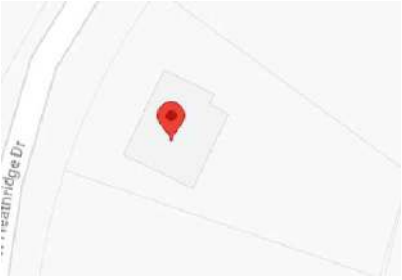


VICINITY MAP  	GORAS RESIDENCE SCOPE OF WORK: SYSTEM SIZE: 6.600 kW DC / 4.350 kW AC MODULE: (15) APTOS DNA-120-MF10-440W [BLK] INVERTER: (15) ENPHASE IQ8PLUS-72-2-US MICROINVERTERS INTERCONNECTION: LOAD BREAKER OCPD SIZE: 30A MAIN SERVICE PANEL BUS RATING: (E) 200 MAIN SERVICE DISCONNECT RATING: (E) 200 SUB PANEL BUS RATING (IF APPLICABLE): N/A SUB PANEL DISCONNECT RATING (IF APPLICABLE): N/A	RESERVED FOR AHJ SPECIFIC STAMPS / NOTES (IF APPLICABLE) 
AERIAL VIEW 	DESIGN CRITERIA: ROOF TYPE(S): COMP SHINGLE WIND SPEED: 130 MPH GROUND SNOW LOAD: 0 PSF ASCE: 7-16 EXPOSURE CATEGORY: B MOUNTING METHOD(S): UNIRAC FLASHLOC-DUO RACKING: UNIRAC SM LT	

GOVERNING CODES:

2017 NATIONAL ELECTRIC CODE (NEC)

2020 7TH EDITION FLORIDA BUILDING CODE: BUILDING

2020 7TH EDITION FLORIDA BUILDING CODE: RESIDENTIAL

2020 7TH EDITION FLORIDA BUILDING CODE: MECHANICAL

2020 7TH EDITION FLORIDA BUILDING CODE: PLUMBING

2020 7TH EDITION FLORIDA BUILDING CODE: FUEL GAS

2020 7TH EDITION FLORIDA BUILDING CODE: ENERGY CONSERVATION

2020 7TH EDITION FLORIDA BUILDING CODE: EXISTING BUILDING

2020 7TH EDITION FLORIDA BUILDING CODE: ACCESSIBILITY

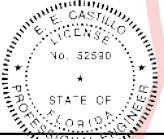
2020 7TH EDITION FLORIDA FIRE PREVENTION CODE (NFPA)
AS ADOPTED BY COLUMBIA COUNTY

GENERAL NOTES

1. UTILITY SHALL BE NOTIFIED BEFORE ACTIVATION OF PHOTOVOLTAIC SYSTEM.
2. 110.2 APPROVAL: ALL ELECTRICAL EQUIPMENT SHALL BE LABELED, LISTED, OR CERTIFIED BY A NATIONALLY RECOGNIZED TESTING LABORATORY ACCREDITED BY THE UNITED STATES OCCUPATIONAL SAFETY HEALTH ADMINISTRATION
3. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS PRIOR TO INITIATING CONSTRUCTION.
4. CONTRACTOR SHALL REVIEW ALL MANUFACTURER INSTALLATION DOCUMENTS PRIOR TO INITIATING CONSTRUCTION.
5. ALL EQUIPMENT AND ASSOCIATED CONNECTIONS, ETC. AND ALL ASSOCIATED WIRING AND INTERCONNECTIONS SHALL BE INSTALLED ONLY BY QUALIFIED PERSONNEL.
6. THE CONTRACTOR OR OWNER MUST PROVIDE ROOF ACCESS (LADDER TO ROOF) FOR ALL THE REQUIRED INSPECTIONS. LADDERS MUST BE OSHA APPROVED, MINIMUM TYPE I WITH A 250LB. RATING, IN GOOD CONDITION AND DESIGNED FOR ITS INTENDED USE.
7. CONTRACTOR SHALL VERIFY THAT THE ROOF STRUCTURE WILL WITHSTAND THE ADDITIONAL LOADS.
8. LAG SCREWS SHALL PENETRATE A MINIMUM 2" INTO SOLID SAWN STRUCTURAL MEMBERS AND SHALL NOT EXCEED MANUFACTURER RECOMMENDATIONS FOR FASTENERS INTO ENGINEERED STRUCTURAL MEMBERS.
9. AN ACCESS POINT SHALL BE PROVIDED THAT DOES NOT PLACE THE GROUND LADDER OVER OPENINGS SUCH AS WINDOWS OR DOORS ARE LOCATED AT STRONG POINTS OF BUILDING CONSTRUCTION AND IN LOCATIONS WHERE THE ACCESS POINT DOES NOT CONFLICT WITH OVERHEAD OBSTRUCTIONS SUCH AS TREE LIMBS, WIRES, OR SIGNS.
10. WHERE DC CONDUCTORS ARE RUN INSIDE BUILDING, THEY SHALL BE CONTAINED IN A METAL RACEWAY; THEY SHALL NOT BE INSTALLED WITHIN 10" OF THE ROOF DECKING OR SHEATHING EXCEPT WHERE COVERED BY THE PV MODULES AND EQUIPMENT.
11. PLUMBING AND MECHANICAL VENTS THROUGH THE ROOF SHALL NOT BE COVERED BY SOLAR MODULES - NO BUILDING, PLUMBING OR MECHANICAL VENTS TO BE COVERED, CONSTRUCTED OR ROUTED AROUND SOLAR MODULES.
12. ALL FIELD -INSTALLED JUNCTION, PULL AND OUTLET BOXES LOCATED BEHIND MODULES SHALL BE ACCESSIBLE DIRECTLY OR BY DISPLACEMENT OF A MODULE SECURED BY REMOVABLE FASTENERS.

ELECTRICAL NOTES

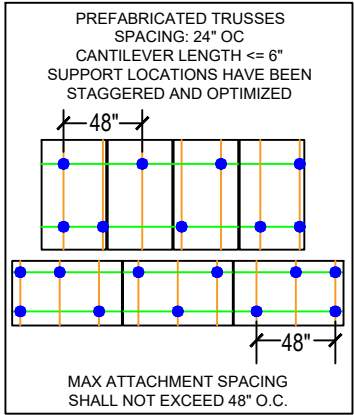
1. WIRING MATERIALS SHALL COMPLY WITH MAXIMUM CONTINUOUS CURRENT OUTPUT AT 25°C AND MAXIMUM VOLTAGE AT 600V; WIRE SHALL BE WET RATED AT 90°C.
2. EXPOSED PHOTOVOLTAIC SYSTEM CONDUCTORS ON THE ROOF WILL BE USE 2 OR PV-TYPE WIRE.
3. PHOTOVOLTAIC SYSTEM CONDUCTORS SHALL BE IDENTIFIED AND GROUPED. THE MEANS OF IDENTIFICATION SHALL BE PERMITTED BY SEPARATE COLOR-CODING, MARKING TAPE, TAGGING OR OTHER APPROVED MEANS.
4. ALL EXTERIOR CONDUIT, FITTINGS, AND BOXES SHALL BE RAIN-TIGHT AND APPROVED FOR USE IN WET LOCATIONS.
5. ALL METALLIC RACEWAYS AND EQUIPMENT SHALL BE BONDED AND ELECTRICALLY CONTINUOUS.
6. WHERE SIZES OF JUNCTION BOXES, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, CONTRACTOR SHALL SIZE THEM ACCORDING TO APPLICABLE CODES.
7. REMOVAL OF A UTILITY-INTERACTIVE INVERTER OR OTHER EQUIPMENT SHALL NOT DISCONNECT THE BUILDING CONNECTION BETWEEN THE GROUNDING ELECTRODE CONDUCTOR AND THE PV SOURCE AND/OR OUTPUT CIRCUIT GROUNDED CONDUCTOR.
8. FOR GROUNDED SYSTEMS, THE PHOTOVOLTAIC SOURCE AND OUTPUT CIRCUITS SHALL BE PROVIDED WITH A GROUND-FAULT PROTECTION DEVICE OR SYSTEM THAT DETECTS A GROUND FAULT, INDICATES THAT FAULT HAS OCCURED AND AUTOMATICALLY DISCONNECTS ALL CONDUCTORS OR CAUSES THE INVERTER TO AUTOMATICALLY CEASE SUPPLYING POWER TO OUTPUT CIRCUITS.
9. FOR UNGROUNDED SYSTEMS, THE INVERTER IS EQUIPPED WITH GROUND FAULT PROTECTION AND A GFI FUSE PORT FOR GROUND FAULT INDICATION.
10. PV MODULE FRAMES SHALL BE BONDED TO RACKING RAIL OR BARE COPPER GEC/GEC PER THE MODULE MANUFACTURER'S LISTED INSTRUCTION SHEET.
11. PV MODULE RACKING RAIL SHALL BE BONDED TO BARE COPPER GEC VIA WEEB LUG, ILSCO GBL-4DBT LAY-IN LUG, OR EQUIVALENT LISTED LUG.
12. THE PHOTOVOLTAIC INVERTER WILL BE LISTED AS UL 1741 COMPLIANT.
13. RACKING AND BONDING SYSTEM TO BE UL2703 RATED.
14. ANY REQUIRED GROUNDING ELECTRODE CONDUCTOR WILL BE CONTINUOUS, EXCEPT FOR SPLICES OR JOINTS AS BUS BARS WITHIN LISTED EQUIPMENT.
15. WHEN BACKFED BREAKER IS THE METHOD OF UTILITY INTERCONNECTION, THE BREAKERS SHALL NOT READ "LINE AND LOAD".
16. WHEN APPLYING THE 120% RULE, THE SOLAR BREAKER TO BE POSITIONED AT THE OPPOSITE END OF THE BUS BAR FROM THE MAIN BREAKER.
17. THE WORKING CLEARANCE AROUND THE EXISTING ELECTRICAL EQUIPMENT AS WELL AS THE NEW ELECTRICAL EQUIPMENT WILL BE MAINTAINED.

 LGCY POWER 3333 DIGITAL DR #600, LEHI, UT 84043, UNITED STATES 855-353-4899	
 LICENSE NUMBER: EC13006601	
RESERVED FOR ENGINEERING STAMP (IF APPLICABLE)	
	Digitally signed by: Ermocrates E Castillo
SYSTEM SIZE: 6600W DC - 4350W AC Date: 2023.08.16 17:44:55	
MODULE(S): (15) APTOS DNA-120-MF10-440W [BLK]	
INVERTER(S): (15) ENPHASE IQ8PLUS-72-2-US ()	
BATTERIES:(----	
AHJ: COLUMBIA COUNTY	
UTILITY: FLORIDA POWER AND LIGHT COMPANY METER #: ACD1156	
SHEET INDEX: PV-1 - COVER SHEET PV-2 - SITE PLAN PV-3 - PROPERTY PLAN PV-4 - ATTACHMENT DETAILS PV-5 - SITE PHOTOS PV-6 - SINGLE LINE DIAGRAM PV-6.1 - THREE LINE DIAGRAM PV-7 - LABELS / PLACARD PV-8 - JOB HAZARD SHEET PV-8.1 - FIELD CHANGE SHEET PV-9(+) - DATASHEETS	
GORAS RESIDENCE 231 SW HEATHRIDGE DR, LAKE CITY FL, 32024 (878) 295-3375 MEDIC16@COMCAST.NET	
DRAWN BY: AV	DATE: 8/16/2023
COVER SHEET	
PV-1	

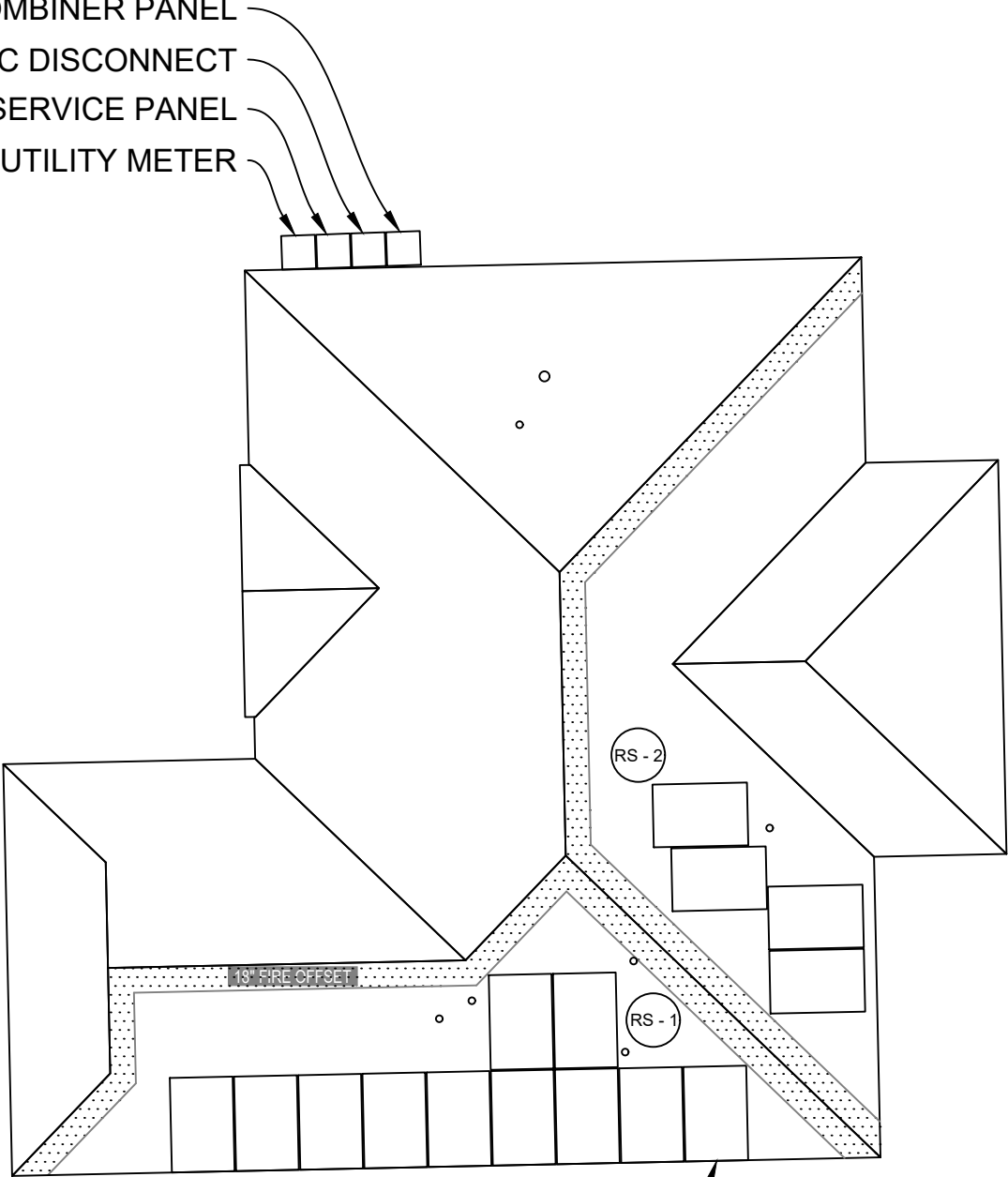
ROOF DESCRIPTION			
ROOF # (ROOF TYPE)	PITCH	AZIMUTH	RAFTER SIZE & SPACING
RS-1 (COMP SHINGLE)	27°	118°	2X4" @ 24"
RS-2 (COMP SHINGLE)	27°	208°	2X4" @ 24"

