
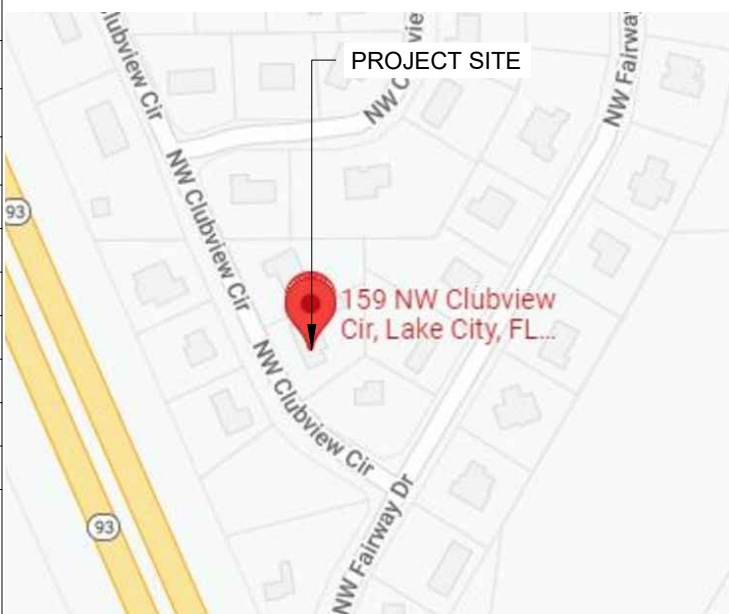



LEACH RESIDENCE  
11.600 kW, 10.121 kW AC PV SYSTEM  
159 NORTHWEST CLUBVIEW CIRCLE  
LAKE CITY, FL 32055

PROJECT DESCRIPTION:	CODES AND STANDARDS	OWNER	HOUSE PHOTO	
<p>29x400 VSUN: VSUN400-108M-BB (400W) MODULES ROOF MOUNTED SOLAR PHOTOVOLTAIC MODULES</p> <p>SYSTEM SIZE: 11.600 kW DC STC,10.121 kW AC ARRAY AREA #1: 336.14 SQ. FT. ARRAY AREA #2: 336.14 SQ. FT.</p> <p><u>EQUIPMENT SUMMARY</u> 29 VSUN: VSUN400-108M-BB (400W) MODULES 29 ENPHASE IQ7A-72-2-US MICROINVERTERS</p> <p>RACKING: SNAPNRACK ULTRA RAIL UR-40 ATTACHMENT: S-5! PROTEA</p> <p>DESIGN CRITERIA: WIND SPEED (ULT): 120 MPH WIND SPEED (ASD): 93 MPH RISK CATEGORY: II EXPOSURE: B</p>	<p><u>GOVERNING CODES :</u> FLORIDA RESIDENTIAL CODE, 7TH EDITION 2020 (FRC) FLORIDA PLUMBING CODE, 7TH EDITION 2020 (FPC) FLORIDA BUILDING CODE, 7TH EDITION 2020 EDITION (FBC) FLORIDA MECHANICAL CODE, 7TH EDITION 2020 (FMC) NATIONAL ELECTRICAL CODE 2017 (NEC) FLORIDA FIRE PREVENTION CODE, 7TH EDITION 2020 (FFPC) ASCE 7-16</p>	LEACH, DARRELL		
		<u>INSTALLER</u>		Power Production Management 625 NW 8th Ave Gainesville, FL 32601 United States PH: (352) 263-0766
		<u>ENGINEER</u>		Castillo Engineering Services LLC 620 N. Wymore Road, Suite 250,Maitland, FL 32751 TEL: (407) 289-2575 Ermocrates E. Castillo License#: FL PE 52590
		<u>SHEET INDEX</u>		
<u>STRUCTURAL CERTIFICATION:</u>	<u>ELECTRICAL CERTIFICATION:</u>	SHEET #	SHEET DESCRIPTION	<u>VICINITY MAP</u> 
		G-01	COVER SHEET	
		A-00	NOTES AND DESCRIPTION	
		A-01	ROOF PLAN	
		S-01	MODULE LAYOUT	
		S-01.1	PARTIAL PRESSURE AND MODULES EXPOSURE	
		S-02	ATTACHMENT DETAIL	
		S-02.1	STRUCTURE CALCULATION	
		E-01	ELECTRICAL LINE DIAGRAM	
		E-02	WIRING CALCULATIONS	
		E-03	SYSTEM LABELING	
		DS-01-05	DATA SHEETS	

<div style="display: flex; justify-content: space-between; align-items: center;"><div><h1 style="margin: 0;">Castillo Engineering</h1><p style="margin: 0;">SOLAR DONE RIGHT™</p></div><div style="font-size: 4em; color: #C00000; font-weight: bold; line-height: 1;">C</div></div> <div style="text-align: center; margin-top: 10px;"><b>CASTILLO ENGINEERING SERVICES, LLC</b> COA # 28345 620 N. WYMORE ROAD, SUITE 250, MAITLAND, FL 32751 TEL: (407) 289-2575 ERMOCRATES E. CASTILLO - FL PE 52590</div>		
<b>COPYRIGHTED BY CASTILLO ENGINEERING SERVICES, LLC</b>		
<b>REVISIONS</b>		
DESCRIPTION	DATE	REV
<b>PROJECT INSTALLER</b>		
<div style="display: flex; align-items: center; justify-content: center;"><div style="font-size: 4em; color: #00FF00; font-weight: bold; line-height: 1;">P</div><div style="margin: 0 10px;">OWER™</div></div> <p style="text-align: center; margin-top: 5px;">PRODUCTION MANAGEMENT, INC.</p>		
<div style="display: flex; align-items: center; justify-content: center;"><div style="text-align: center;"><p style="margin: 0;">Signature with Digital signed by: Ermocrates E Castillo Date: 2022.09.27 15:21:00</p></div><div style="margin-left: 20px; text-align: center;"><p style="margin: 0;">PROJECT NAME</p><div style="display: flex; justify-content: space-between; align-items: center; width: 100%;"><div style="writing-mode: vertical-rl; transform: rotate(180deg); color: #0070C0; font-weight: bold; font-size: 1.5em;">LEACH RESIDENCE</div><div style="writing-mode: vertical-rl; transform: rotate(180deg); color: #000000; font-weight: bold; font-size: 1.2em;">159 NORTHWEST CLUBVIEW CIRCLE LAKE CITY, FL 32055</div></div></div></div>		
<b>SHEET NAME</b>		
<b>COVER SHEET</b>		
<b>SHEET SIZE</b>		
<b>ANSI B</b>		
<b>11" X 17"</b>		
<b>SHEET NUMBER</b>		
<b>G-01</b>		

Symbols:

Section.....

Sheet where section is located

Elevation .....

Detail ID Letter

Sheet where section is located

Detail .....

Detail ID Letter

Sheet where section is located

Detail .....

Detail ID Letter

Area to be enlarged

Sheet where section is located

Keyed Notes .....

1

Keyed note designation on applicable sheet

Ground Terminal .....

Grounding Point/rod....

Solar Panel .....

or

00

Module with Source Circuit number

Combiner Box .....

CB

AC Disconnect .....

ACD

Main Distribution Panel .....

MDP

Fuse .....

Overcurrent Breaker ..

Inverter .....

Transformer .....

Automatic .....

ATS

Transfer Switch

Vent, Attic fan (Roof obstruction)

PV Roof Attachment

Trusses

Conduit

Fire Access

Abbreviations:

ACD	AC Disconnect
AC	Alternating Current
APPROX	Approximate
AWG	American Wire Gauge
BAT	Battery
CB	Combiner Box
DC	Direct Current
DISC	Disconnect
(E)	Existing
EL	Elevation
EQ	Equal
GP	Generation Panel
JB	Junction Box
MCB	Main Combiner Box
MFR	Manufacturer
MID	Microgrid Interconnect Device
MIN	Minimum
MISC	Miscellaneous
MDP	Main Distribution Panel
(N)	New
NAVD	North American Vertical datum
OCPD	Over Current Protection Device
POCC	Point Of Common Coupling
PV	Photovoltaic
SF	Squarefoot/feet
STC	Standard Test Conditions
SD	Soladeck
TBD	To Be Determined
TYP	Typical
UNO	Unless Noted Otherwise
UM	Utility meter
VIF	Verify In Field
WP	Weather Proof

System Description

This system is a grid-tied, PV system, with PV generation consisting of 29 VSUN: VSUN400-108M-BB (400W) MODULES with a combined STC rated dc output power of 11600 W. The modules are connected into 29 ENPHASE IQ7A-72-2-US MICROINVERTERS. The inverter has electronic maximum power point tracking to maximize energy captured by the PV modules. The inverter also has an internal ground fault detection and interruption device that is set to disconnect the array in the event that a ground fault that exceeds one ampere should occur. The inverter has DC and AC disconnect integrated system and labels are provided as required by the *National Electrical Code*

When the sun is shining, power from the PV array is fed into the inverter, where it is converted from DC to AC. The inverter output is then used to contribute to the power requirements of the occupancy. If PV power meets the requirements of the loads of the occupancy, any remaining PV power is sold back to the utility. When utility power is available, but PV power is not available, building loads are supplied by the utility.

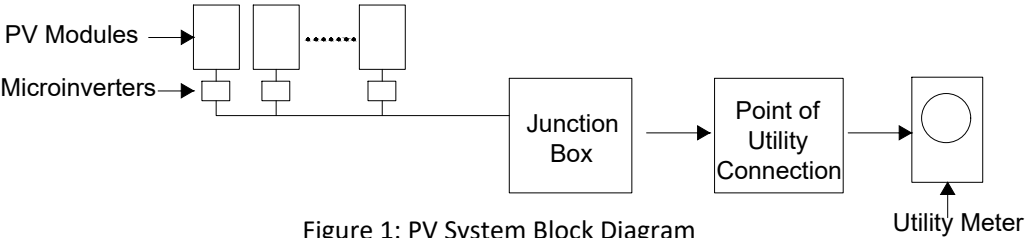


Figure 1: PV System Block Diagram

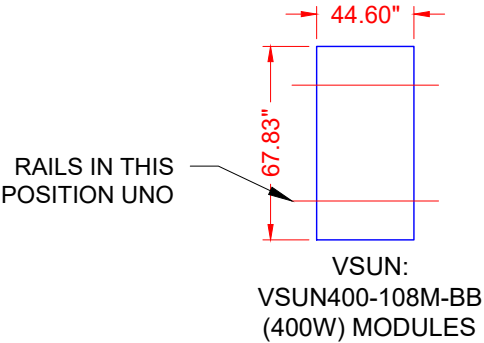
The inverter meets the requirements of IEEE 1547 and UL 1741.

