

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.

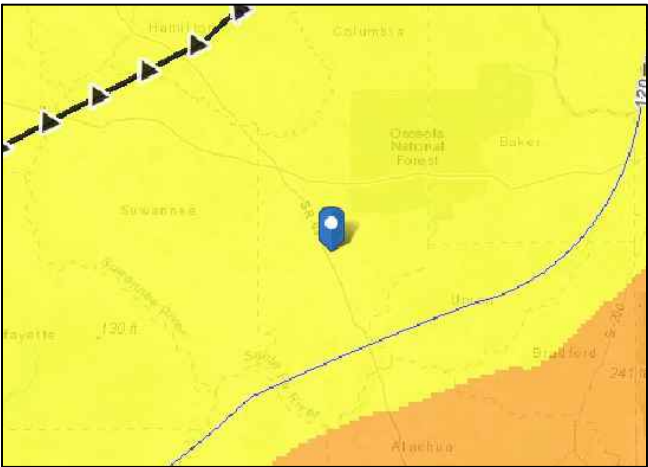
CONTRACTOR SHALL ENSURE ALL ROOF PENETRATIONS TO BE INSTALLED AND SEALED PER 2020 FLORIDA BUILDING CODE 7TH EDITION OR LOCAL GOVERNING CODE.

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.

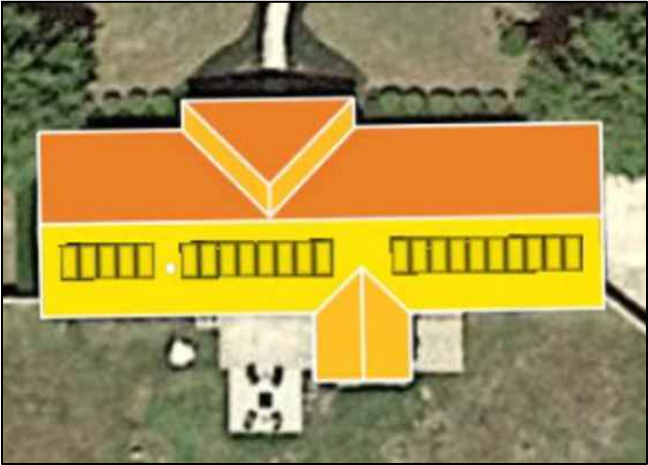
REQUIRED SAFETY SIGNS AND LABELS SHALL BE PERMANENTLY ATTACHED BY ADHESIVE, OR OTHER MECHANICAL MEANS. LABELS SHALL COMPLY WITH ARTICLE 690 VI OF THE NEC 2017 OR OTHER APPLICABLE STATE AND LOCAL CODES. SEE LABELS AND MARKING PAGE FOR MORE INFORMATION.

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.