ARRAY AND ROOF AREA CALC'S			
TOTAL ROOF SQ FT:		2799.86	
ROOF	MODULE COUNT	ARRAY SQ FT	ROOF SQ FT
RS-1	4	93.28	564
RS-2	11	256.52	599
TOTAL:	15	349.80	1163
TOTAL % ARRAY/ROOF		349.80 / 2799.86:	12.49%

EQUIPMENT DETAILS	
SOLAR MODULE:	(15) APTOS DNA-120-MF10-440W [BLK]
INVERTER:	(15) ENPHASE IQ8PLUS-72-2-US



AC COMBINER PANEL
VISIBLE LOCKABLE LABELED AC DISCONNECT
MAIN SERVICE PANEL
UTILITY METER



(N) PV MODULE EQUIPPED W/
(1) MICROINVERTER PER MODULE

GENERAL NOTES:

- VERIFY ALL OBSTRUCTIONS IN THE FIELD.
- VERIFY ALL DIMENSIONS IN THE FIELD.
- CONDUIT TO BE RUN IN ATTIC IF POSSIBLE, OTHERWISE CONDUIT BLOCKS MIN. 1"/MAX 6" ABOVE ROOF SURFACE
- PV MODULES CANNOT BE INSTALLED OVER OR BLOCK ATTIC VENTS, FURNACE OR WATER HEATER VENTS ETC.
- NUMBER OF STORIES: 1
- DISCONNECT SHALL BE INSTALLED WITHIN 10' FROM UTILITY METER
- PV MODULE DIMENSIONS: 75.2" (L) x 44.65" (W)
- SCALE 3/32" = 1'-0"

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

Joseph C. Cirillo
LICENSE NUMBER: EC13006601

RESERVED FOR ENGINEERING STAMP
(IF APPLICABLE)

Digitally
signed by:
Ermocrates
E Castillo

SYSTEM SIZE: 6600W DC - 4350W AC
Date: 2023.08.16 17:44:56

MODULE(S): (15) APTOS
DNA-120-MF10-440W [BLK]

INVERTER(S):
(15) ENPHASE IQ8PLUS-72-2-US
()

BATTERIES:(----

AHJ: COLUMBIA COUNTY

UTILITY: FLORIDA POWER AND
LIGHT COMPANY
METER #: ACD1156

SHEET INDEX:

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PV-7 - LABELS / PLACARD
PV-8 - JOB HAZARD SHEET
PV-8.1 - FIELD CHANGE SHEET
PV-9(+) - DATASHEETS

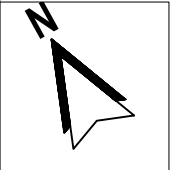
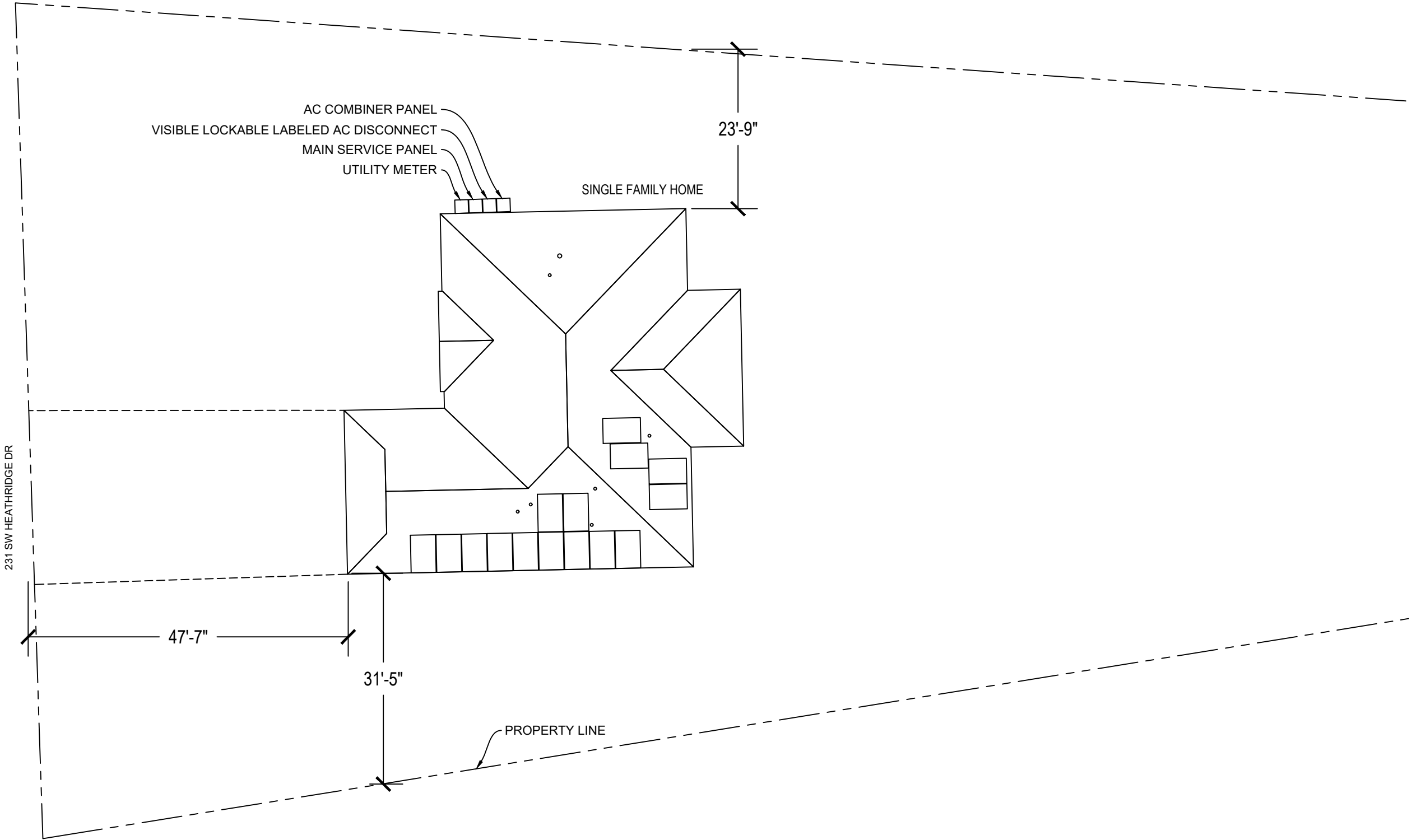
GORAS
RESIDENCE
231 SW HEATHRIDGE DR,
LAKE CITY
FL, 32024
(878) 295-3375
MEDIC16@COMCAST.NET

DRAWN BY: AV
DATE: 8/16/2023

SITE PLAN

PV-2

LEGEND:
SCALE 1/16" = 1'-0"
PROPERTY LINE: - - - - -
DRIVEWAY: - - - - -
FENCE: ○ - ○ - ○



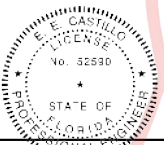


LGCY POWER
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LICENSE NUMBER: EC13006601

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Digitally
signed by:
Ermocrates
E Castillo

SYSTEM SIZE: 6600W DC - 4350W AC

Date: 2023.08.16 17:44:56

MODULE: (15) APTOS

DNA-120-MF10-440W [BLK]

INVERTER(S):

(15) ENPHASE IQ8PLUS-72-2-US

()