**FALL PROTECTION:**  
ANCHORAGES USED FOR ATTACHMENT OF PERSONAL FALL ARREST EQUIPMENT MUST BE INDEPENDENT OF ANY ANCHORAGE BEING USED TO SUPPORT OR SUSPEND PLATFORMS, AND CAPABLE OF SUPPORTING AT LEAST 5,000 POUNDS PER EMPLOYEE ATTACHED, OR MUST BE DESIGNED AND USED AS FOLLOWS:

- AS PART OF A COMPLETE PERSONAL FALL ARREST SYSTEM WHICH MAINTAINS A SAFETY FACTOR OF AT LEAST TWO.
- UNDER THE SUPERVISION OF A QUALIFIED PERSON

**ADDITIONAL INFORMATION**

- 29 CFR 1926 SUBPART M, FALL PROTECTION. OSHA STANDARD.
- 1926.502, FALL PROTECTION SYSTEMS CRITERIA AND PRACTICES
- 1926.502(D)(15)



ALLOWABLE DESIGN PRESSURE	PSF
DOWN PRESSURE	75.0
UPLIFT PRESSURE, 2 RAILS	33.6

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ERMOCRATES E. CASTILLO - FL PE 52590

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REVISIONS		
DESCRIPTION	DATE	REV

PROJECT INSTALLER

**POWER**  
PRODUCTION MANAGEMENT, INC.

Digitally signed by:  
Ermocrates E. Castillo  
Date: 2022.09.27 15:21:00

PROJECT NAME

LEACH RESIDENCE

159 NORTHWEST CLUBVIEW CIRCLE  
LAKE CITY, FL 32055

SHEET NAME

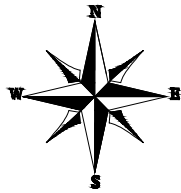
NOTES AND DESCRIPTION

SHEET SIZE

ANSI B  
11" X 17"

SHEET NUMBER

A-00



NORTHWEST CLUBVIEW CIRCLE

1" PVC CONDUIT RUN  
(N) SOLADECK  
ROOF #1  
(16) VSUN: VSUN400-108M-BB  
(400W) MODULES  
(N) (29) ENPHASE IQ7A-72-2-US  
MICROINVERTERS

EXISTING  
DRIVEWAY

1-STORY  
HOUSE

SHED

ROOF #2  
(13) VSUN: VSUN400-108M-BB  
(400W) MODULES

(E) ENPHASE IQ COMBINER BOX  
(E) MAIN SERVICE DISCONNECT/  
MAIN DISTRIBUTION PANEL-B  
(N) ALTERNATIVE POWER SOURCE  
AC DISCONNECT/ RAPID SHUTDOWN  
(E) SERVICE POINT AND  
UTILITY METERING

SCALE: 3/64" = 1'-0"

# 1 ROOF PLAN WITH PROPERTY LINES

A-01

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2022.09.27  
15:21:01

PROJECT NAME

**LEACH RESIDENCE**  
159 NORTHWEST CLUBVIEW CIRCLE  
LAKE CITY, FL 32055

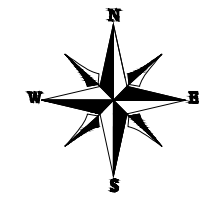
SHEET NAME  
ROOF PLAN

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

SHEET NUMBER  
**A-01**

MODULE TYPE, DIMENSIONS & WEIGHT

NUMBER OF MODULES = 29 MODULES  
MODULE TYPE = VSUN: VSUN400-108M-BB (400W) MODULES  
WEIGHT = 48.06 LBS / 21.8 KG.  
MODULE DIMENSIONS = 67.83" x 44.60" = 21.01 SF  
UNIT WEIGHT OF ARRAY = 2.29 PSF



ROOF	ROOF TYPE	ARRAY AREA (Sq. Ft.)	ROOF AREA (Sq. Ft.)	ROOF AREA COVERED BY ARRAY (%)	TILT	AZIMUTH	SEAM SPACING
#1	METAL ROOF	336.14	582.19	57.74	18.4°	244°	9" O.C.
#2	METAL ROOF	336.14	919.80	36.54	18.4°	244°	9" O.C.
TOTAL PLAN VIEW		609.25	4064.36	14.99			

GENERAL INSTALLATION PLAN NOTES:

- 1) STRUCTURE PROPERTIES
- ROOF FINISH: METAL
  - MEAN ROOF HIEGHT: 15 FT.
  - ROOF SLOPES: 18.4°
  - CONVENTIONAL FRAMING SEAMS
  - WOOD SPECIES: SYP.
  - SEAM SPACING: 12" O.C.
  - ROOF SHEATHING: 7/16" OSB

2) ROOF ATTACHMENTS TO SYP. SEAMS SHALL BE INSTALLED AS SHOWN IN SHEET S-02 AND AS FOLLOWS FOR EACH WIND ZONE::

WIND ZONES	NON - EXPOSED MODULES		EDGE / EXPOSED MODULES	
	SPAN	CANTILEVER	SPAN	CANTILEVER
ZONE 1	6'-9"	1'-4"	6'-9"	1'-4"
ZONE 1'	X	X	X	X
ZONE 2e	6'-9"	1'-4"	6'-9"	1'-4"
ZONE 2n	6'-9"	1'-4"	5'-3"	1'-4"
ZONE 2r	6'-9"	1'-4"	5'-3"	1'-4"
ZONE 3e	6'-9"	1'-4"	5'-3"	1'-4"
ZONE 3r	6'-9"	1'-4"	4'-1"	1'-4"

SEE SHEET S-02.1 FOR SUPPORTING CALCULATIONS.

3) THE EXISTING ROOF AND STRUCTURE IS IN GOOD CONDITION AND WILL NOT BE ADVERSELY AFFECTED BY THE ADDITIONAL LOADS IMPOSED BY THE PV INSTALLATION. THE INSTALLER OR CONTRACTOR IS TO FIELD VERIFY AND REPORT TO THE ENGINEER IF THERE ARE ANY DISCREPANCIES BETWEEN THE PLANS AND IN FIELD CONDITIONS

4) FIRE SETBACK TO BE 3' AMD 18" FROM RIDGES AND EDGES, AND 18" EACH WAY FROM HIPs AND VALLEYS PER NFPA 1, 11.12.2.

\* I CERTIFY THAT THE INSTALLATION OF THE MODULES IS IN COMPLIANCE WITH FBC: RESIDENTIAL 2020 7th ED. CHAPTER 3. BUILDING STRUCTURE WILL SAFELY ACCOMMODATE WIND LATERAL AND UPLIFT FORCES AND EQUIPMENT DEAD LOADS. \*

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DESCRIPTION	DATE	REV

PROJECT INSTALLER

POWER  
PRODUCTION MANAGEMENT, INC.

Signature with Seal  
No. 52590  
ERMOCRATES E. CASTILLO  
Professional Engineer  
FLORIDA  
12/2018 - 12/2024

Digitally signed by:  
Ermocrates E. Castillo  
Date: 2022.09.27 15:21:01

PROJECT NAME

LEACH RESIDENCE

159 NORTHWEST CLUBVIEW CIRCLE  
LAKE CITY, FL 32055

SHEET NAME

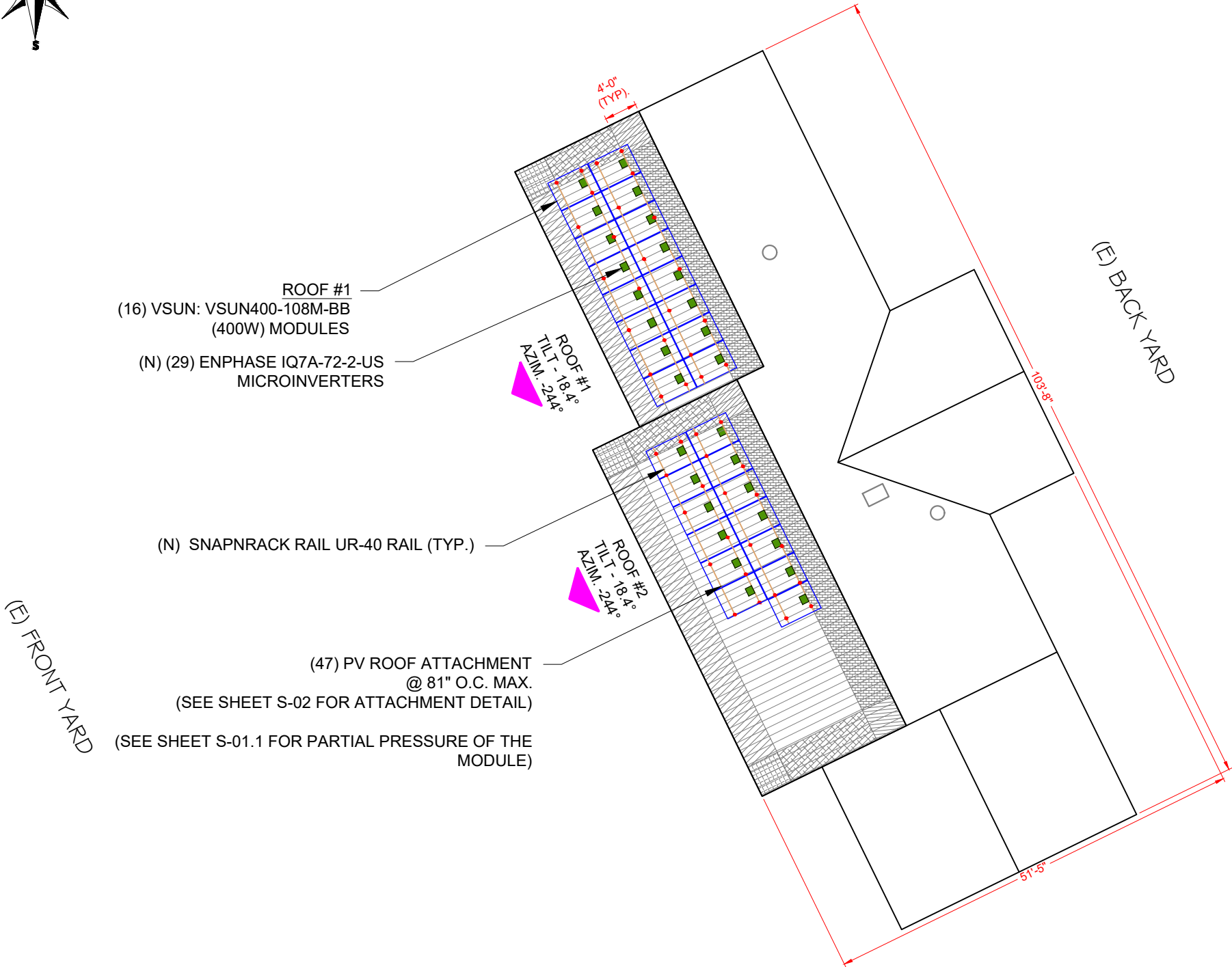
MODULE LAYOUT

SHEET SIZE

ANSI B  
11" X 17"

