



Scott E. Wyssling, PE  
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June 8, 2022

Legacy Solar  
3333 Digital Drive #600  
Lehi, UT 84043

Re: Engineering Services  
Mcnaull Residence  
604 SW Phillips Circle, Lake City FL  
9.680 kW System

To Whom It May Concern:

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

**A. Site Assessment Information**

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

**B. Description of Structure:**

**Roof Framing:** Prefabricated wood trusses at 24" on center. All truss members are constructed of 2x4 dimensional lumber.

**Roof Material:** Composite Asphalt Shingles

**Roof Slope:** 26 degrees

**Attic Access:** Accessible

**Foundation:** Permanent

**C. Loading Criteria Used**

- **Dead Load**
  - Existing Roofing and framing = 7 psf
  - New Solar Panels and Racking = 3 psf
  - TOTAL = 10 PSF
- **Live Load** = 20 psf (reducible) – 0 psf at locations of solar panels
- **Ground Snow Load** = 0 psf
- **Wind Load** based on ASCE 7-16
  - Ultimate Wind Speed = 119 mph (based on Risk Category II)
  - Exposure Category B

*Analysis performed of the existing roof structure utilizing the above loading criteria is in accordance with the FBC 2020, 7<sup>th</sup> Edition, including provisions allowing existing structures to not require strengthening if the new loads do not exceed existing design loads by 105% for gravity elements and 110% for seismic elements. This analysis indicates that the existing framing will support the additional panel loading without damage, if installed correctly.*



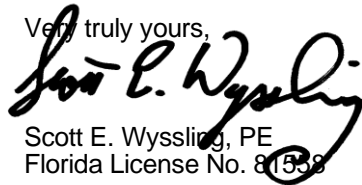
**D. Solar Panel Anchorage**

1. The solar panels shall be mounted in accordance with the most recent Unirac installation manual. If during solar panel installation, the roof framing members appear unstable or deflect non-uniformly, our office should be notified before proceeding with the installation.
2. Connection on the roof is utilizing (4) ½" or #14 screws into the existing decking to resist uplift forces. Contractor to verify installation to be performed in accordance with the Unirac recommendations. Pull out values per screw are based on National Design Specification values for CDX plywood and are identified as 208 lbs/inch. Based on ½" sheathing the value per screw would be 104 lbs providing 416 lbs uplift resistance per attachment.
3. Considering the wind speed, roof slopes, size and spacing of framing members, and condition of the roof, the panel supports shall be placed no greater than 48" on center.
4. Panel supports connections shall be staggered to distribute load to adjacent framing members.

Based on the above evaluation, this office certifies that with the racking and mounting specified, the existing roof system will adequately support the additional loading imposed by the solar system. This evaluation is in conformance with the FBC 2020, 7th Edition, current industry standards, and is based on information supplied to us at the time of this report.

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

Very truly yours,

  
Scott E. Wyssling, PE  
Florida License No. 81558

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SEALED BY SCOTT WYSSLING, PE USING A DIGITAL  
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76 N Meadowbrook Drive Alpine UT 84004  
Florida License # RY34912

Signed 6/8/2022



PROJECT DESCRIPTION:

22x440 APTOS SOLAR DNA-120-MF10 (440W) MODULES  
ROOF MOUNTED SOLAR PHOTOVOLTAIC MODULES  
SYSTEM SIZE: 9.68 kW DC STC  
SYSTEM SIZE: 6.38 kW AC

EQUIPMENT SUMMARY  
22 APTOS SOLAR DNA-120-MF10 (440W) MODULES  
22 ENPHASE IQ8PLUS-72-2-US MICRO-INVERTERS, 240V

DESIGN CRITERIA	
WIND SPEED	119
EXPOSURE CATEGORY	B
RISK CATEGORY	II
MOUNTING METHOD	ROOF MOUNT
GROUND SNOW LOAD	0

CODE COMPLIANCE

ALL WORK SHALL COMPLY WITH ALL STATE AND LOCAL CODES, ORDINANCES AND ANY OTHER REGULATING AUTHORITIES WHICH HAVE AUTHORITY OVER ANY PORTION OF THE WORK.

AHJ NOTES:  
ALL WORK SHALL COMPLY WITH THE  
2020 FLORIDA RESIDENTIAL CODE  
2020 FLORIDA BUILDING CODE  
2020 FLORIDA ENERGY CONSERVATION CODE  
2020 FLORIDA PLUMBING CODE  
2020 FLORIDA FUEL GAS CODE

ELECTRICAL CODE:  
ALL ELECTRICAL WORK SHALL COMPLY WITH THE  
2017 NATIONAL ELECTRIC CODE.

GPS COORDINATES: 30.16406, -82.69984

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GENERAL INSTALLATION NOTES

- INSTALLER SHALL ASSUME FULL RESPONSIBILITY AND LIABILITY FOR COMPLIANCE WITH REGULATIONS PER FEDERAL OSHA AND LOCAL REGULATIONS PERTAINING TO WORK PRACTICES, PROTECTION OF WORKERS AND VISITORS TO THE SITE.
- INSTALLER SHALL VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS AT SITE BEFORE COMMENCING WORK.
- CONTRACTOR SHALL FURNISH ALL MATERIAL EXCEPT AS SPECIFIED IN THE CONTRACT AND/OR THESE DRAWINGS.
- ALL MATERIALS SHALL BE IN NEW AND UNUSED CONDITION.
- MANUFACTURER'S MATERIAL EQUIPMENT, ETC. SHALL BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS AND INSTRUCTIONS.
- THE INSTALLER SHALL BECOME FAMILIAR WITH ALL UTILITY AS-BUILT PLANS AND THE LOCATIONS OF ALL EXISTING UTILITIES, STRUCTURES, PAVEMENT OR IMPROVEMENTS.
- CONTRACTOR SHALL VERIFY EXISTING CONDITIONS AND NOTIFY THE OWNER OF DISCREPANCIES REQUIRING FURTHER CLARIFICATION BEFORE PROCEEDING WITH THE WORKS.
- INSTALL ALL ASPECTS OF THIS PROJECT IN ACCORDANCE WITH THE SPECIFICATIONS AND AS NOTED ON DRAWINGS ISSUED FOR CONSTRUCTION.
- CONDUCTORS EXPOSED TO SUNLIGHT SHALL BE LISTED AS SUNLIGHT RESISTANT PER 310.0(D)
- WORKING CLEARANCES AROUND THE EXISTING AND NEW ELECTRICAL EQUIPMENT WILL BE MAINTAINED IN ACCORDANCE WITH NEC 110.26
- EXACT CONDUIT RUN LOCATIONS SUBJECT TO CHANGE
- ROOF PENETRATIONS ARE SEALED.
- INVERTER IS LISTED TO UL-1741 "UTILITY INTERACTIVE"
- VISIBLE, LABELED, LOCKABLE DISCONNECT LOCATED LESS THAN 10' FROM UTILITY METER

SHEET INDEX	
PV-0	COVER SHEET
PV-1	PLOT PLAN WITH ROOF PLAN
PV-2	ROOF PLAN WITH MODULES
PV-3	ATTACHMENT DETAIL
PV-4	ELECTRICAL LINE DIAGRAM
PV-5	ATTIC PHOTO
PV-6	ELECTRICAL PHOTOS
PV-7	PLACARDS
PV-8	ADDITIONAL NOTES
PV-9	JOB HAZARD ANALYSIS
PV-10+	EQUIPMENT SPECIFICATIONS



1 HOUSE PHOTO  
PV-0 SCALE: NTS



2 VICINITY MAP  
PV-0 SCALE: NTS

LGCY POWER

LGCY POWER  
3333 DIGITAL DR #600, LEHI,  
UT 84043, UNITED STATES  
855-353-4899

Joseph Cirillo

LICENSE NUMBER: EC13006601

REVISIONS		
DESCRIPTION	DATE	REV

Signature with Seal

CUSTOMER INFORMATION

BEVERLY MCNAULL  
604 SW PHILLIPS CIRCLE,  
LAKE CITY, FL 32024 USA  
EMAIL ID# - bgrammy85@gmail.com  
PHONE NO # (386) 984-0757  
APN# 034S1602739239

SHEET NAME

COVER SHEET

SHEET SIZE

ANSI B  
11" X 17"

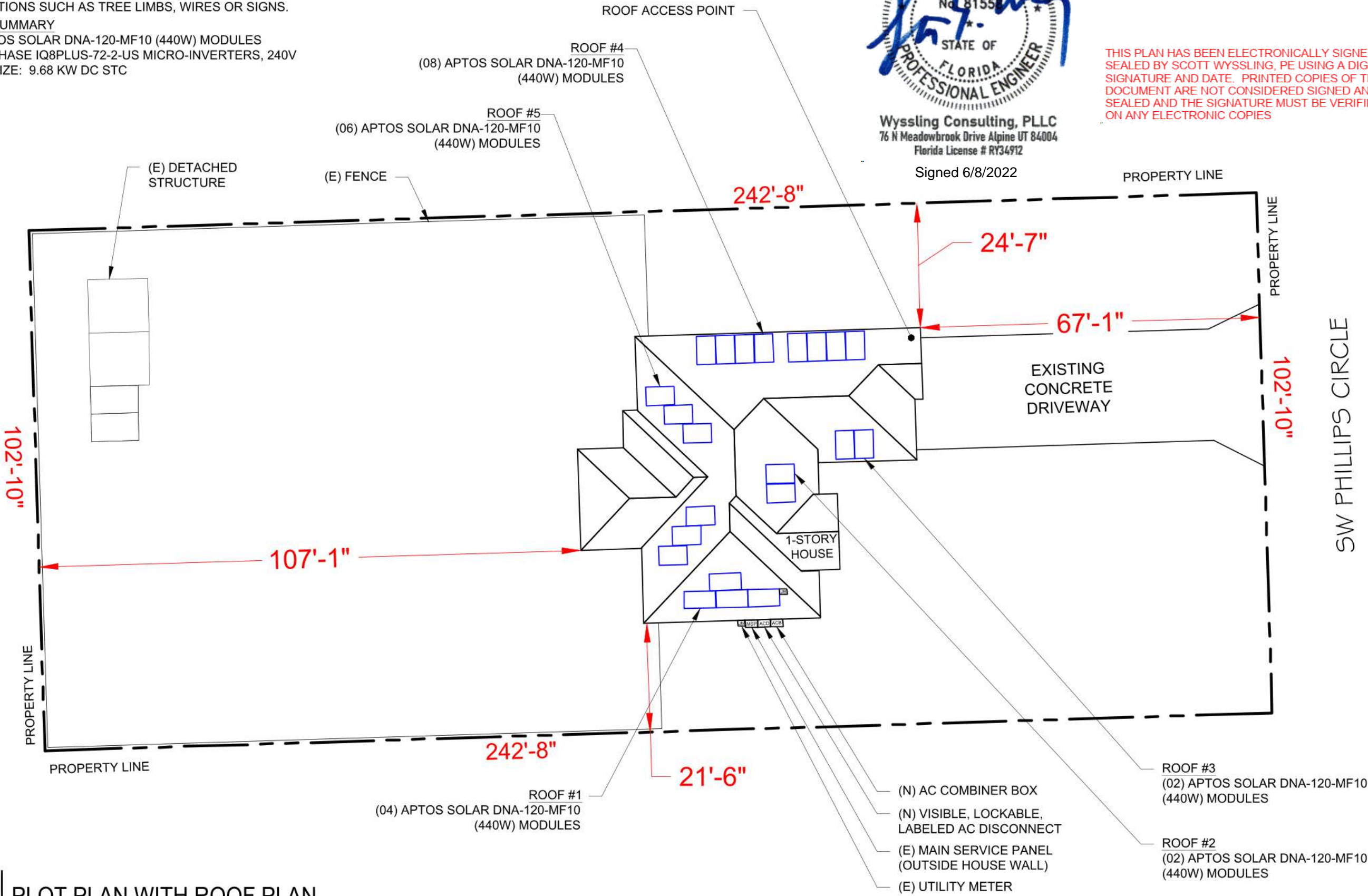
SHEET NUMBER

PV-0



● **ROOF ACCESS POINT**  
ROOF ACCESS POINT SHALL NOT 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.