BATTERIES:(----

AHJ: COLUMBIA COUNTY

UTILITY: FLORIDA POWER AND
LIGHT COMPANY

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PV-9(+) - DATASHEETS

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DRAWN BY:
AV

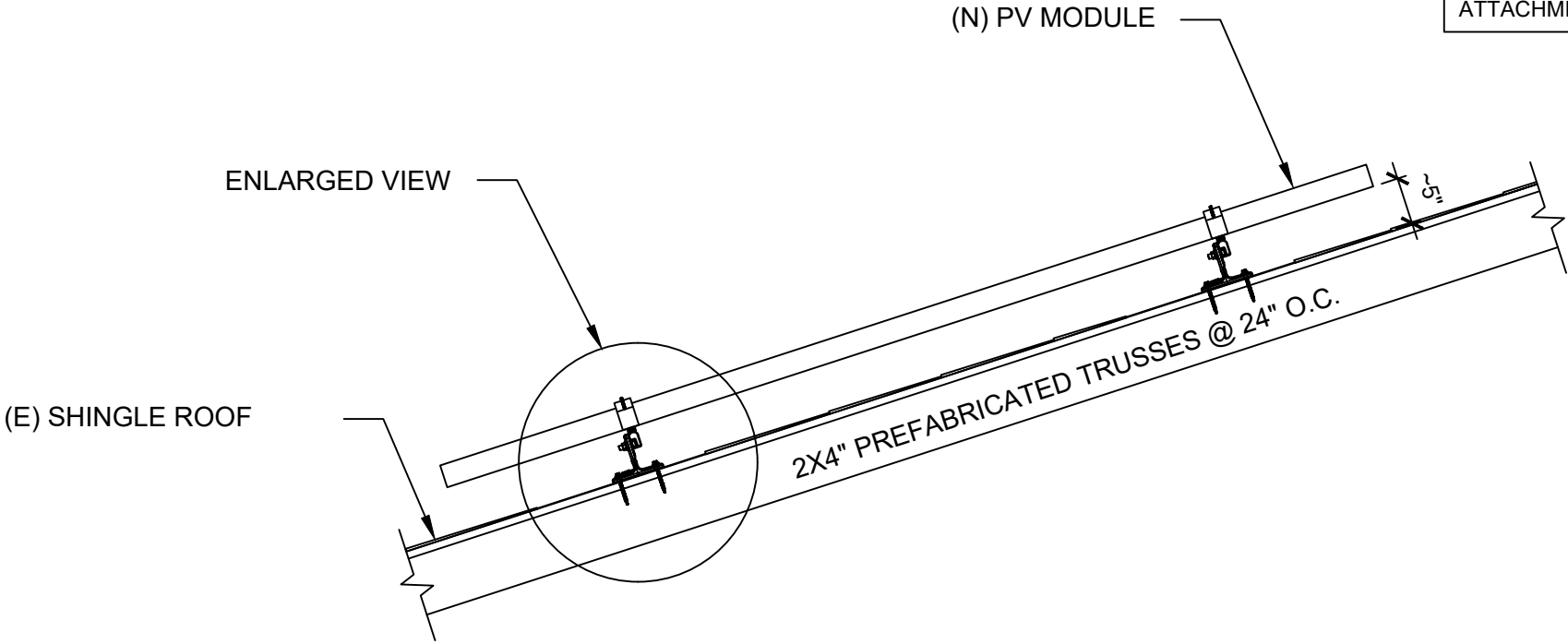
DATE:
8/16/2023

PROPERTY PLAN

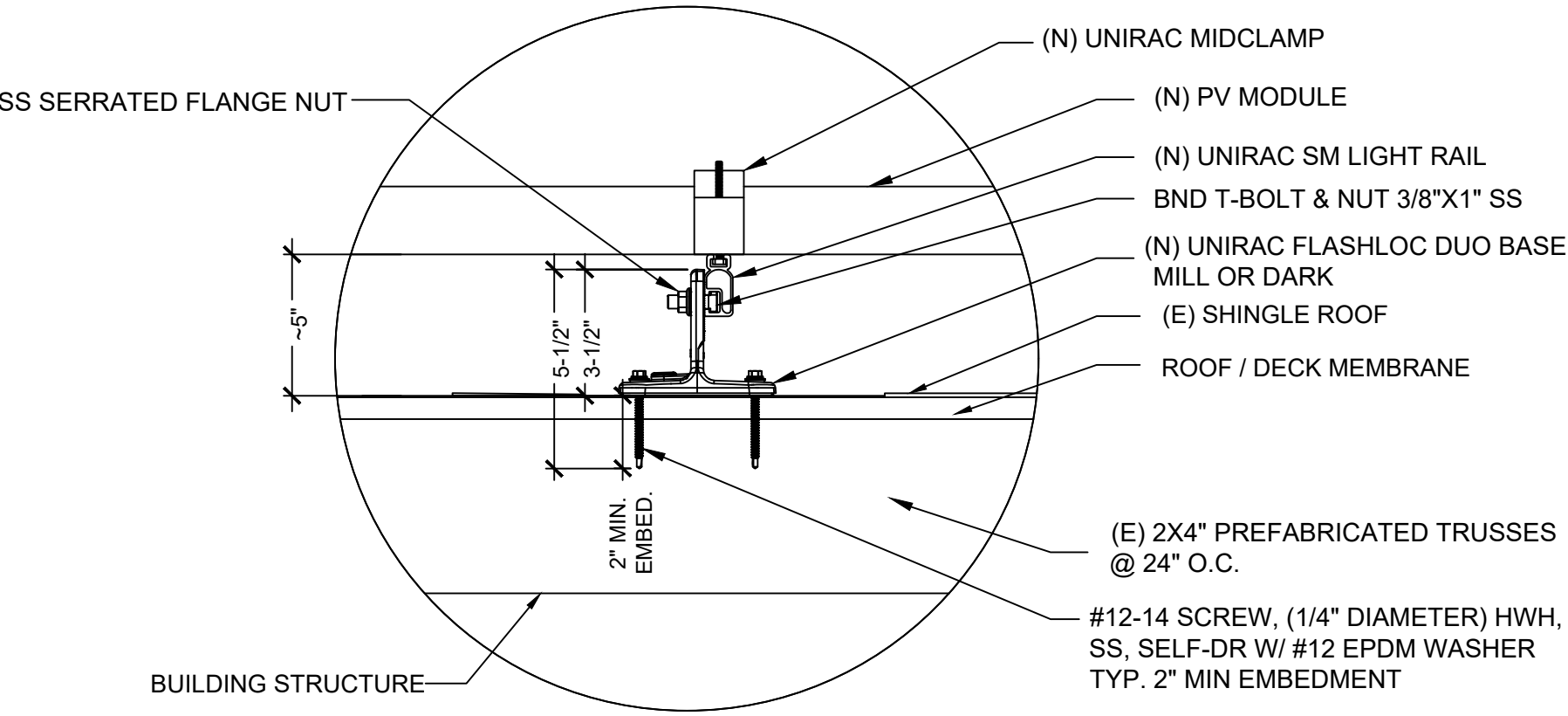
PV-3

APPLICABLE TO SECTION(S): RS-1 / RS-2

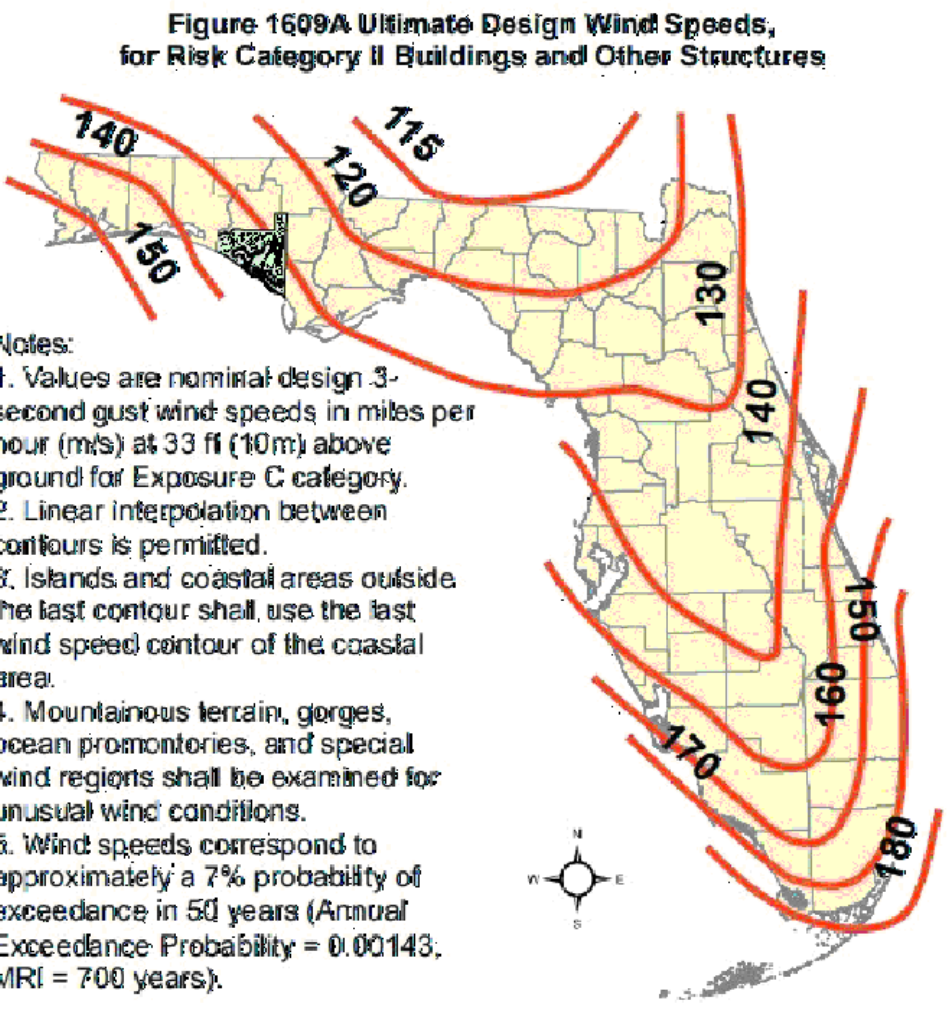
NOTE: ACTUAL ROOF CONDITIONS AND RAFTERS (OR SEAM) LOCATIONS MAY VARY. INSTALL PER MANUFACTURER(S) INSTALLATION GUIDELINES AND ENGINEERED SPANS FOR ATTACHMENTS



1 ATTACHMENT DETAIL
SCALE: NTS



2 ATTACHMENT DETAIL(ENLARGED VIEW)
SCALE: NTS



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Date: 2023.08.16 17:44:56
MODULE(S): (15) APTOS
DNA-120-MF10-440W [BLK]
INVERTER(S): (15) ENPHASE IQ8PLUS-72-2-US
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BATTERIES:(----)

AHJ: COLUMBIA COUNTY
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ATTACHMENT
DETAILS

PV-4



LGCY POWER
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855-353-4899

Joseph Cirillo
LICENSE NUMBER: EC13006601
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SYSTEM SIZE:
6600W DC - 4350W AC
MODULE:(15) APTOS
DNA-120-MF10-440W [BLK]
INVERTER(S):
(15) ENPHASE IQ8PLUS-72-2-US
()
BATTERIES:(----)
AHJ: COLUMBIA COUNTY
UTILITY: FLORIDA POWER AND
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SITE PHOTOS
PV-5

PV MODULE SPECIFICATIONS	
MODEL	APTOS DNA-120-MF10-440W [BLK]
PMAX	440W
VOC	41.34V
VMP	34.16V
IMP	13.17A
ISC	13.8A

MICRO-INVERTER SPECIFICATIONS	
MODEL	ENPHASE IQ8PLUS-72-2-US
MAX INPUT DC VOLTAGE	60V
MAX DC SHORT CIRCUIT CURRENT	15
MAX OUTPUT POWER	290W
MAXIMUM CONT. OUTPUT CURRENT	1.21
CEC EFFICIENCY	97%

DESIGN CRITERIA AND CALCULATIONS BASED UPON:
NEC TABLE CEC/NEC 310.15(B)(16) 90°C (194°F)
ASHRAE 2% AVERAGE HIGH = 32°C
NEC TABLE 310.15(B)(2)(a) 75°C DERATE FACTOR = .96

CONDUCTOR SCHEDULE								
TAG ID	CONDUCTORS				GROUND		CONDUIT	
	WIRES IN CONDUIT	MINIMUM WIRE SIZE	TYPE, MATERIAL	WIRE 75°C (167°F) AMPERAGE RATING TABLE 310.15 (B)(16)	MINIMUM WIRE SIZE	RATING TABLE 250.122	TYPE, MATERIAL	
A*	5	#12 AWG	Q-CABLE	25	#6 AWG	200	BARE, CU	3/4" EMT
B*	5	#12 AWG	12/2 UF-B	35	#10 AWG	60	BARE, CU	3/4" EMT
C	5	#10 AWG	THWN-2, CU	35	#10 AWG	60	THWN-2, CU	3/4" EMT
D	4	#10 AWG	THWN-2, CU	35	#10 AWG	60	THWN-2, CU	3/4" EMT
E**	4	#10 AWG	THWN-2, CU	35	#10 AWG	60	THWN-2, CU	3/4" EMT
* TAG B CABLE WILL BE RUN THROUGH ATTIC WHERE POSSIBLE ** TAG E ONLY IF APPLICABLE *								
CONDUIT AND CONDUCTOR SPECIFICATIONS ARE BASED ON MINIMUM CODE REQUIREMENTS AND ARE NOT MEANT TO LIMIT UPSIZING AS REQUIRED BY FIELD CONDITIONS.								



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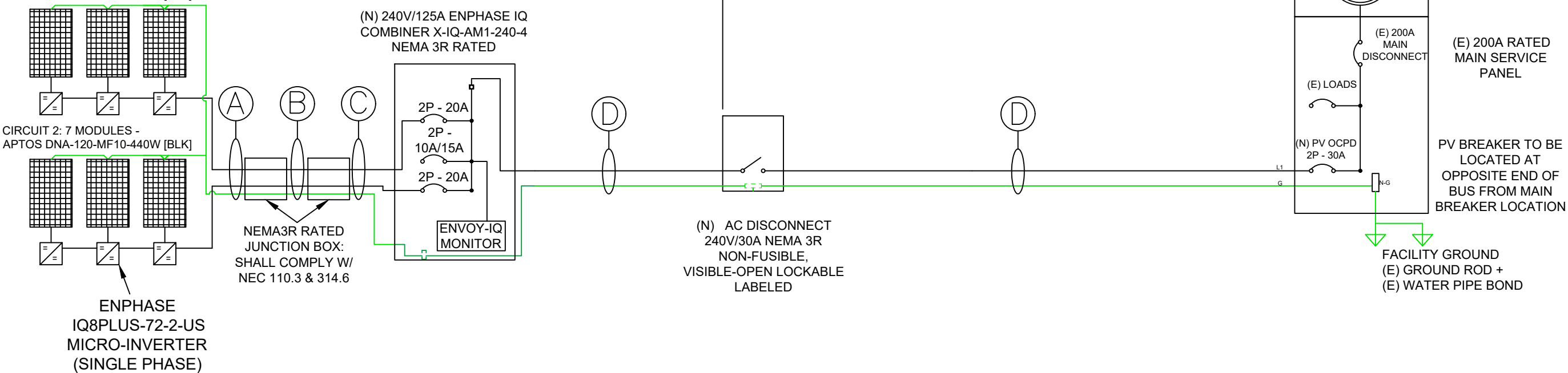
NOTE:

1. SUBJECT PV SYSTEM HAS BEEN DESIGNED TO MEET THE REQUIREMENTS OF THE NEC 2017, AND THOSE SET FORTH BY THE FLORIDA SOLAR ENERGY CENTER CERTIFICATION, INCLUDING MAXIMUM NUMBER OF MODULE STRINGS, MAXIMUM NUMBER OF MODULES PER STRING, MAXIMUM OUTPUT, MODULE MANUFACTURER AND MODEL NUMBER, INVERTER MANUFACTURER AND MODEL NUMBER, AS APPLICABLE.

THE ENPHASE IQ8PLUS-72-2-US MICRO-INVERTERS HAVE INTEGRATED GROUND AND DOUBLE INSULATION, SO NO GEC OR EGC IS REQUIRED. THE DC CIRCUIT IS ISOLATED AND INSULATED FROM GROUND AND MEETS THE REQUIREMENTS OF 2017 NEC

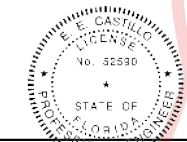
CIRCUIT 1: 8 MODULES -
APTOS DNA-120-MF10-440W [BLK]

CIRCUIT 2: 7 MODULES -
APTOS DNA-120-MF10-440W [BLK]



OCPD CALCULATIONS	
# OF INVERTERS	(15) ENPHASE IQ8PLUS-72-2-US
MAX OUTPUT CURRENT	1.21
OCPD RATING	30A
REQUIRED CONDUCTOR AMPACITY: 1.25 X # MICRO-INVERTERS X MAX OUTPUT CURRENT = 1.25 X 15 X 1.21 = 22.69A	
OCPD RATING (30A) >= 22.69A	

INTERCONNECTION PER NEC 705.12 (B)	
BUSBAR CALCULATIONS PV BREAKER - 120% RULE	
MAIN BUS RATING	(E) 200A
MAIN DISCONNECT RATING	(E) 200A
PV BREAKER RATING	30A
(MAIN BUS RATING X 1.2) - MAIN DISCONNECT RATING >= OCPD RATING	
((E) 200A x 1.2) - (E) 200A >= 30A, OK	



Digitally
signed by:
Ermocrates
E Castillo

SYSTEM SIZE: 6600W DC - 4350W AC
MODULE(S): (15) APTOS
DNA-120-MF10-440W [BLK]
INVERTER(S): (15) ENPHASE IQ8PLUS-72-2-US
()
BATTERIES:(----)

DATE: 2023.08.16
17:44:56

AHJ: COLUMBIA COUNTY

UTILITY: FLORIDA POWER AND
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DRAWN BY:
AV

DATE:
8/16/2023

SINGLE LINE
DIAGRAM

PV-6

PV MODULE SPECIFICATIONS	
MODEL	APTOS DNA-120-MF10-440W [BLK]
PMAX	440W
VOC	41.34V
VMP	34.16V
IMP	13.17A
ISC	13.8A

MICRO-INVERTER SPECIFICATIONS	
MODEL	ENPHASE IQ8PLUS-72-2-US
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MAX DC SHORT CIRCUIT CURRENT	15
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Joseph Cirillo

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RESERVED FOR ENGINEERING STAMP
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INVERTER(S):
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BATTERIES:(----)

AHJ: COLUMBIA COUNTY

UTILITY: FLORIDA POWER AND
LIGHT COMPANY
METER #: ACD1156

SHEET INDEX:

PV-1 - COVER SHEET
PV-2 - SITE PLAN
PV-3 - PROPERTY PLAN
PV-4 - ATTACHMENT DETAILS
PV-5 - SITE PHOTOS
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PV-6.1 - THREE LINE DIAGRAM
PV-7 - LABELS / PLACARD
PV-8 - JOB HAZARD SHEET
PV-8.1 - FIELD CHANGE SHEET
PV-9(+) - DATASHEETS

GORAS
RESIDENCE
231 SW HEATHRIDGE DR,
LAKE CITY
FL, 32024
(878) 295-3375
MEDIC16@COMCAST.NET

DRAWN BY:
AV

DATE:
8/16/2023

THREE LINE
DIAGRAM

PV-6.1

NOTE:

- SUBJECT PV SYSTEM HAS BEEN DESIGNED TO MEET THE REQUIREMENTS OF THE NEC 2017, AND THOSE SET FORTH BY THE FLORIDA SOLAR ENERGY CENTER CERTIFICATION, INCLUDING MAXIMUM NUMBER OF MODULE STRINGS, MAXIMUM NUMBER OF MODULES PER STRING, MAXIMUM OUTPUT, MODULE MANUFACTURER AND MODEL NUMBER, INVERTER MANUFACTURER AND MODEL NUMBER, AS APPLICABLE.

