

PHOTOVOLTAIC ROOF MOUNT SYSTEM

32 MODULES-ROOF MOUNTED - 12.80 kWDC, 9.28 kWAC
210 OLD FIELD LOOP, SANFORD, NC 27332 USA



SYSTEM SUMMARY:

- (N) 32 - HANWHA QCELL Q.PEAK DUO BLK ML-G10.A+ (400W) MODULES
- (N) 32 - ENPHASE ENERGY IQ7PLUS-72-2-US MICRO-INVERTERS
- (N) JUNCTION BOX
- (E) 200A MAIN SERVICE PANEL WITH (E) 200A MAIN BREAKER
- (N) 60A FUSED AC DISCONNECT
- (N) ENPHASE IQ COMBINER BOX 3

DESIGN CRITERIA:

- ROOF TYPE: - COMP 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:- B
- 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)

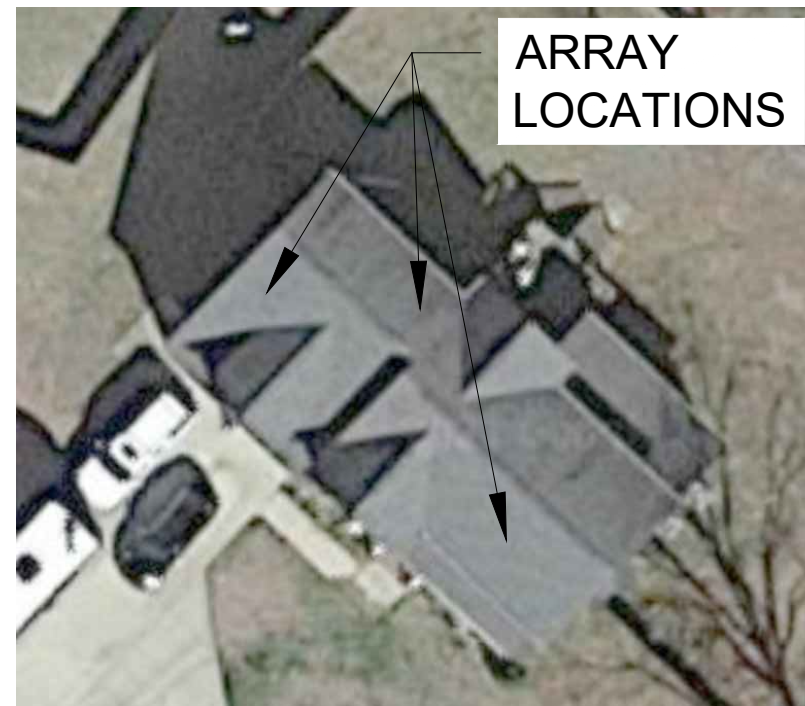
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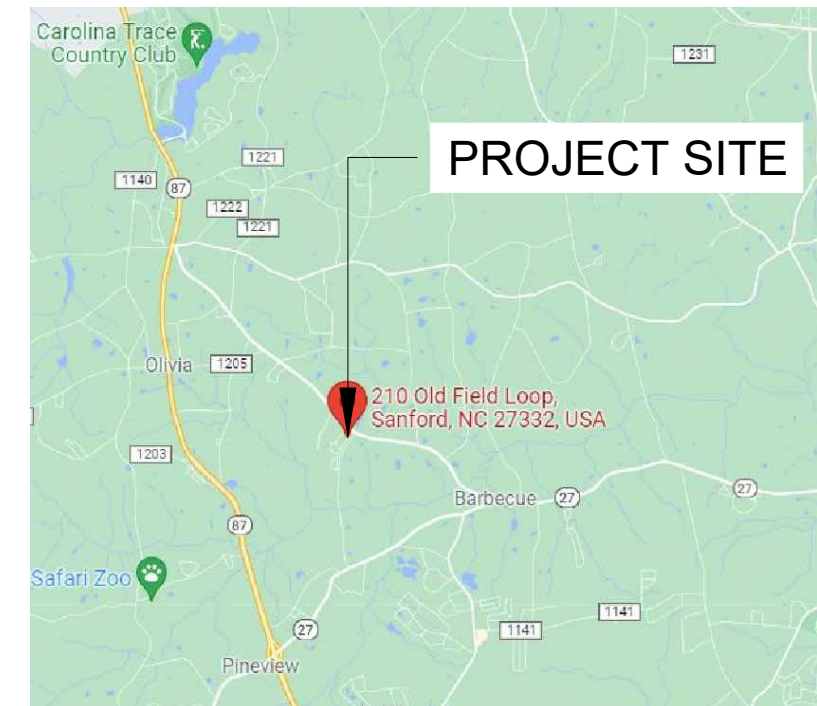


GENERAL NOTES

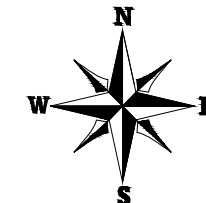
- THE CONTRACTOR/INSTALLER OF THE SOLAR PV SYSTEM OVER EXISTING ROOF SHALL CONFORM TO OSHA REQUIREMENTS DURING THE CONSTRUCTION PHASE. JOB SAFETY AND CONSTRUCTION PROCEDURES ARE THE SOLE RESPONSIBILITY OF THE CONTRACTOR/INSTALLER.
- REFER TO ELECTRICAL DRAWING PV-5 FOR PANEL DETAILED INFORMATION.
- IN 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.



1 | AERIAL PHOTO
PV-0 | SCALE: NTS



2 | VICINITY MAP
PV-0 | SCALE: NTS



VERSION		
DESCRIPTION	DATE	REV
INITIAL RELEASE	11/03/2021	UR

PROJECT NAME
LAVETTE GILBERT
210 OLD FIELD LOOP,
SANFORD, NC 27332 USA
APN# 039577002818
UTILITY: DUKE ENERGY
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.



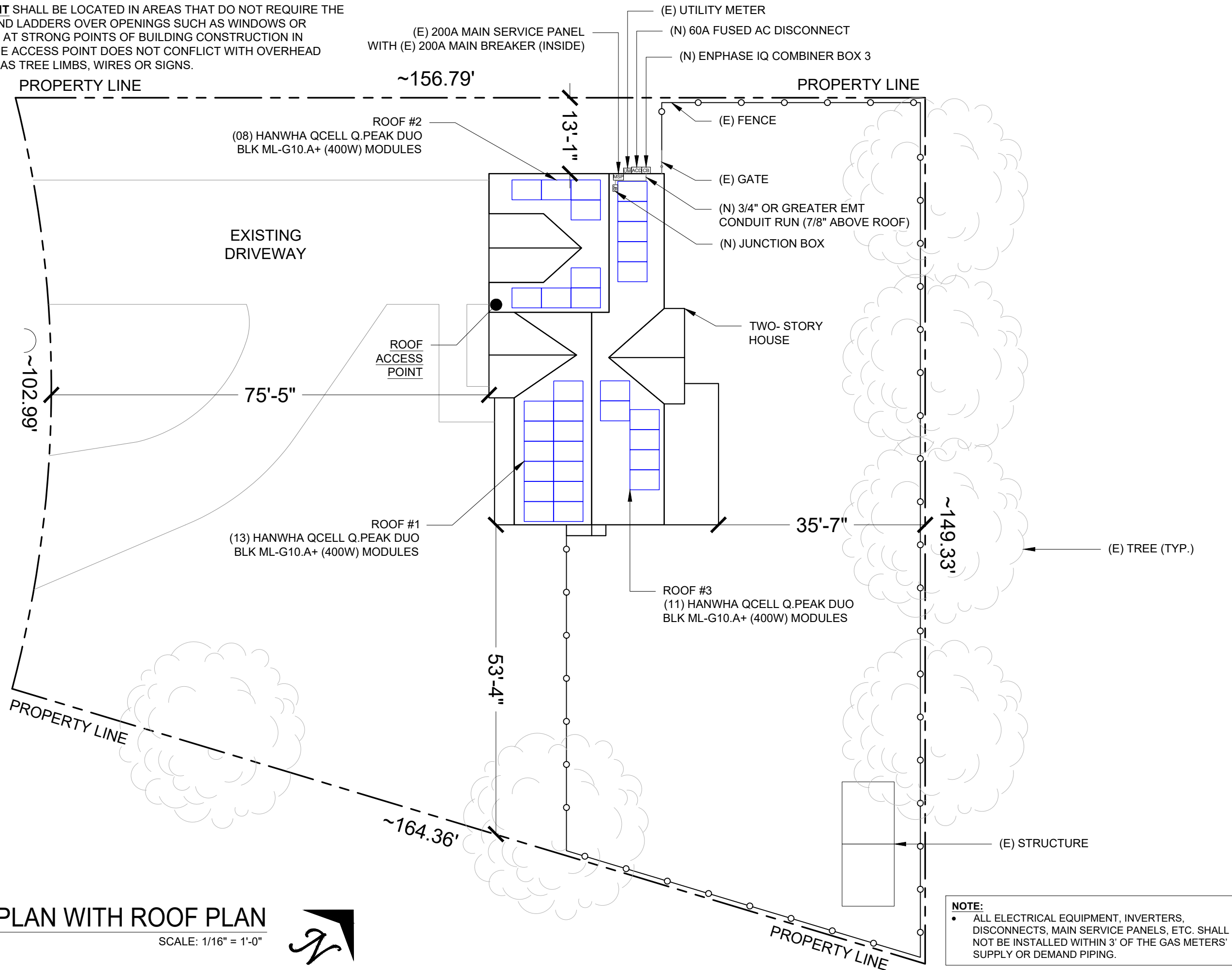
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SHEET NAME
SITE PLAN WITH ROOF PLAN

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-1



NOTE:

