RESIDENTIAL ROOFTOP SOLAR + ESS PERMIT PACKAGE

NABCEP CERTIFIED
PV Installation Professional
Scott Gurney
#PV-011719-015866

Wiyada Sorkaew

1153 Christian Light Rd
Fuquay-varina, North Carolina 27526
9195610124

Enphase Platinum Installer

SUNPOWER® Authorized Dealer

BLUE RAVEN SOLAR
1403 N 630 E
Orem, Utah 84097
(800) 377-4480
BlueRavenSolar.com

SCOPE OF WORK

INSTALLATION OF ROOFTOP MOUNTED PHOTOVOLTAIC SOLAR SYSTEM

INSTALLATION OF ENERGY STORAGE SYSTEM

SHEET INDEX

Digitally signed by John A. Calvert
Date: 2024.07.18 06:57:47 -06'00'

7/18/24
Firm No. : D-0449

Sealed For Existing Roof & Attachment Only

TYPICAL STRUCTURAL INFORMATION

ROOF MATERIAL: Comp Shingle
SHEATHING TYPE: OSB
FRAMING TYPE: Rafter
RACKING TYPE: UNIRAC SFM INFINITY
ATTACHMENT TYPE: UNIRAC SFM INFINITY FLASHKIT
TOTAL ATTACHMENTS: 19

NEW PV SYSTEM INFORMATION

DC SYSTEM SIZE: 4.14 kW DC
AC SYSTEM SIZE: 2.835 kW AC
MODULE TYPE: (9) REC Solar REC460AA PURE-RX
INVERTER TYPE: Enphase IQ7X-96-2-US

TOTAL PV DC SYSTEM SIZE

10.440 kW DC

TOTAL PV AC SYSTEM SIZE

7.560 kW AC

GENERAL NOTES

EXISTING PV SYSTEM INFORMATION

DC SYSTEM SIZE: 6.3 kW DC
AC SYSTEM SIZE: 4.725 kW AC
MODULE TYPE: (15) REC SOLAR REC420AA PURE-R
INVERTER TYPE: ENPHASE IQ7X-96-2-US

DESIGN CRITERIA

WIND SPEED: 115
WIND EXPOSURE FACTOR: C
RISK CATEGORY: II
GROUND SNOW LOAD: 15
ROOF SNOW LOAD: 10.5
SEISMIC DESIGN CATEGORY: B

WEATHER STATION DATA

WEATHER STATION: SEYMOUR-JOHNSON AFB
HIGH TEMP 2% AVG: 35°C
EXTREME MINIMUM TEMP: -10°C

AHJ

Harnett County

UTILITY COMPANY

Duke Energy

EXISTING ESS INFORMATION

BATTERY QUANTITY & MODEL: (2) Franklin aPower
TOTAL USABLE SYSTEM ENERGY: 13.6 kWh
TOTAL REAL POWER (CHARGE): 10 kW AC continuous
TOTAL REAL POWER (DISCHARGE): 10 kW AC continuous
SYSTEM CONTROLLER: Franklin aGate

APPLICABLE CODES

*2017 NATIONAL ELECTRIC CODE (NEC)
*2018 NORTH CAROLINA BUILDING CODE (NCBC)
*2018 NORTH CAROLINA RESIDENTIAL CODE (NCRC), PLUMBING CODE (NCPC), AND ALL STATE AND LOCAL BUILDING, ELECTRICAL, AND PLUMBING CODES

CUSTOMER NAME: Wiyada Sorkaew
1153 Christian Light Rd
Fuquay-varina, North Carolina 27526

AHJ: Harnett County

UTILITY COMPANY: Duke Energy

PROJECT ID: 1009928

PV DC SYSTEM SIZE: 10.440 kW DC

PV AC SYSTEM SIZE: 7.560 kW AC

REVISIONS:

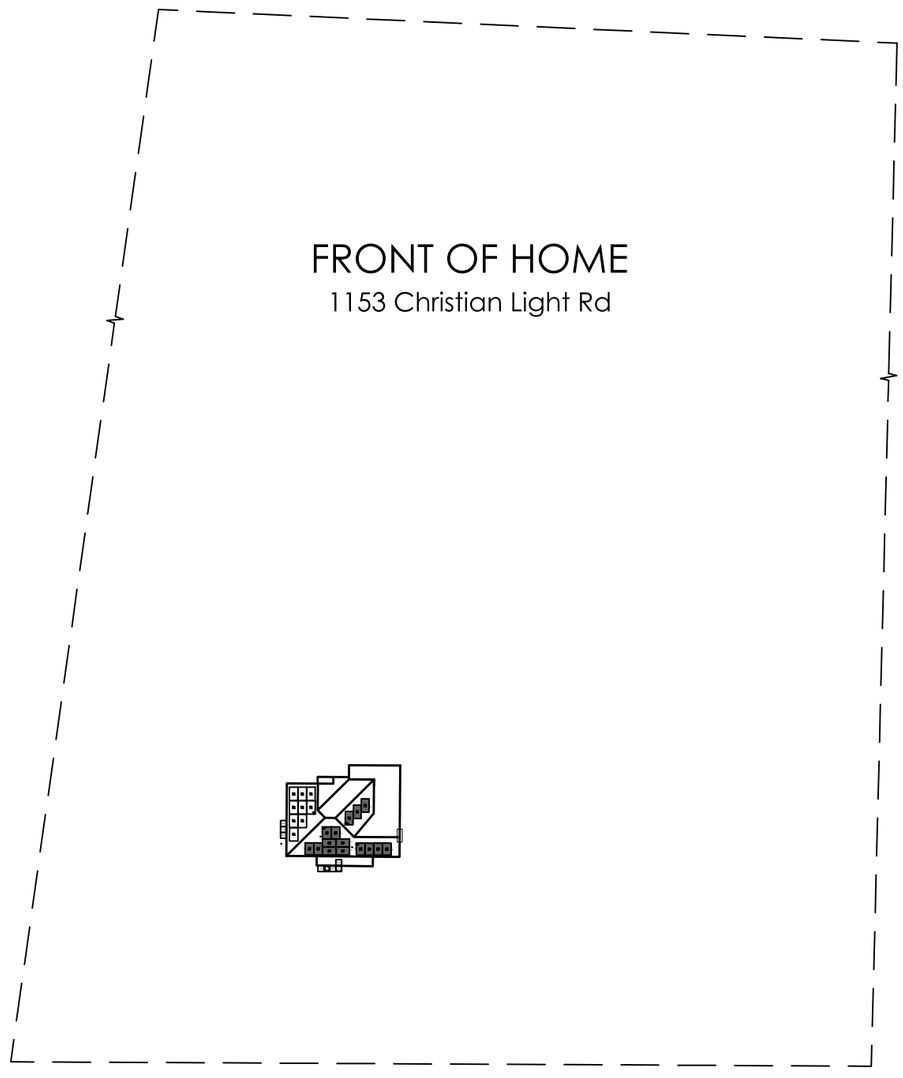
A	----
B	----
C	----
D	----

DRAWN BY: Chantelle Wilkinson

PLOT DATE: July 17, 2024

DRAWING TITLE: Cover Sheet

DRAWING NUMBER: PV1



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7/18/24
Firm No. : D-0449

SITE PLAN
SCALE: 1/64" = 1'-0"

NEW PV SYSTEM
EXISTING PV SYSTEM

LEGEND

M	UTILITY METER	BE	BREAKER ENCLOSURE	BAT	ESS - BATTERY		FIRE SETBACK HATCH
MSP	MAIN SERVICE PANEL	AC	AC DISCONNECT	ESC	ESS - CONTROLLER	DC/AC	MICROINVERTER
SUB	SUBPANEL	PV	PV PRODUCTION METER	RPO	REMOTE POWER OFF SWITCH		ROOF TOP JUNCTION BOX
CT	UTILITY METER CT CABINET	CB	COMBINER BOX	ATS	GENERATOR ATS PANEL	INV	INVERTER

TRENCH OR OVERHEAD

PROPERTY LINE

ICONS WITH DOTTED OUTLINE INDICATE INTERIOR LOCATION

PV SYSTEM SPECIFICATIONS

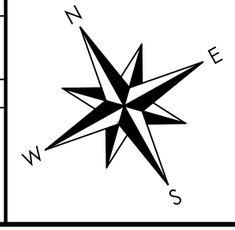
NEW PV SYSTEM INFORMATION

PV MODULE: (9) REC Solar REC460AA PURE-RX, **POWER RATING:** 460 W
INVERTER: (9) Enphase IQ7X-96-2-US, **POWER RATING:** 315 W

EXISTING SYSTEM INFORMATION

PV MODULE: (15) REC Solar REC420AA PURE-R, **POWER RATING**: 420 W
MICROINVERTER: Enphase IQ7X-96-2-US, **POWER RATING**: 315 W
ESS SYSTEM: (2) Franklin aPower 13.6 kWh, **TOTAL POWER**: 10 kW AC continuous
SYSTEM CONTROLER: Franklin aGate

COMPASS



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UTILITY COMPANY: Duke Energy

PROJECT ID: 1009928

PV DC SYSTEM SIZE: 10.440 kW DC

PV AC SYSTEM SIZE: 7.560 kW AC

REVISIONS:

A	----
B	----
C	----
D	----

DRAWN BY: Chantelle Wilkinson

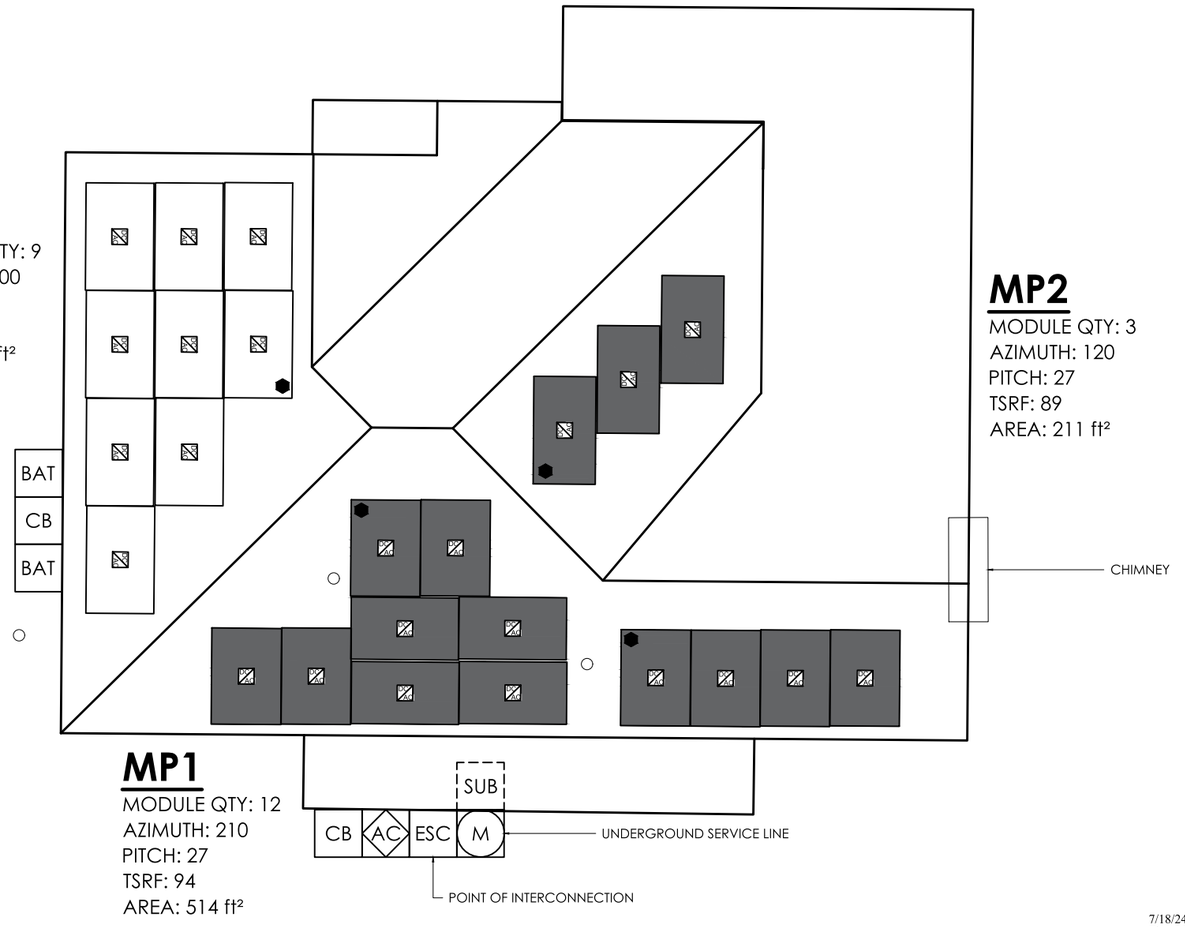
PLOT DATE: July 17, 2024

DRAWING TITLE: Site Plan

DRAWING NUMBER: PV2

DC SYSTEM SIZE: 11.5 KW DCMODULE: REC 460INVERTER(S): Enphase IQ7X Microinverters

FRONT OF HOME



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7/18/24
Firm No. : D-0449

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

NEW PV SYSTEM
EXISTING PV SYSTEM

LEGEND

M	UTILITY METER	BE	BREAKER ENCLOSURE	BAT	ESS - BATTERY		FIRE SETBACK HATCH
MSP	MAIN SERVICE PANEL	AC	AC DISCONNECT	ESC	ESS - CONTROLLER		MICROINVERTER
SUB	SUBPANEL	PV	PV PRODUCTION METER	RPO	REMOTE POWER OFF SWITCH		ROOF TOP JUNCTION BOX
CT	UTILITY METER CT CABINET	CB	COMBINER BOX	ATS	GENERATOR ATS PANEL	INV	INVERTER

TRENCH OR OVERHEAD

PROPERTY LINE

ICONS WITH DOTTED OUTLINE INDICATE INTERIOR LOCATION

PV SYSTEM SPECIFICATIONS

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PV MODULE: (9) REC Solar REC460AA PURE-RX, **POWER RATING:** 460 W
INVERTER: (9) Enphase IQ7X-96-2-US, **POWER RATING:** 315 W

EXISTING SYSTEM INFORMATION

PV MODULE: (15) REC Solar REC420AA PURE-R, **POWER RATING**: 420 W
MICROINVERTER: Enphase IQ7X-96-2-US, **POWER RATING**: 315 W
ESS SYSTEM: (2) Franklin aPower 13.6 kWh, **TOTAL POWER**: 10 kW AC continuous
SYSTEM CONTROLER: Franklin aGate

COMPASS

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PV AC SYSTEM SIZE: 7.560 kW AC

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A	----
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DRAWN BY: Chantelle Wilkinson

PLOT DATE: July 17, 2024

DRAWING TITLE: Roof Plan

DRAWING NUMBER: PV3

	PANEL COUNT	AZIMUTH (DEG)	PITCH (DEG)	TSRF (%)	AREA (ft²)	ROOF MATERIAL	SHEATHING TYPE	FRAMING TYPE	FRAMING SIZE AND SPACING	CEILING JOIST/ PURLINS SIZE AND SPACING	RACKING TYPE	ATTACHMENT TYPE	MAXIMUM ATTACHMENT SPACING (S)	MAXIMUM CANTILEVER (C)
MP1	12	210	27	94	514	Comp Shingle	OSB	Rafter	2x6 @ 16 in OC	2x8 @ 16 in OC	UNIRAC SFM INFINITY	UNIRAC SFM INFINITY FLASHKIT	64"L / 48"P	21"L / 16"P
MP2	3	120	27	89	211	Comp Shingle	OSB	Rafter	2x6 @ 16 in OC	2x8 @ 16 in OC	UNIRAC SFM INFINITY	UNIRAC SFM INFINITY FLASHKIT	64"L / 48"P	21"L / 16"P
MP3	9	300	27	71	364	Comp Shingle	OSB	Rafter	2x6 @ 16 in OC	2x8 @ 16 in OC	UNIRAC SFM INFINITY	UNIRAC SFM INFINITY FLASHKIT	64"L / 48"P	21"L / 16"P
MP4	0													
MP5	0													
MP6	0													
MP7	0													
MP8	0													
MP9	0													
MP10	0													

TOTAL PV ARRAY AREA (ft²)	560.41
TOTAL ROOF AREA (ft²)	1959
DISTRIBUTED LOAD (psf)	2.23
ROOF COVERAGE (%)	28.61
TOTAL PV ARRAY WEIGHT (lbs)	1250
TOTAL PV ATTACHMENTS	19
POINT LOAD (lbs/att.)	65.8