THE ENPHASE IQ8PLUS-72-2-US MICRO-INVERTERS HAVE INTEGRATED GROUND AND DOUBLE INSULATION, SO NO GEC OR EGC IS REQUIRED. THE DC CIRCUIT IS ISOLATED AND INSULATED FROM GROUND AND MEETS THE REQUIREMENTS OF 2017 NEC

CIRCUIT 1: 8 MODULES -
APTOS DNA-120-MF10-440W [BLK]

CIRCUIT 2: 7 MODULES -
APTOS DNA-120-MF10-440W [BLK]

(N) 240V/125A ENPHASE IQ
COMBINER X-IQ-AM1-240-4
NEMA 3R RATED

NEMA3R RATED
JUNCTION BOX:
SHALL COMPLY W/
NEC 110.3 & 314.6

ENPHASE
IQ8PLUS-72-2-US
MICRO-INVERTER
(SINGLE PHASE)

VISIBLE-OPEN LOCKABLE LABELED AC
DISCONNECT TO BE LOCATED IN A
READILY ACCESSIBLE LOCATION
WITHIN 10' OF THE UTILITY METER

UTILITY METER
120/240V
SINGLE PHASE

PV BREAKER TO BE
LOCATED AT
OPPOSITE END OF
BUS FROM MAIN
BREAKER LOCATION

(E) 200A RATED
MAIN SERVICE
PANEL

FACILITY GROUND
(E) GROUND ROD +
(E) WATER PIPE BOND

(N) AC DISCONNECT
240V/30A NEMA 3R
NON-FUSIBLE,
VISIBLE-OPEN LOCKABLE
LABELED

OCPD CALCULATIONS	
# OF INVERTERS	(15) ENPHASE IQ8PLUS-72-2-US
MAX OUTPUT CURRENT	1.21
OCPD RATING	30A
REQUIRED CONDUCTOR AMPACITY: 1.25 X # MICRO-INVERTERS X MAX OUTPUT CURRENT = 1.25 X 15 X 1.21 = 22.69A	
OCPD RATING (30A) >= 22.69A	

INTERCONNECTION
PER NEC 705.12 (B)

BUSBAR CALCULATIONS PV BREAKER - 120% RULE	
MAIN BUS RATING	(E) 200A
MAIN DISCONNECT RATING	(E) 200A
PV BREAKER RATING	30A
(MAIN BUS RATING X1.2) - MAIN DISCONNECT RATING >= OCPD RATING	
((E) 200A x 1.2) - (E) 200A >= 30A, OK	

1) LOCATED AT JUNCTION BOX, COMBINER BOX
NEC 690.13(B)

⚠

WARNING

ELECTRIC SHOCK HAZARD
TERMINALS ON THE LINE AND
LOAD SIDE MAY BE ENERGIZED
IN THE OPEN POSITION

DC VOLTAGE IS ALWAYS PRESENT WHEN
SOLAR MODULES ARE EXPOSED TO SUNLIGHT

5) LOCATED AT RAPID SHUTDOWN
DISCONNECT SWITCH
NEC 690.56(C)(3)

RAPID SHUTDOWN
SWITCH FOR
SOLAR PV SYSTEM

9) LOCATED AT POINT OF
INTERCONNECTION, LABEL MUST
IDENTIFY PHOTOVOLTAIC SYSTEM
NEC 705.12(B)(3-4) & NEC 690.59

⚠

WARNING

DUAL POWER SOURCE.
SECOND SOURCE IS
PHOTOVOLTAIC SYSTEM

2) LOCATED AT EACH PV
DISCONNECTING MEANS
NEC 690.13(B)

PHOTOVOLTAIC

AC DISCONNECT

6) LOCATED AT PRODUCTION
METER (IF INSTALLED)
NEC 705.12(D)(3)

SOLAR PHOTOVOLTAIC
PRODUCTION METER

10) LOCATED AT
SOLAR BREAKER
(IF APPLICABLE)
NEC 705.12(B)(2)(b)

PV SOLAR BREAKER

DO NOT RELOCATE
THIS OVERCURRENT
DEVICE

11) LOCATED AT MAIN
SERVICE DISCONNECT
NEC 690.13(B)

MAIN PHOTOVOLTAIC
SYSTEM DISCONNECT

3) LOCATED AT EMT / CONDUIT RACEWAYS,
SPACED AT MAXIMUM 10 FT OR WHERE
SEPARATED BY ENCLOSURES, WALLS,
PARTITIONS, CEILINGS, OR FLOORS.
NEC 690.31(G)(3)(4)
LETTERS AT LEAST 3/8 INCH; WHITE ON
RED BACKGROUND; REFLECTIVE.
IFC 605.11.1.1

WARNING: PHOTOVOLTAIC
POWER SOURCE

7) LOCATED AT POINT OF
INTERCONNECTION AND EACH AC
DISCONNECTING MEANS
NEC 690.54

PHOTOVOLTAIC AC DISCONNECT

RATED AC OUTPUT CURRENT: 18.15 AMPS
NOMINAL OPERATING
AC VOLTAGE: 240 VOLTS

12) LOCATED AT SOLAR
COMBINER PANEL (IF APPLICABLE)
NEC 690.13(B)

⚠

WARNING

PHOTOVOLTAIC SYSTEM
COMBINER PANEL
DO NOT ADD LOADS

4) LOCATED AT MAIN SERVICE PANEL
IFC 605.11.3.1(1) & NEC 690.56(C)(1)(a)

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

8) LOCATED AT EACH
DISCONNECTING MEANS FOR
PHOTOVOLTAIC EQUIPMENT
NEC 690.13(B)

⚠

WARNING

ELECTRIC SHOCK HAZARD
TERMINALS ON THE LINE AND
LOAD SIDE MAY BE ENERGIZED
IN THE OPEN POSITION

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 PER 110.21(B)

5. APPLICABLE LABELS TO BE A MINIMUM LETTER
HEIGHT OF 3/8", WHITE ON RED BACKGROUND;
REFLECTIVE, AND PERMANENTLY
AFFIXED [IFC 605.11.1.1]

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

Joseph Ciriello

LICENSE NUMBER: EC13006601

RESERVED FOR ENGINEERING STAMP
(IF APPLICABLE)

SYSTEM SIZE:
6600W DC - 4350W AC

MODULE:(15) APTOS
DNA-120-MF10-440W [BLK]

INVERTER(S):
(15) ENPHASE IQ8PLUS-72-2-US
()

BATTERIES:(----

AHJ: COLUMBIA COUNTY

UTILITY: FLORIDA POWER AND
LIGHT COMPANY
METER #: ACD1156

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DATE: 8/16/2023

LABELS / PLACARD

PV-7

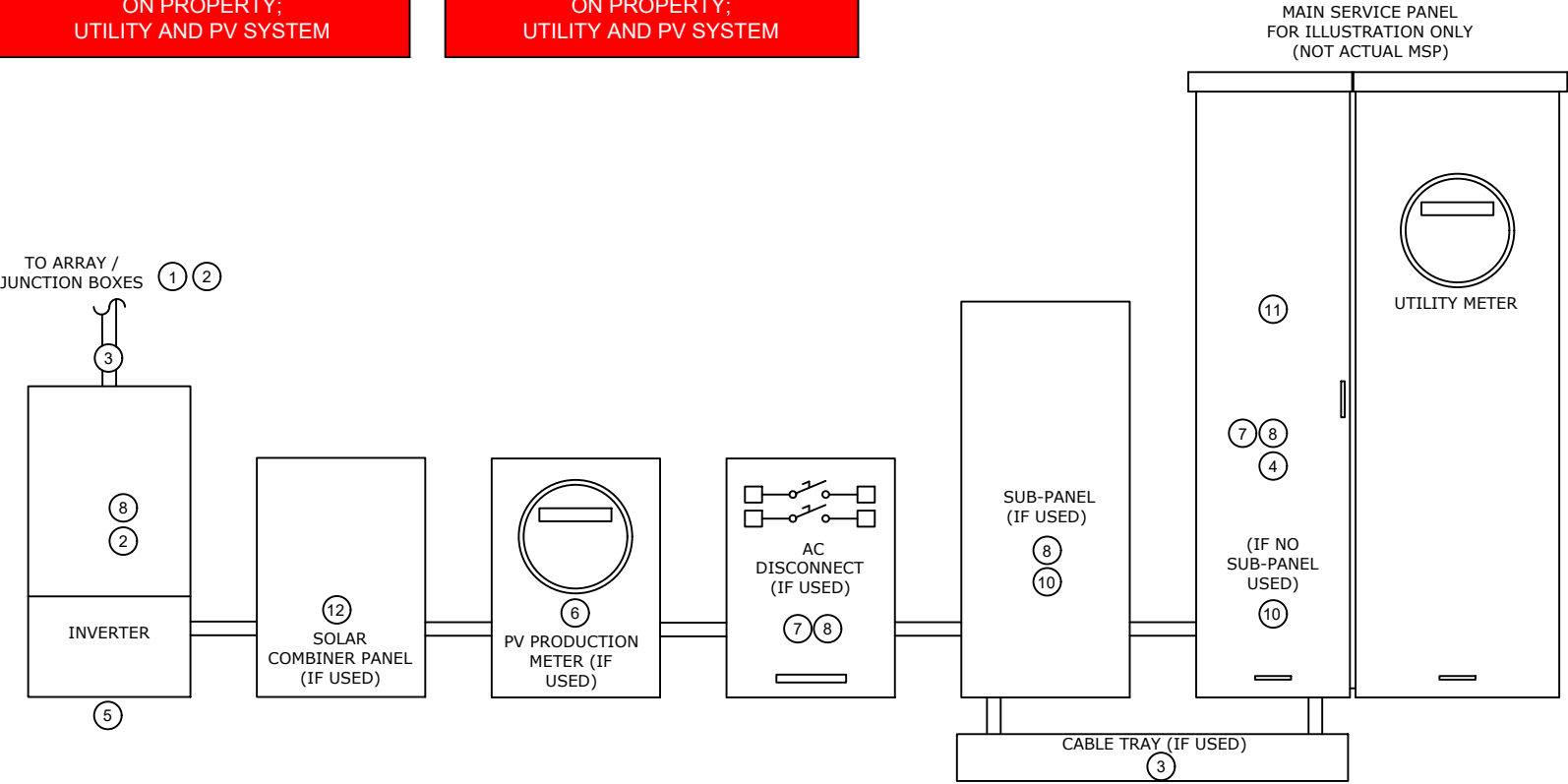
FOR LINE-SIDE TAPS ONLY: LOCATED AT THE
MAIN DISCONNECT IN THE MAIN SERVICE PANEL

DISCONNECT 1 OF 2

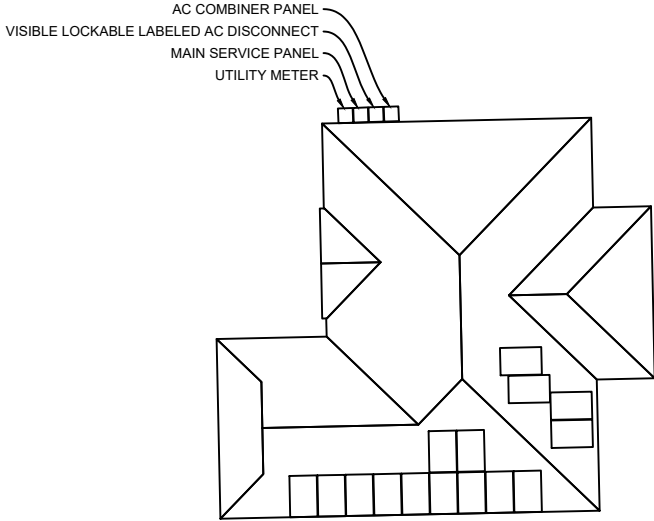
MULTIPLE POWER SOURCES
ON PROPERTY:
UTILITY AND PV SYSTEM

DISCONNECT 2 OF 2

MULTIPLE POWER SOURCES
ON PROPERTY:
UTILITY AND PV SYSTEM

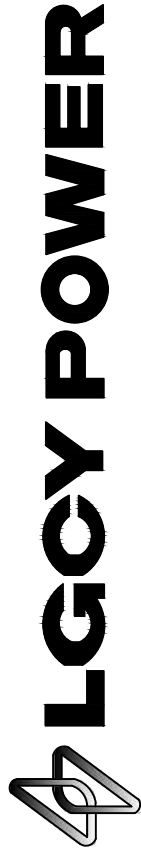


CAUTION
MULTIPLE SOURCES OF POWER.
POWER TO THIS BUILDING IS ALSO SUPPLIED
FROM THE FOLLOWING SOURCES WITH
DISCONNECTS LOCATED AS SHOWN:



231 SW HEATHRIDGE DR, LAKE CITY, FL 32024





JOB HAZARD ANALYSIS

CUSTOMER NAME/JOB ID: _____

CUSTOMER ADDRESS _____

INSTALL DATE - - Time : am/pm

HAZARD CATEGORY	HAZARD TYPE	HAZARD CONTROL MEASURES
LADDER SAFETY	• LOCATION • CONDITION • WORKING CLEARANCE	
FALL PROTECTION	• WORKING 6’ OR HIGHER	
ELECTRICAL SAFETY	• ARCH FLASH • ELECTRIC SHOCK/ELECTROCUTION	
WEATHER CONDITIONS	• HEAT/COLD TEMP • RAINY/ICY/WINDY	
PUBLIC SAFETY	• WORK/OBJECTS OVERHEAD • SLIPS/TRIPS/FALLS • ACCESS TO LIVE ELECTRICAL	

NEAREST EMERGENCY FACILITY _____

CONTACT IMMEDIATELY IN EMERGENCY (911 AND/OR) _____

GENERAL SITE DISCRPTION/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



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

LICENSE NUMBER: EC13006601

Digitally
signed by:
Ermocrates
E Castillo

SYSTEM SIZE: 6600W DC - 4350W AC
MODULE(S): (15) APTOS
DNA-120-MF10-440W [BLK]

Date: 2023.08.16
17:44:56

INVERTER(S):
(15) ENPHASE IQ8PLUS-72-2-US
()