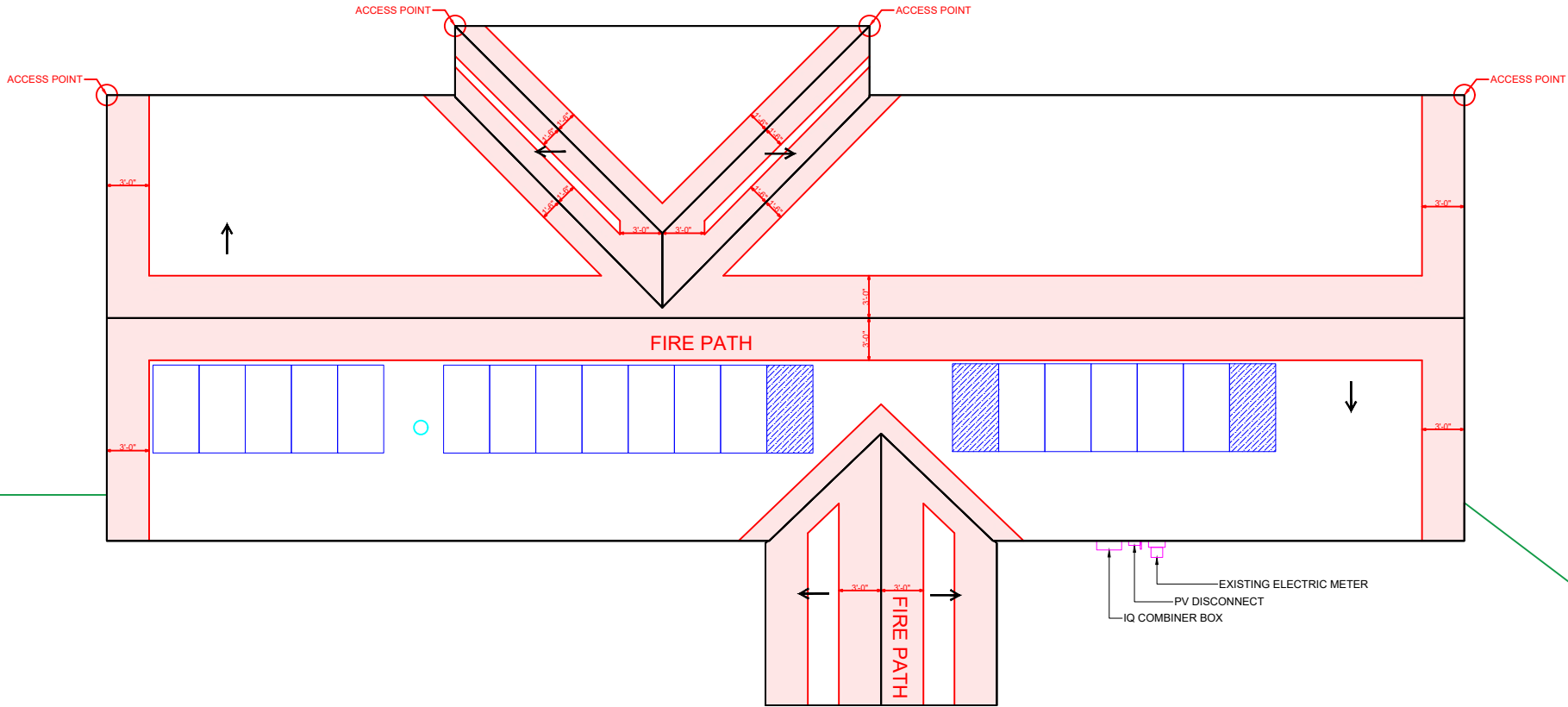
3 IRRADIANCE MAP
N.T.S.



4 3D RENDERING
N.T.S.



"PROPERTY SIDE FACING STREET"



1 ROOF PLAN VIEW / BOS LOCATION
N.T.S.

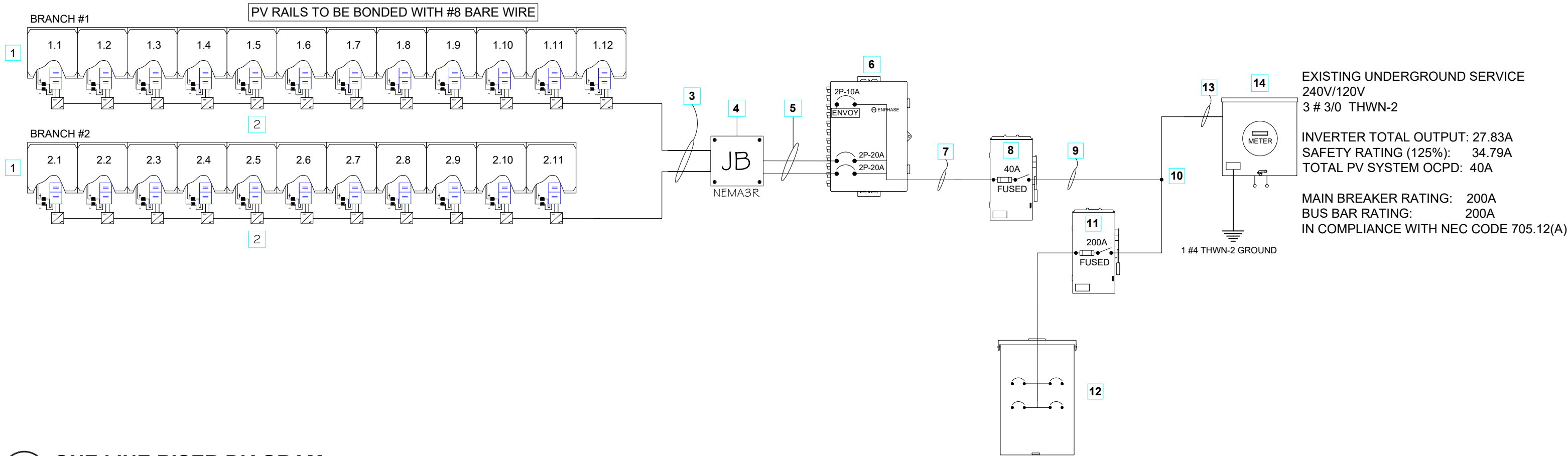
DOCUMENT CONTROL		DATE	sCAD	eCAD
ISSUED FOR PERMIT		8-2-22	JH	DM
REV	DESCRIPTION	DATE	sCAD	eCAD