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

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



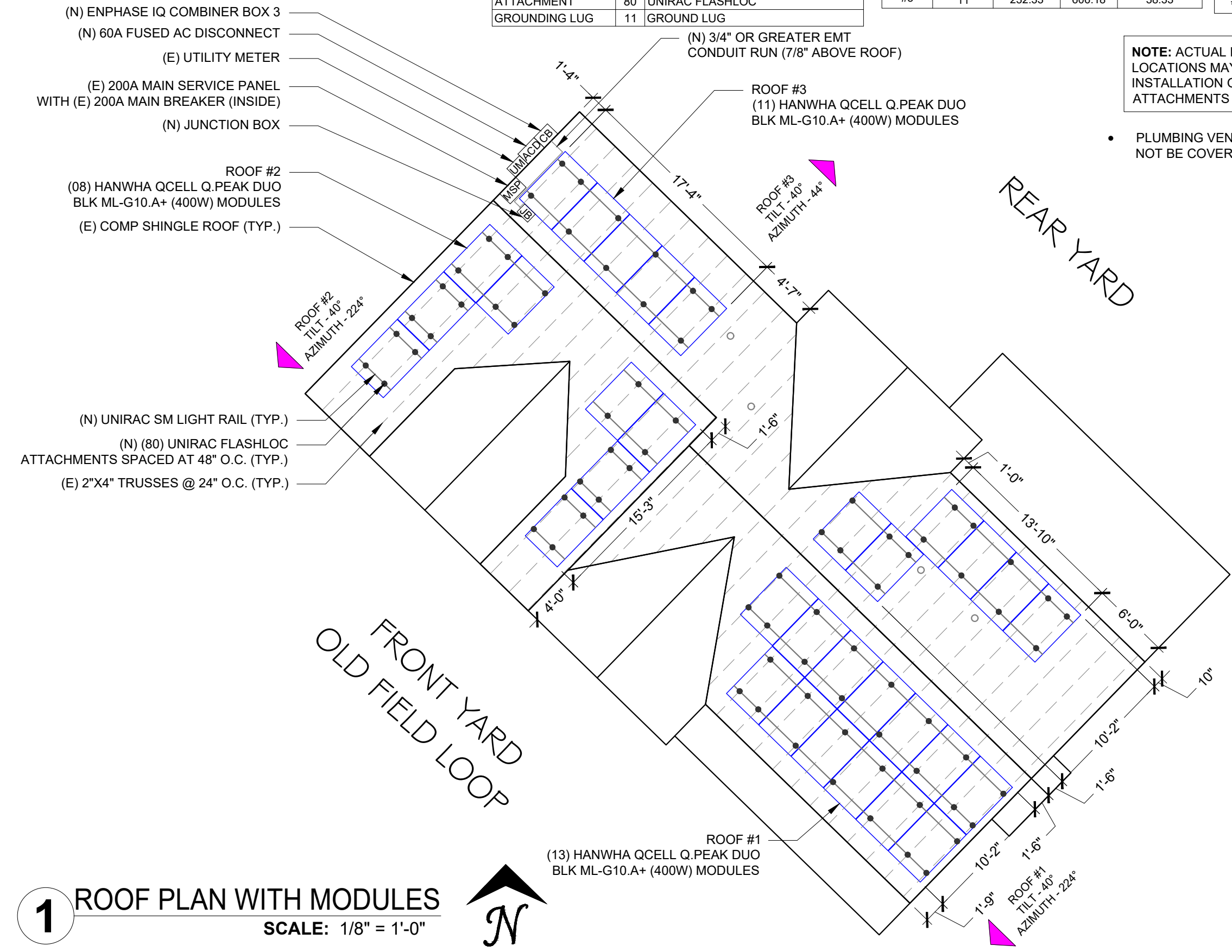
MODULE TYPE, DIMENSIONS & WEIGHT

NUMBER OF MODULES = 32 MODULES
 MODULE TYPE = HANWHA QCELL Q.PEAK DUO BLK ML-G10.A+ (400W) MODULES
 MODULE WEIGHT = 48.5 LBS / 22.0 KG.
 MODULE DIMENSIONS = 74.0"X 41.1" = 21.12 SF
 UNIT WEIGHT OF ARRAY = 2.30 PSF

BILL OF MATERIALS		
EQUIPMENT	QTY	DESCRIPTION
RAIL	16	UNIRAC SM LIGHT RAIL 168" DARK
SPLICE	06	BND SPLICE BAR PRO SERIES DRK
MID CLAMP	42	UNIVERSAL AF SERIES MID CLAMP
END CLAMP	44	UNIVERSAL AF SERIES END CLAMP
ATTACHMENT	80	UNIRAC FLASHLOC
GROUNDING LUG	11	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	13	274.57	410.25	66.93
#2	08	168.97	344.51	49.05
#3	11	232.33	606.18	38.33

ROOF DESCRIPTION				
ROOF TYPE			COMP SHINGLE ROOF	
ROOF	ROOF TILT	AZIMUTH	TRUSSES SIZE	TRUSSES SPACING
#1	40°	224°	2"x4"	24" O.C.
#2	40°	224°	2"x4"	24" O.C.
#3	40°	44°	2"x4"	24" O.C.

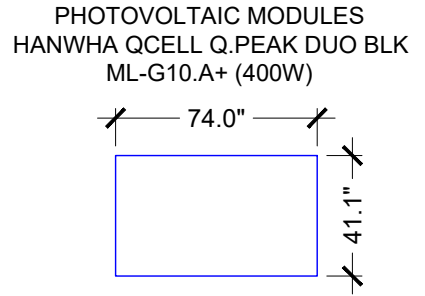


NOTE: ACTUAL ROOF CONDITIONS AND RAFTERS (OR SEAM) LOCATIONS MAY VARY. INSTALL PER MANUFACTURER(S) INSTALLATION GUIDELINES AND ENGINEERED SPANS FOR ATTACHMENTS

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

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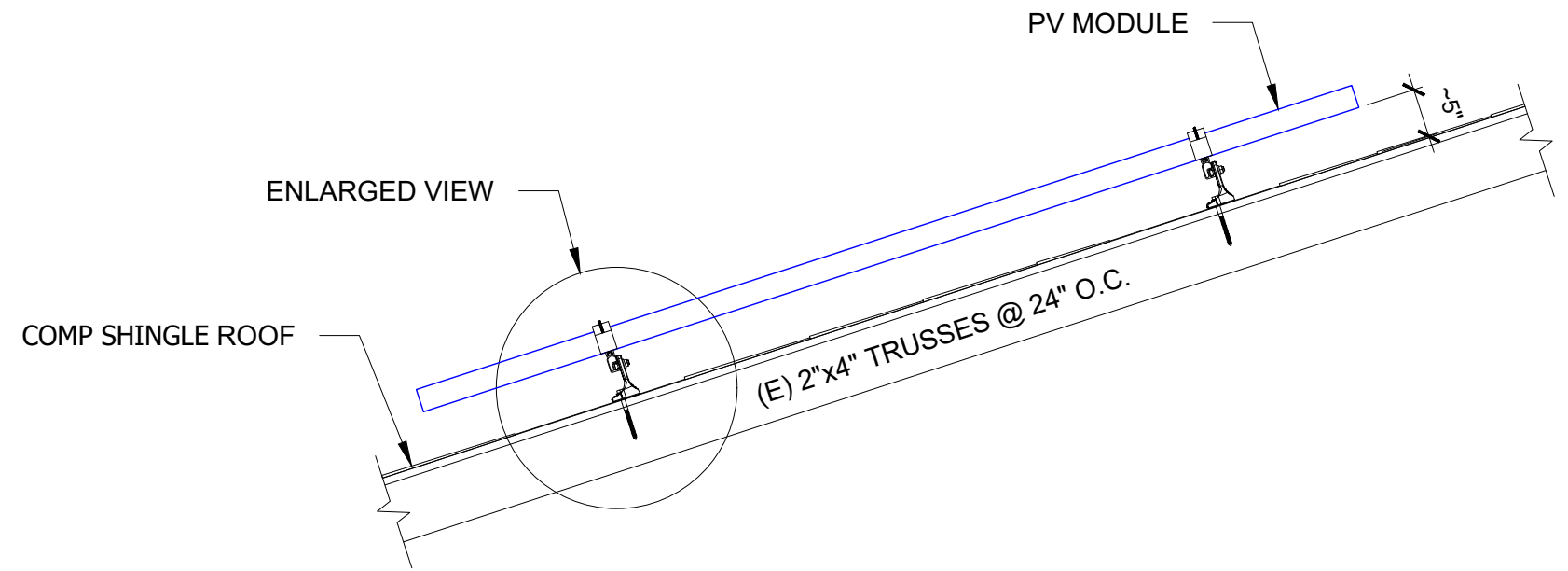


LEGEND	
UM	- UTILITY METER
MSP	- MAIN SERVICE PANEL
ACD	- AC DISCONNECT
CB	- IQ COMBINER BOX 3
JB	- JUNCTION BOX
⊗	- CHIMNEY
○ □	- VENT, ATTIC FAN (ROOF OBSTRUCTION)
●	- ROOF ATTACHMENT
- - -	- TRUSSES
- - - - -	- CONDUIT
▨	- FIRE PATHWAY