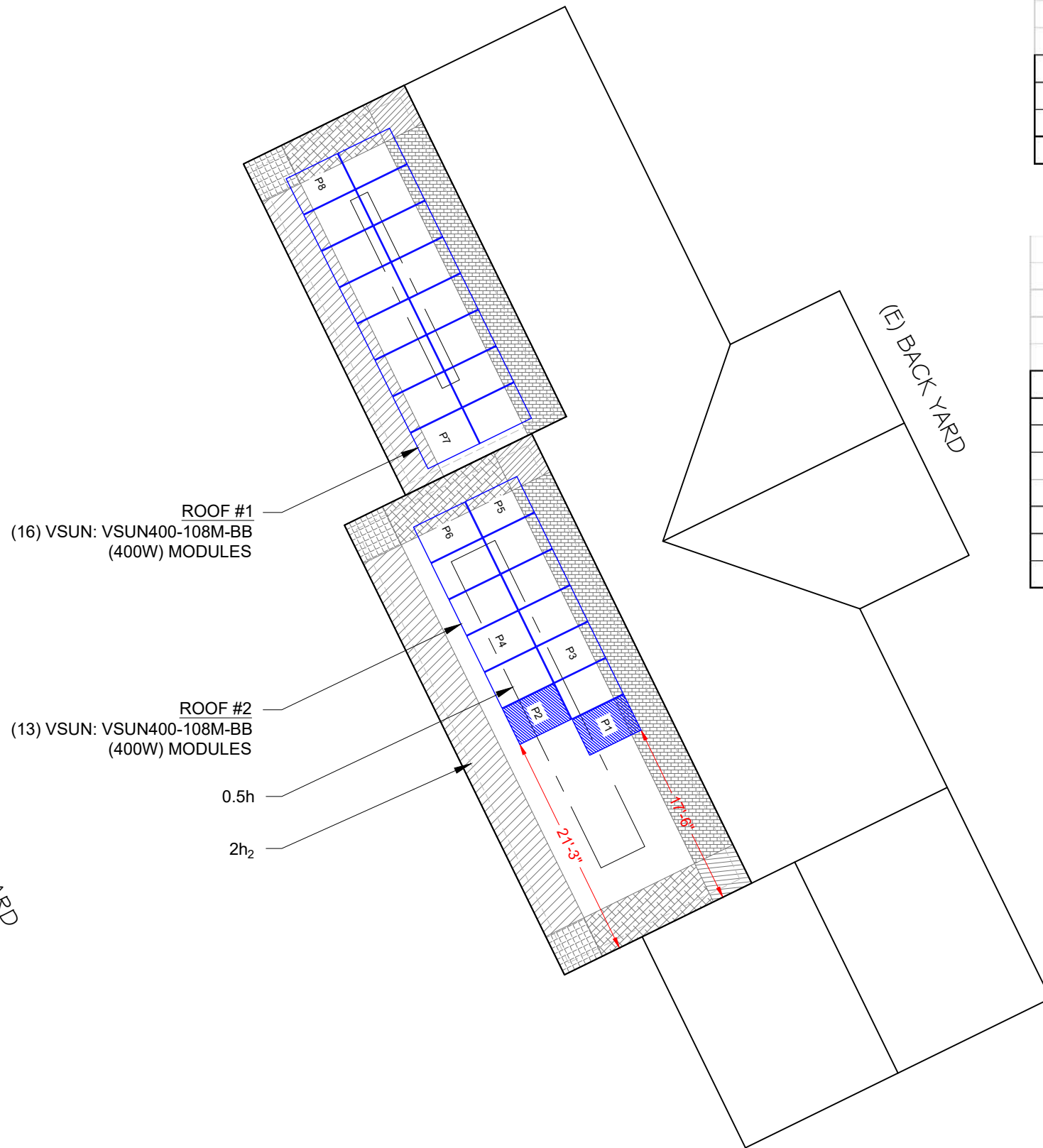
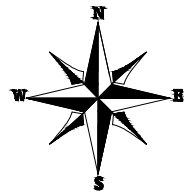
SHEET NUMBER

S-01



LEGEND

- WIND ZONE 1 (TYP)
- WIND ZONE 2e (TYP)
- WIND ZONE 2n (TYP)
- WIND ZONE 2r (TYP)
- WIND ZONE 3r (TYP)
- WIND ZONE 3e (TYP)



	1	1'	2e	2n	2r	3e	3r	
	21.20	0.00	21.20	27.50	27.50	27.50	32.70	
			Module Size		21.08	Sqft.		
Exposed modules								Partial
	1	1'	2e	2n	2r	3e	3r	Pressure
P1	17.20	0.00	0.00	0.00	3.88	0.00	0.00	22.36
P2	21.08	0.00	0.00	0.00	0.00	0.00	0.00	21.20

ALLOWABLE MODULE UPLIFT PRESSURE 2 RAILS: 33.6 PSF  
ALLOWABLE MODULE DOWNLIFT PRESSURE 2 RAILS: 75 PSF

	1	1'	2e	2n	2r	3e	3r	
	16.00	0.00	16.00	18.30	18.30	18.30	21.80	
			Module Size		21.08	Sqft.		
Non-Exposed modules								Partial Pressure
	1	1'	2e	2n	2r	3e	3r	
P3	17.20	0.00	0.00	0.00	3.88	0.00	0.00	16.42
P4	21.08	0.00	0.00	0.00	0.00	0.00	0.00	16.00
P5	12.62	0.00	0.00	4.58	2.85	0.00	1.03	17.09
P6	15.46	0.00	0.00	5.62	0.00	0.00	0.00	16.61
P7	17.10	0.00	3.98	0.00	0.00	0.00	0.00	16.00
P8	12.54	0.00	2.92	4.55	0.00	1.06	0.00	16.61

ALLOWABLE MODULE UPLIFT PRESSURE 2 RAILS: 33.6 PSF  
ALLOWABLE MODULE DOWNLIFT PRESSURE 2 RAILS: 75 PSF

#### LEGEND

- EXPOSED MODULE
- EDGE MODULE
- NON- EXPOSED MODULE
- MISSING MODULE
- MIN. MODULE EDGE DISTANCE LINE
- MODULE EXPOSURE LINE
- WIND ZONE 1 (TYP)
- WIND ZONE 2e (TYP)
- WIND ZONE 2n (TYP)
- WIND ZONE 2r (TYP)
- WIND ZONE 3r (TYP)
- WIND ZONE 3e (TYP)

NOTE : PARTIAL PRESSURES OF THE WIND ZONES ON ALL MODULES HAVE BEEN VERIFIED AND ARE WITHIN THE ALLOWABLE PER THE MANUFACTURER SPECIFICATION, INSTALLER SHOULD FOLLOW THE LAYOUT TO AVOID HIGHER ZONAL PARTIAL PRESSURES. ANY CHANGES IN LAYOUT SHOULD BE REPORTED BACK TO THE ENGINEER OF RECORD.

**Castillo Engineering**  
SOLAR DONE RIGHT®  
CASTILLO ENGINEERING SERVICES, LLC  
OOA# 28345  
620 N. WYMORE ROAD, SUITE 250,  
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REVISIONS		
DESCRIPTION	DATE	REV

