PROJECT DESCRIPTION

SYSTEM CAPACITY: 9.2 KW DC / 6.67 KW AC

PV PANELS: (23) HIDM5 CS1Y-400 BY CANADIAN SOLAR

OPTIMIZERS: (23) IQ COMBINER 4C BY ENPHASE

INVERTER: (1) IQ8+ BY ENPHASE

RACKING SYSTEM: XR100 SYSTEM BY IRON RIDGE SYSTEMS

PROJECT INFORMATION

PROJECT LATITUDE	30.123397	**MIN AMBIENT TEMP**	-5 ° C
PROJECT LONGITUDE	-82.647421	**MAX AMBIENT TEMP**	35 ° C
AHJ	COLUMBIA COUNTY	**WIND EXPOSURE**	C
		DESIGN WIND SPEED	119 MPH

DRAWINGS INDEX

C-1	COVER SHEET
E-1	ONE LINE RISER DIAGRAM
E-2	SAFETY LABELS
S-1	STRUCTURAL PLAN
S-2	RACKING PLAN
S-3	RACKING PLAN
D-1	PV MODULES DATA SHEET
D-2	SMART MONITORING DATA SHEET
D-3	INVERTER DATA SHEET

GENERAL NOTES

PER FL. STATUTE 377.705 (REVISED 7/1/2017), I RAFAEL A. GONZALEZ SOTO, P.E. 83104 AN ENGINEER LICENSED PURSUANT TO CHAPTER 471, CERTIFY THAT THE PV ELECTRICAL SYSTEM AND ELECTRICAL COMPONENTS ARE DESIGNED AND APPROVED USING THE STANDARDS CONTAINED IN THE MOST RECENT VERSION OF THE FLORIDA BUILDING CODE.

APPLICABLE CODES: 2020 FLORIDA BUILDING CODE 7TH EDITION, ASCE 7-16 MINIMUM DESIGN LOADS FOR BUILDING AND OTHER STRUCTURES, FFPC 7TH EDITION, NFPA 2018, NFPA 70 AND NEC 2017.

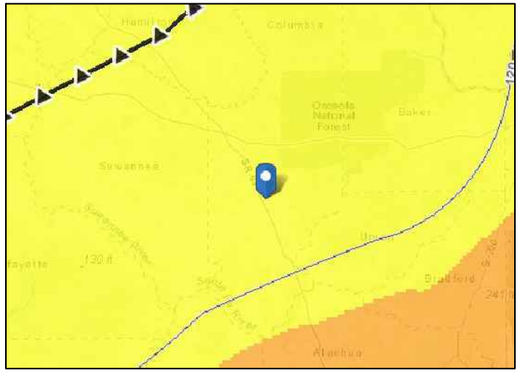
CONTRACTOR SHALL ENSURE ALL ROOF PENETRATIONS TO BE INSTALLED AND SEALED PER 2020 FLORIDA BUILDING CODE 7TH EDITION OR LOCAL GOVERNING CODE.

ALL WIRING METHODS AND INSTALLATION PRACTICES SHALL CONFORM TO THE NATIONAL ELECTRICAL CODE (NEC) 2017, LOCAL STATE CODES, AND OTHER APPLICABLE LOCAL CODES. MEANS SHALL BE PROVIDED TO DISCONNECT ALL CURRENT CARRYING CONDUCTORS OF THE PHOTOVOLTAIC POWER SOURCE FROM ALL OTHER CONDUCTORS IN THE BUILDING. CONNECTORS TO BE TORQUED PER DEVICE LISTING, OR MANUFACTURERS RECOMMENDATIONS. NON-CURRENT CARRYING METAL PARTS SHALL BE CHECKED FOR PROPER GROUNDING.

REQUIRED SAFETY SIGNS AND LABELS SHALL BE PERMANENTLY ATTACHED BY ADHESIVE, OR OTHER MECHANICAL MEANS, LABELS SHALL COMPLY WITH ARTICLE 690 VI OF THE NEC 2017 OR OTHER APPLICABLE STATE AND LOCAL CODES. SEE LABELS AND MARKING PAGE FOR MORE INFORMATION.

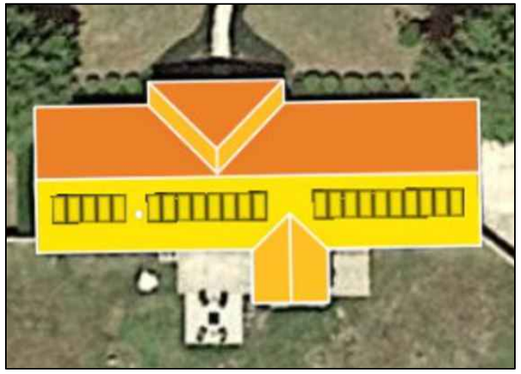
RACKING ROOF MOUNT SYSTEM SHALL BE INSTALLED FOLLOWING MANUFACTURERS INSTRUCTION SPEC'S, INCLUDING ALL GROUNDING WEEB CLIPS, GROUND LUGS, AND RAIL SPLICE KITS FOR ELECTRICAL CONTINUITY.

MECAWIND TOOL IS BASED ON THE C&C WIND LOADS FOR ENCLOSED BUILDINGS. DESIGN WIND PRESSURES ARE CALCULATED USING ASCE 7-16 EQUATION 30.6-1. ALL NOTES IN FIGURES ASCE 7-16 30.4-1 AND 30.4-2(A,B AND /67C) HAVE BEEN INCORPORATED. MEAN ROOF HEIGHT MUST BE LESS THAN 60 FEET.



2 LOCATION MAP / WIND ZONES

N.T.S.



3 IRRADIANCE MAP

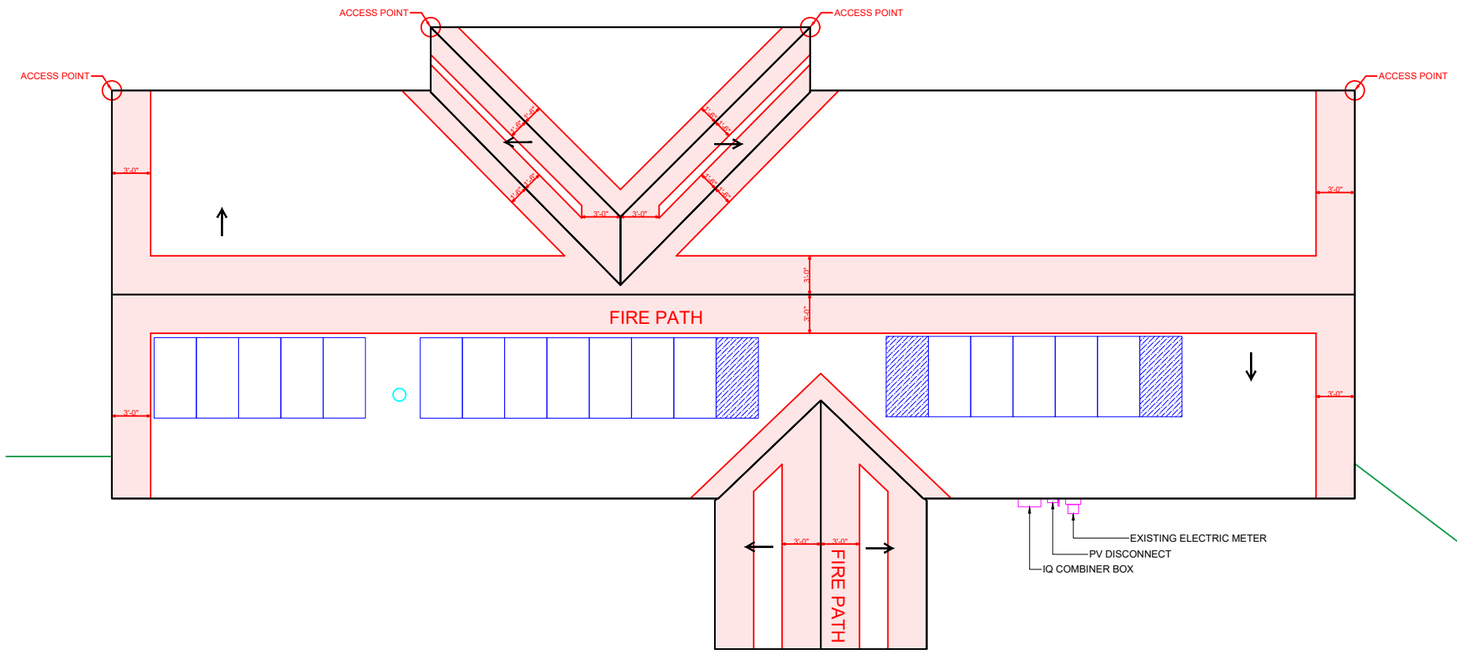
N.T.S.

4 3D RENDERING

N.T.S.

NORTH

"PROPERTY SIDE FACING STREET"



1 ROOF PLAN VIEW / BOS LOCATION

N.T.S.

