



Town of Erwin

Zoning Application & Permit

Planning & Inspections Department

Permit #
24-0101

Rev Jan2013

Each application should be submitted with an attached plot/site plan with the proposed use/structure showing lot shape, existing and proposed buildings, parking and loading areas, access drives and front, rear, and side yard dimensions.

Name of Applicant	BRS Field Ops, LLC	Property Owner	Antonio Johnny
Home Address	1403 N Research Way	Home Address	67 James Allen Ln
City, State, Zip	Orem, UT 84097	City, State, Zip	Dunn, North Carolina, 28334
Telephone	385-482-0045	Telephone	415-941-9964
Email	permitting.department@blueravensolar.com	Email	Antoniojjohnny@gmail.com

Address of Proposed Property	67 James Allen Ln, Dunn, North Carolina, 28334		
Parcel Identification Number(s) (PIN)	0596-94-5908.000	Estimated Project Cost	4,547.09
What is the applicant requesting to build / what is the proposed use of the subject property? Be specific.	5.04	kW PV Solar Panel Installation on Roof Single Family Residential	
Description of any proposed improvements to the building or property	INSTALLATION OF UTILITY INTERACTIVE PHOTOVOLTAIC SOLAR SYSTEM AND ANY NECESSARY ADDITIONAL WORK NEEDED FOR INSTALLATION.		
What was the Previous Use of the subject property?	Single Family Residential		
Does the Property Access DOT road?			
Number of dwelling / structures on the property already			
Property / Parcel Size			
MUST circle one that applies to property	Existing/Proposed Septic System		Or
	Existing/Proposed County/City Sewer		<input checked="" type="checkbox"/>

Owner/Applicant Must Read and Sign

The undersigned property owner, or duly authorized agent/representative thereof certifies that this application and the forgoing answers, statements, and other information herewith submitted are in all respects true and correct to the best of their knowledge and belief. The undersigning party understands that any incorrect information submitted may result in the revocation of this application. Upon issuance of this permit, the undersigning party agrees to conform to all applicable town ordinances, zoning regulations, and the laws of the State of North Carolina regulating such work and to the specifications of plans herein submitted. The undersigning party authorizes the Town of Erwin to review this request and conduct a site inspection to ensure compliance to this application as approved.

Bryson Taylor	<i>Bryson Taylor</i>	Permitting Coordinator	01 / 19 / 2024
Print Name	Signature of Owner or Representative		Date

For Office Use

Zoning District	MD	Existing Nonconforming Uses or Features	NA
Front Yard Setback	NA	Other Permits Required	<input type="checkbox"/> Conditional Use <input type="checkbox"/> Building <input type="checkbox"/> Fire Marshal <input checked="" type="checkbox"/> Other
Side Yard Setback	NA	Zoning Permit Status	<input checked="" type="checkbox"/> Approved <input type="checkbox"/> Denied
Rear Yard Setback	NA	Fee Paid: 20.00	Date Paid: Staff Initials:

Comments	Electrical permit is required from Harnett County
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Signature of Town Representative: <i>[Signature]</i>	Date Approved/Denied: 1/19/24
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• roof solar panels being installed

RESIDENTIAL ROOFTOP SOLAR PERMIT PACKAGE



Enphase
Platinum
Installer



SUNPOWER*
Authorized Installer

Antonio Johnny

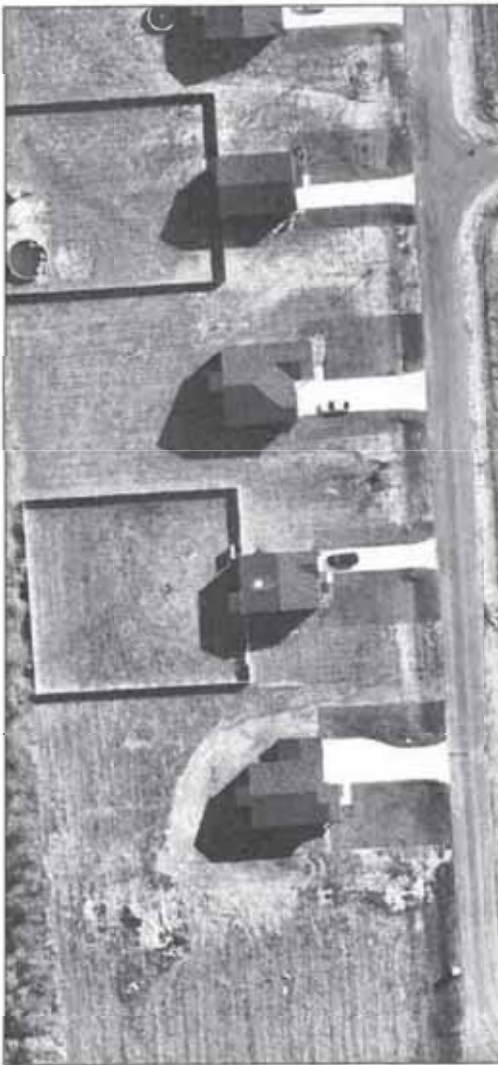
67 James Allen Ln
Dunn, North Carolina 28334
415-941-9964



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

SCOPE OF WORK

INSTALLATION OF ROOFTOP MOUNTED
PHOTOVOLTAIC SOLAR SYSTEM



SHEET INDEX

- PV1 COVER SHEET
- PV2 SITE PLAN
- PV3 ROOF PLAN
- PV4 STRUCTURAL
- PV5 ELECTRICAL 3-LINE
- PV6 ELECTRICAL CALCULATIONS
- PV7 LABELS
- PV8 PLACARD
- SS SPEC SHEETS

TYPICAL STRUCTURAL INFORMATION

ROOF MATERIAL: Comp Shingle
SHEATHING TYPE: OSB
FRAMING TYPE: Manufactured Truss
RACKING TYPE: UNIRAC SFM INFINITY
ATTACHMENT TYPE: UNIRAC SFM INFINITY FLASHKIT
TOTAL ATTACHMENTS: 21

INFORMATION FOR INSTALLER

ECOBEES QTY: 0
LED LIGHTBULB QTY: 0

GENERAL NOTES

NEW PV SYSTEM INFORMATION

AC SYSTEM SIZE: 3.78 kW AC
DC SYSTEM SIZE: 5.04 kW DC
MODULE TYPE: (12) REC Solar REC420AA Pure-R
INVERTER TYPE: Enphase IQ7X-96-2-US

Sealed For
Existing Roof &
Attachment Only

ISSUED
FORM NO. 0408



AHJ
Harnett County
Digitally signed
by John A.
Calvert

UTILITY COMPANY
Duke Energy NC
Date: 2023.12.11
12:28:18 -07'00'

TOTAL DC SYSTEM SIZE

5.04 kW DC

TOTAL AC SYSTEM SIZE

3.78 kW AC

DESIGN CRITERIA

WIND SPEED: 119
WIND EXPOSURE FACTOR: C
RISK CATEGORY: II
GROUND SNOW LOAD: 10
ROOF SNOW LOAD: 7
SEISMIC DESIGN CATEGORY: B

WEATHER STATION DATA

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

APPLICABLE CODES

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

BLUE RAVEN
SOLAR

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

Antonio Johnny
67 James Allen Ln
Dunn, North Carolina 28334

Harnett County
Duke Energy NC

CUSTOMER NAME:
PROJECT ID:
898102

DC SYSTEM SIZE:
5.04 kW DC

AC SYSTEM SIZE:
3.78 kW AC

REVISIONS:

DATE: / /
BY: / /
CHECKED BY: / /
APPROVED BY: / /

DESIGNED BY:
Brendan Filmore
PROJECT DATE:
December 9, 2023
DRAWING TITLE:
Cover Sheet

DRAWING NUMBER:
PV1



BLUE RAVEN
SOLAR

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

CUSTOMER NAME: Antonio Johnny

PROJECT ID: 898102

DC SYSTEM SIZE: 5.04 kW DC

AC SYSTEM SIZE: 3.78 kW AC

REVISIONS:

DATE: December 9, 2023

DRAWING TITLE: Site Plan

DRAWING NUMBER: PV2

PROPERTY COMPANY: Duke Energy NC

CITY: Hamett County

ADDRESS: 67 James Allen Ln
Dunn, North Carolina 28334

DATE: December 9, 2023

DRAWING TITLE: Site Plan

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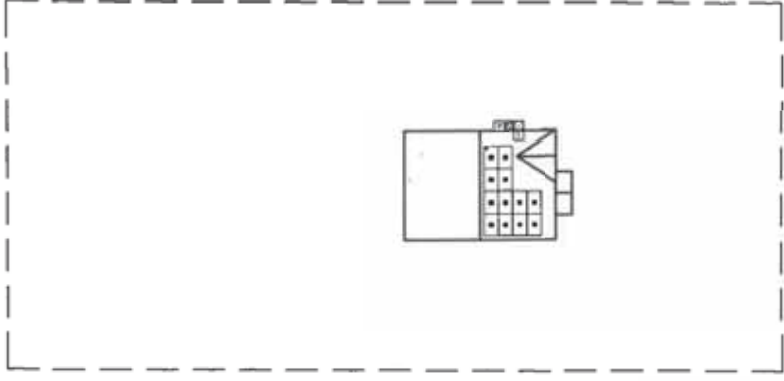
CITY: Hamett County

ADDRESS: 67 James Allen Ln
Dunn, North Carolina 28334

DATE: December 9, 2023

DRAWING TITLE: Site Plan

DRAWING NUMBER: PV2



FRONT OF HOME
67 James Allen Ln

Sealed For
Existing Roof &
Attachment Only



REVISED:
DATE: 12/09/23

SITE PLAN
SCALE: 1/32" = 1'-0"

