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June 10, 2022
Revised: August 25, 2022

Green World Renewable Energy
4408 Ritchie Highway
Baltimore, MD 21225

Scott
Wyssling, PE

Digitally signed by Scott Wyssling, PE
DN: C=US, S=Utah, L=Alpine, O=Wyssling
Consulting, OU=Owner, CN="Scott Wyssling,
PE", E=swyssling@wysslingconsulting.com
Reason: I am the author of this document
Location: your signing location here
Date: 2022.08.25 10:03:29-06'00'
Foxit PDF Editor Version: 11.1.0

Re: Engineering Services
Geiger Residence
399 Southwest Meadow Terrace, Lake City, FL
16.280 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: Assumed prefabricated wood trusses at 24" on center. All truss members are constructed of 2x4 dimensional lumber.
Roof Material: Composite Asphalt Shingles
Roof Slope: 38 degrees
Attic Access: Inaccessible
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 = 140 mph (based on Risk Category II)
 - Exposure Category C

Analysis performed of the existing roof structure utilizing the above loading criteria is in accordance with the FBC 2020 (7th 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.

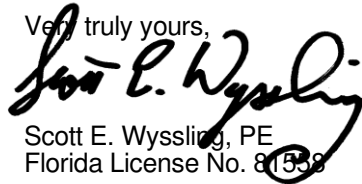
D. Solar Panel Anchorage

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. The maximum allowable withdrawal force for a $\frac{5}{16}$ " lag screw is 235 lbs per inch of penetration as identified in the National Design Standards (NDS) of timber construction specifications. Based on a minimum penetration depth of $2\frac{1}{2}$ ", the allowable capacity per connection is greater than the design withdrawal force (demand). Considering the variable factors for the existing roof framing and installation tolerances, the connection using one $\frac{5}{16}$ " diameter lag screw with a minimum of $2\frac{1}{2}$ " embedment will be adequate and will include a sufficient factor of safety.
3. Considering the wind speed, roof slopes, size and spacing of framing members, and condition of the roof, the panel supports shall be placed no greater than 48" on center.
4. Panel supports connections shall be staggered to distribute load to adjacent framing members.

Based on the above evaluation, this office certifies that with the racking and mounting specified, the existing roof system will adequately support the additional loading imposed by the solar system. This evaluation is in conformance with the 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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Wyssling Consulting, PLLC
76 N Meadowbrook Drive
Alpine UT 84004 COA # RY34912

Signed 8/25/2022



DUSTIN GEIGER
NEW GRID-INTERACTIVE PHOTOVOLTAIC SYSTEM
DC SYSTEM SIZE (16.28 KW)

Unicity
Solar Energy
ADD : 612 FLORIDA AVENUE, PALM
HARBOR, FL 34683, USA
CONTACT : 727 945 6060
LICENSE #EC13010036
#CBC1263094

Signature with Seal

DUSTIN GEIGER

399 SW MEADOW TERRACE, LAKE CITY,
FL 32024, USA

REVISIONS

REV	ENG.	DESCRIPTION	DATE

PERMIT DEVELOPER

DATE	06/10/2022
DESIGNER	OSD
REVIEWER	

SHEET NAME

SITE MAP &
VICINITY MAP

SHEET NUMBER

A-01

SYSTEM DETAILS

DESCRIPTION	NEW GRID-INTERACTIVE PHOTOVOLTAIC SYSTEM WITH NO BATTERY STORAGE
DC RATING OF SYSTEM	SYSTEM SIZE :16.28 KW DC STC
AC RATING OF SYSTEM	12.91KW
AC OUTPUT CURRENT	53.65 A
NO. OF MODULES	(37) APTOS DNA-144-MF26-440W MODULES
NO. OF INVERTERS	(37) ENPHASE IQ7A-72-2-US MICROINVERTERS MICROINVERTERS
POINT OF INTERCONNECTION	LINE SIDE TAP IN THE MSP
ARRAY STRINGING	(3) BRANCHES OF 9 MODULES (1) BRANCH OF 10 MODULES

SITE DETAILS

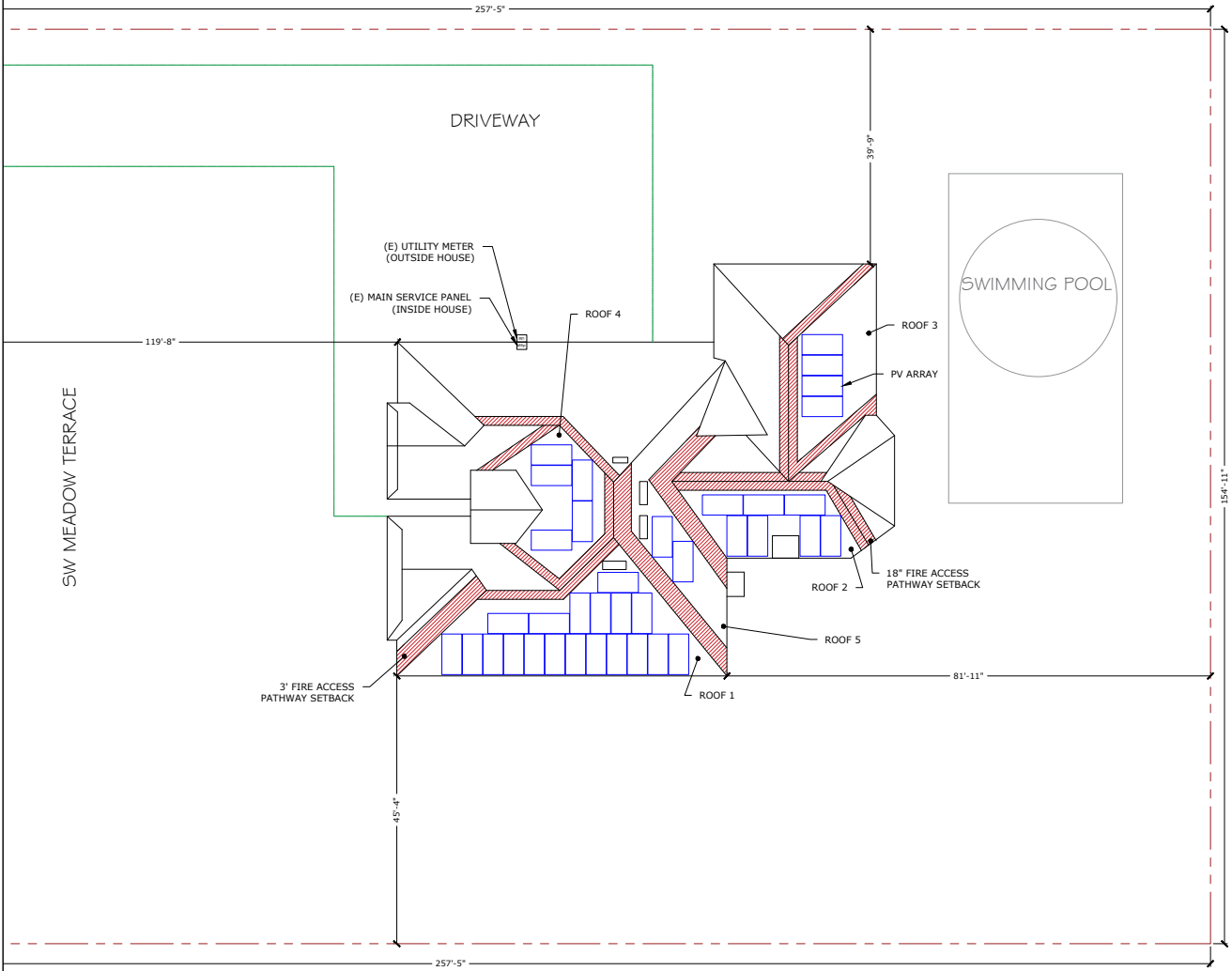
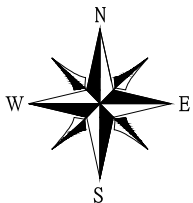
ASHRAE EXTREME LOW	-5°C
ASHRAE 2% HIGH	34°C
GROUND SNOW LOAD	0 PSF
WIND SPEED	140MPH (ASCE 7-16)
RISK CATEGORY	II
WIND EXPOSURE CATEGORY	C

GOVERNING CODES

FLORIDA RESIDENTIAL CODE, 7TH EDITION 2020 (FRC)
FLORIDA BUILDING CODE, 7TH EDITION 2020 (FBC)
FLORIDA FIRE PREVENTION CODE, 7TH EDITION 2020 (FFPC)
NATIONAL ELECTRIC CODE, NEC 2017 CODE BOOK, NFPA 70