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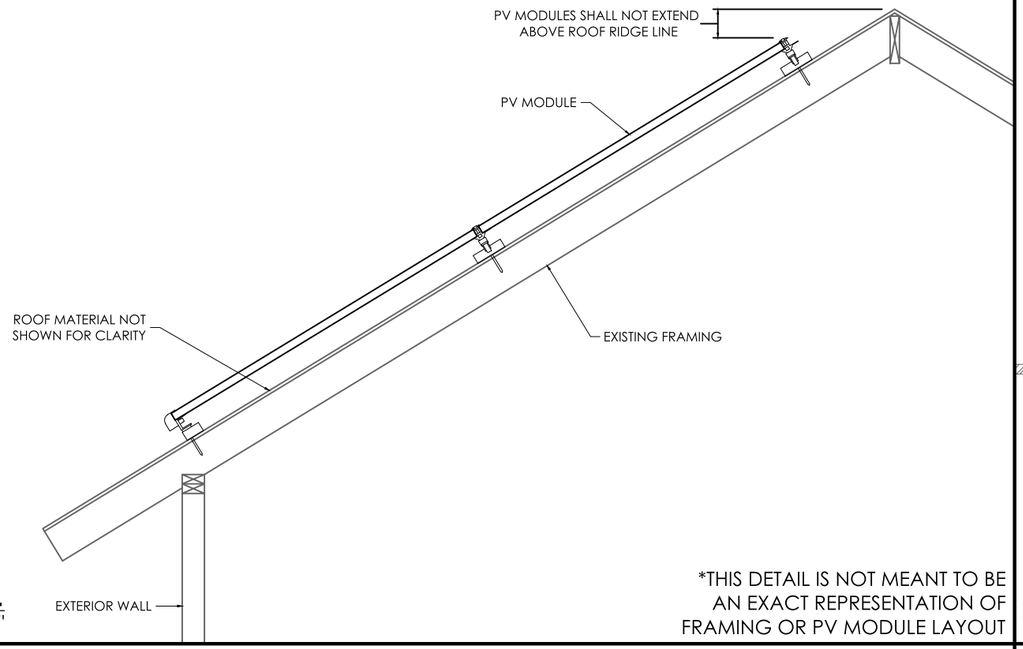
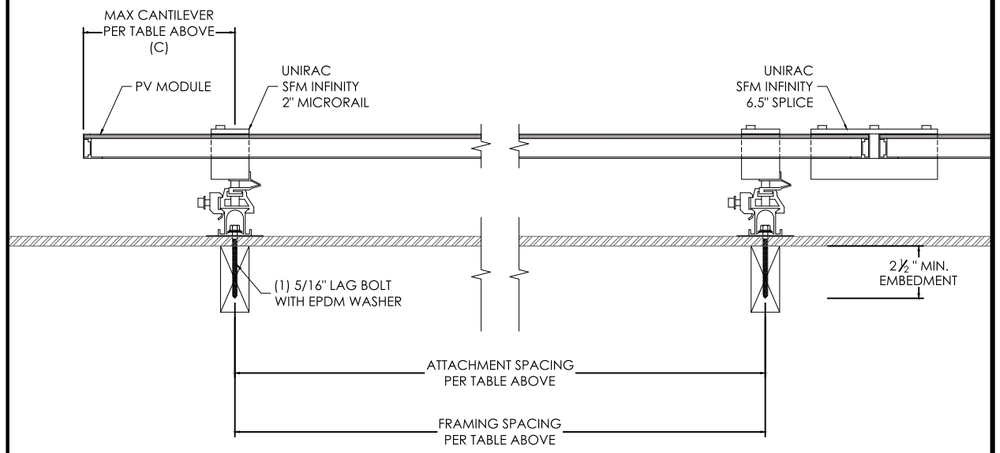


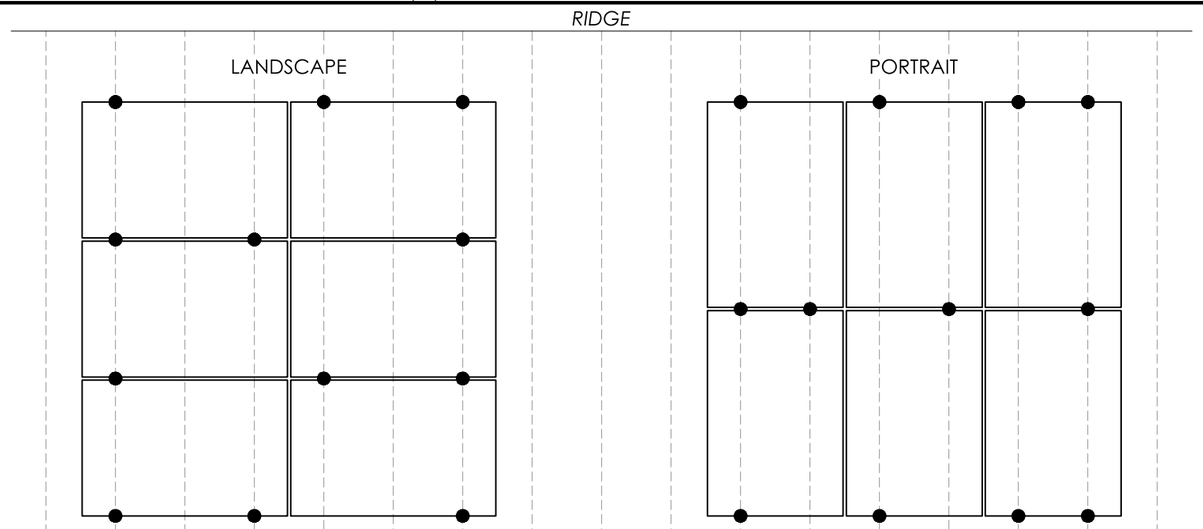
1 FRAMING DETAIL
SCALE: 1/2" = 1'-0"

*THIS DETAIL IS NOT MEANT TO BE AN EXACT REPRESENTATION OF FRAMING OR PV MODULE LAYOUT

ATTACHMENT TYPE:
Unirac SFM Infinity



2 ATTACHMENT DETAIL
SCALE: 1-1/2" = 1'-0"



3 ATTACHMENT PATTERN
SCALE: 1/4" = 1'-0"

*ATTACHMENT PATTERN SHOULD BE STAGGERED UNLESS OTHERWISE NOTED IN ENGINEERING LETTER

NOTES

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UTILITY COMPANY: Duke Energy

PROJECT ID: 1009928

PV DC SYSTEM SIZE: 10.440 kW DC

PV AC SYSTEM SIZE: 7.560 kW AC

REVISIONS:

A	----
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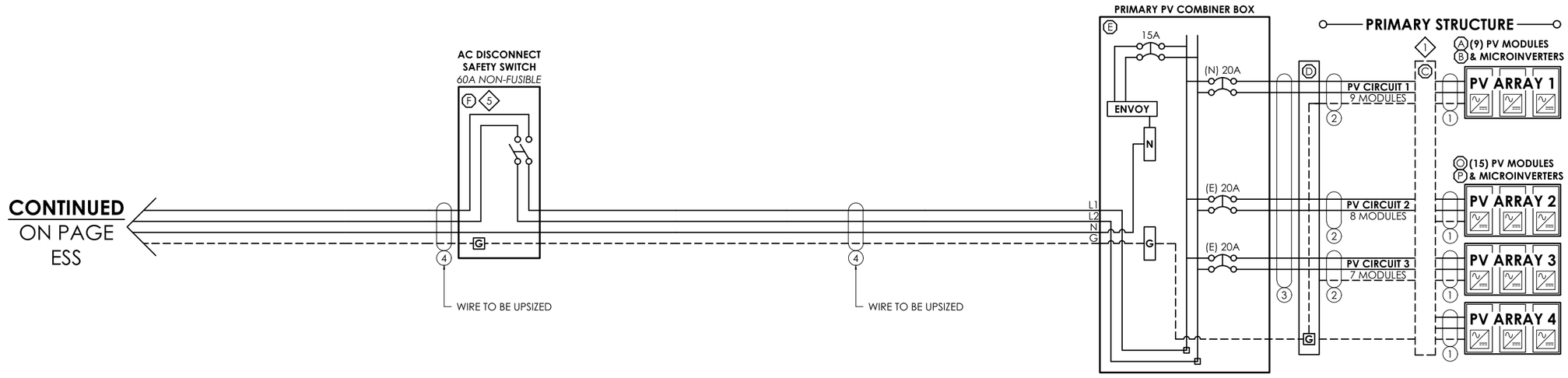
DRAWN BY: Chantelle Wilkinson

PLOT DATE: July 17, 2024

DRAWING TITLE: Structural

DRAWING NUMBER: PV4

4	L1 (1) 8 AWG THHN/THWN-2 CU BLACK L2 (1) 8 AWG THHN/THWN-2 CU RED N (1) 8 AWG THHN/THWN-2 CU WHITE G (1) 10 AWG THHN/THWN-2 CU GREEN 3/4 INCH EMT	Exterior
3	L1 (3) 10 AWG THHN/THWN-2 CU BLACK L2 (3) 10 AWG THHN/THWN-2 CU RED G (1) 10 AWG THHN/THWN-2 CU GREEN *TYPE UF CABLE MAY BE SUBSTITUTED FOR USE IN CONDUIT WHERE NEC CODE PERMITS	3/4 INCH EMT*
2	L1 (1) 10 AWG THHN/THWN-2 CU BLACK L2 (1) 10 AWG THHN/THWN-2 CU RED G (1) 10 AWG THHN/THWN-2 CU GREEN *TYPE NM (ROMEX) OR UF CABLE IS PERMITTED FOR INTERIOR OR ATTIC RUNS AND SHALL BE USED WHEN NEC CODE PERMITS	3/4 INCH *
1	L1 (1) 12 AWG THHN/THWN-2 CU BLACK L2 (1) 12 AWG THHN/THWN-2 CU RED G (1) 6 AWG BARE, CU ENPHASE Q-CABLE, 2-WIRE, FREE AIR	Exterior



GENERAL NOTES

Utility Meter Number: 325330542

WIRE SIZE MUST BE UPDATED TO ACCOMMODATE NEW SYSTEM SIZE. Tie in Method: Load Side Breaker in aGate Main Service Panel Exterior POI

Details: Upgrade PV Breaker to a 50a breaker for the new system size. New array of 9 panels will be strung on a new circuit and added to the combiner box alongside the existing circuit.

LEGEND

(E)	EXISTING	(PV)	PV BREAKER
(N)	NEW	(FIB)	FACTORY INSTALLED BREAKER
(EL)	EXISTING LOADS	SPD	SURGE PROTECTIVE DEVICE
(RL)	RELOCATED LOADS	MI	MECHANICAL INTERLOCK

EQUIPMENT NOTES

1. FINAL CONFIGURATION OF PV CIRCUITS TO BE DECIDED BY INSTALLER. MUST COMPLY WITH MAX MICROINVERTERS PER CIRCUIT AS LISTED ON ATTACHED SPEC SHEET.
2.
3.
4.
5.
6.
7.
8.
9. GROUNDING ELECTRODE SYSTEM SHALL BE IN ACCORDANCE WITH NEC 250.53.
10.
11.
12.

EQUIPMENT DESCRIPTIONS

- A **PV MODULE:** REC Solar REC460AA PURE-RX, 460 W DC, UL 1703 / UL 61730 COMPLIANT
- B **MICROINVERTER:** ENPHASE IQ7X-96-2-US, 315 W AC (0.315 kW), 1 PHASE, UL 1741 COMPLIANT
- C **ROOFTOP JUNCTION BOX:** EZ SOLAR JB-1.2 JUNCTION BOX
- D **JUNCTION BOX:** PVC 4 X 4 JUNCTION BOX
- E **PV COMBINER BOX:** ENPHASE COMBINER 5 (X-IQ-AM1-240-5)
- F SQUARE-D SAFTEY SWITCH 60A, 2P, 240VAC, NON-FUSIBLE (DU222RB)
- G
- H
- I
- J
- K
- L
- M
- N
- O (E) (15) REC Solar REC420AA Pure-R, 420 W DC, UL 1703 / UL 61730 COMPLIANT
- P (E) (15) Enphase IQ7X-96-2-US, 1 PHASE, UL 1741 COMPLIANT
- Q
- R
- S
- T

OTHER NOTES

25 MICROINVERTERS X 315 W AC = 7.875 KW AC;PANEL WATTAGE = 460 W DC

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Fuquay-varina, North Carolina 27526

AHJ: Harnett County

UTILITY COMPANY: Duke Energy

PROJECT ID: 1009928

PV DC SYSTEM SIZE: 10.440 kW DC

PV AC SYSTEM SIZE: 7.560 kW AC

REVISIONS:

A	----
B	----
C	----
D	----

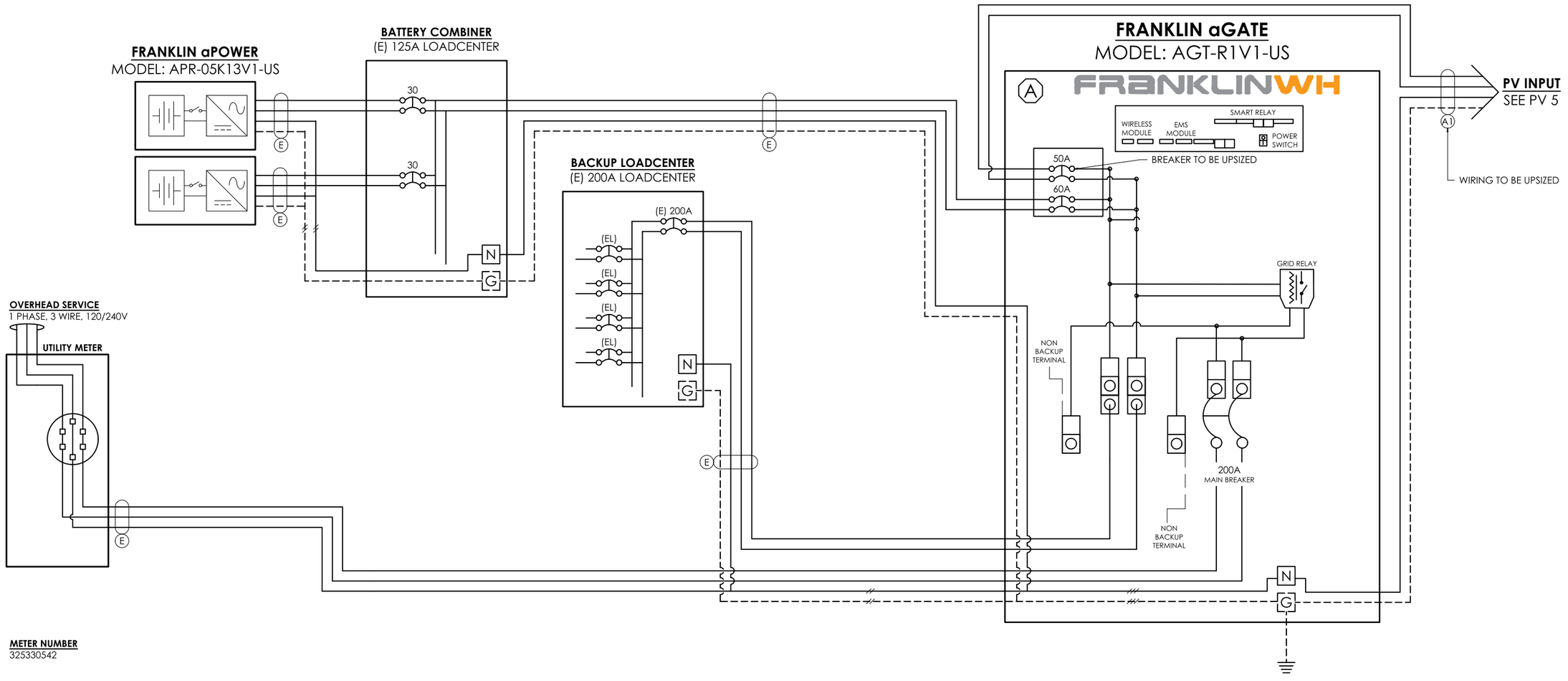
DRAWN BY: Chantelle Wilkinson

PLOT DATE: July 17, 2024

DRAWING TITLE: Electrical 3-Line

DRAWING NUMBER: PV5

A1			
L1	1	8 THHN/THWN-2, CU, BLACK	
0	1	8 THHN/THWN-2, CU, RED	
N	1	8 THHN/THWN-2, CU, WHITE	
G	1	10 THHN/THWN-2, CU, GREEN	
3/4	EMT		EXTERIOR



SUPPLEMENTARY EQUIPMENT NOTES
1
2
3
4
5
6
7
8

SUPPLEMENTARY EQUIPMENT DESCRIPTIONS
A
B
C
D
E
F
G
H

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A	----
B	----
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DRAWN BY: Chantelle Wilkinson

PLOT DATE: July 17, 2024

DRAWING TITLE: Franklin Battery

DRAWING NUMBER: ESS

ELECTRICAL INFORMATION

UTILITY ELECTRICAL SYSTEM	
1-Phase, 3-Wire, 60Hz, 120/240V	
NEW PV SYSTEM	
1-Phase, 3-Wire, 60Hz, 120/240V	
AC SYSTEM SIZE	2.835kW AC
DC SYSTEM SIZE	4.14kW DC
PV MODULES	
QUANTITY	9
TYPE	REC Solar REC460AA PURE-RX
WATTAGE	460W DC
MICROINVERTERS	
TYPE	Enphase IQ7X-96-2-US
OUTPUT CURRENT	1.31A AC
NOMINAL VOLTAGE	240V AC
OUTPUT POWER	315W AC