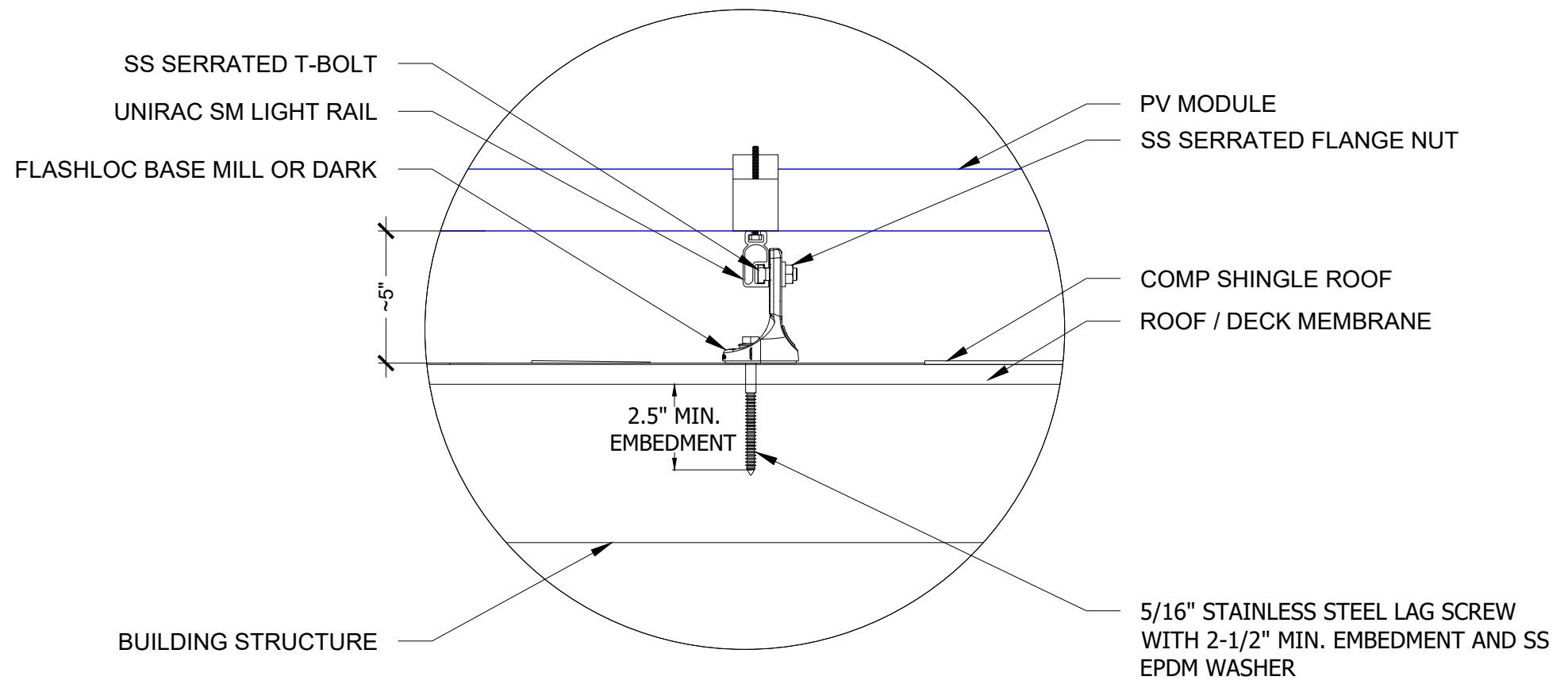
1 ROOF PLAN WITH MODULES
 SCALE: 1/8" = 1'-0"

SHEET NAME	ROOF PLAN WITH MODULES
SHEET SIZE	ANSI B 11" X 17"
SHEET NUMBER	PV-2

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



1 ATTACHMENT DETAIL
SCALE: NTS



2 ATTACHMENT DETAIL (ENLARGED VIEW)
SCALE: NTS

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SHEET NAME
ATTACHMENT DETAIL

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

SHEET NUMBER
PV-3

(32) HANWHA QCELL Q.PEAK DUO BLK ML-G10.A+ (400W) MODULES
 (32) ENPHASE ENERGY IQ7PLUS-72-2-US MICRO-INVERTERS
 (01) BRANCH OF 13 MODULES;
 (01) BRANCH OF 10 MODULES &
 (01) BRANCH OF 09 MODULES CONNECTED IN PARALLEL



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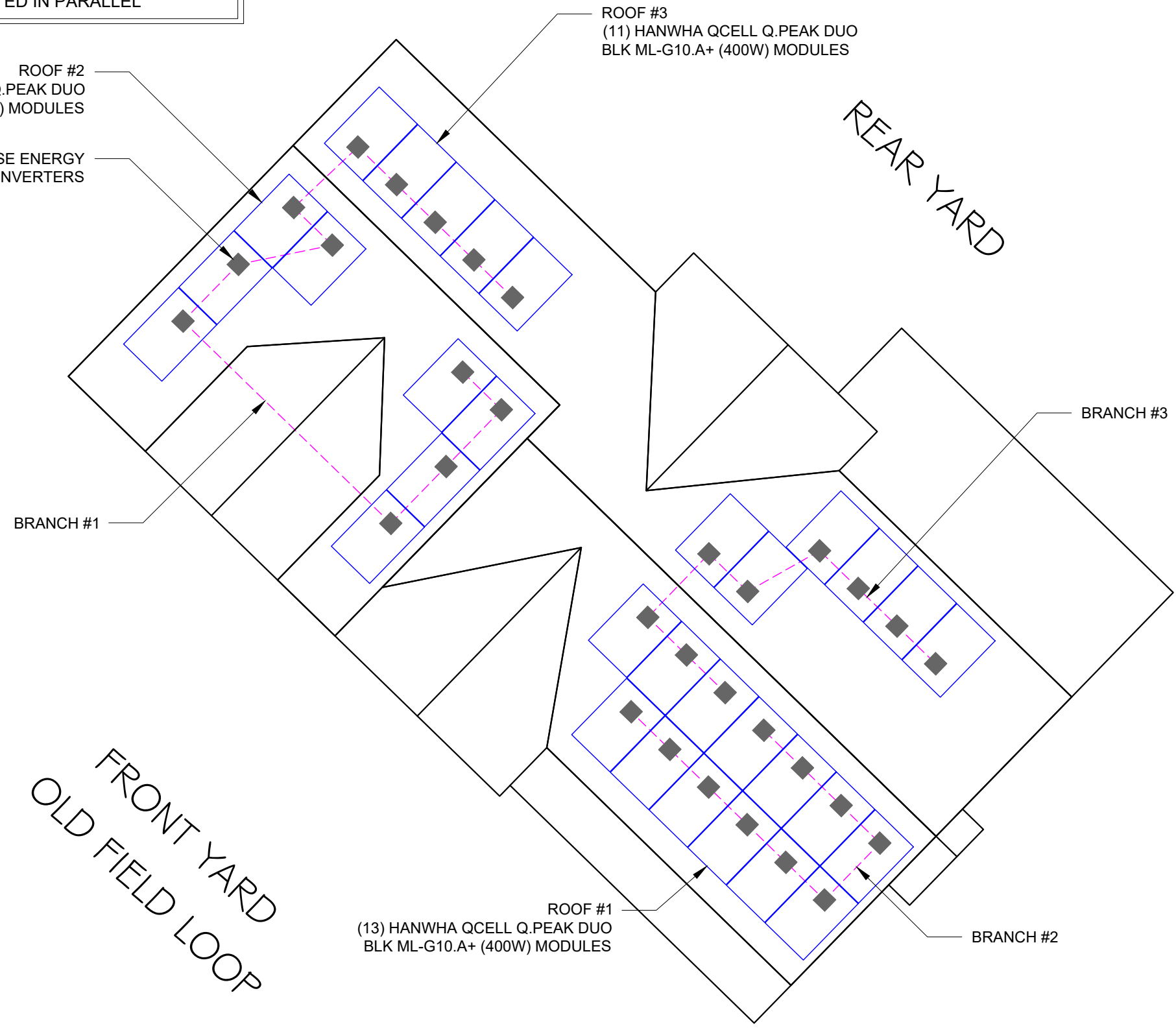
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SHEET NAME
 BRANCH LAYOUT

SHEET SIZE
 ANSI B
 11" X 17"

SHEET NUMBER
 PV-4



ROOF #1
 (13) HANWHA QCELL Q.PEAK DUO
 BLK ML-G10.A+ (400W) MODULES

ROOF #3
 (11) HANWHA QCELL Q.PEAK DUO
 BLK ML-G10.A+ (400W) MODULES

ROOF #2
 (08) HANWHA QCELL Q.PEAK DUO
 BLK ML-G10.A+ (400W) MODULES

(32) ENPHASE ENERGY
 IQ7PLUS-72-2-US MICRO-INVERTERS

BRANCH #1

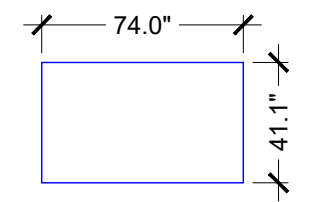
BRANCH #3

BRANCH #2

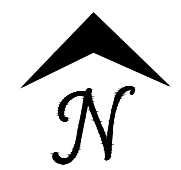
FRONT YARD
 OLD FIELD LOOP

REAR YARD

PHOTOVOLTAIC MODULES
 HANWHA QCELL Q.PEAK DUO BLK
 ML-G10.A+ (400W)



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



(32) HANWHA QCELL Q.PEAK DUO BLK ML-G10.A+ (400W) MODULES
 (32) ENPHASE ENERGY IQ7PLUS-72-2-US MICRO-INVERTERS
 (01) BRANCH OF 13 MODULES;
 (01) BRANCH OF 10 MODULES &
 (01) BRANCH OF 09 MODULES CONNECTED IN PARALLEL

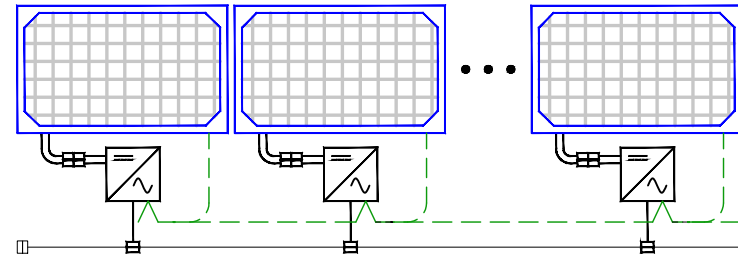
SYSTEM SIZE:- 32 x 400W = 12.80 kWDC
 SYSTEM SIZE:- 32 x 290W = 9.28 kWAC