SHEET INDEX

SHEET NO.	SHEET NAME
A - 01	SITE MAP & VICINITY MAP
A - 02	ROOF PLAN & MODULES
S - 01	ARRAY LAYOUT
S - 02	STRUCTURAL ATTACHMENT DETAIL
E - 01	ELECTRICAL LINE DIAGRAM
E - 02	WIRING CALCULATIONS
E - 03	SYSTEM LABELING
DS - 01	MODULE DATASHEET
DS - 02	INVERTER DATASHEET
DS - 03	COMBINER BOX DATASHEET
DS - 04	ATTACHMENT DATASHEET
DS - 05	RACKING DATASHEET



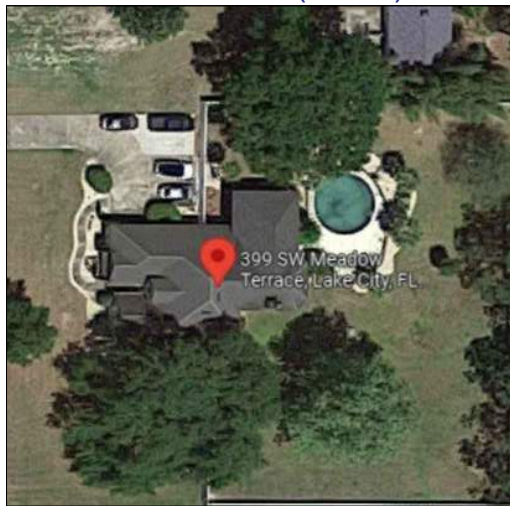
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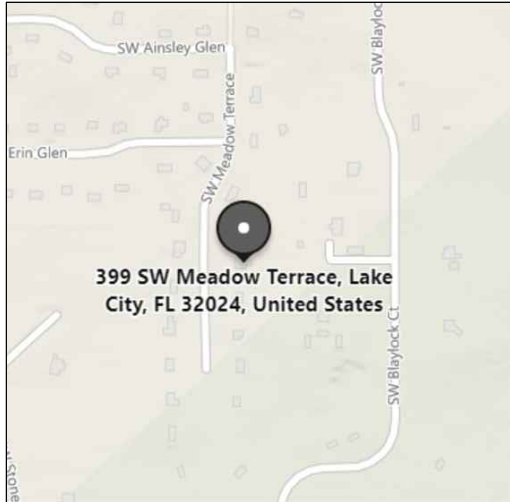
Wyssling Consulting, PLLC
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Alpine UT 84004, COA # RY34932

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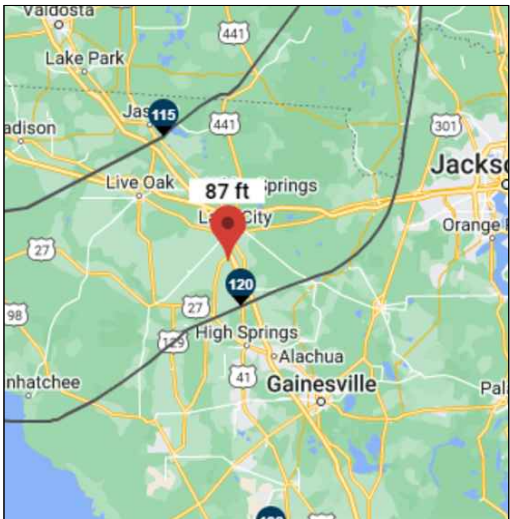
SITE MAP (N.T.S)

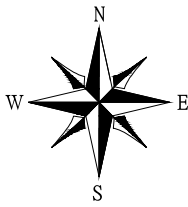


VICINITY MAP



WIND FLOW MAP





MODULE TYPE, DIMENSIONS & WEIGHT

NUMBER OF MODULES = 37 MODULES
MODULE TYPE = APTOS DNA-144-MF26-440W SOLAR MODULES
MODULE WEIGHT = 53.13 LBS / 24.1 KG.
MODULE DIMENSIONS = 82.48" X 40.9" = 23.43 SF

NUMBER OF INVERTER = 37 MICROINVERTERS
INVERTER TYPE = ENPHASE IQ7A-72-2-US MICROINVERTERS
MICROINVERTERS

DC SYSTEM SIZE: 16.28 KW
AC SYSTEM SIZE: 12.91KW

GENERAL INSTALLATION PLAN NOTES:

(1) PANEL DESIGNATIONS SHOWN ON THESE DRAWINGS ARE GIVEN FOR CLARIFICATION OF THE CIRCUITING ONLY AND MAY NOT CORRESPOND TO THE DESIGNATIONS FOUND IN THE FIELD

2) ROOF ATTACHMENTS TO TRUSSES SHALL BE INSTALLED AS SHOWN IN SHEET S-01 AND AS FOLLOWS FOR EACH WIND ZONE:

WIND ZONE 1: MAX SPAN 4'-0" O.C.
WIND ZONE 2: MAX SPAN 4'-0" O.C.
WIND ZONE 3: MAX SPAN 2'-0" O.C.

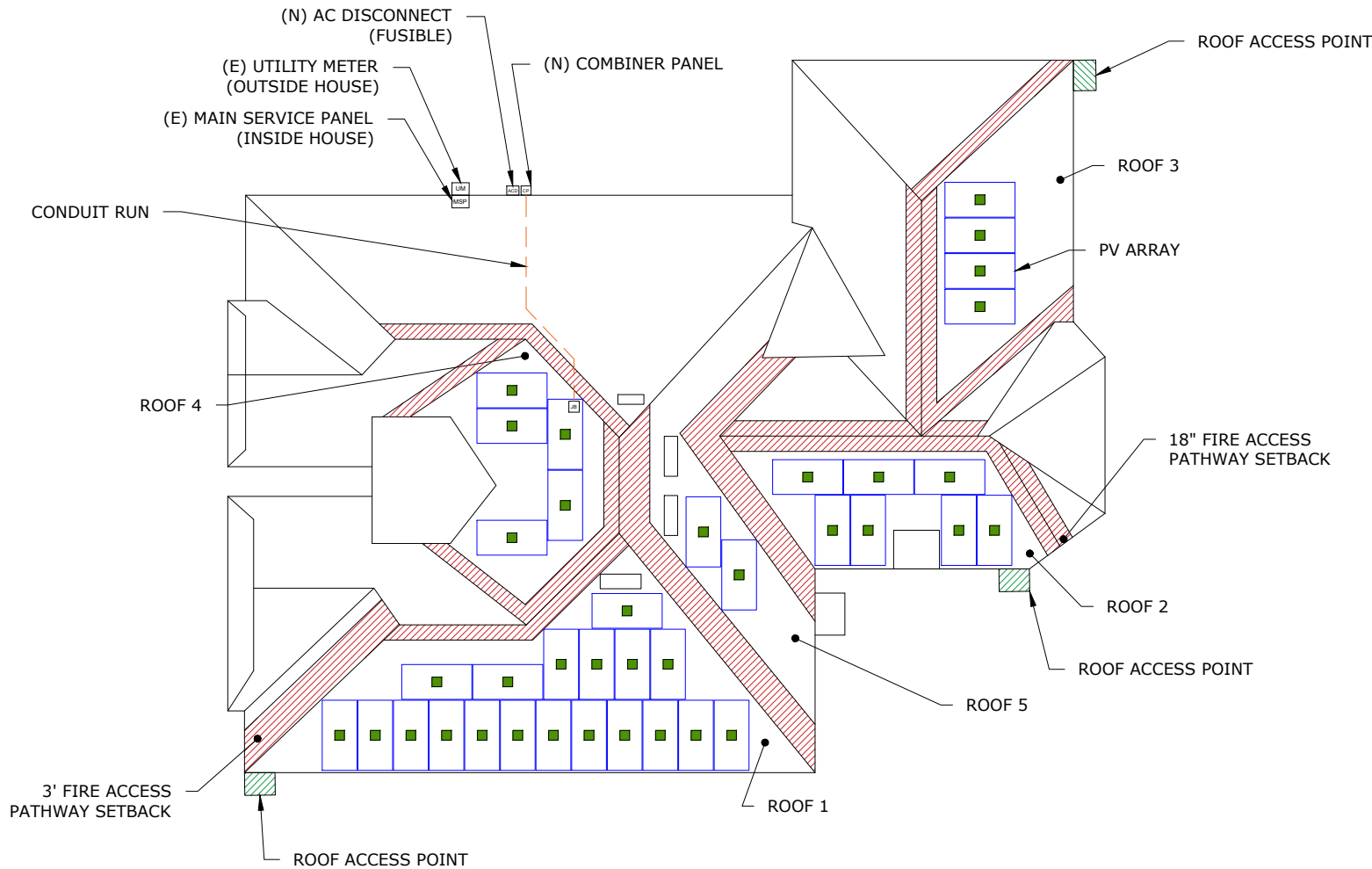
3) EXISTING RESIDENTIAL BUILDING ROOF WITH MEAN ROOF HEIGHT 25 FT AND 2"X4" WOOD ROOF TRUSSES SPACED 24" O.C.

