BE COPPER, RATED FOR 600 V AND 75 & 90 DEGREE C WET ENVIRONMENT.
- 3.) WIRING, CONDUIT, AND RACEWAYS MOUNTED ON ROOFTOPS SHALL BE ROUTED DIRECTLY TO, AND LOCATED AS CLOSE AS POSSIBLE TO THE NEAREST RIDGE, HIP, OR VALLEY.
- 4.) WORKING CLEARANCES AROUND ALL NEW AND EXISTING ELECTRICAL EQUIPMENT SHALL COMPLY WITH NEC 110.26.
- 5.) DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS. CONTRACTOR SHALL FURNISH ALL NECESSARY OUTLETS, SUPPORTS, FITTINGS AND ACCESSORIES TO FULFILL APPLICABLE CODES AND STANDARDS.
- 6.) WHERE SIZES OF JUNCTION BOXES, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, THE CONTRACTOR SHALL SIZE THEM ACCORDINGLY.
- 7.) ALL WIRE TERMINATIONS SHALL BE APPROPRIATELY LABELED AND READILY VISIBLE.
- 8.) MODULE GROUNDING CLIPS TO BE INSTALLED BETWEEN MODULE FRAME AND MODULE SUPPORT RAIL, PER THE GROUNDING CLIP MANUFACTURER'S INSTRUCTION.
- 9.) MODULE SUPPORT RAIL TO BE BONDED TO CONTINUOUS COPPER E.G.C. VIA WEEB LUG OR ILSKO GBL-4DBT LAY-IN LUG.
- 10.) THE POLARITY OF THE GROUNDED CONDUCTORS IS NEGATIVE

1

ELECTRICAL CALCULATION

SCALE: NTS

⚠ WARNING
ELECTRIC SHOCK HAZARD
 TERMINALS ON THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

LABEL LOCATION:
 AC & DC DISCONNECT AND SUB PANEL
 (PER CODE: NEC 690.13(B))

⚠ WARNING DUAL POWER SOURCE
 SECOND SOURCE IS PHOTOVOLTAIC SYSTEM

LABEL LOCATION:
 MAIN SERVICE PANEL & NET METER
 (PER CODE: NEC 705.12(D)(3), NEC 705.12(B)(3-4) & NEC 690.59)

PHOTOVOLTAIC
AC DISCONNECT

LABEL LOCATION:
 AC DISCONNECT
 NEC 690.13(B)

⚠ CAUTION
 PHOTOVOLTAIC SYSTEM CIRCUIT IS BACKFED

LABEL LOCATION:
 MSP
 (PER CODE: NEC 690.13 (F), NEC 705.12(B)(3-4) & NEC 690.59)

RAPID SHUTDOWN SWITCH
FOR SOLAR PV SYSTEM

LABEL LOCATION:
 RAPID SHUTDOWN
 (PER CODE: NEC 690.56(C)(3))

PHOTOVOLTAIC SYSTEM AC DISCONNECT
 RATED AC OPERATING CURRENT 30.25 AMPS
 AC NOMINAL OPERATING VOLTAGE 240 VOLTS

LABEL LOCATION:
 AC DISCONNECT & INVERTER
 (PER CODE: NEC690.54)

⚠ WARNING
 POWER SOURCE OUTPUT CONNECTION
 DO NOT RELOCATE THIS OVERCURRENT DEVICE

LABEL LOCATION:
 SERVICE PANEL IF SUM OF BREAKERS EXCEEDS PANEL RATING
 (PER CODE: NEC 705.12 (B)(2)(3)(b))

WARNING:PHOTOVOLTAIC POWER SOURCE

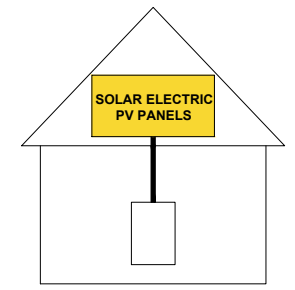
LABEL LOCATION:
 CONDUIT, COMBINER BOX
 (PER CODE: NEC 690.31(G)(3))

MAIN PHOTOVOLTAIC SYSTEM DISCONNECT

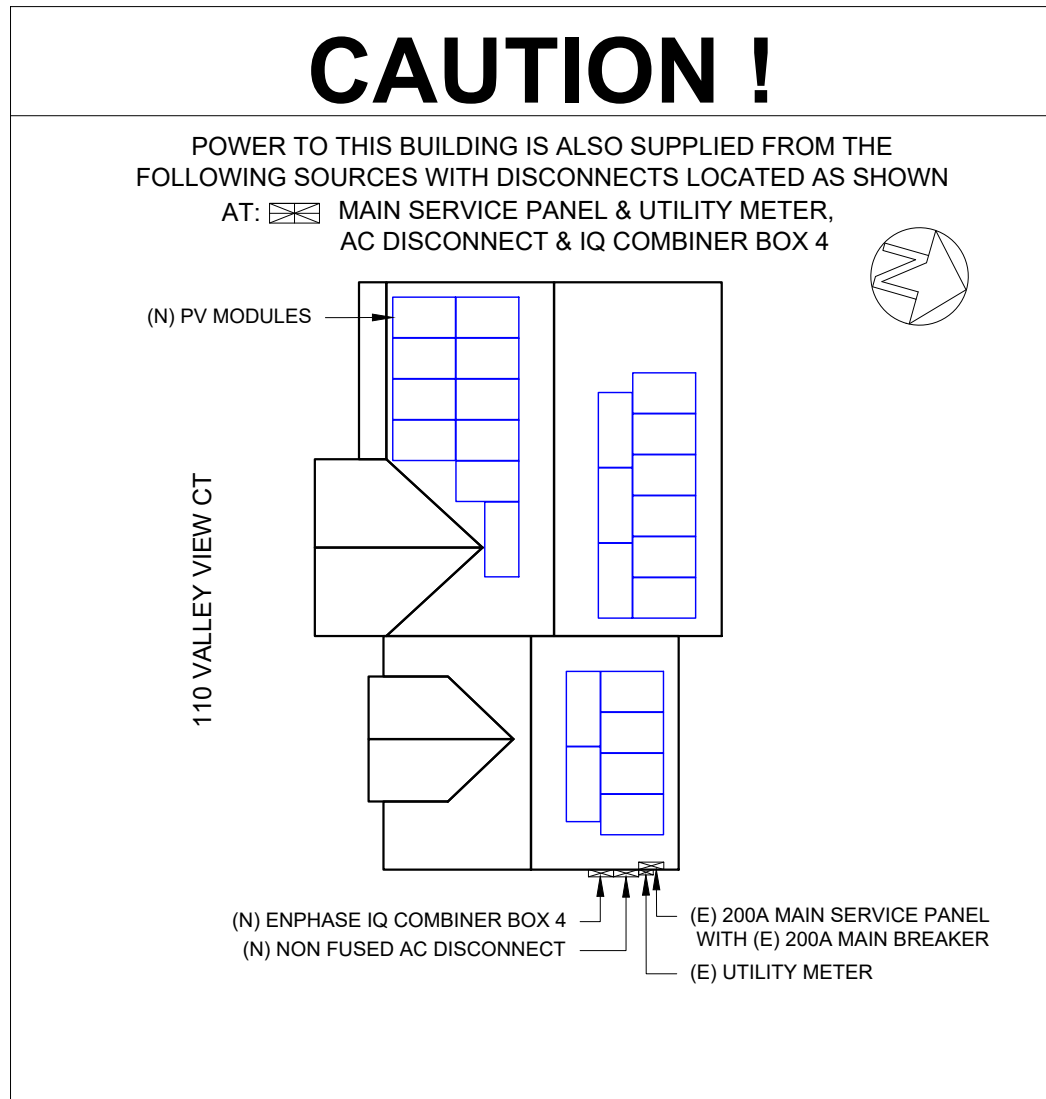
LABEL LOCATION:
 MAIN SERVICE DISCONNECT / UTILITY METER
 (PER CODE: NEC 690.13(B))

SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN

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



LABEL LOCATION:
 AC DISCONNECT, DC DISCONNECT, POINT OF INTERCONNECTION
 (PER CODE: 605.11.3.1(1) & 690.56(C)(1)(a))



VERSION		
DESCRIPTION	DATE	REV
INITIAL RELEASE	07/27/2022	UR

PROJECT NAME
 SONIA COLLINS
 110 VALLEY VIEW CT,
 SANFORD, NC 27332
 APN# 03958708002063
 UTILITY: CENTRAL EMC
 AHJ: HARNETT COUNTY

SHEET NAME
 WARNING LABELS & PLACARD

SHEET SIZE
 ANSI B
 11" X 17"