LEGEND

- ROOF TOP JUNCTION BOX
- UTILITY METER
- MAIN SERVICE PANEL
- SUB SUBPANEL
- BREAKER ENCLOSURE
- AC DISCONNECT
- PV PRODUCTION METER
- COMBINER BOX
- GENERATOR ATS PANEL
- UTILITY METER CT CABINET
- SUNPOWER HUB+
- SUNVAULT ESS
- REMOTE POWER OFF SWITCH
- FIRE SETBACK HATCH
- TRENCH OR OVERHEAD
- PROPERTY LINE
- NEW PV SYSTEM

PV SYSTEM SPECIFICATIONS

NEW PV SYSTEM INFORMATION
PV MODULE: (12) REC Solar REC-420AA Pure-R, POWER RATING: 420 W
MICROINVERTER: Enphase IQ7X-96-2-US, POWER RATING: 315 W

COMPASS





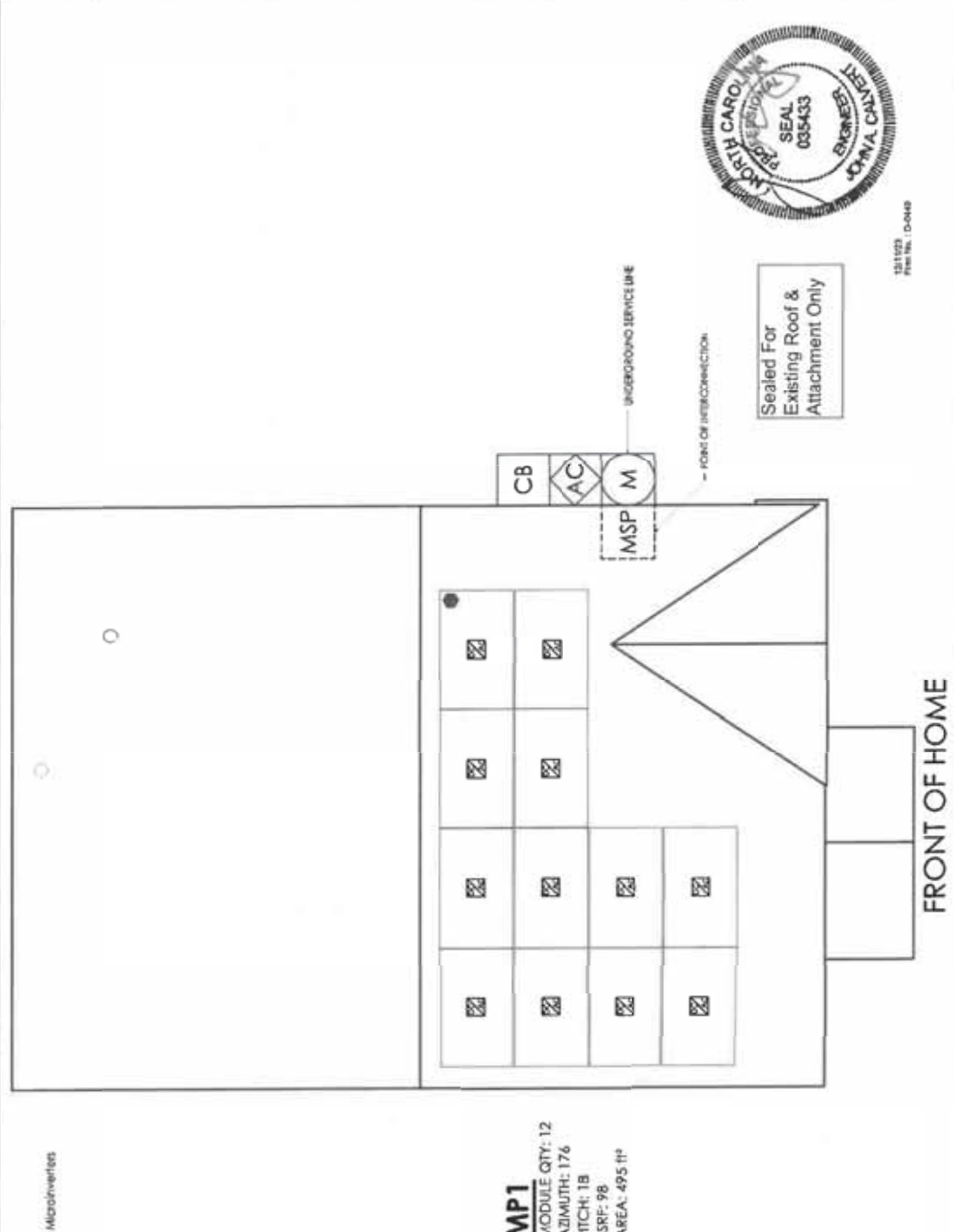
BLUE RAVEN
SOLAR

1403 N 430 E
Orem, Utah 84097
(800) 377-4480
BlueRavenSolar.com

Antonio Johnny
67 James Allen Ln
Dunn, North Carolina 28334
Harnett County
Duke Energy NC

PROJECT ID: **898102**
DC SYSTEM SIZE: 5.04 kW DC
AC SYSTEM SIZE: 3.78 kW AC

DRAWN BY: Brandon Filmore
PLOT DATE: December 9, 2023
DRAWING TITLE: Roof Plan
DRAWING NUMBER: **PV3**



PV SYSTEM SPECIFICATIONS
NEW PV SYSTEM INFORMATION
PV MODULE: (12) REC Solar REC-420AA Pure-R, POWER RATING: 420 W
MICROINVERTER: Enphase IQ7X-96-2-US, POWER RATING: 31.5 W



MP1
MODULE QTY: 12
AZIMUTH: 176
PITCH: 18
TSRF: 98
AREA: 495 ft²

DC SYSTEM SITE: 5.04 kW DC, MODULE: REC 420 INVERTER(S): Enphase IQ7X Microinverters

Sealed For Existing Roof & Attachment Only

POINT OF INTERSECTION

UNDERGROUND SERVICE LINE

121123
Rev. No. 1.0-049

ROOF PLAN
SCALE: 3/16" = 1'-0"

LEGEND	
	ROOF TOP JUNCTION BOX
	UTILITY METER
	MAIN SERVICE PANEL
	SUB SUBPANEL
	BREAKER ENCLOSURE
	AC DISCONNECT
	PV PRODUCTION METER
	COMBINER BOX
	GENERATOR ATS PANEL
	UTILITY METER CT CABINET
	HUB
	SUNPOWER HUB+
	ESS
	REMOTE POWER OFF SWITCH
	FIRE SETBACK HATCH
	TRENCH OR OVERHEAD
	PROPERTY LINE
	NEW PV SYSTEM

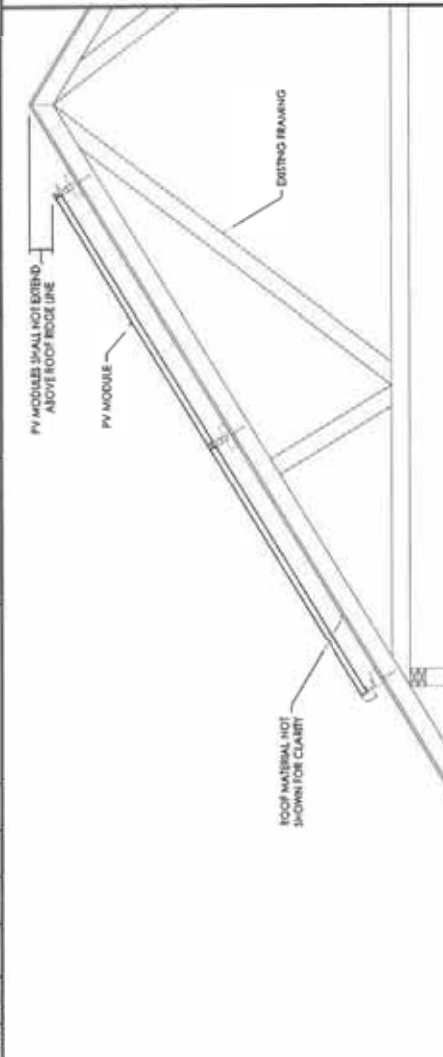
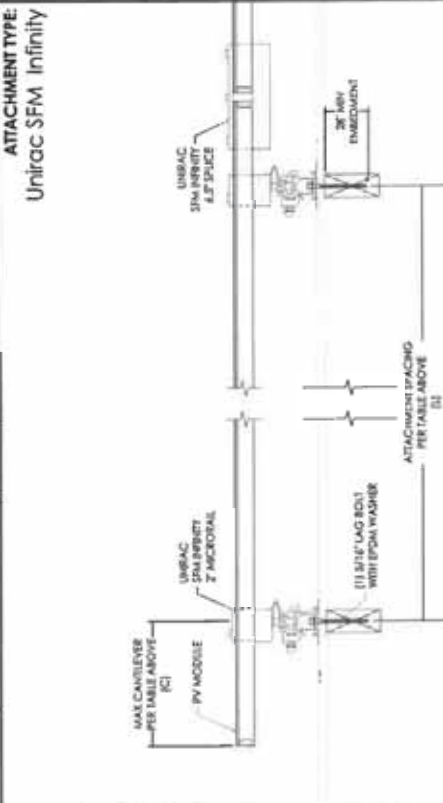
FAMIL COUNT	ADJUTH (PRG)	PRCH (PRG)	DEAT (N)	ATA (PP)	ROOF MATERIAL	SHADING TYPE	FRAMING TYPE	FRAMING SIZE AND SPACING	CEILING JOIST/ AND SPACING	BACKING TYPE	ATTACHMENT TYPE	MAXIMUM ATTACHMENT SPACING (D)	MAXIMUM CABLE/CLIP SPACING (C)	TOTAL PV AREA (SQ FT)	TOTAL ROOF AREA (SQ FT)	TOTAL PV WEIGHT (LBS)	TOTAL ROOF WEIGHT (LBS)	POINT LOAD (LBS/FT ²)	
AMP1	178	18	18	495	Comp Shingle	018	Manufactured	2x6 @ 24" O.C	2x6 @ 24" O.C	UNIRAC 2x4x8x16	UNIRAC SFM INFINITY FLASHTIGHT	24" / 48"	24" / 18"	3637	1145	203	203	1.17	
AMP2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AMP3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AMP4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AMP5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AMP6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AMP7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AMP8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AMP9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AMP10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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Harnett County
Duke Energy NC