BILL OF MATERIALS

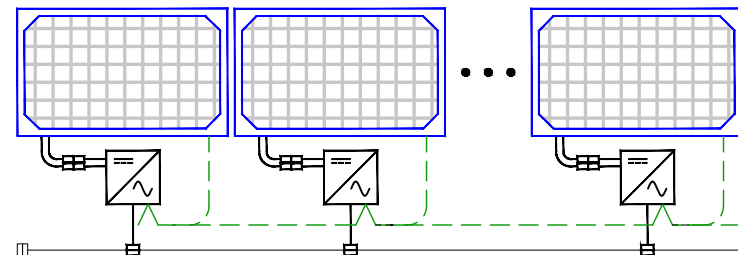
EQUIPMENT	QTY	DESCRIPTION
SOLAR PV MODULE	32	HANWHA QCELL Q.PEAK DUO BLK ML-G10.A+ (400W) MODULES
INVERTER	32	ENPHASE ENERGY IQ7PLUS-72-2-US MICRO-INVERTERS
JUNCTION BOX	1	600V, 55A MAX, 4 INPUTS, MOUNTED ON ROOF FOR WIRE & CONDUIT TRANSITION
COMBINER BOX	1	COMBINER BOX
AC DISCONNECT	1	240VAC, 60A FUSED AC DISCONNECT WITH 50A FUSES, NEMA 3R, UL LISTED



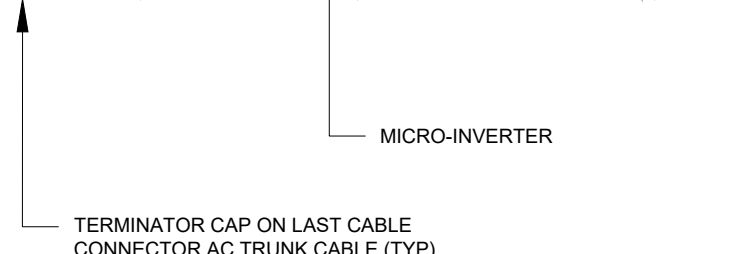
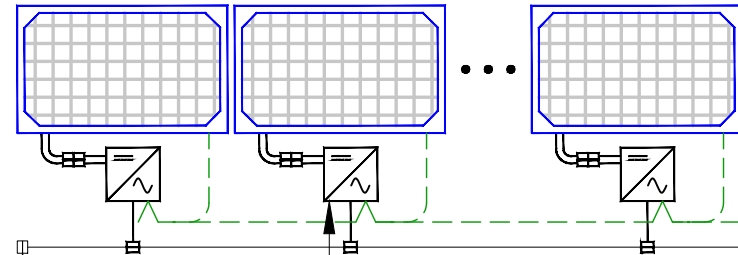
13 MICRO-INVERTERS IN BRANCH CIRCUIT #1



10 MICRO-INVERTERS IN BRANCH CIRCUIT #2



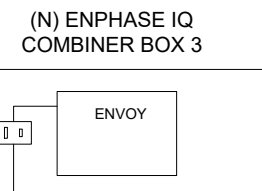
09 MICRO-INVERTERS IN BRANCH CIRCUIT #3



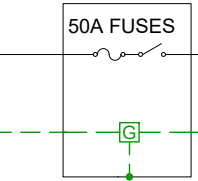
MICRO-INVERTER

TERMINATOR CAP ON LAST CABLE
CONNECTOR AC TRUNK CABLE (TYP)

(3) Q-CABLE (1) PV #6 BARE CU GND (6) #10 AWG THWN-2 (1) #10 AWG THWN-2 GND IN 3/4" EMT CONDUIT RUN

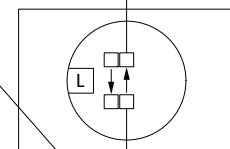


(N) AC DISCONNECT
60A FUSED, 50A/2P
FUSES, 240V NEMA 3R,
UL LISTED,



32 MODULES X 1.21A = 38.72 A
38.72A X 1.25 = 48.40 A
(3) #6 AWG THWN
(1) #8 AWG THWN GND
IN 3/4" EMT CONDUIT RUN

BI-DIRECTIONAL
UTILITY METER
1-PHASE, 3-W,
120V/240V, 60Hz



LINE SIDE TAP

(E) 200A MAIN
SERVICE PANEL
WITH (E) 200A MAIN
BREAKER

EXISTING
GROUNDING
SYSTEM

SERVICE INFO.

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

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SHEET NAME

ELECTRICAL LINE
DIAGRAM

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-5

1 ELECTRICAL LINE DIAGRAM
SCALE: NTS



SOLAR MODULE SPECIFICATIONS	
MANUFACTURER / MODEL #	HANWHA QCELL Q.PEAK DUO BLK ML-G10.A+ (400W) MODULES
VMP	37.13
IMP	10.77
VOC	45.30
ISC	11.14
MODULE DIMENSION	74.0"L x 41.1"W x 1.26"D (In Inch)

INVERTER SPECIFICATIONS	
MANUFACTURER / MODEL #	ENPHASE ENERGY IQ7PLUS-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	0.9"
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 COMBINER BOX:

AMBIENT TEMPERATURE ADJUSTMENT FOR EXPOSED CONDUIT PER NEC 310.15(B)(3)(c): 7/8"
 EXPECTED WIRE TEMP (°C): 36°
 TEMP CORRECTION PER TABLE 310.15(B)(2)(a): 0.91
 # OF CURRENT CARRYING CONDUCTORS: 6
 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):
 1.25 X # MICRO-INVERTERS (MAX. BRANCH LENGTH) X MAX OUTPUT CURRENT
 1.25 X 13 X 1.21A = 19.66A

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 0.8 X 40 = 29.12A

RESULT SHOULD BE GREATER THAN (19.66A) OTHERWISE LESS THE ENTRY FOR CIRCUIT CONDUCTOR SIZE AND AMPACITY

AC CONDUCTOR AMPACITY CALCULATIONS:

FROM COMBINER BOX TO AC DISCONNECT:

OF INVERTERS: 32
 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: 6 AWG
 CIRCUIT CONDUCTOR AMPACITY: 65 A

REQUIRED CIRCUIT CONDUCTOR AMPACITY PER NEC 690.8(B):
 1.25 X # MICRO-INVERTERS X MAX OUTPUT CURRENT =
 1.25 X 1.21 X 32 = 48.40A

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 1.0 X 65 = 57.20A

RESULT SHOULD BE GREATER THAN (48.40A) OTHERWISE LESS THE ENTRY FOR CIRCUIT CONDUCTOR SIZE AND AMPACITY

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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 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 G.E.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

SHEET NAME ELECTRICAL CALCULATION
SHEET SIZE ANSI B 11" X 17"
SHEET NUMBER PV-6



⚠ 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)

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 38.72 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

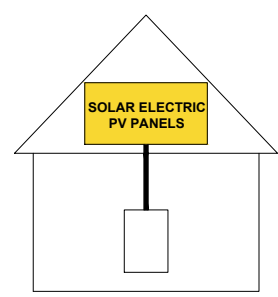
LABEL LOCATION:
 CONDUIT, COMBINER BOX
 (PER CODE: NEC 690.31(G)(3))

MAIN PHOTOVOLTAIC SYSTEM DISCONNECT

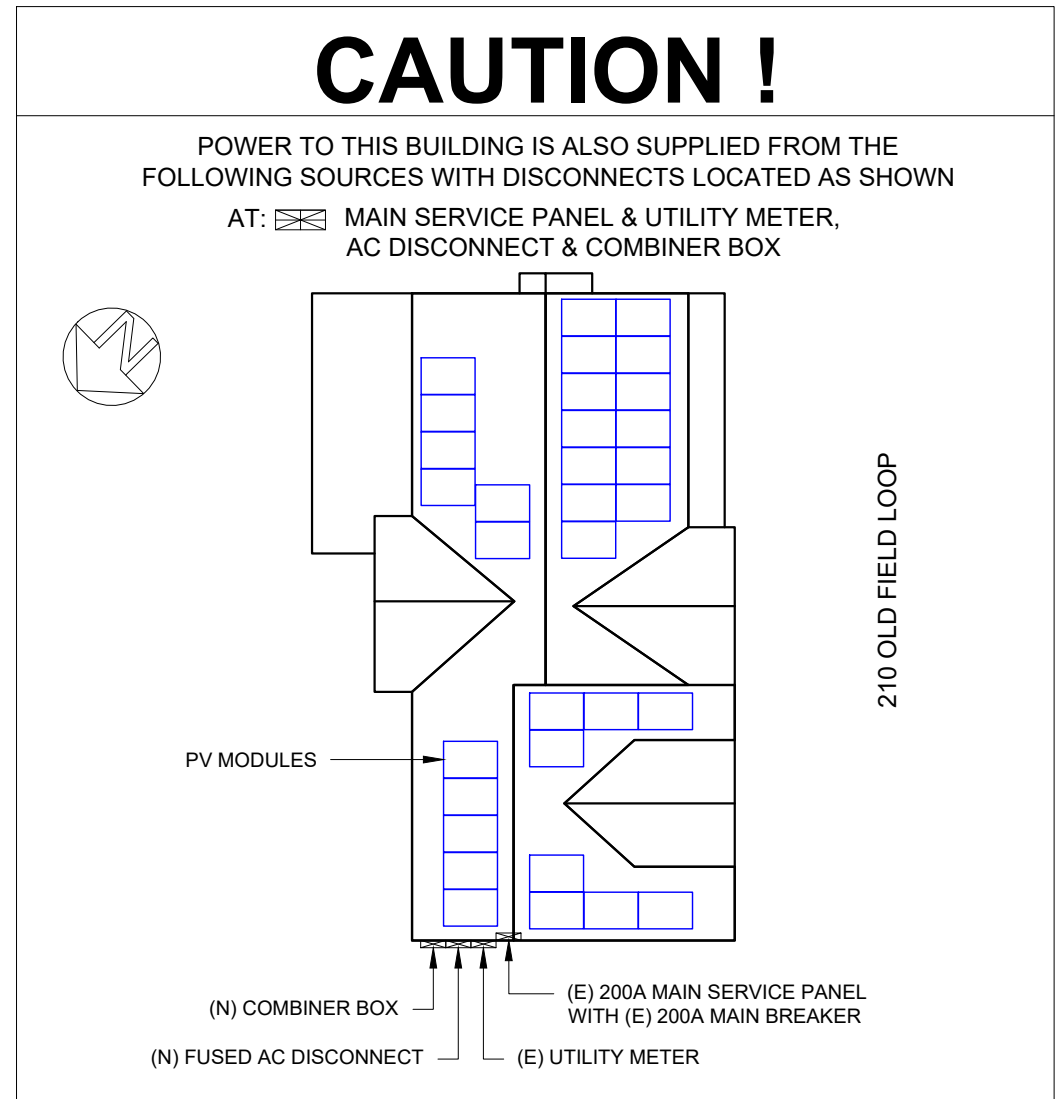
LABEL LOCATION:
 MAIN SERVICE DISCONNECT / UTILITY METER
 (PER CODE: NEC 690.13(B))

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))



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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

VERSION		
DESCRIPTION	DATE	REV
INITIAL RELEASE	11/03/2021	UR

PROJECT NAME

LAVETTE GILBERT
 210 OLD FIELD LOOP,
 SANFORD, NC 27332 USA
 APN# 039577002818
 UTILITY: DUKE ENERGY
 AHJ: HARNETT COUNTY

SHEET NAME

ADDITIONAL NOTES

SHEET SIZE

ANSI B
 11" X 17"

SHEET NUMBER

PV-8



powered by
Q.ANTUM DUO Z

Q.PEAK DUO BLK ML-G10.a+

385-405

ENDURING HIGH PERFORMANCE



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 Technology¹, 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 warranty².