PV BREAKER BACKFEED CALCULATIONS

NEC 705.12(B) -- "120% RULE"

(BUSBAR RATING * 120%) - OCPD RATING = AVAILABLE BACKFEED

	MAIN SERVICE PANEL	SUBPANEL 1	SUBPANEL 2
BUSBAR RATING	200A	----A	----A
PANEL OCPD RATING	200A	----A	----A
AVAILABLE BACKFEED (120% RULE)	40A	##A	##A
PV BREAKER RATING	45A	45A	45A

THESE CALCULATIONS ARE ONLY APPLICABLE IF PV INTERCONNECTION IS A LOAD SIDE BREAKER. *PV BREAKER MUST BE RATED LESS THAN OR EQUAL TO AVAILABLE BACKFEED FOR CODE COMPLIANCE

DESIGN LOCATION AND TEMPERATURES

DATA SOURCE	ASHRAE Weather Station Data
STATE	North Carolina
CITY	Fuquay-varina
WEATHER STATION	SEYMOUR-JOHNSON AFB
HIGH TEMP 2% AVG	35°C
EXTREME MINIMUM TEMP	-10°C

WIRE SIZE SPECIFICATIONS

	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩
MINIMUM CONDUCTOR AMPACITY	14.74A AC	14.74A AC	14.74A AC	40.94A AC	----A AC	----A AC	----A AC	----A AC	----A AC	----A AC
CONDUCTOR MATERIAL	CU	CU	CU	CU	----	----	----	----	----	----
CONDUCTOR TYPE	THHN/THWN-2	THHN/THWN-2	THHN/THWN-2	THHN/THWN-2	----	----	----	----	----	----
CONDUCTOR SIZE	12 AWG	10 AWG	10 AWG	8 AWG	----					
CONDUCTOR AMPACITY	30A	40A	40A	55A	----A	----A	----A	----A	----A	----A
AMBIENT TEMPERATURE ADJUSTMENT FACTOR	0.96	0.96	0.96	0.96	----	----	----	----	----	----
CONDUIT FILL ADJUSTMENT FACTOR	1	1	0.7	1	----	----	----	----	----	----
ADJUSTED CONDUCTOR AMPACITY	28.8A	38.4A	26.88A	52.8A	----A	----A	----A	----A	----A	----A
WIRE RUN DISTANCE (FT)	59	30	20	5	----	----	----	----	----	----
CALCULATED VOLTAGE DROP	0.64%	0.37%	0.24%	0.11%	0%	0%	0%	0%	0%	0%

PV CIRCUIT SPECIFICATIONS

	PRIMARY STRUCTURE								DETACHED STRUCTURE				
	CIRCUIT 1	CIRCUIT 2	CIRCUIT 3	CIRCUIT 4	CIRCUIT 5	CIRCUIT 6	CIRCUIT 7	CIRCUIT 8	CIRCUIT 1	CIRCUIT 2	CIRCUIT 3	CIRCUIT 4	CIRCUIT 5
NUMBER OF MODULES PER CIRCUIT	9	8	8	0	0	0	0	0	0	0	0	0	0
RATED AC OUTPUT CURRENT (I_{OUT})	11.8A	10.5A	10.5A	0.0A	0.0A	0.0A	0.0A	0.0A	0.0A	0.0A	0.0A	0.0A	0.0A
MINIMUM AMPACITY (I_{OUT} x 125%)	14.7A	13.1A	13.1A	0.0A	0.0A	0.0A	0.0A	0.0A	0.0A	0.0A	0.0A	0.0A	0.0A
OVERCURRENT PROTECTION RATING	20A	20A	20A	20A	20A	20A	20A	20A	20A	20A	20A	20A	20A
COMBINED AC OUTPUT CURRENT (C_{OUT})	32.8A								0.0A				
MINIMUM AMPACITY (C_{OUT} x 125%)	40.9A								0.0A				
COMBINED PV BREAKER RATING	45AA								0AA				

TOTAL VOLTAGE DROP

	VOLTAGE DROP
WIRE TAG #1	0.64%
WIRE TAG #2	0.37%
WIRE TAG #3	0.24%
WIRE TAG #4	0.11%
WIRE TAG #5	0%
WIRE TAG #6	0%
TOTAL	***1.360000%***

(E) MSP TO CONTAIN BACKUP LOADS (SUB PANEL 1) 200A - 120/240V

1	AC 60A/2P		30A/2P		2
3					4
5	15A/1P		AC/FURNANCE 20A/2P		6
7	15A/1P				8
9	15A/1P		30A/2P		10
11	15A/1P				12
13	15A/1P		30A/2P		14
15	15A/1P				16
17	20A/1P		20A/2P		18
19	20A/1P				20
21	20A/1P		30A/2P		22
23	20A/1P				24
25	20A/1P		20A/1P		26
27	RANGE 50A/2P		15A/1P		28
29			20A/1P		30

LOAD CALCS FOR ENTIRE HOME ELECTRICAL SYSTEM

Residential Electrical Load Calculations — **NEC 220.83**

		Total VA
Home Square Footage	2,772	8,316 VA

General Loads (Small Appliances) — Small appliances fed by a 15A or 20A 1-pole breaker.

	Qty.	Total VA
Washing Machine	1	1,500 VA
Microwave	1	1,500 VA
Dishwasher	1	1,500 VA
Disposal	1	1,500 VA
Refrigerator	1	1,500 VA
Freezer		
Compactor		
Window A/C Unit		
Dehumidifier		
Ice Maker		
Water Cooler		
Air Handler		
Range Hood		
Other		
Other		
Other		

General Loads (Large Appliances)

		Breaker Rating	Total VA
Large appliances fed by a 2-pole (240V) breaker	Range (Electric)	50	9,600 VA
	Oven (Electric)		
	Stovetop (Electric)		
	Dryer (Electric)	30	5,760 VA
	Water Heater (Electric)	30	5,760 VA
Large appliances fed by a 1-pole (120V) breaker	Range (Gas)		
	Oven (Gas)		
	Stovetop (Gas)		
	Dryer (Gas)		
	Water Heater (Gas)		
	Water Pump (120V)		
	Sump Pump (120V)		
	Water Pump (240V)	30	5,760 VA
	Sump Pump (240V)		
	Other 120V		
	Other 240V	60	11,520 VA
	EV Charger (240V)		

Heating and Air Conditioning Loads

	Sum of Breakers	Total VA
A/C Units	60	11,520 VA
Furnace (Electric)(240V)	20	3,840 VA
Furnace (Gas)(120V)		

Existing Load	**158 A**	38,006 VA

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D	----

DRAWN BY: Chantelle Wilkinson

PLOT DATE: July 17, 2024

DRAWING TITLE: Electrical Calculations

DRAWING NUMBER: PV6

WARNING LABELS

UTILITY METER

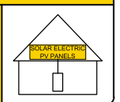
WARNING
DUAL POWER SUPPLY
SOURCES: UTILITY GRID AND PV SOLAR ELECTRIC SYSTEM

NOTICE
IN CASE OF EMERGENCY, PLEASE CONTACT:
BLUE RAVEN SOLAR
(800) 377-4480

MAIN SERVICE PANEL

SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN

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



CAUTION
MULTIPLE SOURCES OF POWER
POWER TO THIS BUILDING IS ALSO SUPPLIED FROM A ROOF MOUNTED SOLAR ARRAY. PV DISCONNECT IS LOCATED WITHIN 10 FT AND LINE OF SIGHT OF UTILITY METER.

WARNING
POWER SOURCE OUTPUT CONNECTION DO NOT RELOCATE THIS OVERCURRENT DEVICE

**LABEL INSTALLED NEXT TO PV BREAKER*

AC DISCONNECT

PHOTOVOLTAIC SYSTEM
AC DISCONNECT

RATED AC OUTPUT CURRENT 31.4 A
NOMINAL OPERATING AC VOLTAGE 240 V

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

RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

PV COMBINER BOX

PHOTOVOLTAIC SYSTEM
COMBINER PANEL

WARNING
AUTHORIZED PERSONNEL ONLY
DO NOT ADD LOADS
NO DC WIRES PRESENT
RAPID SHUTDOWN
TEST NOT REQUIRED

BLUE RAVEN SOLAR
1403 N 630 E
Orem, Utah 84097
(800) 377-4480
BlueRavenSolar.com

CUSTOMER NAME: **Wiyada Sorkaew**
1153 Christian Light Rd
Fuquay-varina, North Carolina 27526

AHJ: Harnett County

UTILITY COMPANY: Duke Energy

PROJECT ID: 1009928

PV DC SYSTEM SIZE: 10.440 kW DC

PV AC SYSTEM SIZE: 7.560 kW AC

REVISIONS:

A	----
B	----
C	----
D	----

DRAWN BY: Chantelle Wilkinson

PLOT DATE: July 17, 2024

DRAWING TITLE: Warning Labels

DRAWING NUMBER: PV7

REC ALPHA® PURE-RX SERIES

DATASHEET

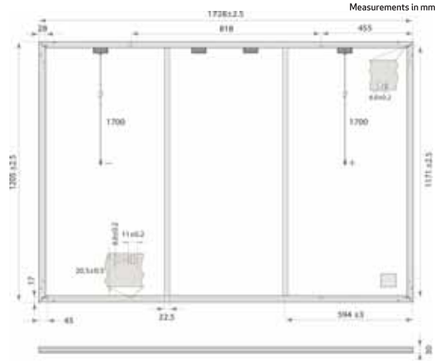
REC SOLAR'S MOST TRUSTED

BLUE RAVEN SOLAR

GENERAL DATA

Cell Type	88 half-cut bifacial REC heterojunction cells, with gapless technology
Glass	3.2 mm solar glass with anti-reflective surface treatment in accordance with EN12150
Backsheet	Highly resistant polymer (Black)
Frame	Anodized aluminum (Black)
Junction Box	4-part, 4 bypass diodes, IP68 rated, in accordance with IEC 62790
Connectors	Stäubli MC4 PV-KBT4/KST4 (4 mm²) in accordance with IEC 62852, IP68 only when connected
Cable	4 mm² solar cable, 1.7 m + 1.7 m in accordance with EN50618
Dimensions	1728 x 1205 x 30 mm (2.08 m²)
Weight	22.7 kg
Origin	Made in Singapore

Measurements in mm



ELECTRICAL DATA

PRODUCT CODE*: RECxxxAA Pure-RX

STC			
Power Output - P_{MAX} (W_P)	450	460	470
Watt Class Sorting - (W)	0/+10	0/- .0	0/+10
Nominal Power Voltage - V_{MPP} (V)	54.3	54.9	55.4
Nominal Power Current - I_{MPP} (A)	8.29	8.38	8.49
Open Circuit Voltage - V_{OC} (V)	65.1	65.3	65.6
Short Circuit Current - I_{SC} (A)	8.81	8.88	8.95
Power Density (W/m²)	216	221	226
Panel Efficiency (%)	21.6	22.1	22.6
NMOT			
Power Output - P_{MAX} (W_P)	343	350	358
Nominal Power Voltage - V_{MPP} (V)	51.2	51.7	52.2
Nominal Power Current - I_{MPP} (A)	6.70	6.77	6.86
Open Circuit Voltage - V_{OC} (V)	61.3	61.6	61.8
Short Circuit Current - I_{SC} (A)	7.11	7.17	7.23

Values at standard test conditions (STC: air mass AM 1.5, irradiance 1000 W/m², temperature 25°C), based on a production spread with a tolerance of P_{MAX}, V_{OC} & I_{SC}: ±3% within one watt class. Nominal module operating temperature (NMOT: air mass AM 1.5, irradiance 800 W/m², temperature 20°C, windspeed 1 m/s). * Where xxx indicates the nominal power class (P_{MAX}) at STC above.

CERTIFICATIONS

IEC 61215:2021; IEC61730:2016; UL61730	
ISO 11925-2	Ignitability (EN 13501-1 Class E)
IEC 62716	Ammonia Resistance
IEC 61701	Salt Mist (SM6)
IEC 61215:2016	Hailstone (35 mm)
UL 61730	Fire Type 2
ISO 14001; ISO9001; IEC45001; IEC62941	

Take-e-way WEEE-compliant scheme

Specifications subject to change without notice.

MAXIMUM RATINGS*

Operational Temperature	-40 °C - 85 °C
System Voltage	1000 V
Maximum Test Load (front)	+7000 Pa (713 kg/m²)
Maximum Test Load (rear)	-4000 Pa (407 kg/m²)
Max Series Fuse Rating	25 A
Max Reverse Current	25 A

* See installation manual for mounting instructions. Design load = Test load / 1.5 (safety factor)

TEMPERATURE RATINGS*

Nominal Module Operating Temperature	44 °C ± 2°C
Temperature coefficient of P_{MAX}	-0.24% / °C
Temperature coefficient of V_{OC}	-0.24% / °C
Temperature coefficient of I_{SC}	0.04% / °C

*The temperature coefficients stated are linear values

DELIVERY INFORMATION

Panels per Pallet	33
Panels per 40 ft GP/high cube container	594 (18 Pallets)
Panels per 13.6 m truck	660 (20 Pallets)

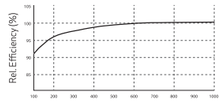
WARRANTY

	Standard	REC ProTrust	
Installed by an REC Certified Professional	No	Yes	Yes
System Size	All	<25 kW	25-500 kW
Product Warranty (yrs)	20	25	25
Power Warranty (yrs)	25	25	25
Labor Warranty (yrs)	0	25	10
Power in Year 1	98%	98%	98%
Annual Degradation	0.25%	0.25%	0.25%
Power in Year 25	92%	92%	92%

The REC ProTrust Warranty is only available on panels purchased through an REC Certified Solar Professional installer. Warranty conditions apply. See www.recgroup.com for more details

LOW LIGHT BEHAVIOUR

Typical low irradiance performance of module at STC:



Available from:

Founded in 1996, REC Group is an international pioneering solar energy company dedicated to empowering consumers with clean, affordable solar power. As Solar's Most Trusted, REC is committed to high quality, innovation, and a low carbon footprint in the solar materials and solar panels it manufactures. Headquartered in Norway with operational headquarters in Singapore, REC also has regional hubs in North America, Europe, and Asia-Pacific.

REC Solar PTE. LTD.
20 Tuas South Ave. 14
Singapore 637312
post@recgroup.com
www.recgroup.com

REC

Ref: PM-DS-12-06-Rev-4.4 5.2024

DRAWING NUMBER:

SS

ENPHASE

US DATA SHEET

IQ7X Microinverter

The high-powered, smart grid-ready IQ7X Microinverter dramatically simplifies the installation process while achieving the highest system efficiency for systems with 96-cell modules.

Part of the Enphase Energy System, the IQ7X Microinverter integrates with the IQ Gateway, IQ Battery, and the Enphase Installer App monitoring and analysis software.

Enphase 25 year limited warranty

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.*

Connect PV modules quickly and easily to IQ7X Microinverters using the included Q-DCC-2 adapter cable with plug-and-play MC4 connectors.

UL CERTIFIED SAFETY

IQ7X Microinverters are UL Listed as PV rapid shutdown equipment and conform with various regulations when installed according to the manufacturer's instructions.

Easy to install

- Lightweight and simple
- Faster installation with improved, lighter two-wire cabling
- Built-in rapid shutdown compliant (NEC 2014, 2017, 2020, and 2023)

Efficient and reliable

- Optimized for high powered 96-cell modules
- Highest CEC efficiency of 97.5%
- More than a million hours of testing
- Class II double-insulated enclosure
- UL Listed

Smart grid-ready

- Complies with advanced grid support, voltage, and frequency ride-through requirements
- Remotely updates to respond to changing grid requirements
- Configurable for varying grid profiles
- Meets CA Rule 21 (UL 1741-SA) and IEEE 1547:2018 (UL 1741-SB, 3rd Ed.)

* 25-year warranty is valid, provided an internet-connected IQ Gateway is installed.

To learn more about Enphase offering, visit Enphase.com

IQ7X Microinverters

INPUT DATA (DC)	UNITS	IQ7X-96-2-US
Commonly used module pairings [1]	W	320–460
Module compatibility	–	To meet compatibility, PV modules must be within the following maximum input DC voltage and maximum module I_{sc}. Module compatibility can be checked at https://enphase.com/installers/microinverters/calculator.
MPPT voltage range	V	53–64
Operating range	V	25–79.5
Minimum/Maximum start voltage	V	33/79.5
Maximum input DC voltage	V	79.5
Maximum continuous input DC current	A	6.5
Maximum module I_{sc}	A	10
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 a maximum of 20 A per branch circuit.