PROJECT ID: **898102**
DC SYSTEM SIZE: 5.04 kW DC
AC SYSTEM SIZE: 3.78 kW AC
REVISIONS:
DRAWN BY: Brendon Filmore
PLOT DATE: December 9, 2023
DRAWING TITLE: Structural
DRAWING NUMBER: **PV4**



ATTACHMENT TYPE:
Unirac SFM Infinity

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

NOTES

Sealed For Existing Roof & Attachment Only

PRINTED PERM. 0-0448

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

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

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

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

FOLLOW ATTACHMENT SPACING IN TABLE ABOVE

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



BLUE RAVEN
SOLAR

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

PROJECT ID: **898102**

DC SYSTEM SIZE: 5.04 kW DC

AC SYSTEM SIZE: 3.78 kW AC

REVISIONS:

DATE: December 9, 2023

DRAWING TITLE: Electrical Calculations

STANDARD NUMBER: PV6

CUSTOMER NAME: **Antonio Johnny**

ADDRESS: 67 James Allen Ln
Dunn, North Carolina 28334

COUNTY: Harnett County

UTILITY COMPANY: Duke Energy NC

WIRE SIZE SPECIFICATIONS

	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩
MINIMUM CONDUCTOR AMPACITY	19.5A AC	19.5A AC	19.5A AC	19.5A AC	19.5A AC	19.5A AC	19.5A AC	19.5A AC	19.5A AC	19.5A AC
CONDUCTOR MATERIAL	CU	CU	CU	CU	CU	CU	CU	CU	CU	CU
CONDUCTOR TYPE	THHN/THWN-2	THHN/THWN-2	THHN/THWN-2	THHN/THWN-2	THHN/THWN-2	THHN/THWN-2	THHN/THWN-2	THHN/THWN-2	THHN/THWN-2	THHN/THWN-2
CONDUCTOR SIZE	12 AWG	10 AWG	10 AWG	10 AWG	10 AWG	10 AWG	10 AWG	10 AWG	10 AWG	10 AWG
CONDUCTOR AMPACITY	30A	30A	30A	30A	30A	30A	30A	30A	30A	30A
AMBIENT TEMPERATURE ADJUSTMENT FACTOR	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
CONDENSED RUL ADJUSTMENT FACTOR	1	1	1	1	1	1	1	1	1	1
ADJUSTED CONDUCTOR AMPACITY	28.8A	28.8A	28.8A	28.8A	28.8A	28.8A	28.8A	28.8A	28.8A	28.8A
WIRE RUN DISTANCE (FT)	79	30	20	3	0.33%	0.33%	0.33%	0.33%	0.33%	0.33%
CALCULATED VOLTAGE DROP	2.28%	0.5%	0.33%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%

PV CIRCUIT SPECIFICATIONS

	PRIMARY STRUCTURE			DETACHED STRUCTURE						
	CIRCUIT 1	CIRCUIT 2	CIRCUIT 3	CIRCUIT 4	CIRCUIT 5	CIRCUIT 6	CIRCUIT 7	CIRCUIT 8	CIRCUIT 9	CIRCUIT 10
NUMBER OF MODULES PER CIRCUIT	12	0	0	0	0	0	0	0	0	0
RATED AC OUTPUT CURRENT (I _{sc})	13.7A	0.0A	0.0A	0.0A	0.0A	0.0A	0.0A	0.0A	0.0A	0.0A
MINIMUM AMPACITY (I _{sc} x 125%)	17.1A	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
COMBINED AC OUTPUT CURRENT (I _{sc})	13.7A	0.0A	0.0A	0.0A	0.0A	0.0A	0.0A	0.0A	0.0A	0.0A
MINIMUM AMPACITY (I _{sc} x 125%)	17.1A	0.0A	0.0A	0.0A	0.0A	0.0A	0.0A	0.0A	0.0A	0.0A
COMBINED PV BREAKER RATING	20A	20A	20A	20A	20A	20A	20A	20A	20A	20A

TOTAL VOLTAGE DROP

WIRE TAG #1	2.00%
WIRE TAG #2	0.5%
WIRE TAG #3	0.33%
WIRE TAG #4	0.08%
WIRE TAG #5	0%
WIRE TAG #6	0%
TOTAL	2.910000%

ELECTRICAL INFORMATION

UTILITY ELECTRICAL SYSTEM

1-Phase, 240V, 60Hz, 120/240V

NEW PV SYSTEM

1-Phase, 240V, 60Hz, 120/240V

AC SYSTEM SIZE | 3.78kW AC

DC SYSTEM SIZE | 5.04kW DC

QUANTITY | 13

PV MODULES

TYPE | REC-500R REC-600A PV-6-B

WARRANTY | 25YR DC

INVERTERS

TYPE | REC-500R-600A PV-6-B

OUTPUT CURRENT | 31.1A AC

NOMINAL VOLTAGE | 240V AC

OUTPUT POWER | 3134W AC

DESIGN LOCATION AND TEMPERATURES

DATA SOURCE | AHJ/RAE Weather Station Data

CITY | Dunn

STATE | North Carolina

WEATHER STATION | SETACOL-3/JOHNSON AFB

HIGH TEMP 2% AVG | 35°C

EXTREME MINIMUM TEMP | -10°C

PV BREAKER BACKFEED CALCULATIONS

(UL984 RATING • 120V • OCCFD RATING • AVAILABLE BACKFEED)

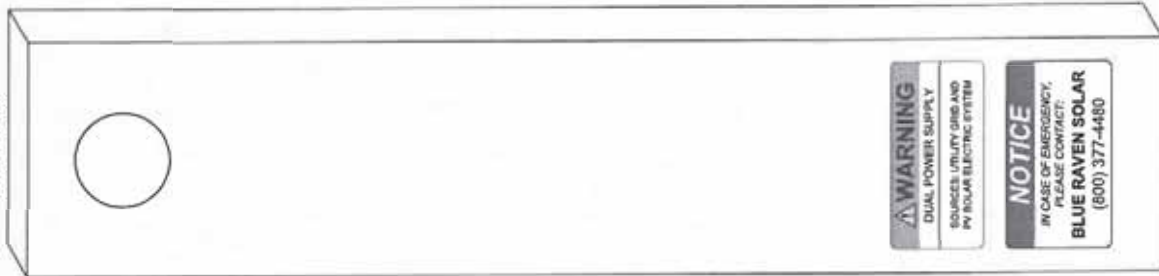
MAIN SERVICE PANEL	SUBPANEL 1
BUSBAR RATING	200A
PANEL OCCFD RATING	200A
AVAILABLE BACKFEED (100% BUS)	70A
PV BREAKER RATING	20A
AVAILABLE BACKFEED (100% BUS)	20A

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*

WARNING LABELS FOR PHOTOVOLTAIC SYSTEM

UTILITY METER



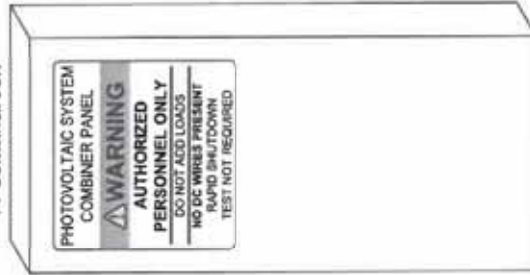
MAIN SERVICE PANEL



AC DISCONNECT



PV COMBINER BOX



<p>BLUE RAVEN SOLAR</p> <p>1403 N 630 E Orem, Utah 84097 (800) 377-4480 BlueRavenSolar.com</p>	<p>Antonio Johnny 67 James Allen Ln Dunn, North Carolina 28334</p>	<p>DUKE COMPANY: Harnett County Duke Energy NC</p>
	<p>PROJECT ID: 898102</p>	<p>DC SYSTEM SIZE: 5.04 kW DC</p> <p>AC SYSTEM SIZE: 3.78 kW AC</p>

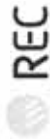
REVISIONS:

1			
2			
3			
4			

DESIGN BY: Brendan Filmore
 DATE: December 9, 2023
 DRAWING TITLE: Warning Labels
 DRAWING NUMBER: PV7



SOLAR'S MOST TRUSTED



REC ALPHA PURE-R SERIES PRODUCT SPECIFICATIONS



COMPACT PANEL - SIZE

9 A MODULE CURRENT
COMPATIBLE WITH MPPE

430 WP
20.7 W/FT²
22.3% EFFICIENCY



LEAD-FREE
ROHS COMPLIANT

EXPERIENCE
PERFORMANCE



REC ALPHA PURE-R SERIES PRODUCT SPECIFICATIONS

GENERAL DATA

Cell type: 60 cell cut REC Crystal hetero-junction cells with back-surface field (BSF) technology

Glass: 0.33" (8.4mm) clear glass with anti-reflection low iron tempered glass on both sides (3.2mm)

Backsheet: High performance polymer (PET) with UV stabilizer and fire retardant

Frame: Anodized aluminum (black)

Junction box: 6 port, 400Vdc, 3000mA, 3000Vdc

Junction box IP: IP67 (not for use in rain) (NEMA 4X)

Connectivity: 20mm MC4 PV-ED1451410 (AWG)

Cable: 12 AWG (4-wire) PV wire, 6.52" (17.17cm) length

Dimensions: 68.1 x 44.8 x 3.2 (inches) / 1728 x 1138 x 80.9 (mm)

Weight: 47.4 lbs (21.5 kg)