¹ APT test conditions according to IEC/TS 62804-1:2015, method A (-1500V, 96h)
² See data sheet on rear for further information.



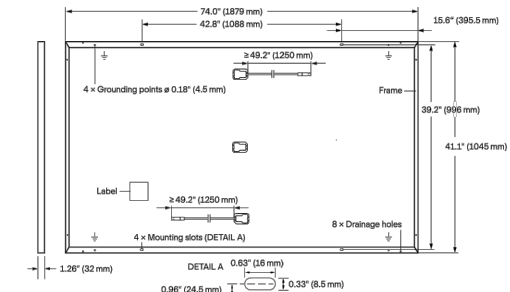
THE IDEAL SOLUTION FOR:
Rooftop arrays on residential buildings

Engineered in Germany



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 mm ² Solar cable; (+) ≥ 49.2 in (1250 mm), (-) ≥ 49.2 in (1250 mm)
Connector	Stäubli MC4; IP68

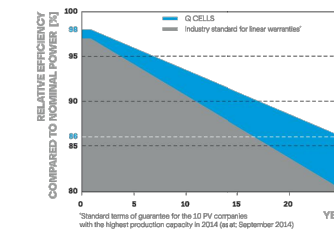


ELECTRICAL CHARACTERISTICS

POWER CLASS		385	390	395	400	405	
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC¹ (POWER TOLERANCE +5W / -0W)							
Minimum	Power at MPP ²	P _{MPP} [W]	385	390	395	400	405
	Short Circuit Current ²	I _{SC} [A]	11.04	11.07	11.10	11.14	11.17
	Open Circuit Voltage ²	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 ²	η [%]	≥19.6	≥19.9	≥20.1	≥20.4	≥20.6
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT²							
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

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

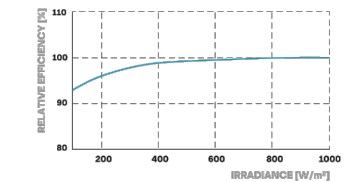
Q CELLS PERFORMANCE WARRANTY



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, 1000W/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 _{MYS}	[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/ft ²]	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/ft ²]	113 (5400 Pa) / 84 (4000 Pa)		

³See 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.



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
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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



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SHEET NAME

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ANSI B
11" X 17"

SHEET NUMBER

PV-9

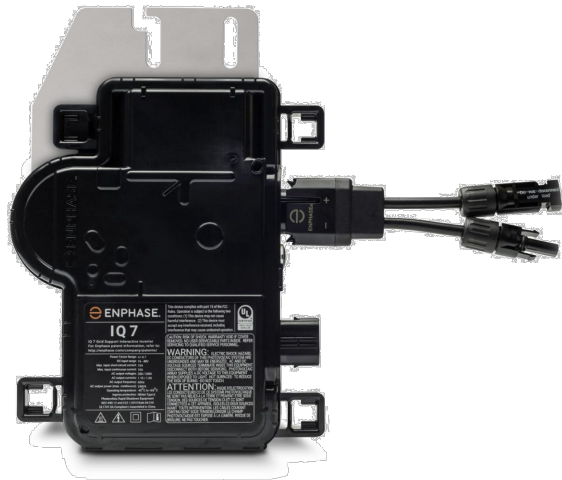
Specifications subject to technical changes © Q CELLS Q.PEAK DUO BLK ML-G10.a+ 385-405 2021-05_Rev01_UA

Enphase IQ 7 and IQ 7+ Microinverters

The high-powered smart grid-ready **Enphase IQ 7 Micro™** and **Enphase IQ 7+ Micro™** dramatically simplify the installation process while achieving the highest system efficiency.

Part of the Enphase IQ System, the IQ 7 and IQ 7+ Microinverters integrate with the Enphase IQ Envoy™, Enphase IQ Battery™, and the Enphase Enlighten™ monitoring and analysis software.

IQ Series Microinverters extend the reliability standards set forth by previous generations and undergo over a million hours of power-on testing, enabling Enphase to provide an industry-leading warranty of up to 25 years.



Easy to Install

- Lightweight and simple
- Faster installation with improved, lighter two-wire cabling
- Built-in rapid shutdown compliant (NEC 2014 & 2017)

Productive and Reliable

- Optimized for high powered 60-cell/120 half-cell and 72-cell/144 half-cell* modules
- More than a million hours of testing
- Class II double-insulated enclosure
- UL listed

Smart Grid Ready

- Complies with advanced grid support, voltage and frequency ride-through requirements
- Remotely updates to respond to changing grid requirements
- Configurable for varying grid profiles
- Meets CA Rule 21 (UL 1741-SA)

* The IQ 7+ Micro is required to support 72-cell/144 half-cell modules.

Enphase IQ 7 and IQ 7+ Microinverters

INPUT DATA (DC)	IQ7-60-2-US		IQ7PLUS-72-2-US	
Commonly used module pairings ¹	235 W - 350 W +		235 W - 440 W +	
Module compatibility	60-cell/120 half-cell PV modules only		60-cell/120 half-cell and 72-cell/144 half-cell PV modules	
Maximum input DC voltage	48 V		60 V	
Peak power tracking voltage	27 V - 37 V		27 V - 45 V	
Operating range	16 V - 48 V		16 V - 60 V	
Min/Max start voltage	22 V / 48 V		22 V / 60 V	
Max DC short circuit current (module Isc)	15 A		15 A	
Overvoltage class DC port	II		II	
DC port backfeed current	0 A		0 A	
PV array configuration	1 x 1 ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit			
OUTPUT DATA (AC)	IQ 7 Microinverter		IQ 7+ Microinverter	
Peak output power	250 VA		295 VA	
Maximum continuous output power	240 VA		290 VA	
Nominal (L-L) voltage/range ²	240 V / 211-264 V	208 V / 183-229 V	240 V / 211-264 V	208 V / 183-229 V
Maximum continuous output current	1.0 A (240 V)	1.15 A (208 V)	1.21 A (240 V)	1.39 A (208 V)
Nominal frequency	60 Hz		60 Hz	
Extended frequency range	47 - 68 Hz		47 - 68 Hz	
AC short circuit fault current over 3 cycles	5.8 Arms		5.8 Arms	
Maximum units per 20 A (L-L) branch circuit ³	16 (240 VAC)	13 (208 VAC)	13 (240 VAC)	11 (208 VAC)
Overvoltage class AC port	III		III	
AC port backfeed current	18 mA		18 mA	
Power factor setting	1.0		1.0	
Power factor (adjustable)	0.85 leading ... 0.85 lagging		0.85 leading ... 0.85 lagging	
EFFICIENCY	@240 V	@208 V	@240 V	@208 V
Peak efficiency	97.6 %	97.6 %	97.5 %	97.3 %
CEC weighted efficiency	97.0 %	97.0 %	97.0 %	97.0 %
MECHANICAL DATA				
Ambient temperature range	-40°C to +65°C			
Relative humidity range	4% to 100% (condensing)			
Connector type	MC4 (or Amphenol H4 UTX with additional Q-DCC-5 adapter)			
Dimensions (HxWxD)	212 mm x 175 mm x 30.2 mm (without bracket)			
Weight	1.08 kg (2.38 lbs)			
Cooling	Natural convection - No fans			
Approved for wet locations	Yes			
Pollution degree	PD3			
Enclosure	Class II double-insulated, corrosion resistant polymeric enclosure			
Environmental category / UV exposure rating	NEMA Type 6 / outdoor			
FEATURES				
Communication	Power Line Communication (PLC)			
Monitoring	Enlighten Manager and MyEnlighten monitoring options. Both options require installation of an Enphase IQ Envoy.			
Disconnecting means	The AC and DC connectors have been evaluated and approved by UL for use as the load-break disconnect required by NEC 690.			
Compliance	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 C22.1-2015 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according manufacturer's instructions.			