BATTERIES:(----

AHJ: COLUMBIA COUNTY

UTILITY: FLORIDA POWER AND
LIGHT COMPANY
METER #: ACD1156

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JOB HAZARD SHEET

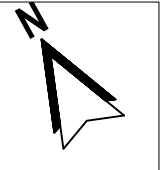
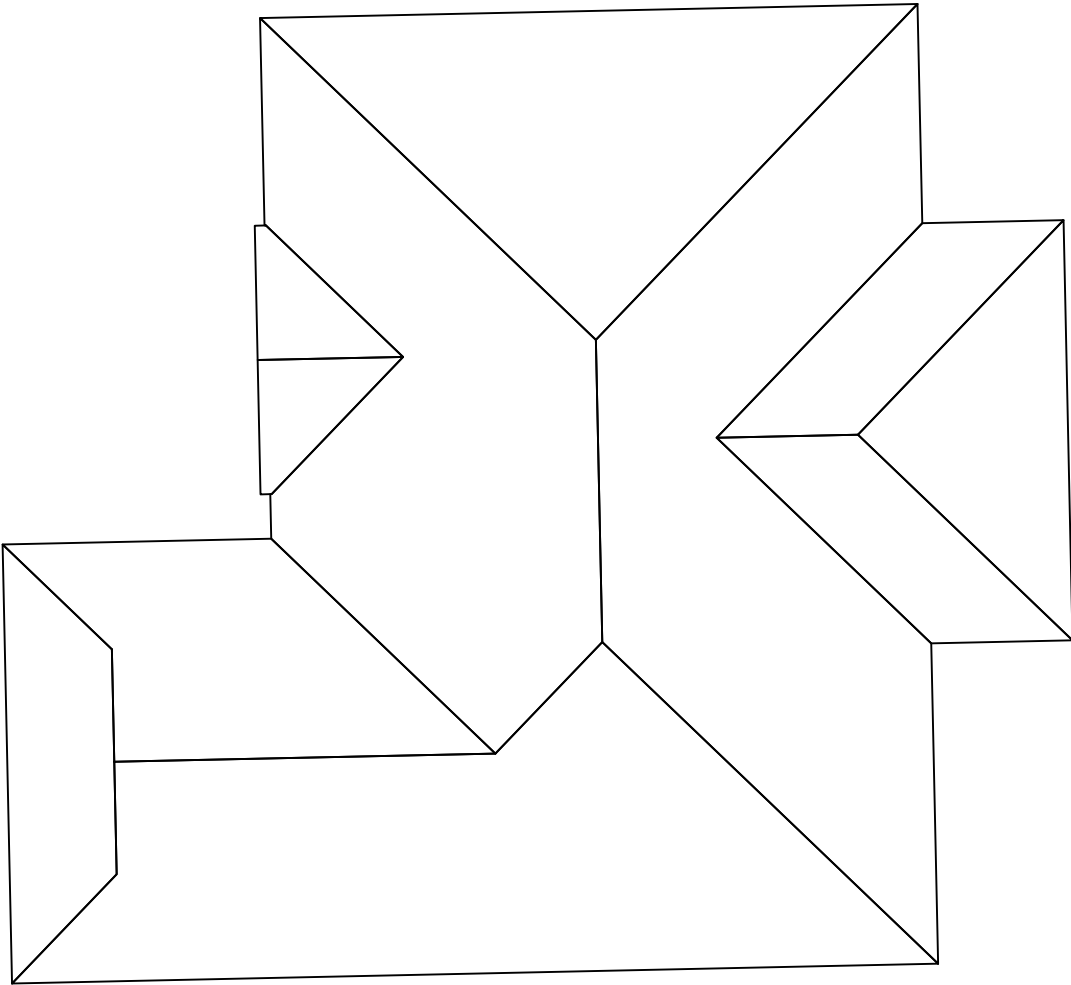
PV-8

FIELD DESIGN CHANGE REQUEST FORM

WHO AUTHORIZED THE CHANGE:

DESCRIBE THE NEEDED CHANGE & WHY:

NEW DESIGN LAYOUT:



I UNDERSTAND AND AGREE TO THE CHANGES MADE ABOVE:

CUSTOMER NAME

CUSTOMER SIGNATURE

DATE

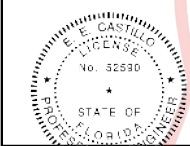


LGCY POWER
3333 DIGITAL DR #600, LEHI,
UT 84043, UNITED STATES
855-353-4899



LICENSE NUMBER: EC13006601

RESERVED FOR ENGINEERING STAMP
(IF APPLICABLE)



Digitally
signed by:
Ermocrates
E Castillo

SYSTEM SIZE: 6600W DC - 4350W AC
Date: 2023.08.16 17:44:56

MODULE: (15) APTOS
DNA-120-MF10-440W [BLK]

INVERTER(S):
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()

BATTERIES:(----

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FIELD CHANGE
SHEET

PV-8.1

DNA™ 120

Solar for Innovators

Residential | Commercial

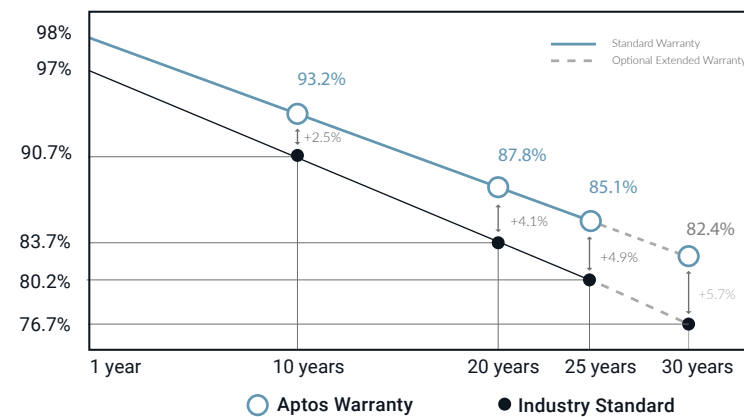


Designed & Engineered in Silicon Valley

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

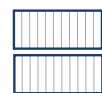


Features



Advanced Technology

Patented DNA™ technology boosts power performance & module efficiency



Maximum Panel Density

Advanced split cell technology with 10 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



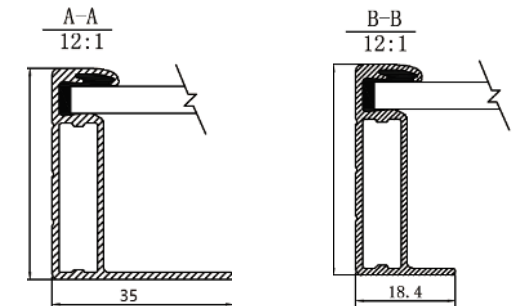
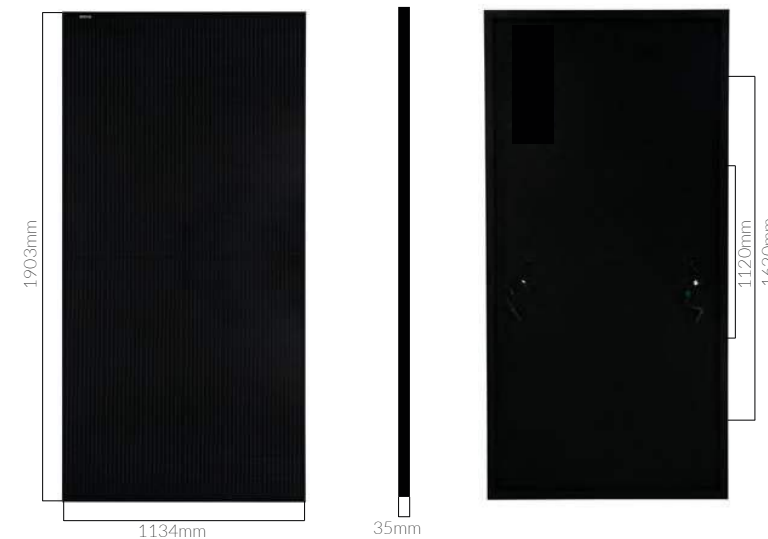
A Safe Investment

Industry leading 30 year warranty



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

v A™ 120



Electrical Specifications

	DNA-120-MF10-430W	DNA-120-MF10-435W	DNA-120-MF10-440W
STCrated Output P_{mpp} (W)	430W	435W	440W
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_{maz} (A)	13.01	13.09	13.17

Standard Test Conditions for front-face of panel: 1000 W/m², 25°C, measurement uncertainty $\pm 3\%$

Temperature Coefficients

Temperature Coefficients P_{mpp}	-0.35%/°C
Temperature Coefficients I_{sc}	+0.06%/°C
Temperature Coefficients V_{oc}	-0.29%/°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

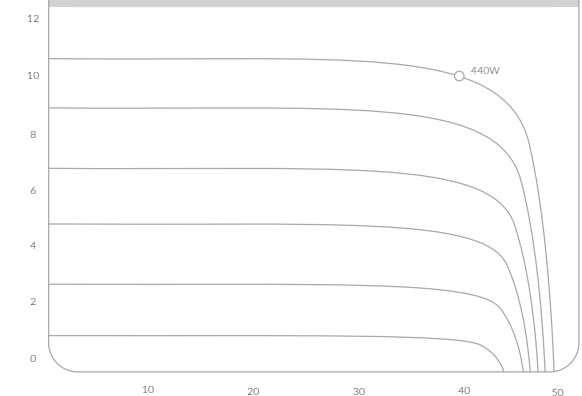
Packaging Configuration

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

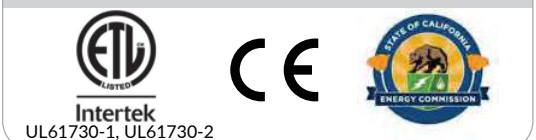
Mechanical Properties

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	4mm2 (EU)12AWG,39.37in.(1200mm)
Weight	52.9lbs.(24kg)
Cable Length	1200mm
Encapsulant	POE

I-V Curve



Certifications



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





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 superfast 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 IQ Battery, 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 Shutdown Equipment and conform with various regulations, when installed according to manufacturer’s instructions.

*Only when installed with IQ System Controller 2, meets UL 1741.
**IQ8 and IQ8Plus support split-phase, 240V installations only.

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) and IEEE 1547:2018 (UL 1741-SB 3rd Ed.)

Note:

IQ8 Microinverters cannot be mixed together with previous generations of Enphase microinverters (IQ7 Series, IQ6 Series, etc) in the same system.

IQ8 and IQ8+ Microinverters

INPUT DATA (DC)		IQ8-60-2-US	IQ8PLUS-72-2-US
Commonly used module pairings ¹	W	235 – 350	235 – 440
Module compatibility		60-cell / 120 half-cell	54-cell / 108 half-cell, 60-cell / 120 half-cell, 66-cell / 132 half-cell and 72-cell / 144 half-cell
MPPT voltage range	V	27 – 37	27 – 45
Operating range	V	16 – 48	16 – 58
Min. / Max. start voltage	V	22 / 48	22 / 58
Max. input DC voltage	V	50	60
Max. continuous input DC current	A	10	12
Max. input DC short-circuit current	A	25	
Max. module I _{sc}	A	20	
Overvoltage class DC port		II	
DC port backfeed current	mA	0	
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)		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 ²	V	240 / 211 – 264	
Max. continuous output current	A	1.0	1.21
Nominal frequency	Hz	60	
Extended frequency range	Hz	47 – 68	
AC short circuit fault current over 3 cycles	Arms	2	
Max. units per 20 A (L-L) branch circuit ³		16	13
Total harmonic distortion		<5%	
Overvoltage class AC port		III	
AC port backfeed current	mA	30	
Power factor setting		1.0	
Grid-tied power factor (adjustable)		0.85 leading – 0.85 lagging	
Peak efficiency	%	97.7	
CEC weighted efficiency	%	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 (H x W x D)	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, IEEE 1547:2018 (UL 1741-SB 3 rd Ed.), 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 Shutdown 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) Pairing PV modules with wattage above the limit may result in additional clipping losses. See the compatibility calculator at <https://link.enphase.com/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.

IQ Combiner 4/4C



X-IQ-AM1-240-4C
X2-IQ-AM1-240-4C (IEEE 1547:2018)

X-IQ-AM1-240-4
X2-IQ-AM1-240-4 (IEEE 1547:2018)

The **IQ Combiner 4/4C** with IQ Gateway and integrated LTE-M1 cell modem (included only with IQ Combiner 4C) consolidates interconnection equipment into a single enclosure. It 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 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
- Supports Wi-Fi, Ethernet, or cellular connectivity
- Optional AC receptacle available for PLC bridge
- Provides production metering and consumption monitoring

Simple

- Mounts on single stud with centered brackets
- Supports bottom, back and side conduit entry
- Allows up to four 2-pole branch circuits for 240VAC 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
- X2-IQ-AM1-240-4 and X2-IQ-AM1-240-4C comply with IEEE 1547:2018 (UL 1741-SB, 3rd Ed.)



To learn more about Enphase offerings, visit enphase.com
IQ-C-4-4C-DS-0103-EN-US-12-29-2022



IQ Combiner 4/4C

MODEL NUMBER	
IQ Combiner 4 X-IQ-AM1-240-4 X2-IQ-AM1-240-4 (IEEE 1547:2018)	IQ Combiner 4 with 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 and IQ System Controller 2 and to deflect heat.
IQ Combiner 4C X-IQ-AM1-240-4C X2-IQ-AM1-240-4C (IEEE 1547:2018)	IQ Combiner 4C with IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 ± 0.5%) and consumption monitoring (± 2.5%). Includes 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)	
Supported microinverters	IQ6, IQ7, and IQ8. (Do not mix IQ6/7 Microinverters with IQ8)
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 - 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
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)
X-IQ-NA-HD-125A	Hold-down kit for Eaton circuit breaker with screws
Consumption monitoring CT (CT-200-SPLIT/CT-200-CLAMP)	A pair of 200A split core current transformers
ELECTRICAL SPECIFICATIONS	
Rating	Continuous duty
System voltage	120/240VAC, 60 Hz
Eaton BR series busbar rating	125A
Max. continuous current rating	65A
Max. continuous current rating (input from PV/storage)	64A
Max. fuse/circuit rating (output)	90A
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
IQ Gateway breaker	10A or 15A rating GE/Siemens/Eaton included
Production metering CT	200A solid core pre-installed and wired to IQ Gateway
MECHANICAL DATA	
Dimensions (WxHxD)	37.5 cm x 49.5 cm x 16.8 cm (14.75 in x 19.5 in x 6.63 in). Height is 53.5 cm (21.06 in) with mounting brackets.
Weight	7.5 kg (16.5 lbs)
Ambient temperature range	-40°C to +46°C (-40°F to 115°F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction
Wire sizes	• 20A to 50A breaker inputs: 14 to 4 AWG copper conductors • 60A 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	Up to 3,000 meters (9,842 feet)
INTERNET CONNECTION OPTIONS	
Integrated Wi-Fi	IEEE 802.11b/g/n
Cellular	CELLMODEM-M1-06-SP-05, CELLMODEM-M1-06-AT-05 (4G based LTE-M1 cellular modem). Note that an Mobile Connect cellular modem is required for all Enphase Energy System installations.
Ethernet	Optional, IEEE 802.3, Cat5E (or Cat6) UTP Ethernet cable (not included)
COMPLIANCE	
Compliance, IQ Combiner	CA Rule 21 (UL 1741-SA) IEEE 1547:2018 - UL 1741-SB, 3 rd Ed. (X2-IQ-AM1-240-4 and X2-IQ-AM1-240-4C) CAN/CSA C22.2 No. 107.1, Title 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

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_FLASHLOCDOU_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.

FASTER INSTALLATION. 25-YEAR WARRANTY.

FOR QUESTIONS OR CUSTOMER SERVICE VISIT [UNIRAC.COM](https://www.unirac.com) OR CALL (505) 248-2702

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 ACCROSS 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.



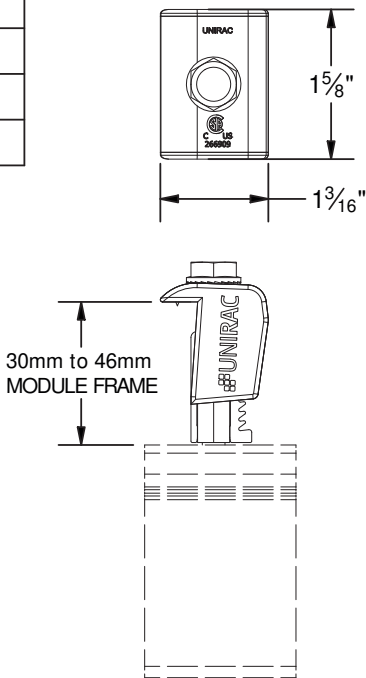
USE ONLY UNIRAC APPROVED SEALANTS. PLEASE CONTACT UNIRAC FOR FULL LIST OF COMPATIBLE SEALANTS.