OUTPUT DATA (AC)	UNITS	IQ7X-96-2-US@240 VAC	IQ7X-96-2-US@208 VAC
Peak output power	VA	320	
Maximum continuous output power	VA	315	
Nominal grid voltage (L-L)	V	240, split-phase (L-L), 180°	208, single-phase (L-L), 120°
Minimum and Maximum grid voltage [2]	V	211–264	183–229
Maximum continuous output current	A	1.31	1.51
Nominal frequency	Hz	60	
Extended frequency range	Hz	49–68	
AC short-circuit fault current over three cycles	A_{rms}	5.8	
Maximum units per 20 A (L-L) branch circuit [3]	–	12	10
Overvoltage class AC port	–	III	
AC port backfeed current	mA	18	
Power factor setting	–	1.0	
Grid-tied power factor (adjustable)	–	0.85 leading ... 0.85 lagging	
CEC weighted efficiency	%	97.5	97.0

MECHANICAL DATA	UNITS	
Ambient temperature range	°C (°F)	-40 to 60 (-40 to 140)
Relative humidity range	%	4 to 100 (condensing)
DC connector type	–	MC4 (or Amphenol H4 UTX with additional Q-DCC-5 adapter)
Dimensions (H × W × D)	mm (in)	212 (8.3) × 175 (6.9) × 30.2 (1.2)
Weight	kg (lbs)	1.1 (2.4)
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

COMPLIANCE	
Compliance	CA Rule 21 (UL 1741-SA), IEEE 1547:2018 (UL 1741-SB 3rd Ed.), HEI Rule 14H SRD 2.0 UL 62109-1, 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, NEC 2020, and NEC 2023 section 690.12 and C22.1-2015. Rule 64-218 rapid shutdown of PV Systems for AC and DC conductors when installed according to the manufacturer's instructions.

(1) Pairing PV modules with wattage above the limit may result in additional clipping losses.
(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.

IQ7X-DSH-00208-2.0-EN-US-2023-11-08

BLUE RAVEN SOLAR

DRAWING NUMBER:
SS

Data Sheet
Enphase Q Cable Accessories
REGION: Americas

Enphase Q Cable Accessories

The **Enphase Q Cable™** and accessories are part of the latest generation Enphase IQ System™. These accessories provide simplicity, reliability, and faster installation times.

Enphase Q Cable

- Two-wire, double-insulated Enphase Q Cable is 50% lighter than the previous generation Enphase cable
- New cable numbering and plug and play connectors speed up installation and simplify wire management
- Link connectors eliminate cable waste

Field-Wireable Connectors

- Easily connect Q cables on the roof without complex wiring
- Make connections from any open connector and center feed any section of cable within branch limits
- Available in male and female connector types

Enphase Q Cable Accessories

CONDUCTOR SPECIFICATIONS	
Certification	UL3003 (raw cable), UL 9703 (cable assemblies), DG cable
Flame test rating	FT4
Compliance	RoHS, OIL RES I, CE, UV Resistant, combined UL for Canada and United States
Conductor type	THHN/THWN-2 dry/wet
Disconnecting means	The AC and DC bulkhead connectors have been evaluated and approved by UL for use as the load-break disconnect required by NEC 690.

Q CABLE TYPES / ORDERING OPTIONS

Connectorized Models	Size / Max Nominal Voltage	Connector Spacing	PV Module Orientation	Connector Count per Box
Q-12-10-240	12 AWG / 277 VAC	1.3 m (4.2 ft)	Portrait	240
Q-12-17-240	12 AWG / 277 VAC	2.0 m (6.5 ft)	Landscape (60-cell)	240
Q-12-20-200	12 AWG / 277 VAC	2.3 m (7.5 ft)	Landscape (72-cell)	200

ENPHASE Q CABLE ACCESSORIES

Name	Model Number	Description
Raw Q Cable	Q-12-RAW-300	300 meters of 12 AWG cable with no connectors
Field-wireable connector (male)	Q-CONN-10M	Make connections from any open connector
Field-wireable connector (female)	Q-CONN-10F	Make connections from any Q Cable open connector
Cable Clip	Q-CLIP-100	Used to fasten cabling to the racking or to secure looped cabling
Disconnect tool	Q-DISC-10	Disconnect tool for Q Cable connectors, DC connectors, and AC module mount
Q Cable sealing caps (female)	Q-SEAL-10	One needed to cover each unused connector on the cabling
Terminator	Q-TERM-10	Terminator cap for unused cable ends
Enphase EN4 to MC4 adaptor[1]	ECA-EN4-S22	Connect PV module using MC4 connectors to IQ micros with EN4 (TE PV4-S SOLARLOK). 150mm/5.9” to MC4.
Enphase EN4 non-terminated adaptor[1]	ECA-EN4-FW	For field wiring of UL certified DC connectors. EN4 (TE PV4-S SOLARLOK) to non-terminated cable. 150mm/5.9”
Enphase EN4 to MC4 adaptor (long)[1]	ECA-EN4-S22-L	Longer adapter cable for EN4 (TE PV4-S SOLARLOK) to MC4. Use with split cell modules or PV modules with short DC cable. 600mm/23.6”
Replacement DC Adaptor (MC4)	Q-DCC-2	DC adaptor to MC4 (max voltage 100 VDC)
Replacement DC Adaptor (UTX)	Q-DCC-5	DC adaptor to UTX (max voltage 100 VDC)

1. Qualified per UL subject 9703.

TERMINATOR
Terminator cap for unused cable ends, sold in packs of ten (Q-TERM-10)

SEALING CAPS
Sealing caps for unused aggregator and cable connections (Q-BA-CAP-10 and Q-SEAL-10)

DISCONNECT TOOL
Plan to use at least one per installation, sold in packs of ten (Q-DISC-10)

CABLE CLIP
Used to fasten cabling to the racking or to secure looped cabling, sold in packs of one hundred (Q-CLIP-100)

To learn more about Enphase offerings, visit **enphase.com**

2020-06-26

To learn more about Enphase offerings, visit **enphase.com**

BLUE RAVEN SOLAR

DRAWING NUMBER:
SS

ENPHASE

DATA SHEET

X-IQ-AM1-240-5
X-IQ-AM1-240-5C

IQ Combiner 5/5C

The IQ Combiner 5/5C consolidates interconnection equipment into a single enclosure and streamlines IQ Series Microinverters and IQ Gateway installation by providing a consistent, pre-wired solution for residential applications. IQ Combiner 5/5C uses wired control communication and is compatible with IQ System Controller 3/3G and IQ Battery 5P.

The IQ Combiner 5/5C, IQ Series Microinverters, IQ System Controller 3/3G, and IQ Battery 5P provide a complete grid-agnostic Enphase Energy System.

IQ Series Microinverters
The high-powered smart grid-ready IQ Series Microinverters (IQ6, IQ7, and IQ8 Series) simplify the installation process.

IQ System Controller 3/3G
Provides microgrid interconnection device (MID) functionality by automatically detecting grid failures and seamlessly transitioning the home energy system from grid power to backup power.

IQ Battery 5P
Fully integrated AC battery system. Includes six field-replaceable IQ8D-BAT Microinverters.

IQ Load Controller
Helps prioritize essential appliances during a grid outage to optimize energy consumption and prolong battery life.

Smart

- Includes IQ Gateway for communication and control
- Includes Enphase Mobile Connect (CELLMODEM-M1-06-SP-05), only with IQ Combiner 5C
- Supports flexible networking: Wi-Fi, Ethernet, or cellular
- Provides production metering (revenue grade) and consumption monitoring

Easy to install

- Mounts to one stud with centered brackets
- Supports bottom, back, and side conduit entries
- Supports up to four 2-pole branch circuits for 240 VAC plug-in breakers (not included)
- 80 A total PV branch circuits
- Bluetooth-based Wi-Fi provisioning for easy Wi-Fi setup

Reliable

- Durable NRTL-certified NEMA type 3R enclosure
- 5-year limited warranty
- 2-year labor reimbursement program coverage included for both the IQ Combiner SKUs*
- UL1741 Listed

Enphase 5 year limited warranty

5-year limited warranty

*For country-specific warranty information, see the https://enphase.com/installers/resources/warranty page.

IQ Combiner 5/5C

MODEL NUMBER	
IQ Combiner 5 (X-IQ-AM1-240-5)	IQ Combiner 5 with IQ Gateway printed circuit board for integrated revenue-grade PV production metering (ANSIC12.20 ±0.5%), consumption monitoring (± 2.5%), and IQ Battery monitoring (±2.5%). Includes a silver solar shield to deflect heat.
IQ Combiner 5C (X-IQ-AM1-240-5C)	IQ Combiner 5C with IQ Gateway printed circuit board for integrated revenue-grade PV production metering (ANSI C12.20 ±0.5%), consumption monitoring (±2.5%) and IQ Battery monitoring (±2.5%). Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05)[1]. Includes a silver solar shield to deflect heat.
WHAT'S IN THE BOX	
IQ Gateway printed circuit board	IQ Gateway is the platform for total energy management for comprehensive, remote maintenance, and management of the Enphase Energy System
Busbar	80 A busbar with support for 1 × IQ Gateway breaker and 4 × 20 A breaker for installing IQ Series Microinverters and IQ Battery 5P
IQ Gateway breaker	Circuit breaker, 2-pole, 10 A/15 A
Production CT	Pre-wired revenue-grade solid-core CT, accurate up to ±0.5%
Consumption CT	Two consumption metering clamp CTs, shipped with the box, accurate up to ±2.5%
IQ Battery CT	One battery metering clamp CT, shipped with the box, accurate up to ±2.5%
CTRL board	Control board for wired communication with IQ System Controller 3/3G and the IQ Battery 5P
Enphase Mobile Connect (only with IQ Combiner 5C)	4G-based LTE-M1 cellular modem (CELLMODEM-M1-06-SP-05) with a 5-year T-Mobile data plan
Accessories kit	Spare control headers for the COMMS-KIT-02 board
ACCESSORIES AND REPLACEMENT PARTS (NOT INCLUDED, ORDER SEPARATELY)	
CELLMODEM-M1-06-SP-05	4G-based LTE-M1 cellular modem with a 5-year T-Mobile data plan
CELLMODEM-M1-06-AT-05	4G-based LTE-M1 cellular modem with a 5-year AT&T data plan
Circuit breakers (off-the-shelf)	Supports Eaton BR2XX, Siemens Q2XX and GE/ABB THQL21XX Series circuit breakers (XX represents 10, 15, 20, 30, 40, 50, or 60). Also supports Eaton BR220B, BR230B, and BR240B circuit breakers compatible with the hold-down kit.
Circuit breakers (provided by Enphase)	BRK-10A-2-240V, BRK-15A-2-240V, BRK-20A-2P-240V, BRK-15A-2P-240V-B, and BRK-20A-2P-240V-B (more details in the "Accessories" section)
XA-SOLARSHIELD-ES	Replacement solar shield for IQ Combiner 5/5C
XA-ENV2-PCBA-5	IQ Gateway replacement printed circuit board (PCB) for IQ Combiner 5/5C
X-IQ-NA-HD-125A	Hold-down kit compatible with Eaton BR-B Series circuit breakers (with screws)
XA-COMMS2-PCBA-5	Replacement COMMS-KIT-02 printed circuit board (PCB) for IQ Combiner 5/5C
ELECTRICAL SPECIFICATIONS	
Rating	80 A
System voltage and frequency	120/240 VAC, 60 Hz
Busbar rating	125 A
Fault current rating	10 kAIC
Maximum continuous current rating (input from PV/storage)	64 A
Branch circuits (solar and/or storage)	Up to four 2-pole Eaton BR, Siemens Q, or GE/ABB THQL Series distributed generation (DG) breakers only (not included)
Maximum total branch circuit breaker rating (input)	80 A of distributed generation/95 A with IQ Gateway breaker included
IQ Gateway breaker	10 A or 15 A rating GE/Siemens/Eaton included
Production metering CT	200 A solid core pre-installed and wired to IQ Gateway
Consumption monitoring CT (CT-200-CLAMP)	A pair of 200 A clamp-style current transformers is included with the box
IQ Battery metering CT	200 A clamp-style current transformer for IQ Battery metering, included with the box

1. A plug-and-play industrial-grade cell modem for systems of up to 60 microinverters. Available in the United States, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.

IQC-5-5C-DSH-00007-3.0-EN-US-2024-03-01

BLUE RAVEN SOLAR

DRAWING NUMBER:
SS

MECHANICAL DATA		
Dimensions (W × H × D)		37.5 cm × 49.5 cm × 16.8 cm (14.75" × 19.5" × 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°F 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
Communication (in-premise connectivity)		Built-in CTRL board for wired communication with IQ Battery 5P and IQ System Controller 3/3G. Integrated power line communication for IQ Series Microinverters
Altitude		Up to 2,600 meters (8,530 feet)
COMMUNICATION INTERFACES		
Integrated Wi-Fi		802.11b/g/n (dual band 2.4 GHz/5 GHz), for connecting the Enphase Cloud through the internet
Wi-Fi range (recommended)		10 m (32.8 feet)
Bluetooth		BLE4.2, 10 m range to configure Wi-Fi SSID
Ethernet		Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included), for connecting to the Enphase Cloud through the internet
Cellular/Mobile Connect		CELLMODEM-M1-06-SP-05 or CELLMODEM-M1-06-AT-05 (included with IQ Combiner 5C)
Digital I/O		Digital input/output for grid operator control
USB 2.0		Mobile Connect, COMMS-KIT-01 for IQ Battery 3/3T/10/10T, COMMS-KIT-02 for IQ Battery 5P
Access point (AP) mode		For connection between the IQ Gateway and a mobile device running the Enphase Installer App
Metering ports		Up to two Consumption CTs, one IQ Battery CT, and one Production CT
Power line communication		90–110 kHz
Web API		See https://developer-v4.enphase.com
Local API		See guide for local API
COMPLIANCE		
IQ Combiner with IQ Gateway		UL 1741, CAN/CSA C22.2 No. 107.1, Title 47 CFR, Part 15, Class B, ICES 003, NOM-208-SCFI-2016, UL 60601-1/CANCSA 22.2 No. 61010-1, IEEE 1547: 2018 (UL 1741-SB, 3rd Ed.), IEEE 2030.5/CSIP Compliant, Production metering: ANSI C12.20 accuracy class 0.5 (PV production)
COMPATIBILITY		
PV	Microinverters	IQ6, IQ7, and IQ8 Series Microinverters
COMMS-KIT-01 [2]	IQ System Controller	EP200G101-M240US00
	IQ System Controller 2	EP200G101-M240US01
	IQ Battery	ENCHARGE-3-1P-NA, ENCHARGE-10-1P-NA, ENCHARGE-3T-1P-NA, ENCHARGE-10T-1P-NA
COMMS-KIT-02 [3]	IQ System Controller 3	SC200D111C240US01, SC200G111C240US01
	IQ Battery	IQBATTERY-5P-1P-NA

2. For information about IQ Combiner 5/5C compatibility with the 2nd-generation batteries, refer to the compatibility matrix.
3. IQ Combiner 5/5C comes pre-equipped with COMMS-KIT-02.