CONTRACTOR TO FIELD VERIFY AND SHALL REPORT TO THE ENGINEER IF ANY DISCREPANCIES EXIST BETWEEN PLANS AND IN FIELD CONDITIONS.

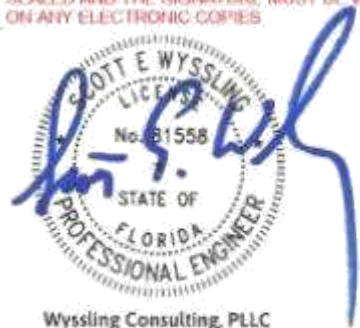
I CERTIFY THAT THE INSTALLATION OF THE MODULES IS IN COMPLIANCE WITH FBC: RESIDENTIAL CHAPTER 3.BUILDING STRUCTURE WILL SAFELY ACCOMMODATE LATERAL AND UPLIFT WIND LOADS, AND EQUIPMENT DEAD LOADS.

NOTES:

1. LOCATION OF JUNCTION BOX(ES), AC DISCONNECTS(S), AC COMBINER PANEL(S), AND OTHER ELECTRICAL EQUIPMENT(S) RELEVANT TO PV INSTALLATION SUBJECT TO CHANGE BASED ON SITE CONDITIONS.
2. SETBACKS AT RIDGES CAN BE REDUCED TO 18 INCHES IN COMPLIANCE WITH FBC R 324.6.2:
TOTAL PLAN VIEW AREA = 4373 SQFT
TOTAL PV AREA = $37(82.48\text{ IN})(40.9\text{ IN})/(144\text{ IN}^2) = 866.78\text{ SQFT}$
 $(866.78\text{ SQFT} / 4373\text{ SQFT})100 = 19.82\%$
TOTAL PV AREA POPULATES 19.82 % OF TOTAL PLAN VIEW AREA AND IS WITHIN THE 33% REQUIREMENT.



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NOTE : INSTALLERS MAY MOVE PANELS IF NEEDED TO BE WITHIN THE MEANS OF THE SETBACKS.

LEGENDS

- UM - UTILITY METER
- MSP - MAIN SERVICE PANEL
- M - METER MAIN COMBO
- JB - JUNCTION BOX
- ACD - AC DISCONNECT
- PM - PRODUCTION METER
- CP - COMBINER PANEL
- FIRE SETBACK
- ROOF ACCESS POINT
- MICROINVERTER
- VENT, ATTIC FAN (ROOF OBSTRUCTION)
- CONDUIT



ADD : 612 FLORIDA AVENUE, PALM HARBOR, FL 34683, USA
CONTACT : 727 945 6060
LICENSE #EC13010036
#CBC1263094

Signature with Seal

DUSTIN GEIGER

399 SW MEADOW TERRACE , LAKE CITY,
FL 32024, USA

REVISIONS	DATE				
	DESCRIPTION				
REV	ENG.				

PERMIT DEVELOPER	
DATE	06/10/2022
DESIGNER	OSD
REVIEWER	

SHEET NAME
ROOF PLAN & MODULES

SHEET NUMBER
A-02

(ROOF #1)

MODULES - 19
ROOF TILT - 38°
ROOF AZIMUTH - 180°
TRUSSES SIZE - 2"X4" @ 24" O.C.

(ROOF #2)

MODULES - 7
ROOF TILT - 38°
ROOF AZIMUTH - 180°
TRUSSES SIZE - 2"X4" @ 24" O.C.

(ROOF #3)

MODULES -4
ROOF TILT - 38°
ROOF AZIMUTH - 90°
TRUSSES SIZE - 2"X4" @ 24" O.C.

(ROOF #4)

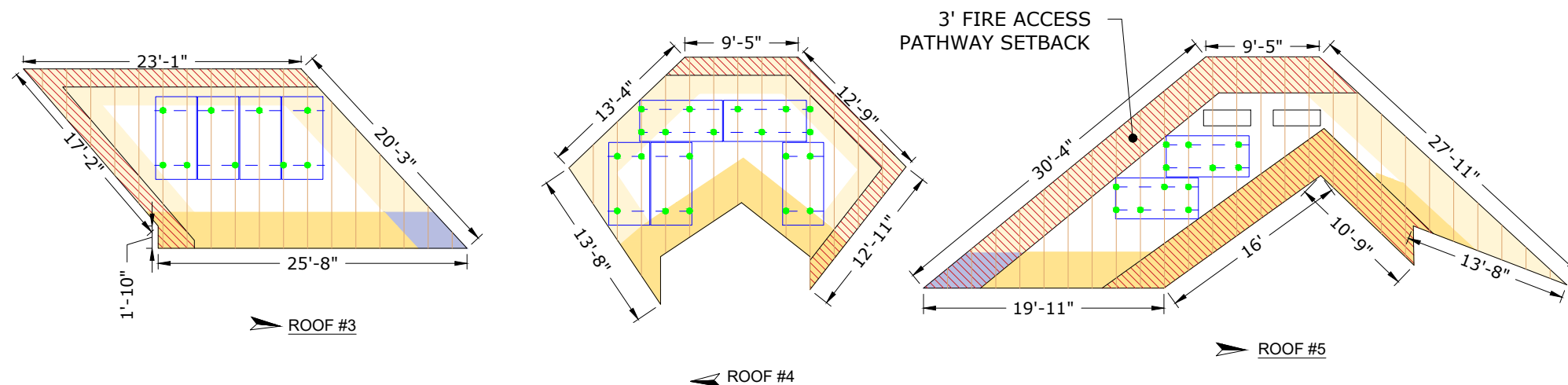
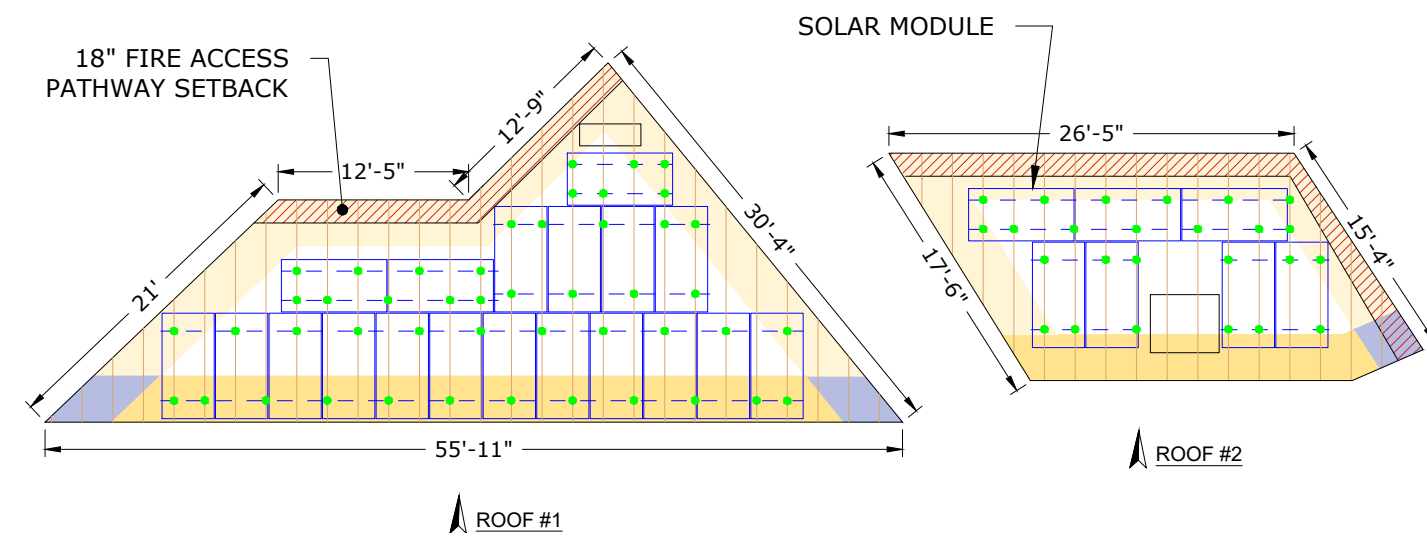
MODULES -5
ROOF TILT - 38°
ROOF AZIMUTH - 270°
TRUSSES SIZE - 2"X4" @ 24" O.C.