ENGINEER CONTACT INFORMATION	ENGINEERING STAMP	CONTRACTOR CONTACT INFORMATION
ENGINEPARTNERS LLC C.A. 32661 1825 PONCE DE LEON BLVD #114 CORAL GABLES, FL 33134 DESIGN@ENGINEPARTNERS.COM 833 - 888 - 3644	 Rafael A Gonzalez Soto 2022.08.04 15:38:52 -04'00'	SUN4 2222 PONCE DE LEON BLVD, 3RD FLOOR, CORAL GABLES, FL 33134 (786) 833 -7864 #CVC57137 #EC13008093

CONTRACTOR LOGO	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 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 CURRENT (AMP)	MIN OCPD (AMP)	WIRE DE-RATED CALCULATION				DIST.	VOLTAGE	VOLTAGE DROP %	CONDUIT FILL %
										WIRE RATING	AMBIENT TEMPERATURE COEFFICIENT	# OF CONDUCTORS COEFFICIENT	DE-RATES AMPACITY				
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%


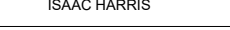



1 ONE LINE RISER DIAGRAM

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	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	ENGINEER CONTACT INFORMATION		ENGINEERING STAMP		CONTRACTOR CONTACT INFORMATION		CONTRACTOR LOGO		CUSTOMER:		SHEET NAME:		
ISSUED FOR PERMIT				8-2-22	JH	DM	ENGIPARTNERS LLC C.A. 32661 1825 PONCE DE LEON BLVD #114 CORAL GABLES, FL 33134 DESIGN@ENGIPARTNERS.COM 833 - 888 - 3644				SUN4 2222 PONCE DE LEON BLVD, 3RD FLOOR, CORAL GABLES, FL 33134 (786) 833 - 7864 #CVC57137 #EC13008093				ISAAC HARRIS		ONE LINE RISER DIAGRAM		
REV				DATE	sCAD	eCAD									PROJECT ADDRESS:				
															465 SW HARMONY LN, LAKE CITY FL, 32025				
															PARCEL NUMBER:				
															19-4S-17-08572-001 (31851)				
														PROJECT ID:		ENGINEER OF RECORD:		SHEET TITLE:	
														EP15365		ENG. RAFAEL A. GONZALEZ SOTO, PE			
																DATE:			
																		8-1-22	
																		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)

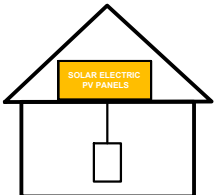
**WARNING**

**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.



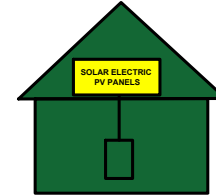
LABEL LOCATION:
AC DISCONNECT, MAIN PANEL
PER CODE: NEC 690.56(C)(1)(a)

**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)

**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

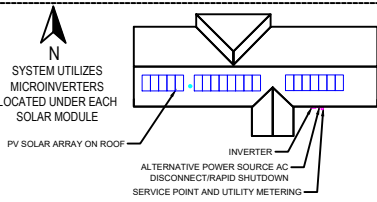
GENERAL NOTE:

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]

**CAUTION**

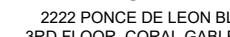

POWER TO THIS BUILDING IS ALSO
SUPPLIED FROM THE FOLLOWING SOURCES
WITH DISCONNECTS LOCATED AS SHOWN:



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

1

PV SAFETY LABELS DATA
N.T.S.