**SYSTEM SUMMARY**  
22 APTOS SOLAR DNA-120-MF10 (440W) MODULES  
22 ENPHASE IQ8PLUS-72-2-US MICRO-INVERTERS, 240V  
SYSTEM SIZE: 9.68 KW DC STC



**SCOTT E WYSSLING**  
LICENSE  
No. 81552  
STATE OF  
FLORIDA  
PROFESSIONAL ENGINEER

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**SHEET NAME**

**PLOT PLAN WITH  
ROOF PLAN**

**SHEET SIZE**

**ANSI B  
11" X 17"**

**SHEET NUMBER**

**PV-1**

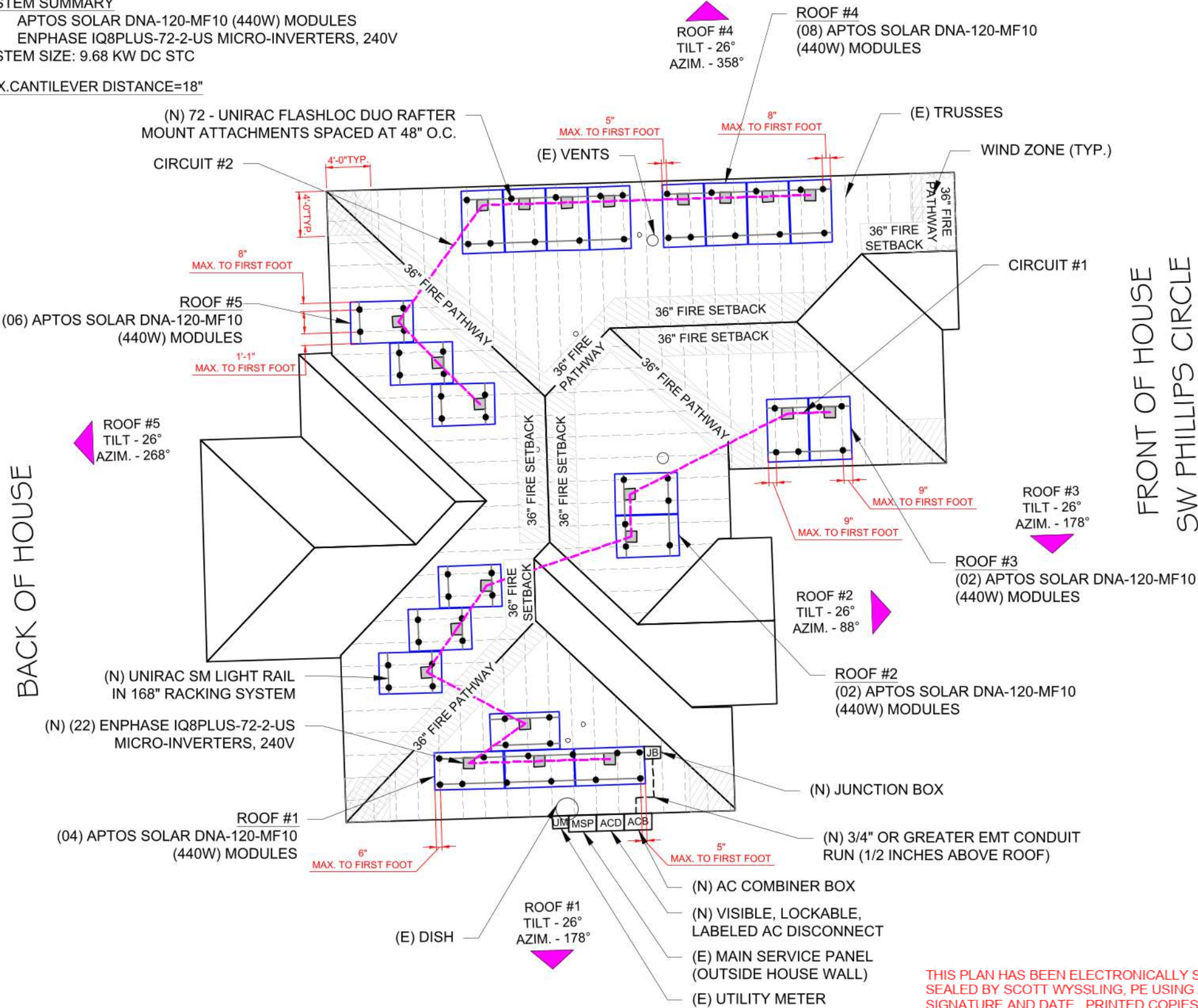


MODULE TYPE, DIMENSIONS & WEIGHT

NUMBER OF MODULES = 22 MODULES  
MODULE TYPE = APTOS SOLAR DNA-120-MF10 (440W) MODULES  
MODULE WEIGHT = 52.9 LBS / 24.0 KG.  
MODULE DIMENSIONS = 74.92"x 44.65" = 23.23 SF  
UNIT WEIGHT OF ARRAY = 2.28 PSF

SYSTEM SUMMARY  
22 APTOS SOLAR DNA-120-MF10 (440W) MODULES  
22 ENPHASE IQ8PLUS-72-2-US MICRO-INVERTERS, 240V  
SYSTEM SIZE: 9.68 KW DC STC

MAX.CANTILEVER DISTANCE=18"



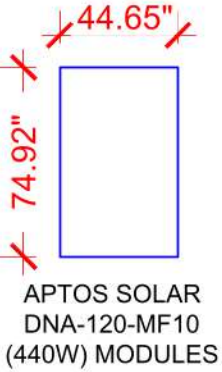
ROOF DESCRIPTION				
ROOF TYPE			COMPOSITE SHINGLE	
ROOF	ROOF TILT	AZIMUTH	FRAMING SIZE	FRAMING SPACING
#1	26°	178°	2"x4"	24" O.C.
#2	26°	88°	2"x4"	24" O.C.
#3	26°	178°	2"x4"	24" O.C.
#4	26°	358°	2"x4"	24" O.C.
#5	26°	268°	2"x4"	24" O.C.

TOTAL ARRAY AREA WITH MOUNTING ROOF AREA				
ROOF	# OF MODULES	ARRAY AREA (Sq. Ft.)	MOUNTING ROOF AREA (Sq. Ft.)	ROOF AREA COVERED BY ARRAY (%)
#1	04	92.92	309	30.07
#2	02	46.46	298	15.59
#3	02	46.46	222	20.93
#4	08	185.84	617	30.12
#5	06	139.38	526	26.50

TOTAL ARRAY AREA WITH MOUNTING ROOF AREA				
ROOF	# OF MODULES	ARRAY AREA (Sq. Ft.)	MOUNTING ROOF AREA (Sq. Ft.)	ROOF AREA COVERED BY ARRAY (%)
#1-5	22	511.07	1972	25.92



Signed 6/8/2022



LEGEND

- MICRO-INVERTERS
- UM - UTILITY METER
- JB - JUNCTION BOX
- ACB - AC COMBINER BOX
- ACD - AC DISCONNECT
- MSP - MAIN SERVICE PANEL
- - VENTS, DISH (ROOF OBSTRUCTION)
- - CONDUIT RUN
- - TRUSSES
- - ROOF ATTACHMENT
- - RAIL
- - CIRCUIT



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Joseph Ciriello

LICENSE NUMBER: EC13006601

REVISIONS

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Signature with Seal

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SHEET NAME

ROOF PLAN  
WITH MODULES

SHEET SIZE

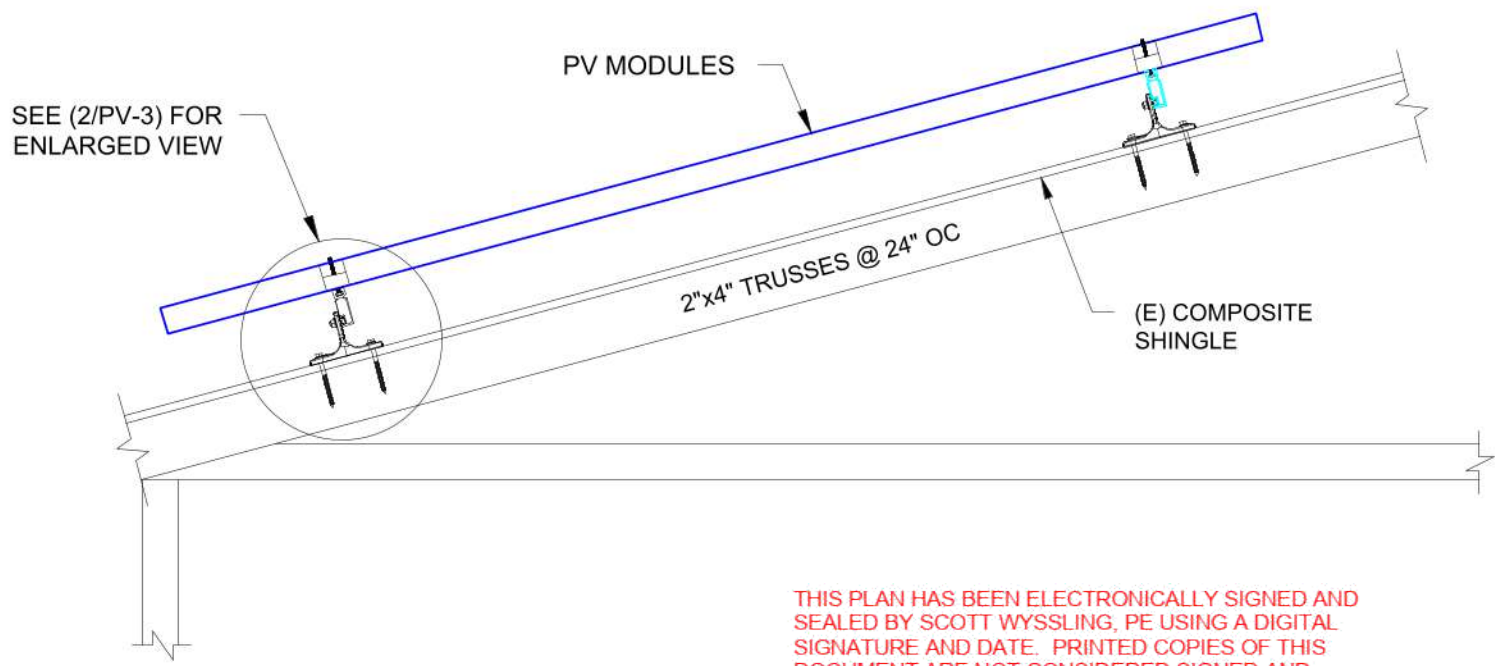
ANSI B  
11" X 17"

SHEET NUMBER

PV-2



SYSTEM SUMMARY  
22 APTOS SOLAR DNA-120-MF10 (440W) MODULES  
22 ENPHASE IQ8PLUS-72-2-US MICRO-INVERTERS, 240V  
SYSTEM SIZE: 9.68 KW DC STC



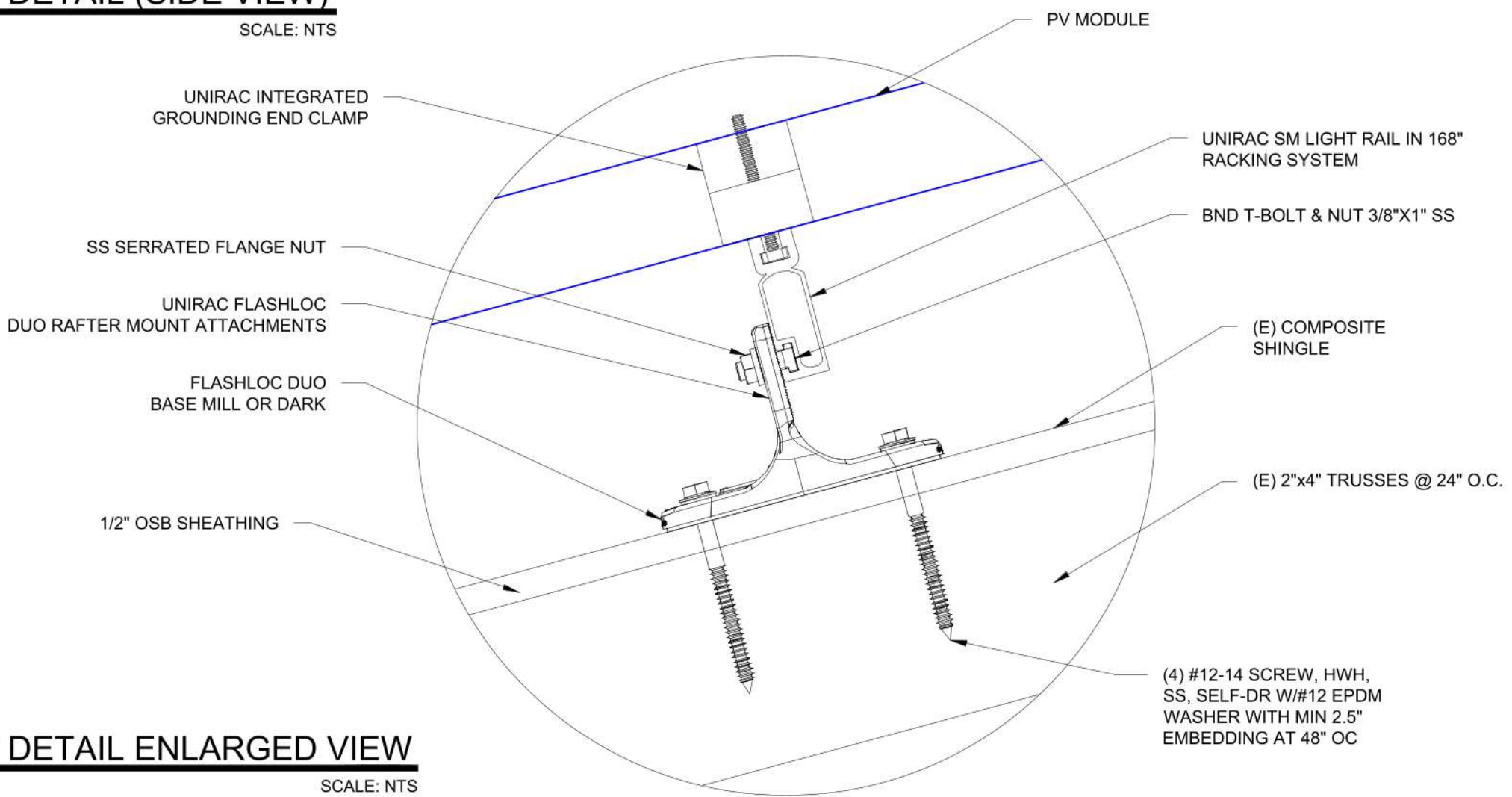
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1 ATTACHMENT DETAIL (SIDE VIEW)  
PV-3 SCALE: NTS