Origin: Made in Singapore

ELECTRICAL DATA

Parameter	Value	Product Code	REC Alpha PURE-R
Power Output - P_{max} (W)	430	432	
V _{OC} (V)	41.0	01-10	
V _{MPPT} (V)	48.8	48.4	
V _{MPPT} (V) @ 1000W (V)	48.2	8.30	
V _{MPPT} (V) @ 1000W (V) @ 25°C	59.9	59.2	
V _{MPPT} (V) @ 1000W (V) @ 45°C	8.80	8.84	
V _{MPPT} (V) @ 1000W (V) @ 65°C	19.28	19.24	
V _{MPPT} (V) @ 1000W (V) @ 85°C	20.7	21.2	
V _{MPPT} (V) @ 1000W (V) @ 105°C	30.5	31.2	
V _{MPPT} (V) @ 1000W (V) @ 125°C	46.0	47.1	
V _{MPPT} (V) @ 1000W (V) @ 145°C	6.64	6.70	
V _{MPPT} (V) @ 1000W (V) @ 165°C	55.5	55.8	
V _{MPPT} (V) @ 1000W (V) @ 185°C	7.11	7.18	
V _{MPPT} (V) @ 1000W (V) @ 205°C			
V _{MPPT} (V) @ 1000W (V) @ 225°C			
V _{MPPT} (V) @ 1000W (V) @ 245°C			
V _{MPPT} (V) @ 1000W (V) @ 265°C			
V _{MPPT} (V) @ 1000W (V) @ 285°C			
V _{MPPT} (V) @ 1000W (V) @ 305°C			
V _{MPPT} (V) @ 1000W (V) @ 325°C			
V _{MPPT} (V) @ 1000W (V) @ 345°C			
V _{MPPT} (V) @ 1000W (V) @ 365°C			
V _{MPPT} (V) @ 1000W (V) @ 385°C			
V _{MPPT} (V) @ 1000W (V) @ 405°C			
V _{MPPT} (V) @ 1000W (V) @ 425°C			
V _{MPPT} (V) @ 1000W (V) @ 445°C			
V _{MPPT} (V) @ 1000W (V) @ 465°C			
V _{MPPT} (V) @ 1000W (V) @ 485°C			
V _{MPPT} (V) @ 1000W (V) @ 505°C			
V _{MPPT} (V) @ 1000W (V) @ 525°C			
V _{MPPT} (V) @ 1000W (V) @ 545°C			
V _{MPPT} (V) @ 1000W (V) @ 565°C			
V _{MPPT} (V) @ 1000W (V) @ 585°C			
V _{MPPT} (V) @ 1000W (V) @ 605°C			
V _{MPPT} (V) @ 1000W (V) @ 625°C			
V _{MPPT} (V) @ 1000W (V) @ 645°C			
V _{MPPT} (V) @ 1000W (V) @ 665°C			
V _{MPPT} (V) @ 1000W (V) @ 685°C			
V _{MPPT} (V) @ 1000W (V) @ 705°C			
V _{MPPT} (V) @ 1000W (V) @ 725°C			
V _{MPPT} (V) @ 1000W (V) @ 745°C			
V _{MPPT} (V) @ 1000W (V) @ 765°C			
V _{MPPT} (V) @ 1000W (V) @ 785°C			
V _{MPPT} (V) @ 1000W (V) @ 805°C			
V _{MPPT} (V) @ 1000W (V) @ 825°C			
V _{MPPT} (V) @ 1000W (V) @ 845°C			
V _{MPPT} (V) @ 1000W (V) @ 865°C			
V _{MPPT} (V) @ 1000W (V) @ 885°C			
V _{MPPT} (V) @ 1000W (V) @ 905°C			
V _{MPPT} (V) @ 1000W (V) @ 925°C			
V _{MPPT} (V) @ 1000W (V) @ 945°C			
V _{MPPT} (V) @ 1000W (V) @ 965°C			
V _{MPPT} (V) @ 1000W (V) @ 985°C			
V _{MPPT} (V) @ 1000W (V) @ 1005°C			

MAXIMUM RATINGS

Parameter	Value	Standard	REC Product
Operational temperature	-40 ~ +85°C	IEC 61215	Yes
System voltage	1000V	IEC 61215	Yes
Test load (bars)	+2000hPa (14.7psi) / -1000hPa (-7.35psi)	IEC 61215	Yes
Test load (bars)	+0.057Pa (0.833mmHg) / -0.057Pa (-0.833mmHg)	IEC 61215	Yes
Series Resistor	25A	IEC 61215	Yes
Reverse current	25A	IEC 61215	Yes

HUMIDITY

Parameter	Value	Standard	REC Product
Insulation resistance	>1000MΩ (1000VDC)	IEC 61215	Yes
System Size	432 W 25-100 MM	IEC 61215	Yes
Power Warranty (yr)	25	IEC 61215	Yes
Labor Warranty (yr)	5	IEC 61215	Yes
Power at Year 1	88%	IEC 61215	Yes
Annual Degradation	0.25%	IEC 61215	Yes
Power at Year 25	82%	IEC 61215	Yes

Available from:

Founded in 1996, REC Group is an international power solar energy company dedicated to engineering customers 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 manufacturers. Headquarters in Nanjing with regional headquarters in Singapore, REC has two regional distribution centers in Australia, Europe, and Asia Pacific.



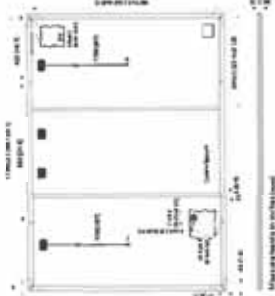
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PROFESSIONAL
Scott County
RPV-011718-016MAN

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CERTIFICATIONS

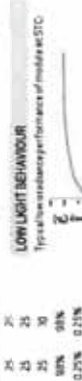
Standard	Value
IEC 61215-2016	IEC 61730-2016, UL 61730
IEC 61853	IP67
IEC 61730	Salt Mist
IEC 61736	Aerosol Resistance
UL 61730	Fire Type 2
IEC 62782	Dynamic Mechanical Load
IEC 61732-2016	Hailstone (DIN)
IEC 62782	Leakdown w/UVS (DIN EN 60605)
ISO 9001:2015	ISO 14001:2015

TEMPERATURE RATINGS

Parameter	Value
Normal Module Operating Temperature	4°C (39°F)
Temperature coefficient of P_{max}	-0.24%/°C
Temperature coefficient of V_{oc}	-0.24%/°C
Temperature coefficient of I_{sc}	0.04%/°C

DELIVERY INFORMATION

Parameter	Value
Panels per pallet	33
Pallet size (L x W x H) (inches)	68.1 x 44.8 x 3.2
Panels per 53h truck	658 (26 pallets)



REC Solar PTE LTD.
20 East South Ave 14
Singapore 637332
www.recgroup.com

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.

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.

Easy to Install

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

Efficient and Reliable

- Optimized for high-powered 96-cell modules
- Highest CEC efficiency of 97.5%
- More than a million repairs at no charge
- 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 1741-3B, 3rd Ed)

* The IQ7X is required to support 96-cell modules



To learn more about Enphase offerings, visit enphase.com
IQ7X-05-0099-EN-US-12-27-2022

IQ7X Microinverter

INPUT DATA (DC)	
Commonly used module pairings ¹	IQ7X-96-2-US 320W - 4850W
Module compatibility	96-cell PV modules
Maximum input DC voltage	79.5V
Peak power tracking voltage	53V - 64V
Operating range	25V - 79.5V
Min/Max start voltage	33V/79.5V
Max DC short circuit current (module fact)	10A
Over-voltage class DC port	II
DC port backfeed current	0A
PV array configuration	1 x 1 ungrounded array. No additional DC side protection required. AC side protection requires max. 20A per branch circuit @ 240VAC
OUTPUT DATA (AC)	
Peak output power	320VA
Maximum continuous output power	315VA
Nominal (L-L) voltage/range*	240V/211-254V
Maximum continuous output current	1.31A (240VAC)
Nominal frequency	60Hz
Extended frequency range	49 - 68 Hz
AC short circuit fault current over 3 cycles	5.8 Arms
Maximum units per 20A (L-L) branch circuit ²	12 (240VAC)
Over-voltage class AC port	III
AC port backfeed current	18 mA
Power factor setting	1.0
Power factor (adjustable)	0.95 leading - 0.85 lagging
CEC weighted efficiency	@ 240VAC 97.5%
MECHANICAL DATA	
Ambient temperature range	-40°C to +107°C
Relative humidity range	4% to 100% (condensing)
Connector type (IQ7X 96-2 US)	MCA (or Amphenol H4 UTX with optional Q-DCC-S adapter)
Dimensions (WxHxD)	212 mm x 176 mm x 30.2 mm (without bracket)
Weight	1.58 kg (2.98 lbs)
Cooling	Natural convection. No fans
Approved for wet locations	Yes
Pollution degree	FD3
Enclosure ³	Class II double-insulated. Corrosion resistant polymers, enclosure
Environmental category/UV exposure rating	NEMA Type 3R outdoor
FEATURES	
Communication	Power Line Communications (PLC)
Monitoring	Enphase Installer App and monitoring option
Disconnecting means	Compatible with IQ Gateway
Compliance	The AC and DC connectors have been evaluated and approved by UL for use as the load-break disconnect required by NEC 690
	CA Rule 21 (UL 1741-SA), IEEE 1547-2018 (UL 1741-3B, 3rd Ed)
	IEEE 1547-2018 (UL 1741-3B, 3rd Ed)
	CA Rule 21 (UL 1741-SA), IEEE 1547-2018 (UL 1741-3B, 3rd Ed)
	CA Rule 21 (UL 1741-SA), IEEE 1547-2018 (UL 1741-3B, 3rd Ed)
	This product is UL Listed as PV Rapid Shutdown Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020, section 690.12 and C22.1-2015 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to manufacturer's instructions.

1. Pairing PV modules with wattage above the limit may result in additional clipping losses. See the compatibility calculator at bit.ly/ulacclass-compatibility.
2. Maximum number of units per branch circuit is limited by the utility.
3. Units may only refer to load requirements to derive the number of microinverters per branch in your array.