FASTER INSTALLATION. 25-YEAR WARRANTY.

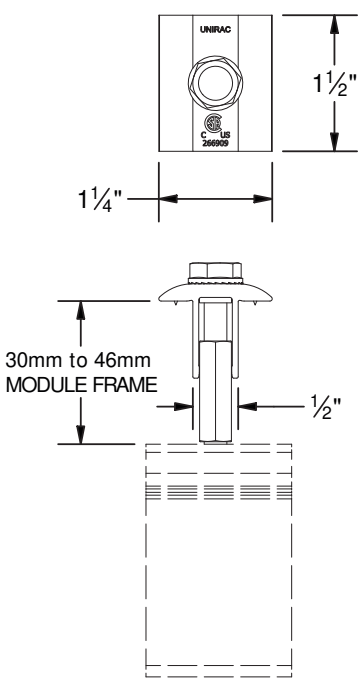
FOR QUESTIONS OR CUSTOMER SERVICE VISIT [UNIRAC.COM](https://www.unirac.com) OR CALL (505) 248-2702

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

UNI VERSAL AF
END CLAMP

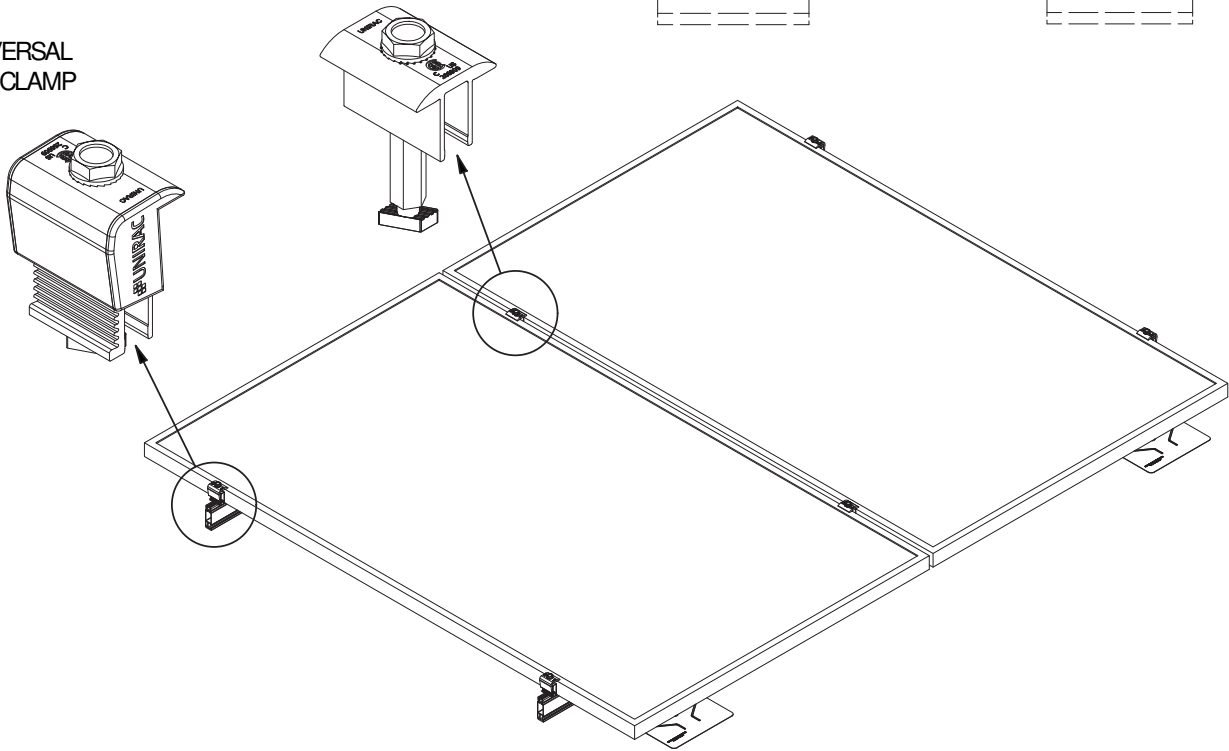


UNI VERSAL AF
MID CLAMP



UNI VERSAL
END CLAMP

UNI VERSAL
MID CLAMP



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

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

DRAWING NOT TO SCALE
ALL DIMENSIONS ARE
NOMINAL

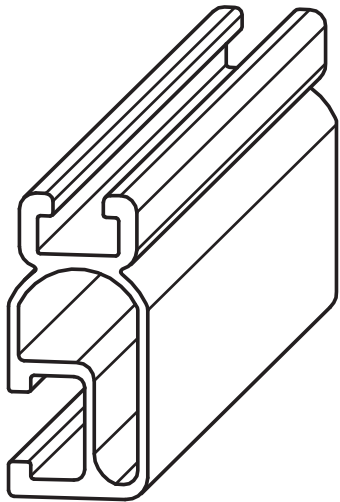
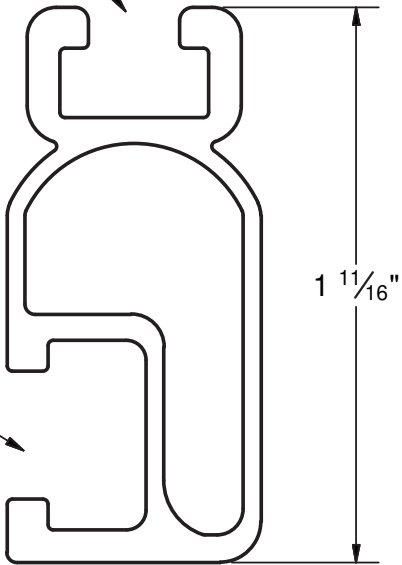
PRODUCT PROTECTED BY
ONE OR MORE US PATENTS
LEGAL NOTICE

SM-A01B

SHEET

1/4" BOLT LOCATION

3/8" BOLT LOCATION



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



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

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

DRAWING NOT TO SCALE
ALL DIMENSIONS ARE
NOMINAL

PRODUCT PROTECTED BY
ONE OR MORE US PATENTS
LEGAL NOTICE

SM-P02

SHEET

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, Type 19, Type 22, & Type 25	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.

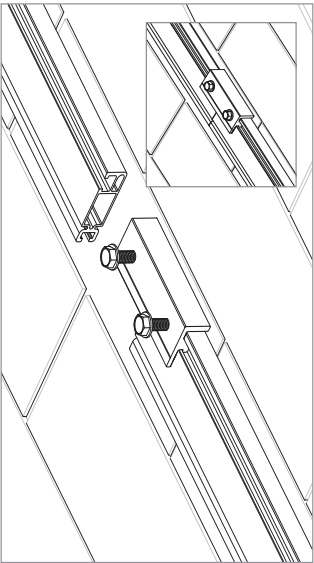
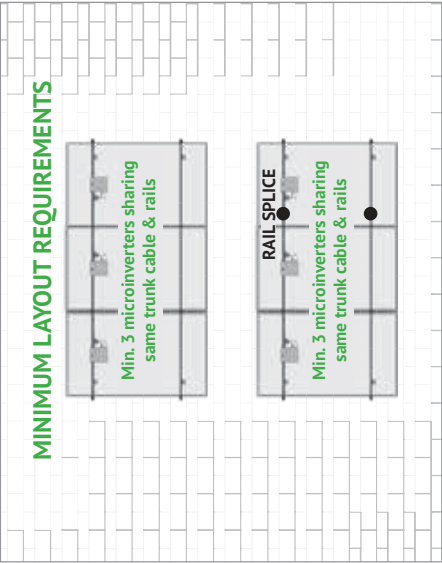
UL2703 CERTIFICATION MARKING LABEL

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.

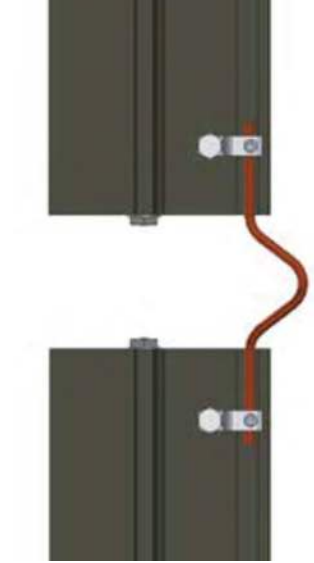
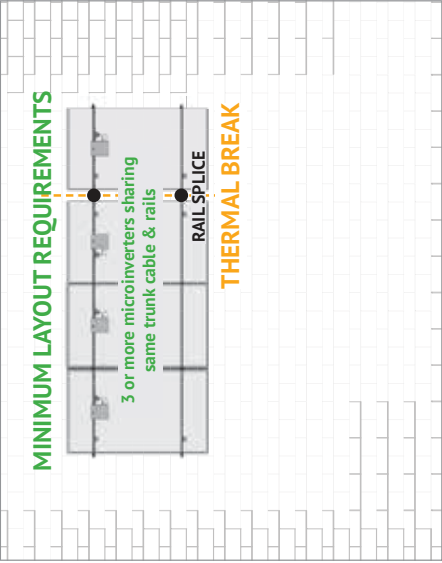


CONTINUOUS RAIL & ELECTRICAL BONDING SPLICE
Enphase Microinverter (MI) Requirements (Model No. M215 & M250)
3 Microinverters sharing same trunk cable & rails



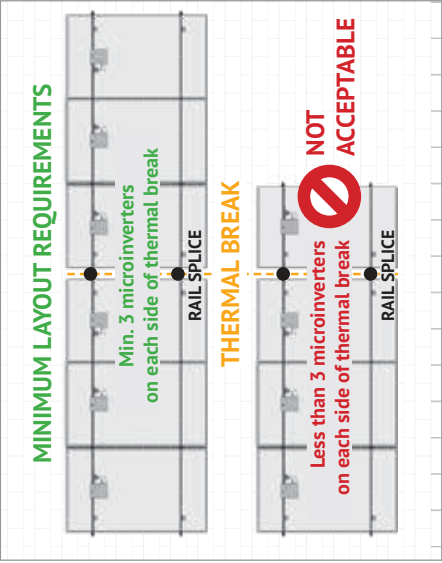
ELECTRICAL BONDING SPLICE

EXPANSION JOINT W/GROUNDING LUGS & COPPER JUMPER
Enphase Microinverter (MI) Requirements (Model No. M215 & M250)
3 or more Microinverters sharing same trunk cable & rails



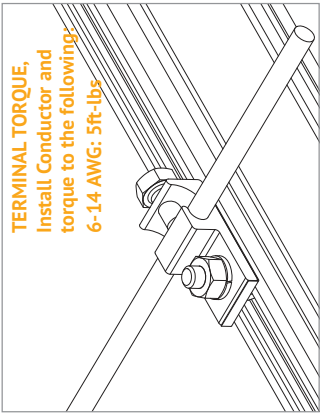
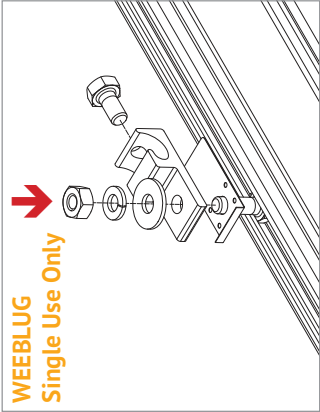
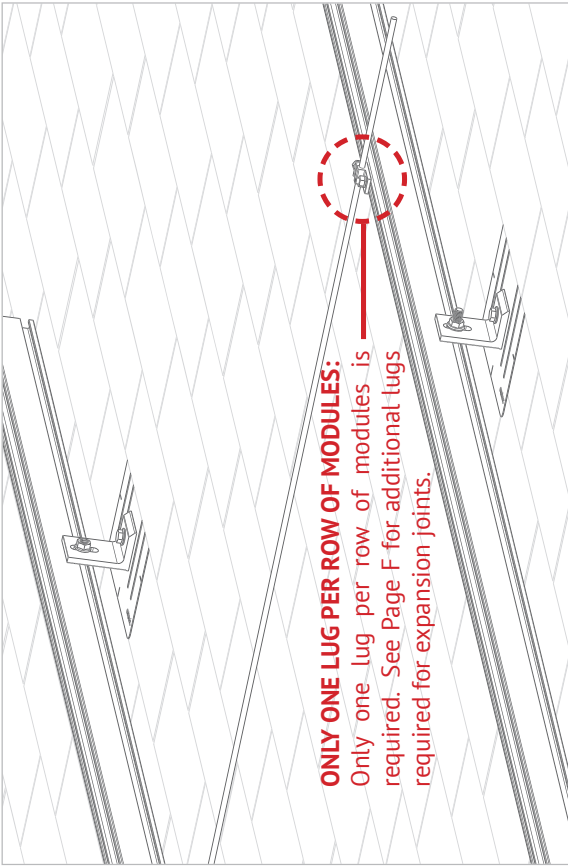
EXPANSION JOINT USED AS THERMAL BREAK W/
GROUNDING LUGS & COPPER JUMPER

EXPANSION JOINT W/O ELECTRICAL BONDING CONNECTION
Enphase Microinverter (MI) Requirements (Model No. M215 & M250)
M/n. 3 Microinverters on each side of thermal break



EXPANSION JOINT USED AS THERMAL BREAK W/O
ELECTRICAL BONDING CONNECTION

NOTE: THE ABOVE IMAGES ARE SAMPLE CONFIGURATIONS TO ILLUSTRATE THE REQUIREMENTS FOR SM SYSTEM GROUNDING THROUGH ENPHASE MICROINVERTERS DESCRIBED ON PAGE 1



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 CONDUCTOR - UNIRAC P/N 008002S:

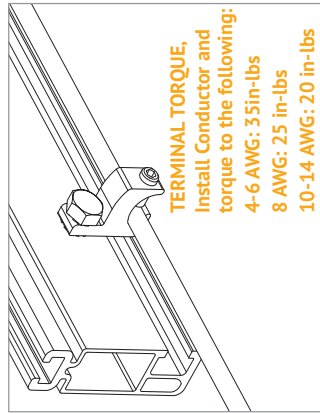
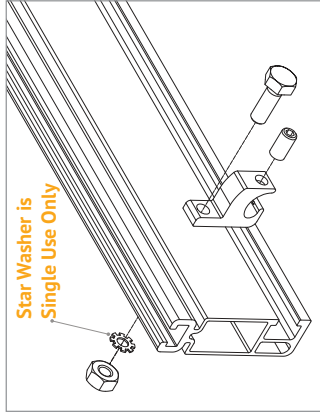
Apply Anti Seize and insert a bolt in the aluminum rail and through the clearance hole in the stainless steel flat washer. Place the stainless steel flat washer on the bolt, oriented so the dimples will contact the aluminum rail. Place the lug portion on the bolt and stainless steel flat washer. Install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

GROUNDING LUG MOUNTING DETAILS:

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

Required if not using approved integrated grounding microinverters

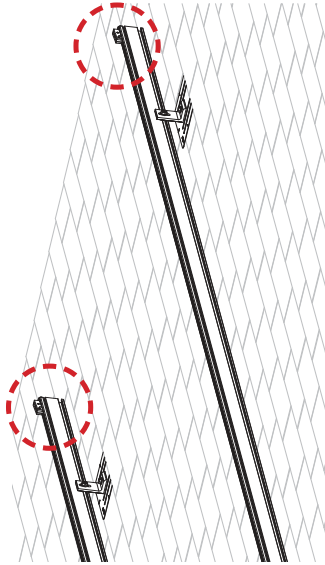
GROUNDING LUG - BOLT SIZE & DRILL SIZE		
GROUND LUG	BOLT SIZE	DRILL SIZE
WEEBLug	1/4"	N/A - Place in Top SM Rail Slot
ILSCO Lug	#10-32	7/32"
- Torque value depends on conductor size. - See product data sheet for torque value.		