SHEET NUMBER
 PV-7

1. EACH MODULE TO BE GROUNDED USING THE SUPPLIED CONNECTION POINT PER MANUFACTURER'S REQUIREMENTS. ALL SOLAR MODULES, EQUIPMENT, AND METALLIC COMPONENTS ARE TO BE BONDED. IF THE EXISTING GROUNDING ELECTRODE SYSTEM CAN NOT BE VERIFIED OR IS ONLY METALLIC WATER PIPING, IT IS THE CONTRACTOR'S RESPONSIBILITY TO INSTALL A SUPPLEMENTAL GROUNDING ELECTRODE.
2. ALL PLAQUES AND SIGNAGE REQUIRED BY THE LATEST EDITION OF NATIONAL ELECTRICAL CODE. LABEL SHALL BE METALLIC OR PLASTIC, ENGRAVED OR MACHINE PRINTED IN A CONTRASTING COLOR TO THE PLAQUE. PLAQUE SHALL BE UV RESISTANT IF EXPOSED TO SUNLIGHT.
3. DC CONDUCTORS SHALL BE RUN IN EMT AND SHALL BE LABELED, "CAUTION DC CIRCUIT" OR EQUIV. EVERY 5 FT.
4. EXPOSED NON-CURRENT CARRYING METAL PARTS OF ELECTRICAL EQUIPMENT SHALL BE GROUNDED IN ACCORDANCE WITH 250.134 OR 250.136(A).
5. CONFIRM LINE SIDE VOLTAGE AT ELECTRIC UTILITY SERVICE PRIOR TO CONNECTING INVERTER. VERIFY SERVICE VOLTAGE IS WITHIN INVERTER VOLTAGE OPERATIONAL RANGE.
6. OUTDOOR EQUIPMENT SHALL BE NEMA-3R RATED OR BETTER.
7. ELECTRICAL CONTRACTOR TO PROVIDE CONDUIT EXPANSION JOINTS AND ANCHOR CONDUIT RUNS AS REQUIRED PER NEC.
8. ALL WIRING MUST BE PROPERLY SUPPORTED BY DEVICES OR MECHANICAL MEANS DESIGNED AND LISTED FOR SUCH USE, AND FOR ROOF-MOUNTED SYSTEMS, WIRING MUST BE PERMANENTLY AND COMPLETELY HELD OFF OF THE ROOF SURFACE. NEC 110.2 - 110.4 / 300.4



DEL MAR, CA 92014, USA

VERSION

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SONIA COLLINS
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 UTILITY: CENTRAL EMC
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SHEET NAME

ADDITIONAL NOTES

SHEET SIZE

ANSI B
 11" X 17"

SHEET NUMBER

PV-8



NEW

HiKuBlack Mono PERC
BLACK FRAME ON BLACK BACKSHEET
F23 Frame
380 W ~ 410 W
CS3N-380 | 385 | 390 | 395 | 400 | 405 | 410MS

MORE POWER

- Module power up to 410 W
Module efficiency up to 20.2 %
- Lower LCOE & BOS cost
- Comprehensive LID / LeTID mitigation technology, up to 50% lower degradation
- Better shading tolerance
- Minimizes micro-crack impacts
- Heavy snow load up to 8100 Pa, enhanced wind load up to 6000 Pa*

25 Years Industry Leading Product Warranty on Materials and Workmanship*
25 Years Linear Power Performance Warranty*

1st year power degradation no more than 2%
Subsequent annual power degradation no more than 0.55%

*Subject to the terms and conditions contained in the applicable Canadian Solar Limited Warranty Statement. Also this 25-year limited product warranty is available only for products installed and operating on residential rooftops in certain regions.

MANAGEMENT SYSTEM CERTIFICATES*

ISO 9001: 2015 / Quality management system
 ISO 14001: 2015 / Standards for environmental management system
 ISO 45001: 2018 / International standards for occupational health & safety

PRODUCT CERTIFICATES*

IEC 61215 / IEC 61730 / CE
 FSEC (US Florida) / UL 61730 / IEC 61701 / IEC 62716



* The specific certificates applicable to different module types and markets will vary, and therefore not all of the certifications listed herein will simultaneously apply to the products you order or use. Please contact your local Canadian Solar sales representative to confirm the specific certificates available for your Product and applicable in the regions in which the products will be used.

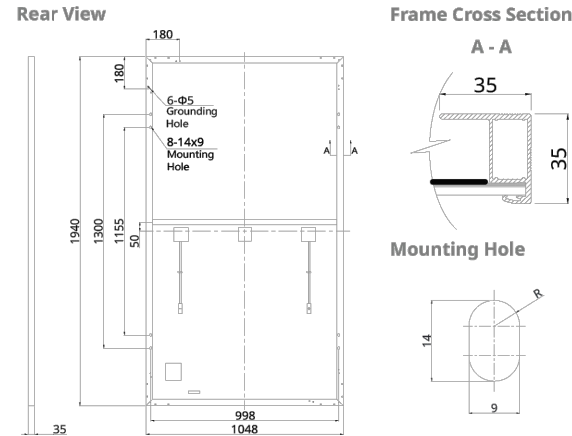
CSI SOLAR (USA) CO., LTD. is committed to providing high quality solar photovoltaic modules, solar energy and battery storage solutions to customers. The company was recognized as the No. 1 module supplier for quality and performance/price ratio in the IHS Module Customer Insight Survey. Over the past 20 years, it has successfully delivered over 63 GW of premium-quality solar modules across the world.

* For detailed information, please refer to Installation Manual.

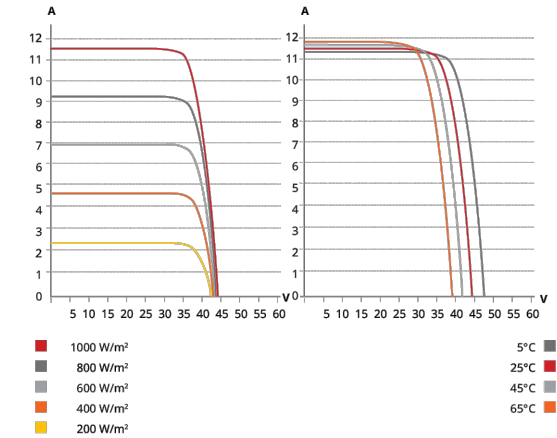
CSI SOLAR (USA) CO., LTD.

1350 Treat Blvd. Suite 500, Walnut Creek, CA 94598, USA | www.csisolar.com/na | service.ca@csisolar.com

ENGINEERING DRAWING (mm)



CS3N-400MS / I-V CURVES



ELECTRICAL DATA | STC*

CS3N	380MS	385MS	390MS	395MS	400MS	405MS	410MS
Nominal Max. Power (Pmax)	380 W	385 W	390 W	395 W	400 W	405 W	410 W
Opt. Operating Voltage (Vmp)	36.4 V	36.6 V	36.8 V	37.0 V	37.2 V	37.4 V	37.6 V
Opt. Operating Current (Imp)	10.44 A	10.52 A	10.60 A	10.68 A	10.76 A	10.83 A	10.92 A
Open Circuit Voltage (Voc)	43.7 V	43.9 V	44.1 V	44.3 V	44.5 V	44.7 V	44.9 V
Short Circuit Current (Isc)	11.26 A	11.32 A	11.38 A	11.44 A	11.50 A	11.56 A	11.62 A
Module Efficiency	18.7%	18.9%	19.2%	19.4%	19.7%	19.9%	20.2%
Operating Temperature	-40°C ~ +85°C						
Max. System Voltage	1000V (UL)						
Module Fire Performance	TYPE 2 (UL 61730 1000V)						
Max. Series Fuse Rating	20 A						
Application Classification	Class A						
Power Tolerance	0 ~ +10 W						

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

ELECTRICAL DATA | NMOT*

CS3N	380MS	385MS	390MS	395MS	400MS	405MS	410MS
Nominal Max. Power (Pmax)	284 W	288 W	291 W	295 W	299 W	303 W	306 W
Opt. Operating Voltage (Vmp)	34.0 V	34.2 V	34.4 V	34.6 V	34.7 V	34.9 V	35.1 V
Opt. Operating Current (Imp)	8.35 A	8.42 A	8.48 A	8.54 A	8.60 A	8.66 A	8.73 A
Open Circuit Voltage (Voc)	41.2 V	41.4 V	41.6 V	41.8 V	41.9 V	42.1 V	42.3 V
Short Circuit Current (Isc)	9.08 A	9.13 A	9.18 A	9.23 A	9.28 A	9.33 A	9.37 A

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

MECHANICAL DATA

Specification	Data
Cell Type	Mono-crystalline
Cell Arrangement	132 [2 X (11 X 6)]
Dimensions	1940 X 1048 X 35 mm (76.4 X 41.3 X 1.38 in)
Weight	23.4 kg (51.6 lbs)
Front Cover	3.2 mm tempered glass
Frame	Anodized aluminium alloy
J-Box	IP68, 3 bypass diodes
Cable	12 AWG (UL)
Cable Length (Including Connector)	Portrait: 400 mm (15.7 in) (+) / 280 mm (11.0 in) (-) (supply additional cable jumper: 2 lines/pallet); landscape: 1250 mm (49.2 in)*
Connector	T4 or MC4 series
Per Pallet	30 pieces
Per Container (40' HQ)	720 pieces

* For detailed information, please contact your local Canadian Solar sales and technical representatives.

TEMPERATURE CHARACTERISTICS

Specification	Data
Temperature Coefficient (Pmax)	-0.34 % / °C
Temperature Coefficient (Voc)	-0.26 % / °C
Temperature Coefficient (Isc)	0.05 % / °C
Nominal Module Operating Temperature	42 ± 3°C

PARTNER SECTION



* The specifications and key features contained in this datasheet may deviate slightly from our actual products due to the on-going innovation and product enhancement. CSI Solar Co., Ltd. reserves the right to make necessary adjustment to the information described herein at any time without further notice. Please be kindly advised that PV modules should be handled and installed by qualified people who have professional skills and please carefully read the safety and installation instructions before using our PV modules.

CSI SOLAR (USA) CO., LTD.