DOCUMENT CONTROL				DATE	sCAD	eCAD	ENGINEER CONTACT INFORMATION		ENGINEERING STAMP		CONTRACTOR CONTACT INFORMATION		CONTRACTOR LOGO		CUSTOMER: ISAAC HARRIS		SHEET NAME: SAFETY LABELS			
ISSUED FOR PERMIT				8-2-22	JH	DM	ENGIPARTNERS LLC C.A. 32661 1825 PONCE DE LEON BLVD #114 CORAL GABLES, FL 33134 DESIGN@ENGIPARTNERS.COM 833 - 888 - 3644				SUN4 2222 PONCE DE LEON BLVD, 3RD FLOOR, CORAL GABLES, FL 33134 (786) 833 - 7864 #CVC57137 #EC13008093				PROJECT ADDRESS: 465 SW HARMONY LN, LAKE CITY FL, 32025 PARCEL NUMBER: 19-4S-17-08572-001 (31851)					
REV				DESCRIPTION	DATE	sCAD											eCAD			
													PROJECT ID: EP15365		ENGINEER OF RECORD: ENG. RAFAEL A. GONZALEZ SOTO, PE DATE: 8-1-22		SHEET TITLE: E-2			

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

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

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

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

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

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.

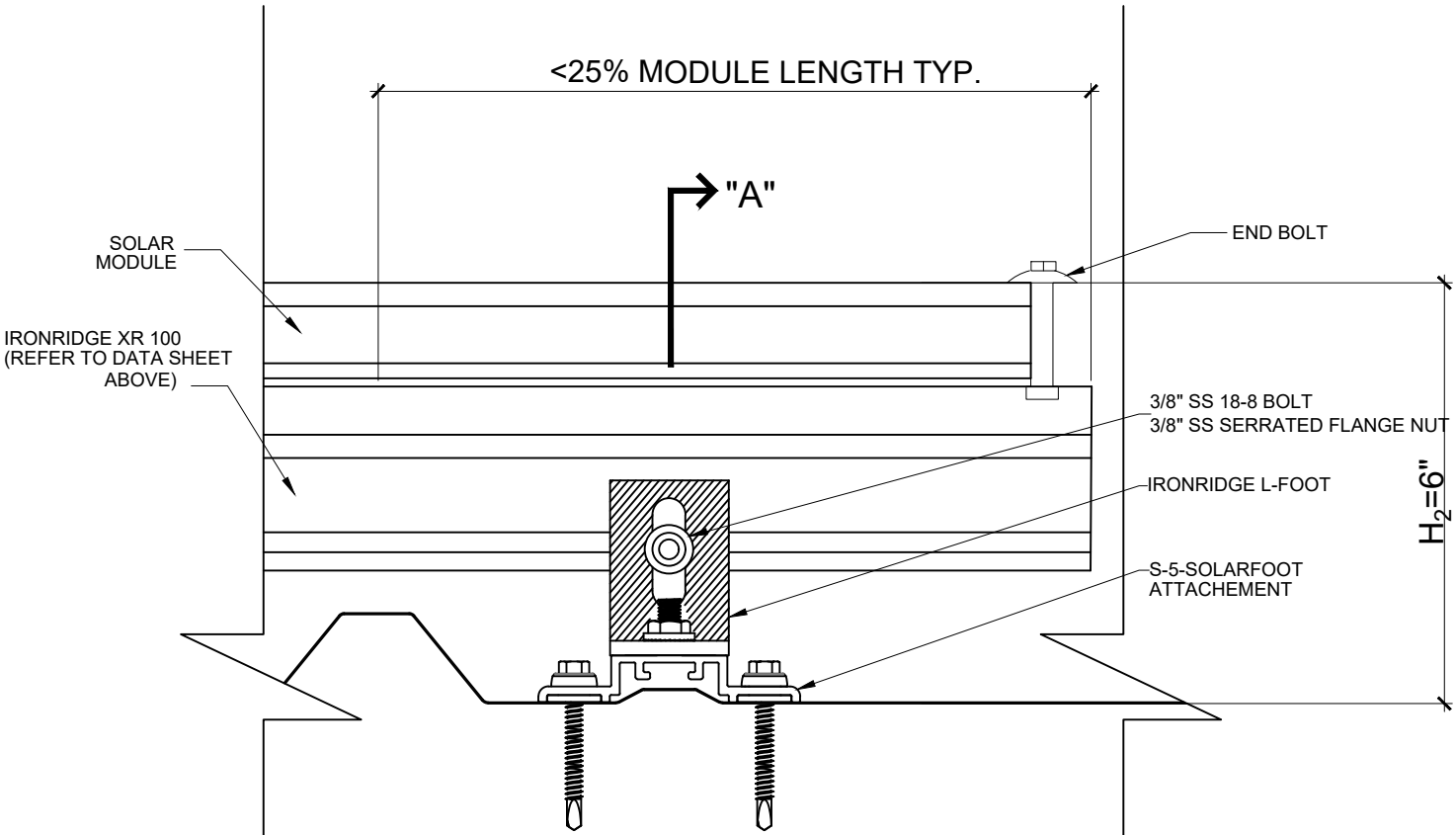
(4) This table does not include shear capacities. If necessary, contact a local engineer to specify lag bolt size with regard to shear forces.