(ROOF #5)

MODULES -2
ROOF TILT - 38°
ROOF AZIMUTH - 90°
TRUSSES SIZE - 2"X4" @ 24" O.C.

TRUSS LOCATIONS ARE APPROXIMATE.
ACTUAL LOCATIONS MAY DIFFER AND
CONTRACTOR MAY NEED TO ADJUST MOUNT
LOCATIONS. IN NO CASE SHALL THE MOUNT
SPACING EXCEED "MAX. MOUNT SPACING"

WIND LOAD INFORMATION:
THIS SYSTEM HAS BEEN DESIGN TO MEET
THE REQUIREMENTS OF THE 7TH EDITION OF
THE FLORIDA BUILDING CODE AND USED
THE FOLLOWING DESIGN PARAMETERS:
ULTIMATE WIND SPEED: 120 MPH
EXPOSURE CATEGORY: B
RISK CATEGORY: II
MEAN ROOF HEIGHT: 25 FEET
ROOF SLOPE: 20-27°



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Signed 8/25/2022

LEGENDS

-  - FIRE SETBACK
 -  - VENT, ATTIC FAN (ROOF OBSTRUCTION)
 -  - PV ROOF ATTACHMENT
 -  - RAIL
 -  - RAFTERS / TRUSSES
 -  - METAL SEAM
- WIND ZONE 1
-  - WIND ZONE 1
 -  - WIND ZONE 1'
- WIND ZONE 2
-  - WIND ZONE (2)
 -  - WIND ZONE (2r)
 -  - WIND ZONE (2e)
 -  - WIND ZONE (2n)
- WIND ZONE 3
-  - WIND ZONE (3)
 -  - WIND ZONE (3r)
 -  - WIND ZONE (3e)



Signature with Seal

DUSTIN GEIGER

3399 SW MEADOW TERRACE , LAKE CITY ,
FL 32024, USA

REVISIONS		
REV	ENG.	DATE

PERMIT DEVELOPER	
DATE	06/10/2022
DESIGNER	OSD
REVIEWER	

SHEET NAME

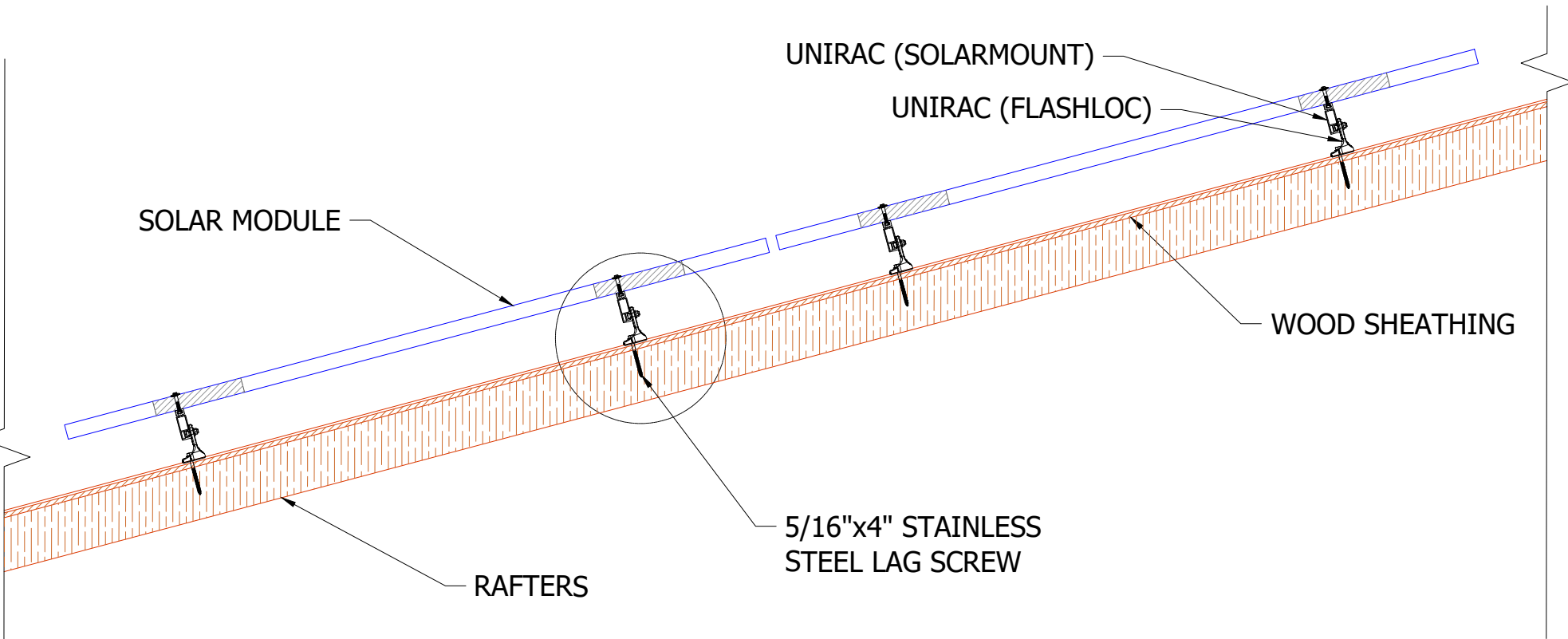
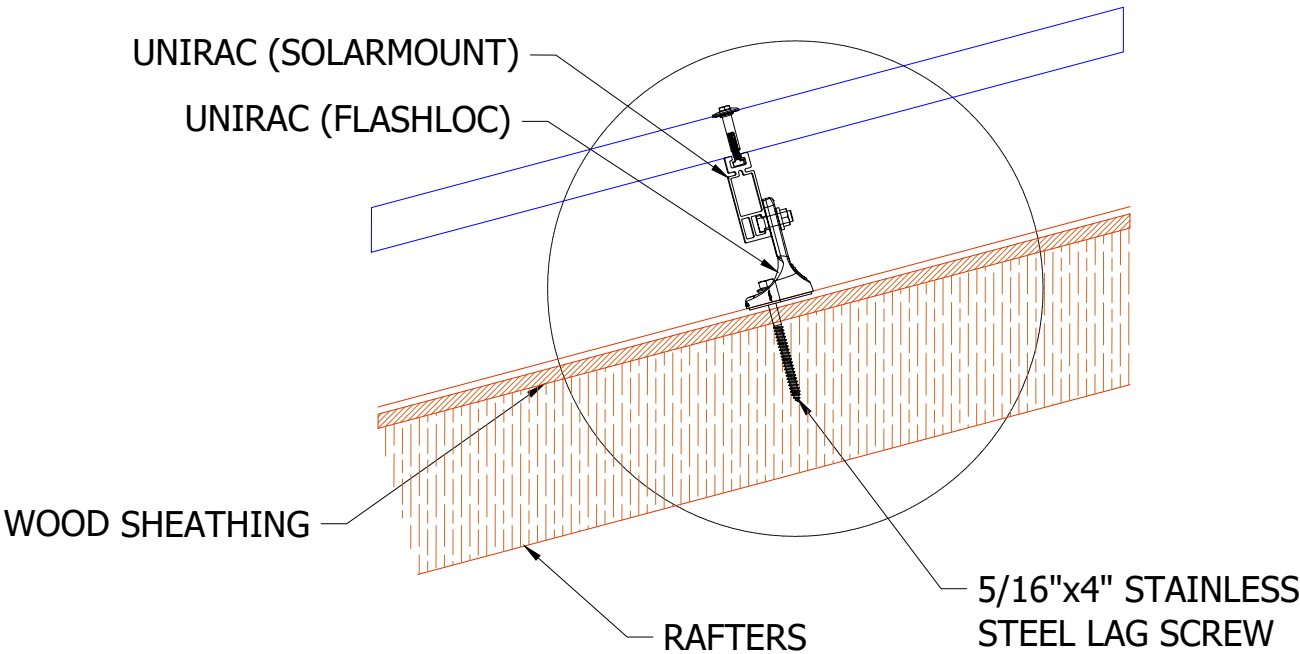
ARRAY LAYOUT