PROJECT INSTALLER

**POWER**  
PRODUCTION MANAGEMENT, INC.

Digitally signed by:  
Ermocrates E. Castillo  
Date: 2022.09.27 15:21:02

PROJECT NAME

**LEACH RESIDENCE**  
159 NORTHWEST CLUBVIEW CIRCLE  
LAKE CITY, FL 32055

SHEET NAME  
PARTIAL PRESSURE AND  
MODULES EXPOSURE

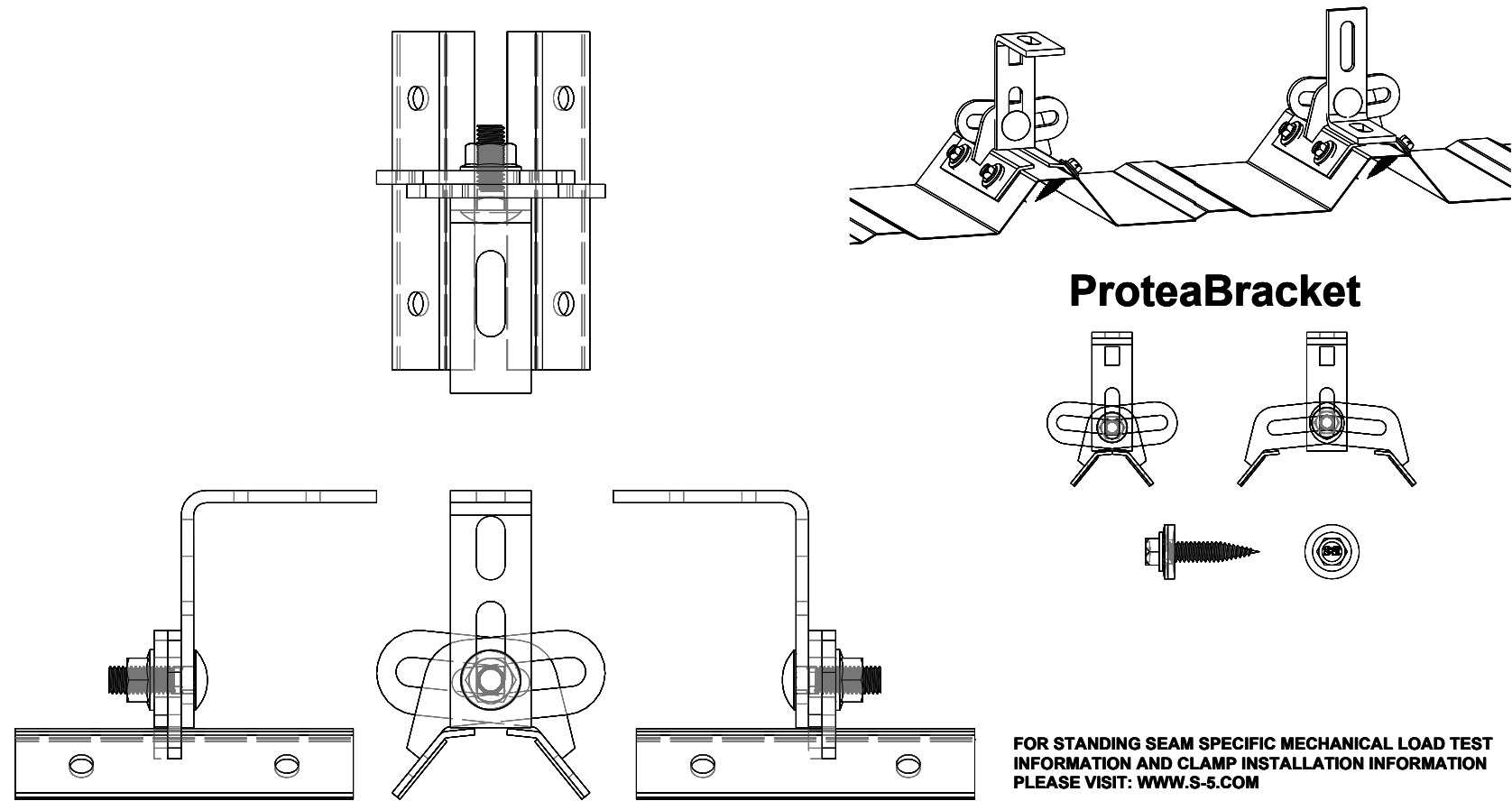
SHEET SIZE  
**ANSI B**  
11" X 17"

SHEET NUMBER  
**S-01.1**

## 1 PARTIAL PRESSURE AND MODULES EXPOSURE

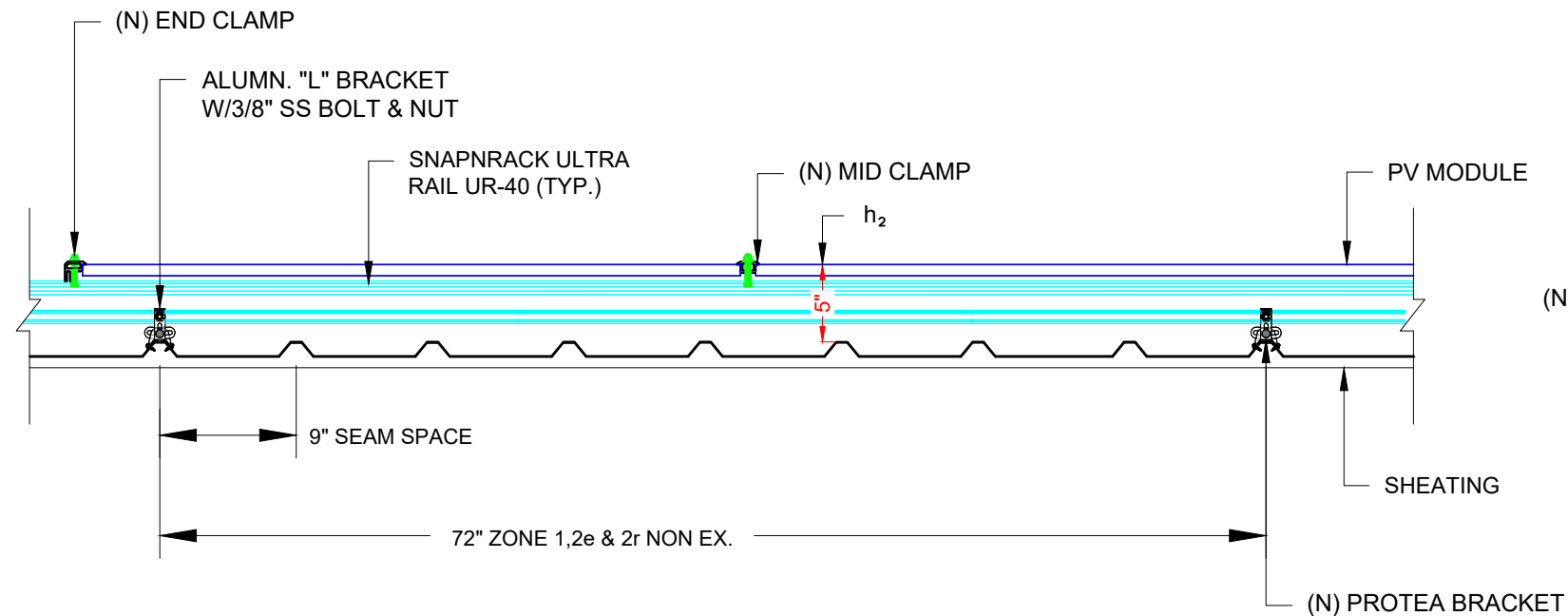
S-01.1

SCALE: 5/64" = 1'-0"



ProteaBracket

FOR STANDING SEAM SPECIFIC MECHANICAL LOAD TEST  
INFORMATION AND CLAMP INSTALLATION INFORMATION  
PLEASE VISIT: [WWW.S-5.COM](http://WWW.S-5.COM)



(N) PROTEA BRACKET

(E) STANDING SEAM

SHEATING

(N) STAINLESS STEEL  
SCREWS

2 ATTACHMENT DETAIL (ENLARGED VIEW)

S-02

SCALE: 1" = 4"

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DESCRIPTION	DATE	REV

PROJECT INSTALLER

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PRODUCTION MANAGEMENT, INC.

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signed by:  
Ermocrate  
s E Castillo  
Date:  
2022.09.27  
15:21:02

PROJECT NAME

LEACH RESIDENCE

159 NORTHWEST CLUBVIEW CIRCLE  
LAKE CITY, FL 32055

SHEET NAME

ATTACHMENT DETAIL

SHEET SIZE

ANSI B  
11" X 17"

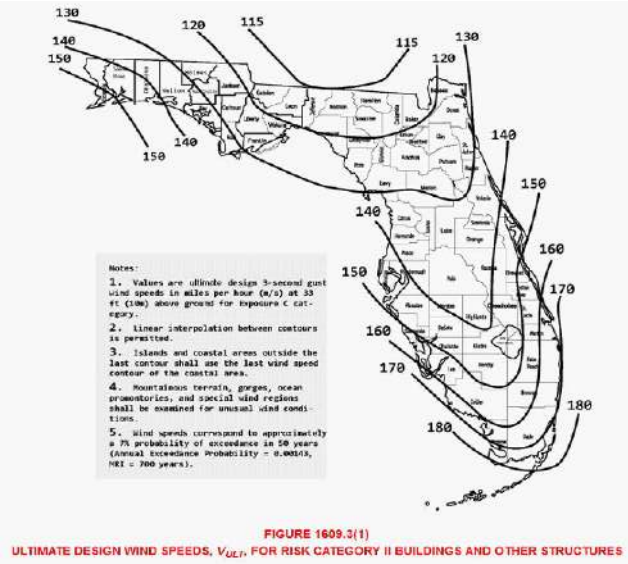
SHEET NUMBER

S-02

# WIND LOAD CALCULATIONS FOR MODULES INSTALLED ON ROOFS WITH A HEIGHT LESS THAN 60'

SITE INFORMATION			
FBC VERSION	2020	RISK CATEGORY	II
MEAN ROOF HEIGHT (ft)	15.0	EXPOSURE CATEGORY	B
ROOF LENGTH (ft)	103.9	ROOF SLOPE	4 / 12
ROOF WIDTH (ft)	51.6	ROOF SLOPE (°)	18.4
PARAPET HEIGHT (ft)	0.0	ROOF TYPE	GABLE
MODULE LENGTH (in)	67.83	ULTIMATE WIND SPEED	120 mph
MODULE WIDTH (in)	44.6	NOMINAL WIND SPEED	93 mph
MODULE ORIENTATION	PORTRAIT	EXPOSURE FACTOR (C <sub>e</sub> )	1.000
MODULE AREA (sq. ft.)	21.01	TEMPERATURE FACTOR (C <sub>t</sub> )	1.000
GROUND SNOW LOAD (psf)	0.0	IMPORTANCE FACTOR (I <sub>s</sub> )	1.000
DEAD LOAD (psf)	3.0	SLOPE FACTOR (C <sub>s</sub> )	0.910
SLOPED ROOF SNOWLOAD (psf)	0.0	K <sub>D</sub>	0.850
EFFECTIVE WIND AREA (ft <sup>2</sup> )	21.0	K <sub>ZT</sub>	1.000
GROUND ELEVATION (ft)	117.0	K <sub>e</sub>	0.996
HVHZ	NO	K <sub>z</sub>	0.575

DESIGN CALCULATIONS			
VELOCITY PRESSURE (q) = .00256*K <sub>z</sub> K <sub>zt</sub> K <sub>d</sub> V <sup>2</sup>			
VELOCITY PRESSURE(ASD) 10.8 psf			
WIDTH OF PRESSURE COEFFICIENT	51.6' * 10%	=	5.16'
	15' * 40%	=	6'
EXTERNAL PRESSURE COEFFICIENT	ZONE 1	0.460	-1.954
	ZONE 1'	X	X
	ZONE 2e	0.460	-1.954
	ZONE 2n	0.460	-2.539
	ZONE 2r	0.460	-2.539
	ZONE 3e	0.460	-2.539
	ZONE 3r	0.460	-3.020
INTERNAL PRESSURE COEFFICIENT (+/-)		0	