1. No enforced DC/AC ratio. See the compatibility calculator at <https://enphase.com/en-us/support/module-compatibility>.
 2. Nominal voltage range can be extended beyond nominal if required by the utility.
 3. Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

To learn more about Enphase offerings, visit enphase.com

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ANSI B
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PV-10

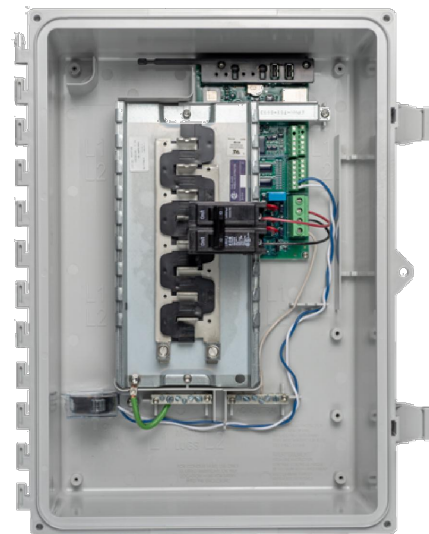


To learn more about Enphase offerings, visit enphase.com



Enphase IQ Combiner 3 (X-IQ-AM1-240-3)

The **Enphase IQ Combiner 3™** with Enphase IQ Envoy™ consolidates interconnection equipment into a single enclosure and streamlines PV 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 Envoy for communication and control
- Flexible networking supports Wi-Fi, Ethernet, or cellular
- Optional AC receptacle available for PLC bridge
- Provides production metering and optional consumption monitoring
- Supports Ensemble Communications Kit for communication with Enphase Encharge™ storage and Enphase Enpower™ smart switch

Simple

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

Reliable

- Durable NRTL-certified NEMA type 3R enclosure
- Five-year limited warranty
- UL listed



To learn more about Enphase offerings, visit enphase.com



Enphase IQ Combiner 3

MODEL NUMBER	
IQ Combiner 3	IQ Combiner 3 with Enphase IQ Envoy™ printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and optional* consumption monitoring (+/- 2.5%).
X-IQ-AM1-240-3	
ACCESSORIES and REPLACEMENT PARTS (not included, order separately)	
Enphase Mobile Connect™ CELLMODEM-03 (4G/12-year data plan) CELLMODEM-01 (3G/5-year data plan) CELLMODEM-M1 (4G based LTE-M/5-year data plan)	Plug and play industrial grade cellular modem with data plan 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.)
Consumption Monitoring* CT CT-200-SPLIT	Split core current transformers enable whole home consumption metering (+/- 2.5%).
* Consumption monitoring is required for Enphase Storage Systems	
Ensemble Communications Kit COMMS-KIT-01	Installed at the IQ Envoy. For communications with Enphase Encharge™ storage and Enphase Enpower™ smart switch. Includes USB cable for connection to IQ Envoy or Enphase IQ Combiner™ and allows wireless communication with Encharge and Enpower.
Circuit Breakers BRK-10A-2-240 BRK-15A-2-240 BRK-20A-2P-240	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
EPLC-01	Power line carrier (communication bridge pair), quantity - one pair
XA-SOLARSHIELD-ES	Replace the default solar shield with this Ensemble Combiner Solar Shield to match the look and feel of the Enphase Enpower™ smart switch and the Enphase Encharge™ storage system
XA-PLUG-120-3	Accessory receptacle for Power Line Carrier in IQ Combiner 3 (required for EPLC-01)
XA-ENV-PCBA-3	Replacement IQ Envoy printed circuit board (PCB) for Combiner 3
ELECTRICAL SPECIFICATIONS	
Rating	Continuous duty
System voltage	120/240 VAC, 60 Hz
Eaton BR series busbar rating	125 A
Max. continuous current rating (output to grid)	65 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. continuous current rating (input from PV)	64 A
Max. total branch circuit breaker rating (input)	80 A of distributed generation / 95 A with IQ Envoy breaker included
Envoy breaker	10A or 15A rating GE Q-line/Siemens Type QP / Eaton BR series included
Production Metering CT	200 A solid core pre-installed and wired to IQ Envoy
MECHANICAL DATA	
Dimensions (WxHxD)	49.5 x 37.5 x 16.8 cm (19.5" x 14.75" 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	<ul style="list-style-type: none"> • 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
Ethernet	Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included)
Cellular	CELLMODEM-M1 4G based LTE-M cellular modem (not included). Note that an Enphase Mobile Connect cellular modem is required for all Ensemble installations.
COMPLIANCE	
Compliance, 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)
Compliance, IQ Envoy	UL 60601-1/CANCSA 22.2 No. 61010-1

To learn more about Enphase offerings, visit enphase.com

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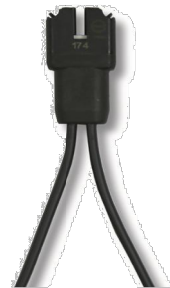
SHEET NAME
SPEC SHEETS

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**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)



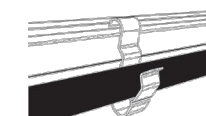
SEALING CAPS

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)

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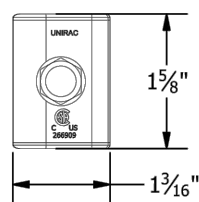
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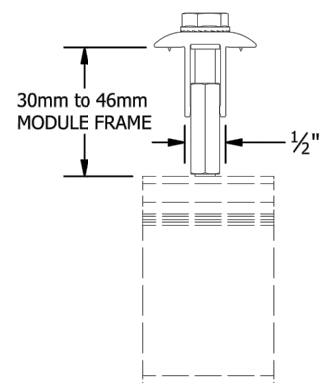
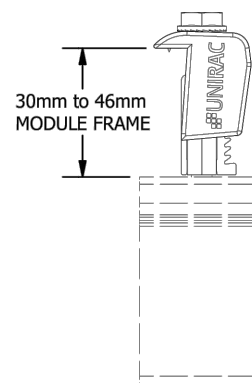
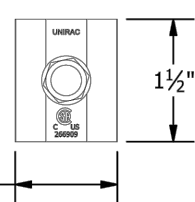
PV-12

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

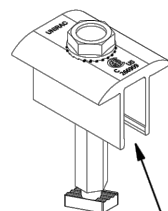
**UNIVERSAL AF
END CLAMP**



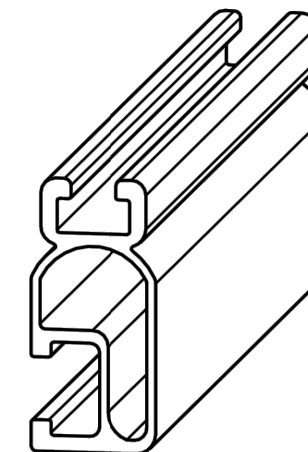
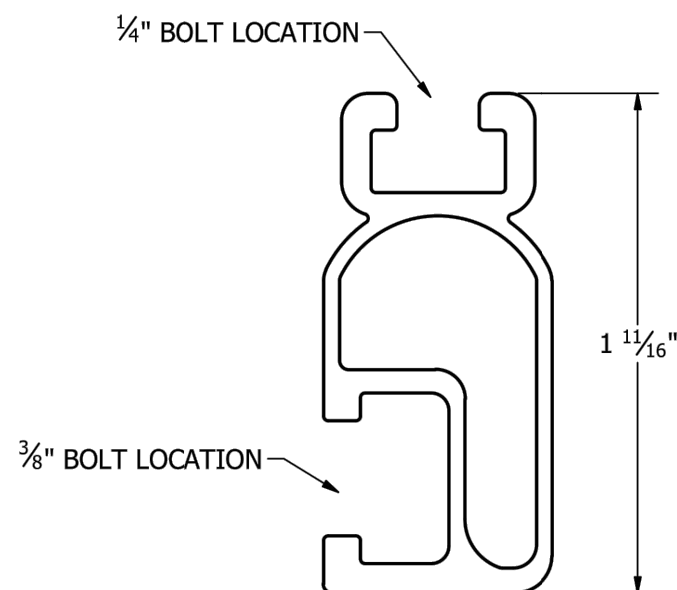
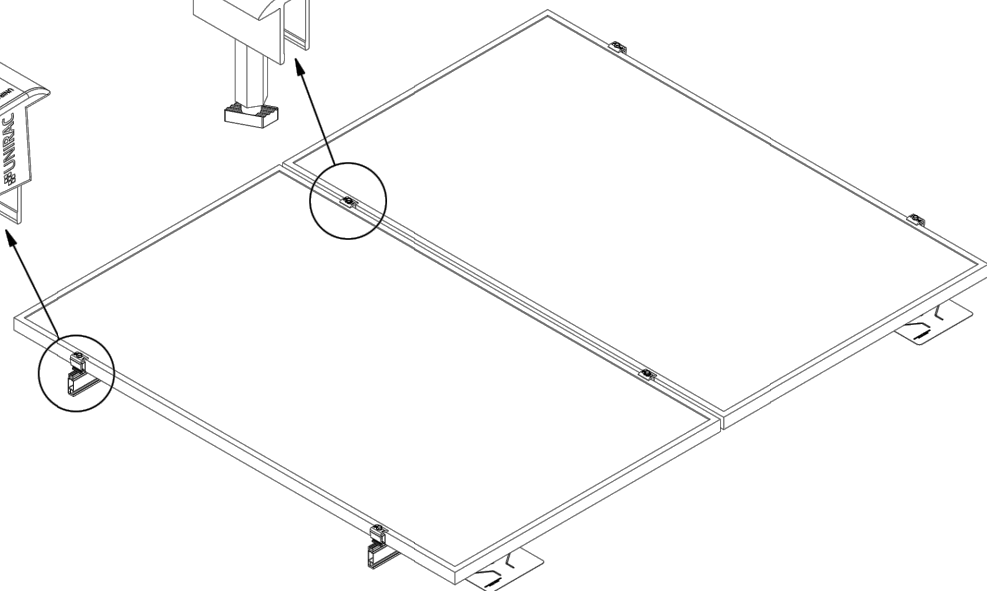
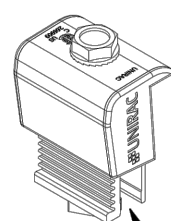
**UNIVERSAL AF
MID CLAMP**



**UNIVERSAL
MID CLAMP**



**UNIVERSAL
END CLAMP**



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 & 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



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	11/03/2021	UR

PROJECT NAME

LAVETTE GILBERT
210 OLD FIELD LOOP,
SANFORD, NC 27332 USA
APN# 039577002818
UTILITY: DUKE ENERGY
AHJ: HARNETT COUNTY

SHEET NAME

SPEC SHEETS

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-13

FLASH LOC

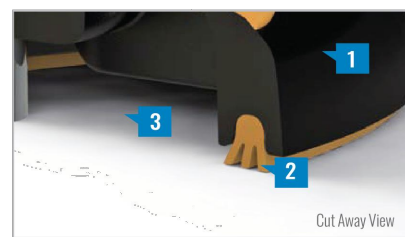


FLASHLOC is the ultimate attachment for composition shingle and rolled comp roofs. The all-in-one mount installs fast — no kneeling on hot roofs to install flashing, no prying or cutting shingles, no pulling nails. Simply drive the lag bolt and inject sealant into the base. **FLASHLOC's** patented TRIPLE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



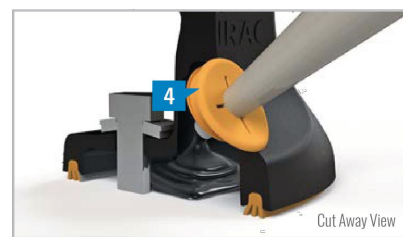
PROTECT THE ROOF

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.