Accessories

Mobile Connect

4G-based LTE-M1 cellular modem with a 5-year data plan
(CELLMODEM-M1-06-SP-05 for Sprint and CELLMODEM-M1-06-AT-05 for AT&T)

Circuit breakers

BRK-10A-2-240V Circuit breaker, 2-pole, 10 A, Eaton BR210
BRK-15A-2-240V Circuit breaker, 2-pole, 15 A, Eaton BR215
BRK-20A-2P-240V Circuit breaker, 2-pole, 20 A, Eaton BR220
BRK-15A-2P-240V-B Circuit breaker, 2-pole, 15 A, Eaton BR215B with hold-down kit support
BRK-20A-2P-240V-B Circuit breaker, 2-pole, 20 A, Eaton BR220B with hold-down kit support

CT-200-SOLID

200 A revenue-grade solid core Production CT with <0.5% error rate (replacement SKU)

CT-200-CLAMP

200 A clamp-style consumption and battery metering CT with <2.5% error rate (replacement SKU)

IQC-5-5C-DSH-00007-3.0-EN-US-2024-03-01

BLUE RAVEN SOLAR

DRAWING NUMBER:
SS

Data Sheet
Enphase Networking

Enphase IQ Envoy

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

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

Smart

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

Simple

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

Reliable

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

CERTIFIED

To learn more about Enphase offerings, visit **enphase.com**

ENPHASE

Enphase IQ Envoy

MODEL NUMBERS	
Enphase IQ Envoy™ ENV-IQ-AM1-240	Enphase IQ Envoy communications gateway with integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and optional consumption monitoring (+/- 2.5%). Includes one 200A continuous rated production CT (current transformer).
ACCESORIES (Order Seperately)	
Enphase Mobile Connect™ CELLMODEM-M1 (4G based LTE-M/5-year data plan) CELLMODEM-M1-B (4G-based LTE-M1/5-year data plan)	Plug and play industrial grade cellular modem with data plan for systems up to 60 microinverters. (Available in the US, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.)
Consumption Monitoring CT CT-200-SPLIT	Split-core consumption CTs enable whole home metering.
Ensemble Communications Kit COMMS-KIT-01	Installed at the IQ Envoy. For communications with Enphase Encharge™ storage and Enphase Enpower™ smart switch. Includes USB cable for connection to IQ Envoy or Enphase IQ Combiner™ and allows wireless communication with Encharge and Enpower.
POWER REQUIREMENTS	
Power requirements	120/240 VAC split-phase. Max 20 A overcurrent protection required.
Typical Power Consumption	5W
CAPACITY	
Number of microinverters polled	Up to 600
MECHANICAL DATA	
Dimensions (WxHxD)	21.3 x 12.6 x 4.5 cm (8.4” x 5” x 1.8”)
Weight	17.6 oz (498 g)
Ambient temperature range	-40° to 65° C (-40° to 149° F) -40° to 46° C (-40° to 115° F) if installed in an enclosure
Environmental rating	IP30. For installation indoors or in an NRTL-certified, NEMA type 3R enclosure.
Altitude	To 2000 meters (6,560 feet)
Production CT	- Limited to 200A of continuous current / 250A OCPD – 72kW AC - Internal aperture measures 19.36mm to support 250MCM THWN conductors (max) - UL2808 certified for revenue grade metering
Consumption CT	- For electrical services to 250A with parallel runs up to 500A - Internal aperture measures 0.84” x 0.96” (21.33mm x 24.38mm) to support 3/0 THWN conductor - UL2808 certified, for use at service entrance for services up to 250Vac
INTERNET CONNECTION OPTIONS	
Integrated Wi-Fi	802.11b/g/n
Ethernet	802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included)
Mobile	CELLMODEM-M1 (4G) or CELLMODEM-M1-B (4G). Not included. Note that an Enphase Mobile Connect cellular modem is required for all Ensemble installations.
COMPLIANCE	
Compliance	UL 61010-1 CAN/CSA C22.2 No. 61010-1 47 CFR, Part 15, Class B, ICES 003 IEC/EN 61010-1:2010, EN50065-1, EN61000-4-5, EN61000-6-1, EN61000-6-2 Metering: ANSI C12.20 accuracy class 0.5 (PV production only)

To learn more about Enphase offerings, visit **enphase.com**

ENPHASE

BLUE RAVEN SOLAR
1403 N. Research Way
Orem, UT 84097
800.377.4480
WWW.BLUERAVENSOLAR.COM

NABCEP CERTIFIED
PV INSTALLATION PROFESSIONAL
Scott Gurney
#PV-011719-015866

CONTRACTOR:
BRS FIELD OPS
385-498-6700

DRAWING BY:

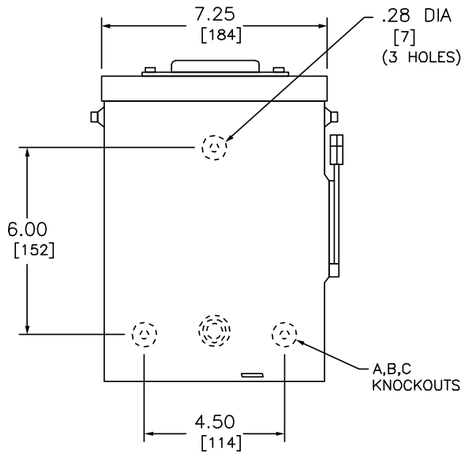
PLOT DATE:

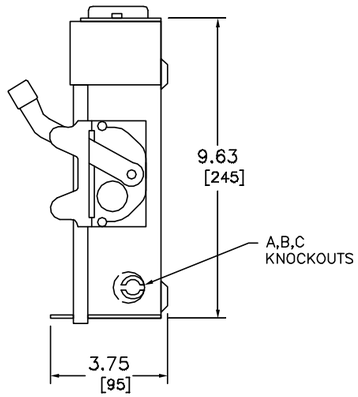
PROJECT NUMBER:

SHEET NAME:
SPEC SHEET

REVISION: ----

PAGE NUMBER: SS

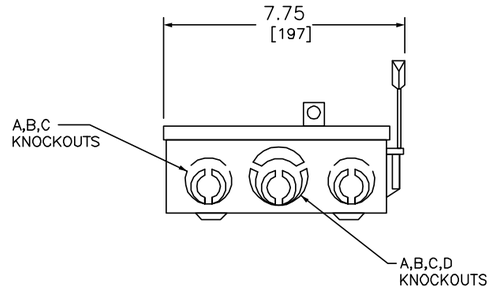




WIRING DIAGRAMS
NOT FUSIBLE
A B

TERMINAL LUGS ‡			
AMPERES	MAX. WIRE	MIN. WIRE	TYPE
60	# 2 AWG # 2 AWG	#10 AWG #14 AWG	AL CU

KNOCKOUTS				
SYMBOL	A	B	C	D
CONDUIT SIZE	.50	.75	1	1.25



NEMA TYPE 3R

DUAL DIMENSIONS: INCHES / MILLIMETERS

CATALOG NUMBER	VOLTAGE RATINGS	WIRING DIAG.	HORSEPOWER RATINGS	
			240VAC	
			MAX.	
			1Ø	3Ø
DU222RB DU322RB	240VAC 240VAC	A B	10 10	– 15

NOTES:
FINISH – GRAY BAKED ENAMEL
UL LISTED – FILE E–2875
SUITABLE FOR USE AS SERVICE EQUIPMENT
TOP OF NEMA TYPE 3R SWITCHES HAVE PROVISIONS FOR MAXIMUM 2 1/2" BOLT–ON HUB.
SHORT CIRCUIT CURRENT RATINGS:
10,000 AMPERES WHEN USED WITH OR PROTECTED BY CLASS H OR K FUSES
100,000 AMPERES WHEN USED WITH OR PROTECTED BY CLASS R FUSES.
‡ LUGS SUITABLE FOR 60°C OR 75°C COPPER OR ALUMINUM CONDUCTORS.

GENERAL DUTY SAFETY SWITCHES
VISIBLE BLADE TYPE
60 AMPERE
ENCLOSURE – NEMA TYPE 3R RAINPROOF

SQUARE D
Schneider Electric

DWG# NO. 1861

DECEMBER 2004

REF DWG #1861

BLUE RAVEN SOLAR

DRAWING NUMBER:
SS

EZ⚡SOLAR
making solar simple.

JB-1.2, JB-1.XL
Specification Sheet
PV Junction Box for Composition/Asphalt Shingle Roofs

EZ⚡SOLAR
making solar simple.

PHONE: 385-202-4150
WWW.EZSOLARPRODUCTS.COM

BLUE RAVEN SOLAR

A. System Specifications and Ratings

- Maximum Voltage: 1,000 Volts
- Maximum Current: **JB-1.2:** 80 Amps; **JB-1.XL:** 120 Amps
- Allowable Wire: 14 AWG – 6 AWG
- Spacing: Please maintain a spacing of at least ½" between uninsulated live parts and fittings for conduit, armored cable, and uninsulated live parts of opposite polarity.
- Enclosure Rating: Type 3R
- Roof Slope Range: 2.5 – 12:12
- Max Side Wall Fitting Size: 1"
- Max Floor Pass-Through Fitting Size: 1"
- Ambient Operating Conditions: (-35°C) - (+75°C)
- Compliance:
  - **JB-1.2:** UL1741, CSA C22.2 No. 290; **JB-1.XL:** UL1741, CSA C22.2 No. 290
  - Approved wire connectors: must conform to UL1741, CSA C22.2 No. 290
- System Marking: **Interek Symbol and File #5019942**
- Periodic Re-inspections: If re-inspections yield loose components, loose fasteners, or any corrosion between components, components that are found to be affected are to be replaced immediately.

c ETL us
Intertek
5019942

Table 1: Typical Wire Size, Torque Loads and Ratings

	1 Conductor	2 Conductor	Torque				
			Type	NM	Inch Lbs	Voltage	Current
ABB ZS6 terminal block	10-24 awg	16-24 awg	Sol/Str	0.5-0.7	6.2-8.85	600V	30 amp
ABB ZS10 terminal block	6-24 awg	12-20 awg	Sol/Str	1.0-1.6	8.85-14.16	600V	40 amp
ABB ZS16 terminal block	4-24 awg	10-20 awg	Sol/Str	1.6-2.4	14.6-21.24	600V	60 amp
ABB M6/8 terminal block	8-22 awg		Sol/Str	.08-1	8.85	600V	50 amp
Ideal 452 Red WING-NUT Wire Connector	8-18 awg		Sol/Str	Self-Torque	Self-Torque	600V	
Ideal 451 Yellow WING-NUT Wire Connector	10-18 awg		Sol/Str	Self-Torque	Self-Torque	600V	
Ideal, In-Sure Push-In Connector Part #39	10-14 awg		Sol/Str	Self-Torque	Self-Torque	600V	
WAGO, 2204-1201	10-20 awg	16-24 awg	Sol/Str	Self-Torque	Self-Torque	600V	30 amp
WAGO, 221-612	10-20 awg	10-24 awg	Sol/Str	Self-Torque	Self-Torque	600V	30 amp
Dottie DRC75	6-12 awg		Sol/Str	Snap-In	Snap-In		
ESP NG-53	4-6 awg		Sol/Str		45	2000V	
	10-14 awg		Sol/Str		35		
ESP NG-717	4-6 awg		Sol/Str		45	2000V	
	10-14 awg		Sol/Str		35		
Brumall 4-5,3	4-6 awg		Sol/Str		45	2000V	
	10-14 awg		Sol/Str		35		

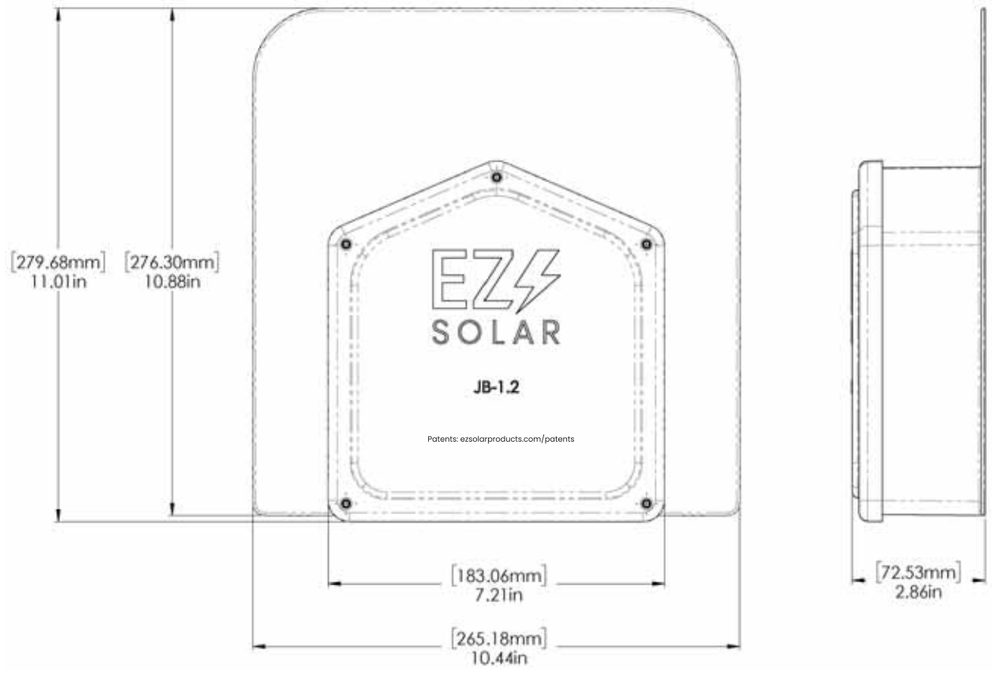
Table 2: Minimum wire-bending space for conductors through a wall opposite terminals in mm (inches)

Wire size, AWG or kcmil (mm2)	Wires per terminal (pole)							
	1		2		3		4 or More	
	mm	(inch)	mm	(inch)	mm	(inch)	mm	(inch)
14-10 (2.1-5.3)	Not Specified		-		-		-	
8 (8.4)	38.1	(1-1/2)	-		-		-	
6 (13.3)	50.8	(2)	-		-		-	

ITEM NO.	PART NUMBER	DESCRIPTION	QTY
1	JB-1.2 BODY	POLYCARBONATE WITH UV INHIBITORS	1
2	JB-1.2 LID	POLYCARBONATE WITH UV INHIBITORS	1
3	#10 X 1-1/4" PHILLIPS PAN HEAD SCREW		6
4	#8 X 3/4" PHILLIPS PAN HEAD SCREW		6

SIZE	DWG. NO.	REV
B	JB-1.2	
SCALE: 1:2	WEIGHT: 1.45 LBS	SHEET 1 OF 3

TORQUE SPECIFICATION:	15-20 LBS
CERTIFICATION:	UL 1741, NEMA 3R CSA C22.2 NO. 290
WEIGHT:	1.45 LBS



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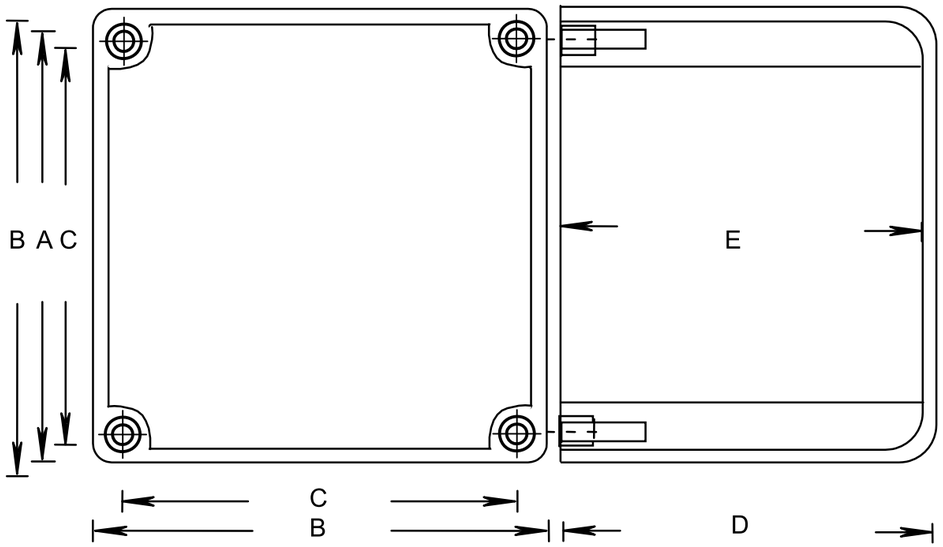


PRODUCT CODE	PART NUMBER	NOMINAL SIZE (in)	NOMINAL SIZE (mm)	A (in)	A (mm)	B (in)	B (mm)	C (in)	C (mm)
076668	J444 STAHLIN	4	103	3.675	93	4.000	102	3.450	88
076259	AMJB444 ALLIED	4	103	3.675	93	4.000	102	3.450	88
077643*	2037-424T CANLET	4	103	3.675	93	4.000	102	3.450	88
077696	JB 444	4	103	4.000	101	4.395	112	3.950	101

PRODUCT CODE	PART NUMBER	NOMINAL SIZE (in)	NOMINAL SIZE (mm)	D (in)	D (mm)	E (in)	E (mm)	VOLUME (cu. In)	VOLUME (cu. Cm)
076668	J444 STAHLIN	4	103	4.180	106.	3.850	98	51.5	844.6
076259	AMJB444 ALLIED	4	103	4.180	106	3.850	98	51.5	844.6
077643*	2037-424T CANLET	4	103	4.180	106	3.850	98	51.5	844.6
077696	JB 444	4	103	4.170	106	3.930	100	51.5	844.6

PRODUCT CODE	PART NUMBER	NOMINAL SIZE (in)	NOMINAL SIZE (mm)	GASKET CODE	INSERT CODE	SCREW CODE	M.FEET CODE
076668	J444 STAHLIN	4	103		072538 (4)		
076259	AMJB444 ALLIED	4	103		072538 (4)		
077643*	2037-424T CANLET	4	103		072538 (4)		
077696	JB 444	4	103	097731	072538 (4) 072539 (2)	072522 (4) 072513 (2)	097747

* BOX WITH MOLDED MOUNTING FEET, INSERT ONLY; NO COVER, OR GASKET, UL LISTED 576J

RIGID PVC CONDUIT FITTINGS

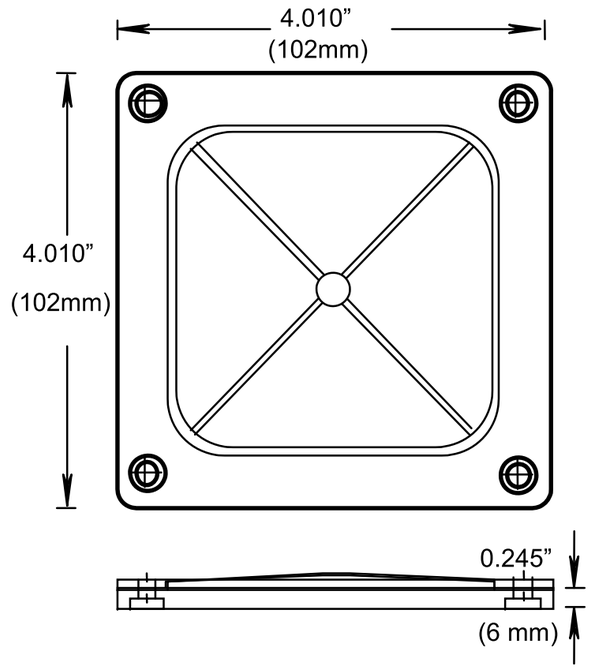
JB444 JUNCTION BOXES

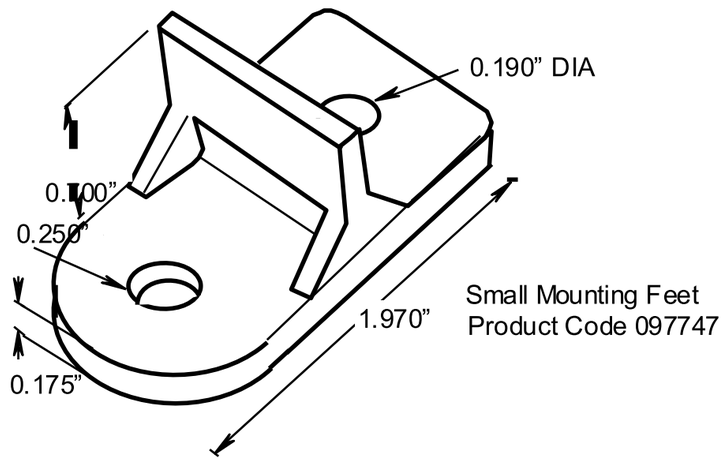
ISSUE DATE:
DATE D'EMISSION: 2009 04 30

SUPERCEDES:
REMPLACE: 2004 07 15

5

COVER DIMENSIONS





Small Mounting Feet
Product Code 097747

DRAWING NUMBER:
SS

"Stay Connected" with HEYCO® Solar Power Components

a PennEngineering® Company

Heyco®-Tite Liquid Tight Cordgrips for Enphase Q Cables

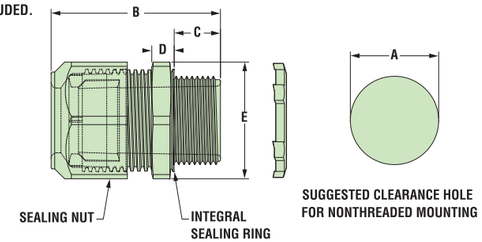
Straight-Thru, NPT Hubs with Integral Sealing Ring

The Ultimate in Liquid Tight Strain Relief Protection

ALL NEW PRODUCT!