SHEET NUMBER

S-01

PHOTOVOLTAIC MODULE GENERAL NOTES:

- FOR PITCHED ROOF
- 1. APPLICABLE CODE: 2020 FLORIDA BUILDING CODE 7th ED. & ASCE 7-16
MINIMUM DESIGN LOADS FOR BUILDING AND OTHER STRUCTURES
 - 2. BOLT DIAMETER AND EMBEDMENT LENGTHS ARE DESIGNED PER NDS(2012)
REQUIREMENTS. ALL BOLT CAPACITIES ARE BASED ON A
WOOD ROOF TRUSS AS EMBEDMENT MATERIAL.
 - 3. ALL WIND DESIGN CRITERIA AND PARAMETERS ARE FOR HIP AND GABLE
RESIDENTIAL ROOFS, CONSIDERING FROM A 7° TO A MAXIMUM 27° (2/12 TO A
MAXIMUM 6/12 PITCH) ROOF IN SCHEDULE. ALL RESIDENTIAL ROOFS SHALL NOT
EXCEED 30'-0" MEAN ROOF HEIGHT.
 - 4. ROOF SEALANTS SHALL CONFORM TO ASTM C920 AND ASTM 6511.
 - 5. THIS SHEET REFLECTS STRUCTURAL CONNECTIONS ONLY. REFER TO
MANUFACTURER'S MANUAL FOR ALL ARCHITECTURAL, MECHANICAL,
ELECTRICAL AND SOLAR SPECS.
 - 6. ALL ALUMINIUM COMPONENTS SHALL BE ANODIZED ALUMINIUM 6105-T5 UNLESS
OTHERWISE NOTED.
 - 7. LAG BOLTS SHALL BE ASTM A276 STAINLESS STEEL UNLESS OTHERWISE NOTED.
 - 8. ALL RAILING AND MODULES SHALL BE INSTALLED PER
MANUFACTURER'S INSTRUCTIONS.
 - 9. I CERTIFY THAT THE INSTALLATION OF THE MODULES IS IN COMPLIANCE
WITH FBC:BUILDING CHAPTER 16 AND FRC:RESIDENTIAL CHAPTER 3.
BUILDING STRUCTURE WILL SAFELY ACCOMMODATE CALCULATED
WIND LATERAL AND UPLIFT FORCES AND EQUIPMENT DEAD LOADS.



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Signed 8/25/2022

STRUCTURAL ATTACHMENT DETAILS



Unicity
Solar Energy

ADD : 612 FLORIDA AVENUE, PALM
HARBOR, FL 34683, USA
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FL 32024, USA

REVISIONS	DATE				
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REV	ENGG				

PERMIT DEVELOPER	
DATE	06/10/2022
DESIGNER	OSD
REVIEWER	

SHEET NAME
STRUCTURAL ATTACHMENT DETAILS

SHEET NUMBER
S-02

MODULE SPECIFICATION	
MODEL NO.	APTOS DNA-144-MF26-440W
PEAK POWER	440W
RATED VOLTAGE (Vmpp)	41 V
RATED CURRENT (Impp)	10.74A
OPEN CIRCUIT VOLTAGE (Voc)	49.9V
SHORT CIRCUIT CURRENT (Isc)	11.33A

INVERTER SPECIFICATIONS	
MANUFACTURER	ENPHASE
MODEL NO.	IQ7A-72-2-US
MAX DC INPUT VOLTAGE	58 V
MAX OUTPUT POWER	349 VA
NOMINAL AC OUTPUT VOLTAGE	240 V
NOMINAL AC OUTPUT CURRENT	1.45 A

- NOTE:
- ALL ELECTRICAL EQUIPMENTS SHALL COMPLY WITH NEC CODE AND MAY CHANGE AS PER THE SITE CONDITION, NEC OR AHJ REQUIREMENTS.
 - LEGEND: (E) = EXISTING, (N) = NEW; APPLICABLE TO CONDUCTORS, CONDUITS, ELECECTRICAL ENCLOSURES, ETC.

- NOTE:
- SUBJECT PV SYSTEMS HAS BEEN DESIGNED TO MEET THE REQUIREMENTS OF THE NEC 2017, NFPA 70 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.
 - PROVIDE TAP BOX IN COMPLIANCE WITH 312.8 IF PANEL GUTTER SPACE IS INADEQUATE.

SOLAR ARRAY (16.28 KW-DC STC)

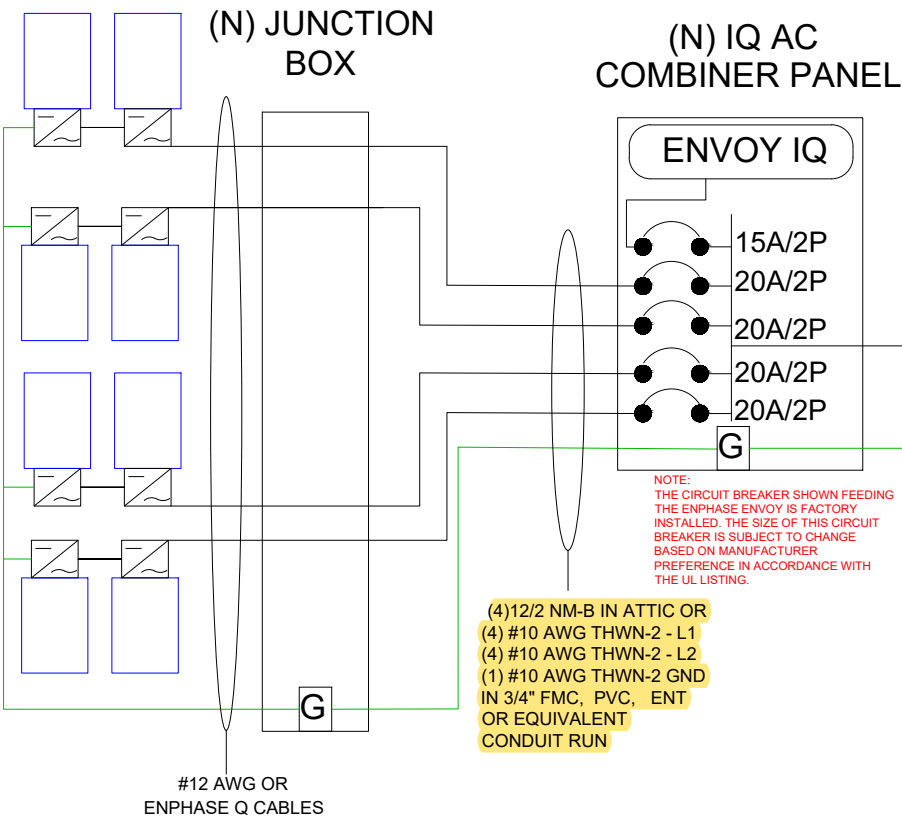
- (37) APTOS DNA-144-MF26-440W
(3) BRANCHES OF 9 MODULES
(1) BRANCH OF 10 MODULES

1 STRING OF
10 MODULES W/O
MICROINVERTERS

1 STRING OF
9 MODULES W/O
MICROINVERTERS

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PERMIT DEVELOPER	
DATE	06/10/2022
DESIGNER	OSD
REVIEWER	

SHEET NAME	
SINGLE LINE DIAGRAM	

SHEET NUMBER	
E-01	

ELECTRICAL CALCULATIONS:

1. CURRENT CARRYING CONDUCTOR

(A) BEFORE IQ COMBINER PANEL

AMBIENT TEMPERATURE = 34°C
CONDUIT INSTALLED AT MINIMUM DISTANCE OF 7/8 INCHES ABOVE ROOFNEC 310.15(B)(3)(c)
TEMPERATURE DERATE FACTOR - 0.96 ...NEC 310.15(B)(2)(a)
GROUPING FACTOR - 0.7...NEC 310.15(B)(3)(a)

CONDUCTOR AMPACITY
= (INV O/P CURRENT) x 1.25 / A.T.F / G.F ...NEC 690.8(B)
= [(10 x 1.45) x 1.25] / 0.96 / 0.7
= 26.97 A
SELECTED CONDUCTOR - #10 THWN-2 ...NEC 310.15(B)(16)

(B) AFTER IQ COMBINER PANEL
TEMPERATURE DERATE FACTOR - 0.96
GROUPING FACTOR - 1

CONDUCTOR AMPACITY
=(TOTAL INV O/P CURRENT) x 1.25 / 0.96 / 1 ...NEC 690.8(B)
=[(37x 1.45) x 1.25] /0.96 / 1
=69.86 A
SELECTED CONDUCTOR - #4 THWN-2 ...NEC 310.15(B)(16)