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DEL MAR, CA 92014, USA

VERSION

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110 VALLEY VIEW CT,
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APN# 03958708002063
UTILITY: CENTRAL EMC
AHJ: HARNETT COUNTY

SHEET NAME

SPEC SHEETS

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-9



IQ8 Series Microinverters

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



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



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



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



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

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IQ8SE-DS-0001-01-EN-US-2021-10-19

Easy to install

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

High productivity and reliability

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

Microgrid-forming

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

IQ8 Series Microinverters

INPUT DATA (DC)		IQ8-60-2-US	IQ8PLUS-72-2-US	IQ8M-72-2-US	IQ8A-72-2-US	IQ8H-240-72-2-US	IQ8H-208-72-2-US ¹
Commonly used module pairings ²	W	235 – 350	235 – 440	260 – 460	295 – 500	320 – 540+	295 – 500+
Module compatibility		60-cell/120 half-cell	60-cell/120 half-cell and 72-cell/144 half-cell				
MPPT voltage range	V	27 – 37	29 – 45	33 – 45	36 – 45	38 – 45	38 – 45
Operating range	V	25 – 48	25 – 58				
Min/max start voltage	V	30 / 48	30 / 58				
Max input DC voltage	V	50	60				
Max DC current ³ [module Isc]	A	15					
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
Peak output power	VA	245	300	330	366	384	366
Max continuous output power	VA	240	290	325	349	380	360
Nominal (L-L) voltage/range ⁴	V	240 / 211 – 264					208 / 183 – 250
Max continuous output current	A	1.0	1.21	1.35	1.45	1.58	1.73
Nominal frequency	Hz	60					
Extended frequency range	Hz	50 – 68					
Max units per 20 A (L-L) branch circuit ⁵		16	13	11	11	10	9
Total harmonic distortion		<5%					
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					
Acoustic noise at 1 m		<60 dBA					
Pollution degree		PD3					
Enclosure		Class II double-insulated, corrosion resistant polymeric enclosure					
Environ. category / UV exposure rating		NEMA Type 6 / outdoor					
COMPLIANCE							
Certifications		CA Rule 21 (UL 1741-SA), UL 62109-1, UL1741/IEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01					

(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.

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VERSION

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110 VALLEY VIEW CT,
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APN# 03958708002063
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AHJ: HARNETT COUNTY

SHEET NAME

SPEC SHEETS

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-10

Enphase IQ Combiner 4/4C

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



X-IQ-AM1-240-4C

X-IQ-AM1-240-4



To learn more about Enphase offerings, visit enphase.com

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



Enphase IQ Combiner 4/4C

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

To learn more about Enphase offerings, visit enphase.com

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SHEET NAME

SPEC SHEETS

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-11

Enphase Q Cable and Accessories

The **Enphase Q Cable™** and accessories are part of the sixth generation Enphase IQ System™. These products provide simplicity, reliability, and faster installation times.



Enphase Q Cable

- Two-wire, double-insulated Enphase Q Cable is 50% lighter than the previous generation Enphase cable
- Four-wire (three-phase) option also available
- New cable numbering and plug and play connectors speed up installation and simplify wire management
- Link connectors eliminate cable waste



Field-Wireable Connectors

- Easily connect Q cables on the roof without complex wiring
- Make connections from any open connector and center feed any section of cable within branch limits
- Available in male and female connector types

Enphase Q Cable Accessories

Q CABLE SPECIFICATIONS




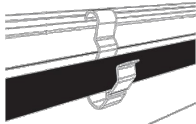
Voltage rating	600V (connector rating up to 250 V)
Cable temperature rating	90° C wet/dry
UV exposure rating	EN ISO 492-2
Environmental protection rating	IEC 60529 IP67
Compliance	RoHS, OIL RES I, CE, UV resistant
Cable insulator rating	H07BQ-F
Flame rating	IEC 60332-1-2

Q CABLE TYPES / ORDERING OPTIONS

Model Number	Max Nominal Voltage	Ampacity Rating	Connector Spacing	PV Module Orientation	Connector Count per Box
Q-25-10-240 (single-phase)	250 VAC	25 A	1.3 m	Portrait	240
Q-25-17-240 (single-phase)	250 VAC	25 A	2.0 m	Landscape (60-cell)	240
Q-25-20-200 (single-phase)	250 VAC	25 A	2.3 m	Landscape (72-cell)	200
Q-25-10-3P-200 (three-phase)	250 VAC	25 A	1.3 m	Portrait	200
Q-25-17-3P-160 (three-phase)	250 VAC	25 A	2.0 m	Landscape (60-cell)	160
Q-25-20-3P-160 (three-phase)	250 VAC	25 A	2.3 m	Landscape (72-cell)	160

ENPHASE Q CABLE ACCESSORIES

Name	Model Number	Description
Raw Q Cable (single-phase)	Q-25-RAW-300	300 meters cable with no connectors
Raw Q Cable (three-phase)	Q-25-RAW-3P-300	300 meters cable with no connectors
Field-wireable connector (male)	Q-CONN-R-10M	Make connections using single-phase cable
Field-wireable connector (male)	Q-CONN-3P-10M	Make connections using three-phase cable
Field-wireable connector (female)	Q-CONN-R-10F	Make connections from any Q Cable (single-phase) open connector
Field-wireable connector (female)	Q-CONN-3P-10F	Make connections from any Q Cable (three-phase) open connector
Cable Clip	ET-CLIP-100	Used to fasten cabling to the racking or to secure looped cabling
Disconnect tool	Q-DISC-10	Disconnect tool for Q Cable connectors, DC connectors, and AC module mount
Disconnect tool	Q-DISC-3P-10	Disconnect tool for three-phase Field wireable connectors
Q Cable sealing caps (female)	Q-SEAL-10	One needed to cover each unused connector on the cabling
Terminator (single-phase)	Q-TERM-R-10	Terminator cap for unused single-phase cable ends
Terminator (three-phase)	Q-TERM-3P-10	Terminator cap for unused three-phase cable ends
Replacement DC Adaptor (MC4)	Q-DCC-2-INT	DC adaptor to MC4 (max voltage 100 VDC)

	TERMINATOR Terminator cap for unused cable ends, sold in packs of ten (Q-TERM-R-10 / Q-TERM-3P-10))		SEALING CAPS Sealing caps for unused cable connections, sold in packs of ten (Q-SEAL-10)
	DISCONNECT TOOL Plan to use at least one per installation, sold in packs of ten (Q-DISC-10) Three-phase model (Q-DISC-3P-10)		CABLE CLIP Used to fasten cabling to the racking or to secure looped cabling, sold in packs of one hundred (ET-CLIP-100)

To learn more about Enphase offerings, visit enphase.com/in



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DEL MAR, CA 92014, USA

VERSION

DESCRIPTION	DATE	REV
INITIAL RELEASE	07/27/2022	UR

PROJECT NAME

SONIA COLLINS
 110 VALLEY VIEW CT,
 SANFORD, NC 27332
 APN# 03958708002063
 UTILITY: CENTRAL EMC
 AHJ: HARNETT COUNTY

SHEET NAME

SPEC SHEETS

SHEET SIZE

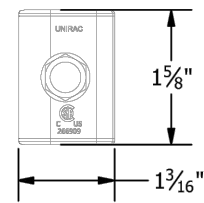
ANSI B
 11" X 17"

SHEET NUMBER

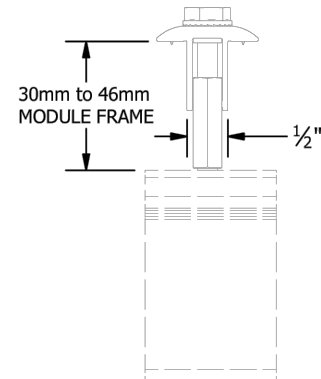
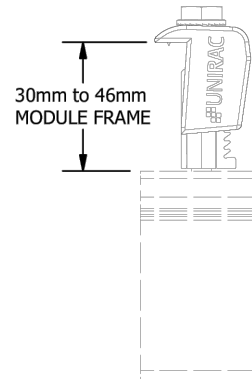
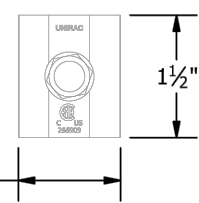
PV-12

PART # TABLE	
P/N	DESCRIPTION
302045M	UNIVERSAL AF MID CLAMP - MILL
302045D	UNIVERSAL AF MID CLAMP - DRK
302050M	UNIVERSAL AF END CLAMP - MILL
302050D	UNIVERSAL AF END CLAMP - DRK