GLAND CONFIGURATION Conductors Type *	Size mm.	No.	PART NO. Black	DESCRIPTION	UL/CSA	PART DIMENSIONS A Clearance Hole Dia. in.	mm.	B Max. O.A. Length in.	mm.	C Thread Length in.	mm.	D Wrenching Thickness in.	mm.	E Nut Flat Size in.	mm.
Oval Gland															
Q Cable	6,1 x 9,7	1	**M3231GCZ**	LTCG 1/2 6.1x9.7MM	UL/CSA	.875	22,2	1.70	43,2	.61	15,5	.21	5,3	.98	24,9
Break-Thru Skinned Over Gland															
Q Cables plus Ground	6,1 x 9,7 3,3	2 1	**M3234GDA-SM**	SMCG 3/4 2-6.1x9.7MM 1-3.3MM	UL/CSA	1.040	26,4	2.00	50,8	.62	15,7	.25	6,4	1.30	33,0

Metal Locknuts INCLUDED.



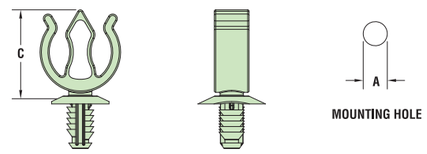
Material		Nylon 6/6 with TPE Sealing Gland
Certifications	UL	Listed under Underwriters' Laboratories File E504900
	CSA	CSA Certified by the Canadian Standards Association File 93876
Flammability Rating		94V-2
Temperature Range		Static -40°F (-40°C) to 239°F (115°C) Dynamic -4°F (-20°C) to 212°F (100°C)
IP Rating		IP 68

- Two new cordgrips now accommodate the Enphase Q Cable – M3231GCZ (1/2˝ NPT) and M3234GDA-SM (3/4˝ NPT).
- The 1/2˝ version provides liquid tight entry for one Enphase Q Cable – .24 x .38˝ (6,1 x 9,7 mm).
- The 3/4˝ version provides liquid tight entry for up to two Enphase Q Cables – .24 x .38" (6,1 x 9,7 mm) and an additional .130" (3,3 mm) dia. hole for a #8 solid grounding cable.
- The 3/4˝ version utilizes our skinned-over technology so any unused holes will retain a liquid tight seal.
- Rated for use with DG Cable.

Heyco® Helios® UVX Clip – Blind Mount

ALL NEW PRODUCT!

PANEL THICKNESS RANGE Minimum in.	mm.	Maximum in.	mm.	WIRE DIAMETER RANGE 1-2 Wires	PART NO.	DESCRIPTION	MOUNTING HOLE DIA. A in.	mm.	OVERALL HEIGHT C in.	mm.
1-2 Wires										
.028	0,7	.250	6,4	.23 (5,8 mm) - .32 (8,0 mm) each cable	**S6520**	Helios UVX Clip 100 Pack	.260	6,6	.96	24,4
					S6560	Helios UVX Clip Bulk				



Material	Nylon 6/6 with extended UV Capabilities
Flammability Rating	94V-2
Temperature Range	Dynamic -4°F (-20°C) to 185°F (85°C)

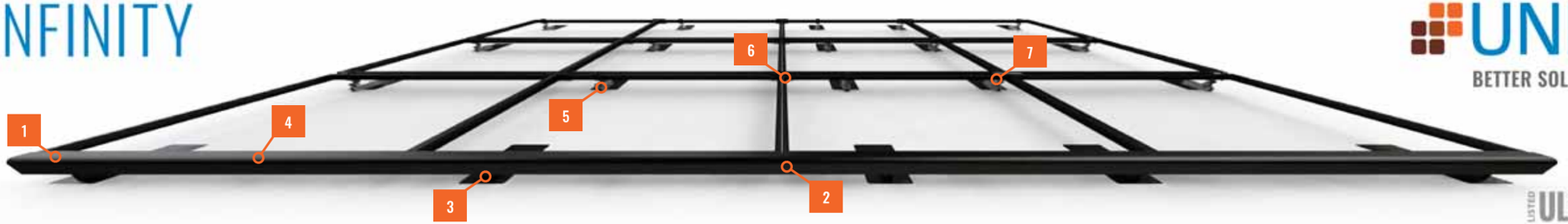
- The jersey pine tree mounting style installs easily with superior holding power.
- UVX nylon protects from corrosion due to outdoor exposure.
- Installs into .260˝ (6,6 mm) mounting hole.
- Holds up to 2 cables between .230 - .315˝ (5,8 - 8,0 mm) each.
- Cables install with fingertip pressure.
- Molded from our robust UVX nylon 6/6 with extended UV capabilities for our Solar 20 Year Warranty.

1-800-526-4182 • 732-286-1800 (NJ) • FAX: 732-244-8843 • www.heyco.com

BLUE RAVEN SOLAR

DRAWING NUMBER: SS

SFM INFINITY



UNIRAC®
BETTER SOLAR STARTS HERE

LISTED UL2703

2 INSTALLS PER DAY

Make two installs per day your new standard. **SFM** INFINITY has fewer roof attachments, one tool installation, and pre-assembled components to get you off the roof 40% faster.

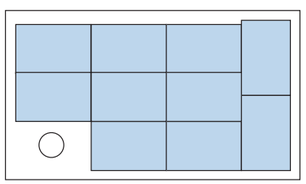
87% OF HOMEOWNERS **PREFER**

BETTER AESTHETICS

Install the system with the aesthetics preferred by homeowners, with integrated front trim, trim end caps, dark components, and recessed hardware.

MAXIMUM POWER DENSITY

Easily mix module orientations to achieve optimal power density without incurring the increased bill of materials, labor, and attachments required by rail.



SYSTEM OVERVIEW

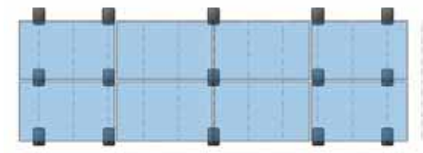
	PART NAME	DESCRIPTION
1	TRIMRAIL	Structural front trim provides aesthetic and aligns modules.
2	TRIMRAIL SPLICE	Connects and electrically bonds sections of **TRIM**RAIL.
3	TRIMRAIL FLASHKIT	Attaches **TRIM**RAIL to roof. Available for comp shingle or tile.
4	MODULE CLIPS	Secure modules to **TRIM**RAIL.
5	MICRORAIL	Connects modules to SLIDERS. Provides post-install array leveling.
6	SPLICE	Connects and supports modules. Provides east-west bonding. ATTACHED SPLICE also available.
7	SLIDER FLASHKIT	Roof attachment and flashing. Available for comp shingle and tile.

BONDING AND ACCESSORIES

PART NAME	DESCRIPTION
TRIMRAIL ENDCAPS	Covers ends of **TRIM**RAIL for refined aesthetic.
TRIMRAIL BONDING CLAMP	Electrically bonds **TRIM**RAIL and modules
N/S BONDING CLAMP	Electrically bonds rows of modules

20% FEWER ATTACHMENTS

Save time and money on every project: **SFM** INFINITY requires fewer attachments than rail systems.



SFM INFINITY 15 Attachments

RAIL 20 Attachments

30% LOGISTICS SAVINGS

With fewer SKUs and compact components, **SFM** INFINITY is easier to stock, easier to transport, and easier to lift to the roof. Plus, make more efficient use of your vehicle fleet.

SFM INFINITY REVOLUTIONIZES ROOFTOP SOLAR WITH BENEFITS ACROSS YOUR BUSINESS, FROM DESIGN AND LOGISTICS, THROUGH ARRAY INSTALLATION AND SERVICE.

BLUE RAVEN SOLAR

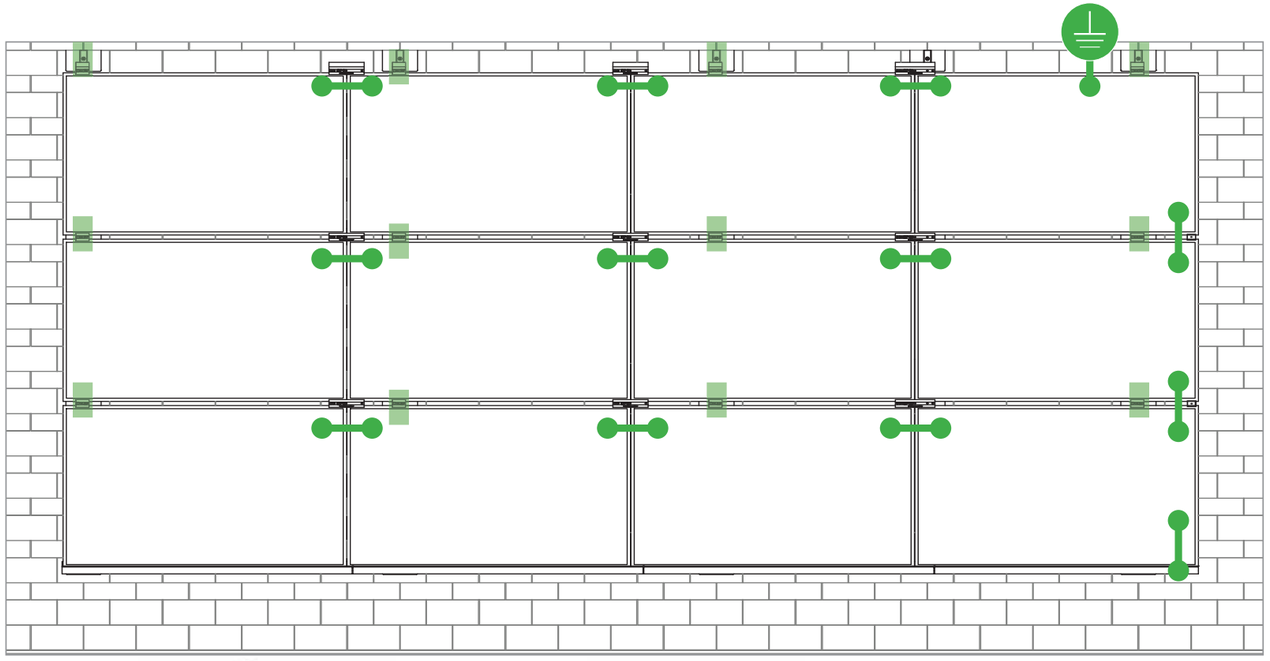
DRAWING NUMBER:
SS

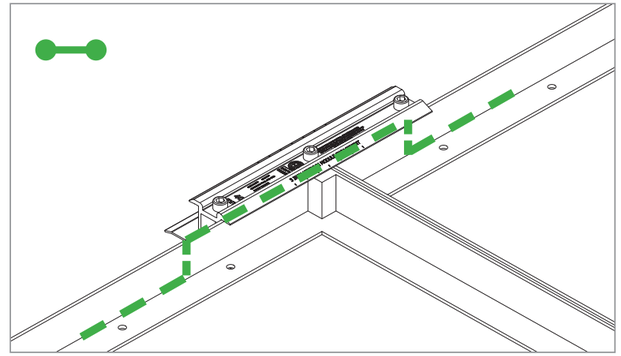
SFM SUN FRAME MICRORAIL™

SYSTEM BONDING & GROUNDING

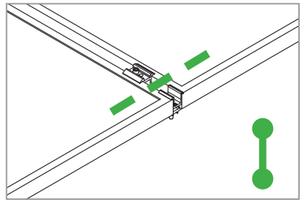
INSTALLATION GUIDE

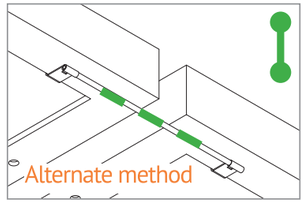
BLUE RAVEN SOLAR



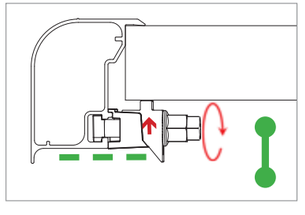


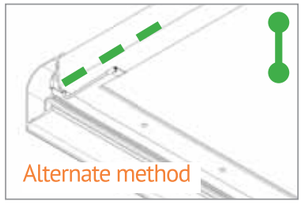
E-W BONDING PATH:
E-W module to module bonding is accomplished with 2 pre-installed bonding pins which engage on the secure side of the MicrorailTM and splice.





N-S BONDING PATH:
N-S module to module bonding is accomplished with bonding clamp with 2 integral bonding pins. **(refer also to alternate method)**





TRIMRAIL BONDING PATH:
Trimrail to module bonding is accomplished with bonding clamp with integral bonding pin and bonding T-bolt. **(refer also to alternate method)**

Star Washer is Single Use Only

TERMINAL TORQUE, Install Conductor and torque to the following:
4-6 AWG: 35in-lbs
8 AWG: 25 in-lbs
10-14 AWG: 20 in-lbs

LUG DETAIL & TORQUE INFO
Ilsco Lay-In Lug (GBL-4DBT)
- 10-32 mounting hardware
- Torque = 5 ft-lb
- AWG 4-14 - Solid or Stranded

TERMINAL TORQUE, Install Conductor and torque to the following:
4-14 AWG: 35in-lbs

LUG DETAIL & TORQUE INFO
Ilsco Flange Lug (SGB-4)
- 1/4" mounting hardware
- Torque = 75 in-lb
- AWG 4-14 - Solid or Stranded

WEEBLUG
Single Use Only

TERMINAL TORQUE, Install Conductor and torque to the following:
6-14 AWG: 7ft-lbs

LUG DETAIL & TORQUE INFO
Wiley WEEBLug (6.7)
- 1/4" mounting hardware
- Torque = 10 ft-lb
- AWG 6-14 - Solid or Stranded

NOTE: ISOLATE COPPER FROM ALUMINUM CONTACT TO PREVENT CORROSION

System bonding is accomplished through modules. System grounding accomplished by attaching a ground lug to any module at a location on the module specified by the module manufacturer.

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SYSTEM LEVEL FIRE CLASSIFICATION

The system fire class rating requires installation in the manner specified in the SUNFRAME MICRORAIL (SFM) Installation Guide. SFM has been classified to the system level fire portion of UL 1703. This UL 1703 classification has been incorporated into the UL 2703 product certification. SFM has achieved Class A, B & C system level performance for low slope & steep sloped roofs when used in conjunction with type 1 and type 2 modules. Class A, B & C system level fire performance is inherent in the SFM design, and no additional mitigation measures are required. The fire classification rating is valid for any roof pitch. There is no required minimum or maximum height limitation above the roof deck to maintain the Class A, B & C fire rating for SFM. SUNFRAME MICRORAIL™ components shall be mounted over a fire resistant roof covering rated for the application.