DOCUMENT CONTROL	DATE	sCAD	eCAD
ISSUED FOR PERMIT	8-2-22	JH	DM

REV	DESCRIPTION	DATE	sCAD	eCAD

ENGINEER CONTACT INFORMATION

ENGIPARTNERS LLC
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ENGINEERING STAMP

Rafael A Gonzalez Soto
2022.08.04 15:38:52 -04'00'

CONTRACTOR CONTACT INFORMATION

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2222 PONCE DE LEON BLVD,
3RD FLOOR, CORAL GABLES, FL
33134

(786) 833 -7864
#CVC57137
#EC13008093

CONTRACTOR LOGO

SUN4

CUSTOMER: ISAAC HARRIS

PROJECT ADDRESS: 465 SW HARMONY LN, LAKE CITY FL, 32025

PARCEL NUMBER: 19-4S-17-08572-001 (31851)

SHEET NAME: COVER SHEET

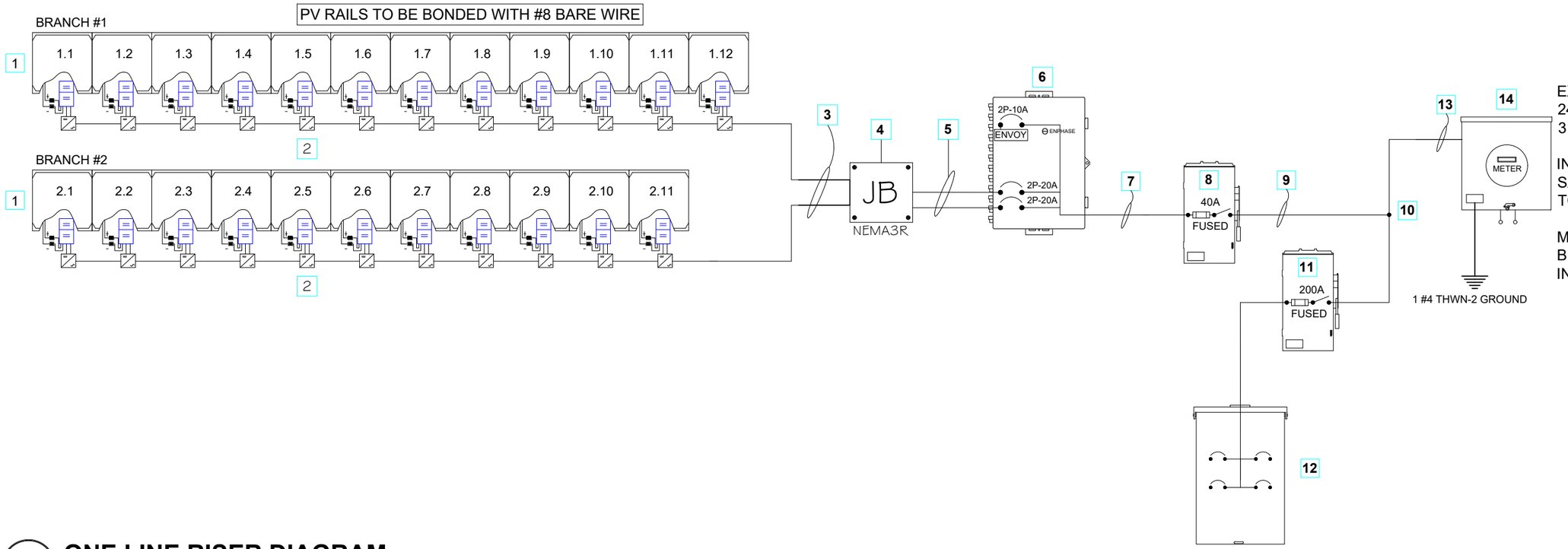
PROJECT ID: EP15365

ENGINEER OF RECORD: ENG. RAFAEL A. GONZALEZ SOTO, PE

DATE: 8-1-22

SHEET TITLE: C-1

	WIRE SIZES, QUANTITY & TYPE			RACEWAY SIZE, TYPE & LOCATION			WIRE AMPACITY CALCULATIONS							ADDITIONAL INFORMATION			
										WIRE DE-RATED CALCULATION							
WIRE TAG	CONDUCTOR QTY. SIZE & TYPE	NEUTRAL QTY. SIZE & TYPE	GROUND QTY. SIZE & TYPE	RACEWAY SIZE & TYPE	RACEWAY LOCATION	RACEWAY HEIGHT ABOVE ROOF	OUTPUT CURRENT (AMP)	125% OF OUTPUT CURRRENT (AMP)	MIN OCPD (AMP)	WIRE RATING	AMBIENT TEMPERATURE COEFFICIENT	# OF CONDUCTORS COEFFICIENT	DE-RATES AMPACITY	DIST.	VOLTAGE	VOLTAGE DROP %	CONDUIT FILL %
AC.1 BRANCH 1 (BEFORE JB)	(1) IQ CABLE BY ENPHASE	N/A	(1) #8 AWG BARE COPPER	NOT APPLICABLE	UNDER ARRAY	1/2" TO 3-1/2"	14.52	18.15	20A	30A	0.76	1	22.8A	10 FT.	240V	0.11%	6.4%
AC.1 BRANCH 2 (BEFORE JB)	(1) IQ CABLE BY ENPHASE	N/A	(1) #8 AWG BARE COPPER	NOT APPLICABLE	UNDER ARRAY	1/2" TO 3-1/2"	13.31	16.64	20A	30A	0.76	1	22.8A	10 FT.	240V	0.11%	6.4%
AC.2 BRANCH 1 (FROM JB TO COMBINER BOX)	(2) #10 AWG THWN-2	N/A	(1) #8 AWG THWN-2	3/4" EMT CONDUIT	ABOVE ROOF	1/2" TO 3-1/2"	14.52	18.15	20A	40A	0.76	0.8	24.3A	20 FT.	240V	0.21%	8.1%
AC.2 BRANCH 2 (FROM JB TO COMBINER BOX)	(2) #10 AWG THWN-2	N/A	(1) #8 AWG THWN-2	3/4" EMT CONDUIT	ABOVE ROOF	1/2" TO 3-1/2"	13.31	16.64	20A	40A	0.76	0.8	24.3A	20 FT.	240V	0.21%	8.1%
AC.3(FROM COMBINER BOX TO SERVICE)	(2) #6 AWG THWN-2	(1) #6 AWG THWN-2	(1) #8 AWG THWN-2	3/4" EMT CONDUIT	EXTERIOR WALL	"N/A"	27.83A	34.79A	40A	75A	1	1	75A	5 FT.	240V	0.1%	7.7%



1 ONE LINE RISER DIAGRAM

N.T.S.

LEGEND:

1	(23) HIDM5 CS1Y-400 BY CANADIAN SOLAR REFER TO D-1 SHEET	2	IQ8+ MICROINVERTER BY ENPHASE REFER TO D-3 SHEET	3	2 IQ CABLE BY ENPHASE 1 #8 BARED WIRE GROUND
4	NEMA 3R JUNCTION BOX	5	4 #10 THWN-2 1 #8 THWN-2 GROUND 3/4" EMT CONDUIT	6	IQ COMBINER BOX BY ENPHASE - REFER TO D-2 SHEET WITH ENVOY BREAKER - OPTIONAL SIZE:10A, 15A OR 20 A
7	2 #6 L1,L2 THWN-2 1 #6 THWN-2 NEUTRAL 1 #8 THWN-2 GROUND 3/4" EMT CONDUIT	8	PV SYSTEM DISCONNECT - 60A RATED W/40A FUSES	9	2 #6 L1, L2 THWN-2 1 #6 THWN-2 NEUTRAL 3/4" EMT CONDUIT
10	PV INTERCONNECTION POINT	11	SERVICE DISCONNECT - 200A RATED FUSES	12	MAIN DISTRIBUTION PANEL
13	2 #3/0 L1, L2 THWN-2 1 #3/0 THWN-2 NEUTRAL 1 1/2" EMT CONDUIT	14	UTILITY ELECTRICAL SERVICE	15	NOT USED

DOCUMENT CONTROL		DATE	sCAD	eCAD
ISSUED FOR PERMIT		8-2-22	JH	DM
REV	DESCRIPTION	DATE	sCAD	eCAD

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CONTRACTOR CONTACT INFORMATION
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#EC13008093

CONTRACTOR LOGO

SUN4

CUSTOMER: ISAAC HARRIS

PROJECT ADDRESS: 465 SW HARMONY LN, LAKE CITY FL, 32025

PARCEL NUMBER: 19-4S-17-08572-001 (31851)

SHEET NAME: ONE LINE RISER DIAGRAM

PROJECT ID: EP15365

ENGINEER OF RECORD: ENG. RAFAEL A. GONZALEZ SOTO, PE

DATE: 8-1-22

SHEET TITLE: E-1

WARNING

ELECTRICAL SHOCK HAZARD

TERMINALS ON BOTH LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

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

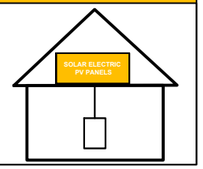
WARNING

TURN OFF PHOTOVOLTAIC AC DISCONNECT PRIOR TO WORKING INSIDE PANEL

LABEL LOCATION:
AC DISCONNECT, MAIN PANEL
PER CODE: NEC 110.27 (C)
OSHA 1910.145(f)(7)

SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN

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



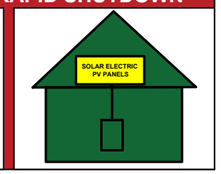
LABEL LOCATION:
AC DISCONNECT, MAIN PANEL
PER CODE: NEC 690.56(C)(1)(a)

PHOTOVOLTAIC SYSTEM EQUIPPED WITH RAPID SYSTEM SHUTDOWN

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

EMERGENCY RESPONDER
THIS SOLAR PV SYSTEM IS EQUIPPED WITH RAPID SHUTDOWN

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



LABEL LOCATION:
AC DISCONNECT, MAIN PANEL
PER CODE: FFPC 7TH EDITION: 11.12.2.1.1.1.1

INVERTER #1

NOMINAL OPERATING AC VOLTAGE	240 V
NOMINAL OPERATING AC FREQUENCY	60 HZ
MAXIMUM AC POWER	6.67 KW
MAXIMUM AC CURRENT	27.83A
MAX OVERCURRENT DEVICE RATING FOR AC MODULE PROTECTION	20A

LABEL LOCATION:
INVERTER
PER CODE: NEC 690.52

MAXIMUM VOLTAGE	60 VDC
MAXIMUM CIRCUIT CURRENT	15.73 A
MAX RATED OUTPUT CURRENT OF THE CHARGE CONTROLLER OR DC-TO-DC CONVERTER (IF INSTALLED)	N/A

LABEL LOCATION:
INVERTER
PER CODE: NEC 690.53

PHOTOVOLTAIC AC DISCONNECT

RATED AC OUTPUT CURRENT:	27.83 A
NOMINAL OPERATING AC VOLTAGE:	240V

LABEL LOCATION:
AC DISCONNECT
PER CODE: NEC 690.54

MAIN PHOTOVOLTAIC SYSTEM DISCONNECT

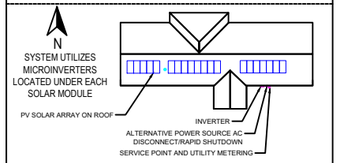
LABEL LOCATION:
AC DISCONNECT
PER CODE: NEC 690.13 (B)

WARNING: PHOTOVOLTAIC POWER SOURCE

LABEL LOCATION:
MAIN SERVICES
DISCONNECT, DC CONDUIT
PER CODE: NEC 690.31 (G) (3)

CAUTION

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



PER CODE: NEC 690.56 (B) , NEC705.10

WARNING DUAL POWER SOURCE
SECOND SOURCE IS PHOTOVOLTAIC SYSTEM

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

WARNING
POWER SOURCE OUTPUT CONNECTION. DO NOT RELOCATE THIS OVERCURRENT DEVICE

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

CAUTION
PHOTOVOLTAIC SYSTEM CIRCUIT IS SUPPLY SIDE

LABEL LOCATION:
MAIN SERVICE PANEL
PER CODE: NEC 690.45(B)(5)

DO NOT DISCONNECT UNDER LOAD

LABEL LOCATION:
POINT OF INTERCONNECTION
PER CODE:
NEC 690.33(E)(2) & NEC 690.15 (C)

CAUTION: SOLAR ELECTRIC SYSTEM CONNECTED

LABEL LOCATION: POINT OF INTERCONNECTION
PER CODE: NEC 690.15, NEC 690.13(B)

LABEL LOCATION: ADJACENT TO MAIN DISCONNECT

SUN4

PHONE: 786-833-7864

ADDRESS: 2222 PONCE DE LEON BLVD
3RD FLOOR CORAL GABLES, FL 33134

GENERAL NOTE:

ADHESIVE FASTENED SIGNS:

· THE LABEL SHALL BE VISIBLE, REFLECTIVE AND SUITABLE FOR THE ENVIRONMENT WHERE IT IS INSTALLED [NFPA 1, 11.12.2.1]
· WHERE REQUIRED ELSEWHERE IN THIS CODE, ALL FIELD APPLIED LABELS, WARNINGS, AND MARKINGS SHOULD COMPLY WITH ANSI Z535.4 [NEC 110.21(B) FIELD MARKING].
· ADHESIVE FASTENED SIGNS MAY BE ACCEPTABLE IF PROPERLY ADHERED. VINYL SIGNS SHALL BE WEATHER RESISTANT [IFC 605.11.1.3]

1 **PV SAFETY LABELS DATA**
N.T.S.

DOCUMENT CONTROL	DATE	sCAD	eCAD
ISSUED FOR PERMIT	8-2-22	JH	DM

REV	DESCRIPTION	DATE	sCAD	eCAD

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CONTRACTOR CONTACT INFORMATION
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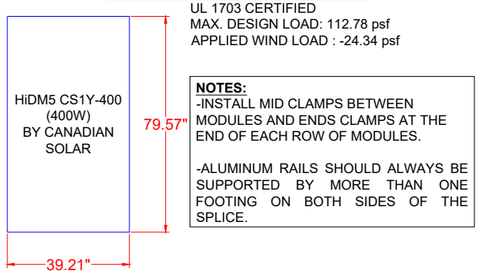
(786) 833 -7864
#CVC57137
#EC13008093

CONTRACTOR LOGO
SUN4

CUSTOMER: ISAAC HARRIS
PROJECT ADDRESS: 465 SW HARMONY LN, LAKE CITY FL, 32025
PARCEL NUMBER: 19-4S-17-08572-001 (31851)

SHEET NAME: SAFETY LABELS
PROJECT ID: EP15365
ENGINEER OF RECORD: ENG. RAFAEL A. GONZALEZ SOTO, PE
DATE: 8-1-22
SHEET TITLE: E-2

SOLAR MODULE



UL 1703 CERTIFIED
MAX. DESIGN LOAD: 112.78 psf
APPLIED WIND LOAD : -24.34 psf

NOTES:
-INSTALL MID CLAMPS BETWEEN MODULES AND ENDS CLAMPS AT THE END OF EACH ROW OF MODULES.

-ALUMINUM RAILS SHOULD ALWAYS BE SUPPORTED BY MORE THAN ONE FOOTING ON BOTH SIDES OF THE SPLICE.

WORST CASE MODULE:

ZONE 1: 99%
ZONE 2r: 1%
24.17(0.99) + 41.19(0.01) = -24.34psf

ULTIMATE WIND SPEED	120	mph
DESIGN WIND SPEED	119	mph
RISK CATEGORY	II	
EXPOSURE CATEGORY	C	
ROOF SLOPE (°)	20	
ROOF TYPE	GABLED	
MATERIAL ROOF TYPE	ASPHALT SHINGLES	
PRESSURE ZONE:	1&2	
MEAN ROOF HEIGHT:	12.58 '	
0.5 MEAN ROOF HEIGHT	6.290000	
$2H_2$	12 "	
PERIMETER WIDTH:	3.36 '	
K_D	0.85	
K_{ZT}	1.0	
K_H	0.849	
VELOCITY PRESSURE (q) = 0.60*0.00256* $K_H K_{ZT} K_D V^2$		
VELOCITY PRESSURE (ASD)	15.69	

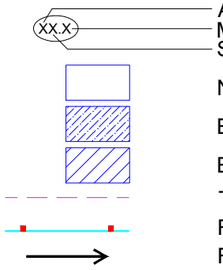
NON EXPOSED	EXPOSED	ARRAY EQUALIZATION FACTOR:
EDGE FACTOR: γ_E = 1.0	EDGE FACTOR: γ_E = 1.5	γ_a = 0.7

EXTERNAL PRESSURE COEFFICIENT Z1	0.7	-1.5
EXTERNAL PRESSURE COEFFICIENT Z2e	0.7	-1.5
EXTERNAL PRESSURE COEFFICIENT Z2n	0.7	-2.5
EXTERNAL PRESSURE COEFFICIENT Z2r	0.7	-2.5
EXTERNAL PRESSURE COEFFICIENT Z3e	0.7	-2.5
EXTERNAL PRESSURE COEFFICIENT Z3r	0.7	-3.6
INTERNAL PRESSURE COEFFICIENT	0.18	

ZONES	PRESSURES (PSF)	NON EXPOSED PRESSURES (PSF)	EXPOSED PRESSURES (PSF)	MAX SPAN (FT)	MAX CANTI-LEVER (IN)
1	-26.37	-16.47	-24.71	4 '	16 "
2e	-26.37	-16.47	-24.71	4 '	16 "
2n	-42.06	-27.46	-41.19	4 '	16 "
2r	-42.06	-27.46	-41.19	4 '	16 "
3e	-42.06	-27.46	-41.19	4 '	16 "
3r	-59.33	-39.54	-59.31	4 '	16 "

TOTAL ROOF AREA	3596.07	sq.-ft
TOTAL MODULES:	23	
TOTAL PHOTOVOLTAIC AREA:	498.34	sq.-ft
TOTAL PERCENTAGE AREA OF PV SYSTEM:	13.86	%
WIND LOAD (PSF):	-24.34	
TOTAL WIND LOAD (LBS):	-12,129.60	
TOTAL ROOF MOUNTS:	40	
TENSION FORCE PER MOUNT (LBS):	-303.24	