**UNIVERSAL AF
END CLAMP**

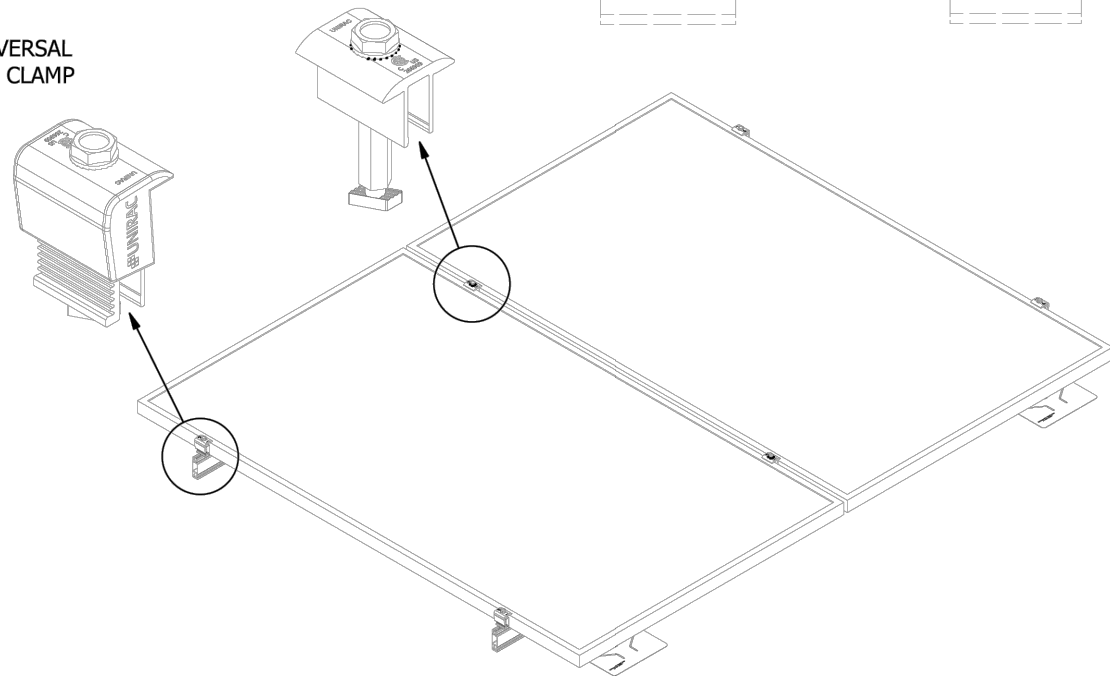


**UNIVERSAL AF
MID CLAMP**



UNIVERSAL
END CLAMP

UNIVERSAL
MID CLAMP



1411 BROADWAY BLVD. NE
ALBUQUERQUE, NM 87102 USA
PHONE: 505.242.6411
WWW.UNIRAC.COM

PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	PART & ASSEMBLY
DESCRIPTION:	UNIVERSAL AF CLAMPS
REVISION DATE:	9/28/2020

DRAWING NOT TO SCALE
ALL DIMENSIONS ARE
NOMINAL

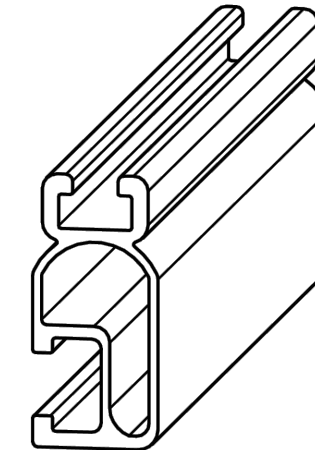
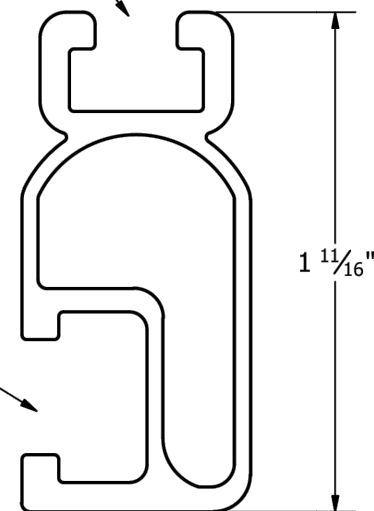
PRODUCT PROTECTED BY
ONE OR MORE US PATENTS
LEGAL NOTICE

SM-A01B

SHEET

1/4" BOLT LOCATION

3/8" BOLT LOCATION



PART # TABLE

P/N	DESCRIPTION	LENGTH
315168M	SM LIGHT RAIL 168" MILL	168"
315168D	SM LIGHT RAIL 168" DRK	168"
315240M	SM LIGHT RAIL 240" MILL	240"
315240D	SM LIGHT RAIL 240" DRK	240"



1411 BROADWAY BLVD. NE
ALBUQUERQUE, NM 87102 USA
PHONE: 505.242.6411
WWW.UNIRAC.COM

PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	PART DETAIL
DESCRIPTION:	LIGHT RAIL
REVISION DATE:	9/11/2017

DRAWING NOT TO SCALE
ALL DIMENSIONS ARE
NOMINAL

PRODUCT PROTECTED BY
ONE OR MORE US PATENTS
LEGAL NOTICE

SM-P02

SHEET

VERSION

DESCRIPTION	DATE	REV
INITIAL RELEASE	07/27/2022	UR

PROJECT NAME

SONIA COLLINS
110 VALLEY VIEW CT,
SANFORD, NC 27332
APN# 03958708002063
UTILITY: CENTRAL EMC
AHJ: HARNETT COUNTY

SHEET NAME

SPEC SHEETS

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-13

FLASH LOC



FLASH LOC INSTALLATION GUIDE

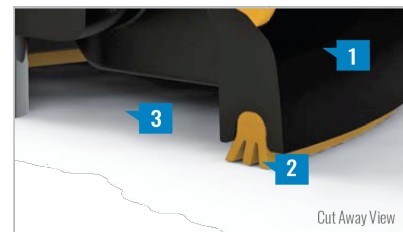


FLASHLOC is the ultimate attachment for composition shingle and rolled comp roofs. The all-in-one mount installs fast — no kneeling on hot roofs to install flashing, no prying or cutting shingles, no pulling nails. Simply drive the lag bolt and inject sealant into the base. **FLASHLOC's** patented TRIPLE 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!**



PROTECT THE ROOF

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



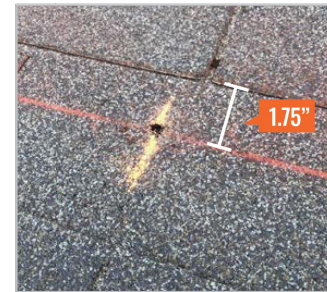
LOC OUT WATER

With an outer shield **1** contour-conforming gasket **2** and pressurized sealant chamber **3** the Triple-Loc Seal 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.



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, then fill pilot hole with sealant.

NOTE: Space mounts per racking system install specifications. When down pressure is ≥ 34 psf, span may not exceed 2 ft.



STEP 1: SECURE

Place **FLASHLOC** 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 **FLASHLOC** 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 **FLASHLOC** is installed over gap between shingle or tabs or vertical joints, fill gap/joint with sealant between mount and upslope edge of shingle course.

Use only provided sealant.



DEL MAR, CA 92014, USA

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AHJ: HARNETT COUNTY

SHEET NAME

SPEC SHEETS

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-14

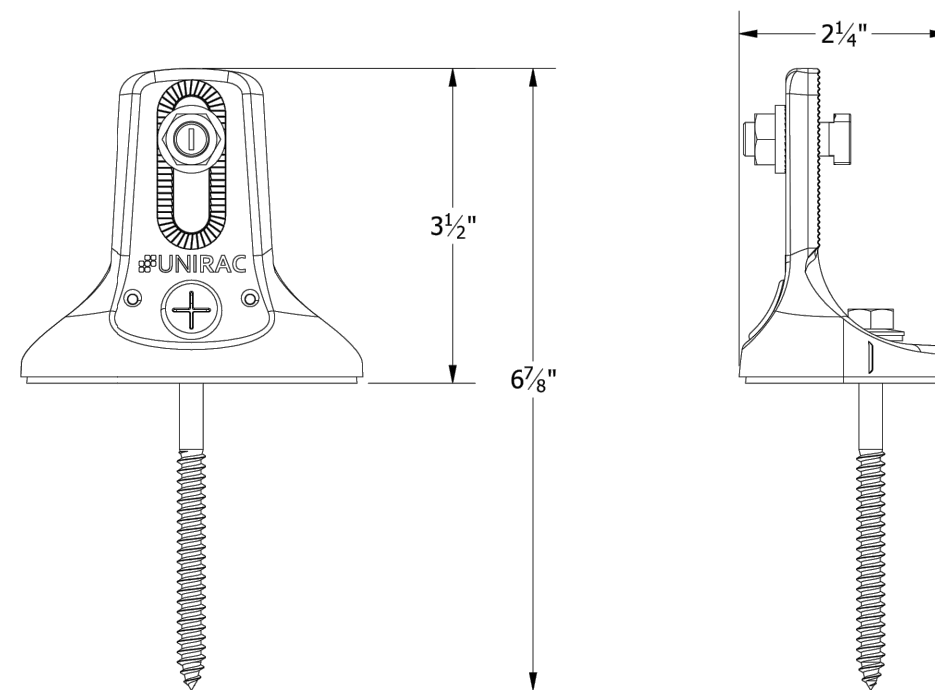
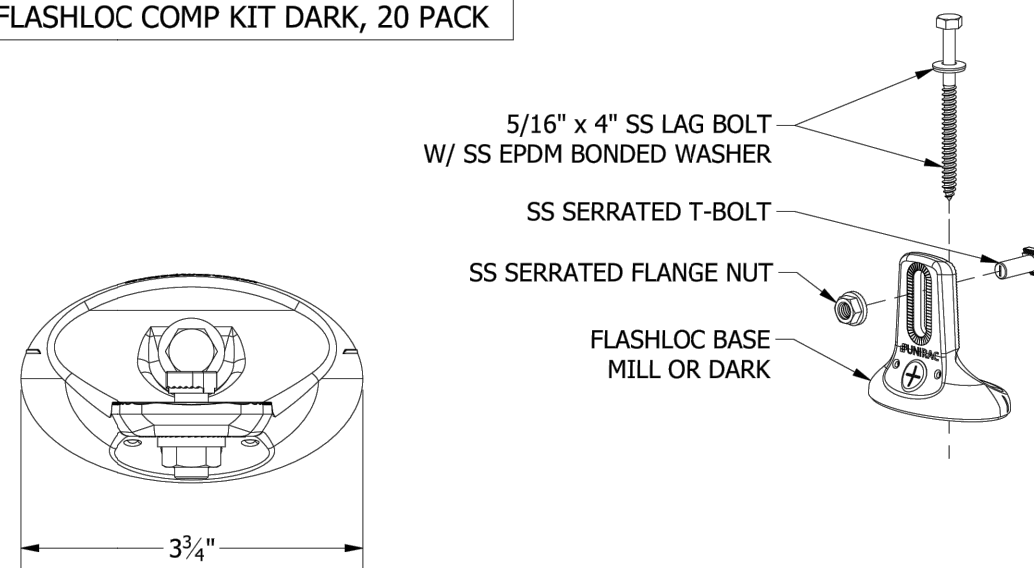
FASTER INSTALLATION. 25-YEAR WARRANTY.