Module Type	Roof Slope	System Level Fire Rating	Microrail Direction	Module Orientation	Mitigation Required
Type 1 and Type 2	Steep Slope & Low Slope	Class A, B & C	East-West	Landscape OR Portrait	None Required

UL2703 TEST MODULES

See pages 22 and 23 for a list of modules that were electrically and mechanically tested or qualified with the SUNFRAME MICRORAIL (SFM) components outlined within this Installation Guide.

- Maximum Area of Module = 27.76 sqft
- UL2703 Design Load Ratings:
  - a) Downward Pressure – 113 PSF / 5400 Pa
  - b) Upward Pressure – 50 PSF / 2400 Pa
  - c) Down-Slope Load – 21.6 PSF / 1034 Pa
- Tested Loads:
  - a) Downward Pressure – 170 PSF / 8000 Pa
  - b) Upward Pressure – 75 PSF / 3500 Pa
  - c) Down-Slope Load – 32.4 PSF / 1550 Pa
- Maximum Span = 6ft
- Use with a maximum over current protection device OCPD of 30A
- System conforms to UL Std 2703, certified to LTR AE-001-2012
- Rated for a design load of 2400 Pa / 5400 Pa with 24 inch span
- PV modules may have a reduced load rating, independent of the SFM load rating. Please consult the PV module manufacturer's installation guide for more information
- Down-Slope design load rating of 30 PSF/ 1400 Pa for module areas of 22.3 sq ft or less

SFM SUN FRAME MICRORAIL™

TESTED / CERTIFIED MODULE LIST

INSTALLATION GUIDE

BLUE RAVEN SOLAR

Manufacture	Module Model / Series
Aleo	P-Series
Aptos	DNA-120-(BF/MF)26 DNA-144-(BF/MF)26
Astronergy	CHSM6612P, CHSM6612P/HV, CHSM6612M, CHSM6612M/HV, CHSM6610M (BL)(BF)/(HF), CHSM72M-HC
Auxin	AXN6M610T, AXN6P610T, AXN6M612T & AXN6P612T
Axitec	AXIblackpremium 60 (35mm), AXIpower 60 (35mm), AXIpower 72 (40mm), AXIpremium 60 (35mm), AXIpremium 72 (40mm).
Boviet	BVM6610, BVM6612
BYD	P6K & MHK-36 Series
Canadian Solar	CS1(H/K/U/Y)-MS CS3(K/L/U), CS3K-MB-AG, CS3K-(MS/P) CS3N-MS, CS3U-MB-AG, CS3U-(MS/P), CS3W CS5A-M, CS6(K/U), CS6K-(M/P), CS6K-MS CS6P-(M/P), CS6U-(M/P), CS6V-M, CS6X-P
Centrosolar America	C-Series & E-Series
CertainTeed	CT2xxMxx-01, CT2xxPxx-01, CTxxxMxx-02, CTxxxM-03, CTxxxMxx-04, CTxxxHC11-04
Dehui	DH-60M

Manufacture	Module Model / Series
Eco Solargy	Orion 1000 & Apollo 1000
ET Solar	ET-M672BHxxxTW
Freedom Forever	FF-MP-BBB-370
FreeVolt	Mono PERC
GCL	GCL-P6 & GCL-M6 Series
Hansol	TD-AN3, TD-AN4, UB-AN1, UD-AN1
Heliene	36M, 60M, 60P, 72M & 72P Series, 144HC M6 Monofacial/ Bifacial Series, 144HC M10 SL Bifacial
HT Solar	HT60-156(M) (NDV) (-F), HT 72-156(M/P)
Hyundai	KG, MG, TG, RI, RG, TI, MI, HI & KI Series HiA-SxxxHG
ITEK	iT, iT-HE & iT-SE Series
Japan Solar	JPS-60 & JPS-72 Series
JA Solar	JAP6 60-xxx, JAM6-60-xxx/SI, JAM6(K)-60/ xxx, JAP6(k)-72-xxx/4BB, JAP72SYY-xxx/ZZ, JAP6(k)-60-xxx/4BB, JAP60SYY-xxx/ZZ, JAM6(k)-72-xxx/ZZ, JAM72SYY-xxx/ZZ, JAM6(k)-60-xxx/ZZ, JAM60SYY-xxx/ZZ. i. YY: 01, 02, 03, 09, 10 ii. ZZ: SC, PR, BP, HiT, IB, MW, MR
Jinko	JKM & JKMS Series Eagle JKMxxxM JKMxxxM-72HL-V
Kyocera	KU Series

Manufacture	Module Model / Series
LG Electronics	LGxxxN2T-A4 LGxxx(A1C/E1C/E1K/N1C/N1K/N2T/N2W/ Q1C/Q1K/S1C/S2W)-A5 LGxxxN2T-B5 LGxxxN1K-B6 LGxxx(A1C/M1C/M1K/N1C/N1K/Q1C/Q1K/ QAC/QAK)-A6 LGxxx(N1C/N1K/N2T/N2W)-E6 LGxxx(N1C/N1K/N2W/S1C/S2W)-G4 LGxxxN2T-J5 LGxxx(N1K/N1W/N2T/N2W)-L5 LGxxx(N1C/Q1C/Q1K)-N5 LGxxx (N1C/N1K/N2W/Q1C/Q1K)-V5
LONGi	LR4-60(HIB/HIH/HPB/HPH)-xxxM LR4-72(HIH/HPH)-xxxM LR6-60(BP/HBD/HIBD)-xxxM (30mm) LR6-60(BK)(PE)(HPB)(HPH)-xxxM (35mm) LR6-60(BK)(PE)(PB)(PH)-xxxM (40mm) LR6-72(BP)(HBD)(HIBD)-xxxM (30mm) LR6-72(HV)(BK)(PE)(PH)(PB)(HPH)-xxxM (35mm) LR6-72(BK)(HV)(PE)(PB)(PH)-xxxM (40mm)
Mission Solar Energy	MSE Series
Mitsubishi	MJE & MLE Series
Neo Solar Power Co.	D6M & D6P 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
- Please see the SFM UL2703 Construction Data Report at Unirac.com to ensure the exact solar module selected is approved for use with SFM
- SFM Infinity is not compatible with module frame height of less than 30mm and more than 40mm. See Module Mounting section, page 12 for further information

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SFM SUN FRAME MICRORAIL™

TESTED / CERTIFIED MODULE LIST

INSTALLATION GUIDE

BLUE RAVEN SOLAR

Manufacture	Module Model / Series
Panasonic	EVPVxxx (H/K/PK), VBHNxxxSA15 & SA16, VBHNxxxSA17 & SA18, VBHNxxxSA17(E/G) & SA18E, VBHNxxxKA01 & KA03 & KA04, VBHNxxxZA01, VBHNxxxZA02, VBHNxxxZA03, VBHNxxxZA04
Peimar	SGxxxM (FB/BF)
Phono Solar	PS-60, PS-72
Prism Solar	P72 Series
Q.Cells	Plus, Pro, Peak, G3, G4, G5, G6(+), G7, G8(+) Pro, Peak L-G2, L-G4, L-G5, L-G6, L-G7 Q.PEAK DUO BLK-G6+ Q.PEAK DUO BLK-G6+/TS Q.PEAK DUO (BLK)-G8(+) Q.PEAK DUO L-G8.3/BFF Q.PEAK DUO (BLK) ML-G9(+) Q.PEAK DUO XL-G9/G9.2/G9.3 Q.PEAK DUO (BLK) ML-G10(+) Q.PEAK DUO XL-G(10/10.2/10.3/10.c/10.d) Q.PEAK DUO BLK ML-G10+ / t
REC Solar	Alpha (72) (Black) (Pure) RECxxxAA PURE-R RECxxxNP3 Black N-Peak (Black) N-Peak 2 (Black) PEAK Energy Series PEAK Energy BLK2 Series PEAK Energy 72 Series

Manufacture	Module Model / Series
REC Solar (cont.)	TwinPeak Series TwinPeak 2 Series TwinPeak 2 BLK2 Series TwinPeak 2S(M)72(XV) TwinPeak 3 Series (38mm) TP4 (Black)
Renesola	Vitrus2 Series & 156 Series
Risen	RSM72-6 (MDG) (M), RSM60-6
SEG Solar	SEG-xxx-BMD-HV SEG-xxx-BMD-TB
S-Energy	SN72 & SN60 Series (40mm)
Seraphim	SEG-6 & SRP-6 Series
Sharp	NU-SA & NU-SC Series
Silfab	SLA, SLG, BC Series & SILxxx(BL/NL/NT/HL/ML/BK/NX/NU/HC)
Solarever USA	SE-166*83-xxxM-120N
Solaria	PowerXT-xxxR-(AC/PD/BD) PowerXT-xxxC-PD PowerXT-xxxR-PM (AC)
SolarWorld	Sunmodule Protect, Sunmodule Plus
Sonali	SS-M-360 to 390 Series, SS-M-390 to 400 Series, SS-M-440 to 460 Series, SS-M-430 to 460 BiFacial Series, SS 230 - 265
SunEdison	F-Series, R-Series & FLEX FXS Series

Manufacture	Module Model / Series
Suniva	MV Series & Optimus Series
SunPower	A-Series A400-BLK , SPR-MAX3-XXX-R, X-Series, E-Series & P-Series
Suntech	STP, STPXXXS - B60/Wnhb
Talesun	TP572, TP596, TP654, TP660, TP672, Hipor M, Smart
Tesla	SC, SC B, SC B1, SC B2 TxxxH, TxxxS
Trina	PA05, PD05, DD05, DE06, DD06, PE06, PD14, PE14, DD14, DE09.05, DE14, DE15, PE15H
Upsolar	UP-MxxxP(-B), UP-MxxxM(-B)
United Renewable Energy (URE)	D7MxxxH7A, D7(M/K)xxxH8A FAKxxx(C8G/E8G), FAMxxxE7G-BB FAMxxxE8G(-BB) FBMxxxMFG-BB
Vikram	Eldora, Solivo, Somera
Waaree	AC & Adiya Series
Winaico	WST & WSP Series
Yingli	YGE & YLM Series
ZN Shine	ZXM6-72, ZXM6-NH144-166_2094

- 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
- Please see the SFM UL2703 Construction Data Report at Unirac.com to ensure the exact solar module selected is approved for use with SFM
- SFM Infinity is not compatible with module frame height of less than 30mm and more than 40mm. See Module Mounting section, page 12 for further information

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Address:	1411 Broadway Blvd NE Albuquerque, NM 87102	**Address:**	
Country:	USA	**Country:**	

Party Authorized To Apply Mark: Same as Manufacturer
Report Issuing Office: Intertek Testing Services NA, Inc., Lake Forest, CA

Control Number: 5003705 **Authorized by:** Kenan Lacy
for L. Matthew Snyder, Certification Manager

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Standard(s):	Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels [UL 2703:2015 Ed.1+R:24Mar2021] PV Module and Panel Racking Mounting System and Accessories [CSA TIL No. A-40:2020]
Product:	Photovoltaic Mounting System, Sun Frame Microrail Installation Guide, PUB2023MAY10
Brand Name:	Unirac
Models:	Unirac SFM

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Address:
Country: USA
Country:
Party Authorized To Apply Mark: Same as Manufacturer
Report Issuing Office: Intertek Testing Services NA, Inc., Lake Forest, CA
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for L. Matthew Snyder, Certification Manager

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Product:	Photovoltaic Mounting System, Sun Frame Microrail Installation Guide, PUB2023MAY10
Brand Name:	Unirac
Models:	Unirac SFM

ATM for Report 102393982LAX-002 Page 2 of 4 ATM Issued: 17-May-2023
ED 16.3.15 (1-Jul-2022) Mandatory

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Address:	1411 Broadway Blvd NE Albuquerque, NM 87102	**Address:**	
Country:	USA	**Country:**	

Party Authorized To Apply Mark: Same as Manufacturer
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Control Number: *5019851* **Authorized by:** Kevan Lavery
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Product:	Photovoltaic Mounting System, Sun Frame Microrail Installation Guide, PUB2023MAY10
Brand Name:	Unirac
Models:	Unirac SFM

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Address:	1411 Broadway Blvd NE Albuquerque, NM 87102	**Address:**	
Country:	USA	**Country:**	

Party Authorized To Apply Mark: Same as Manufacturer
Report Issuing Office: Intertek Testing Services NA, Inc., Lake Forest, CA

Control Number: *5021866* **Authorized by:** Kevan Lavery
for L. Matthew Snyder, Certification Manager

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Product:	Photovoltaic Mounting System, Sun Frame Microrail Installation Guide, PUB2023MAY10
Brand Name:	Unirac
Models:	Unirac SFM

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DRAWING NUMBER:
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1.0 Reference and Address

Report Number	102393982LAX-002	Original 11-Apr-2016	Revised: 5-Oct-2022
Standard(s)	Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels [UL 2703:2015 Ed.1+R:24Mar2021] PV Module and Panel Racking Mounting System and Accessories [CSA TIL No. A-40:2020]		

Applicant	Unirac, Inc	Manufacturer 2	
Address	1411 Broadway Blvd NE Albuquerque, NM 87102	Address	
Country	USA	Country	
Contact	Klaus Nicolaedis Todd Ganshaw	Contact	
Phone	505-462-2190 505-843-1418	Phone	
FAX	NA	FAX	
Email	klaus.nicolaedis@unirac.com toddg@unirac.com	Email	

Manufacturer 3		Manufacturer 4	
Address		Address	
Country		Country	
Contact		Contact	
Phone		Phone	
FAX		FAX	
Email		Email	

Manufacturer 5
Address
Country
Contact
Phone
FAX

Listing Constructional Data Report (CDR)

1.0 Reference and Address

Report Number	102393982LAX-002	Original 11-Apr-2016	Revised: 5-Oct-2022
Email			

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2.0 Product Description	
Product	Photovoltaic Mounting System, Sun Frame Microrail Installation Guide, PUB2022SEP28
Brand name	Unirac
Description	The product covered by this report is the Sun Frame Micro Rail roof mounted Photovoltaic Rack Mounting System. This system is designed to provide bonding and grounding to photovoltaic modules. The mounting system employs anodized or mill finish aluminum brackets that are roof mounted using the slider, outlined in section 4 of this report. There are no rails within this product, whereas the 3" Micro Rail, Floating Splice, and 9" Attached Splice electrically bond the modules together forming the path to ground. The Micro Rails are installed onto the module frame by using a stainless steel bolt anodized with black oxide with a stainless type 300 bonding pin, torqued to 20 ft-lbs, retaining the modules to the bracket. The bonding pin of the Micro Rail when bolted and torqued, penetrate the anodized coating of the photovoltaic module frame (at bottom flange) to contact the metal, creating a bonded connection from module to module. The grounding of the entire system is intended to be in accordance with the latest edition of the National Electrical Code, including NEC 250: Grounding and Bonding, and NEC 690: Solar Photovoltaic Systems or the Canadian Electrical Code, CSA C22.1 Part 1 in accordance to the revision in effect in the jurisdiction in which the project resides. Any local electrical codes must be adhered in addition to the national electrical codes. The Grounding Lug is secured to the photovoltaic module, torqued in accordance with the installation manual provided in this document. Other optional grounding includes the use of the Enphase UL2703 certified grounding system, which requires a minimum of 2 micro-inverters mounted to the same rail, and using the same engage cable.

2.0 Product Description	
Models	Unirac SFM
Model Similarity	NA
Ratings	Fuse Rating: 30A Module Orientation: Portrait or Landscape Maximum Module Size: 17.98 ft² UL2703 Design Load Rating: 33 PSF Downward, 33 PSF Upward, 10 PSF Down-Slope Tested Loads - 50 psf/2400Pa Downward, 50psf/2400Pa Uplift, 15psf/720Pa Down Slope Trina TSM-255PD05.08 and Sunpower SPR-E20-327 used for Mechanical Loading Increased size ML test: Maximum Module Size: 22.3 ft² UL2703 Design Load Rating: 113 PSF Downward, 50 PSF Upward, 30 PSF Down-Slope LG355S2W-A5 used for Mechanical Loading test. Mounting configuration: Four mountings on each long side of panel with the longest span of 24" UL2703 Design Load Rating: 46.9 PSF Downward, 40 PSF Upward, 10 PSF Down-Slope LG395N2W-A5, LG360S2W-A5 and LG355S2W-A5 used for used for Mechanical Loading test. Mounting configuration: Six mountings for two modules used with the maximum span of 74.5" IEC 61646 Test Loads - 112.78 psf/5400Pa Downward, 50psf/2400Pa Uplift Mechanical Load test to add FlashLoc Slider and Trim Assemblies to UL2703 and IEC 61646 Certifications, & Increase SFM System UL2703 Module Size: Maximum Module Size: 27.76 ft² UL2703 Design Load Rating: 113 PSF Downward, 50 PSF Upward, 21.6 PSF Down-Slope Jinko Eagle 72HM G5 used for Mechanical Loading test. Mounting configuration: Four mountings on each long side of panel with the longest span of 24" Mamzimum module size: 21.86 ft2 IEC 61646 Test Loads - 112.78 psf/5400Pa Downward, 75psf/3600Pa Uplift SunPower model SPR-A430-COM-MLSD used for Mechanical Loading Fire Class Resistance Rating: - Class A for Steep Slope Applications when using Type 1 Modules. Can be installed at any interstitial gap. Installations must include Trim Rail. - Class A for Steep Slope Applications when using Type 2 Modules. Can be installed at any interstitial gap. Installations must include Trim Rail. - Class A Fire Rated for Low Slope applications with Type 1 or 2 listed photovoltaic modules. This system was evaluated with a 5” gap between the bottom of the module and the roof’s surface See section 7.0 illustractions # 1, 1a and 1b for a complete list of PV modules evaluated with these racking systems
Other Ratings	NA

BLUE RAVEN SOLAR

DRAWING NUMBER:
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DATASHEET

Franklin Home Power

The Franklin Home Power (FHP) system integrates the grid, solar generation, batteries and even generators, into a robust energy control system that is managed via a simple mobile app. The FHP provides real time monitoring and control for a home's day-to-day energy usage, and supplies energy from multiple power sources during grid outages.