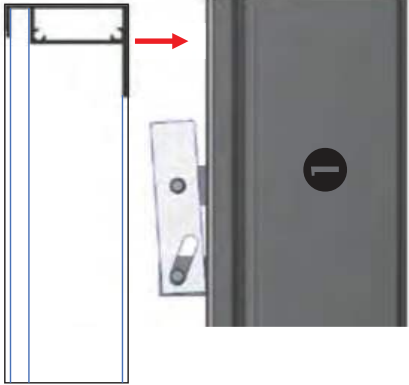
ILSCO LAY-IN LUG CONDUCTOR - UNIRAC P/N 008009P: Alternate Grounding Lug

- Drill, deburr hole and bolt thru both rail walls per table.
TORQUE VALUE 5 ft lbs. (See Note on PG. A)
See ILSCO product data sheet for more details, Model No. GBL-4DBT.

NOTE: ISOLATE COPPER FROM ALUMINUM CONTACT TO PREVENT CORROSION



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 FIRST MODULE:

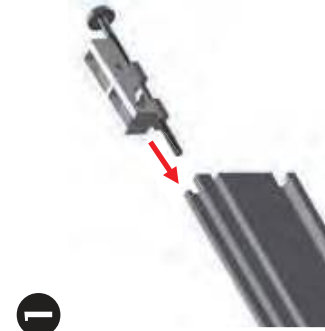
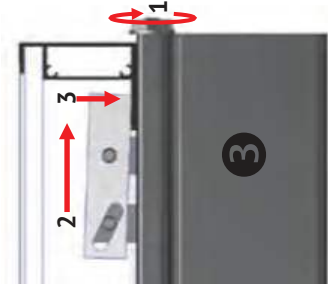
Install the first end module onto rails with the flange of the module frame positioned between end clamps an ends of rails.



ENGAGE CLAMP: While holding module in position and with flange in full contact with rail, rotate end clamp bolt until clamp engages with flange to provide clamp force.

To ensure bolt is not over-torqued, use low torque setting on drill or if using an impact driver, stop rotation as soon as impact action of driver begins.

TORQUE VALUE (See table and notes on PG. A)
End clamp bolt to 5 ft-lbs, No anti-seize

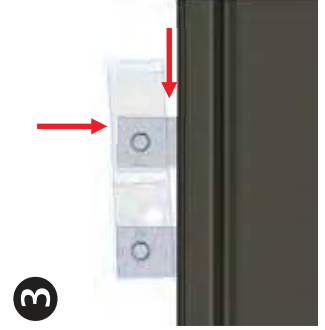


INSTALL END CLAMPS ON RAIL:

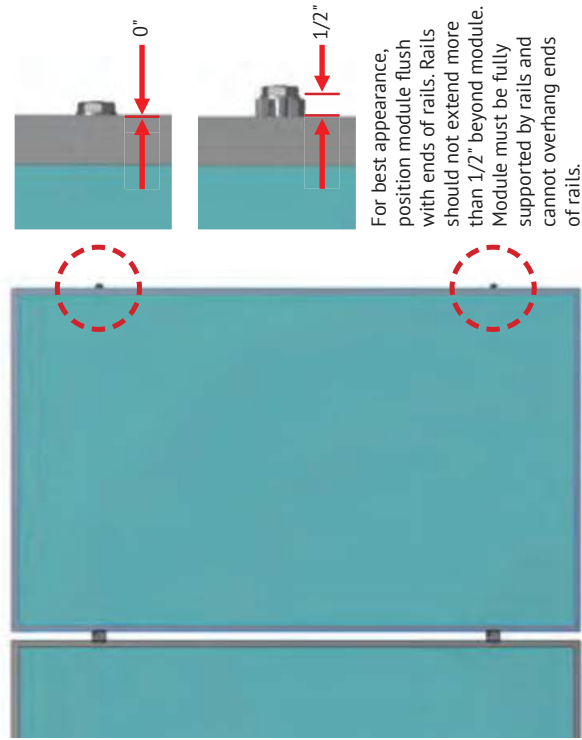
Slide end clamp on to rail by engaging the two t-guide brackets on to rail until bolt head engages with the top slot of the rails. **Ensure bolt is extended as far as possible so that clamp is positioned at max. distance from end of rail.**

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.



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.



Electrical Bonding and Grounding Test Modules

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

Manufacture	Module Model / Series
Aionrise	AION60G1, AION72G1
Aleo	P-Series & S-Series
Aptos Solar	DNA-120-(MF/BF)10-xxxW
	DNA-120-MF10
	DNA-120-(MF/BF)23
	DNA-144-(MF/BF)23
	DNA-120-(MF/BF)26
Astronergy	DNA-144-(MF/BF)26
	DNA-108-(MF/BF)10-xxxW
Astronergy	CHSM6612 M, M/HV
	CHSM6612P Series
	CHSM6612P/HV Series
	CHSM72M4-HC
	CHSM72M(DG)/F-BH
Auxin	AXN6M610T
	AXN6P610T
	AXN6M612T
	AXN6P612T
Axitec	AC-xxx(M/P)/60S, AC-xxx(M/P)/72S
	AC-xxxP/156-60S
	AC-xxxMH/120(SV/SB/VB)
	AC-xxxMH/144(SV/SB/VB)
Boviet	BVM6610, BVM6612
	P6K & MHK-36 Series
BYD	CS1(H/K/U/Y)-MS
Canadian Solar	CS3K-(MB)/MB-AG/MS/P/P HE/(PB-AG)
	CS3L-(MS/P)
	CS3N-MS
	CS3U-(MB)/MB-AG/MS/P/P HE/(PB/PB-AG)
	CS3W-(MS)/MB-AG/P/P-PB-AG)
	CS3Y-MB-AG

Manufacture	Module Model / Series
Canadian Solar (cont.)	CS5A-M
	CS6K-(M)/MS/MS AllBlack(P/P HE)
	CS6P-(M/P)
	CS6R-MS
	CS6U-(M/P/P HE)
	CS6W-(MS/MB-AG)
	CS6X-P CSX-P
Centrosolar America	ELPS CS6(A/P)-MM
	C-Series & E-Series
Certainfeed	CT2xxMxx-01, CT2xxPxx-01, CTxxxMxx-01
	CTxxxPxx-01, CTxxxMxx-02, CTxxxMxx-03
	CTxxxMxx-04, CTxxxHC11-04
Eco Solargy	Orion 1000 & Apollo 1000
EMMVEE	ExxxP72-B
	ExxxM72-B
ET Solar	ExxxH CM120-B
ET Solar	ET AC Module, ET Module
	ET-M72BH520-550WW/WB
First Solar	FS-6XXX(A)
Flextronics	FS-6XXX(A)-P, FS-6XXX(A)-P-I
	FXS-xxxBB
Freedom Forever	FF-MP-BBB-xxx, FF-MP1-BBB-xxx
FreeVolt	PV/Graf
GCL	GCL-P6 & GCL-M6 Series
Hansol	TD-AN3, TD-AN4
Hanwha SolarOne	UB-AN1, UD-AN1
	HSL 60

Manufacture	Module Model / Series
Heliene	36M, 36P 60M, 60P, 72M & 72P Series
	144HC M6
HT-SAAE	144HC M10 SL Bifacial
	HT60-156M-C
	HT60-156M(V)-C
	HT72-156(M/P)
	HT72-156P-C, HT72-156P(V)-C
	HT72-156M(PDV)-BF, HT72-156M(PD)-BF
	HT72-166M, HT72-18X
Hyperion Solar	HY-DH108P8(B), HY-DH108N8B
	HY-DH144P8
Hyundai	KG, MG, RW, TG, RI, RG, TI, KI, HI Series
	HIA-SxxxHG, HID-SxxxRG(BK), HIS-S400PI
	HIS-SxxxYH(BK)
	HIS-SxxxXG(BK)
	HIN-SxxxXG(BK)
ITEK	IT-SE Series
JA Solar	JPS-60 & JPS-72 Series
	JAM54S31 xxx/MR
	JAM72D30MB, JAM78D10MB
	JAM72S30 /MR
	JAP6 60-xxx
	JAM6(K)-60/xxx, JAP6(k)-72-xxx/4BB
	JAP72S##-xxx/**
	JAP6(k)-60-xxx/4BB, JAP6OS##-xxx/**
	JAM6(k)-72-xxx**, JAM72S##-xxx/**
	JAM6(k)-60-xxx**, JAM6OS##-xxx/**
	i. ##: 01, 02, 03, 09, 10
	ii. **: SC, PR, BP, HIT, IB, MW, MR
	** = Backsheet, ## Cell technology

• Unless otherwise noted, all modules listed above include all wattages and specific models within that series. Variable wattages are represented as "xxx"

• Items in parenthesis are those that may or may not be present in a compatible module's model ID

• Slashes "/" between one or more items indicates that either of those items may be the one that is present in a module's model ID

• The frame profile must not have any feature that might interfere with the bonding devices that are integrated into the racking system

• Use with a maximum over current protection device OCPD of 30A

• **Listed models can be used to achieve a Class A fire system rating for steep slope applications. See page 30**



Electrical Bonding and Grounding Test Modules

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

Manufacture	Module Model / Series
Jinko	JKM & JKMS Series
	JKMxxxM-72HL-V
	JKMxxxM-72HL4-(TV
	JKMxxxM-72HLM-TV
	JKMxxxM-7RL3-V
	JKMxxxM-72HL4-TV
Kyocera	KD-F & KU Series
LA Solar	LSxxxHC(L66)
	LSxxxBL
	LSxxxHC
LG Electronics	LGxxx(E1C)/E1K/N1K/N1K/N27/N2W/S1C/S2W/Q1C/Q1K)-A5
	LGxxx(A1C)/M1C/M1K/M1C/N1K/N1K/Q1C/Q1K/QAC/QAK)-A6
	LGxxxN2W-B3
	LGxxxN2T-B5
	LGxxxN1K-B6
	LGxxx(N1C/N1K/N27/N2W)-E6
	LGxxx(N1C/N1K/N2W/S1C/S2W)-G4
	LGxxxN2T-J5
	LGxxx(N1K/N1W/N27/N2W)-L5
	LGxxx(M1C/N1C/Q1C/Q1K)-N5
	LGxxx(N1C/N1K/N2W/Q1C/Q1K)-V5
	LGxxxN3K-V6
LONGi	LR4-60(HPB/HPH)
	LR4-72(HPH)
	LR6-60
	LR6-60(BK)/HPB/HPH/HV/PB/PE/PH)
	LR6-72
	LR6-72(BK)/HV/PB/PE/PH)
	RealBlack LR4-60HPB
	RealBlack LR6-60HPB

Manufacture	Module Model / Series
Maxeon	SPR-MAX3-xxx-COM
Meyer Burger	Meyer Burger Black, Meyer Burger White
	Meyer Burger Glass
Mission Solar Energy	MSE Mono, MSE Perc
	MSExxx(SR87/SR8K/SR9S/SX5T)
	MSExxx(SX5K/SX6W)
Mitrex	Mxxx-L3H, Mxxx-I3H
Mitsubishi	MJE & MLE Series
Neo Solar Power Co.	D6M Series
NE Solar	NESE xxx-72MHB-M10
	NESE xxx-60MH-M6
Panasonic	VBHNxxxSA06/SA08/SA11/SA11B
	VBHNxxxSA15/SA15B/SA16/SA16B,
	VBHNxxxKA, VBHNxxxKA03/04,
	VBHNxxxSA17/SA17G/SA17E/SA18/SA18E,
	VBHNxxxZA01/ZA02/ZA03/VBHNxxxZA04
Peimar	EVPIVxxx
	EVPIVxxx(H/K/PK/HK)
	SGxxxM (FB/BF)
	SMxxxM
Phono Solar	PSxxxM1-20/U
	PSxxxM1H-20/U
	PSxxxM1-20UH
	PSxxxM1H-20UH
	PSxxxM4(H)-24/TH
	PSxxxM1-20/UH
	PSxxxM1H-20/UH
	PSxxxM-24/T
	PSxxxMH-24/T
	PSxxxM-24/TH
	PSxxxMH-24/TH

Manufacture	Module Model / Series
Q Cells	P72 Series, P72X-xxx
	Plus, Pro, Peak, G3, G4,
	Peak G5(SC) , G6(+)(SC)(AC), G7, G8(+),
	Plus, Pro, Peak L-G2, L-G4, L-G5
	Peak L-G5, L-G6, L-G7, L-G8(BFF)
	QPEAK DUO(BLK)-G6+
	QPEAK DUO BLK-G6+/TS
	QPEAK DUO (BLK)-G7
	QPEAK DUO L-(G7/G7.1/G7.2/G7.3/G7.7)
	QPEAK DUO (BLK) G8(+)
	QPEAK DUO L-(G8/G8.1/G8.2/G8.3)
	QPEAK DUO L-G8.3 (BFF/BFG/BGT)
	QPEAK DUO (BLK) ML-G9(+)
	QPEAK DUO XL-(G9/G9.2/G9.3)
	QPEAK DUO XL-G9.3/BFG
	QPEAK DUO-G10+
	QPEAK DUO BLK G10(+)
	QPEAK DUO BLK G10+ /AC
	QPEAK DUO (BLK) ML-G10(a)(+)
	QPEAK DUO BLK ML-G10+ / t
	QPEAK DUO XL-(G10/G10.2/G10.3/G10.4/G10.d)
	QPEAK DUO XL-G10.3/BFG
	QPEAK DUO XL-G10.d/BFG
	QPEAK DUO XL-(G11.2/G11.3)
	QPEAK DUO XL-G11.3/BFG