2 ATTACHMENT DETAIL ENLARGED VIEW  
PV-3 SCALE: NTS

**LGCY POWER**  
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855-353-4899

*Joseph Cirillo*  
LICENSE NUMBER: EC13006601

REVISIONS		
DESCRIPTION	DATE	REV

Signature with Seal

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APN# 034S1602739239

SHEET NAME  
**ATTACHMENT  
DETAIL**

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

SHEET NUMBER  
**PV-3**



INVERTER SPECIFICATIONS	
MANUFACTURER	ENPHASE IQ8PLUS-72-2-US
MAX. DC VOLT RATING	60 VOLTS
MAX. POWER AT 40 C	290 WATTS
NOMINAL AC VOLTAGE	240 VOLTS
MAX. AC CURRENT	1.21 AMPS
MAX. OCPD RATING	20 AMPS
MAX. PANELS/CIRCUIT	13
SHORT CIRCUIT CURRENT	15 AMPS

SOLAR MODULE SPECIFICATIONS	
MANUFACTURER / MODEL #	APTOS SOLAR DNA-120-MF10 (440W)
VMP	33.82V
IMP	13.01A
VOC	40.80V
ISC	13.61A
MODULE DIMENSION	74.92"L x 44.65"W x 1.38"D (In Inch)

(22) APTOS SOLAR DNA-120-MF10 (440W) MODULES  
(22) ENPHASE IQ8PLUS-72-2-US MICRO-INVERTERS, 240V  
(02) CIRCUITS OF 11 MODULES WITH MICRO INVERTERS  
CONNECTED IN SERIES PER CIRCUIT  
SYSTEM SIZE: 9.68 KW DC STC

NOTE:  
CONDUIT AND CONDUCTOR SPECIFICATIONS ARE BASED ON  
MINIMUM CODE REQUIREMENTS AND ARE NOT MEANT TO  
LIMIT UP-SIZING AS REQUIRED BY FIELD CONDITIONS.

THIS PANEL IS FED BY MULTIPLE SOURCES (UTILITY AND SOLAR)	
AC OUTPUT CURRENT	26.62A
NOMINAL AC VOLTAGE	240V

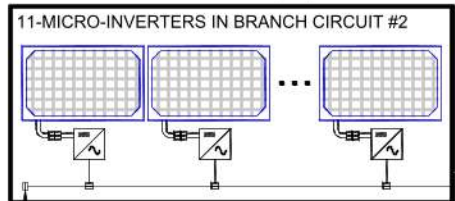
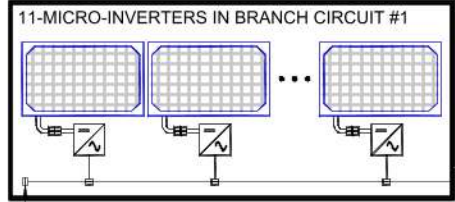
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120% RULE	
BUS BAR RATING X 120%) - MAIN BREAKER RATING = MAX. PV OCPD	
(200A x 120%) - 200A = 40.00A	

Rooftop conductor ampacities designed in compliance  
with art. 690.8, Tables 310.15(B)(2)(a),  
310.15(B)(3)(a), 310.15(B)(3)(c), 310.15(B)(16),  
Chapter 9 Table 4, 5, & 9. Location specific  
temperature obtained from ASHRAE 2017 data tables

RECORD LOW TEMP	-10°
AMBIENT TEMP (HIGH TEMP 2%)	37°
CONDUIT HEIGHT	0.5"
ROOF TOP TEMP	59°
CONDUCTOR TEMPERATURE RATE	90°

(N) (22) (ENPHASE IQ8PLUS-72-2-US  
MICRO-INVERTERS, 240V, 1.21A MAX  
CEC WEIGHTED EFFICIENCY 97.0%  
NEMA 4R, UL LISTED, INTERNAL GFDI



(N) APTOS SOLAR DNA-120-MF10  
(440W) MODULE

(N) NEMA 3R  
RATED JUNCTION  
BOX: SHALL  
COMPLY W/NEC  
110.3 & 314.6

(N) 125A ENPHASE IQ  
COMBINER X-IQ-AM1-240-4  
COMBINER PANEL, 240V

(N) 15A BREAKER

(N) 60A, RATED  
NON-FUSED AC  
DISCONNECT, 240V  
NEMA 3R, UL LISTED

CLAY ELECTRIC COOPERATIVE  
UTILITY METER

EXISTING CONDUCTORS

TO UTILITY GRID  
L1L2N

EXISTING BI-DIRECTIONAL  
UTILITY METER  
METER NO. - 154 738 490  
1-PHASE, 3-W,  
120V/240V

(E) MAIN SERVICE PANEL  
200A RATED, 240V  
(OUTSIDE HOUSE WALL)

(E) MAIN BREAKER  
200A, 240V (TOP FED)

(N) 40A/2P PV BREAKER

GEC  
GROUNDING  
ELECTRODE SYSTEM

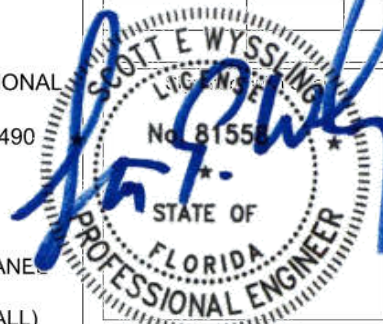
VISIBLE, LOCKABLE,  
LABELED DISCONNECT

WIRE TAG #	WIRE FROM --	CONDUIT	WIRE QTY	WIRE GAUGE:	WIRE TYPE ENPHASE Q-CABLE INCLUDES #12 GROUND	TEMP RATING:	WIRE AMP	TEMP DE-RATE:	CONDUIT FILL:	WIRE OCP:	TERMINAL 75°C RATING:	INVERTER QTY:	NOC:	NEC:	STRING AMPS	GRND SIZE	GRND WIRE TYPE
1	ARRAY TO JUNCTION BOX	-	4	#12	Q-CABLE	90°	30A	x 0.91	x 0.80	= 21.84A	25A	11	x 1.21	x 1.25	= 16.64A	#6	BARE CU
2	JUNCTION BOX TO JUNCTION BOX	FREE AIR	4	#12	12/2 UF-B	75°	25A	x 0.88	x 0.80	= 17.60A	25A	11	x 1.21	x 1.25	= 16.64A	#10	BARE CU
3	JUNCTION BOX TO COMBINER PANEL	3/4" EMT	4	#10	THWN-2	75°	35A	x 0.88	x 0.80	= 24.64A	35A	11	x 1.21	x 1.25	= 16.64A	#10	THWN-2
4	COMBINER PANEL TO MAIN SERVICE PANEL	3/4" EMT	3	#6	THWN-2	75°	65A	x 0.88	x 1.00	= 57.20A	65A	22	x 1.21	x 1.25	= 33.28A	#10	THWN-2

**LGCY POWER**  
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3333 DIGITAL DR #600, LEHI,  
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*Joseph C. Wells*  
LICENSE NUMBER: EC13006601

REVISIONS		
DESCRIPTION	DATE	REV



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PHONE NO.# (386) 984-0757  
APN# 034S1602739239

SHEET NAME  
**ELECTRICAL LINE  
DIAGRAM**

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

SHEET NUMBER  
**PV-4**





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SHEET NAME

ATTIC  
PHOTO

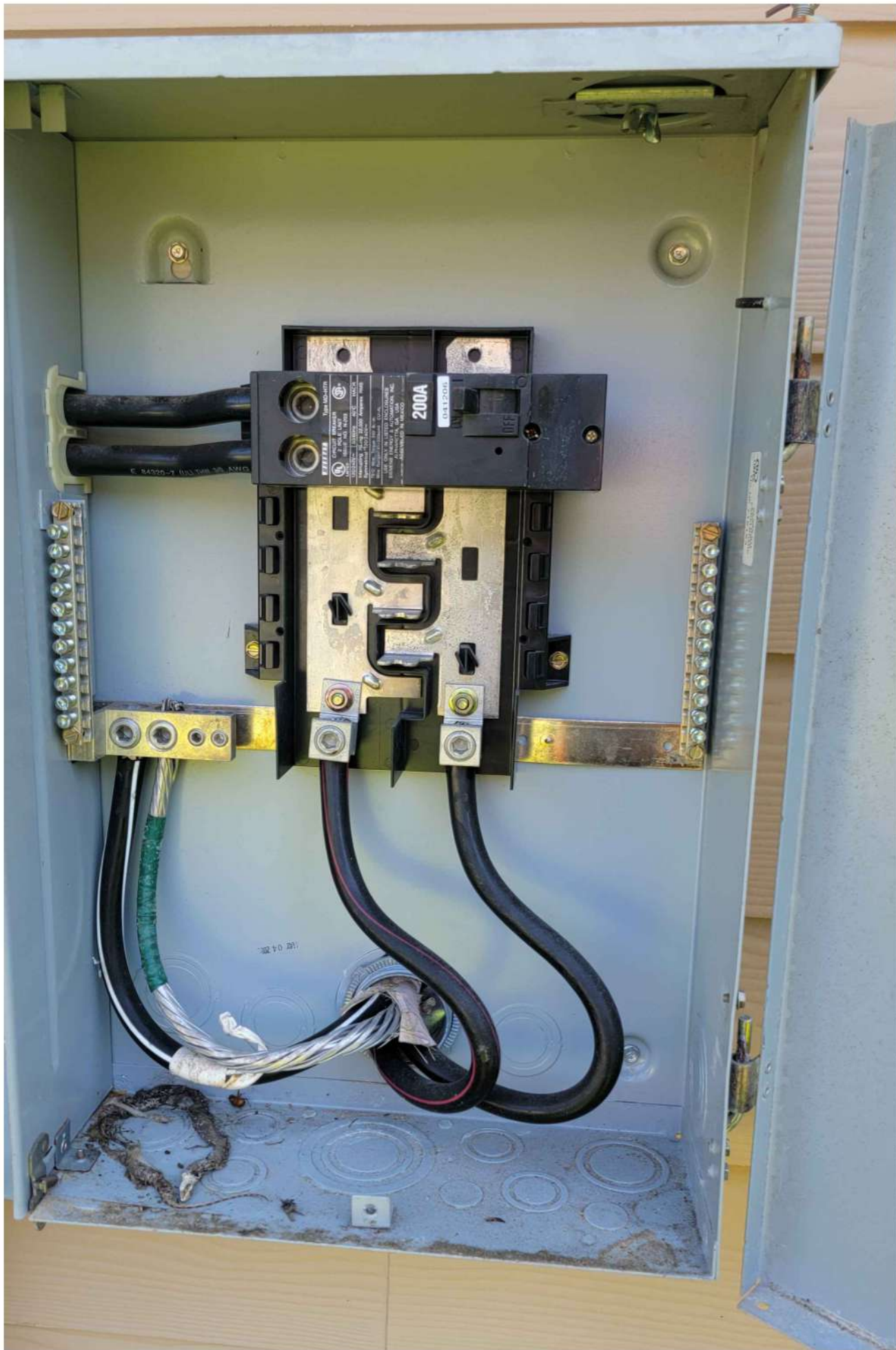
SHEET SIZE

ANSI B  
11" X 17"

SHEET NUMBER

PV-5





### Rainproof Combination Metering

Catalog Number  
**JA0816B1200TH**

RATING  
200 AMPS MAX.  
120/240 VOLTS AC, 1 phase, 3 wire  
200Y/120 VOLTS AC, 1 phase, 3 wire, when 5th jaw is installed.  
(Derived from 3 phase, 4 wire system)

METER SOCKET RATING  
200 AMPS continuous

SUITABLE ONLY FOR USE AS SERVICE EQUIPMENT.

FOR OVERHEAD OR UNDERGROUND SERVICE  
USE 60/75° COPPER OR ALUMINUM CONDUCTOR  
terminals A1, B1, N1, N2, N3, G1, A2 AND B2.

GENERAL INFORMATION  
Removed busbars from deadfront only where breakers will be installed. All openings must be filled with breakers or filler plates.

Circuit breakers overload trip position is indicated by handle position midway between ON and OFF. To reset, move handle to OFF position then to ON.

For installation in accordance with all local electrical codes and/or The National Electrical Code®.

Sum of MPRT, MPQT, MHT, MPAT, MPET, MG, MW breakers not to exceed 80 AMPS per stat.

Any unused neutral positions may be used as ground conductors.