2. PV OVER CURRENT PROTECTION ..NEC 690.9(B)
=TOTAL INVERTER O/P CURRENT x 1.25
=(37 x 1.45) x 1.25 = 67.06 A
SELECTED OCPD = 70A

SELECTED EQUIPMENT GROUND CONDUCTOR (EGC) = #8 THWN-2 ... NEC 250.122(A)

MAX VOLTAGE DROP CALCULATION						
CABLE SIZE	CABLE DESCRIPTION	ONE WAY DISTANCE IN FEET (D)	BRANCH CURRENT (I)	RESISTANCE OF CONDUCTOR(R)	VOLTAGE (V)	% VOLTAGE DROP=(0.2*D*I*R)/V
#10 THWN-2	JUNCTION BOX TO COMBINER PANEL	20	53.65	1.24	240	1.11

ELECTRICAL NOTES

1. ALL EQUIPMENT TO BE LISTED BY UL OR OTHER NRTL AND LABELED FOR ITS APPLICATION.
2. COPPER CONDUCTORS SHALL BE RATED FOR 600 V AND 90 DEGREE C WET ENVIRONMENT. THE TERMINALS ARE RATED FOR 75 DEGREE C ROMEX/NM-B (NONMETALLIC-SHEATHED) CABLE MAY BE USED FOR BOTH EXPOSED AND CONCEALED WORK IN NORMALLY DRY LOCATIONS AT TEMPERATURES NOT TO EXCEED 90°C (WITH AMPACITY LIMITED TO THAT FOR 60°C CONDUCTORS) AS SPECIFIED IN THE NATIONAL ELECTRICAL CODE. VOLTAGE RATING FOR NM-B CABLE IS 600 VOLTS.
3. CONDUCTOR TERMINATION AND SPLICING AS PER NEC 110.14 WIRING, CONDUIT AND RACEWAYS MOUNTED ON ROOFTOPS SHALL BE ROUTED DIRECTLY TO AND LOCATED AS CLOSE AS POSSIBLE TO THE NEAREST RIDGE, HIP, OR VALLEY. SHALL BE ROUTED DIRECTLY TO, AND LOCATED AS CLOSE AS
4. WORKING CLEARANCES AROUND ALL NEW AND EXISTING ELECTRICAL EQUIPMENT SHALL COMPLY WITH NEC 110.265. WORKING CLEARANCES AROUND ALL NEW AND EXISTING
5. DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS CONTRACTOR SHALL FURNISH ALL NECESSARY OUTLETS, SUPPORTS, FITTINGS AND ACCESSORIES TO FULFILL APPLICABLE CODES AND STANDARDS.
6. WHERE SIZES OF JUNCTION BOXES, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, THE CONTRACTOR SHALL SIZE THEM ACCORDINGLY.
7. ALL WIRE TERMINATIONS SHALL BE APPROPRIATELY LABELED AND READILY VISIBLE.
8. MODULE GROUNDING CLIPS TO BE INSTALLED BETWEEN MODULE FRAME AND MODULE SUPPORT RAIL, PER THE GROUNDING CLIP MANUFACTURER'S INSTRUCTION.
9. MODULE SUPPORT RAIL TO BE BONDED TO CONTINUOUS COPPER G.E.C. VIA WEEB LUG OR ILS CO GBL-4DBT LAY-IN LUG.
10. THE POLARITY OF THE GROUNDED CONDUCTORS IS NEGATIVE.
11. UTILITY HAS 24-HR UNRESTRICTED ACCESS TO ALL PHOTOVOLTAIC SYSTEM COMPONENTS LOCATED AT THE SERVICE ENTRANCE.
12. MODULES CONFORM TO AND ARE LISTED UNDER UL 1703.
13. RACKING CONFORMS TO AND IS LISTED UNDER UL 2703.
14. CONDUCTORS EXPOSED TO SUNLIGHT SHALL BE LISTED AS SUNLIGHT RESISTANT PER NEC ARTICLE 300.6 (C) (1) AND ARTICLE 310.10 (D).
15. CONDUCTORS EXPOSED TO WET LOCATIONS SHALL BE SUITABLE FOR USE IN WET LOCATIONS PER NEC ARTICLE 310.10 (C)

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Wyssling Consulting, PLLC
76 N Meadowbrook Drive
Alpine UT 84004, COA # RY34912

Signed 8/25/2022



Unicity
Solar Energy

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CONTACT : 727 945 6060
LICENSE #EC13010036
#CBC1263094

Signature with Seal

DUSTIN GEIGER

399 SW MEADOW TERRACE ,LAKE CITY,
FL 32024, USA

REVISIONS	DATE				
	DESCRIPTION				
	REV	ENGG.			

PERMIT DEVELOPER	
DATE	06/10/2022
DESIGNER	OSD
REVIEWER	

SHEET NAME
WIRING CALCULATIONS

SHEET NUMBER
E-02

⚠️

WARNING

ELECTRIC SHOCK HAZARD

DO NOT TOUCH TERMINALS
TERMINALS ON BOTH LINE AND
LOAD SIDES MAY BE ENERGIZED
IN THE OPEN POSITION

LABEL LOCATION:
AC DISCONNECT, POINT OF INTERCONNECTION,
COMBINER PANEL
(PER CODE: NEC 690.13(B))

WARNING PHOTOVOLTAIC
POWER SOURCE

LABEL LOCATION:
CONDUIT RUNWAY
(PER CODE: NEC690.31(G)(3)(4))

⚠️

WARNING DUAL POWER SOURCE

SECOND SOURCE IS PHOTOVOLTAIC SYSTEM

LABEL LOCATION:
MAIN SERVICE DISCONNECT
(NEC 705.12(B)(3-4) & NEC 690.59)

ADHESIVE FASTENED SIGNS:

- ANSI Z535.4-2011 PRODUCT SAFETY SIGNS AND LABELS, PROVIDES GUIDELINES FOR SUITABLE FONT SIZES, WORDS, COLORS, SYMBOLS, AND LOCATION REQUIREMENTS FOR LABELS. NEC 110.21(B)(1)
- THE LABEL SHALL BE OF SUFFICIENT DURABILITY TO WITHSTAND THE ENVIRONMENT INVOLVED. NEC 110.21(B)(3)
- ADHESIVE FASTENED SIGNS MAY BE ACCEPTABLE IF PROPERLY ADHERED. VINYL SIGNS SHALL BE WEATHER RESISTANT. IFC 605.11.1.3

PHOTOVOLTAIC SYSTEM AC DISCONNECT

RATED AC OPERATING CURRENT 53.65 AMPS

AC NOMINAL OPERATING VOLTAGE 240 VOLTS

LABEL LOCATION:
AC DISCONNECT, INVERTER
(PER CODE: NEC 690.54)

WARNING

INVERTER OUTPUT CONNECTION DO NOT
RELOCATE THIS OVERCURRENT DEVICE

LABEL LOCATION:
POINT OF INTERCONNECTION, MAIN SERVICE DISCONNECT
(PER CODE: NEC 705.12 (B)(2)(c))
[Not required if panelboard is rated not less than sum of ampere ratings
of all overcurrent devices supplying it]

DATA PER PANEL

NOMINAL OPERATING AC VOLTAGE -	240	V
NOMINAL OPERATING AC FREQUENCY-	60	Hz
MAXIMUM AC POWER-	349	VA
MAXIMUM AC CURRENT-	1.45	A
MAXIMUM OVERCURRENT DEVICE RATING FOR AC MODULE PROTECTION PER CIRCUIT-	20	A

LABEL LOCATION:
COMBINER PANEL, AC DISCONNECT
(PER CODE: NEC 690.52)

PHOTOVOLTAIC SYSTEM
EQUIPPED WITH RAPID
SHUTDOWN

LABEL LOCATION:
AC DISCONNECT, DC DISCONNECT, POINT OF
INTERCONNECTION
(PER CODE: NEC 690.56(C)(3))

⚠️

WARNING

INVERTER OUTPUT CONNECTION
DO NOT RELOCATE THIS
OVERCURRENT DEVICE

EMERGENCY CONTACT

727-945-6060

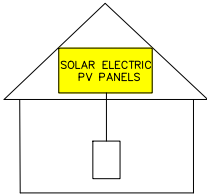
⚠️

WARNING

DEDICATED SOLAR PANELS DO
NOT CONNECT ANY OTHER LOADS

SOLAR PV SYSTEM EQUIPPED
WITH RAPID SHUTDOWN

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



IFC 605.11.3.1(1) & 690.56(C)(1)(a) Label for PV Systems that
Shut down the array and the conductors leaving the array

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Signed 8/25/2022



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399 SW MEADOW TERRACE ,LAKE CITY,
FL 32024, USA

REVISIONS	DATE				
	DESCRIPTION				
REV	ENG.				

