LUCENT ENGINEERING
2023.07.19

814 E 1475 N
Lehi, UT 84043
m: (309) 645-0999
admin@lucenteng.co

October 13, 2023

Encōr Solar, LLC
2392 N Orchard Way
Saratoga Springs UT 84045

RE: Engineering Services
Padrta Residence
253 Nw Country Lake Dr, Lake City, FL
12.675 kW System
Solo Job #3808785

Nicholas J Bowens

Digitally signed by Nicholas J Bowens
DN: CN=Nicholas J Bowens, dnQualifier=A01410C00000184534708F50004D286, O=LUCENT ENGINEERING P.C., C=US
Date: 2023.10.13 12:19:31-06'00'

To Whom It May Concern,

We have reviewed the following information regarding the solar panel installation for this project. Alterations to these documents or plans shall not be made without direct written consent of the Engineer of Record.

A. Assumptions from Field Observation provided by Encōr Solar, LLC

The following structural design regarding the proposed alterations have been prepared from these assumptions. The verification of the field observations is the responsibility of the contractor. **Prior to commencement of work, the contractor shall verify the framing sizes, spacings, and spans noted in the sealed plans, calculations, and/or certification letter and notify the Engineer of Record of any discrepancies.**

	Roof
Roof Finish :	Asphalt Shingle
Roof Underlayment :	OSB
Roof Profile :	Hip Gable
Roof Structural System :	Metal Plate Trusses
Truss Top Chord/Setup :	2 x 4 / Fan / Hip
Chord/Rafter Wood Grade :	Southern Pine #2 or better
Truss/Rafter Spacing :	24" o.c.
Roof Slope :	30 deg
Max Top Chord/Rafter Span :	7.14 ft
Bearing Wall Type :	Convl Lt-Frame Constr
Foundation :	Permanent Concrete
Stories :	Two

B. Building Design Criteria

Code :	2020 FBC, 7th Ed (ASCE 7-16)	Risk Category :	II
Roof Live Load :	20 psf (0 psf at panels)	Occupancy Class :	R-3
Ground Snow Load :	0 psf	Roof Dead Load :	6.5 psf
Ult Wind Speed :	120 mph	PV Dead Load :	3 psf
Exposure Category :	C	Total Dead Load :	9.5 psf

C. Summary of Existing Structure Results

Roof
After review of the field observations and based on our calculations and in accordance with the applicable building codes and current industry standards, the existing roof structure supporting the proposed alterations consisting of the solar array has been determined to be:

- Adaquate to support the additional imposed loads. **No structural upgrades are required.**

1. Solar panels shall be designed, mounted, and installed in accordance with the most recent "UniRac Manual", which can be found on the UniRac website (http://unirac.com/).
2. Manufacturer's Panel Bracket Connection to Roof Chord/Rafter Member:

Fastener :	(1) 5/16" Lag Screw per Bracket
NDS Withdrawl Value :	307 lbs/inch
Min. Thread Length and Pentration Depth :	2.5"

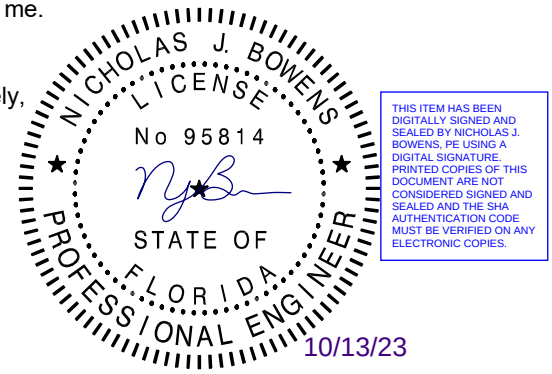
3. Considering the existing roof's slope, size, spacing, condition, and calculated loads, the panel bracket supports shall be placed no greater than 48 in. o/c.
4. Panel supports connections shall be staggered to distribute load to adjacent trusses.

E. Overall Summary

Based on the information supplied to us at the time of this report, on the evaluation of the existing structure, and solar array panel bracket connection, it is our opinion that the roof system will adequately support the additional loads imposed by the solar array. This evaluation conforms to 2020 FBC, 7th Ed and current industry standards.

Should you have any questions regarding this letter or if you require further information, do not hesitate to contact me.