Enclosure  
Type 3R

Terminal	Wire Size	Torque
A1, B1	350kcmil - #6	275 lb-in
N1	#2 - #3 #4 - #6 #8 #10 - #14	50 lb-in 45 lb-in 40 lb-in 35 lb-in
N2	250kcmil - #6	275 lb-in
A2, B2, G1	250kcmil - #4	275 lb-in
N3	1/0 - #14	120 lb-in
Branch Breaker Terminals	See Markings on Breaker	
Neutral Bar	#10 - #14 CU #10 - #12 AL #8 #6 - #4	20 lb-in 20 lb-in 25 lb-in 35 lb-in
Ground Conductors Only	(2) or (3) #14 AWG (2) #12-#10 AWG	20 lb-in 20 lb-in

ACCESSORIES  
Filler Plate - ECQF3  
5th Jaw Accessory - EMC5J  
Lay-In Lug Neutral Kit - ELLK1  
Interlock Kit - ECSPK05, ECSPK07

IF HUB IS REQUIRED, THE CATALOG NUMBERS LISTED BELOW MAY BE USED ON THIS ENCLOSURE

TRADE SIZE (IN)	CATALOG NUMBER
1-1/4"	EC38597
1-1/2"	EC38598
2"	EC38599
2-1/2"	EC38600

SHORT CIRCUIT CURRENT RATING  
(Without meter not included in short circuit rating)  
The package has a short circuit current rating of 22,000 amperes symmetrical, 120/240 VAC. The correct branch breaker and main branch breaker series combination to be used for various short circuit current levels are listed in the tabulation below. Any circuit breaker installed, replaced, or added in the package must be manufactured by Siemens and must be of the correct type as indicated in the tabulation below.

MAIN BREAKER WHEN THE MAIN BREAKER IS	BRANCH BREAKER AND THE BRANCH BREAKERS INSTALLED ARE MURRAY TYPE	THEN THE MAXIMUM SHORT CIRCUIT RATING IN RMS SYMMETRICAL AMPERES, 120/240 VOLTS AC IS
MO HTR	MP-T, MP-QT, MP-HQT, MP-HT, MH-T, MP-AT, MP-HAT, MP-ET, MP-HET, MO-TB, MO, MW	22,000

® NATIONAL ELECTRICAL CODE IS A REGISTERED TRADEMARK OF NATIONAL FIRE PROTECTION ASSOCIATION  
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Murray Electrical Products  
Siemens Energy & Automation, Inc.  
Alpharetta, Georgia, U.S.A.

4099617 Rev.D

**MURRAY**

IMPORTANT DO NOT ALLOW PETROLEUM BASED (HYDROCARBON) SPRAYS, CHEMICALS, SOLVENTS OR ANY PAINT TO CONTACT INTERIOR COMPONENTS. PETROLEUM BASED CHEMICALS CAN CAUSE DEGRADATION OF ELECTRICAL INSULATING MATERIALS.

MANUFACTURED DATE: 05/04/06



LGCY POWER  
3333 DIGITAL DR #600, LEHI,  
UT 84043, UNITED STATES  
855-353-4899

*Joseph Cirillo*

LICENSE NUMBER: EC13006601

REVISIONS

DESCRIPTION	DATE	REV

Signature with Seal

CUSTOMER INFORMATION

BEVERLY MCNAULL  
604 SW PHILLIPS CIRCLE,  
LAKE CITY, FL 32024 USA  
EMAIL ID# - bgrammy85@gmail.com  
PHONE NO # (386) 984-0757  
APN# 034S1602739239

SHEET NAME

ELECTRICAL  
PHOTOS

SHEET SIZE

ANSI B  
11" X 17"

SHEET NUMBER

PV-6



1) COMBINER PANEL  
NEC 705.12(B)(3)(4)  
LOCATED AT AC COMBINER PANEL

WARNING

PHOTOVOLTAIC SYSTEM  
COMBINER PANEL  
DO NOT ADD LOADS

2) AC DISCONNECT  
NEC 690.54  
LOCATED ON AC DISCONNECT

PHOTOVOLTAIC SYSTEM  
AC DISCONNECT

OPERATING VOLTAGE 240 VOLTS  
OPERATING CURRENT 26.62 AMPS

3) PV SOLAR BREAKER  
NEC 705.12(B)(3)(2)  
LOCATED NEXT TO THE PV BREAKER

PV SOLAR BREAKER

DO NOT RELOCATE THIS  
OVERCURRENT DEVICE

4) PV CONDUCTORS  
NEC 690.31(D)(2)  
LOCATED ON CABLE TRAYS, JUNCTION BOXES AND CONDUIT

WARNING: PHOTOVOLTAIC  
POWER SOURCE

LABELS MUST BE VISIBLE AFTER INSTALLATION.  
LABELS MUST BE LOCATED ON EVERY SECTION OF  
THE WIRING SYSTEM SEPARATED BY WALLS,  
FLOORS OR OTHER PARTITIONS AND MUST NOT BE  
SEPARATED BY MORE THAN 10'

5) RAPID SHUTDOWN  
NEC 690.56(C)(2)  
LOCATED ON AC DISCONNECT

RAPID SHUTDOWN  
SWITCH FOR  
SOLAR PV SYSTEM

6) DUEL POWER SOURCES  
NEC 690.56(C)  
MUST BE LOCATED ON THE MAIN SERVICE PANEL

SOLAR SYSTEM EQUIPPED  
WITH RAPID SHUTDOWN

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

SOLAR ELECTRIC  
PV PANELS

7) ELECTRIC SHOCK HAZARD  
NEC 690.13(B)  
LOCATED ON AC DISCONNECT & PRODUCTION METER

WARNING

ELECTRIC SHOCK HAZARD

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

8) DUAL POWER SUPPLY  
NEC 705.12(B)(3)  
MUST BE LOCATED ON THE MAIN SERVICE PANEL

WARNING

DUAL POWER SUPPLY

SOURCES: UTILITY GRID AND  
PV SOLAR ELECTRIC SYSTEM

- LABELING NOTES:
1. LABELS CALLED OUT ACCORDING TO ALL COMMON CONFIGURATIONS. ELECTRICIAN TO DETERMINE EXACT REQUIREMENTS IN THE FIELD PER CURRENT NEC AND LOCAL CODES AND MAKE APPROPRIATE ADJUSTMENTS.
  2. LABELING REQUIREMENTS BASED ON THE NATIONAL ELECTRIC CODE, OSHA STANDARD 19010.145, ANSI Z535.
  3. MATERIAL BASED ON THE REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION.
  4. LABELS TO BE OF SUFFICIENT DURABILITY TO WITHSTAND THE ENVIRONMENT INVOLVED [NEC 110.21] THEY SHALL BE PERMANENTLY ATTACHED, WEATHER/SUNLIGHT RESISTANT, AND SHALL NOT BE HAND WRITTEN NEC 11.21(B)
  5. LABELS TO BE A MINIMUM LETTER HEIGHT OF 3/8", WHITE ON RED BACKGROUND; REFLECTIVE, AND PERMANENTLY AFFIXED [IFC 605.11.1.1]

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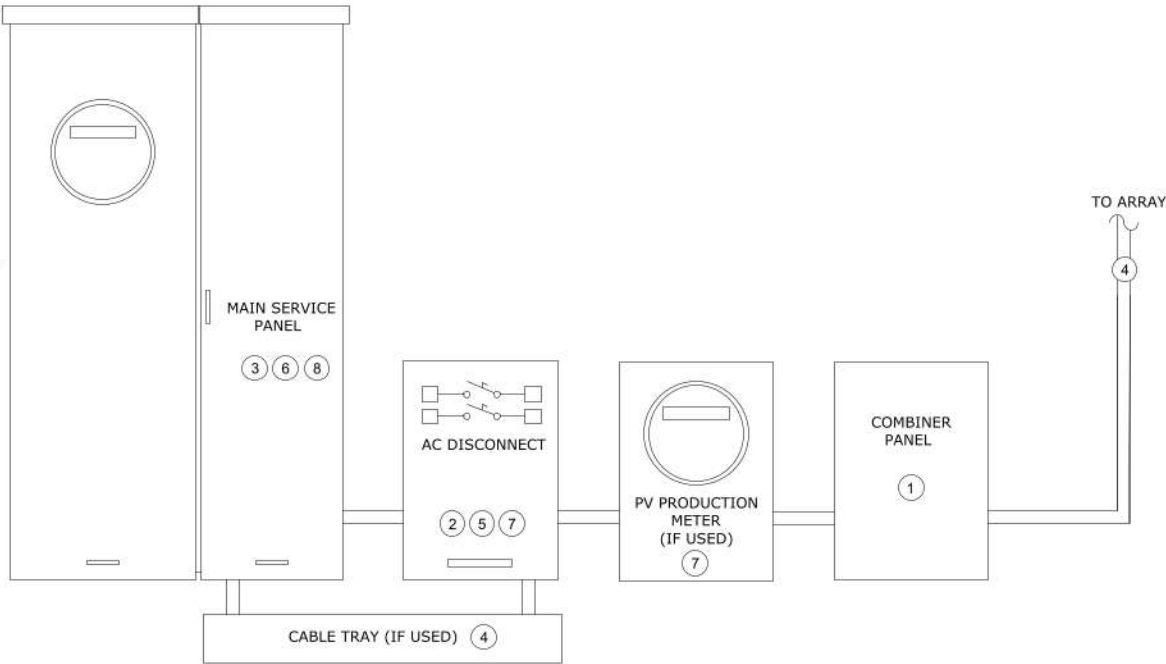
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DESCRIPTION	DATE	REV

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CUSTOMER INFORMATION

PHOTOVOLTAIC SYSTEMS  
EQUIPPED WITH  
RAPID SHUTDOWN

UTILITY METER ENTRANCE/METER, INVERTER/ DC  
DISCONNECT PER CODE(S): NEC 2020 ARTICLE 690.56(C)



CAUTION

POWER TO THIS BUILDING IS ALSO SUPPLIED FROM THE  
FOLLOWING SOURCES WITH DISCONNECTS LOCATED AS SHOWN  
AT: ☒ MAIN SERVICE PANEL & UTILITY METER,  
AC DISCONNECT, AC COMBINER BOX

(E) UTILITY METER  
(E) MAIN SERVICE PANEL  
(OUTSIDE HOUSE WALL)

(N) AC COMBINER BOX  
(N) VISIBLE, LOCKABLE,  
LABELED AC DISCONNECT

604 SW PHILLIPS CIRCLE, LAKE CITY, FL 32024 USA

ALL LABELS MUST BE PERMANENTLY ATTACHED, MUST BE WEATHER AND SUNLIGHT  
RESISTANT AND MAY NOT BE HAND-WRITTEN

BEVERLY MCNAULL

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PHONE NO # (386) 984-0757  
APN# 034S1602739239

SHEET NAME

PLACARDS

SHEET SIZE

ANSI B  
11" X 17"

SHEET NUMBER

PV-7



ELECTRICAL NOTES:

- 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.
- 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 ACCORDANCE WITH NEC REQUIREMENTS. PLAQUE SHALL BE UV RESISTANT IF EXPOSED TO SUNLIGHT.
- 3. EXPOSED NON-CURRENT CARRYING METAL PARTS OF ELECTRICAL EQUIPMENT SHALL BE GROUNDED IN ACCORDANCE WITH 250.134 OR 250.138(A).
- 4. CONFIRM LINE SIDE VOLTAGE AT ELECTRIC UTILITY SERVICE PRIOR TO CONNECTING INVERTER. VERIFY SERVICE VOLTAGE IS WITHIN INVERTER VOLTAGE OPERATIONAL RANGE.
- 5. OUTDOOR EQUIPMENT SHALL BE NEMA-3R RATED OR BETTER.
- 6. ELECTRICAL CONTRACTOR TO PROVIDE CONDUIT EXPANSION JOINTS AND ANCHOR CONDUIT RUNS AS REQUIRED PER NEC.
- 7. 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 HELP OFF OF THE ROOF SURFACE. NEC 110.2 - 110.4 / 300.4



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*Joseph Cirillo*

LICENSE NUMBER: EC13006601

REVISIONS		
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Signature with Seal

CUSTOMER INFORMATION

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PHONE NO # (386) 984-0757  
APN# 034S1602739239

SHEET NAME

ADDITIONAL NOTES

SHEET SIZE

ANSI B  
11" X 17"

SHEET NUMBER

PV-8





FIELD DESIGN REQUEST FORM

JOB INFORMATION

JOB NAME:

DATE:

ADDRESS:

CHANGE REQUEST

WHO AUTHORIZED THE CHANGE:

DESCRIBE THE NEEDED CHANGE & WHY:

NEW DESIGN LAYOUT

DRAW THE MOUNTING PLANE SHOWING THE NEW MODULE LAYOUT:

INSTALLER NAME(PRINT):

I UNDERSTAND AND AGREE TO THE CHANGES MADE ABOVE:

CUSTOMER NAME

CUSTOMER SIGNATURE

DATE

JOB HAZARD ANALYSIS

CUSTOMER NAME/JOB ID: CUSTOMER ADDRESS

INSTALL DATE - - Time : am/pm

HAZARD CATEGORY	HAZARD TYPE	HAZARD CONTROL MEASURES
LADDER SAFETY	<ul style="list-style-type: none"><li>LOCATION</li><li>CONDITION</li><li>WORKING CLEARANCE</li></ul>	
FALL PROTECTION	<ul style="list-style-type: none"><li>WORKING 6' OR HIGHER</li></ul>	
ELECTRICAL SAFETY	<ul style="list-style-type: none"><li>ARCH FLASH</li><li>ELECTRIC SHOCK/ELECTROCUTION</li></ul>	
WEATHER CONDITIONS	<ul style="list-style-type: none"><li>HEAT/COLD TEMP</li><li>RAINY/ICY/WINDY</li></ul>	
PUBLIC SAFETY	<ul style="list-style-type: none"><li>WORK/OBJECTS OVERHEAD</li><li>SLIPS/TRIPS/FALLS</li><li>ACCESS TO LIVE ELECTRICAL</li></ul>	