PERMIT DEVELOPER	
DATE	06/10/2022
DESIGNER	OSD
REVIEWER	

SHEET NAME
SYSTEM LABELING

SHEET NUMBER
E-03

DNA™ 144

Solar for Innovators

Residential | Commercial

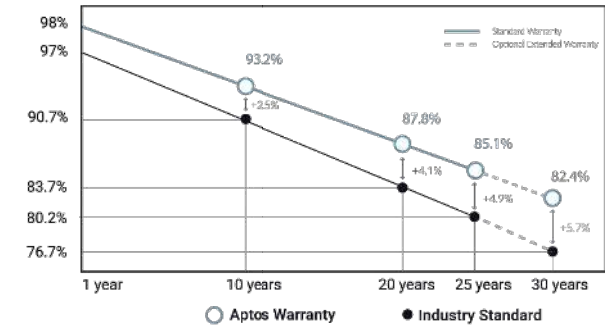
Designed & Engineered in Silicon Valley
440W | 435W | 430W

Our DNA™ Split Cell Series impressively combines advanced solar technologies to maximize performance. Our patented Dual Nano Absorber (DNA™) Technology allows the panel to operate at high-efficiencies in extreme temperatures. Contact our sales team today to learn more about our line of high-efficiency solar panels.

- ⚡ Patented DNA™ technology boosts power performance & module efficiency
- 🔌 Advanced split cell technology with 9 ultra-thin busbars allows for less resistance and more photon capture
- 🌿 Ideal solution for applications affected by shading
- 💡 All-black design for pristine aesthetics
No excessive silver bussing or ribbons
- ☁️ Robust product design is resilient in extreme weather. Up to 5400 Pa snow load and 210 mph wind speeds



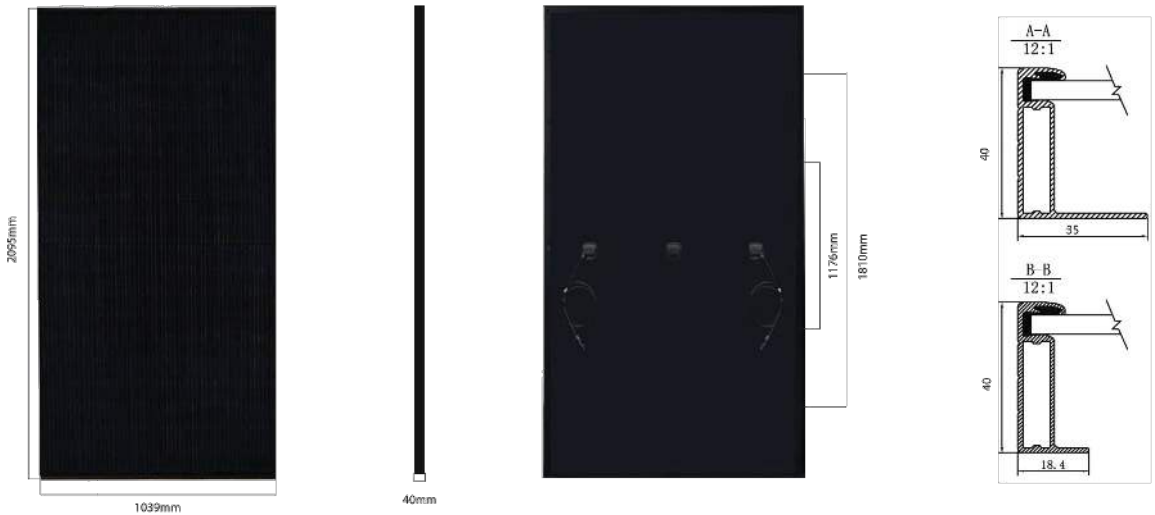
Linear Performance Warranty



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

DNA™ 144

Solar for Innovators



Electrical Specifications	DNA-144-MF26-440W	DNA-144-MF26-435W	DNA-144-MF26-430W
STCrated Output P _{mp} (W)	440W	435W	430W
Module Efficiency	20.21%	19.98%	19.76%
Open Circuit Voltage V _{oc} (V)	49.9	49.7	49.5
Short Circuit Current I _{sc} (A)	11.33	11.26	11.19
Rated Voltage V _{mp} (V)	41.0	40.8	40.6
Rated Voltage I _{mp} (A)	10.74	10.67	10.60

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

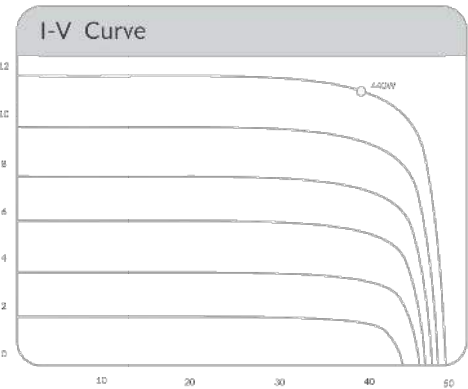
Temperature Coefficients	
Temperature Coefficients P _{mp}	-0.36%
Temperature Coefficients I _{sc}	+0.05%/°C
Temperature Coefficients V _{oc}	-0.29%/°C
Normal Operating Cell Temperature (NOCT)	44°C

Test Operating Conditions	
Maximum Series Fuse	20A
Maximum System Voltage	1,000 VDC (UL&IEC)
Maximum Load Capacity (Per UL 1703)	5400 PA Snow Load / 210mph Wind Rating
Fire Performance Class	Class C/Type 1

Packaging Configuration	
Number of Modules per Pallet	27
Number of Pallets per 40ft. Container	22
Pallet Dimensions	2110 X 1120 X 2365
Pallet Weight (kg)	680
Container Weight (kg)	14960

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

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	2095 X 1039 X 40mm
Output Cable	4mm2 (EU)12AWG,39.37in.(1200mm)
Weight	53.13lbs.(24.1kg)
Cable Length	1200mm
Encapsulant	POE



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REVISIONS	DATE	DESCRIPTION	REV	ENGG

PERMIT DEVELOPER	
DATE	06/10/2022
DESIGNER	OSD
REVIEWER	

SHEET NAME	MODULE DATASHEET
SHEET NUMBER	DS-01

Enphase
IQ 7A Microinverter



To learn more about Enphase offerings, visit enphase.com

The high-powered smart grid-ready **Enphase IQ 7A Micro™** dramatically simplifies the installation process while achieving the highest system efficiency for systems with 60-cell and 72-cell modules.

Part of the Enphase IQ System, the IQ 7A Micro integrates with the Enphase IQ Envoy™, Enphase IQ Battery™, and the Enphase Enlighten™ monitoring and analysis software.

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

High Power

- Peak output power 366 VA @ 240 VAC and 295 VA @ 208 VAC

Easy to Install

- Lightweight and simple
- Faster installation with improved, lighter two-wire cabling
- Built-in rapid shutdown compliant (NEC 2014, 2017 & 2020)

Efficient and Reliable

- Optimized for high powered 60-cell and 72-cell modules
- Highest CEC efficiency of 97%
- More than a million hours of testing
- Class II double-insulated enclosure
- UL listed

Smart Grid Ready

- Complies with advanced grid support, voltage and frequency ride-through requirements
- Envoy and Internet connection required
- Configurable for varying grid profiles
- Meets CA Rule 21 (UL 1741-SA)