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

FASTER INSTALLATION. 25-YEAR WARRANTY.

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

PART TABLE	
P/N	DESCRIPTION
004085M	FLASHLOC COMP KIT MILL, 20 PACK
004085D	FLASHLOC COMP KIT DARK, 20 PACK




1411 BROADWAY BLVD. NE
ALBUQUERQUE, NM 87102 USA
PHONE: 505.242.6411
WWW.UNIRAC.COM

PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	PART DRAWING
DESCRIPTION:	FLASHLOC COMP KIT
REVISION DATE:	4/28/2020

DRAWING NOT TO SCALE
ALL DIMENSIONS ARE
NOMINAL

PRODUCT PROTECTED BY
ONE OR MORE US PATENTS
LEGAL NOTICE

FL-A01
SHEET

VERSION		
DESCRIPTION	DATE	REV
INITIAL RELEASE	07/27/2022	UR

PROJECT NAME

SONIA COLLINS
110 VALLEY VIEW CT,
SANFORD, NC 27332
APN# 03958708002063
UTILITY: CENTRAL EMC
AHJ: HARNETT COUNTY

SHEET NAME	SPEC SHEETS
SHEET SIZE	ANSI B 11" X 17"
SHEET NUMBER	PV-15

UNIVERSAL AF

EXPECT MORE

FROM A UNIVERSAL FASTENER.

Ditch the Spacers

The Universal Aesthetic Fastener (Universal AF) accommodates every module between 30 and 46 mm without extra spacers, while providing the fast intuitive install experience that installers require, and a refined aesthetic home owners will love.

More than just Universal

- Self standing, twist-and-lock install
- Guaranteed T-bolt engagement
- 1-tool installation
- Integrated bonding mid and end clamps

Sleek Aesthetics

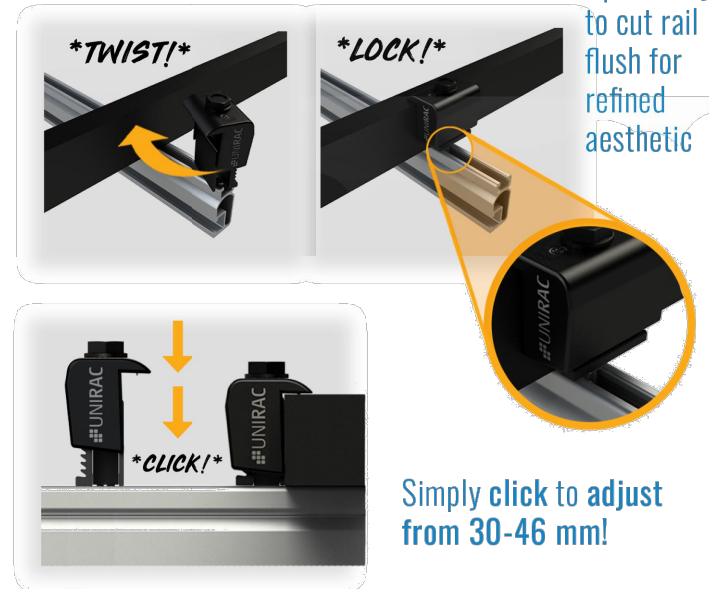
- Low profile hardware
- 1/2" module gap, end caps
- Optionality to cut rail flush
- Rail endcaps available for refined finish.

Product Specifications

PART #	PRODUCT DESCRIPTION	LIST PRICE	PACK SIZE
#302045M	UNIVERSAL AF SERIES MID CLAMP MILL	\$2.33	20
#302045D	UNIVERSAL AF SERIES MID CLAMP DRK	\$2.52	20
#302050M	UNIVERSAL AF SERIES END CLAMP MILL	\$2.69	20
#302050D	UNIVERSAL AF SERIES END CLAMP DRK	\$2.90	20

END-CLAMP

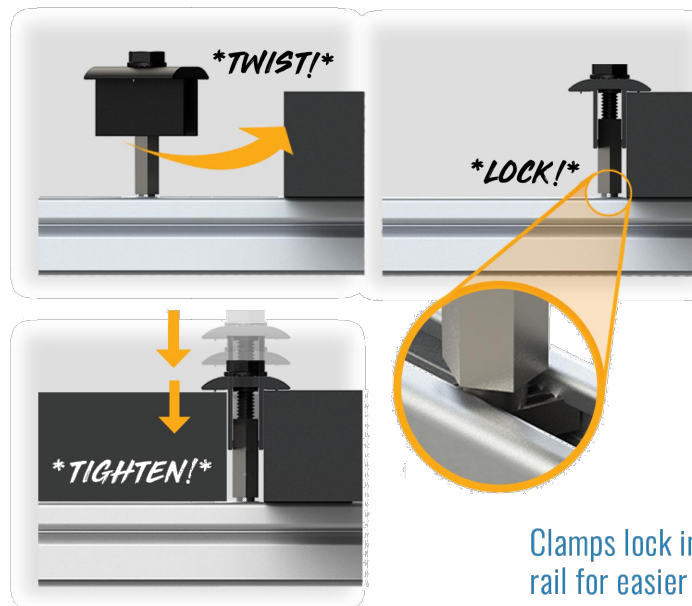
Twist and Lock engagement feature



Simply click to adjust from 30-46 mm!

MID-CLAMP

Twist and Lock engagement feature



Tighten to adjust from 30-46 mm!

Clamps lock into rail for easier panel placement

CONTACT: 505-242-6411 | SALES@UNIRAC.COM | WWW.UNIRAC.COM

UNIRAC
BETTER SOLAR STARTS HERE



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SPEC SHEETS

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-16

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 UL 1703. This UL 1703 classification has been incorporated into our UL 2703 product certification. SOLARMOUNT has achieved system level performance for steep sloped roofs. System level fire performance is inherent in the SOLARMOUNT design, and no additional mitigation measures are required. 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 are listed below:

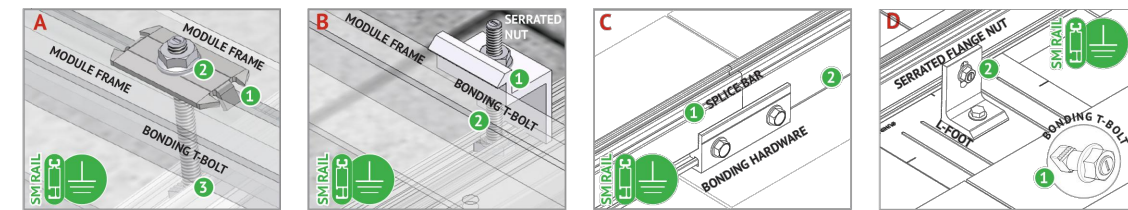
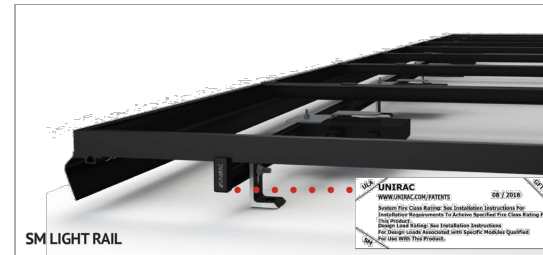
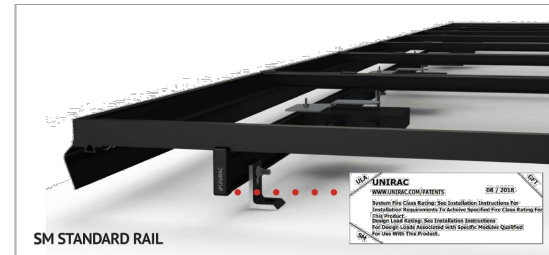
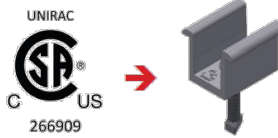
Rail Type	Module Type	System Level Fire Rating	Rail Direction	Module Orientation	Mitigation Required
Standard Rail	Type 1, Type 2, Type 3 & Type 10	Class A, Class B & Class C	East-West	Landscape OR Portrait	None Required
			North-South	Landscape OR Portrait	None Required
Light Rail	Type 1 & Type 2	Class A, Class B & Class C	East-West	Landscape OR Portrait	None Required
			North-South	Landscape OR Portrait	None Required

This racking system may be used to ground and/or mount a PV module complying with UL1703 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.



BONDING MIDCLAMP ASSEMBLY

1. Stainless steel Midclamp points, 2 per module, pierce module frame anodization to bond module to module through clamp.
2. Serrated flange nut bonds stainless steel clamp to stainless steel T-bolt.
3. Serrated T-bolt head penetrates rail anodization to bond T-bolt, nut, clamp, and modules to grounded SM rail.