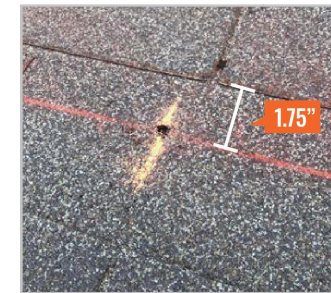


HIGH-SPEED INSTALL

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

FLASH LOC

INSTALLATION GUIDE



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.



VERSION		
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INITIAL RELEASE	11/03/2021	UR

PROJECT NAME

LAVETTE GILBERT
210 OLD FIELD LOOP,
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APN# 039577002818
UTILITY: DUKE ENERGY
AHJ: HARNETT COUNTY

SHEET NAME

SPEC SHEETS

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

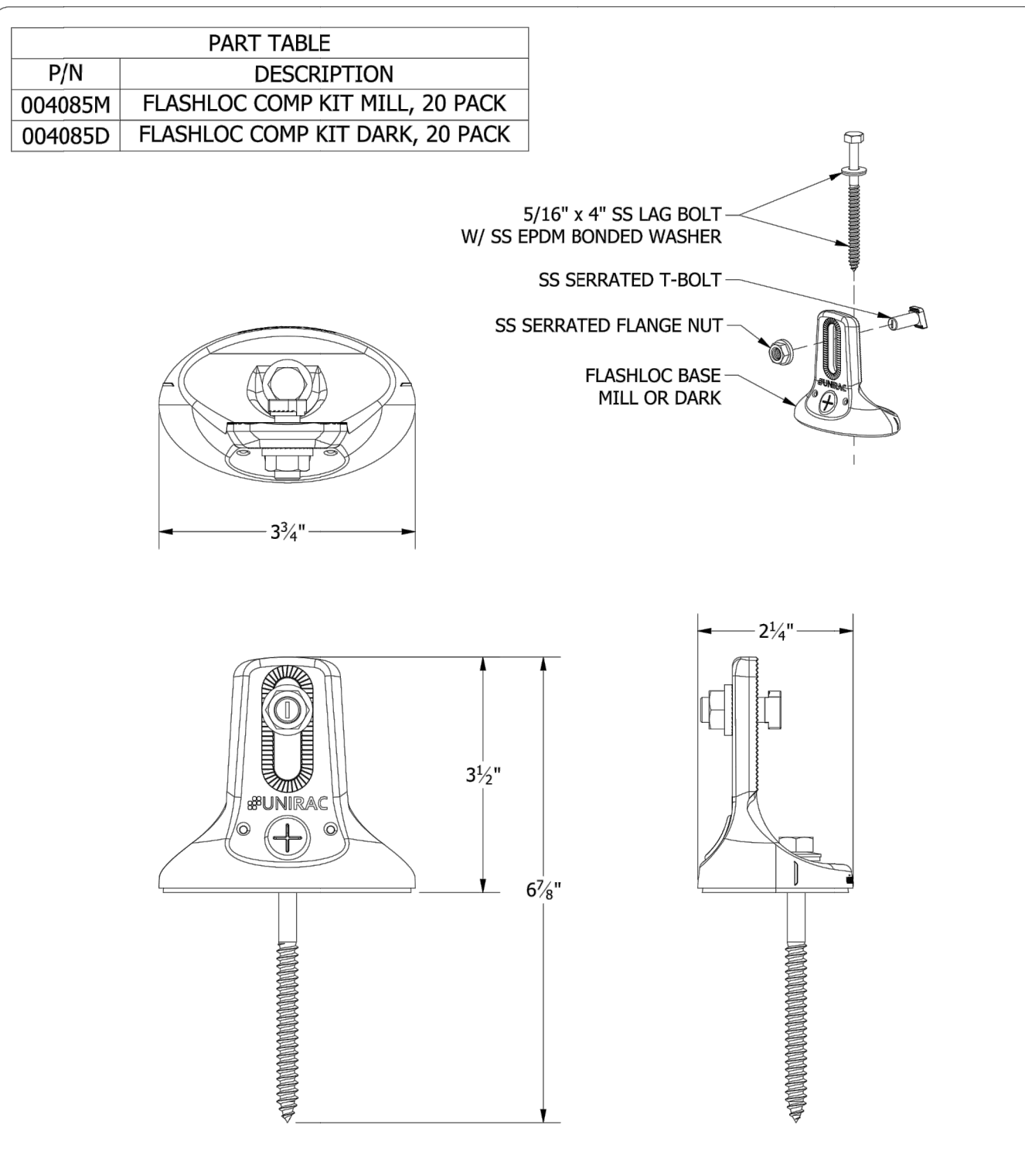
PV-14

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



VERSION		
DESCRIPTION	DATE	REV
INITIAL RELEASE	11/03/2021	UR

PROJECT NAME

LAVETTE GILBERT
210 OLD FIELD LOOP,
SANFORD, NC 27332 USA
APN# 039577002818
UTILITY: DUKE ENERGY
AHJ: HARNETT COUNTY



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

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

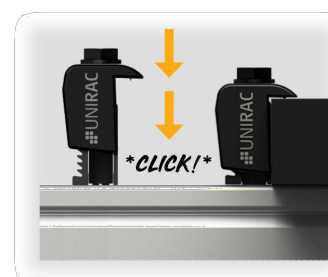
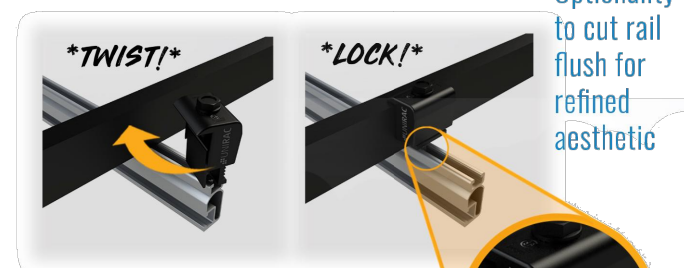
- Low profile hardware
- 1/2" module gap, end caps
- Optionality to cut rail flush
- Rail endcaps available for refined finish.

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!

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

UNIRAC
BETTER SOLAR STARTS HERE

VERSION		
DESCRIPTION	DATE	REV
INITIAL RELEASE	11/03/2021	UR

PROJECT NAME
LAVETTE GILBERT
210 OLD FIELD LOOP,
SANFORD, NC 27332 USA
APN# 039577002818
UTILITY: DUKE ENERGY
AHJ: HARNETT COUNTY

SHEET NAME
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:

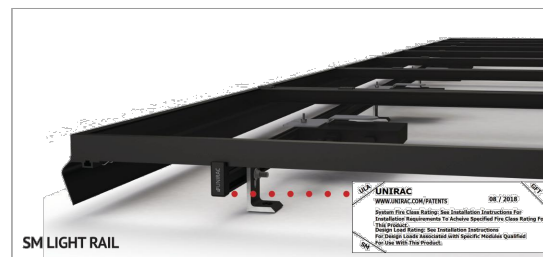
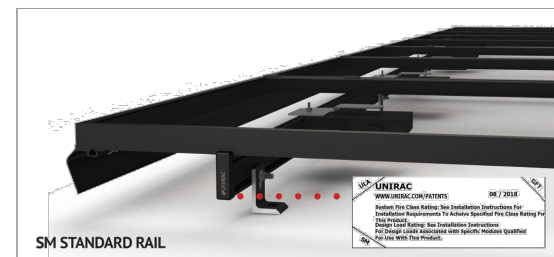
Rail Type	Module Type	System Level Fire Rating	Rail Direction	Module Orientation	Mitigation Required
Standard Rail	Type 1, Type 2, Type 3 & Type 10	Class A, Class B & Class C	East-West	Landscape OR Portrait	None Required
			North-South	Landscape OR Portrait	None Required
Light Rail	Type 1 & Type 2	Class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

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

ENDCLAMP ASSEMBLY

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

Note: End clamp does not bond to module frame.

BONDING RAIL SPLICE BAR

- Bonding Hardware creates bond between splice bar and each rail section.
- 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

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

BONDING MICROINVERTER MOUNT

- HEX NUT w/ CAPTIVE LOCK WASHER bonds metal microinverter flange to stainless steel T-bolt.
- 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 J for details.

RACK SYSTEM GROUND

- WEEB washer dimples pierce anodized rail to create bond between rail and lug.
- 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.

- Position clamp to align T-bolt with rail slot. Lower clamp and insert T-bolt into rail slot.
- Rotate clamp clockwise 2/3 of a turn to engage T-bolt inside rail slot.
- Place module at least 3/4" from end of rail and position clamp against module frame.
- While applying pressure to hold the clamp against the module, push down on the module side of the clamp cap.
- When the cap contacts the module frame, release and it will re-engage to the clamp base.
- Tighten bolt and torque to 15 ft-lbs.
- 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.

- Position clamp to align T-bolt with rail slot. Lower clamp and insert T-bolt into rail slot.
- Rotate clamp clockwise 2/3 of a turn to engage T-bolt inside rail slot.
- Slide clamp into position against module.
- Place second module.
- 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.