Sincerely,



Nicholas J. Bowens, PE
License No. 95814

Limits of Scope of Work and Liablity

The existing structure is assumed to have been designed and constructed following appropriate codes at the time of erection and assumed to have appropriated permits. The calculations performed are only for the roof framing supporting the solar array installation referenced in the stamped plans and were completed according to generally recognized structural analysis standards and procedures, professional engineering, and design experience opinions and judgements. Existing deficiencies which are unknown or were not observed during the time the site observation are not included in this scope of work. All solar panel modules, racking, and mounting equipment shall be designed and installed per the manufacturer's approved installation specifications. The Engineer of Record and the engineering consulting firm assume no responsibility for misuse or improper installation. This analysis is not stamped for water leakage. Framing was determined on information in provided plans and/or photos, along with engineering judgement. Prior to commencement of work, the contractor shall verify the framing sizes, spacings, and spans noted in the stamped plans, calculations, and/or certification letter and notify the Engineer of Record of any discrepancies prior to starting construction. If during solar panel installation, the roof framing members appear unstable or deflect non-uniformly, our office should be notified before proceeding with the installation. The contactor shall also verify that there are no damage/deficiencies (i.e., dry rot, water damage, termite damage, framing member/connection damage, etc.) to framing that was not addressed in the stamped plans, calculations, and/or certification letter and notify the Engineer of Record of any concerns prior to starting construction.

AERIAL VIEW

STREET VIEW

SHEET INDEX

PV01 COVER
PV02 SITE PLAN
PV03 ROOF PLAN
PV04 MOUNTING DETAIL
PV05 LINE DIAGRAM
PV06 ELECTRICAL CALCS
PV07 LABELS
PV08 PLACARD
PV09 SITE PHOTOS

GENERAL NOTES

1. INSTALLATION OF SOLAR PHOTOVOLTAIC SYSTEM SHALL BE IN ACCORDANCE WITH NEC ARTICLE 690, AND ALL OTHER APPLICABLE NEC CODES WHERE NOTED OR EXISTING
2. PROPER ACCESS AND WORKING CLEARANCE AROUND EXISTING AND PROPOSED ELECTRICAL EQUIPMENT WILL COMPLY WITH NEC ARTICLE 110
3. ALL WIRES, INCLUDING THE GROUNDING ELECTRODE CONDUCTOR SHALL BE PROTECTED FROM PHYSICAL DAMAGE IN ACCORDANCE WITH NEC ARTICLE 250
4. THE PV MODULES ARE CONSIDERED NON-COMBUSTIBLE; THIS SYSTEM IS UTILITY INTERACTIVE PER UL 1741 AND DOES NOT INCLUDE STORAGE BATTERIES OR OTHER ALTERNATIVE STORAGE SOURCES
5. ALL DC WIRES SHALL BE SIZED ACCORDING TO [NEC 690.8]
6. DC CONDUCTORS SHALL BE WITHIN PROTECTED RACEWAYS IN ACCORDANCE WITH [NEC 690.31]
7. ALL SIGNAGE TO BE PLACED IN ACCORDANCE WITH LOCAL JURISDICTIONAL BUILDING CODE

PHOTOVOLTAIC (PV) SYSTEM SPECIFICATIONS

ELECTRICAL EQUIPMENT

PV MODULES:
(39) SOLARIA POWERX-390R
DC SYSTEM SIZE: 15.21 KW DC
INVERTER(S):
(39) ENPHASE IQ8M-72-2-US INVERTER(S)
AC SYSTEM SIZE: 12.675 KW AC

RACKING

RACKING: UNIRAC SM
ATTACHMENT: UNIRAC - FLASHKIT PRO

APPLICABLE GOVERNING CODES

2017 NEC
2020 FBC 7TH EDITION, BUILDING
2020 FBC 7TH EDITION, RESIDENTIAL
2020 FBC 7TH EDITION, EXISTING BUILDING
2020 FFPC

SITE SPECIFICATIONS

OCCUPANCY: R-3
ZONING: RESIDENTIAL

ENCŌR

CONTRACTOR INFORMATION:
Encor Solar LLC
2392 N Orchard Way
Saratoga Springs UT 84045
License #CVC57229
(888)-543-6267