DESIGN PRESSURES				
ROOF ZONE	DOWN	UP		
1	16.0	-21.0	psf	
1'	X	X	psf	
2e	16.0	-21.0	psf	Module allowable uplift pressure 33.6 psf
2n	16.0	-27.3	psf	Module allowable down pressure 75 psf
2r	16.0	-27.3	psf	
3e	16.0	-27.3	psf	
3r	16.0	-32.5	psf	

ARRAY FACTORS			
ARRAY EDGE FACTOR (EXPOSED)	1.5	SOLAR PANEL PRESSURE	
ARRAY EDGE FACTOR (NON-EXPOSED)	1	EQUALIZATION FACTOR	0.671

ADJUSTED DESIGN PRESSURES				
ROOF ZONE	DOWN	UP (Exposed)	UP (N. Exposed)	
1	16.0	-21.2	-16.0	psf
1'	X	X	X	psf
2e	16.0	-21.2	-16.0	psf
2n	16.0	-27.5	-18.3	psf
2r	16.0	-27.5	-18.3	psf
3e	16.0	-27.5	-18.3	psf
3r	16.0	-32.7	-21.8	psf

ATTACHMENTS USED		
ATTACHMENT MODEL	S-5 protea	
ATTACHMENT STRENGTH	422	lbs

MAX DESIGN LOADS ALLOWABLE						
LIMIT MAX SPAN TO		N/A		in		
RAFTER/SEAM SPACING		9		in		
ROOF ZONE	DOWN	UP (Exposed)	UP (N. Exposed)	SPANS (E)	SPANS (N.E)	
1	305.2	403.7	305.2	81 in	81 in	
1'	X	X	X	X in	X in	
2e	305.2	403.7	305.2	81 in	81 in	
2n	305.2	408.0	349.7	63 in	81 in	
2r	305.2	408.0	349.7	63 in	81 in	
3e	305.2	408.0	349.7	63 in	81 in	
3r	305.2	377.4	415.9	49 in	81 in	

**Castillo Engineering**  
SOLAR DONE RIGHT™

**CASTILLO ENGINEERING SERVICES, LLC**  
COA # 28345  
620 N. WYMORE ROAD,  
SUITE 250,  
MAITLAND, FL 32751  
TEL: (407) 289-2575  
ERMOCRATES E. CASTILLO - FL PE 52590

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REVISIONS		
DESCRIPTION	DATE	REV

PROJECT INSTALLER

**POWER**  
PRODUCTION MANAGEMENT, INC.

Digitally signed by:  
Ermocrates E Castillo  
Date: 2022.09.27 15:21:02

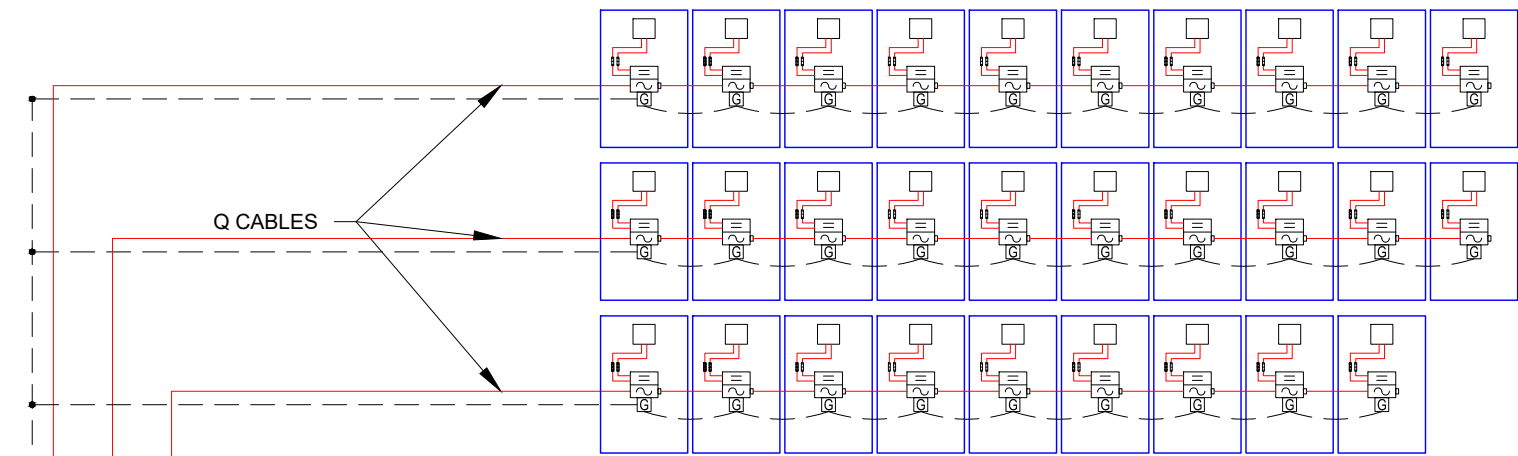
PROJECT NAME

**LEACH RESIDENCE**  
159 NORTHWEST CLUBVIEW CIRCLE  
LAKE CITY, FL 32055

SHEET NAME  
STRUCTURE  
CALCULATION

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

SHEET NUMBER  
**S-02.1**



SOLAR ARRAY (11.600 KW-DC STC, 10.121 kW AC)  
(29) VSUN: VSUN400-108M-BB (400W) MODULES  
(02) BRANCHES OF 10 MODULES  
(01) BRANCH OF 09 MODULES

**NOTE:**

1. SUBJECT PV SYSTEMS HAS BEEN DESIGNED TO MEET THE REQUIREMENTS OF THE NEC 2017, 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.
2. PROVIDE TAP BOX IN COMPLIANCE WITH NEC 312.8 IF PANEL GUTTER SPACE IS INADEQUATE.
3. IF THE PV SERVICE DISCONNECT WIRE RUN EXCEEDS 10 FT FROM THE POINT OF INTERCONNECTION, CABLE LIMITERS OR CURRENT-LIMITED CIRCUIT BREAKERS MUST BE INSTALLED FOR EACH UNGROUNDED CONDUCTOR PER NEC 705.31.

#6 BARE CU WIRE PROTECTED PER NEC 250.64(B)

(N)(01) SOLADECK  
600V, NEMA 3R  
UL LISTED

(N) 125A ENPHASE IQ COMBINER 3  
(X-IQ-AM1-240-3) [WITH UPTO (4)  
2-POLE BREAKERS AND ENVOY  
COMMUNICATION GATEWAY]

FACTORY INSTALLED  
BREAKER FOR ENVOY

(3) 10/2 ROMEX RUN IN ATTIC  
OR  
(3) #10 AWG THWN-2 - Red  
(3) #10 AWG THWN-2 - Black  
(1) #10 AWG THWN-2 - GND  
IN 1" PVC, IMC, RMC,  
LFMC, EMT OR FMT CONDUIT RUN

(N) ALTERNATIVE POWER  
SOURCE AC  
DISCONNECT/RAPID  
SHUTDOWN 240V, 60AMP  
RATED, NEMA 3R, UL LISTED,  
LOCKABLE & FUSIBLE,  
WITH 60A FUSES

(3) #6 AWG THWN-2  
(1) #10 AWG THWN-2 GND  
IN 1" PVC CONDUIT RUN

SUPPLY SIDE TAP USING INSULATION  
PIERCING PER NEC 705.12(A)

(3) #6 AWG THWN-2  
IN 1" PVC CONDUIT RUN

TO UTILITY GRID

BI-DIRECTIONAL  
SERVICE POINT AND  
UTILITY METERING  
1-PHASE, 240V

(E) MAIN BREAKER  
200A/2P, 240V

(E) MAIN SERVICE DISCONNECT/  
MAIN DISTRIBUTION PANEL,  
200A RATED, 240V

EXISTING GROUNDING  
ELECTRODE SYSTEM

**Castillo**  
**Engineering**  
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**REVISIONS**

DESCRIPTION	DATE	REV

**PROJECT INSTALLER**

**POWER**  
PRODUCTION MANAGEMENT, INC.

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Ermocrates E. Castillo  
Date:  
2022.09.27  
15:21:03

**PROJECT NAME**

**LEACH RESIDENCE**

159 NORTHWEST CLUBVIEW CIRCLE  
LAKE CITY, FL 32055

**SHEET NAME**

**ELECTRICAL  
LINE DIAGRAM**

**SHEET SIZE**

**ANSI B  
11" X 17"**

**SHEET NUMBER**

**E-01**

ELECTRICAL CALCULATIONS

Module Manufacturer	VSUN
Module Model	VSUN400-108M-BB
Inverter Manufacturer	ENPHASE
Inverter Model	ENPHASE IQ 7 A
Modules/Branch Circuit 1	10
Modules/Branch Circuit 2	10
Modules/Branch Circuit 3	9
Total Array Power (kW)	11.600
System AC Voltage	240V 1-PHASE

DESIGN TEMPERATURE	
Min. Ambient Temp. °F	32
Max. Ambient Temp. °F	117
Calculated Max. V <sub>OC</sub>	40
Calculated Min V <sub>MP</sub>	25
CONDUIT FILL	
Number of Conduits	1

AMPACITY CALCULTIONS										
Circuit	Max Amps	1.25 x Max Amps	AWG	90 °C AMPACITY	Ambient Temp °F	Temp Derate	Conduit Fill	Fill Derate	Derated AMPACITY	Maximum Circuit Breaker
Circuit 1	14.5	18.2	#10	40	130	0.76	6	0.8	24.32	20 A
Circuit 2	14.5	18.2	#10	40	130	0.76	6	0.8	24.32	20 A
Circuit 3	13.1	16.4	#10	40	130	0.76	6	0.8	24.32	20 A
AC COMBINER	42.2	52.8	#6	75	95	0.96	3	1	72	60 A

Maximum Circuit Voltage Drop	2%
------------------------------	----

VOLTAGE DROP CALCULATIONS					
Circuit	AWG	Circular Mills	I	V	Max Length
Circuit 1	#10	10380	14.5	240	133 Feet
Circuit 2	#10	10380	14.5	240	133 Feet
Circuit 3	#10	10380	13.1	240	148 Feet
Combiner Panel Output	#8	16510	42.2	240	73 Feet