ENDCLAMP ASSEMBLY

1. Serrated flange nut bonds aluminum Endclamp to stainless steel T-bolt.
2. Serrated T-bolt head penetrates rail anodization to bond T-bolt, nut, and Endclamp to grounded SM rail.

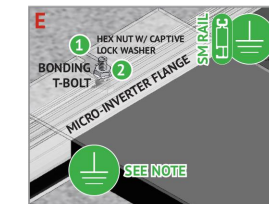
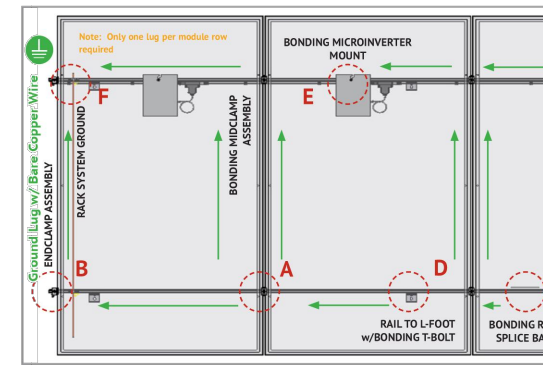
BONDING RAIL SPLICE BAR

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.

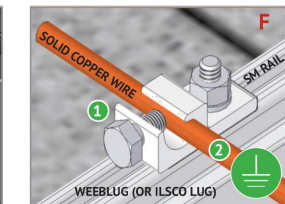
RAIL TO L-FOOT w/BONDING T-BOLT

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

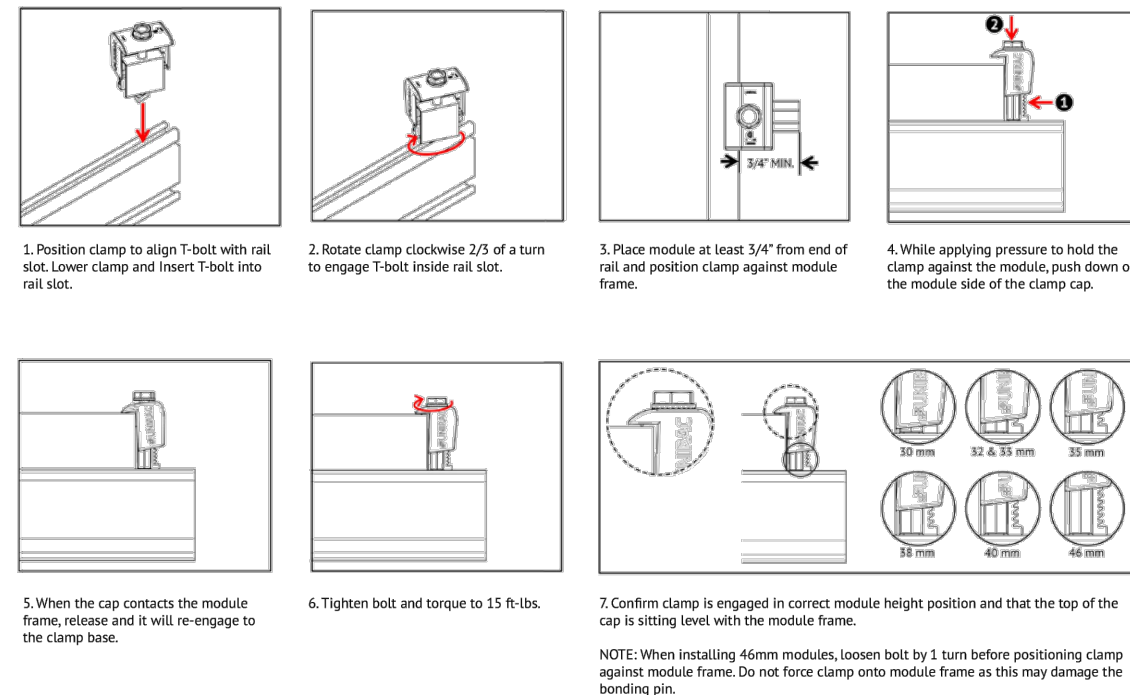
1. Hex nut with captive lock washer bonds metal microinverter flange to stainless steel T-bolt.
2. Serrated T-bolt head penetrates rail anodization to bond T-bolt, nut, and L-foot to grounded SM rail. System ground including racking and modules may be achieved through the trunk cable of approved microinverter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

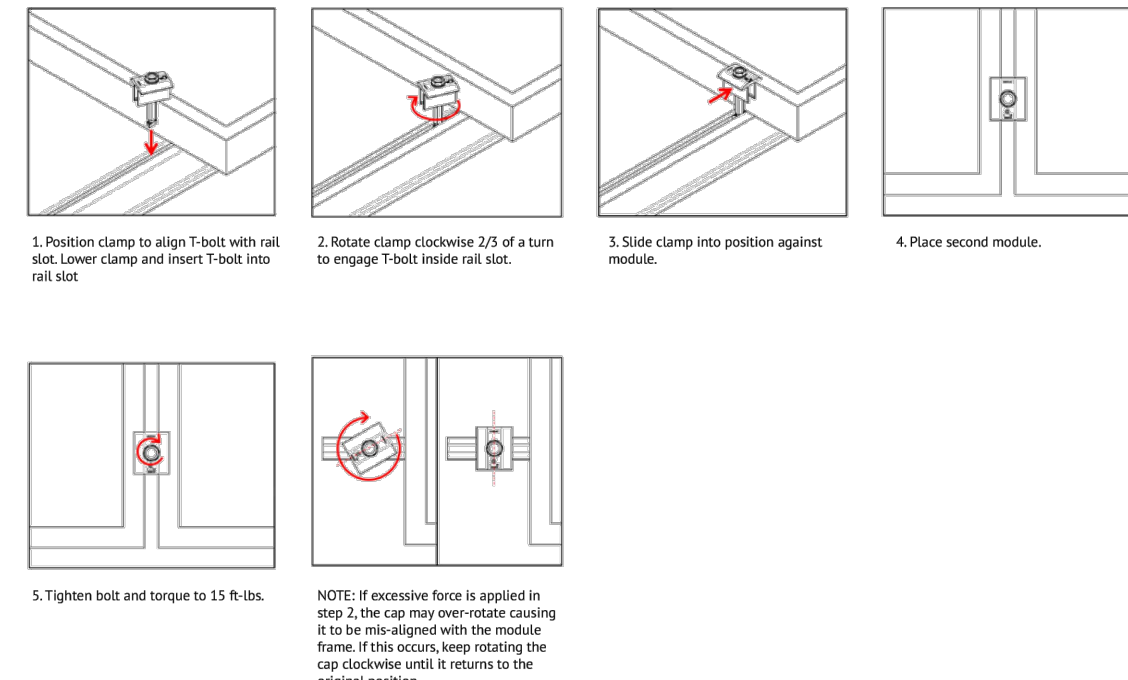
NOTE: Ilco lug can also be used when secured to the side of the rail. See page J for details.



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.



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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110 VALLEY VIEW CT,
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APN# 03958708002063
UTILITY: CENTRAL EMC
AHJ: HARNETT COUNTY

SHEET NAME

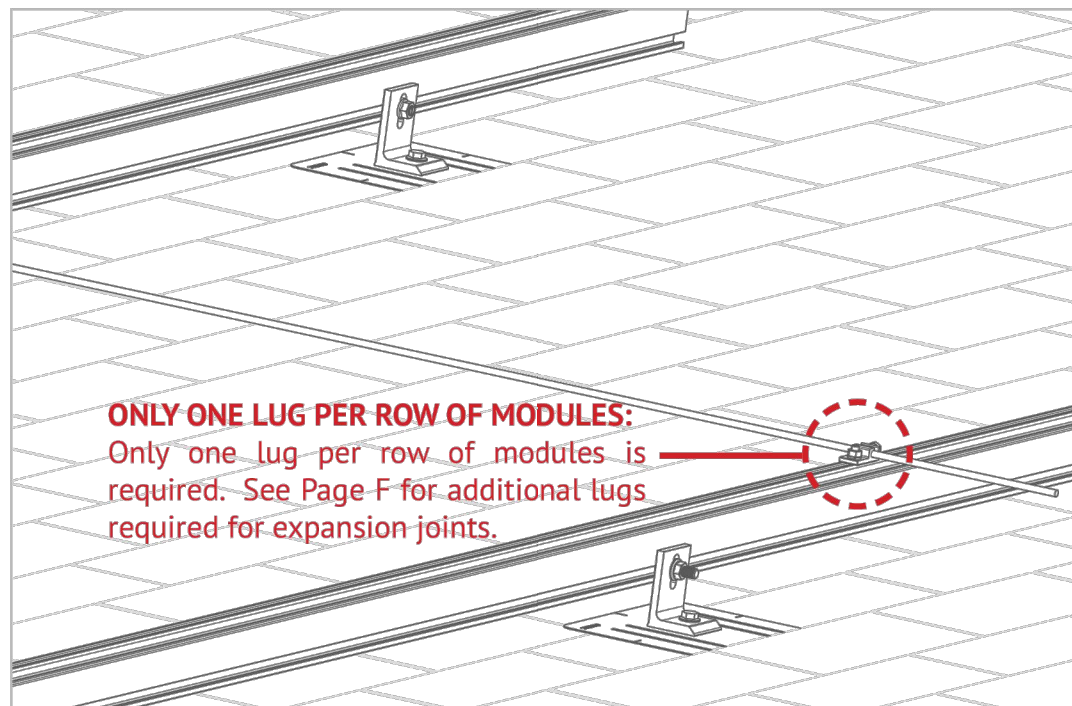
SPEC SHEETS

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-17



ONLY ONE LUG PER ROW OF MODULES:
Only one lug per row of modules is required. See Page F for additional lugs required for expansion joints.