LEGEND & SYMBOLS



ROOF OBSTRUCTIONS
ARRAY #
MODULE #
STRING #

NON-EXPOSED MODULES

EXPOSED MODULES

EDGE MODULES

TRUSSES OR RAFTERS

ROOF MOUNTS & RAIL

ROOF SLOPE

ROOF'S GENERAL NOTES:

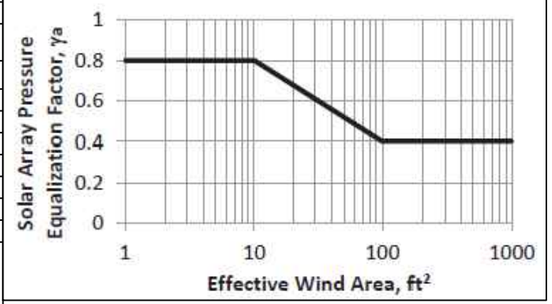
1- CONTRACTOR/INSTALLER TO VERIFY ROOF CONDITIONS FOR PROPER INSTALLATION OF THE PV SYSTEM.
2- CONTRACTOR/INSTALLER TO NOTIFY THE OWNER IMMEDIATELY OF ANY ROOF DEFICIENCIES AND/OR REPAIR REQUIRED TO INSTALL THE PV SYSTEM.
3- EOR DOES NOT ASSUME ANY RESPONSIBILITY FOR THE INSTALLATION OF ANY PV SYSTEM ON DEFICIENT ROOFS.
4-CONTRACTOR/INSTALLER ASSUMES ALL RESPONSIBILITY TO INSTALL AS PER MANUFACTURER STANDARDS.

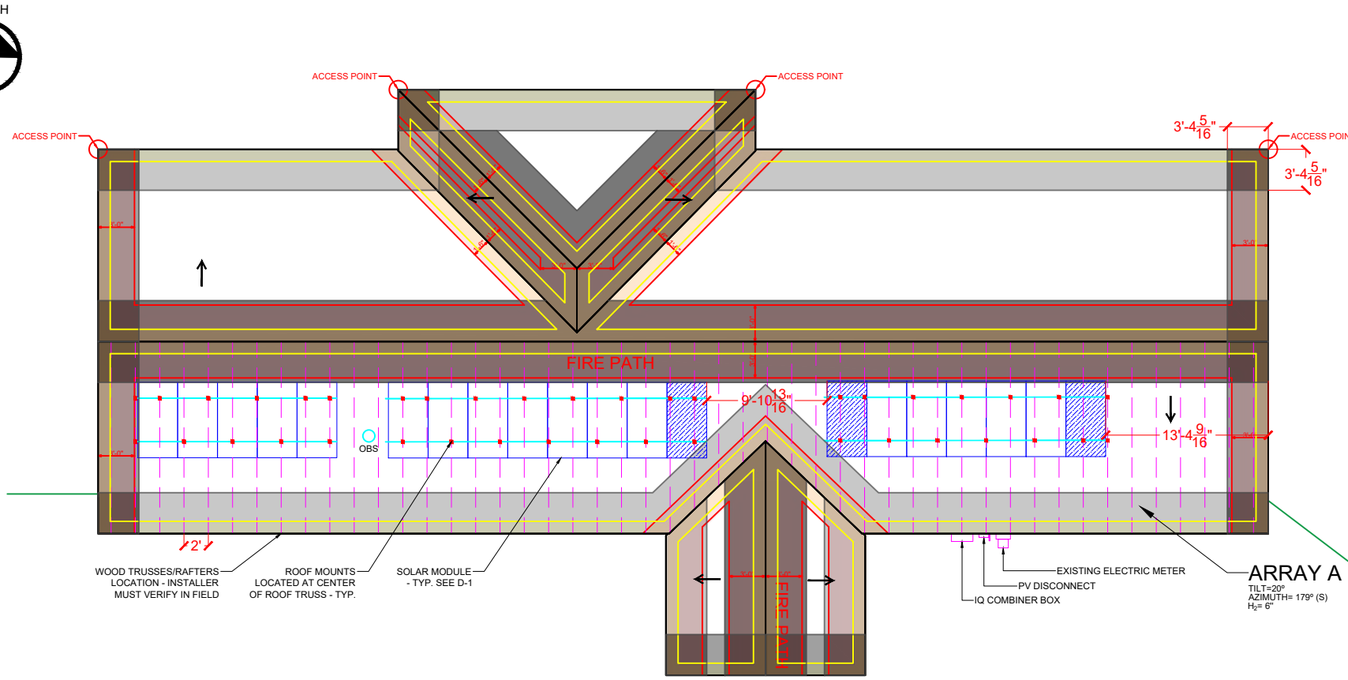
ROOF INSPECTION NOTE:

A PANEL IS DEFINED AS
EXPOSED IF D1 TO THE ROOF EDGE >0.5H AND ONE OF THE FOLLOWING APPLIES:
1. D1 TO THE ADJACENT ARRAY > 4 FT (1.2 M) OR
2. D2 TO THE NEXT ADJACENT PANEL> 4 FT. (1.2 M)

ASCE 7.16 - 29.4-7
DESIGNED WIND PRESSURES:

$$p = q_h (GC_p)(\gamma_E)(\gamma_a)$$





1 STRUCTURAL ROOF PLAN & PV MODULES LAYOUT

N.T.S.

DOCUMENT CONTROL	DATE	sCAD	eCAD
ISSUED FOR PERMIT	8-2-22	JH	DM

REV	DESCRIPTION	DATE	sCAD	eCAD

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CONTRACTOR LOGO
SUN4

CUSTOMER: ISAAC HARRIS

PROJECT ADDRESS: 465 SW HARMONY LN, LAKE CITY FL, 32025

PARCEL NUMBER: 19-4S-17-08572-001 (31851)

SHEET NAME: STRUCTURAL PLAN

PROJECT ID: EP15365

ENGINEER OF RECORD: ENG. RAFAEL A. GONZALEZ SOTO, PE

DATE: 8-1-22

SHEET TITLE: S-1

Grouping of ASCE 7-16 Roof Zones (Gable)

Roof Slope	8° - 27°			28° - 45°		
Group	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
ASCE 7-16 Roof Zones	1 2e	2n 2r 3e	3r	1 2e 2r	2n 3r	3e

= min 72" span = min 64" span = min 48" span
= Shaded cells indicate conditions in which UFO Mid Clamp connection capacity is exceeded.

RAIL: XR100		GABLE ROOF FLUSH MOUNT SYSTEM SPAN TABLE (INCHES) - PORTRAIT OR LANDSCAPE INSTALLATION MAX MODULE LENGTH: 80.0" EXPOSURE C								
WIND SPEED (MPH)	ROOF SLOPE (DEG.)	GROUND SNOW: 0 PSF			EXPOSED MOD.			EDGE MOD.		
		GROUP 1	GROUP 2	GROUP 3	GROUP 1	GROUP 2	GROUP 3	GROUP 1	GROUP 2	GROUP 3
120 MPH	20 TO 27	107	92	88	83	73	69	64	57	52

S-5 BRACKET PULL OUT CALCULATIONS

Ultimate Pull Out Strength per Clamp	798 lbs.
Max. Pull Out Strength Required per Clamp	303.239890
Allowable Clamp Pull Out Strength Safety Factor	2.63

DISTRIBUTED LOAD CALCULATIONS

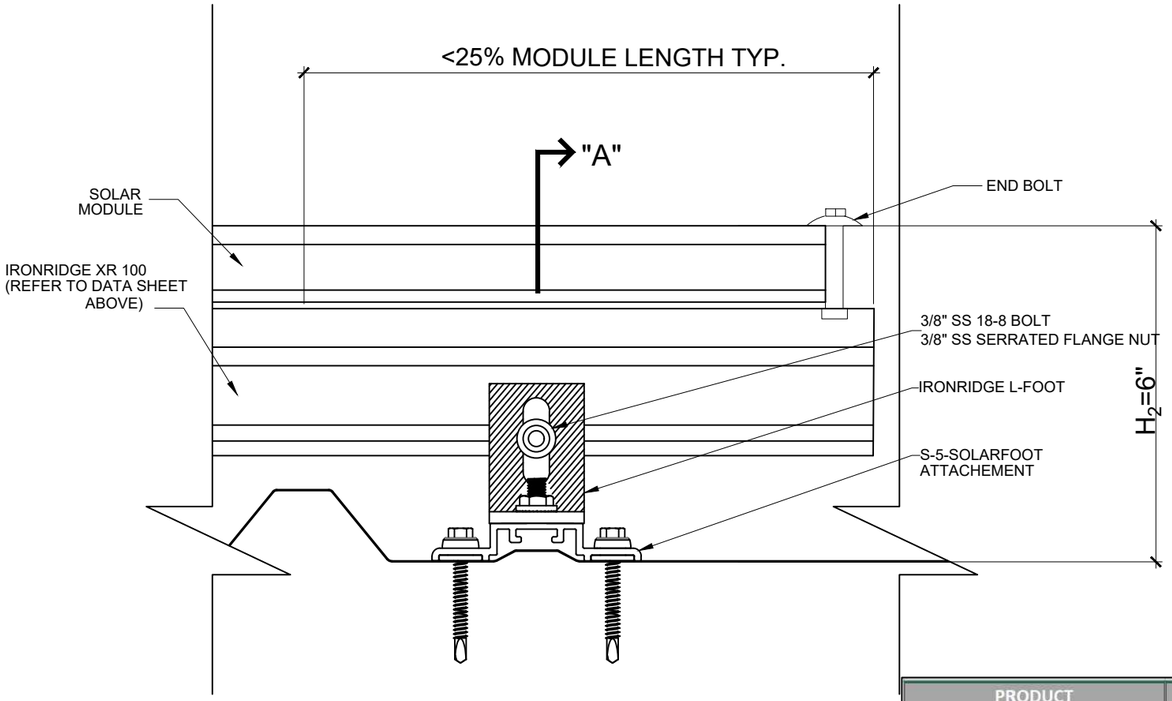
PV MODULES & RACKING WEIGHT = (INDIVIDUAL MODULE WEIGHT + 3.5 LBS) * (MODULE QTY) = (56.40 LBS) * (23) = 1,297.20 LBS