• Unless otherwise noted, all modules listed above include all wattages and specific models within that series. Variable wattages are represented as "xxx"

• Items in parenthesis are those that may or may not be present in a compatible module's model ID

• Slashes "/" between one or more items indicates that either of those items may be the one that is present in a module's model ID

• The frame profile must not have any feature that might interfere with the bonding devices that are integrated into the racking system

• Use with a maximum over current protection device OCPD of 30A

• **Listed models can be used to achieve a Class A fire system rating for steep slope applications. See page 30**



Electrical Bonding and Grounding Test Modules

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

Manufacture	Module Model / Series
REC	RECxxxxA (BLK/Pure/R)
	RECxxxxNP (N-PEAK)
	RECxxxxNP2 (Black)
	RECxxxxNP3 Black
	RECxxxPE, RECxxxPE72
	RECxxxTP, RECxxxTP72
	RECxxxTP2(M/BLK2)
	RECxxxTP2(S/M)72
Renesola	RECxxxTP3M (Black)
	RECxxxTP4 (Black)
Risen	All 60-cell modules
	RSM Series, RSM110-8-xxxBMDG
SEG Solar	SEG-xxx-BMD-HV
	SEG-xxx-BMD-TB
S-Energy	SN72 & SN60 Series
	SEG-(6PA/6PB/6MA/6MA-HV/6MB/E01/E11) SRP-(6QA/6QB)
Seraphim	SRP-xxx-6MB-HV, SRP-320-375-BMB-HV,
	SRP-xxx-BMC-HV, SRP-390-450-BMA-HV,
	SRP-xxx-BMZ-HV, SRP-390-405-BMD-HV
	NU-SA & NU-SC Series
Sharp	SLA-M, SLA-P, SLG-M, SLG-P & BC Series
Sifab	SIL-xxx(BG/BK/BL/HC+/HL/HM/HN/ML/ NL/NT/NX/NU)
Solar4America	S4Axxx-108MH10BB, S4Axxx-72MH5BB

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

Manufacture	Module Model / Series
TSMC	TS-150C2 CIGSw
	UNI4xx-1448MH-DG
Universal Solar	UNI5xx-1448MH-DG
	UNIxxx-108M-BB
	UNIxxx-120M-BB
	UNIxxx-120MH
Upsolar	UP-MxxxP, UP-MxxxM(-B)
	D7Kxxx(H7A/H8A), D7Mxxx(H7A/H8A)
URECO	FAKxxx(C8G/E8G), FAMxxxE7G-BB
	FAMxxxE8G(-BB), FBKxxxM8G
	F6MxxxE7G-BB
	FBMxxxMFG-BB
Vikram	Eldora, Somera, Ultima
	PREXOS VSMDHT.60AAA.05
	PREXOS VSMDHT.72AAA.05
Vina	VNS-72M1-5-xxxW-1.5,
	VNS-72M3-5-xxxW-1.5,
	VNS-144M1-5-xxxW-1.5,
	VNS-144M3-5-xxxW-1.5,
	VNS-120M3-5-xxxW-1.0
VSUN	VSUNxxx-60M-BB, VSUNxxx-72MH
	VSUN4xx-144BMH
	VSUN4xx-144BMH-DG
	VSUN5xx-144BMH-DG
	VSUNxxx-108M-BB
	VSUNxxx-120M-BB
	VSUNxxx-120BMH
	VSUNxxx-132BMH
Waaree	VSUNxxx-108BMH
	Ahnay Series Bi-33
	Arka Series WSMDi



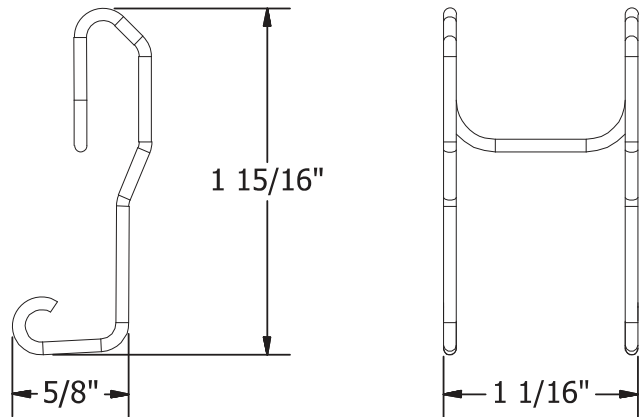
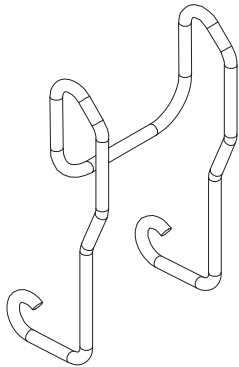
Electrical Bonding and Grounding Test Modules

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

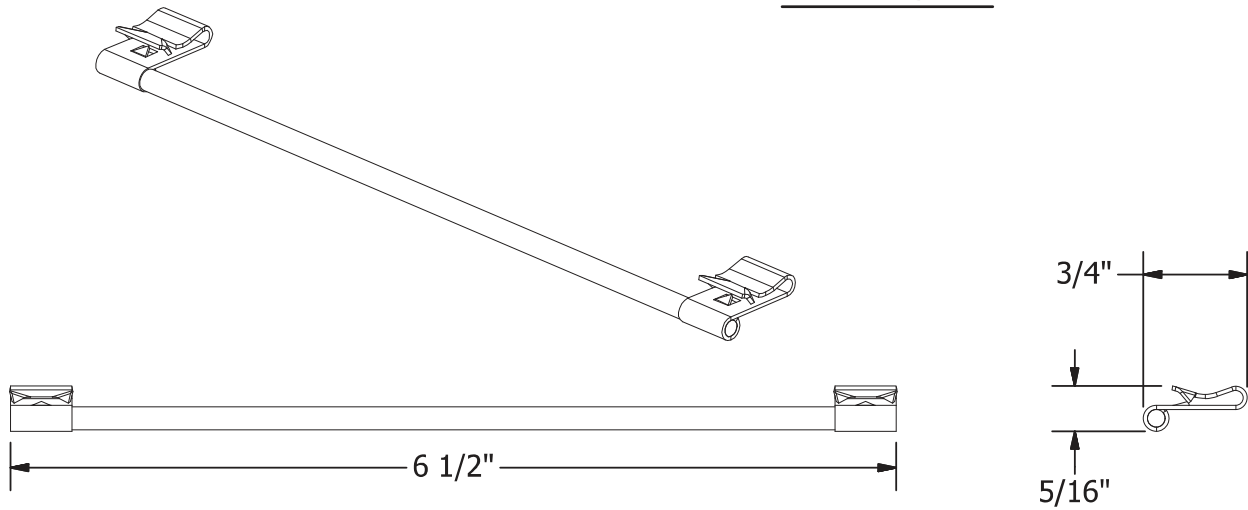
Manufacture	Module Model / Series
Winaico	WST & WSP Series
Yingli	YGE & YLM Series
Yotta Energy	YSM-B450-1
ZNShine	ZXM6-72 Series, ZXM6-NH144
	ZXM6-NHLDD144
	ZXM7-SH108 Series

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

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:	SFMC
DRAWING TYPE:	PART
DESCRIPTION:	TRIM CLIP / WIRE BONDING CLIP
REVISION DATE:	6/27/2018

DRAWING NOT TO SCALE
ALL DIMENSIONS ARE
NOMINAL

PRODUCT PROTECTED BY
ONE OR MORE US PATENTS
LEGAL NOTICE

SFMC-P04

SHEET



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

Models: SM SOLARMOUNT Flush-to-Roof is an extruded aluminum rail PV racking system that is installed parallel to the roof in landscape or portrait orientations.

ULA Unirac Large Array is a ground mount system using the SolarMount (SM) platform for the bonding and grounding of PV modules.

Solarmount

The system listed is designed to provide bonding/grounding, and mechanical stability for photovoltaic modules. The system is secured to the roof with the L-Foot components through the roofing material to building structure. Modules are secured to the racking system with stainless steel or aluminum mid clamps and Aluminum end clamps. The modules are bonded to the racking system with the stainless steel bonding mid clamps with piercing points. The system is grounded with 10 AWG copper wire to bonding/grounding lugs. Fire ratings of Class A with Type 1, 2, 3, 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/ft²)	75.2
Upward Design Load (lb/ft²)	33.4
Down-Slope Load (lb/ft²)	5.0

Test Loads:

Downward Load (lb/ft²)	112.8
Upward Load (lb/ft²)	50.13
Down-Slope Load (lb/ft²)	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.

Conditions of Acceptability:

Installation is subject to acceptance of the local inspection authorities having jurisdiction. The certification of these products relates only to the methods of installation, bonding, and grounding as outlined in the Installation Manual for each product.

APPLICABLE REQUIREMENTS

- UL 2703-1st Edition
- Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels.
- LTR AE-001-2012
- List of Technical Requirements for Photovoltaic Module and Panel racking Systems

MARKINGS

The manufacturer is required to apply the following markings:

- Products shall be marked with the markings specified by the particular product standard.
- Products certified for Canada shall have all Caution and Warning markings in both English and French.

Additional bilingual markings not covered by the product standard(s) may be required by the Authorities Having Jurisdiction. It is the responsibility of the manufacturer to provide and apply these additional markings, where applicable, in accordance with the requirements of those authorities.

The products listed are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US (indicating that products have been manufactured to the requirements of both Canadian and U.S. Standards) or with adjacent indicator 'US' for US only or without either indicator for Canada only.

The following markings appear on the rail by adhesive label:

1. Submitter’s name and/or CSA Master Contract number “266909”;
2. Model designation;
3. Manufacturing date;
4. System fire class rating/designation of information location in Installation Manual;
5. Design load rating/designation of information location in Installation Manual;

The following markings appear on the Mid clamp by stamping:

1. Submitter’s name and/or CSA Master Contract number “266909”;
2. CSA mark
3. Mil ID for factory location

Nameplate adhesive label material approval information:

SATO AMERICA INC, SF401 DuraMark Polyester, MH48415 - Printing Materials – Component, UL 969-Marking and Labeling Systems

ALTERATIONS

Not Applicable

FACTORY TESTS

Not Applicable

SPECIAL INSTRUCTIONS FOR FIELD SERVICES

1. Component descriptions marked with either the "(INT)" or "(INT*)" identifiers may be substituted with other components providing the requirements specified under the notes in the "Description" are complied with.

COMPONENT SPECIAL PICKUP

1. Component descriptions marked with the identifier "(CT)" are subject to annual pickup and Conformity Testing.

DESCRIPTION

Notes:

1. Component Substitution

a) Critical components (those identified by mfr name, cat no), which are NOT identified with either "INT" or "INT*" are not eligible for substitution without evaluation and report updating

b) The term "INT" means a "Certified" and/or "Listed" (or a "Recognized" and/or "Accepted") component may be replaced by one "Certified" and/or "Listed" by another certification organization accredited by the appropriate accreditation body or scheme requirements to the correct standard, for the same application; providing the applicable country identifiers are included and requirements in item "d" below are complied with.

c) The Term "(INT*)" means a "Recognized" and/or "Accepted" component may be replaced by a component that is CSA Certified. The applicable country identifiers shall be included, the requirements in item "d" below as well as any "conditions of suitability" for the component (as recorded in this descriptive report) shall be complied with;

d) Components which have been substituted, must be of an equivalent rating, configuration (size, orientation, mounting) and the applicable minimum creepage and clearance distances are to be maintained from live parts to bonded metal parts and secondary parts.

e) Substitution of a "Certified" and/or "Listed" component with a component that is "Recognized" or "Accepted" is not permitted without evaluation and report updating.

f) Substitution of a "Recognized" and/or "Accepted" component by one that is not CSA Certified is not permitted without a proper evaluation as well as a report update because the Conditions of Acceptance of the original component may be different than the Conditions of Acceptance of the substitute component.

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



Certificate of Compliance

Certificate: 70131735

Master Contract: 266909

Project: 80096297

Date Issued: 2021-10-22

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



Certificate: 70131735

Project: 80096297

Master Contract: 266909

Date Issued: 2021-10-22

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

Solarmount

The system listed is designed to provide bonding/grounding, and mechanical stability for photovoltaic modules. The system is secured to the roof with the L-Foot components through the roofing material to building structure. Modules are secured to the racking system with stainless steel or aluminum mid clamps and Aluminum end clamps. The modules are bonded to the racking system with the stainless-steel bonding mid clamps with piercing points. The system is grounded with 10 AWG copper wire to bonding/grounding lugs. Fire ratings of Class A with Type 1, 2, 3, 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



January 20, 2021

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. 2020 Florida Building Code, by Florida Building Commission
- 2. Minimum Design Loads for Buildings and other Structures, ASCE/SEI 7-16
- 3. 2018 International Building Code, by International Code Council, Inc. w/ Provisions from SEAOC PV-2 2017.
- 4. 2018 International Residential Code, by International Code Council, Inc. w/ Provisions from SEAOC PV-2 2017.
- 5. AC428, Acceptance Criteria for Modular Framing Systems Used to Support Photovoltaic (PV) Panels, November 1, 2012 by ICC-ES.
- 6. 2015 Aluminum Design Manual, by The Aluminum Association, 2015

Following are typical specifications to meet the above code requirements:

Design Criteria:	Ground Snow Load = 0 - 100 (psf) Basic Wind Speed = 85 - 190 (mph) Roof Mean Height = 0 - 60 (ft) Roof Pitch = 0 - 45 (degrees) Exposure Category = B, C & D
Attachment Spacing:	Per U-builder Engineering report.
Cantilever:	Maximum cantilever length is L/3, where “L” is the span noted in the U-Builder online tool.
Clearance:	2” to 10” clear from top of roof to top of PV panel.
Tolerance(s):	1.0” tolerance for any specified dimension in this report is allowed for installation.
Installation Orientation:	See SOLARMOUNT Rail Flush Installation Guide. Landscape - PV Panel long dimension is parallel to ridge/eave line of roof and the PV panel is mounted on the long side. Portrait - PV Panel short dimension is parallel to ridge/eave line of roof and the PV panel is mounted on the short side.



Components and Cladding Roof Zones:
The Components and Cladding Roof Zones shall be determined based on ASCE 7-16 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, kzt 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

THIS ITEM HAS BEEN ELECTRONICALLY SIGNED AND SEALED BY PAUL K. ZACHER, PE ON 01/20/2021 USING A SHA-1 AUTHENTICATION CODE.

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