(5) Install lag bolts with head ad washer flush to surface (no gap). Do not 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

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






TECHBULLETIN

FLORIDA PRODUCT APPROVAL
STRAIGHTENING SOLAR DESIGN & PERMITTING


The First in Florida

ASCE 7-16 Velocity Pressure

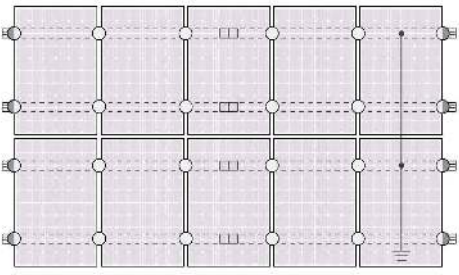
ASCE 7-16 Velocity Pressure



Approved Components & Configurations



System Diagram




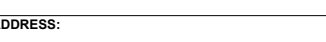
UL Certification

The Ironridge Flush Mount, Tilt Mount, and Ground Mount System have been tested to UL 2700 by UL Listed Group 10.

UL 2700 is the standard for evaluating solar mounting systems. It ensures these systems will maintain strong connections and mechanical connections over an extended period of time in extreme outdoor service conditions.

Go to ironridge.com/UL

System	Flush Mount	Tilt Mount	Ground Mount
XR Rails	✓	✓	✓
UFO/Stopper	✓	✓	✓
Bonded Splice	✓	✓	✓
Grounding Lugs	✓	✓	✓
Microinverters & Power Optimizers	✓	✓	✓
Wire Rating	✓	✓	✓
Modules	✓	✓	✓

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REV				DESCRIPTION	DATE	sCAD									eCAD	PROJECT ADDRESS:				
													465 SW HARMONY LN, LAKE CITY FL, 32025		PROJECT ID: EP15365		ENGINEER OF RECORD: ENG. RAFAEL A. GONZALEZ SOTO, PE		SHEET TITLE: S-2	
													PARCEL NUMBER: 19-4S-17-08572-001 (31851)							



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
- 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*

* 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

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

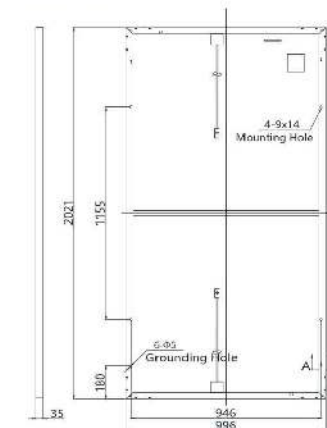


* The specific certificates applicable to different module types and markets will vary, and therefore not all of the certifications listed herein will simultaneously apply to the products you order or use. Please contact your local Canadian Solar sales representative to confirm the specific certificates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