To learn more about Enphase offerings, visit enphase.com

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IQ7X-05-0099-EN-US-12-27-2022



The IQ7X is required to support 96-cell modules

To learn more about Enphase offerings, visit enphase.com
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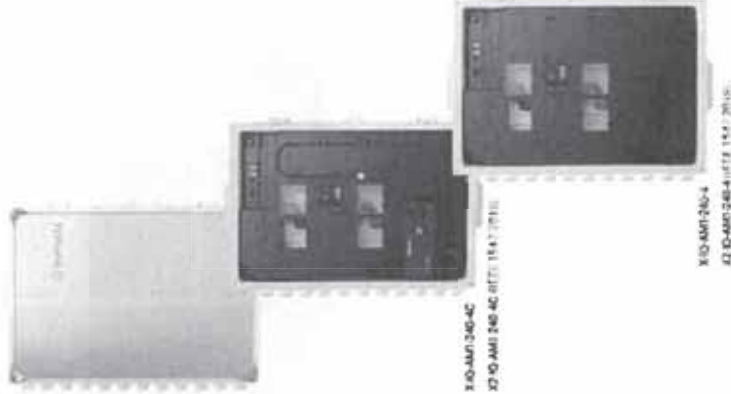
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PROFESSIONAL
Scott Gurney
#PV-011718101808

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IQ Combiner 4/4C



IQ-AMI-240-4C

IQ-AMI-240-4C (RTT)

IQ-AMI-240-4

IQ-AMI-240-4 (RTT)

The IQ Combiner 4/4C, Anti-IG Gateway and integrated 110V AC meter (included only with IQ Combiner 4C) consolidates interconnection equipment into a single enclosure. It streamlines IQ Micro-inverters and storage installations by providing a consistent, one-wire solution for residential applications. It offers up to four 2-pole output circuits and Enphase BR series breaker assembly.

Smart

- Includes IQ Gateway for monitoring, status and control
- Includes Mobile Command cellular modem
- CELL MODEM M1, M2, M3, M4, M5, M6, M7, M8, M9, M10, M11, M12, M13, M14, M15, M16, M17, M18, M19, M20, M21, M22, M23, M24, M25, M26, M27, M28, M29, M30, M31, M32, M33, M34, M35, M36, M37, M38, M39, M40, M41, M42, M43, M44, M45, M46, M47, M48, M49, M50, M51, M52, M53, M54, M55, M56, M57, M58, M59, M60, M61, M62, M63, M64, M65, M66, M67, M68, M69, M70, M71, M72, M73, M74, M75, M76, M77, M78, M79, M80, M81, M82, M83, M84, M85, M86, M87, M88, M89, M90, M91, M92, M93, M94, M95, M96, M97, M98, M99, M100, M101, M102, M103, M104, M105, M106, M107, M108, M109, M110, M111, M112, M113, M114, M115, M116, M117, M118, M119, M120, M121, M122, M123, M124, M125, M126, M127, M128, M129, M130, M131, M132, M133, M134, M135, M136, M137, M138, M139, M140, M141, M142, M143, M144, M145, M146, M147, M148, M149, M150, M151, M152, M153, M154, M155, M156, M157, M158, M159, M160, M161, M162, M163, M164, M165, M166, M167, M168, M169, M170, M171, M172, M173, M174, M175, M176, M177, M178, M179, M180, M181, M182, 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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 integrals 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

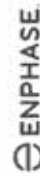
- Easy system configuration using Enphase Installer Toolkit™ mobile app
- Flexible networking with Wi-Fi, Ethernet, or cellular

Reliable

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



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Enphase IQ Envoy

MODEL NUMBERS Enphase IQ Envoy™ ENV-IQ-AMI-240	Enphase IQ Envoy communications gateway with integrated revenue grade PV production metering and optional consumption monitoring (v1 - 2.5N) including (AMS) CT1-20 v1 - 0.5N) and optional consumption monitoring (v1 - 2.5N) and one 200A continuous rated production CT (transit transformer).
ACCESSORIES (Order Separately) Enphase Mobile Connect™ CELLMOD-M1-M1 (4G based LTE-M/5-year data plan) CELLMOD-M1-B (4G based LTE-M/5-year data plan) Consumption Monitoring CT CT-200-SPLT	Plug and play industrial grade cellular modem with data plan for systems up to 60 microconverters. (Available in the US, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.) Split-core consumption CTs enable whole home metering.
Enphase Communications Kit COMPS-KIT-01	Installed at the IQ Envoy. For communications with Enphase Enlighten™, Enphase and Enphase Engage™ smart switches. Includes USB cable for connection to PC and Enphase IQ Controller™ and allows wireless communication with Enlighten and Engage.
POWER REQUIREMENTS Power requirement Typical Power Consumption	100-240 VAC split phase Max 20 A overcurrent protection required. 5W
CAPACITY Number of microconverters joined	Up to 600
MECHANICAL DATA Dimensions (WxHxD) Weight Ambient temperature range Environmental rating Altitude Production CT	213 x 123 x 45 mm (8.4" x 5" x 1.8") 17.6 oz (498 g) -40° to 65° C (-40° to 149° F) -40° to 48° C (-40° to 115° F) if installed in an enclosure IP30. For installation indoors or in an NEMA-certified, NEMA type 3R enclosure. To 2000 meters (6,560 feet) - Limited to 200A of continuous current / 250A OCPD - 72NVA AC - Internal aperture measures 18.34mm to support 250MCM T11NVA conductors (max) - UL2888 certified for revenue grade metering - For electrical services to 250A with parallel runs up to 500A. - Internal aperture measures 0.84" x 0.56" (21.3mm x 14.18mm) to support 3/0 THWN conductor - UL2808 certified, for use at service entrance for services up to 250Wac
INTERNET CONNECTION OPTIONS Integrated Wi-Fi Ethernet Mobile	802.11b/g/n 802.3 Cat5E (for Cat 4) UTP Ethernet cable (not included) CELLMOD-M1 (4G) or CELLMOD-M1-B (4G). Not included. Note that an Enphase Mobile Connect cellular modem is required for all 5-assembly installations.
COMPLIANCE Compliance	UL 61010-1 CAN/CSA C22.2 No. 61010-1 4E CPE Part 1.5 Class B ICES 001 FCC Part 15 Class B ICES 002 ICES 003 ICES 004 ICES 005 ICES 006 ICES 007 ICES 008 ICES 009 ICES 010 ICES 011 ICES 012 ICES 013 ICES 014 ICES 015 ICES 016 ICES 017 ICES 018 ICES 019 ICES 020 ICES 021 ICES 022 ICES 023 ICES 024 ICES 025 ICES 026 ICES 027 ICES 028 ICES 029 ICES 030 ICES 031 ICES 032 ICES 033 ICES 034 ICES 035 ICES 036 ICES 037 ICES 038 ICES 039 ICES 040 ICES 041 ICES 042 ICES 043 ICES 044 ICES 045 ICES 046 ICES 047 ICES 048 ICES 049 ICES 050 ICES 051 ICES 052 ICES 053 ICES 054 ICES 055 ICES 056 ICES 057 ICES 058 ICES 059 ICES 060 ICES 061 ICES 062 ICES 063 ICES 064 ICES 065 ICES 066 ICES 067 ICES 068 ICES 069 ICES 070 ICES 071 ICES 072 ICES 073 ICES 074 ICES 075 ICES 076 ICES 077 ICES 078 ICES 079 ICES 080 ICES 081 ICES 082 ICES 083 ICES 084 ICES 085 ICES 086 ICES 087 ICES 088 ICES 089 ICES 090 ICES 091 ICES 092 ICES 093 ICES 094 ICES 095 ICES 096 ICES 097 ICES 098 ICES 099 ICES 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CONTRACTOR:
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SHEET NAME:
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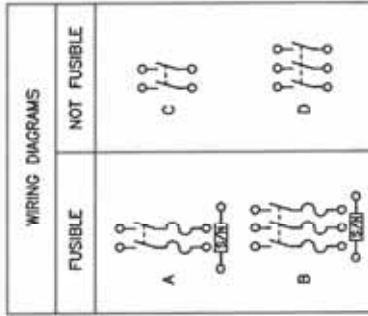
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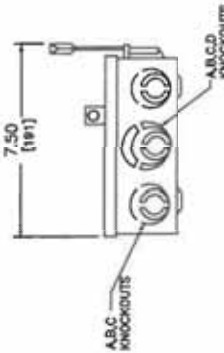
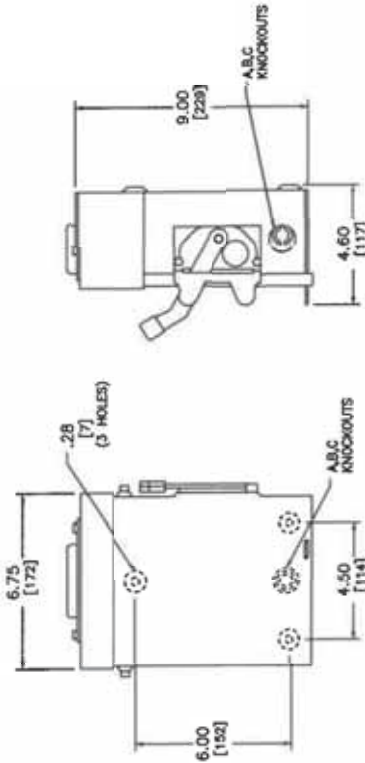


TERMINAL LUGS #	AMPERS	MAX. WIRE #	MIN. WIRE	TYPE
30	# 6 AWG	# 12 AWG	AL	
	# 5 AWG	# 14 AWG	CU	

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

DUAL DIMENSIONS: INCHES MILLIMETERS

CATALOG NUMBER	VOLTAGE RATINGS	WIRING DIAG.	HORSEPOWER RATINGS			
			120VAC STD.	120VAC MAX.	240VAC STD.	240VAC MAX.
0211NRB**	240VAC	A	1/2	2	1 1/2	3
0221NRB	240VAC	A	-	-	1 1/2	3*
0321NRB	240VAC	B	-	-	1 1/2	3
04221RB	240VAC	C	-	-	-	3
03221RB	240VAC	D	-	-	-	3



NEMA TYPE 3R ILLUSTRATED

- NOTES: - GRAY BAKED ENAMEL ELECTRODEPOSITED OVER CLEANED PHOSPHATIZED STEEL.
 UL LISTED AS FILE E-2075
 FINISH IS UNPAINTED, GROUNDABLE
 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.
 * 100,000 AMPERES WHEN USED WITH OR PROTECTED BY CLASS H OR K FUSES.
 * FOR CORNER GROUNDING WITH CLASS R FUSES.
 * FOR CORNER GROUNDING DELTA SYSTEMS.
 # LUGS SUITABLE FOR 60°C OR 75° CONDUCTORS.