VERSION		
DESCRIPTION	DATE	REV
INITIAL RELEASE	11/03/2021	UR

PROJECT NAME

LAVETTE GILBERT
210 OLD FIELD LOOP,
SANFORD, NC 27332 USA
APN# 039577002818
UTILITY: DUKE ENERGY
AHJ: HARNETT COUNTY

SHEET NAME

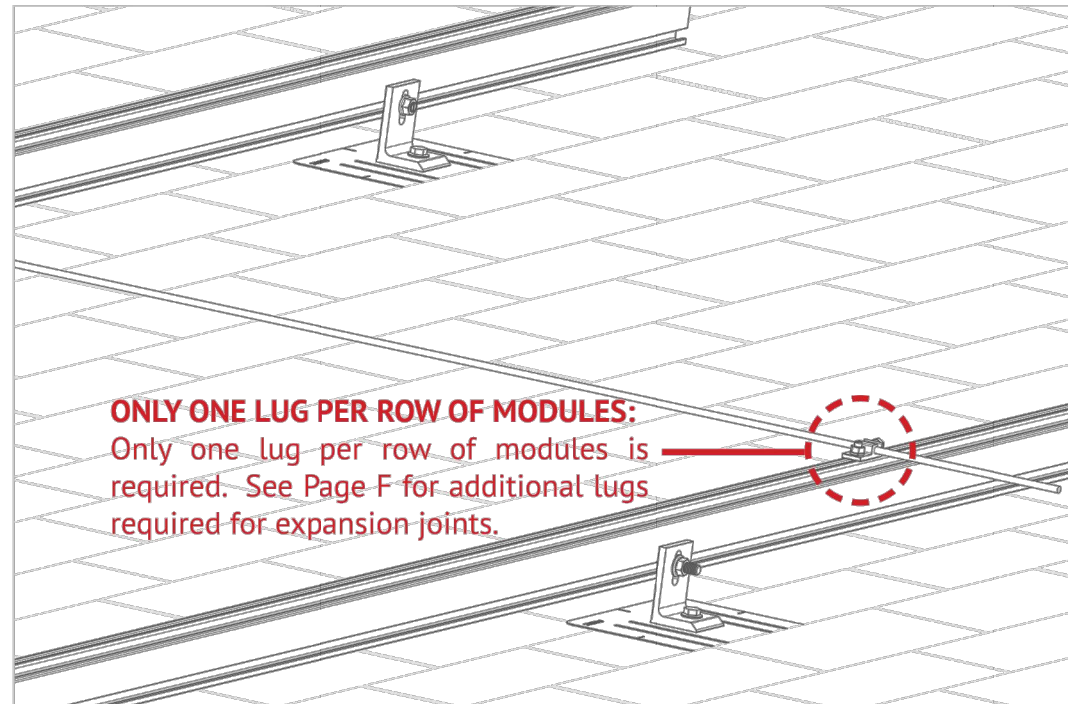
SPEC SHEETS

SHEET SIZE

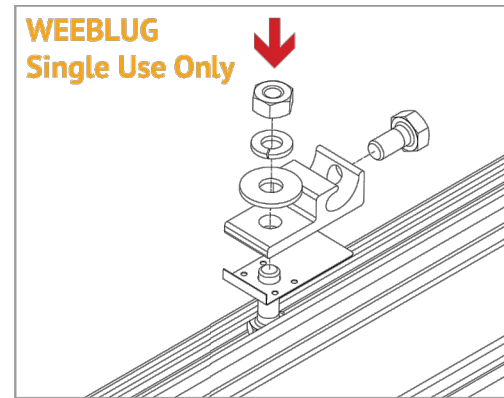
ANSI B
11" X 17"

SHEET NUMBER

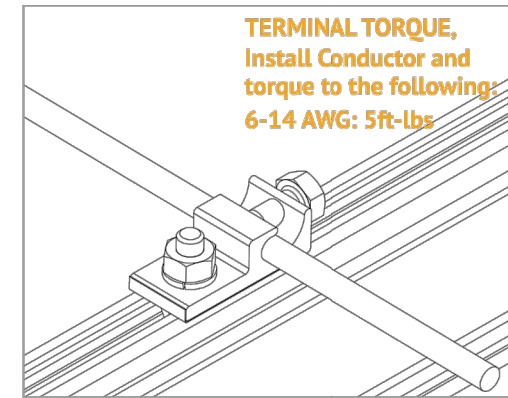
PV-17



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.



WEEBLUG
Single Use Only



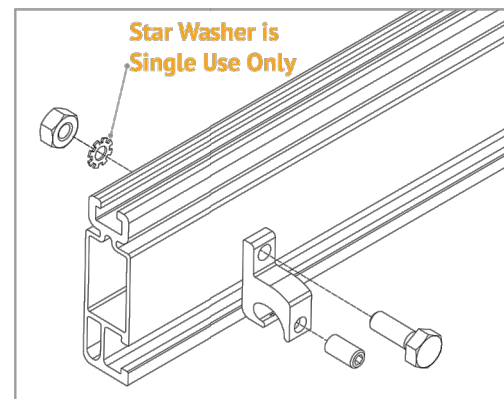
TERMINAL TORQUE,
Install Conductor and torque to the following:
6-14 AWG: 5ft-lbs

WEEBLUG CONDUCTOR - UNIRAC P/N 008002S:

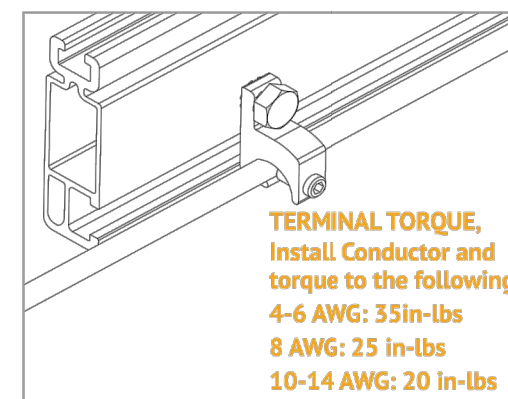
Apply Anti Seize and insert a bolt in the aluminum rail and through the clearance hole in the stainless steel flat washer. Place the stainless steel flat washer on the bolt, oriented so the dimples will contact the aluminum rail. Place the lug portion on the bolt and stainless steel flat washer. Install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

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.

VERSION		
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PROJECT NAME

LAVETTE GILBERT
210 OLD FIELD LOOP,
SANFORD, NC 27332 USA
APN# 039577002818
UTILITY: DUKE ENERGY
AHJ: HARNETT COUNTY

SHEET NAME
SPEC SHEETS

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-18



October 3, 2019

UniRac
1411 Broadway Boulevard NE
Albuquerque, New Mexico 87102-1545
TEL: (505) 242-6411
FAX: (505) 242-6412

Attn.: Unirac Engineering Department,

Re: Engineering Certification for UniRac's SolarMount Design & Engineering Guide

PZSE, Inc.-Structural Engineers has reviewed UniRac's "SolarMount Design & Engineering Guide" and specifically the enhancements of the SolarMount Flush-to-Roof System, Pressure Lookup Tables, and Downward & Upward Span Length Tables.

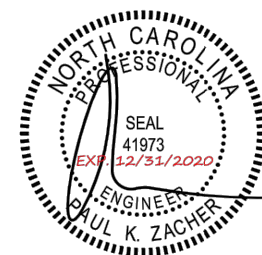
This certification excludes connections to building structures and the effects on building structure components. All information, data and analysis contained within the Installation Manual are based on, and comply with the following:

1. 2018 North Carolina Building Code, by The North Carolina State Building Code Council
2. 2009, 2012, 2012, & 2015 International Building Code, by International Code Council, Inc.
3. ASCE/SEI 7-05 & 7-10: Minimum Design Loads for Buildings and other Structures
4. 2010 & 2015 Aluminum Design Manual, by The Aluminum Association, 2015

This letter certifies that the structural calculations contained within UniRac's "SolarMount Design & Engineering Guide" are in compliance with the above Codes.

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

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



1478 Stone Point Drive, Suite 190, Roseville, CA 95661
T 916.961.3960 F 916.961.3965 W www.pzse.com
Experience | Integrity | Empowerment

VERSION		
DESCRIPTION	DATE	REV
INITIAL RELEASE	11/03/2021	UR

PROJECT NAME

LAVETTE GILBERT
210 OLD FIELD LOOP,
SANFORD, NC 27332 USA
APN# 039577002818
UTILITY: DUKE ENERGY
AHJ: HARNETT COUNTY

SHEET NAME
SPEC SHEETS

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-19



Certificate of Compliance

Certificate: 70131735 **Master Contract:** 266909
Project: 80090260 **Date Issued:** 2021-07-14
Issued To: **Unirac**
1411 Broadway NE
Albuquerque, New Mexico, 87102
United States

Attention: Klaus Nicolaedis

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

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



Certificate: 70131735
Project: 80090260

Master Contract: 266909
Date Issued: 2021-07-14

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, 10, 19, 22 or 25 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

Unirac Large Array

ULA is a ground mount system using the SolarMount (SM) platform for the bonding and grounding of PV modules. ULA aluminum components merge with SM rails and installer-supplied steel pipe. The SM rail system is secured to the horizontal Pipe using the Rail Bracket components. The Rear and Front cap secures the horizontal Pipe to the vertical Pipe. The Front cap is also used to secure the Cross brace. A Slider is attached to the vertical Pipe to secure the Cross brace. The SM rails, caps, slider, rail brackets, and cross braces materials are 6105-T5 aluminum extrusion. Fasteners materials are 304 stainless steel. Horizontal and vertical pipe materials meet the minimum requirements of ASTM A53 for galvanized steel pipe in 2" and 3" diameter.

The mechanical load ratings from the SM test data will be applied to the ULA model.

Fire Testing is not applicable due to being a ground mount system.



VERSION

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INITIAL RELEASE	11/03/2021	UR

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SANFORD, NC 27332 USA
APN# 039577002818
UTILITY: DUKE ENERGY
AHJ: HARNETT COUNTY

SHEET NAME

SPEC SHEETS

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-20