ENGINEERING DRAWING (mm)

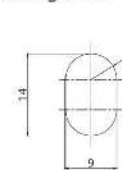
Rear View



Frame Cross Section A-A



Mounting Hole



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*

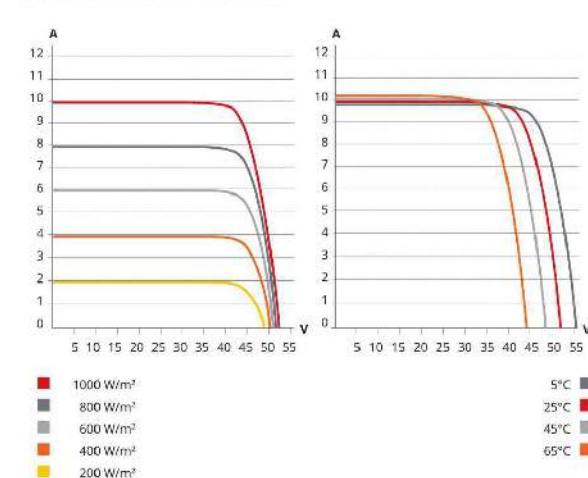
CS1Y	380MS	385MS	390MS	395MS	400MS	405MS	410MS
Nominal Max. Power (Pmax)	281 W	285 W	288 W	292 W	296 W	299 W	303 W
Opt. Operating Voltage (Vmp)	39.4 V	39.5 V	39.7 V	39.9 V	40.1 V	40.3 V	40.4 V
Opt. Operating Current (Imp)	7.14 A	7.20 A	7.26 A	7.31 A	7.37 A	7.43 A	7.51 A
Open Circuit Voltage (Voc)	48.1 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.

* 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.

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CS1Y-400MS / I-V CURVES



MECHANICAL DATA

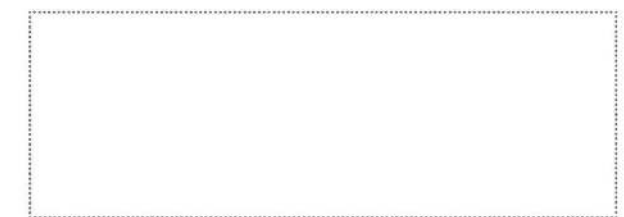
Specification	Data
Cell Type	Mono-crystalline
Dimensions	2021 x 996 x 35 mm (79.6 x 39.2 x 1.38 in)
Weight	24.0 kg (52.9 lbs)
Front Cover	3.2 mm tempered glass
Frame	Anodized aluminium alloy, crossbar enhanced
J-Box	IP68, 3 bypass diodes
Cable	4.0 mm² (IEC), 12 AWG (UL)
Cable Length (Including Connector)	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



DOCUMENT CONTROL				ENGINEER CONTACT INFORMATION		ENGINEERING STAMP		CONTRACTOR CONTACT INFORMATION		CONTRACTOR LOGO		CUSTOMER:		SHEET NAME:				
ISSUED FOR PERMIT				DATE	sCAD	eCAD	ENGINEER CONTACT INFORMATION		CONTRACTOR CONTACT INFORMATION		CONTRACTOR LOGO		ISAAC HARRIS		PV MODULES DATA SHEET			
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Enphase IQ Combiner 4/4C

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



To learn more about Enphase offerings, visit enphase.com

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



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)


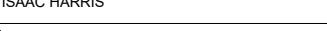
COMPLIANCE

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	ENGINEER CONTACT INFORMATION		ENGINEERING STAMP	CONTRACTOR CONTACT INFORMATION		CONTRACTOR LOGO	CUSTOMER:		SHEET NAME: SMART MONITORING DATA SHEET					
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															PROJECT ID: EP15365		ENGINEER OF RECORD: ENG. RAFAEL A. GONZALEZ SOTO, PE		SHEET TITLE: D-2	
															DATE: 8-1-22					



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.



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.



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

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IQ8SP-DS-0002-01-EN-US-2021-10-19

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

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		1.06 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			
		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	
Certifications		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.

IQ8SP-DS-0002-01-EN-US-2021-10-19

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