GENERAL DUTY SAFETY SWITCHES
VISIBLE BLADE TYPE
30 AMPERE
ENCLOSURE - NEMA TYPE 3R RAINPROOF

SQUARE D
by Schneider Electric

REF 1852

REF DWG #1852

FEBRUARY 2014



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RPV-2017-9-215688

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A. System Specifications and Ratings

- Maximum Voltage: 1,000 Volts
- Maximum Current: 80 Amps
- Allowable Wire: 14 AWG – 6 AWG
- Spacing: Please maintain a spacing of at least 1/2" between un-insulated live parts and fittings for conduit, armored cable, and un-insulated 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
 - Approved wire connectors: must conform to UL1741
- 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.

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	QTY	REV
B	JB-1.2	
SCALE: 1:2	WEIGHT LABELS	SHEET 1 OF 3
TABLE SPECIFICATION:	15-20 LBS	
CERTIFICATION:	UL STANDARD 1741, NEMA 3R	
WEIGHT:	1.46 LBS	

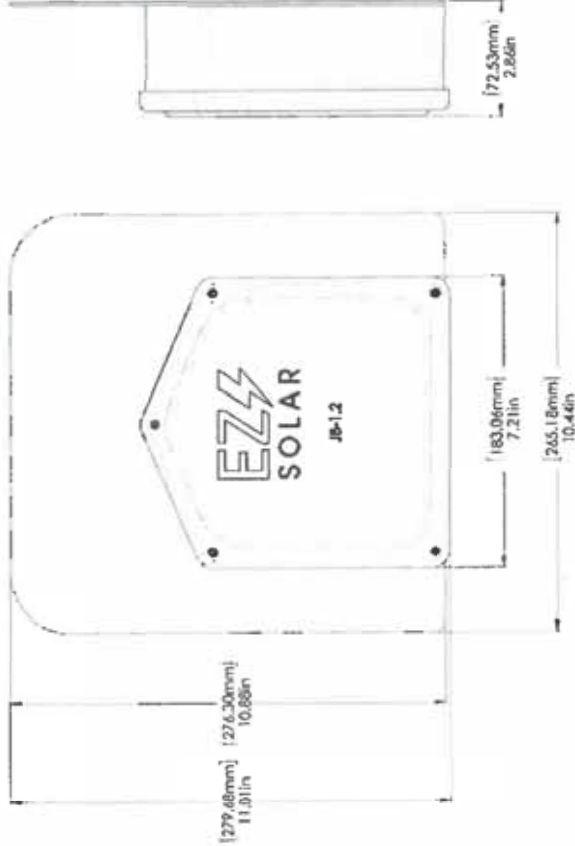


Table 1: Typical Wire Size, Torque Loads and Ratings

	1 Conductor		2 Conductor		Torque		Voltage	Current
	mm	Type	mm	Type	Inch-Lbs	Inch-Lbs		
ABB 250 terminal block	10-24 AWG	10-24 AWG	10-24 AWG	10-24 AWG	6.3 @ 95%	6.00V	600V	10 AMP
ABB 250 terminal block	6-24 AWG	10-24 AWG	10-24 AWG	10-24 AWG	8.85-14.16	600V	600V	10 AMP
ABB 250 terminal block	4-24 AWG	10-24 AWG	10-24 AWG	10-24 AWG	14.6-21.24	600V	600V	10 AMP
ABB MK60 terminal block	8-22 AWG	10-24 AWG	10-24 AWG	10-24 AWG	8.85	600V	600V	10 AMP
ABB 45.2 Red Wire, RJ-45 Connector	8-18 AWG	10-24 AWG	10-24 AWG	10-24 AWG	Self Torque	600V	600V	10 AMP
ABB 45.1 Yellow Wire, RJ-45 Connector	10-18 AWG	10-24 AWG	10-24 AWG	10-24 AWG	Self Torque	600V	600V	10 AMP
ABB In-Sure Push-in Connector Part 039	10-14 AWG	10-24 AWG	10-24 AWG	10-24 AWG	Self Torque	600V	600V	10 AMP
ABB 2204-1-201	10-20 AWG	10-24 AWG	10-24 AWG	10-24 AWG	Self Torque	600V	600V	10 AMP
ABB 221-6117	10-20 AWG	10-24 AWG	10-24 AWG	10-24 AWG	Self Torque	600V	600V	10 AMP
ABB 221-6117	6-12 AWG	10-24 AWG	10-24 AWG	10-24 AWG	Self Torque	600V	600V	10 AMP
ABB 10-5-1	4-6 AWG	10-24 AWG	10-24 AWG	10-24 AWG	Self Torque	45	2000V	
ABB 10-5-1	4-6 AWG	10-24 AWG	10-24 AWG	10-24 AWG	Self Torque	45	2000V	
ABB 10-5-1	4-6 AWG	10-24 AWG	10-24 AWG	10-24 AWG	Self Torque	45	2000V	
ABB 6-5-3	10-14 AWG	10-24 AWG	10-24 AWG	10-24 AWG	Self Torque	45	2000V	

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

Wire size, AWG or kcmil	Wires per terminal (inches)			
	1	2	3	4 or More
14-20 (0.1-0.31)	mm	mm	mm	mm
8 (0.4)	mm	mm	mm	mm
6 (0.33)	mm	mm	mm	mm

"Stay Connected" with **HEYCO** Solar Power Components

© Heyco Engineering 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!

- Two new cordgrips now accommodate the Enphase Q Cables - M3231GCZ (1/2" NPT) and M3234GDN-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 .730" (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 UG Cable.

BLANK Cordgrip Configuration	PART NO.	DESCRIPTION	PART DIMENSIONS				D	E			
			A	B	C	F					
Type	Size	NPT	Max Dia.	Length	Thread	Thickness	Flat Dia.	Working Dia.			
Overall Gland	M3231GCZ	1/2" (12.7)	1.10	1.70	0.2	0.1	1.5	0.1	0.3	0.8	24.8
Break-Thru Skinned Over Gland	M3234GDN-SM	3/4" (19.0)	1.4	1.6	1.6	0.4	1.5	0.1	0.5	0.4	30.0

Metal Locknuts INCLUDED.



Material: Nylon 6/6 with TFE Sealing Blend
 Certifications: UL Listed under Underwriters Laboratories File E504900
 CSA Certified by the Canadian Standards Association file 50276
 Flammability Rating: 94V-2
 Temperature Range: Static -40°F (-40°C) to 230°F (115°C)
 Dynamic -4°F (-20°C) to 212°F (100°C)
 IP Rating: IP 68

Heyco® Helios® UVX Clip - Blind Mount

ALL NEW PRODUCT!

- 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.

PANEL THICKNESS RANGE	MINIMUM	MAXIMUM	WIRE DIAMETER RANGE	PART NO.	DESCRIPTION	MOUNTING HOLE DIA. (MINOR)				
						A	B	C		
In.	In.	In.	In.			In.	In.	In.		
.238	0.7	.250	0.4	23	(2.9 mm) - .27 (6.9 mm) each cable	M3235	Helios UVX Clip 100 Pack	.260	0.8	.264
				M3236	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)

1-800-328-4182 • 732-286-1890 (NJ) • FAX: 732-244-9843 • www.heyco.com

SFM INFINITY

UNIRAC
BETTER SOLAR STARTS HERE

BLUE RAVEN
SOLAR



UL1703



2 INSTALLS PER DAY

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

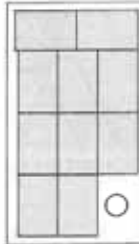
87% OF HOMEOWNERS PREFER

BETTER AESTHETICS

Install the system with the aesthetics preferred by homeowners, with integrated rams, trim, trim and 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
TRIMRAIL	Structural host to all panels, brackets and other modules.
TRIMRAIL SPICE	Connects and electrically bonds sections of TRIMRAIL.
TRIMRAIL FLASHKIT	Attaches TRIMRAIL to roof. Available for composite or tile.
MODULE CLIPS	Secure modules to TRIMRAIL.
MICRORAIL	Connects modules to SUBRACK. Provides post-install array leveling.
SPICE	Connects and supports modules. Provides east-west bonding. Attachment direction also available.
SEIDER FLASHKIT	Roof attachment and flashing. Available for composite and tile.

BONDING AND ACCESSORIES

PART NAME	DESCRIPTION
TRIMRAIL ENDCAPS	Seals ends of TRIMRAIL for reduced aesthetics.
TRIMRAIL BONDING CLAMP	Electrically bonds TRIMRAIL and modules.
M/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 IS Attachments



RAIL 20 Attachments

30% LOGISTICS SAVINGS

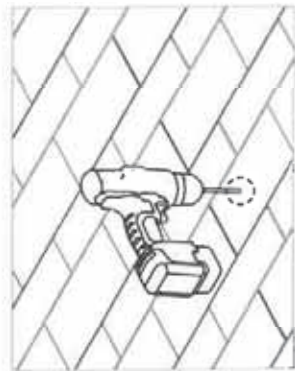
With fewer SKUs and compact components, SFM INFINITY is easier to stock, easier to transport, and easier to fit in the roof. Plus, make more efficient use of your vehicle fleet.