NOTES
TEMP DERATE BASED ON NEC TABLE 310.15(B)(2)(A)
CONDUIT FILL DERATE BASED ON NEC TABLE 310.15(B)(3)(A)
MAXIMUM V <sub>OC</sub> CALCULATED USING MODULE MANUFACTURE TEMPERATURE COEFFICIENTS PER NEC 690.7(A)
UNLESS OTHERWISE SPECIFIED, ALL WIRING MUST BE THHN OR THWN-2 COPPER
ALL WIRE SIZES LISTED ARE THE MINIMUM ALLOWABLE

MODULE PROPERTIES			
V <sub>OC</sub>	37.36	I <sub>SC</sub>	11.19
V <sub>MP</sub>	31.36	I <sub>MP</sub>	10.39
T <sub>G</sub> V <sub>OC</sub>	-0.32%/K	T <sub>G</sub> V <sub>MP</sub>	-0.32%/K
P <sub>MP</sub>	400.0	N <sub>OC</sub> T	45 °C

INVERTER PROPERTIES	
Output Voltage	240 L-L 1-PH
Max Input DC Voltage	58 V <sub>DC</sub>
Operating Range	18 - 58 V <sub>DC</sub>
MPPT Voltage Range	30 - 58 V <sub>DC</sub>
Start Voltage	30 V <sub>DC</sub>
Max Input Power	460 W <sub>DC</sub>
Continuous AC Power	349 VA

ELECTRICAL NOTES

1. ALL EQUIPMENT TO BE LISTED BY UL OR OTHER NRTL, AND LABELED FOR ITS APPLICATION.
2. ALL CONDUCTORS SHALL BE COPPER, RATED FOR 600 V AND 90 DEGREE C WET ENVIRONMENT. THE TERMINALS ARE RATED FOR 75 DEGREE C.
3. THE WIRES ARE SIZED ACCORDING TO NEC 110.14.
4. 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.
5. WORKING CLEARANCES AROUND ALL NEW AND EXISTING ELECTRICAL EQUIPMENT SHALL COMPLY WITH NEC 110.26.
6. DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS. CONTRACTOR SHALL FURNISH ALL NECESSARY OUTLETS, SUPPORTS, FITTINGS AND ACCESSORIES TO FULFILL APPLICABLE CODES AND STANDARDS.
7. WHERE SIZES OF JUNCTION BOXES, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, THE CONTRACTOR SHALL SIZE THEM ACCORDINGLY.
8. ALL WIRE TERMINATIONS SHALL BE APPROPRIATELY LABELED AND READILY VISIBLE.
9. MODULE GROUNDING CLIPS TO BE INSTALLED BETWEEN MODULE FRAME AND MODULE SUPPORT RAIL, PER THE GROUNDING CLIP MANUFACTURER'S INSTRUCTION.
10. MODULE SUPPORT RAIL TO BE BONDED TO CONTINUOUS COPPER G.E.C. VIA WEEB LUG OR ILSCO GBL-4DBT LAY-IN LUG.
11. THE POLARITY OF THE GROUNDED CONDUCTORS IS NEGATIVE .
12. UTILITY HAS 24-HR UNRESTRICTED ACCESS TO ALL PHOTOVOLTAIC SYSTEM COMPONENTS LOCATED AT THE SERVICE ENTRANCE.
13. MODULES CONFORM TO AND ARE LISTED UNDER UL 1703.
14. RACKING CONFORMS TO AND IS LISTED UNDER UL 2703.
15. CONDUCTORS EXPOSED TO SUNLIGHT SHALL BE LISTED AS SUNLIGHT RESISTANT PER NEC ARTICLE 300.6 (C) (1) AND ARTICLE 310.10 (D).
16. CONDUCTORS EXPOSED TO WET LOCATIONS SHALL BE SUITABLE FOR USE IN WET LOCATIONS PER NEC ARTICLE 310.10 (C).
17. THIS SYSTEM IS EQUIPPED WITH RAPID SHUTDOWN OF PV CONDUCTORS IN COMPLIANCE WITH NEC 690.12.
18. LABELING IN COMPLIANCE WITH NEC 690.12 AND 690.56(C) IS SHOWN ON SHEET E-03.
19. ALL CONDUITS TO BE INSTALLED A MINIMUM OF 7/8" ABOVE THE ROOF SURFACE.

I ERMOCRATES CASTILLO PE# 52590 AN ENGINEER LICENSED PURSUANT TO CHAPTER 471, CERTIFY THAT THE PV ELECTRICAL SYSTEM AND ELECTRICAL COMPONENTS ARE DESIGNED AND APPROVED USING THE STANDARDS CONTAINED IN THE MOST RECENT VERSION OF THE FLORIDA BUILDING CODE. FBC 107, THE NEC 2017, AND THOSE SET FORTH BY THE FLORIDA SOLAR ENERGY CENTER CERTIFICATION

Castillo

Engineering

SOLAR DONE RIGHT™

CASTILLO ENGINEERING SERVICES, LLC

COA # 28345

620 N. WYMORE ROAD, SUITE 250, MAITLAND, FL 32751

TEL: (407) 289-2575

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REVISIONS		
DESCRIPTION	DATE	REV

PROJECT INSTALLER

POWER

PRODUCTION MANAGEMENT, INC.

Signature with Digital Seal

signed by: Ermocrates E Castillo

Date: 2022.09.27 15:21:03

PROJECT NAME

LEACH RESIDENCE

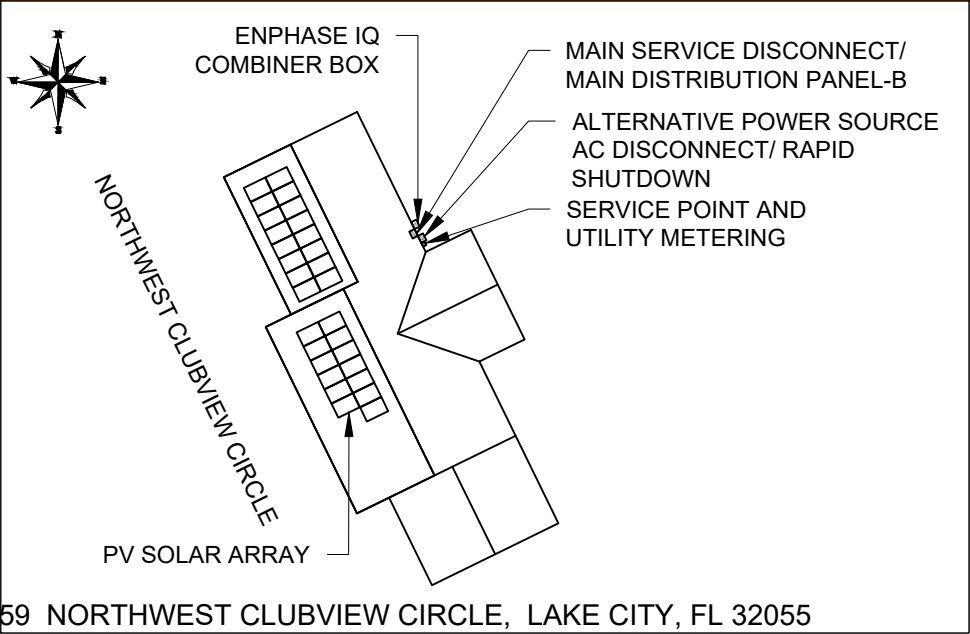
159 NORTHWEST CLUBVIEW CIRCLE  
LAKE CITY, FL 32055

SHEET NAME  
WIRING CALCULATIONS

SHEET SIZE  
ANSI B  
11" X 17"

SHEET NUMBER  
E-02

CAUTION!  
POWER TO THIS BUILDING  
SUPPLIED FROM MULTIPLE SOURCES



LABEL LOCATION:  
MAIN SERVICE DISCONNECT / MAIN DISTRIBUTION PANEL, PV DISCONNECT  
LOCATED NO MORE THAN 3FT (1M) FROM THE SERVICE DISCONNECT  
(TEXT HEIGHT SHOULD BE A MINIMUM OF 3/8")  
PER CODE NEC 705.10

SOLAR PV 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

LABEL LOCATION:  
AC DISCONNECT, POINT OF INTERCONNECTION  
(PER CODE: NEC 690.56(C)(1)(a), IFC 1204.5.1

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

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

**WARNING** DUAL POWER SOURCE  
SECOND SOURCE IS PHOTOVOLTAIC SYSTEM

LABEL LOCATION:  
POINT OF INTERCONNECTION  
(PER CODE: NEC 705.12(B)(2)(3)(b))

PHOTOVOLTAIC SYSTEM AC DISCONNECT  
RATED AC OPERATING CURRENT 42.2 AMPS  
AC NOMINAL OPERATING VOLTAGE 240 VOLTS

LABEL LOCATION:  
AC DISCONNECT, POINT OF INTERCONNECTION  
(PER CODE: NEC 690.54)

**WARNING:**  
POWER SOURCE OUTPUT CONNECTION DO  
NOT RELOCATE THIS OVERCURRENT DEVICE

LABEL LOCATION:  
POINT OF INTERCONNECTION  
(PER CODE: NEC 705.12(B)(2)(3)(b))

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 BOX  
(PER CODE: NEC 690.52)

RAPID SHUTDOWN  
SWITCH FOR SOLAR PV  
SYSTEM

LABEL LOCATION:  
AC DISCONNECT  
(PER CODE: NEC 690.56(C)(3))

**WARNING:**  
THIS EQUIPMENT FED BY MULTIPLE  
SOURCES. TOTAL RATING OF ALL  
OVERCURRENT DEVICES, EXCLUDING  
MAIN SUPPLY OVERCURRENT DEVICE,  
SHALL NOT EXCEED AMPACITY OF BUSBAR

LABEL LOCATION:  
POINT OF INTERCONNECTION  
(PER CODE: NEC 705.12(B)(2)(3)(c))

EMERGENCY RESPONDER  
THIS SOLAR PV SYSTEM IS EQUIPPED  
WITH RAPID SHUTDOWN.

TURN RAPID  
SHUTDOWN SWITCH  
TO THE "OFF" POSITION  
TO SHUT DOWN ENTIRE  
PV SYSTEM

- SECTIONS OF THE PV SYSTEM THAT  
ARE SHUT DOWN WHEN THE RAPID  
SHUTDOWN SWITCH IS OPERATED.

- SECTIONS OF THE PV SYSTEM THAT  
ARE NOT SHUT DOWN WHEN THE RAPID  
SHUTDOWN SWITCH IS OPERATED.