NEAREST EMERGENCY FACILITY

CONTACT IMMEDIATLY IN EMERGENCY (911 AND/OR)

GENERAL SITE DISCRIPTION/NOTES

CREW MEMBERS ON SITE FOR INSTALL

NAME	SIGNATURE
FMU/LMD-	

ELECTRICAL COMPLETION  
PHOTOS QR CODE



ROOFTOP INSTALLATION  
PHOTOS QR CODE



MPU COMPLETION  
PHOTOS QR CODE



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PHONE NO # (386) 984-0757  
APN# 034S1602739239

SHEET NAME

JOB HAZARD  
ANALYSIS

SHEET SIZE

ANSI B  
11" X 17"

SHEET NUMBER

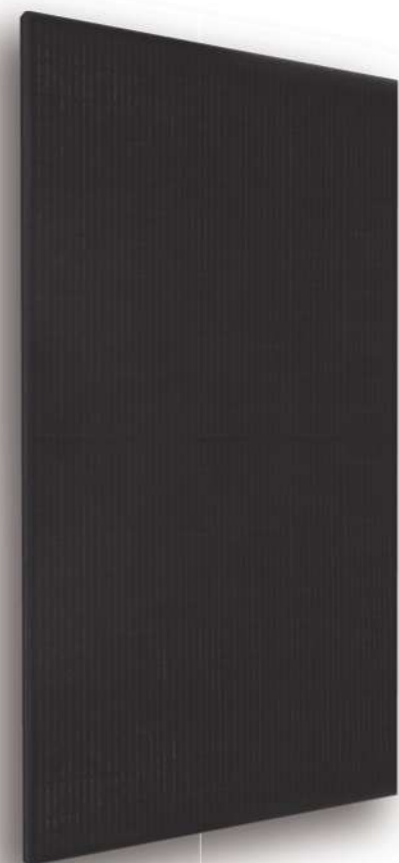
PV-9



# DNA™ 120

Solar for Innovators

Residential | Commercial

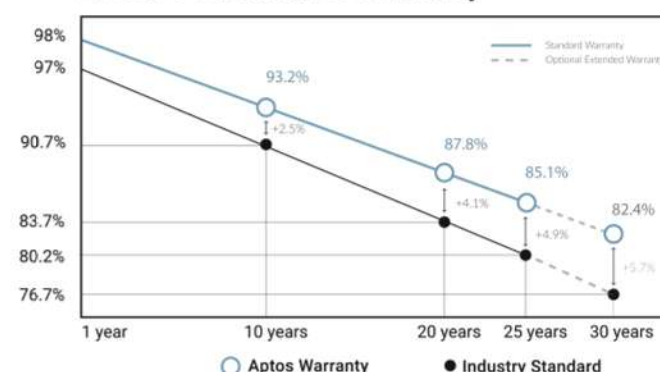


## Designed & Engineered in Silicon Valley

440W | 435W | 430W

Our DNA Split Cell Series uses advanced selective emitter PERC technology with thin film layers to improve heat tolerance, increase photon capture, minimize resistive loss, and use 5% more of the available active area for optimal power performance. Our panels exceed IEC standards and come with an industry leading, 30-year warranty.

### Linear Performance Warranty



### Features



**Advanced Technology**  
Patented DNA™ technology boosts power performance & module efficiency



**Maximum Panel Density**  
Advanced split cell technology with 9 ultra-thin busbars allows for less resistance and more photon capture



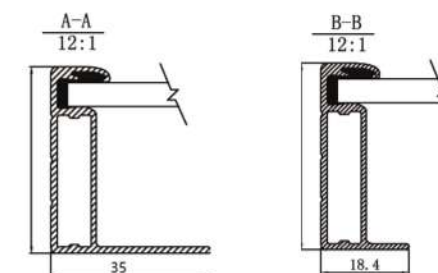
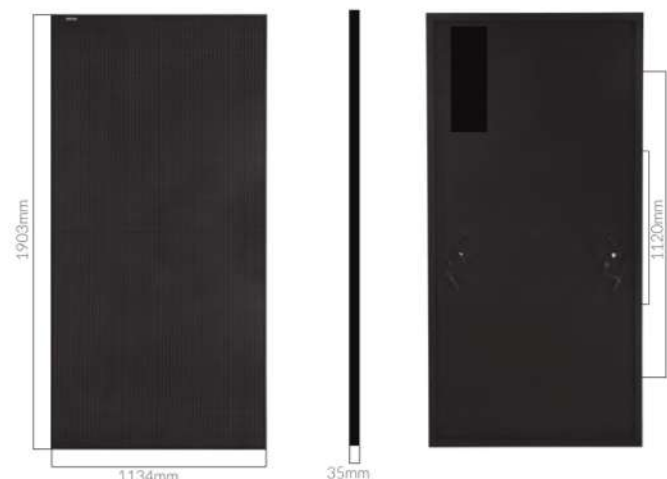
**Durable Design**  
Robust product design is resilient in extreme weather. Up to 5400 Pa snow load and 5400 Pa wind load



**A Safe Investment**  
Industry leading 30 year warranty



3140 De La Cruz Blvd., Ste 200  
Santa Clara, CA 95054  
www.aptosolar.com | info@aptossolar.com



### Electrical Specifications

	DNA-120-MF10-440W	DNA-120-MF10-445W	DNA-120-MF10-450W
STC Rated Output $P_{mp}$ (W)	440W	445W	450W
Module Efficiency	20.39%	20.62%	20.85%
Open Circuit Voltage $V_{oc}$ (V)	40.80	41.10	41.34
Short Circuit Current $I_{sc}$ (A)	13.61	13.70	13.80
Rated Voltage $V_{mp}$ (V)	33.82	34.02	34.16
Rated Voltage $I_{mp}$ (A)	13.01	13.09	13.17

Standard Test Conditions for front-face of panel: 1000 W/m<sup>2</sup>, 25°C, measurement uncertainty  $\pm 3\%$

### Temperature Coefficients

Temperature Coefficients $P_{mp}$	-0.35%/°C
Temperature Coefficients $I_{sc}$	+0.06%/°C
Temperature Coefficients $V_{oc}$	-0.31%/°C
Nominal Operating Cell Temperature (NOCT)	45°C

### Test Operating Conditions

Maximum Series Fuse	25A
Maximum System Voltage	1,500 VDC (UL&IEC)
Maximum Load Capacity (Per UL 1703)	5400 PA Snow Load / 5400 Pa Wind Load
Fire Performance Class	Class C/Type 1

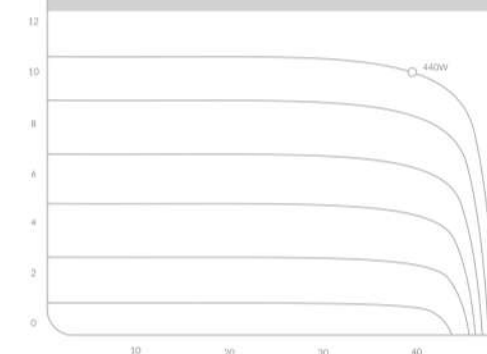
### Packaging Configuration

Number of Modules per Pallet	31
Number of Pallets per 40ft. Container	24
Pallet Dimensions	2030 X 1220 X 1200
Pallet Weight (kg)	766
Container Weight (kg)	18,384

### Mechanical Properties

Cell Type	Monocrystalline
Glass	3.2mm, anti-reflection coating, high transmission, low iron, tempered glass
Frame	Anodized Aluminum Alloy
Junction Box	IP68
Dimensions	1903 X 1134 X 35 mm
Output Cable	4mm <sup>2</sup> (EU)12AWG, 39.37in.(1200mm)
Weight	52.9lbs.(24kg)
Cable Length	1200mm
Encapsulant	POE

### I-V Curve



### Certifications



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855-353-4899

Joseph Cirillo

LICENSE NUMBER: EC13006601

### REVISIONS

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Signature with Seal

### CUSTOMER INFORMATION

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APN# 034S1602739239

SHEET NAME

EQUIPMENT  
SPECIFICATION

SHEET SIZE

ANSI B  
11" X 17"

SHEET NUMBER

PV-10

Aptos Solar Technology reserves the right to make specification changes without notice





DATA SHEET



## IQ8 and IQ8+ Microinverters

Our newest IQ8 Microinverters are the industry's first microgrid-forming, software-defined microinverters with split-phase power conversion capability to convert DC power to AC power efficiently. The brain of the semiconductor-based microinverter is our proprietary application-specific integrated circuit (ASIC) which enables the microinverter to operate in grid-tied or off-grid modes. This chip is built 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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IQ8SP-DS-0002-01-EN-US-2022-03-17

### 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

\* Only when installed with IQ System Controller 2, meets UL 1741.

\*\* IQ8 and IQ8Plus supports split phase, 240V installations only.

## IQ8 and IQ8+ Microinverters

INPUT DATA (DC)		IQ8-60-2-US	IQ8PLUS-72-2-US
Commonly used module pairings <sup>1</sup>	W	235 – 350	235 – 440
Module compatibility		60-cell/120 half-cell	60-cell/120 half-cell, 66-cell/132 half-cell and 72-cell/144 half-cell
MPPT voltage range	V	27 – 37	29 – 45
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 <sup>2</sup> [module Isc]	A	15	
Overtoltage 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
Peak output power	VA	245	300
Max continuous output power	VA	240	290
Nominal (L-L) voltage/range <sup>3</sup>	V	240 / 211 – 264	
Max continuous output current	A	1.0	1.21
Nominal frequency	Hz	60	
Extended frequency range	Hz	50 – 68	
AC short circuit fault current over 3 cycles	Arms	2	
Max units per 20 A (L-L) branch circuit <sup>4</sup>		16	13
Total harmonic distortion		<5%	
Overtoltage 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
CEC weighted efficiency	%	97	97
Night-time power consumption	mW	60	
MECHANICAL DATA			
Ambient temperature range		-40°C to +60°C (-40°F to +140°F)	
Relative humidity range		4% to 100% (condensing)	
DC Connector type		MC4	
Dimensions (HxWxD)		212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")	
Weight		1.08 kg (2.38 lbs)	
Cooling		Natural convection – no fans	
Approved for wet locations		Yes	
Pollution degree		PD3	
Enclosure		Class II double-insulated, corrosion resistant polymeric enclosure	
Environ. category / UV exposure rating		NEMA Type 6 / outdoor	
COMPLIANCE			
Certifications		CA Rule 21 (UL 1741-SA), UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01  This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020 section 690.12 and C22.1-2018 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to manufacturer's instructions.	

(1) No enforced DC/AC ratio. See the compatibility calculator at <https://link.enphase.com/module-compatibility>

(2) Maximum continuous input DC current is 10.6A (3) Nominal voltage range can be extended beyond nominal if required by the utility. (4) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

IQ8SP-DS-0002-01-EN-US-2022-03-17



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3333 DIGITAL DR #600, LEHI,  
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*Joseph Cirillo*

LICENSE NUMBER: EC13006601

### REVISIONS

DESCRIPTION	DATE	REV

Signature with Seal

### CUSTOMER INFORMATION

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APN# 034S1602739239

SHEET NAME

EQUIPMENT  
SPECIFICATION

SHEET SIZE

ANSI B  
11" X 17"

SHEET NUMBER

PV-11



# Enphase IQ Combiner 4/4C

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



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

### Smart

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

### Simple

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

### Reliable

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



To learn more about Enphase offerings, visit [enphase.com](https://enphase.com)

## 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](https://enphase.com)

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LGCY POWER  
3333 DIGITAL DR #600, LEHI,  
UT 84043, UNITED STATES  
855-353-4899

*Joseph Cirillo*

LICENSE NUMBER: EC13006601

### REVISIONS

DESCRIPTION	DATE	REV

Signature with Seal

### CUSTOMER INFORMATION

BEVERLY MCNAULL  
604 SW PHILLIPS CIRCLE,  
LAKE CITY, FL 32024 USA  
EMAIL ID# - bgrammy85@gmail.com  
PHONE NO # (386) 984-0757  
APN# 034S1602739239

SHEET NAME

EQUIPMENT  
SPECIFICATION

SHEET SIZE

ANSI B  
11" X 17"

SHEET NUMBER

PV-12



# Enphase IQ Envoy

The **Enphase IQ Envoy™** communications gateway delivers solar production and energy consumption data to Enphase Enlighten™ monitoring and analysis software for comprehensive, remote maintenance and management of the Enphase IQ System.

With integrated revenue grade production metering and optional consumption monitoring, Envoy IQ is the platform for total energy management and integrates with the Enphase Ensemble™ and the Enphase IQ Battery™.