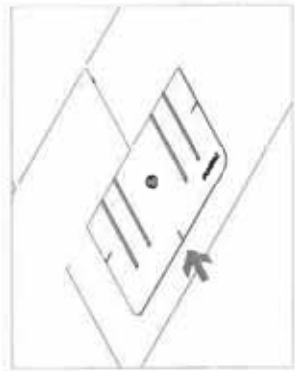
SFM INFINITY REVOLUTIONIZES ROOFTOP SOLAR WITH BENEFITS ACROSS YOUR BUSINESS, FROM DESIGN AND LOGISTICS, THROUGH ARRAY INSTALLATION AND SERVICE.

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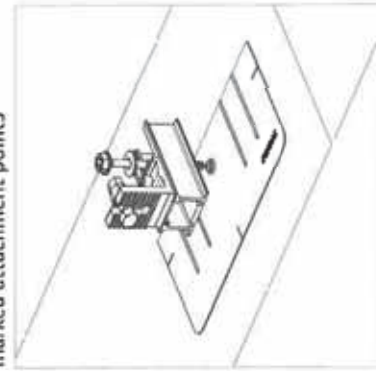
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PILOT HOLES:
 Drill pilot holes for lag screws or structural screws (as necessary) at marked attachment points

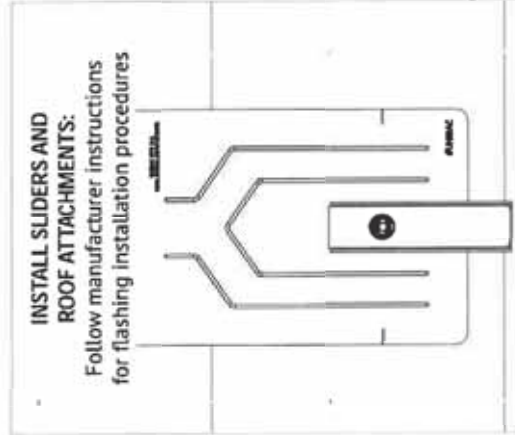
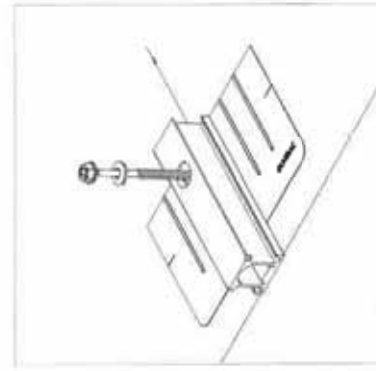


FLASHINGS:
 Place flashings

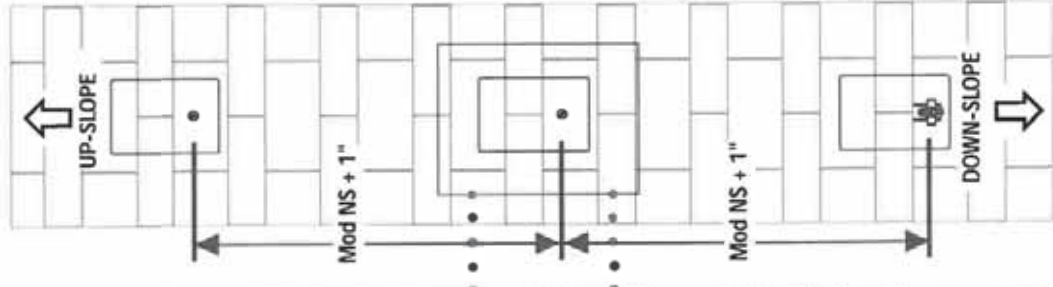
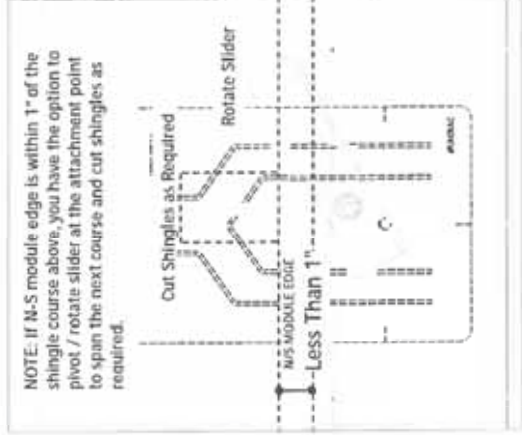


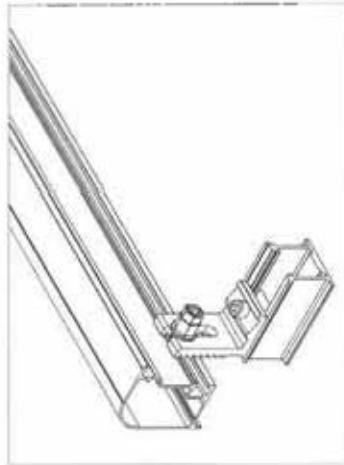
INSTALL SLIDERS AND TRIMRAIL ROOF ATTACHMENTS:

- Insert flashings per manufacturer instructions
- NOTE: Use Lag screw or structural fastener with a maximum diameter of 5/16"
- Attach sliders to rafters
- Verify proper row to row spacing for module size (Mod NS + 1')
- Ensure that Trimrail™ roof attachments in each row have sufficient engagement with slider dovetails for proper attachment.



INSTALL SLIDERS AND ROOF ATTACHMENTS:
 Follow manufacturer instructions for flashing installation procedures



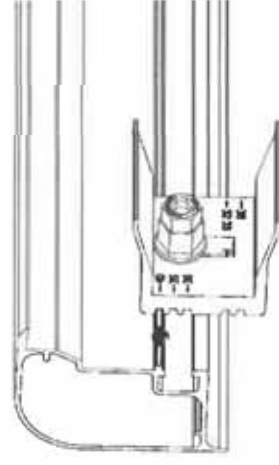


ATTACH TRIMRAIL TO ROOF ATTACHMENT:
Attach rail using 3/8" hex bolt & Tri-drive or serrated flange nuts. Make sure Trimrail™ is level across all Trimrail™ roof attachments. After rail is level, tighten channel clamp bolts to secure Trimrail™ roof attachments to channels.

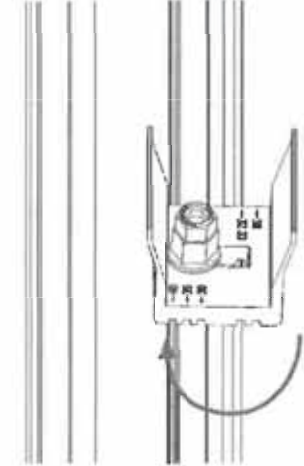


INSTALL MODULE CLIPS ON TRIMRAIL:
Attach module clips to Trimrail using 3/8" T-bolts and Tri-drive or serrated flange nuts. A minimum of two clips are required per module. Refer to SFM D&E guide and U-builder for required position and quantity of module clips.

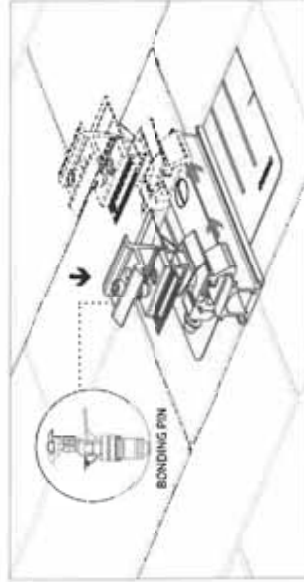
NOTE: module clips may be pre-installed on trimrail prior to attaching trimrail to roof attachments



POSITION MODULE CLIPS ACCORDING TO MODULE THICKNESS:
Align notch in module clip with trimrail rib according to module thickness (identified in mm on faces of module clips). Rotate clip to position at required location.



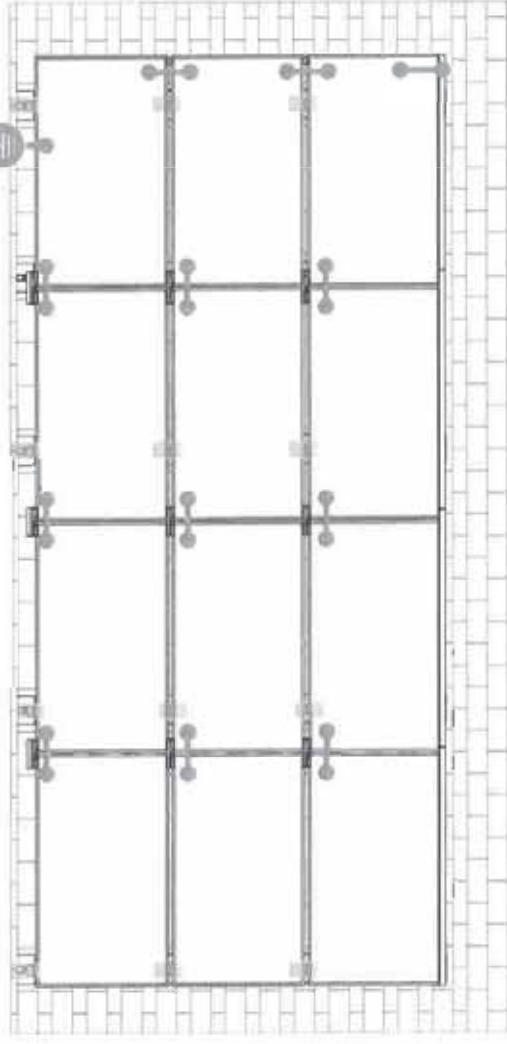
NOTE: Bonding pin on Microrails should be positioned downslope.
INSTALL MICRORAILS:
Install Microrail™ at marked attachment points. Click Microrail™ into sliders and push Microrail™ to top of slider. Ensure that cap remains in upper most (40mm) position.