PER SQUARE FEET (PSF) ARRAY LOAD = PV MODULES & RACKING WEIGHT / TOTAL ARRAY AREA = 1,297.20 LBS / 498.34 SQFT = 2.60 PSF

HENCE, ROOF WILL CARRY THE ADDITIONAL SOLAR SYSTEM LOAD

Lag Screw Installation Guidelines

1. Determine location for the Mount on roof by drilling through the center of truss from bottom with 5/32" drill bit.
2. Mark mounting holes for Mount on underlayment. Mounting holes should be centered on the trusses.
3. Drill 15/64" pilot hole.
4. Apply sealant to bottom of Mount.
5. Place Mount over roof underlayment with holes in roof.
6. Apply sealant to bottom of Mount, apply sealant to lag screws and fasten Mount securely to trusses.
7. Apply additional sealant to top assembly to be sure all penetrations are sealed.



1 METAL ROOF MOUNT DETAIL & DATA

N.T.S.

ASCE 7-16 Velocity Pressure
qz10 = 0.00256Kz Kzt Kd V2
Where:
qz10 = ASCE 7-16 velocity pressure evaluated at mean roof height (psf)
Kz = velocity pressure exposure coefficient
Kzt = topographic factor
Kd = wind directionality factor
V = basic wind speed (mph) from ASCE 7-16 maps referred to as ultimate wind speed maps in 2020 FBC.

As an example, for an array having an area of 158.04 sq.-ft., the total uplifting (resultant) force acting on the array would be -39.1 psf x 158.04 sq. ft. = -6,179.364 lb. Knowing this resultant force, the design engineer can now determine the number of attachment points and the size of the mounting hardware necessary to safely carry this load.

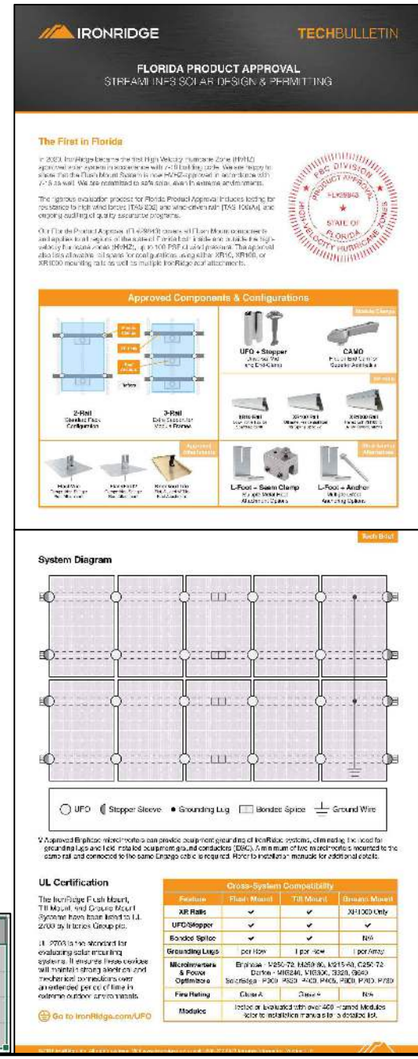
Live Loads:

Live loads associated with photovoltaic systems are usually assumed to be distributed uniformly and are small, on the order of 4 psf or less.

Notes: (1) Thread must be embedded in the side grain of a Trusses or other structural member integral with the building structure.

(2) Lag Bolts must be located in the middle third of the structural member.
(3) These values are not valid for wet services.
(4) This table does not include shear capacities. If necessary, contact a local engineer to specify lag bolt size with regard to shear forces.
(5) Install lag bolts with head ad washer flush to surface (no gap). Do nor over-torque.
(6) Withdrawal design values for lag screw connections shall be multiplied by applicable adjustment factors if necessary. See table 10.3.1 in the American Wood Council NDS for Wood Construction.

PRODUCT	THICKNESS MATERIAL	SCREW TENSION (inch-lbs)	ULTIMATE LOAD (lbs)	FAILURE MODE	ALLOWABLE LOAD (lbs)
Standing Seam 360	24 ga steel	115	1778	B	889
Standing Seam II Panel	24 ga steel	115	1583	B	792
Series 1000 Standing Seam	24 ga steel	115	1032	F	516
Snap-On Standing Seam	24 ga steel	115	748	A/B	374


IRONRIDGE TECHBULLETIN
FLORIDA PRODUCT APPROVAL
STRUCTURAL SOLAR DESIGN & PERMITTING
The First in Florida
Approved Components & Configurations
System Diagram
UL Certification
Cross-System Compatibility
Go to ironRidge.com/UFO

DOCUMENT CONTROL	DATE	sCAD	eCAD
ISSUED FOR PERMIT	8-2-22	JH	DM

REV	DESCRIPTION	DATE	sCAD	eCAD

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CONTRACTOR LOGO
SUN4

CUSTOMER:
ISAAC HARRIS

PROJECT ADDRESS:
465 SW HARMONY LN,
LAKE CITY FL, 32025

PARCEL NUMBER:
19-4S-17-08572-001 (31851)

SHEET NAME:
RACKING PLAN

PROJECT ID:
EP15365

ENGINEER OF RECORD:
ENG. RAFAEL A. GONZALEZ SOTO, PE

DATE:
8-1-22

SHEET TITLE:
S-2

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SFS GROUP USA, INC.
TEST REPORT

SCOPE OF WORK
ASTM E2140 TESTING ON SYSTEM 1 AND SYSTEM 2, ROOF ATTACHMENTS

REPORT NUMBER
MS502.01-309-44

TEST DATE
07/02/21

ISSUE DATE
07/26/21

RECORD RETENTION END DATE
07/02/25

PAGES
17

DOCUMENT CONTROL NUMBER
ATI 00078 (07/24/17)
RT-R-AMER-Test-2805
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TEST REPORT FOR SFS GROUP USA, INC.
Report No.: MS502.01-309-44
Date: 07/26/21

SECTION 1
TEST METHOD(S)

The specimens were evaluated in accordance with the following:

ASTM E2140-01(2017), *Standard Test Method for Water Penetration of Metal Roof Panel Systems by Static Water Pressure Head*

SECTION 3
MATERIAL SOURCE/INSTALLATION

Test specimen(s) were provided by the client. Representative samples of the test specimen(s) will be retained by Intertek B&C for a minimum of four years from the test completion date.

The specimens were installed into a Spruce-Pine-Fir wood test deck. The test deck for System #1 had an interior dimension of 88 3/4" x 72 1/4" with joists spaced 24" on center with 1/2" plywood sheathed into place for the valley mount attachments. A sheet of Kynar® metal roofing was secured to the test deck for mounting the attachments. The test deck for System #2 had an interior dimension of 75-1/4" x 65-1/4" with 1/2" plywood sheathed into place for the valley mount attachments. A sheet of corrugated metal roofing was secured to the test deck for mounting the attachments. The interior perimeters of the test decks were sealed with silicone.