### Smart

- Enables web-based monitoring and control
- Bidirectional communications for remote upgrades
- Supports power export limiting and zeroexport applications

### Simple

- Easy system configuration using Enphase Installer Toolkit™ mobile app
- Flexible networking with Wi-Fi, Ethernet, or cellular

### Reliable

- Designed for installation indoors or outdoors
- Five-year warranty

## Enphase IQ Envoy

MODEL NUMBERS	
Enphase IQ Envoy™ ENV-IQ-AM1-240	Enphase IQ Envoy communications gateway with integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and optional consumption monitoring (+/- 2.5%). Includes one 200A continuous rated production CT (current transformer).
ACCESSORIES (Order Separately)	
Enphase Mobile Connect™ CELLMODEM-M1 (4G based LTE-M/5-year data plan) CELLMODEM-M1-B (4G-based LTE-M1/5-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 consumption CTs enable whole home metering.
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.
POWER REQUIREMENTS	
Power requirements	120/240 VAC split-phase. Max 20 A overcurrent protection required.
Typical Power Consumption	5W
CAPACITY	
Number of microinverters polled	Up to 600
MECHANICAL DATA	
Dimensions (WxHxD)	21.3 x 12.6 x 4.5 cm (8.4" x 5" x 1.8")
Weight	17.6 oz (498 g)
Ambient temperature range	-40° to 65° C (-40° to 149° F) -40° to 46° C (-40° to 115° F) if installed in an enclosure
Environmental rating	IP30. For installation indoors or in an NRTL-certified, NEMA type 3R enclosure.
Altitude	To 2000 meters (6,560 feet)
Production CT	- Limited to 200A of continuous current / 250A OCPD – 72kW AC - Internal aperture measures 19.36mm to support 250MCM THWN conductors (max) - UL2808 certified for revenue grade metering
Consumption CT	- For electrical services to 250A with parallel runs up to 500A - Internal aperture measures 0.84" x 0.96" (21.33mm x 24.38mm) to support 3/0 THWN conductor - UL2808 certified, for use at service entrance for services up to 250Vac
INTERNET CONNECTION OPTIONS	
Integrated Wi-Fi	802.11b/g/n
Ethernet	802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included)
Mobile	CELLMODEM-M1 (4G) or CELLMODEM-M1-B (4G). Not included. Note that an Enphase Mobile Connect cellular modem is required for all Ensemble installations.
COMPLIANCE	
Compliance	UL 61010-1 CAN/CSA C22.2 No. 61010-1 47 CFR, Part 15, Class B, ICES 003 IEC/EN 61010-1:2010, EN50065-1, EN61000-4-5, EN61000-6-1, EN61000-6-2 Metering: ANSI C12.20 accuracy class 0.5 (PV production only)



To learn more about Enphase offerings, visit [enphase.com](https://enphase.com)



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*Joseph Cirillo*

LICENSE NUMBER: EC13006601

REVISIONS		
DESCRIPTION	DATE	REV

Signature with Seal

### CUSTOMER INFORMATION

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604 SW PHILLIPS CIRCLE,  
LAKE CITY, FL 32024 USA  
EMAIL ID# - bgrammy85@gmail.com  
PHONE NO # (386) 984-0757  
APN# 034S1602739239

SHEET NAME

EQUIPMENT  
SPECIFICATION

SHEET SIZE

ANSI B  
11" X 17"

SHEET NUMBER

PV-13



## 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




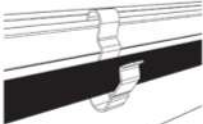


### Field-Wireable Connectors

- 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)			

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

REVISIONS		
DESCRIPTION	DATE	REV

Signature with Seal

### CUSTOMER INFORMATION

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PHONE NO # (386) 984-0757  
APN# 034S1602739239

### SHEET NAME

EQUIPMENT  
SPECIFICATION

### SHEET SIZE

ANSI B  
11" X 17"

### SHEET NUMBER

PV-14



# FLASHLOC™ DUO

THE MOST VERSATILE DIRECT TO DECK ATTACHMENT



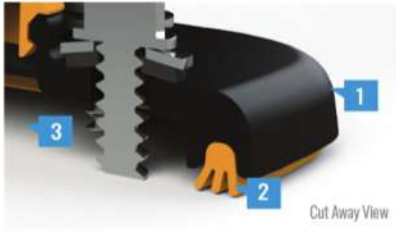
**FLASHLOC™ DUO** is the most versatile direct to deck and rafter attachment for composition shingle and rolled comp roofs. The all-in-one mount installs fast — no kneeling on hot roofs to install flashing, no prying or cutting shingles, no pulling nails. Simply drive the required number of screws to secure the mount 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 two rafter screws, sealant and hardware for maximum convenience (deck screws sold separately). Don't just divert water, **LOC it out!**



### PROTECT THE ROOF

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

APRIL2021\_FLASHLOC2DUO\_V1



### LOC OUT WATER

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



### HIGH-SPEED INSTALL

Simply drive the required number of screws and inject sealant into the port **4** to create a permanent pressure seal.

# FLASHLOC™ DUO

INSTALLATION GUIDE



### PRE-INSTALL: CLEAN SURFACE AND MARK LOCATION

Ensure existing roof structure is capable of supporting loads prescribed in Flashloc Duo D&E Guide. Clean roof surface of dirt, debris, snow and ice.

Snap chalk lines for attachment rows. On shingle roofs, snap lines 1/4" below upslope edge of shingle course. This line will be used to align the upper edge of the mount.

**NOTE:** Space mounts per span charts found in Flashloc Duo D&E Guide.



### STEP ONE: SECURE

**ATTACHING TO A RAFTER:** Place FLASHLOC DUO over rafter location and align upper edge of mount with horizontal chalk line. Secure mount with the two (2) provided rafter screws. **BACKFILL ALL PILOT HOLES WITH SEALANT.**

**ATTACHING TO SHEATHING:** Place FLASHLOC DUO over desired location and align upper edge of mount with horizontal chalk line. Secure mount with the two (2) provided rafter screws. Next, secure mount with four (4) deck screws by drilling through the FLASHLOC DUO deck mount hole locations. Unirac recommends using a drill as opposed to an impact gun to prevent over-tightening or stripping roof sheathing.

**IMPORTANT:** SECURELY ATTACH MOUNT BUT DO NOT OVERTIGHTEN SCREWS.



### STEP TWO: SEAL

Insert tip of UNIRAC approved sealant into port and inject until sealant exits vent. Continue array installation, attaching rails to mounts with provided T-bolts.

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

**CUT SHINGLES AS REQUIRED:** DO NOT INSTALL THE FLASHLOC SLIDER ACROSS THICKNESS VARIATIONS GREATER THAN 1/8" SUCH AS THOSE FOUND IN HIGH DEFINITION SHINGLES.

**NOTE:** When installing included rail attachment hardware, torque T-bolt nut to 30 ft-lbs.

**NOTE:** If an exploratory hole falls outside of the area covered by the sealant, flash hole accordingly.



USE ONLY UNIRAC APPROVED SEALANTS. PLEASE CONTACT UNIRAC FOR FULL LIST OF COMPATIBLE SEALANTS.

**FASTER INSTALLATION. 25-YEAR WARRANTY.**

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

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855-353-4899

*Joseph Ciriello*

LICENSE NUMBER: EC13006601

REVISIONS		
DESCRIPTION	DATE	REV

Signature with Seal

### CUSTOMER INFORMATION

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EMAIL ID# - bgrammy85@gmail.com  
PHONE NO # (386) 984-0757  
APN# 034S1602739239

SHEET NAME

**EQUIPMENT  
SPECIFICATION**

SHEET SIZE

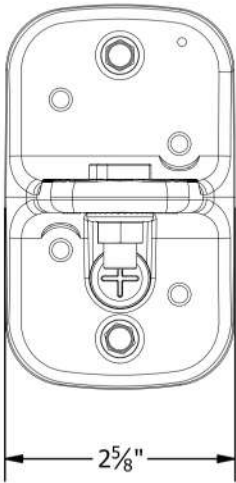
**ANSI B  
11" X 17"**

SHEET NUMBER

**PV-15**



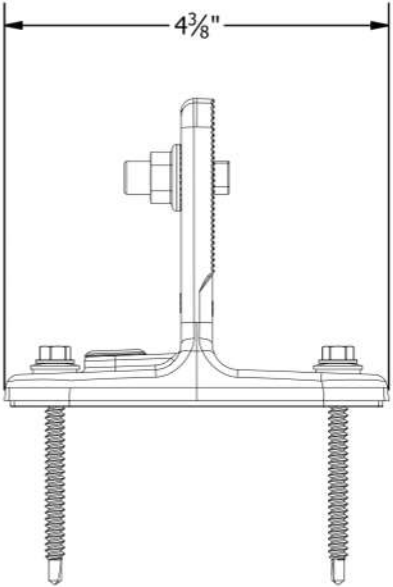
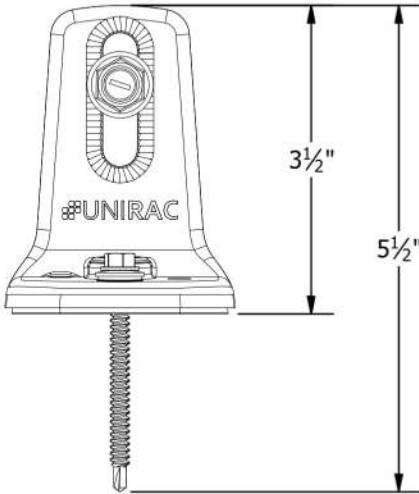
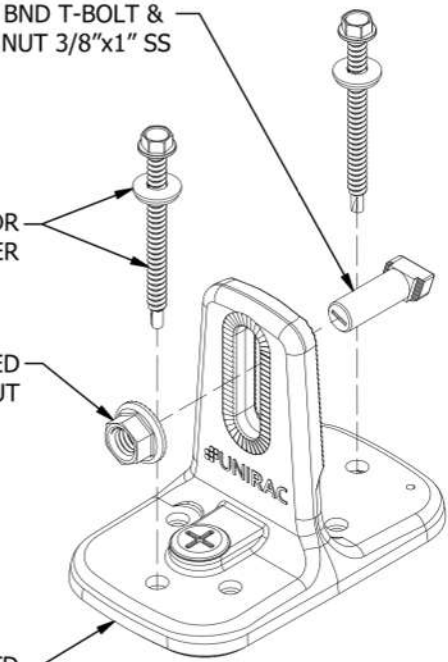
PART TABLE	
P/N	DESCRIPTION
004275M	FLASHLOC DUO MILL, 20 PACK
004275D	FLASHLOC DUO DARK, 20 PACK



#12-14 SCREW, HWH, SS, SELF-DR  
W/ #12 EPDM WASHER

SS SERRATED  
FLANGE NUT

FLASHLOC DTD  
MILL OR DARK





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

PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	ASSEMBLY DETAIL
DESCRIPTION:	FLASHLOC DUO KIT
REVISION DATE:	4/29/2021

DRAWING NOT TO SCALE  
ALL DIMENSIONS ARE  
NOMINAL

PRODUCT PROTECTED BY  
ONE OR MORE US PATENTS  
LEGAL NOTICE

FL-A04

SHEET



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3333 DIGITAL DR #600, LEHI,  
UT 84043, UNITED STATES  
855-353-4899



LICENSE NUMBER: EC13006601

REVISIONS		
DESCRIPTION	DATE	REV

Signature with Seal

CUSTOMER INFORMATION

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 604 SW PHILLIPS CIRCLE,  
 LAKE CITY, FL 32024 USA  
 EMAIL ID# - bgrammy85@gmail.com  
 PHONE NO # (386) 984-0757  
 APN# 034S1602739239

SHEET NAME

EQUIPMENT  
SPECIFICATION

SHEET SIZE

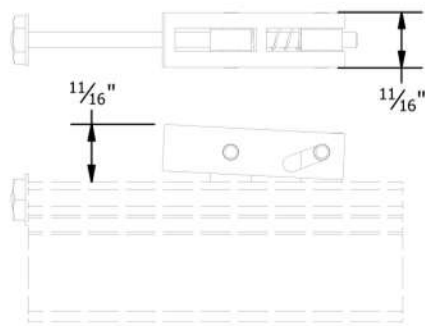
ANSI B  
11" X 17"