The FHP's energy management is provided by the aGate X, an intelligent controller that integrates all power sources and automatically detects grid outages to seamlessly transition a home to backup power within 16ms.

An aGate X Smart Circuits Module is available for controlling of and automated load shedding for heavy energy loads during an outage. It provides custom scheduling of unique loads for more efficient use. A Generator Module can also be added to the aGate X for standby generator integration, providing maximum energy resilience and independence. The FHP is designed for daily cycling and emergency backup power. The aGate X complies with NEC 2017, NEC 2020, and UL1741 PCS Certification for main panel upgrade (MPU) avoidance.

The FHP system pairs the aGate X with the aPower X, a lithium iron phosphate (LFP) battery designed by FranklinWH. A single battery has large 13.6kWh capacity with continuous power of 5kW, and its peak power 10kW can last for 10s. Up to 15 aPower X batteries can be connected to a single aGate X.

One aGate X															
aPower X Units	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Capacity(kWh)	13.6	27.2	40.8	54.4	68	81.6	95.2	108.8	122.4	136	149.6	163.2	176.8	190.4	204
Cont. power(kW)	5	10	15	20	25	30	35	38.4	38.4	38.4	38.4	38.4	38.4	38.4	38.4
Peak power(kW)	10	20	30	40	50	60	70	76.8	76.8	76.8	76.8	76.8	76.8	76.8	76.8

For FHP system >8 units, please reach out to info@franklinwh.com

Safe

- Lithium iron phosphate battery
- Automotive grade lithium cells
- Advanced Battery Management System (BMS) with Sate of Health (SOH) pro-active battery technology.

Intelligent

- Micro-grid interconnect device (MID) functionality
- Auto-detect grid outages, seamless power transfer
- Black-start functionality; daily PV restart capabilities

Reliable

- 12-year warranty
- NEMA 3R enclosure
- Corrosion-proof

Scalable

- Up to 15 aPower X units can be used with a single aGate X
- Usable energy expandable from 13.6kWh to 204kWh
- Continuous output power ranges from 5kW to 38.4kW

Easy & Flexible

- Compatible with any solar inverter/standby generator
- Generator monitoring and controls via the FranklinWH app
- Pre-assembled, indoor/outdoor/wall/floor installation
- Multiple conduit entries
- App-based, remote commissioning

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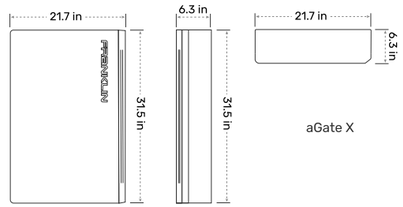
AGATE X DATASHEET

The **aGate X** is available with two optional accessories that can be added to customize the homeowner's FHP experience:

- **Smart Circuits Module:** manual and scheduled control for unique electric circuits, via the FranklinWH app.
- **Generator Module:** standby generator integration, redundant power source to the aPower X.



Performance

Switch Over Time (grid to micro-grid)	<16ms
User Interface	FranklinWH app
Maximum Supply Fault Current	20 kA
Communications	Ethernet / 4G / Wifi

Electrical Connections

aPower Over Current Protection Device	100A Max
Solar Input Over Current Protection Device	80A Max
Backup Load Port Over Current Protection Device	200A Max
Generator Over Current Protection Device[1]	200A Max
Smart Circuits Over Current Protection Device[2]	Option A: (1) × 80A Max @240V & (2) × 50A Max @120V Option B: (1) × 80A Max @240V & (1) × 50A Max @240V

Electrical Interface

Coupling	AC Coupled
Feed-in Phase	Split Phase
Split Phase	L1 / L2 / N / PE

Mechanical

Dimensions (H × W × D)	aGate X: 31.5 × 21.7 × 6.3 in (800 × 550 × 160 mm)
Weight	aGate X: 50 lb (23 kg)
Installation	Wall mount

Compliance & Certificates

aGate X	UL1741 PCS, UL 67[3], UL 869A[3], UL 916[3], CAN/CSA C22.2 No. 107.1-16
Seismic	AC156, OSHPD, IEEE 693-2005 (high)
Environmental	California Proposition 65 RoHS Directive 2011 / EU
Emissions	FCC Part 15 Class B, ICES 003

Environmental

Operating Temperature	-4°F to 122°F (-20°C to 50°C)
Operating Humidity (RH)	Up to 100% RH, condensing
Altitude	Maximum 9,843 ft (3,000 m)
Storage Condition	14°F to 113°F (-10°C to 45°C) Up to 95% RH, non-condensing
Enclosure Type	NEMA 3R
Environment	Indoor and outdoor rated

1: Generator Module is optional.
2: Smart Circuit Module is optional.
3: Sections from these standards were used during the safety evaluation and included in the UL 1741 listing.

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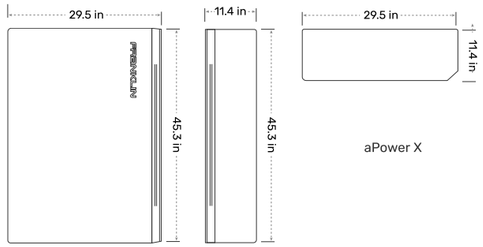
BLUE RAVEN SOLAR

DRAWING NUMBER:
SS

APOWER X DATASHEET

The **aPower X** is a lithium iron phosphate (LFP), AC-coupled battery that is proprietary to the FHP system. With an all-in-one form factor, the aPower X battery is self-contained with battery cells, a battery management system, and an AC inverter.



aPower X

Performance

Battery Chemistry	Lithium Iron Phosphate (LFP)
Usable Battery Energy	13.6 kWh per unit, scalable up to 15 units[4]
Warranted Energy Throughput (12yrs)	43 MWh
Nominal AC Voltage	120V / 240V, 60 Hz
Maximum Continuous / Peak Discharge Power (10 s)	5 kW / 10 kW
Round Trip Efficiency	89%[5]
Noise Emission (optimal)	<30 dB (A)
User Interface	FranklinWH app

Electrical Interface

Coupling	AC-Coupled
Feed-in Phase	Split Phase
Split Phase	L1 / L2 / N / PE

Application Mode Programming

Self-Consumption
Time of Use
Emergency Backup

Mechanical

Dimensions (H × W × D)	aPower X: 45.3 × 29.5 × 11.4 in (1150 × 750 × 290 mm)
Weight	aPower X: 408 lb (185 Kg)
Installation	Wall mount or floor mount

Compliance & Certificates

aPower X	UL 9540, UL 1741SA, UL 1741SB, UL 1973, UL 9540A, IEEE 1547, IEEE 1547.1, UN 38.3, CAN/CSA C22.2 No. 107.1-16
Seismic	AC156, OSHPD, IEEE 693-2005 (high)
Environmental	California Proposition 65 RoHS Directive 2011 / EU
Emissions	FCC Part 15 Class B, ICES 003

Environmental

Operating Temperature	-4°F to 122°F (-20°C to 50°C)
Operating Humidity (RH)	Up to 100% RH, condensing
Altitude	Maximum 9,843 ft (3,000 m)
Ingress Rating	IP67 (Battery and power converter system) IP56 (Wiring compartment)
Storage Condition	14°F to 113°F (-10°C to 45°C) Up to 95% RH, non-condensing
Enclosure Type	NEMA 3R
Environment	Indoor and outdoor rated

4: Please contact us for solution design support if you have large capacity requirements.
5: At beginning of life, AC to battery to AC, 50% power rating.

FRANKLINWH APP DATASHEET

The FranklinWH app allows remote monitoring and management of your whole home energy management system at any time, from anywhere. Homeowners can see historical and real-time energy usage and patterns, can set and choose personalized energy-saving plans for family, and enjoy life with the help of our robust features. Installers can use it for a rapid commissioning and faster debugging.

Smart Energy Management

Use energy per homeowner's discretion:
- Self-Consumption
- Time of Use
- Emergency Backup

Fully visibility into energy production and consumption
Remotely control household's energy from anywhere at any time
Heavy load shedding/controls via Smart Circuits to manage backup energy supply
Local & remote debugging supported

Simple & Reliable

- Intuitive, easy to use
- Real-time and historic energy activity
- One app to monitor and control all power generation
- Multiple comms: Ethernet/Wifi/4G

APP Features

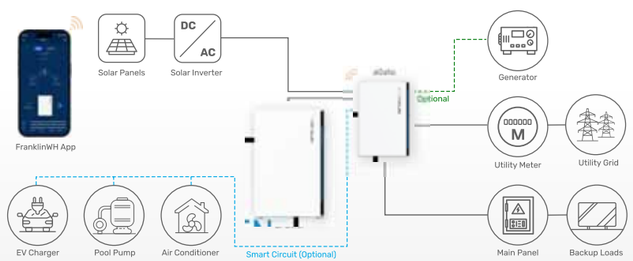
Functionality

Operating System	Android & iOS
Generator Output Setting	Power, current, voltage frequency, time plan
Smart Circuit Setting	Time plan, manual switch, circuits merge, SOC threshold
Storm Hedge Setting	Enable & Disable
SOC Setting	Self-consumption, Time of Use
LED Strip Setting	Switch on/off, time plan
Access Point Setting	Modify name and password
Power Sources Monitor	Working status, current flow
Backup Remaining Display	Duration
History Data	Daily, monthly, yearly
Summary Report	Daily, monthly, yearly
Downtime Maintenance	Keep home powered during aPower X maintenance
Grid Compliance	HECO SRD V2.0, CA UL 1741 SA, User Defined
Grid Program	NEM+ / CSS / CGS / CGS+ / NEM 2.0 / BB & NEM / BB & CSS / BB & CGS+ / Smart export
Account Security	Password verification support

Application Mode Programming

Self-Consumption
Time of Use
Emergency Backup

FranklinWH's solution for Whole Home backup



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Telephone: +1 888-837-2655
Email: info@franklinwh.com
Website: www.franklinwh.com

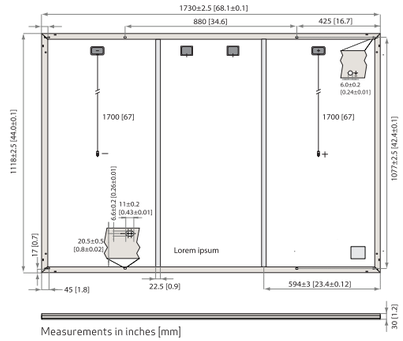
BLUE RAVEN SOLAR

DRAWING NUMBER:
SS

REC ALPHA PURE-R SERIES
PRODUCT SPECIFICATIONS

SOLAR'S MOST TRUSTED

GENERAL DATA	
Cell type:	80 half-cut REC bifacial, heterojunction cells with lead-free, gapless technology
Glass:	0.13 in (3.2 mm) solar glass with anti-reflective surface treatment in accordance with EN 12150
Backsheet:	Highly resistant polymer (black)
Frame:	Anodized aluminum (black)
Junction box:	4-part, 4 bypass diodes, lead-free IP68 rated, in accordance with IEC 62790
Connectors:	Stäubli MC4 PV-KBT4/KST4 (12 AWG) in accordance with IEC 62852, IP68 only when connected
Cable:	12 AWG (4 mm²) PV wire, 67 + 67 in (1.7 + 1.7 m) in accordance with EN 50618
Dimensions:	68.1 x 44.0 x 1.2 in (20.77 ft²) / 1730 x 1118 x 30 mm (1.93 m²)
Weight:	47.4 lbs (21.5 kg)
Origin:	Made in Singapore



Measurements in inches [mm]

ELECTRICAL DATA	Product Code*: RECxxxAA PURE-R			
STC				
Power Output - P_{MAX} (Wp)	400	410	420	430
Watt Class Sorting - (W)	0/+10	0/+10	0/+10	0/+10
Nominal Power Voltage - V_{MPP} (V)	48.8	49.4	50.0	50.5
Nominal Power Current - I_{MPP} (A)	8.20	8.30	8.40	8.52
Open Circuit Voltage - V_{OC} (V)	58.9	59.2	59.4	59.7
Short Circuit Current - I_{SC} (A)	8.80	8.84	8.88	8.91
Power Density (W/ft²)	19.26	19.74	20.22	20.70
Panel Efficiency (%)	20.7	21.2	21.8	22.3
NMOT				
Power Output - P_{MAX} (Wp)	305	312	320	327
Nominal Power Voltage - V_{MPP} (V)	46.0	46.6	47.1	47.6
Nominal Power Current - I_{MPP} (A)	6.64	6.70	6.80	6.88
Open Circuit Voltage - V_{OC} (V)	55.5	55.8	56.0	56.3
Short Circuit Current - I_{SC} (A)	7.11	7.16	7.20	7.24

Values at standard test conditions (STC: air mass AM 1.5, irradiance 1075 W/sq ft (1000 W/m²), temperature 77°F (25°C), based on a production spread with a tolerance of P_{MAX}, V_{OC} & I_{SC} ±3% within one watt class. Nominal module operating temperature (NMOT: air mass AM 1.5, irradiance 800 W/m², temperature 68°F (20°C), windspeed 3.3 ft/s (1 m/s). * Where xxx indicates the nominal power class (P_{MAX}) at STC above.

MAXIMUM RATINGS	
Operational temperature:	-40 ... +85°C
System voltage:	1000 V
Test load (front):	+ 7000 Pa (146 lbs/ft²)*
Test load (rear):	- 4000 Pa (83.5 lbs/ft²)*
Series fuse rating:	25 A
Reverse current:	25 A

* See installation manual for mounting instructions. Design load = Test load / 1.5 (safety factor)

WARRANTY	Standard	REC ProTrust	
Installed by an REC Certified Solar Professional	No	Yes	Yes
System Size	All	≤25 kW	25-500 kW
Product Warranty (yrs)	20	25	25
Power Warranty (yrs)	25	25	25
Labor Warranty (yrs)	0	25	10
Power in Year 1	98%	98%	98%
Annual Degradation	0.25%	0.25%	0.25%
Power in Year 25	92%	92%	92%

See warranty documents for details. Conditions apply

Available from:

Founded in 1996, REC Group is an international pioneering solar energy company dedicated to empowering consumers with clean, affordable solar power. As Solar's Most Trusted, REC is committed to high quality, innovation, and a low carbon footprint in the solar materials and solar panels it manufactures. Headquartered in Norway with operational headquarters in Singapore, REC also has regional hubs in North America, Europe, and Asia-Pacific.

CERTIFICATIONS	
IEC 61215:2016, IEC 61730:2016, UL 61730	
IEC 62804	PID
IEC 61701	Salt Mist
IEC 62716	Ammonia Resistance
UL 61730	Fire Type 2
IEC 62782	Dynamic Mechanical Load
IEC 61215-2:2016	Hailstone (35mm)
IEC 62321	Lead-free acc. to RoHS EU 863/2015
ISO 14001, ISO 9001, IEC 45001, IEC 62941	

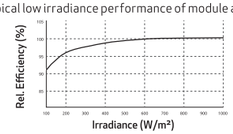
TEMPERATURE RATINGS*	
Nominal Module Operating Temperature:	44°C (±2°C)
Temperature coefficient of P_{MAX}:	-0.24 %/°C
Temperature coefficient of V_{OC}:	-0.24 %/°C
Temperature coefficient of I_{SC}:	0.04 %/°C

*The temperature coefficients stated are linear values

DELIVERY INFORMATION	
Panels per pallet:	33
Panels per 40 ft GP/high cube container:	858 (26 pallets)
Panels per 53 ft truck:	858 (26 pallets)

LOW LIGHT BEHAVIOUR

Typical low irradiance performance of module at STC:



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post@recgroup.com
www.recgroup.com

Specifications subject to change without notice.

Ref: PD-DS-AAPR Rev 3.1 03.23

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NABCEP CERTIFIED
PV INSTALLATION PROFESSIONAL
Scott Gurney
#PV-011719-015866

CONTRACTOR:
BRS FIELD OPS
385-498-6700

DRAWING BY:

PLOT DATE:

PROJECT NUMBER:

SHEET NAME:
SPEC SHEET

REVISION: ----

PAGE NUMBER: SS