SECTION 4
EQUIPMENT

Pressure Loop Calibrator – 63495
Stopwatch – 047E0074
Weather Station – 63316
Tape Measure Verification – 03788

SECTION 5
LIST OF OFFICIAL OBSERVERS

NAME	COMPANY
James Cole	SFS Group USA, Inc.
Ian Moss	SFS Group USA, Inc.
Vicki L. McElwain	Intertek B&C
Kyle W. Rush	Intertek B&C

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TEST REPORT FOR SFS GROUP USA, INC.
Report No.: MS502.01-309-44
Date: 07/26/21

SECTION 6
TEST SPECIMEN DESCRIPTION

System #1:

ATTACHMENT #	PRODUCT NAME	DESCRIPTION	ATTACHMENT
1	Protech B.25 Hole TPE	3" wide by 4" long by 2-3/4" high extruded aluminum with TPE sealing pads 3" wide by 4" long by 2-3/4" high extruded aluminum with EPDM sealing pads	Four 1/4" x 1" hex washer head screws with STEAM watchers
2	Protech B.25 Hole EPDM		
3	Rib Bracket III 0.25 Hole TPE	2-1/2" wide by 5-3/4" long by 2-3/4" high extruded aluminum with TPE sealing pads	Four 1/4" x 1-1/2" hex washer head screws with STEAM watchers Three 1/4" x 1-1/2" hex washer head screws with STEAM watchers Two 1/4" x 1" hex washer head screws with STEAM watchers
4	Rib Bracket III 0.25 Hole EPDM	2-1/2" wide by 5-3/4" long by 2-3/4" high extruded aluminum with EPDM sealing pads	
5	Solar Foot Butyl	3-5/8" wide by 2" long by 1-2/8" high extruded aluminum with butyl sealing pads	
6			
7	VersaFlashlock™ 47 Butyl	3-1/2" wide by 2-7/8" long by 2-3/4" high extruded aluminum with butyl sealing pad	
8			
15	EF Tap 0.25 Hole TPE	3-3/16" wide by 7" long by 3/4" high extruded aluminum with TPE sealing pad	

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TEST REPORT FOR SFS GROUP USA, INC.
Report No.: MS502.01-309-44
Date: 07/26/21

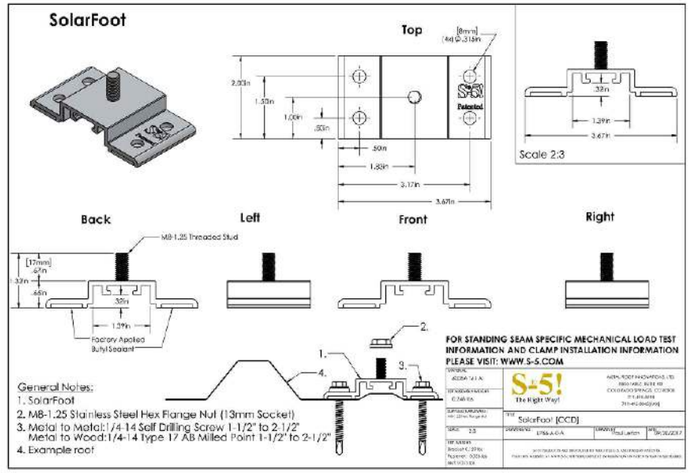
SECTION 8
CONCLUSION

This report does not constitute certification of this product nor an opinion or endorsement by this laboratory. Intertek B&C will service this report for the entire test record retention period. The test record retention period ends four years after the test date. Test records, such as detailed drawings, datasheets, representative samples of test specimens, or other pertinent project documentation, will be retained for the entire test record retention period.

Unless differently required, Intertek reports apply the "Simple Acceptance" rule, also called "Shared Risk approach," of ILAC-G8:09/2019, Guidelines on Decision Rules and Statements of Conformity.

SECTION 9
PHOTOGRAPHS

Photo No. 1
System #1



Tech Brief

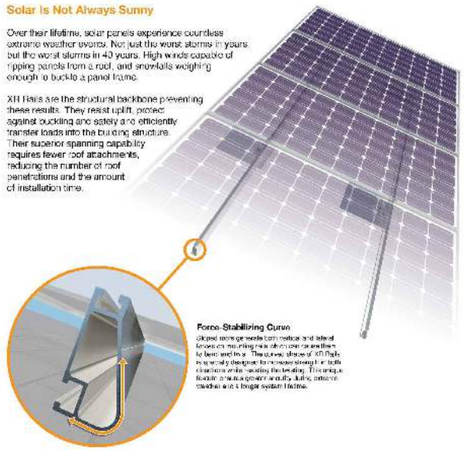
IRONRIDGE

XR Rail Family

Solar Is Not Always Sunny

Over their lifetime, solar panels experience countless extreme weather events. Not just the worst storms in years, but the worst storms in 40 years. High winds capable of ripping panels from a roof, and snowfalls weighing enough to buckle a panel frame.

XR Rails are the structural backbone preventing these results. They resist uplift, protect against buckling and safely and efficiently transfer loads into the building structure. Their superior spanning capability requires fewer roof attachments, reducing the number of roof penetrations and the amount of installation time.



Compatible with Flat & Pitched Roofs

XR Rails are compatible with flush-mount and other pitched roof attachments.

Their 6" profile offers a range of tilt leg options for flat roof mounting applications.

Corrosion-Resistant Materials

All XR Rails are made of 6000-series aluminum alloy, then reinforced with an anodized finish. Assuring a durable, seaworthy surface that provides a more attractive appearance.

Tech Brief

XR Rail Family

The XR Rail Family offers the strength of a curved rail in three targeted sizes. Each size supports specific design loads, while minimizing material costs. Depending on your location, there is an XR Rail to match.

XR10

XR10 is a sleek, low-profile mounting rail, designed for regions with light or no snow. It achieves spans up to 6 feet, while remaining light and economical.

- 6' spanning capability
- Moderate load capability
- Class A fire classification
- Internal splices available

XR100

XR100 is the ultimate residential mounting rail. It supports a range of wind and snow conditions, while also supporting spans up to 10 feet.

- 10' spanning capability
- Heavy load capability
- Class A fire classification
- Internal splices available

XR1000

XR1000 is a heavy-weight racking solar mounting rail. Built to handle extreme conditions and spanning up to 12 feet for commercial applications.

- 12' spanning capability
- Extreme load capability
- Class A fire classification
- Internal splices available

Rail Selection

The table below was prepared in compliance with applicable engineering codes and standards.* Values are based on the following criteria: ASCE 7-16, Gable Roof Flush Mount, Roof Zones 1 & 2e, Exposure B, Roof Slope of 8 to 20 degrees and Mean Building Height of 30 ft. Visit IronRidge.com for detailed certification letters.

Load		Rail Span					
Snow (PSF)	Wind (MPH)	4'	5' 4"	6'	8'	10'	12'
None	90	XR10		XR100		XR1000	
	120						
	140						
	160						
20	90						
	120						
	140						
	160						
30	90						
	160						
40	90						
	160						
80	160						
120	160						

*Table is meant to be a rough look about the coverage given all conditions. Use approved certification and not for actual design purposes.

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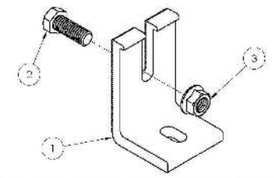
Cut Sheet

IRONRIDGE

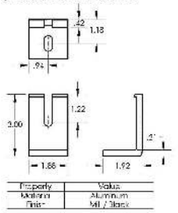
Slotted L-Foot



Item Number	Component	Qty in Kit
1	FOOT, EXTRUDED L - SLOTTED	4
2	BOLT, 3/8-16 X 1" HEX GR 5 SS	4
3	NUT, FLANGE HEX 3/8-16 SS	4

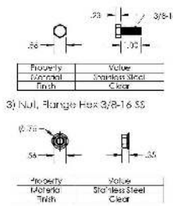
Part Number	Description
RS-LFT-001	Kit of 4, Slotted L-Foot (Mill Finish)
RS-LFT-001B	Kit of 4, Slotted L-Foot (Black Finish)

1) Foot, Extruded L - Slotted



Property	Value
Material	Aluminum
Finish	Mill / Black

2) Bolt, 3/8-16 x 1" Hex GR 5 SS

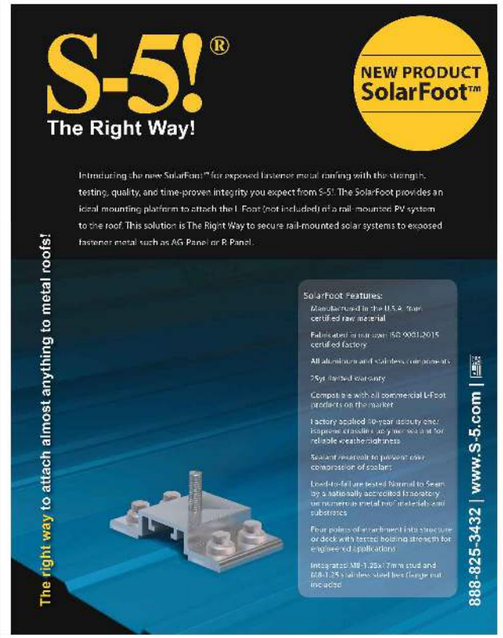


Property	Value
Material	Stainless Steel
Finish	Clear

3) Nut, Flange Hex 3/8-16 SS

Property	Value
Material	Stainless Steel
Finish	Clear

v1.0



1 METAL ROOF MOUNT DETAIL & DATA
N.T.S.

DOCUMENT CONTROL	DATE	sCAD	eCAD
ISSUED FOR PERMIT	8-2-22	JH	DM

REV	DESCRIPTION	DATE	sCAD	eCAD

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SUN4

CUSTOMER:
ISAAC HARRIS

PROJECT ADDRESS:
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PARCEL NUMBER:
19-4S-17-08572-001 (31851)

SHEET NAME:
RACKING PLAN

PROJECT ID:
EP15365

ENGINEER OF RECORD:
ENG. RAFAEL A. GONZALEZ SOTO, PE

DATE:
8-1-22

SHEET TITLE:
S-3

CanadianSolar

HiDM5 (All-Black)

ALL-BLACK HIGH DENSITY MONO PERC MODULE

380 W ~ 410 W

CS1Y- 380|385|390|395|400|405|410MS

MORE POWER

- Aesthetically pleasing design blends into your roof
- UP TO 20.4% — Maximize the light absorption area, module efficiency up to 20.4 %
- Low temperature coefficient (Pmax): -0.36 % / °C
- Better shading tolerance

MORE RELIABLE

- Lower internal current, lower hot spot temperature
- Minimizes micro-crack impacts
- Heavy snow load up to 7000 Pa, wind load up to 5400 Pa*

15 years enhanced product warranty on materials and workmanship*

25 years linear power output warranty*

*According to the applicable Canadian Solar Limited Warranty Statement.