SHEET NUMBER

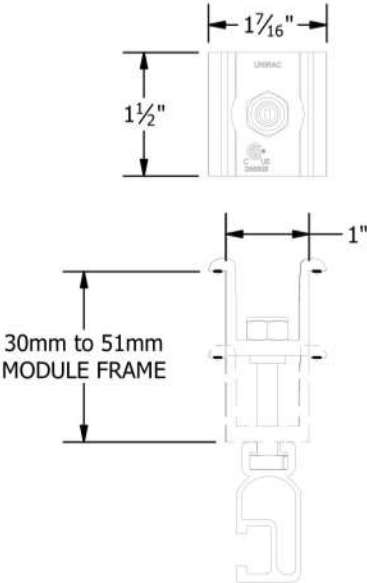
PV-16



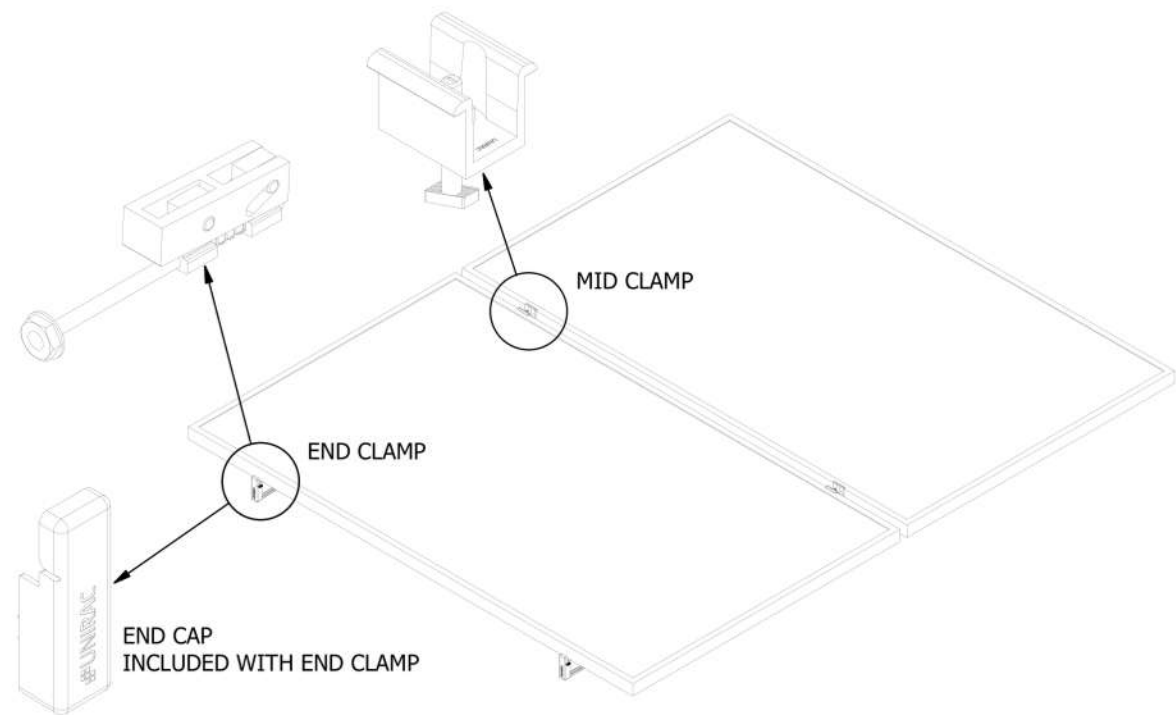
PRO SERIES END CLAMP



PRO SERIES MID CLAMP



PART # TABLE	
P/N	DESCRIPTION
302035M	ENDCLAMP PRO
302030M	MIDCLAMP PRO - MILL
302030D	MIDCLAMP PRO - DRK





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

PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	PART & ASSEMBLY
DESCRIPTION:	PRO SERIES BONDING CLAMPS
REVISION DATE:	10/26/2017

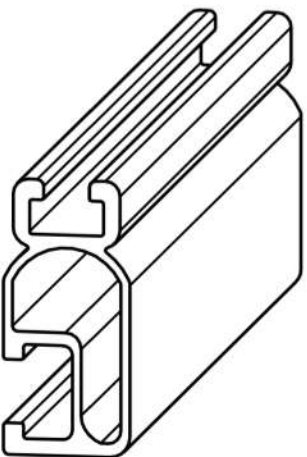
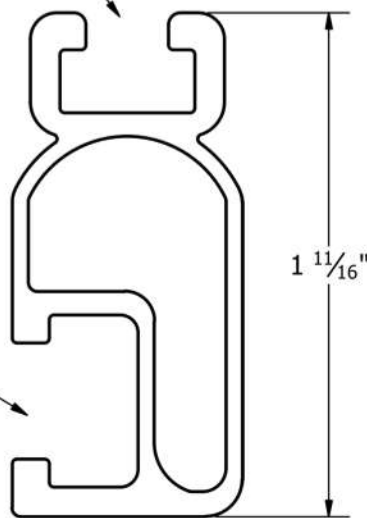
DRAWING NOT TO SCALE ALL DIMENSIONS ARE NOMINAL
PRODUCT PROTECTED BY ONE OR MORE US PATENTS
LEGAL NOTICE

SM-A01

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



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UT 84043, UNITED STATES  
855-353-4899



LICENSE NUMBER: EC13006601

REVISIONS		
DESCRIPTION	DATE	REV

Signature with Seal

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604 SW PHILLIPS CIRCLE,  
LAKE CITY, FL 32024 USA  
EMAIL ID# - bgrammy85@gmail.com  
PHONE NO # (386) 984-0757  
APN# 034S1602739239

SHEET NAME

EQUIPMENT SPECIFICATION

SHEET SIZE

ANSI B  
11" X 17"

SHEET NUMBER

PV-17





## CODE COMPLIANCE NOTES

### INSTALLATION GUIDE

C PAGE

#### SYSTEM LEVEL FIRE CLASSIFICATION

The system fire class rating requires installation in the manner specified in the SOLARMOUNT Installation Guide. SOLARMOUNT has been classified to the system level fire portion of 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  $\geq 2$  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

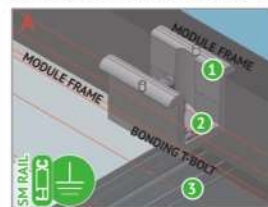
Unirac SOLARMOUNT is listed to UL 2703. Certification marking is embossed on all mid clamps as shown. Labels with additional information will be provided. After the racking system is fully assembled, a single label should be applied to the SOLARMOUNT rail at the edge of the array. Note: The sticker label should be placed such that it is visible, but not outward facing.



## BONDING CONNECTION GROUND PATHS

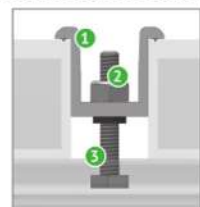
### INSTALLATION GUIDE

0 PAGE



#### BONDING MIDCLAMP ASSEMBLY

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

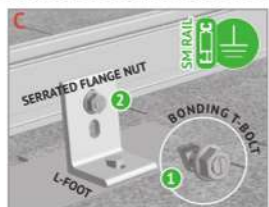


#### BONDING MIDCLAMP ASSEMBLY



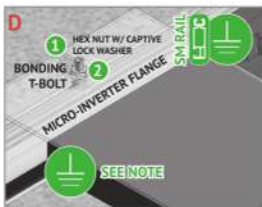
#### BONDING RAIL SPLICE BAR

- 1 Stainless steel self drilling screws drill and tap into splice bar and rail, creating 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.



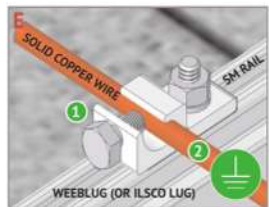
#### RAIL TO L-FOOT w/BONDING T-BOLT

- 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.



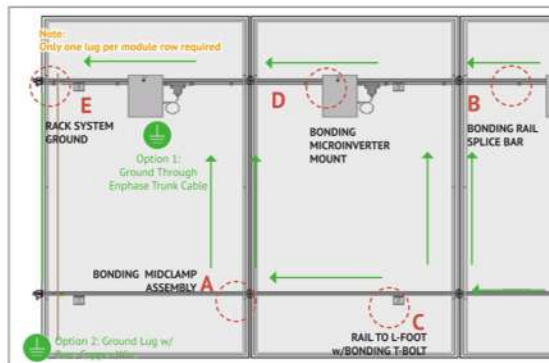
#### BONDING MICROINVERTER MOUNT

- 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 cabling and modules may be achieved through the trunk cable of approved microinverter systems. See page 1 for details.



#### RACK SYSTEM GROUND

- 1 WEEB washer dimples pierce anodized rail to create bond between rail and lug
- 2 Solid copper wire connected to lug is routed to provide final system ground connection. NOTE: flexo lug can also be used when secured to the side of the rail. See page 1-5 for details.



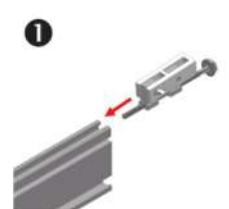
## ENDCLAMP, FIRST MODULE & TRIM

### INSTALLATION GUIDE

K PAGE



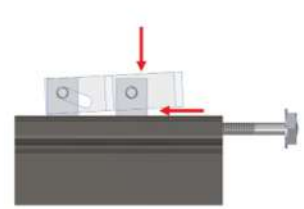
**INSTALL MODULE END CLAMPS:** The End clamp is supplied as an assembly with a 1/2" hex head bolt that is accessible at the ends of rails. The clamp should be installed on the rails prior to installing end modules.



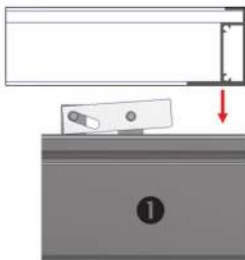
**INSTALL END CLAMPS ON RAIL:** Slide end clamp on to rail by engaging the two t-guide brackets with the top slot of the rails. **Ensure bolt is extended as far as possible so that clamp is positioned at max. distance from end of rail.**



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



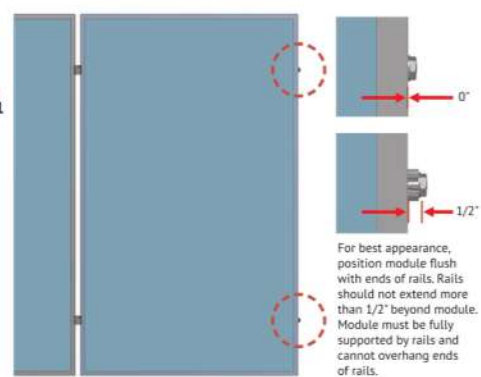
**NOTE:** To assist insertion of clamp into rail slot, Pressure may be applied to top or side of bracket as shown. Do not force clamp into rail by pushing on bolt with excessive force.



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



**ENGAGE CLAMP:** While holding module in position and with flange in full contact with rail, rotate end clamp bolt until clamp engages with flange to provide clamp force. **To ensure bolt is not over-torqued, use low torque setting on drill or If using an impact driver, stop rotation as soon as impact action of driver begins.** **TORQUE VALUE (See table and notes on PG. 1)** End clamp bolt to 3 ft-lbs. No anti-seize



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



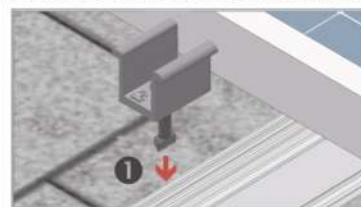
## BONDING MIDCLAMP & TRIM

### INSTALLATION GUIDE

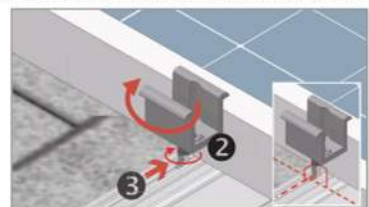
L PAGE



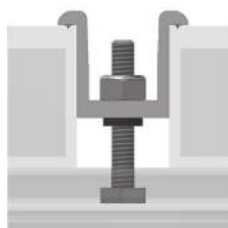
**INSTALL MIDCLAMPS:** Midclamp is supplied as an assembly with a T-bolt for module installation. Clamp assemblies may be positioned in rail near point of use prior to module placement.



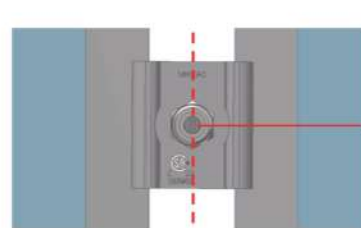
**INSERT MIDCLAMP ASSEMBLY:** Insert 1/4" T-Bolt into top slot of rail



**MIDCLAMP:** Rotate midclamp assembly and slide until clamp is against module frame. Do not tighten nut until next module is in position. Ensure bolt is perpendicular to rail.



**PLACE ADJACENT MODULE AGAINST CLAMPS:** Modules must be tight against clamps with no gaps. Tighten nut to required torque.