LABEL LOCATION:  
AC DISCONNECT  
(TEXT HEIGHT SHOULD BE A MINIMUM OF 3/8")  
(PER CODE: NFPA 1, 11.12.2.1.1)

**POWER PRODUCTION MANAGEMENT**  
EMERGENCY CONTACT:   
PH. NO. : (352) 263-0766

LABEL LOCATION:  
MAIN DISCONNECT  
(PER CODE: NFPA - 1, 11.12.2.1.5)

- ADHESIVE FASTENED SIGNS:
- THE LABEL SHALL BE VISIBLE, REFLECTIVE AND SUITABLE FOR THE ENVIRONMENT WHERE IT IS INSTALLED [NFPA 1, 11.12.2.1]
  - WHERE REQUIRED ELSEWHERE IN THIS CODE, ALL FIELD APPLIED LABELS, WARNINGS, AND MARKINGS SHOULD COMPLY WITH ANSI Z35.4 [NEC 110.21(B) FIELD MARKING].
  - ADHESIVE FASTENED SIGNS MAY BE ACCEPTABLE IF PROPERLY ADHERED. VINYL SIGNS SHALL BE WEATHER RESISTANT [IFC 605.11.1.3]

**Castillo Engineering**  
SOLAR DONE RIGHT™  
CASTILLO ENGINEERING SERVICES, LLC  
COA # 28345  
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MAITLAND, FL 32751  
TEL: (407) 289-2575  
ERMOCRATES E. CASTILLO - FL PE 52590

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REVISIONS

DESCRIPTION	DATE	REV

PROJECT INSTALLER

**POWER**  
PRODUCTION MANAGEMENT, INC.

Signature with Digital  
signed by:  
Ermocrates E Castillo  
Date:  
2022.09.27  
15:21:04

PROJECT NAME

LEACH RESIDENCE

159 NORTHWEST CLUBVIEW CIRCLE  
LAKE CITY, FL 32055

SHEET NAME

SYSTEM LABELING

SHEET SIZE

ANSI B  
11" X 17"

SHEET NUMBER

E-03

# VSUN405-108M-BB

**405W**

Highest power output

**20.75%**

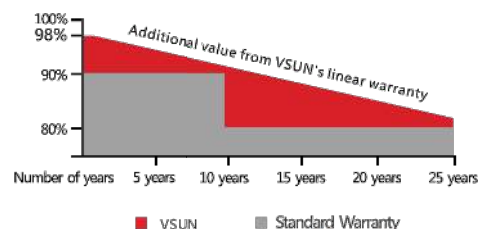
Module efficiency

**12years**

Material & Workmanship warranty

**25years**

Linear power output warranty



**Munich RE**



MBB technology with Circular Ribbon



Higher output power



Half-cell Technology



Positive tolerance offer

**VSUN405-108M-BB**  
**VSUN395-108M-BB**

**VSUN400-108M-BB**  
**VSUN390-108M-BB**



Micro Gap



Better shading tolerance



Fire safety: Class C



Load certificates: wind to 2400Pa and snow to 5400Pa



Beautiful appearance with black frame and black backsheet

VSUN, a BNEF Tier-1 PV module manufacturer invested by Fuji Solar, has been committed to providing greener, cleaner and more intelligent renewable energy solutions. VSUN is dedicated to bringing reliable, customized and high-efficient products into various markets and customers worldwide.



Engineered in Japan  
[www.vsun-solar.com](http://www.vsun-solar.com)

## Electrical Characteristics at Standard Test Conditions(STC)

Module Type	VSUN405-108M-BB	VSUN400-108M-BB	VSUN395-108M-BB	VSUN390-108M-BB
Maximum Power - Pmax (W)	405	400	395	390
Open Circuit Voltage - Voc (V)	37.36	37.2	37.03	36.84
Short Circuit Current - Isc (A)	13.78	13.68	13.59	13.5
Maximum Power Voltage - Vmpp (V)	31.36	31.17	31	30.82
Maximum Power Current - Imp (A)	12.92	12.84	12.75	12.66
Module Efficiency	20.75%	20.49%	20.23%	19.98%

Standard Test Conditions (STC): irradiance 1,000 W/m<sup>2</sup>; AM 1.5; module temperature 25°C. Pmax Sorting : 0~5W. Measuring Tolerance: ±3%.

Remark: Electrical data do not refer to a single module and they are not part of the offer. They only serve for comparison among different module types.

## Electrical Characteristics at Normal Operating Cell Temperature(NOCT)

Module Type	VSUN405-108M-BB	VSUN400-108M-BB	VSUN395-108M-BB	VSUN390-108M-BB
Maximum Power - Pmax (W)	302.1	298.4	294.7	287.3
Open Circuit Voltage - Voc (V)	35.1	34.9	34.8	34.5
Short Circuit Current - Isc (A)	11.19	11.13	11.05	10.91
Maximum Power Voltage - Vmpp (V)	29.1	28.9	28.8	28.4
Maximum Power Current - Imp (A)	10.39	10.32	10.25	10.1

Normal Operating Cell Temperature( NOCT) : irradiance 800W/m<sup>2</sup>; wind speed 1 m/s; ambient temperature 20°C. Measuring Tolerance: ±3%.

## Temperature Characteristics

NOCT	45°C (±2°C)
Voltage Temperature Coefficient	-0.27%/°C
Current Temperature Coefficient	+0.048%/°C
Power Temperature Coefficient	-0.32%/°C

## Maximum Ratings

Maximum System Voltage [V]	1000
Series Fuse Rating [A]	30

## Material Characteristics

Dimensions	1723×1133×35mm (L×W×H)
Weight	21.8kg
Frame	Black anodized aluminum profile
Front Glass	White toughened safety glass, 3.2 mm
Cell Encapsulation	EVA (Ethylene-Vinyl-Acetate)
Back Sheet	Composite film
Cells	12×9 pieces monocrystalline solar cells series strings
Junction Box	IP68, 3 diodes
Cable&Connector	Potrait: 500 mm (cable length can be customized) , 1×4 mm <sup>2</sup> , Connector: PV-ZH202B

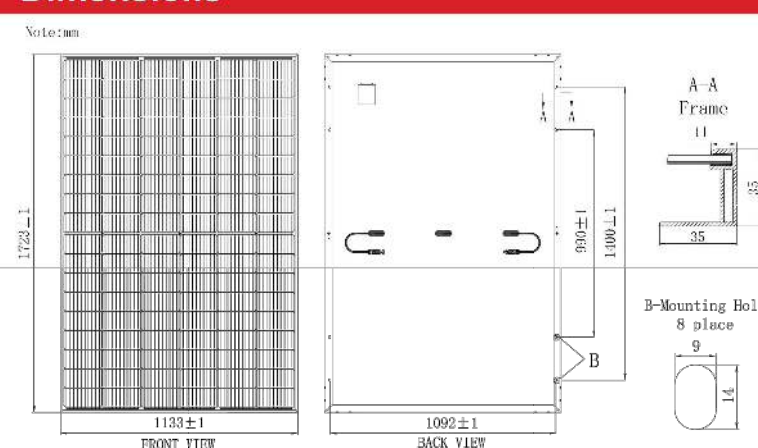
## Packaging

Dimensions(L×W×H)	1760×1125×1253mm
Container20'	186
Container40'	403
Container40'HC	806

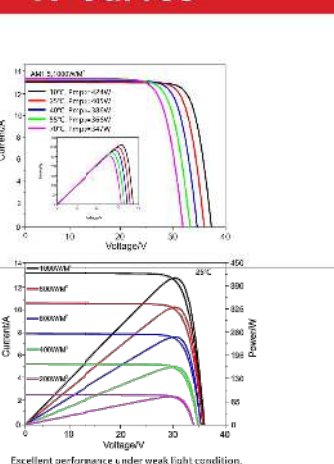
## System Design

Temperature Range	-40 °C to + 85 °C
Withstanding Hail	Maximum diameter of 25 mm with impact speed of 23 m/s-1
Maximum Surface Load	5,400 Pa
Application class	class A

## Dimensions



## IV-Curves



## REVISIONS

DESCRIPTION	DATE	REV

## PROJECT INSTALLER



Digitally signed by: Ermocrates E Castillo  
Date: 2022.09.27 15:21:04

## PROJECT NAME

LEACH RESIDENCE

159 NORTHWEST CLUBVIEW CIRCLE  
LAKE CITY, FL 32055

SHEET NAME

DATA SHEET

SHEET SIZE

ANSI B  
11" X 17"

SHEET NUMBER

DS-01

# Enphase IQ 7A Microinverter

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)

## 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 and 72-cell PV modules	
Maximum input DC voltage	58 V	
Maximum input DC current	10.2 A	
Peak power tracking voltage	38 V–43 V	
Operating range	18 V–58 V	
Min/Max start voltage	30 V / 58 V	
Max DC short circuit current (module Isc)	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/range²	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 circuit³	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 (WxHxD)	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 and NEC-2017 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. Voltage range can be extended beyond nominal if required by the utility.  
3. Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

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

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2019-08-07



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ERMOCRATES E. CASTILLO - FL PE 52590

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REVISIONS		
DESCRIPTION	DATE	REV

PROJECT INSTALLER



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Date: 2022.09.27 15:21:05

PROJECT NAME

LEACH RESIDENCE  
159 NORTHWEST CLUBVIEW CIRCLE  
LAKE CITY, FL 32055

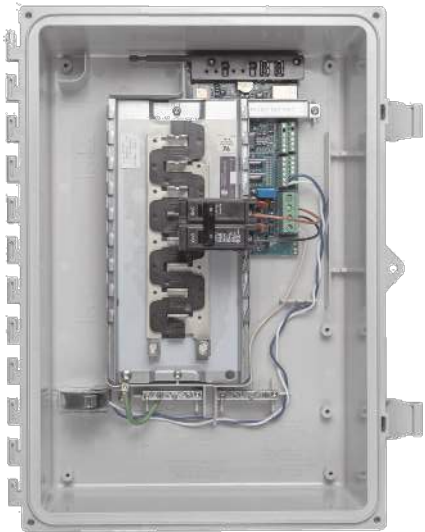
SHEET NAME  
DATA SHEET

SHEET SIZE  
ANSI B  
11" X 17"

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

## 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 warranty
- UL listed



To learn more about Enphase offerings, visit [enphase.com](https://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%).
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 2
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)	80A of distributed generation / 90A with IQ Envoy breaker included
Production Metering CT	200 A solid core pre-installed and wired to IQ Envoy
MECHANICAL DATA	
Dimensions (WxHxD)	49.5 x 37.5 x 16.8 cm (19.5" x 14.75" x 6.63"). Height is 21.06" (53.5 cm with mounting brackets).
Weight	7.5 kg (16.5 lbs)
Ambient temperature range	-40° C to +46° C (-40° to 115° F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction
Wire sizes	• 20 A to 50 A breaker inputs: 14 to 4 AWG copper conductors • 60 A breaker branch input: 4 to 1/0 AWG copper conductors • Main lug combined output: 10 to 2/0 AWG copper conductors • Neutral and ground: 14 to 1/0 copper conductors Always follow local code requirements for conductor sizing.
Altitude	To 2000 meters (6,560 feet)
INTERNET CONNECTION OPTIONS	
Integrated Wi-Fi	802.11b/g/n
Ethernet	Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included)
Cellular	Optional, CELLMODEM-01 (3G) or CELLMODEM-03 (4G) or CELLMODEM-M1 (4G based LTE-M) (not included)
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
* Consumption monitoring is required for Enphase Storage Systems.	