MANAGEMENT SYSTEM CERTIFICATES*

ISO 9001: 2015 / Quality management system
ISO 14001: 2015 / Standards for environmental management system
ISO 45001: 2018 / International standards for occupational health & safety

PRODUCT CERTIFICATES*

IEC 61215 / IEC 61730
UL 61730 / IEC 61701 / IEC 62716
Take-e-way

* The specific certificates applicable to different module types and markets will vary, and therefore not all of the certifications listed herein will simultaneously apply to the products you order or use. Please contact your local Canadian Solar sales representative to confirm the specific certificates available for your Product and applicable in the regions in which the products will be used.

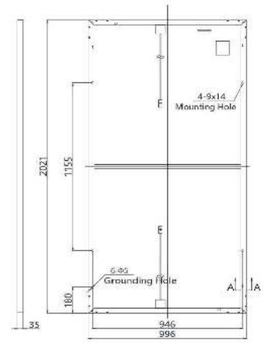
Canadian Solar (USA) Inc. is committed to providing high quality solar products, solar system solutions and services to customers around the world. Canadian Solar was recognized as the No. 1 module supplier for quality and performance/price ratio in the IHS Module Customer Insight Survey, and is a leading PV project developer and manufacturer of solar modules, with over 55 GW deployed around the world since 2001.

* For detailed information, please refer to Installation Manual.

Canadian Solar (USA) Inc.
1350 Treat Blvd. Suite 500, Walnut Creek, CA 94598, USA | www.csisolar.com/na | service.ca@csisolar.com

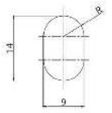
ENGINEERING DRAWING (mm)

Rear View

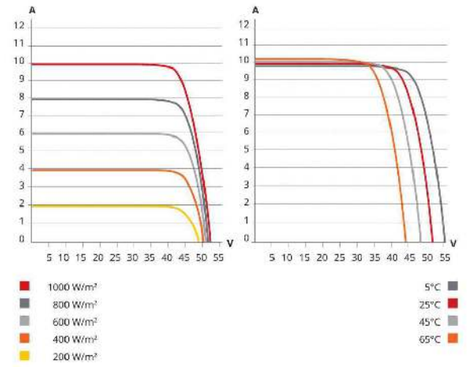


Frame Cross Section A-A

Mounting Hole



CS1Y-400MS / I-V CURVES



ELECTRICAL DATA | STC*

CS1Y	380MS	385MS	390MS	395MS	400MS	405MS	410MS
Nominal Max. Power (Pmax)	380 W	385 W	390 W	395 W	400 W	405 W	410 W
Opt. Operating Voltage (Vmp)	42.7 V	42.9 V	43.1 V	43.3 V	43.5 V	43.7 V	43.8 V
Opt. Operating Current (Imp)	8.89 A	8.97 A	9.05 A	9.13 A	9.20 A	9.27 A	9.37 A
Open Circuit Voltage (Voc)	51.5 V	51.7 V	51.9 V	52.1 V	52.3 V	52.5 V	52.7 V
Short Circuit Current (Isc)	9.74 A	9.78 A	9.82 A	9.86 A	9.90 A	9.94 A	9.98 A
Module Efficiency	18.9 %	19.1%	19.4%	19.6%	19.9%	20.1%	20.4%
Operating Temperature	-40°C ~ +85°C						
Max. System Voltage	1000V (IEC/UL)						
Module Fire Performance	TYPE 1 (UL 61730 1500V) or TYPE 2 (UL 61730 1000V) or CLASS C (IEC 61730)						
Max. Series Fuse Rating	16 A						
Application Classification	Class A						
Power Tolerance	0 ~ + 10 W						

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m2, spectrum AM 1.5 and cell temperature of 25°C.

ELECTRICAL DATA | NMOT*

CS1Y	380MS	385MS	390MS	395MS	400MS	405MS	410MS
Nominal Max. Power (Pmax)	281 W	285 W	288 W	292 W	296 W	299 W	303 W
Opt. Operating Voltage (Vmp)	39.4 V	39.5 V	39.7 V	39.9 V	40.1 V	40.3 V	40.4 V
Opt. Operating Current (Imp)	7.14 A	7.20 A	7.26 A	7.31 A	7.37 A	7.43 A	7.51 A
Open Circuit Voltage (Voc)	48.1 V	48.3 V	48.5 V	48.6 V	48.8 V	49.0 V	49.2 V
Short Circuit Current (Isc)	7.87 A	7.90 A	7.93 A	7.96 A	7.99 A	8.02 A	8.06 A

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m2, spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

MECHANICAL DATA

Specification	Data
Cell Type	Mono-crystalline
Dimensions	2021 x 996 x 35 mm (79.6 x 39.2 x 1.38 in)
Weight	24.0 kg (52.9 lbs)
Front Cover	3.2 mm tempered glass
Frame	Anodized aluminium alloy, crossbar enhanced
J-Box	IP68, 3 bypass diodes
Cable	4.0 mm² (IEC), 12 AWG (UL)
Cable Length (Including Connector)	740 mm (29.1 in) (without optimizer or micro-inverter) *, or 2000 mm (78.7 in) (+) / 1200 mm (47.2 in) (-) (with optimizer or micro-inverter) **
Connector	T4 series or MC4
Per Pallet	30 pieces
Per Container (40' HQ)	660 pieces

* Adjacent two modules (portrait: left and right modules, landscape: up and down modules) need to be rotated 180 degrees.
** For detailed information, please contact your local Canadian Solar sales and technical representatives.

TEMPERATURE CHARACTERISTICS

Specification	Data
Temperature Coefficient (Pmax)	-0.36 % / °C
Temperature Coefficient (Voc)	-0.28 % / °C
Temperature Coefficient (Isc)	0.05 % / °C
Nominal Module Operating Temperature	44 ± 3°C

PARTNER SECTION

* The specifications and key features contained in this datasheet may deviate slightly from our actual products due to the on-going innovation and product enhancement. CSI Solar Co., Ltd. reserves the right to make necessary adjustment to the information described herein at any time without further notice.
Please be kindly advised that PV modules should be handled and installed by qualified people who have professional skills and please carefully read the safety and installation instructions before using our PV modules.

Canadian Solar (USA) Inc. August 2021 | All rights reserved | Module Product Datasheet v1.4_F23_J3_NA

DOCUMENT CONTROL		DATE	sCAD	eCAD
ISSUED FOR PERMIT		8-2-22	JH	DM
REV	DESCRIPTION	DATE	sCAD	eCAD

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#EC13008093

CONTRACTOR LOGO
SUN4

CUSTOMER: ISAAC HARRIS
PROJECT ADDRESS: 465 SW HARMONY LN, LAKE CITY FL, 32025
PARCEL NUMBER: 19-4S-17-08572-001 (31851)

SHEET NAME: PV MODULES DATA SHEET
PROJECT ID: EP15365
ENGINEER OF RECORD: ENG. RAFAEL A. GONZALEZ SOTO, PE
DATE: 8-1-22
SHEET TITLE: D-1

Data Sheet
Enphase Networking

Enphase IQ Combiner 4/4C

X-IQ-AM1-240-4
X-IQ-AM1-240-4C

X-IQ-AM1-240-4C

X-IQ-AM1-240-4

The **Enphase IQ Combiner 4/4C** with Enphase IQ Gateway and integrated LTE-M1 cell modem (included only with IQ Combiner 4C) consolidates interconnection equipment into a single enclosure and streamlines IQ microinverters and storage installations by providing a consistent, pre-wired solution for residential applications. It offers up to four 2-pole input circuits and Eaton BR series busbar assembly.