**POSITION INDICATOR - SERRATED T-BOLT:** Verify the T-bolt position indicator is perpendicular to the rail.

**TORQUE VALUE (See table and notes on PG. A)** 11 ft-lbs. No anti-seize.



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UT 84043, UNITED STATES  
855-353-4899

Joseph Cirillo

LICENSE NUMBER: EC13006601

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#### CUSTOMER INFORMATION

BEVERLY MCNAULL  
604 SW PHILLIPS CIRCLE,  
LAKE CITY, FL 32024 USA  
EMAIL ID# - bgrammy85@gmail.com  
PHONE NO # (386) 984-0757  
APN# 034S1602739239

SHEET NAME

EQUIPMENT  
SPECIFICATION

SHEET SIZE

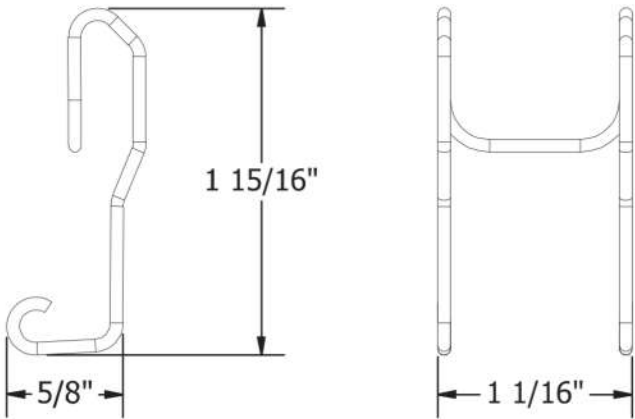
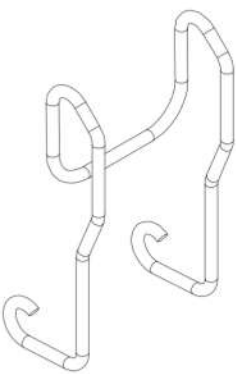
ANSI B  
11" X 17"

SHEET NUMBER

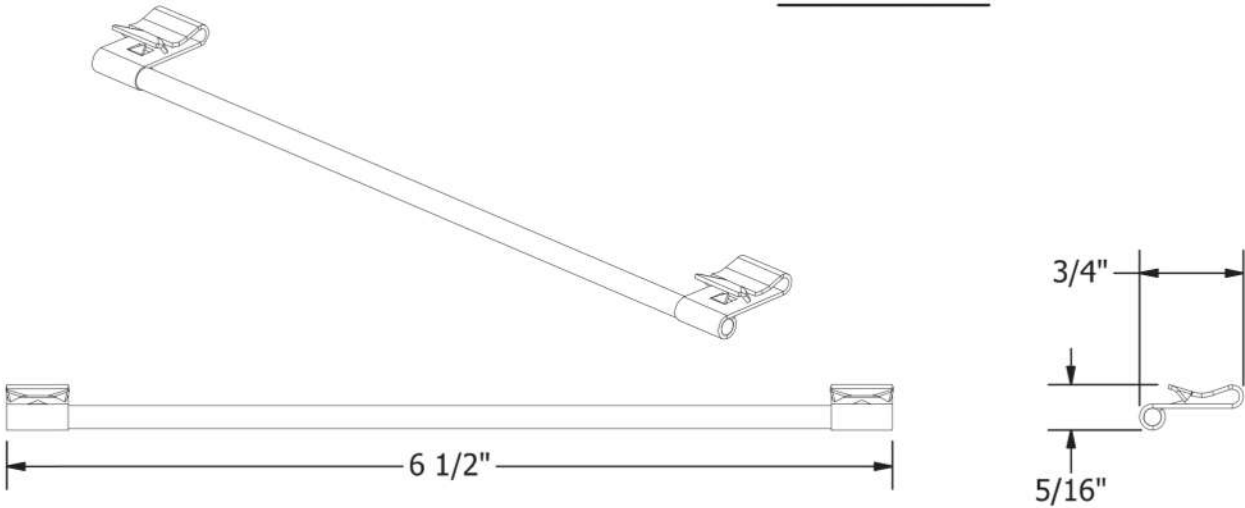
PV-18




PART # TABLE	
P/N	DESCRIPTION
240905C	SFM TRIM CLIP
008015S	SFM WIRE BONDING CLIP



TRIM CLIP



WIRE BONDING CLIP



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

PRODUCT LINE:	SFMCR	DRAWING NOT TO SCALE ALL DIMENSIONS ARE NOMINAL	SFMCR-P04 SHEET
DRAWING TYPE:	PART		
DESCRIPTION:	TRIM CLIP / WIRE BONDING CLIP	PRODUCT PROTECTED BY ONE OR MORE US PATENTS LEGAL NOTICE	
REVISION DATE:	6/27/2018		



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UT 84043, UNITED STATES  
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LICENSE NUMBER: EC13006601

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SHEET NAME

EQUIPMENT SPECIFICATION

SHEET SIZE

ANSI B  
11" X 17"

SHEET NUMBER

PV-19





## Descriptive Report and Test Results

MASTER CONTRACT: 266909  
REPORT: 70131735  
PROJECT: 80050628

- Edition 1:** September 20, 2017; Project 70131735– Albuquerque  
Issued by Michael Hoffnagle
- Edition 2:** December 6, 2017; Project 70161436– Albuquerque  
Issued by Michael Hoffnagle
- Edition 3:** October 8, 2018; Project 70185553 - Irvine  
Issued by Michael Hoffnagle
- Edition 4:** May 15, 2019; Project 70218415 - Irvine  
Issued by Uday Singh
- Edition 5:** November 18, 2019; Project 80007667 - Irvine  
Issued by Michael Hoffnagle
- Edition 6:** January 28, 2020; Project 80030869 - Irvine  
Issued by Michael Hoffnagle
- Edition 7:** April 11, 2020; Project 80038806 - Irvine  
Prepared By: Michael Hoffnagle  
Authorized By: Sean Jiang
- Edition 8:** September 29, 2020; Project 80050628 - Irvine  
Prepared By: Michael Hoffnagle  
Authorized By: Michael Hoffnagle

Report pages reissued

Contents: Certificate of Compliance - Pages 1 to 3  
Supplement to Certificate of Compliance - Pages 1 to 2  
Description and Tests - Pages 1 to 20  
Att1 Installation Manual SM– Pages 1 to 31  
Att2 Schematics SM– Pages 1 to 55  
Att3 Installation Manual ULA– Pages 1 to 20

### 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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MASTER CONTRACT: 266909  
REPORT: 70131735  
PROJECT: 80050628

Page No: 11  
Date Issued: September 29, 2020

Table 2

Module Manufacturer	Model/Series	
	Below models can be used together with racking system in this report to be a Class A fire system, only when they are rated for Fire Type 1, 2, 3, or 10 for steep slope applications.	
AU Optronics (BenQ Solar)	PM Series	
Aleo	P18, P19, S18, S19, S59, S79	
Aptos Solar	DNA-144 & DNA 120 Series	
Astronergy	CHSM6612 M, M/HV CHSM72M-HC, CHSM6612P Series CHSM6612P/HV Series	
Auxin	AXN6M610Txxx, AXN6P610Txxx, AXN6M612Txxx, AXN6P612Txxx	
Axitec	AC-XXXM/60S, AC-XXXP/60S, AC-XXXM/72S, AC-XXXP/156-60S, AC-XXXP/72S	
Boviet	BVM6610P-XXX, BVM6610M-XXX, BVM6612M-XXX, BVM6612P-XXX	
BYD	P6K Series MHK-36	
Canadian Solar	CS6P-M, CS6P-P, CSX-P, CS6X-P CS5A-M, CS6U-P, CS6U-M, CS6K-MS, CS6K-M, CS6K-P, ELPS CS6A-MM, ELPS CS6P-MM CS3U-P CS3U-MS, CS3K-P, CS3K-MS, CS1K-MS CS3K-MB, CS3K-PB, CS3U-MB, CS3W-P, CS3L-P, CS3U-PB, CS1H-MS, CS3U-MS	CS3U-xxxPB-AG, CS3U-xxxMB-AG, CS3KxxxPB-AG, CS3KxxxMB-AG, CS3WxxxP-PB-AG, CS1HxxxMS, CS1UxxxMS, CS3UxxxP HighEfficiency, CS3KxxxP HighEfficiency, CS6UxxxP High Efficiency, CS6KxxxP HighEfficiency, CS6KxxxMS AllBlack, ELPS CS6P-MM, ELPS CS6A-MM



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*Joseph Ciriello*

LICENSE NUMBER: EC13006601

#### REVISIONS

DESCRIPTION	DATE	REV

Signature with Seal

#### CUSTOMER INFORMATION

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PHONE NO # (386) 984-0757  
APN# 034S1602739239

SHEET NAME

EQUIPMENT  
SPECIFICATION

SHEET SIZE

ANSI B  
11" X 17"

SHEET NUMBER

PV-20





November 17, 2020

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, ASCE/SEI 7-10, ASCE/SEI 7-16
2. 2006-2018 International Building Code, by International Code Council, Inc. w/ Provisions from SEAOC PV-2 2017.
3. 2006-2018 International Residential Code, by International Code Council, Inc. w/ Provisions from SEAOC PV-2 2017.
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:

<b>Design Criteria:</b>	Ground Snow Load = 0 - 100 (psf)
	Basic Wind Speed ASD Minimum 110 mph to 147 mph
	Basic Wind Speed LRFD Minimum 142 mph to 190 mph
	Roof Mean Height = 0 - 60 (ft)
	Roof Pitch = 0 - 45 (degrees)
	Exposure Category = B, C & D
<b>Attachment Spacing:</b>	Per U-builder Engineering report.
<b>Cantilever:</b>	Maximum cantilever length is L/3, where "L" is the span noted in the U-Builder online tool.
<b>Clearance:</b>	2" to 10" clear from top of roof to top of PV panel.
<b>Tolerance(s):</b>	1.0" tolerance for any specified dimension in this report is allowed for installation.
<b>Installation Orientation:</b>	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.

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



#### Components and Cladding Roof Zones:

The Components and Cladding Roof Zones shall be determined based on ASCE 7-05, ASCE 7-10 & 7-16 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 7-16.
  - 3) Topographic factor,  $k_{zt}$  is 1.0.
  - 4) Array Edge Factor  $Y_e = 1.5$
  - 5) Average parapet height is 0.0 ft.
  - 6) Wind speeds are LRFD values.
  - 7) 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

DIGITAL SIGNATURE



F-15844

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UT 84043, UNITED STATES  
855-353-4899

*Joseph Cirillo*

LICENSE NUMBER: EC13006601

REVISIONS		
DESCRIPTION	DATE	REV

Signature with Seal

CUSTOMER INFORMATION

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LAKE CITY, FL 32024 USA  
EMAIL ID# - bgrammy85@gmail.com  
PHONE NO # (386) 984-0757  
APN# 034S1602739239

SHEET NAME

EQUIPMENT  
SPECIFICATION

SHEET SIZE

ANSI B  
11" X 17"

SHEET NUMBER

PV-21





# Certificate of Compliance

**Certificate:** 70131735      **Master Contract:** 266909  
**Project:** 80060420      **Date Issued:** 2021-02-23  
**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.



**Certificate:** 70131735  
**Project:** 80060420

**Master Contract:** 266909  
**Date Issued:** 2021-02-23

## 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, or 10 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 <sup>2</sup> )	113.5
Upward Design Load (lb/ft <sup>2</sup> )	50.7
Down-Slope Load (lb/ft <sup>2</sup> )	16.1

Test Loads:

Downward Load (lb/ft <sup>2</sup> )	112.8
Upward Load (lb/ft <sup>2</sup> )	50.13
Down-Slope Load (lb/ft <sup>2</sup> )	7.5

## 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.



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855-353-4899

*Joseph Ciriello*

LICENSE NUMBER: EC13006601

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PHONE NO # (386) 984-0757  
APN# 034S1602739239

SHEET NAME

EQUIPMENT  
SPECIFICATION

SHEET SIZE

ANSI B  
11" X 17"

SHEET NUMBER

PV-22



CERTIFICATE OF COMPLIANCE

Certificate Number 20220223-E341165  
Report Reference E341165-20210317  
Issue Date 2022-02-23

Issued to: Enphase Energy Inc.  
1420 N. McDowell Blvd. Petaluma, CA 94954-6515

This is to certify that representative samples of Grid Support, Utility Interactive Supporting Energy Storage, Multimode, Bi-directional Microinverters

Models IQ8-60, IQ8PLUS-72, IQ8M-72, IQ8A-72, IQ8H-208-72, IQ8H-240-72, may be f/b -2, -5, -E, or -M, may be f/b -ACM, f/b -US, may be f/b -NM, may be f/b -RMA, may be f/b -&, where "&" designates additional characters.

Has been investigated by UL in accordance with the Standard(s) indicated on this Certificate.

Standard(s) for Safety: See Page 2

Additional Information: See the UL Online Certifications Directory at [www.ul.com/database](http://www.ul.com/database) for additional information

This Certificate of Compliance is provided as a courtesy to help our customers communicate product compliance information, as documented in our UL Follow-Up Services procedure. This Certificate of Compliance does not provide authorization to apply the UL Mark. Only the UL Follow-Up Services Procedure provides authorization to apply the UL Mark.

Only those products bearing the UL Mark shall be considered as being UL Certified and covered under UL's Follow-Up Services. Look for the UL Certification Mark on the product.

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B. Mahlenz  
Bruce Mahlenholz, Director North American Certification Program  
UL LLC

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CERTIFICATE OF COMPLIANCE

Certificate Number 20220223-E341165  
Report Reference E341165-20210317  
Issue Date 2022-02-23

This is to certify that representative samples of the product as specified on this certificate were tested according to the current UL requirements.

Standards for Safety:

UL 62109-1, STANDARD FOR SAFETY OF POWER CONVERTERS FOR USE IN PHOTOVOLTAIC POWER SYSTEMS - PART 1: GENERAL REQUIREMENTS, Edition 1, Revision Date 04/30/2019

IEC 62109-2, SAFETY OF POWER CONVERTERS FOR USE IN PHOTOVOLTAIC POWER SYSTEMS - PART 2: PARTICULAR REQUIREMENTS FOR INVERTERS, Edition 1, Issue Date 06/2011

UL 1741, Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources, Edition 2, Revision Date 06/10/2021, including the requirements in UL 1741 Supplement SA, sections as noted in the Technical considerations.

IEEE 1547, IEEE Standard for Interconnecting Distributed Resources with Electric Power Systems.

IEEE 1547.1, IEEE Standard for Conformance Test Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems.

CSA C22.2 No. 62109-1, Safety of Power Converters for Use in Photovoltaic Power Systems - Part 1: General Requirements, Edition 1, Issue Date 07/2016

CSA C22.2 No. 62109-2, Safety of Power Converters for Use in Photovoltaic Power Systems - Part 2: Particular Requirements for Inverters, Edition 1, Issue Date 07/2016

B. Mahlenz  
Bruce Mahlenholz, Director North American Certification Program  
UL LLC

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PV-23