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

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2018-09-13



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PROJECT NAME

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159 NORTHWEST CLUBVIEW CIRCLE  
LAKE CITY, FL 32055

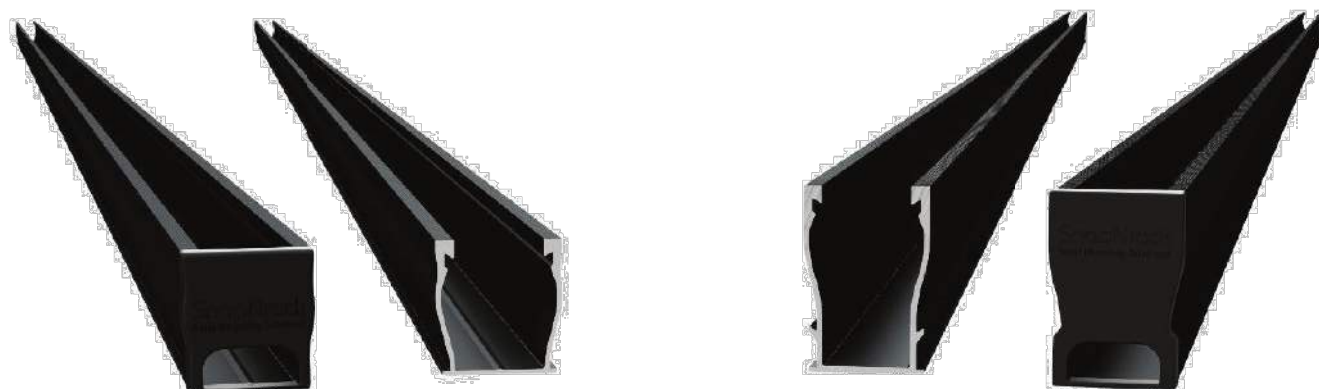
SHEET NAME  
  
DATA SHEET

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

SHEET NUMBER  
**DS-03**

# Ultra Rail

**UR-40**  
**UR-60**



## The Ultimate Value in Rooftop Solar



Industry leading Wire Management Solutions



Mounts available for all roof types



Single Tool Installation



All SnapNrack Module Clamps & Accessories are compatible with both rail profiles

**Start Installing Ultra Rail Today**

**RESOURCES**  
**DESIGN**  
**WHERE TO BUY**

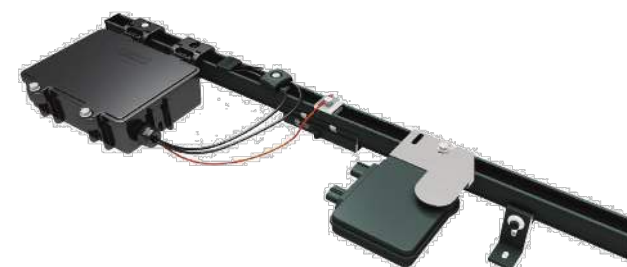
[snapnrack.com/resources](https://snapnrack.com/resources)  
[snapnrack.com/configurator](https://snapnrack.com/configurator)  
[snapnrack.com/where-to-buy](https://snapnrack.com/where-to-buy)

## SnapNrack Ultra Rail System

A sleek, straightforward rail solution for mounting solar modules on all roof types. Ultra Rail features two rail profiles; UR-40 is a lightweight rail profile that is suitable for most geographic regions and maintains all the great features of SnapNrack rail, while UR-60 is a heavier duty rail profile that provides a larger rail channel and increased span capabilities. Both are compatible with all existing mounts, module clamps, and accessories for ease of install.

### The Entire System is a Snap to Install

- New Ultra Rail Mounts include snap-in brackets for attaching rail
- Compatible with all the SnapNrack Mid Clamps and End Clamps customers love
- Universal End Clamps and snap-in End Caps provide a clean look to the array edge



### Unparalleled Wire Management

- Open rail channel provides room for running wires resulting in a long-lasting quality install
- Industry best wire management offering includes Junction Boxes, Universal Wire Clamps, MLPE Attachment Kits, and Conduit Clamps
- System is fully bonded and listed to UL 2703 Standard

### Heavy Duty UR-60 Rail

- UR-60 rail profile provides increased span capabilities for high wind speeds and snow loads
- Taller, stronger rail profile includes profile-specific rail splice and end cap
- All existing mounts, module clamps, and accessories are retained for the same great install experience



# Quality. Innovative. Superior.

SnapNrack Solar Mounting Solutions are engineered to optimize material use and labor resources and improve overall installation quality and safety.

877-732-2860

[www.snapnrack.com](https://www.snapnrack.com)

[contact@snapnrack.com](mailto:contact@snapnrack.com)

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PRODUCTION MANAGEMENT, INC.

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### PROJECT NAME

**LEACH RESIDENCE**

159 NORTHWEST CLUBVIEW CIRCLE  
LAKE CITY, FL 32055

### SHEET NAME

DATA SHEET

### SHEET SIZE

ANSI B  
11" X 17"

### SHEET NUMBER

DS-04

The right way to attach solar PV to trapezoidal roof profiles!

# S-5!®

## The Right Way!™

NEW

NOW AVAILABLE  
IN ALUMINUM

ProteaBracket™

### ProteaBracket™

A versatile bracket for mounting solar PV to trapezoidal roof profiles

ProteaBracket™ is now made in aluminum. Still the most versatile trapezoidal metal roof attachment solution on the market, the S-5! ProteaBracket just got better!

The bracket features an adjustable attachment base and module attachment options to accommodate different roof profile dimensions and mounting options.

Our pre-applied EPDM gasket with peel and stick adhesive makes installation a snap, ensuring accurate and secure placement the first time.

With no messy sealants, faster installation, and a weather-proof fit, ProteaBracket offers you the most versatile solar attachment solution available.

ProteaBracket\* can be used for rail mounting or "direct-attach" with S-5! PVKIT™

### Features and Benefits

- 34% lighter - saves on shipping
- Stronger L-Foot™
- Load-tested for engineered application
- Corrosion-resistant materials
- Adjustable - Fits rib profiles up to 3"
- Peel-and-Stick prevents accidental shifting during installation
- Fully pre-assembled
- 25-year warranty\*

\*When ProteaBracket is used in conjunction with the S-5! PVKIT, an additional nut is required during installation.

\*See [www.S-5.com](http://www.S-5.com) for details.



888-825-3432 | [www.S-5.com](http://www.S-5.com)

# S-5!®

The Right Way!™

ProteaBracket™ is the perfect solar attachment solution for most trapezoidal rib, exposed-fastened metal roof profiles!

ProteaBracket™ is compatible with common metal roofing materials and comes with a pre-applied EPDM gasket on the base.

**Note:** All four pre-punched holes must be used to achieve tested strength. Fasteners are provided.

For design assistance, ask your distributor, or visit [www.S-5.com](http://www.S-5.com) for the independent lab test data that can be used for load-critical designs and applications. Also, please visit our website for more information including metallurgical compatibilities and specifications.

S-5!® holding strength is unmatched in the industry.

### Multiple Attachment Options:



Side  
Mount Rail



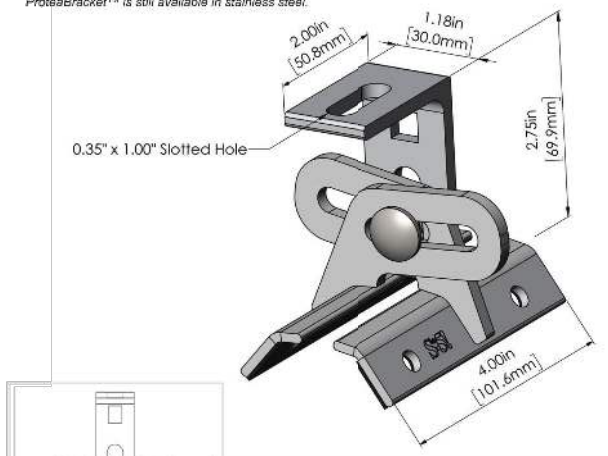
Bottom  
Mount Rail



w/ S-5!  
PVKIT™  
(rail-less)

### ProteaBracket™

ProteaBracket™ is still available in stainless steel.



ProteaBracket fits profiles  
up to 3 inches

INSTALLATION:

No surface preparation needed. (1) Wipe away excess oil and debris. (2) Peel off adhesive release paper. (3) Align and mount bracket directly onto crown of panel. (4) Secure ProteaBracket through pre-punched holes, using piercing-point S-5! screws.



ProteaBracket™ and the S-5! PVKIT™ 2.0 mounted on a trapezoidal roof profile

S-5!® Warning! Please use this product responsibly!

Products are protected by multiple U.S. and foreign patents. For published data regarding holding strength, bolt torque, patents, and trademarks, visit the S-5! website at [www.S-5.com](http://www.S-5.com).

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PRODUCTION MANAGEMENT, INC.

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### PROJECT NAME

LEACH RESIDENCE

159 NORTHWEST CLUBVIEW CIRCLE  
LAKE CITY, FL 32055

### SHEET NAME

DATA SHEET

### SHEET SIZE

ANSI B  
11" X 17"

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DS-05