Enphase IQ 7A Microinverter

INPUT (DC)	IQ7A-72-2-US	
Commonly used module pairings¹	295 W–460 W+	
Module compatibility	60-cell, 66-cell and 72-cell PV modules	
Maximum input DC voltage	58 V	
Power point tracking voltage range²	18 V–58 V	
Min/Max start voltage	33 V / 58 V	
Max DC short circuit current (module Isc)³	15 A	
Overvoltage class DC port	II	
DC port backfeed current	0 A	
PV array configuration	1 x 1 ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit	
OUTPUT (AC)	@ 240 VAC	@ 208 VAC
Peak output power	366 VA	295 VA
Maximum continuous output power	349 VA	290 VA
Nominal (L-L) voltage/range⁴	240 V / 211–264 V	208 V / 183–229 V
Maximum continuous output current	1.45 A (240 VAC)	1.39 A (208 VAC)
Nominal frequency	60 Hz	
Extended frequency range	47–68 Hz	
AC short circuit fault current over 3 cycles	5.8 Arms	
Maximum units per 20 A (L-L) branch circuit⁵	11 (240 VAC)	11 (208 VAC)
Overvoltage class AC port	III	
AC port backfeed current	18 mA	
Power factor setting	1.0	
Power factor (adjustable)	0.85 leading ... 0.85 lagging	
EFFICIENCY	@240 VAC	@208 VAC
CEC weighted efficiency	97.0 %	96.5%
MECHANICAL		
Ambient temperature range	-40°C to +60°C	
Relative humidity range	4% to 100% (condensing)	
Connector type: DC (IQ7A-72-2-US)	MC4	
Dimensions (HxWxD)	212 mm x 175 mm x 30.2 mm (without bracket)	
Weight	1.08 kg (2.38 lbs)	
Cooling	Natural convection — No fans	
Approved for wet locations	Yes	
Pollution degree	PD3	
Enclosure	Class II double-insulated, corrosion resistant polymeric enclosure	
Environmental category / UV exposure rating	NEMA Type 6 / outdoor	
FEATURES		
Communication	Power Line Communication (PLC)	
Monitoring	Enlighten Manager and MyEnlighten monitoring options Compatible with Enphase IQ Envoy	
Disconnecting means	The AC and DC connectors have been evaluated and approved by UL for use as the load-break disconnect required by NEC 690.	
Compliance	CA Rule 21 (UL 1741-SA) UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01 This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020, section 690.12 and C22.1-2015 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according manufacturer's instructions.	

1. No enforced DC/AC ratio. See the compatibility calculator at <https://enphase.com/en-us/support/module-compatibility>.
2. CEC peak power tracking voltage range is 38 V to 43 V.
3. Maximum continuous input DC current is 10.2A.
4. Voltage range can be extended beyond nominal if required by the utility.
5. Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

To learn more about Enphase offerings, visit enphase.com

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11-04-2021



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DUSTIN GEIGER

399 SW MEADOW TERRACE ,LAKE CITY,
FL 32024, USA

REVISIONS	DATE				
	DESCRIPTION				
	REV	ENG.			

PERMIT DEVELOPER	
DATE	06/10/2022
DESIGNER	OSD
REVIEWER	

SHEET NAME
INVERTER DATASHEET

SHEET NUMBER
DS-02

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

The **Enphase IQ Combiner 3™** with Enphase IQ Envoy™ consolidates interconnection equipment into a single enclosure and streamlines PV and storage installations by providing a consistent, pre-wired solution for residential applications. It offers up to four 2-pole input circuits and Eaton BR series busbar assembly.



Smart

- Includes IQ Envoy for communication and control
- Flexible networking supports Wi-Fi, Ethernet, or cellular
- Optional AC receptacle available for PLC bridge
- Provides production metering and optional consumption monitoring
- Supports Ensemble Communications Kit for communication with Enphase Encharge™ storage and Enphase Enpower™ smart switch

Simple

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

Reliable

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



To learn more about Enphase offerings, visit enphase.com



Enphase IQ Combiner 3

MODEL NUMBER	
IQ Combiner 3 X-IQ-AM1-240-3	IQ Combiner 3 with Enphase IQ Envoy™ printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and optional* consumption monitoring (+/- 2.5%).
ACCESSORIES and REPLACEMENT PARTS (not included, order separately)	
Enphase Mobile Connect™ CELLMODEM-03 (4G/12-year data plan) CELLMODEM-01 (3G/5-year data plan) CELLMODEM-M1 (4G based LTE-M/5-year data plan)	Plug and play industrial grade cellular modem with data plan for systems up to 60 microinverters. (Available in the US, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.)
Consumption Monitoring* CT CT-200-SPLIT	Split core current transformers enable whole home consumption metering (+/- 2.5%).
* Consumption monitoring is required for Enphase Storage Systems	
Ensemble Communications Kit COMMS-KIT-01	Installed at the IQ Envoy. For communications with Enphase Encharge™ storage and Enphase Enpower™ smart switch. Includes USB cable for connection to IQ Envoy or Enphase IQ Combiner™ and allows wireless communication with Encharge and Enpower.
Circuit Breakers BRK-10A-2-240 BRK-15A-2-240 BRK-20A-2P-240	Supports Eaton BR210, BR215, BR220, BR230, BR240, BR250, and BR260 circuit breakers. Circuit breaker, 2 pole, 10A, Eaton BR210 Circuit breaker, 2 pole, 15A, Eaton BR215 Circuit breaker, 2 pole, 20A, Eaton BR220
EPLC-01	Power line carrier (communication bridge pair), quantity - one pair
XA-SOLARSHIELD-ES	Replace the default solar shield with this Ensemble Combiner Solar Shield to match the look and feel of the Enphase Enpower™ smart switch and the Enphase Encharge™ storage system
XA-PLUG-120-3	Accessory receptacle for Power Line Carrier in IQ Combiner 3 (required for EPLC-01)
XA-ENV-PCBA-3	Replacement IQ Envoy printed circuit board (PCB) for Combiner 3
ELECTRICAL SPECIFICATIONS	
Rating	Continuous duty
System voltage	120/240 VAC, 60 Hz
Eaton BR series busbar rating	125 A
Max. continuous current rating (output to grid)	65 A
Max. fuse/circuit rating (output)	90 A
Branch circuits (solar and/or storage)	Up to four 2-pole Eaton BR series Distributed Generation (DG) breakers only (not included)
Max. continuous current rating (input from PV)	64 A
Max. total branch circuit breaker rating (input)	80 A of distributed generation / 95 A with IQ Envoy breaker included
Envoy breaker	10A or 15A rating GE Q-line/Siemens Type QP /Eaton BR series included
Production Metering CT	200 A solid core pre-installed and wired to IQ Envoy
MECHANICAL DATA	
Dimensions (WxHxD)	49.5 x 37.5 x 16.8 cm (19.5" x 14.75" x 6.63"). Height is 21.05" (53.5 cm with mounting brackets).
Weight	7.5 kg (16.5lbs)
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/r
Ethernet	Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included)
Cellular	CELLMODEM-M1 4G based LTE-M cellular modem (not included). Note that an Enphase Mobile Connect cellular modem is required for all Ensemble installations.
COMPLIANCE	
Compliance, Combiner	UL 1741, CAN/CSA C22.2 No. 107.1, 47 CFR, Part 15, Class B, ICES 003 Production metering: ANSI C12.20 accuracy class 0.5 (PV production)
Compliance, IQ Envoy	UL 60601-1/CANCSA 22.2 No. 61010-1

To learn more about Enphase offerings, visit enphase.com

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DUSTIN GEIGER

399 SW MEADOW TERRACE ,LAKE CITY ,
FL 32024, USA

REVISIONS	DATE				
	DESCRIPTION				
	REV	ENG.			

PERMIT DEVELOPER	
DATE	06/10/2022
DESIGNER	OSD
REVIEWER	

SHEET NAME
COMBINER BOX DATASHEET

SHEET NUMBER
DS-03

FLASH LOC

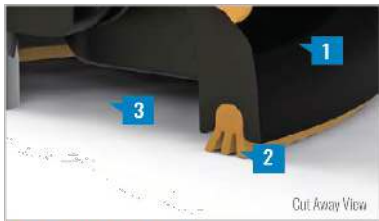


FLASHLOC is the ultimate attachment for composition shingle and rolled comp roofs. The all-in-one mount installs fast — no kneeling on hot roofs to install flashing, no prying or cutting shingles, no pulling nails. Simply drive the lag bolt and inject sealant into the base. **FLASHLOC**'s patented TRIPLE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



PROTECT THE ROOF

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



LOC OUT WATER

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



HIGH-SPEED INSTALL

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

FASTER INSTALLATION. 25-YEAR WARRANTY.

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

FLASH LOC

INSTALLATION GUIDE



PRE-INSTALL

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

At each location, drill a 7/32" pilot hole. Clean roof surface of dirt, debris, snow, and ice, then fill pilot hole with sealant.

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



STEP 1: SECURE

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

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



STEP 2: SEAL

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

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

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

Use only provided sealant.

FASTER INSTALLATION. 25-YEAR WARRANTY.

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REVIEWER	

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ATTACHMENT DATASHEET
SHEET NUMBER
DS-04