Smart

- Includes IQ Gateway for communication and control
- Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), included only with IQ Combiner 4C
- Includes solar shield to match Enphase IQ Battery aesthetics and deflect heat
- Flexible networking supports Wi-Fi, Ethernet, or cellular
- Optional AC receptacle available for PLC bridge
- Provides production metering and consumption monitoring

Simple

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

Reliable

- Durable NRTL-certified NEMA type 3R enclosure
- Five-year limited warranty
- Two years labor reimbursement program coverage included for both the IQ Combiner SKU's
- UL listed

UL LISTED

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ENPHASE

Enphase IQ Combiner 4/4C

MODEL NUMBER	
IQ Combiner 4 (X-IQ-AM1-240-4)	IQ Combiner 4 with Enphase IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes a silver solar shield to match the IQ Battery system and IQ System Controller 2 and to deflect heat.
IQ Combiner 4C (X-IQ-AM1-240-4C)	IQ Combiner 4C with Enphase IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), a plug-and-play industrial-grade cell modem for systems up to 60 microinverters. (Available in the US, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.) Includes a silver solar shield to match the IQ Battery and IQ System Controller and to deflect heat.
ACCESSORIES AND REPLACEMENT PARTS	(not included, order separately)
Ensemble Communications Kit COMMS-CELLMODEM-M1-06 CELLMODEM-M1-06-SP-05 CELLMODEM-M1-06-AT-05	- Includes COMMS-KIT-01 and CELLMODEM-M1-06-SP-05 with 5-year Sprint data plan for Ensemble sites - 4G based LTE-M1 cellular modem with 5-year Sprint data plan - 4G based LTE-M1 cellular modem with 5-year AT&T data plan
Circuit Breakers BRK-10A-2-240V BRK-15A-2-240V BRK-20A-2P-240V BRK-15A-2P-240V-B BRK-20A-2P-240V-B	Supports Eaton BR210, BR215, BR220, BR230, BR240, BR250, and BR260 circuit breakers. Circuit breaker, 2 pole, 10A, Eaton BR210 Circuit breaker, 2 pole, 15A, Eaton BR215 Circuit breaker, 2 pole, 20A, Eaton BR220 Circuit breaker, 2 pole, 15A, Eaton BR215B with hold down kit support Circuit breaker, 2 pole, 20A, Eaton BR220B with hold down kit support
EPLC-01	Power line carrier (communication bridge pair), quantity - one pair
XA-SOLARSHIELD-ES	Replacement solar shield for IQ Combiner 4/4C
XA-PLUG-120-3	Accessory receptacle for Power Line Carrier in IQ Combiner 4/4C (required for EPLC-01)
XA-ENV-PCBA-3	Replacement IQ Gateway printed circuit board (PCB) for Combiner 4/4C
X-IQ-NA-HD-125A	Hold down kit for Eaton circuit breaker with screws.
ELECTRICAL SPECIFICATIONS	
Rating	Continuous duty
System voltage	120/240 VAC, 60 Hz
Eaton BR series busbar rating	125 A
Max. continuous current rating	65 A
Max. continuous current rating (input from PV/storage)	64 A
Max. fuse/circuit rating (output)	90 A
Branch circuits (solar and/or storage)	Up to four 2-pole Eaton BR series Distributed Generation (DG) breakers only (not included)
Max. total branch circuit breaker rating (input)	80A of distributed generation / 95A with IQ Gateway breaker included
Production metering CT	200 A solid core pre-installed and wired to IQ Gateway
Consumption monitoring CT (CT-200-SPLIT)	A pair of 200 A split core current transformers
MECHANICAL DATA	
Dimensions (WxHxD)	37.5 x 49.5 x 16.8 cm (14.75" x 19.5" x 6.63"). Height is 21.06" (53.5 cm) with mounting brackets.
Weight	7.5 kg (16.5 lbs)
Ambient temperature range	-40° C to +46° C (-40° to 115° F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction
Wire sizes	• 20 A to 50 A breaker inputs: 14 to 4 AWG copper conductors • 60 A breaker branch input: 4 to 1/0 AWG copper conductors • Main lug combined output: 10 to 2/0 AWG copper conductors • Neutral and ground: 14 to 1/0 copper conductors Always follow local code requirements for conductor sizing.
Altitude	To 2000 meters (6,560 feet)
INTERNET CONNECTION OPTIONS	
Integrated Wi-Fi	802.11b/g/n
Cellular	CELLMODEM-M1-06-SP-05, CELLMODEM-M1-06-AT-05 (4G based LTE-M1 cellular modem). Note that an Enphase Mobile Connect cellular modem is required for all Ensemble installations.
Ethernet	Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included)
COMPLIANCE	
Compliance, IQ Combiner	UL 1741, CAN/CSA C22.2 No. 107.1, 47 CFR, Part 15, Class B, ICES 003 Production metering: ANSI C12.20 accuracy class 0.5 (PV production) Consumption metering: accuracy class 2.5
Compliance, IQ Gateway	UL 60601-1/CANCSA 22.2 No. 61010-1

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

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DOCUMENT CONTROL		DATE	sCAD	eCAD
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REV	DESCRIPTION	DATE	sCAD	eCAD

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PARCEL NUMBER:
19-4S-17-08572-001 (31851)

SHEET NAME:
SMART MONITORING DATA SHEET

PROJECT ID:
EP15365

ENGINEER OF RECORD:
ENG. RAFAEL A. GONZALEZ SOTO, PE

DATE:
8-1-22

SHEET TITLE:
D-2

ENPHASE

DATA SHEET

IQ8 and IQ8+ Microinverters

Our newest IQ8 Microinverters are the industry's first microgrid-forming, software-defined microinverters with split-phase power conversion capability to convert DC power to AC power efficiently. The brain of the semiconductor-based microinverter is our proprietary application-specific integrated circuit (ASIC) which enables the microinverter to operate in grid-tied or off-grid modes. This chip is built in advanced 55nm technology with high speed digital logic and has super-fast response times to changing loads and grid events, alleviating constraints on battery sizing for home energy systems.

Part of the Enphase Energy System, IQ8 Series Microinverters integrate with the Enphase IQ Battery, Enphase IQ Gateway, and the Enphase App monitoring and analysis software.

Enphase 25 year limited warranty

IQ8 Series Microinverters redefine reliability standards with more than one million cumulative hours of power-on testing, enabling an industry-leading limited warranty of up to 25 years.

Connect PV modules quickly and easily to IQ8 Series Microinverters using the included Q-DCC-2 adapter cable with plug-n-play MC4 connectors.

UL CERTIFIED SAFETY

IQ8 Series Microinverters are UL Listed as PV Rapid Shut Down Equipment and conform with various regulations, when installed according to manufacturer's instructions.

Easy to install

- Lightweight and compact with plug-n-play connectors
- Power Line Communication (PLC) between components
- Faster installation with simple two-wire cabling

High productivity and reliability

- Produce power even when the grid is down
- More than one million cumulative hours of testing
- Class II double-insulated enclosure
- Optimized for the latest high-powered PV modules

Microgrid-forming

- Complies with the latest advanced grid support
- Remote automatic updates for the latest grid requirements
- Configurable to support a wide range of grid profiles
- Meets CA Rule 21 (UL 1741-SA) requirements

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IQ8 and IQ8+ Microinverters

INPUT DATA (DC)		IQ8-60-2-US	IQ8PLUS-72-2-US
Commonly used module pairings[1]	W	235 – 350	235 – 440
Module compatibility		60-cell/120 half-cell	60-cell/120 half-cell and 72-cell/144 half-cell
MPPT voltage range	V	27 – 37	29 – 45
Operating range	V	25 – 48	25 – 58
Min/max start voltage	V	30 / 48	30 / 58
Max input DC voltage	V	50	60
Max DC current[2] [module Isc]	A	15	
Overvoltage class DC port		II	
DC port backfeed current	mA	0	
PV array configuration		1x1 Ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit	
OUTPUT DATA (AC)		**IQ8-60-2-US**	**IQ8PLUS-72-2-US**
Peak output power	VA	245	300
Max continuous output power	VA	240	290
Nominal (L-L) voltage/range[3]	V	240 / 211 – 264	
Max continuous output current	A	1.0	1.21
Nominal frequency	Hz	60	
Extended frequency range	Hz	50 – 68	
Max units per 20 A (L-L) branch circuit[4]		16	13
Total harmonic distortion		<5%	
Overvoltage class AC port		III	
AC port backfeed current	mA	30	
Power factor setting		1.0	
Grid-tied power factor (adjustable)		0.85 leading – 0.85 lagging	
Peak efficiency	%	97.5	97.6
CEC weighted efficiency	%	97	97
Night-time power consumption	mW	60	
MECHANICAL DATA			
Ambient temperature range		-40°C to +60°C (-40°F to +140°F)	
Relative humidity range		4% to 100% (condensing)	
DC Connector type		MC4	
Dimensions (HxWxD)		212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")	
Weight		1.08 kg (2.38 lbs)	
Cooling		Natural convection – no fans	
Approved for wet locations		Yes	
Acoustic noise at 1 m		<60 dBA	
Pollution degree		PD3	
Enclosure		Class II double-insulated, corrosion resistant polymeric enclosure	
Environ. category / UV exposure rating		NEMA Type 6 / outdoor	
COMPLIANCE			
Certifications		CA Rule 21 (UL 1741-SA), UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01 This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020 section 690.12 and C22.1-2018 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to manufacturer's instructions.	

(1) No enforced DC/AC ratio. See the compatibility calculator at https://link.enphase.com/module-compatibility (2) Maximum continuous input DC current is 10.6A (3) Nominal voltage range can be extended beyond nominal if required by the utility. (4) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

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