GROUNDING LUG MOUNTING DETAILS:

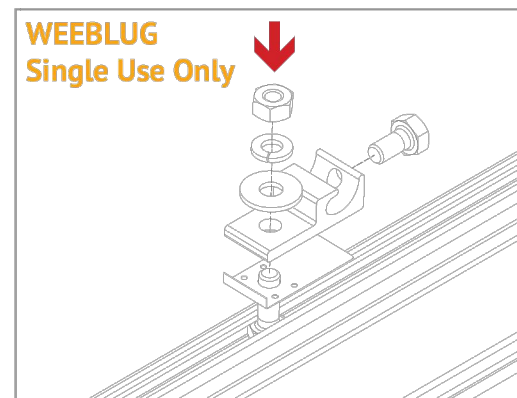
Details are provided for both the WEEB and IlSCO products. The WEEBLug has a grounding symbol located on the lug assembly. The IlSCO lug has a green colored set screw for grounding indication purposes. Installation must be in accordance with NFPA NEC 70, however the electrical designer of record should refer to the latest revision of NEC for actual grounding conductor cable size.

Required if not using approved integrated grounding microinverters

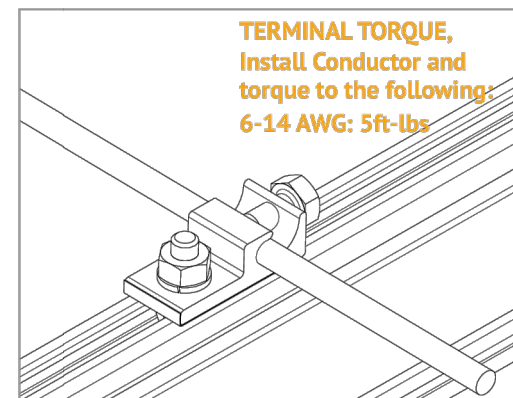
GROUNDING LUG - BOLT SIZE & DRILL SIZE

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.



WEEBLUG
Single Use Only



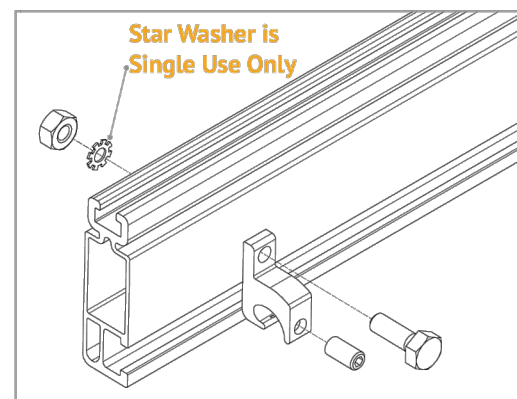
TERMINAL TORQUE,
Install Conductor and
torque to the following:
6-14 AWG: 5ft-lbs

WEEBLUG CONDUCTOR - UNIRAC P/N 008002S:

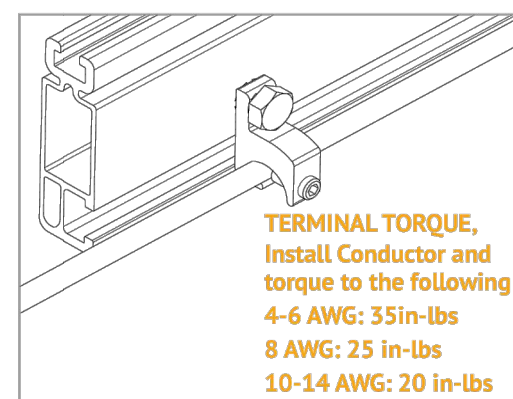
Apply Anti Seize and insert a bolt in the aluminum rail and through the clearance hole in the stainless steel flat washer. Place the stainless steel flat washer on the bolt, oriented so the dimples will contact the aluminum rail. Place the lug portion on the bolt and stainless steel flat washer. Install 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



Star Washer is
Single Use Only



TERMINAL TORQUE,
Install Conductor and
torque to the following:
4-6 AWG: 35in-lbs
8 AWG: 25 in-lbs
10-14 AWG: 20 in-lbs

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

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AHJ: HARNETT COUNTY

SHEET NAME

SPEC SHEETS

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-18



Descriptive Report and Test Results

MASTER CONTRACT: 266909
REPORT: 70131735
PROJECT: 80128750

Edition 1: September 20, 2017; Project 70131735– Albuquerque
Issued by Michael Hoffnagle

Edition 17: April 22, 2022; Project 80116723 - Irvine
Prepared By: Michael Hoffnagle
Authorized By: Michael Hoffnagle

Edition 18: June 8, 2022; Project 80128750 - Irvine
Prepared By: Michael Hoffnagle
Authorized By: Michael Hoffnagle

Report pages reissued

Contents: Certificate of Compliance - Pages 1 to 6
Supplement to Certificate of Compliance - Pages 1 to 3
Description and Tests - Pages 1 to 27
Att1 Installation Manual SM– Pages 1 to 36
Att2 Schematics SM/ULA– Pages 1 to 72
Att3 Installation Manual ULA– Pages 1 to 22
Att4 RM5_Installation Guide - 1 to 19
Att5 RMDT_Installation Guide - 1 to 20
Att6 RM series schematics – 1 to 32
Att7 Installation Manual, GFT Shared Rail – Pages 1 to 40
Att8 Installation Manual, GFT 4-Rail – Pages 1 to 39
Att9 GFT Schematics – Pages 1 to 42
Att10 NXT Horizon Installation Manual – Pages 1 to 22
Att11 Schematics NXT Horizon – Pages 1 to 13

PRODUCTS

CLASS - C531302 - POWER SUPPLIES - PHOTOVOLTAICS-PV Racking and clamping systems
CLASS - C531382 - POWER SUPPLIES - PHOTOVOLTAICS-PV Racking and clamping systems -
Certified to US Standards

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34 Bunsen, Irvine, CA, U.S.A. 92618
Telephone: 949.733.4300 1.800.463.6727 Fax: 949.733.4320 www.csagroup.org



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AHJ: HARNETT COUNTY

SHEET NAME

SPEC SHEETS

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-19



APPENDIX A : B

System Certification : PAGE



Electrical Bonding and Grounding Test Modules

The list below is not exhaustive of compliant modules but shows those that have been evaluated and found to be electrically compatible with the SOLARMOUNT system.

Manufacture	Module Model / Series
Aionrise	AION60G1, AION72G1
Aleo	P-Series & S-Series
Aptos Solar	DNA-120-MF10 DNA-120-(MF/BF)23 DNA-144-(MF/BF)23 DNA-120-(MF/BF)26 DNA-144-(MF/BF)26
Astronergy	CHSM6612 M, M/HV CHSM6612P Series CHSM6612P/HV Series CHSM72M-HC CHSM72M(DG)/F-BH
Auxin	AXN6M610T AXN6P610T AXN6M612T AXN6P612T
Axitec	AC-xxx(M/P)/60S, AC-xxx(M/P)/72S AC-xxxP/156-60S AC-xxxMH/120(S/V/SB/VB) AC-xxxMH/144(S/V/SB/VB)
Boviet	BVM6610, BVM6612
BYD	P6K & MHK-36 Series
Canadian Solar	CS1(H/K/U/Y)-MS CS3K-(MB/MB-AG/MS/P/P HE/PB-AG) CS3L-(MS/P) CS3N-MS CS3U-(MB/MB-AG/MS/P/P HE/PB/PB-AG) CS3W-(MS/P/P-PB-AG)

Manufacture	Module Model / Series
Canadian Solar (cont.)	CS5A-M CS6K-(M/MS/MS AllBlack/P/P HE) CS6P-(M/P) CS6U-(M/P/P HE) CS6X-P, CSX-P ELPS CS6(A/P)-MM
Centrosolar America	C-Series & E-Series
CertainTeed	CT2xxMxx-01, CT2xxPxx-01, CTxxxMxx-01 CTxxxPxx-01, CTxxxMxx-02, CTxxxMxx-03 CTxxxMxx-04, CTxxxHC11-04
Eco Solargy	Orion 1000 & Apollo 1000
ET Solar	ET AC Module, ET Module
First Solar	FS-6XXX(A) FS-6XXX(A)-P, FS-6XXX(A)-P-I
Flextronics	FXS-xxxBB
FreeVolt	PVGraf
GCL	GCL-P6 & GCL-M6 Series
Hanwha SolarOne	HSL 60
Hansol	TD-AN3, TD-AN4 UB-AN1, UD-AN1
Heliene	36M, 36P 60M, 60P, 72M & 72P Series 144HC M6
HT Solar	HT72-156(M/P) HT72-156P-C, HT72-156P(V)-C HT72-156M(PDV)-BF, HT72-156M(PD)-BF HT60-156M-C HT60-156M(V)-C