SYSTEM BONDING & GROUNDING

19

INSTALLATION GUIDE PAGE



Star Washer
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
Ilisco 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
Ilisco 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)

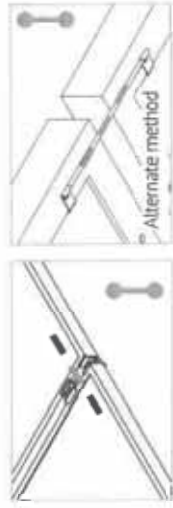
- 1/4" mounting hardware
- Torque = 10 ft-lb
- AWG 6-14- Solid or Stranded

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.



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 Microrail™ 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)

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.

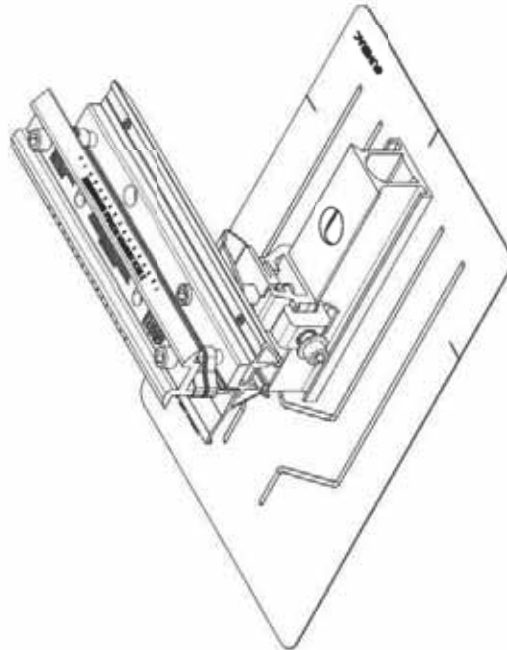
- Maximum Area of Module = 27.76 sqft
- UL2703 Design Load Ratings:
 - a) Downward Pressure – 113 PSF / 5400 Pa
 - b) Upward Pressure – 50 PSF / 2400 Pa
 - c) Down-Slope Load – 21.6 PSF / 1034 Pa
- Tested Loads:
 - a) Downward Pressure – 170 PSF / 8000 Pa
 - b) Upward Pressure – 75 PSF / 3500 Pa
 - c) 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™

UL CODE COMPLIANCE NOTES 21
INSTALLATION GUIDE PAGE

LABEL MARKINGS

- System fire class rating: See installation instructions for installation requirements to achieve a specified system fire class rating with Unirac.
- Unirac SUNFRAME MICRORAIL™ is listed to UL 2703.
- All splices within a system are shipped with marking indicating date and location of manufacture.



Manufacture	Module Model / Series	Manufacture	Module Model / Series	Manufacture	Module Model / Series
Panasonic	EVPxxxx (HX/PK), VBHxxxxSA15 & SA16, VBHxxxxSA17 & SA18, VBHxxxxSA17(E/G) & SA18E, VBHxxxxKA01 & KA05 & KA0A, VBHxxxxZA01, VBHxxxxZA02, VBHxxxxZA03, VBHxxxxZA04	REC Solar (cont.)	TwinPeak Series TwinPeak 2 Series TwinPeak 2 BLK2 Series TwinPeak 25P(172)XX TwinPeak 3 Series (58mm) TP4 (Black)	Suniva	MV Series & Optimus Series A-Series A400-BLK, SPR-MAX3-XXX-R, X-Series, E-Series & P-Series
	Peimar	Renesola	Vitus2 Series & 156 Series	SunPower	STP, STPXXX - B60/Whhb TP572, TP596, TP654, TP660, TP672, Hipar M, Smart
	Phono Solar	Risen	R3172-6 (MDG) (M), R3M60-6	Talesun	TP672, Hipar M, Smart SC, SC B, SC B1, SC B2 Txxxx, Txxxx
	Ptism Solar	SEG Solar	SEG-xxxx-BMD-HV SEG-xxx-BMD-TB	Tesla	PA05, PD05, DD05, DE06, DD06, PE06, PD14, PE14, DD14, DE09.05, DE14, DE15, PE15H
	Q.Cells	S-Energy	SN72 & SN60 Series (40mm)	Trina	UP-MxxxxP(B), UP-MxxxxM(B)
REC Solar	PS-60, PS-72	Scraper	SEG-6 & SRP-6 Series	Upolar	07M-xxxx-7A, D7(M/K)xxxxH8A FAKxxxx(CB/G/E8/G), FAKxxxxE7G-BB FAKxxxxEBG(-BB) FBHxxxxMG-BB
	PT2 Series	Sharp	NU-SA & NU-SC Series	United Renewable Energy (URE)	Eldora, Solivo, Somera
	Plus, Pro, Peak, G3, G4, G5, G6(+), G7, G8(+) Pro, Peak L-G2, L-G4, L-G5, L-G6, L-G7	Silfab	SLA, SLG, BC Series & SLxxx(BL/NL/NT/HL/ML/BK/XX/NU/HQ)	Vikram	AC & Adlyr Series WST & WSP Series YGE & YLM Series
	Q.PEAK DUO BLK-G6+	Solarer USA	SE-166'83-xxxxM-120N	Winneco	ZXH6-72, ZXM6-NH144-166_2094
	Q.PEAK DUO BLK-G6+7S	Solaria	PowerXT-xxxx(-JAC/PD/BD)	Yingli	
	Q.PEAK DUO (BLK)-G8(+)	SolarWorld	PowerXT-xxxxC-PD PowerXT-xxxxR-PM (AC)	ZN Shine	
	Q.PEAK DUO L-G8.3(BFF)		Summodule Protect, Summodule Plus		
	Q.PEAK DUO (BLK) ML-G9(+)		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		
	Q.PEAK DUO XL-G(10/10.2/10.3/10.4/10.d)		F-Series, R-Series & FLEX FXS Series		
	Q.PEAK DUO BLK ML-G10+ /1				

- 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



AUTHORIZATION TO MARK

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Applicant: Unirac, Inc. **Manufacturer:**
Address: 1411 Broadway Blvd NE
Albuquerque, NM 87102
Country: USA
Party Authorized To Apply Mark: Same as Manufacturer
Report Issuing Office: Intertek Testing Services NA, Inc., Lake Forest, CA
Control Number: 5003705 **Authorized by:** *Kimberly L. Lundy*
for L. Matthew Snyder, Certification Manager



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Intertek Testing Services NA Inc.
545 East Algonquin Road, Arlington Heights, IL 60005
Telephone 800-345-3851 or 847-439-5667 Fax 312-263-1672

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 Microcell Installation Guide, PUB2023MAY10
Brand Name:	Unirac
Model:	Unirac SFM



AUTHORIZATION TO MARK

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Applicant: Unirac, Inc. **Manufacturer:**
Address: 1411 Broadway Blvd NE
Albuquerque, NM 87102
Country: USA
Party Authorized To Apply Mark: Same as Manufacturer
Report Issuing Office: Intertek Testing Services NA, Inc., Lake Forest, CA
Control Number: 5014989 **Authorized by:** *Kimberly L. Lundy*
for L. Matthew Snyder, Certification Manager



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Intertek Testing Services NA Inc.
545 East Algonquin Road, Arlington Heights, IL 60005
Telephone 800-345-3851 or 847-439-5667 Fax 312-263-1672

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 Microcell Installation Guide, PUB2023MAY10
Brand Name:	Unirac
Model:	Unirac SFM

Listing Constructional Data Report (CDR)

Listing Constructional Data Report (CDR)

1.0 Reference and Address	
Report Number	1023292LAX-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]

1.0 Reference and Address	
Report Number	1023292LAX-002
Original	11-Apr-2015
Revised	5-Oct-2022
Email	

Applicant	Manufacturer 2
Address	Address
Country	Country
Contact	Contact
Phone	Phone
FAX	FAX
Email	Email

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

Manufacturer 5
Address
Country
Contact
Phone
FAX

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2.0 Product Description	
Product Brand name	Unirac
Description	<p>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.</p> <p>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, penetrates the anodized coating of the photovoltaic module frame (at bottom flange) to contact the metal, creating a bonded connection from module to module.</p> <p>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 to 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.</p> <p>Other optional grounding includes the use of the Emphase UL2703 certified grounding system, which requires a minimum of 2 micro-inverters mounted to the same rail, and using the same engage cable.</p>

2.0 Product Description	
Models	Unirac SFM
Model Similarity	NA
Fuse Rating: 30A	
Module Orientation: Portrait or Landscape	
Maximum Module Size: 17.98 ft	
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-25SPD05-08 and Sunpower SPR-E20-327 used for Mechanical Loading	
Increased size ML test:	
Maximum Module Size: 22.3 ft	
UL2703 Design Load Rating: 113 PSF Downward, 50 PSF Upward, 30 PSF Down-Slope	
LG35S2W-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 LG35S2W-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	
Ratings	<p>Mechanical Load test to add FishLoc Slider and Trim Assemblies to UL2703 and IEC 61646 Certifications, & Increase SFM System UL2703 Module Size.</p> <p>Maximum Module Size: 27.76 ft</p> <p>UL2703 Design Load Rating: 113 PSF Downward, 50 PSF Upward, 21.6 PSF Down-Slope</p> <p>Jirko Eagle 72HM G5 used for Mechanical Loading test.</p> <p>Mounting configuration: Four mountings on each long side of panel with the longest span of 24"</p> <p>Maximum module size: 21.86 ft</p> <p>IEC 61646 Test Loads - 112.78 psf/5400Pa Downward, 75psf/3600Pa Uplift</p> <p>SunPower model SPR-A430-COM-MLSD used for Mechanical Loading</p>
Other Ratings	<p>Fire Class Resistance Rating:</p> <ul style="list-style-type: none"> - 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 <p>See section 7.0 illustrations # 1, 1a and 1b for a complete list of PV modules evaluated with these racking systems</p>