Manufacture	Module Model / Series
Hyundai	KG, MG, RW, TG, RI, RG, TI, KI, HI Series HiA-SxxxHG, HiD-SxxxRG(BK), HiS-S400PI
ITEK	iT-SE Series
Japan Solar	JPS-60 & JPS-72 Series
JA Solar	JAM72D30MB, JAM78D10MB JAP6 60-xxx JAM6(k)-60/xxx, JAP6(k)-72-xxx/4BB JAP72S##-xxx/** JAP6(k)-60-xxx/4BB, JAP60S##-xxx/** JAM6(k)-72-xxx/**, JAM72S##-xxx/** JAM6(k)-60-xxx/**, JAM60S##-xxx/** i. ##: 01, 02, 03, 09, 10 ii. **: SC, PR, BP, HiT, IB, MW, MR ** = Backsheet, ## Cell technology
Jinko	JKM & JKMS Series JKMxxxM-72HL-V JKMxxxM-72HL4-(T)V JKMxxxM-7RL3-V
Kyocera	KD-F & KU Series
LA Solar	LSxxxHC(166)
LG Electronics	LGxxx(E1C/E1K/N1C/N1K/N2T/N2W/S1C/ S2W/Q1C/Q1K)-A5 LGxxx(A1C/M1C/M1K/N1C/N1K/Q1C/Q1K/ QAC/QAK)-A6 LGxxxN2W-B3 LGxxxN2T-B5 LGxxxN1K-B6 LGxxx(N1C/N1K/N2T/N2W)-E6 LGxxx(N1C/N1K/N2W/S1C/S2W)-G4

- Unless otherwise noted, all modules listed above include all wattages and specific models within that series. Variable wattages are represented as "xxx"
- Items in parenthesis are those that may or may not be present in a compatible module's model ID
- Slashes "/" between one or more items indicates that either of those items may be the one that is present in a module's model ID
- The frame profile must not have any feature that might interfere with the bonding devices that are integrated into the racking system
- Use with a maximum over current protection device OCPD of 30A
- **Listed models can be used to achieve a Class A fire system rating for steep slope applications. See Appendix A, page A**

VERSION		
DESCRIPTION	DATE	REV
INITIAL RELEASE	07/27/2022	UR

PROJECT NAME

SONIA COLLINS
110 VALLEY VIEW CT,
SANFORD, NC 27332
APN# 03958708002063
UTILITY: CENTRAL EMC
AHJ: HARNETT COUNTY

SHEET NAME
SPEC SHEETS

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-20



March 28, 2022

Unirac
1411 Broadway Blvd. NE
Albuquerque, NM 87102

Attn.: Unirac - Engineering Department

Re: Engineering Certification for the Unirac U-Builder 2.0 SOLARMOUNT Flush Rail

PZSE, Inc. - Structural Engineers has reviewed the Unirac SOLARMOUNT rails, proprietary mounting system constructed from modular parts which is intended for rooftop installation of solar photovoltaic (PV) panels; and has reviewed the U-builder Online tool. This U-Builder software includes analysis for the SOLARMOUNT LIGHT rail, SOLARMOUNT STANDARD rail, and SOLARMOUNT HEAVY DUTY rail with Standard and Pro Series hardware. All information, data and analysis contained within are based on, and comply with the following codes and typical specifications:

1. Minimum Design Loads for Buildings and other Structures, ASCE/SEI 7-05 and ASCE/SEI 7-10
2. 2006-2015 International Building Code, by International Code Council, Inc.
3. 2006-2015 International Residential Code, by International Code Council, Inc.
4. AC428, Acceptance Criteria for Modular Framing Systems Used to Support Photovoltaic (PV) Panels, November 1, 2012 by ICC-ES.
5. 2015 Aluminum Design Manual, by The Aluminum Association, 2015

Following are typical specifications to meet the above code requirements:

Design Criteria: Ground Snow Load = 0 - 100 (psf)
Basic Wind Speed = 85 - 190 (mph)
Roof Mean Height = 0 - 60 (ft)
Roof Pitch = 0 - 45 (degrees)
Exposure Category = B, C & D

Attachment Spacing: Per U-builder Engineering report.

Cantilever: Maximum cantilever length is L/3, where "L" is the span noted in the U-Builder online tool.

Clearance: 2" to 10" clear from top of roof to top of PV panel.

Tolerance(s): 1.0" tolerance for any specified dimension in this report is allowed for installation.

Installation Orientation: See SOLARMOUNT Rail Flush Installation Guide.
Landscape - PV Panel long dimension is parallel to ridge/eave line of roof and the PV panel is mounted on the long side.
Portrait - PV Panel short dimension is parallel to ridge/eave line of roof and the PV panel is mounted on the short side.



Components and Cladding Roof Zones:

The Components and Cladding Roof Zones shall be determined based on ASCE 7-05 and ASCE 7-10 Component and Cladding design.

- Notes:
- 1) U-builder Online tool analysis is only for Unirac SM SOLARMOUNT Rail Flush systems only and do not include roof capacity check.
 - 2) Risk Category II per ASCE 7-10.
 - 3) Topographic factor, kzt is 1.0.
 - 4) Average parapet height is 0.0 ft.
 - 5) Wind speeds are LRFD values.
 - 6) Attachment spacing(s) apply to a seismic design category E or less.

Design Responsibility:

The U-Builder design software is intended to be used under the responsible charge of a registered design professional where required by the authority having jurisdiction. In all cases, this U-builder software should be used under the direction of a design professional with sufficient structural engineering knowledge and experience to be able to:

- Evaluate whether the U-Builder Software is applicable to the project, and
- Understand and determine the appropriate values for all input parameters of the U-Builder software.

This letter certifies that the Unirac SM SOLARMOUNT Rails Flush, when installed according to the U-Builder engineering report and the manufacture specifications, is in compliance with the above codes and loading criteria.

This certification excludes evaluation of the following components:

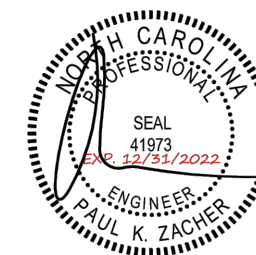
- 1) The structure to support the loads imposed on the building by the array; including, but not limited to: strength and deflection of structural framing members, fastening and/or strength of roofing materials, and/or the effects of snow accumulation on the structure.
- 2) The attachment of the SM SOLARMOUNT Rails to the existing structure.
- 3) The capacity of the solar module frame to resist the loads.

This requires additional knowledge of the building and is outside the scope of the certification of this racking system.

If you have any questions on the above, do not hesitate to call.

Prepared by:
PZSE, Inc. – Structural Engineers
Roseville, CA

DIGITALLY SIGNED



03/28/2022



DEL MAR, CA 92014, USA

VERSION

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PROJECT NAME

SONIA COLLINS
 110 VALLEY VIEW CT,
 SANFORD, NC 27332
 APN# 03958708002063
 UTILITY: CENTRAL EMC
 AHJ: HARNETT COUNTY

SHEET NAME

SPEC SHEETS

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-21



Certificate of Compliance

Certificate: 70131735 **Master Contract:** 266909
Project: 80128750 **Date Issued:** 2022-06-08
Issued To: Unirac
1411 Broadway NE
Albuquerque, New Mexico, 87102
United States

Attention: Rob D'Anastasio

The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US or with adjacent indicator 'US' for US only or without either indicator for Canada only.



Issued by: Michael Hoffnagle
Michael Hoffnagle

PRODUCTS

CLASS - C531302 - POWER SUPPLIES - PHOTOVOLTAICS-PV Racking and clamping systems
CLASS - C531382 - POWER SUPPLIES - PHOTOVOLTAICS-PV Racking and clamping systems -
Certified to US Standards



Certificate: 70131735
Project: 80128750

Master Contract: 266909
Date Issued: 2022-06-08

Models:	SM	-	SOLARMOUNT Flush-to-Roof is an extruded aluminum rail PV racking system that is installed parallel to the roof in landscape or portrait orientations.
	ULA	-	Unirac Large Array is a ground mount system using the SolarMount (SM) platform for the bonding and grounding of PV modules.

Solarmount

The system listed is designed to provide bonding/grounding, and mechanical stability for photovoltaic modules. The system is secured to the roof with the L-Foot components through the roofing material to building structure. Modules are secured to the racking system with stainless steel or aluminum mid clamps and Aluminum end clamps. The modules are bonded to the racking system with the stainless-steel bonding mid clamps with piercing points. The system is grounded with 10 AWG copper wire to bonding/grounding lugs. Fire ratings of Class A with Type 1, 2, 3 (with metallic frame), 4 (with trim), 5 (with trim), 10(with metallic frame), 19, 22, 25, 29, or 30 for steep slope. Tested at 5" interstitial gap which allows installation at any stand-off height.

The grounding of the system is intended to comply with the latest edition of the National Electrical Code, to include NEC 250 & 690. Local codes compliance is required, in addition to national codes. All grounding/bonding connections are to be torqued in accordance with the Installation Manual and the settings used during the certification testing for the current edition of the project report.

The system may employ optimizers/micro-inverters and used for grounding when installed per installation instructions.

UL 2703 Mechanical Load ratings:

Downward Design Load (lb/ft ²)	113.5
Upward Design Load (lb/ft ²)	50.7
Down-Slope Load (lb/ft ²)	16.13

Test Loads:

Downward Load (lb/ft ²)	170.20
Upward Load (lb/ft ²)	76.07
Down-Slope Load (lb/ft ²)	24.2



DEL MAR, CA 92014, USA

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APN# 03958708002063
UTILITY: CENTRAL EMC
AHJ: HARNETT COUNTY

SHEET NAME

SPEC SHEETS

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-22