NICHOLAS J. BOWENS
LICENSE
No 95814
STATE OF
FLORIDA
PROFESSIONAL ENGINEER

THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY NICHOLAS J. BOWENS, PE USING A DIGITAL SIGNATURE. PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SHA AUTHENTICATION CODE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

10/13/23

SITE INFORMATION

JERRY PADRTA

253 NW COUNTRY LAKE DR

LAKE CITY, FL 32055

AC SYSTEM SIZE: 12.675 KW AC

DC SYSTEM SIZE: 15.21 KW DC

LAT, 30.206973

LONG, -82.6976787999999

(39) SOLARIA POWERX-390R
PV MODULES

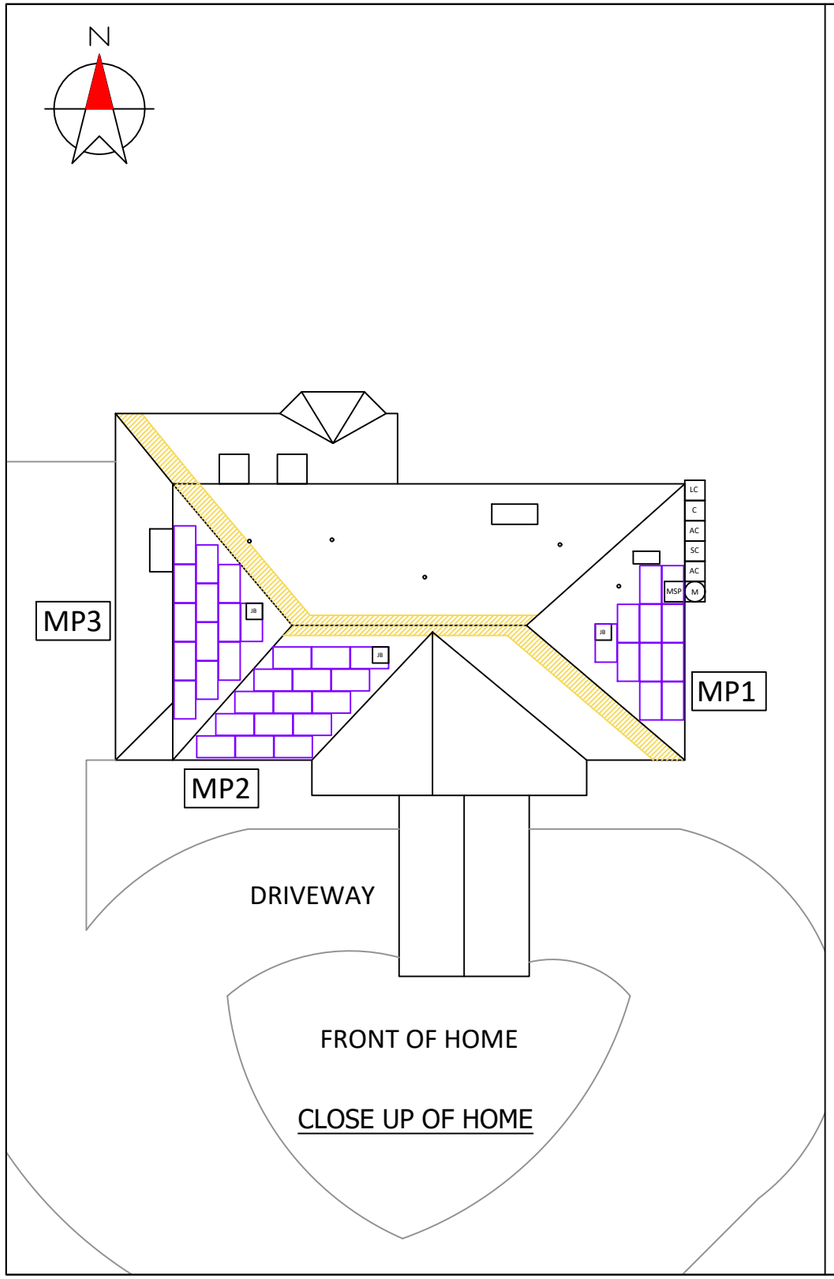
(39) ENPHASE IQ8M-72-2-US INVERTER(S)

FLORIDA POWER & LIGHT

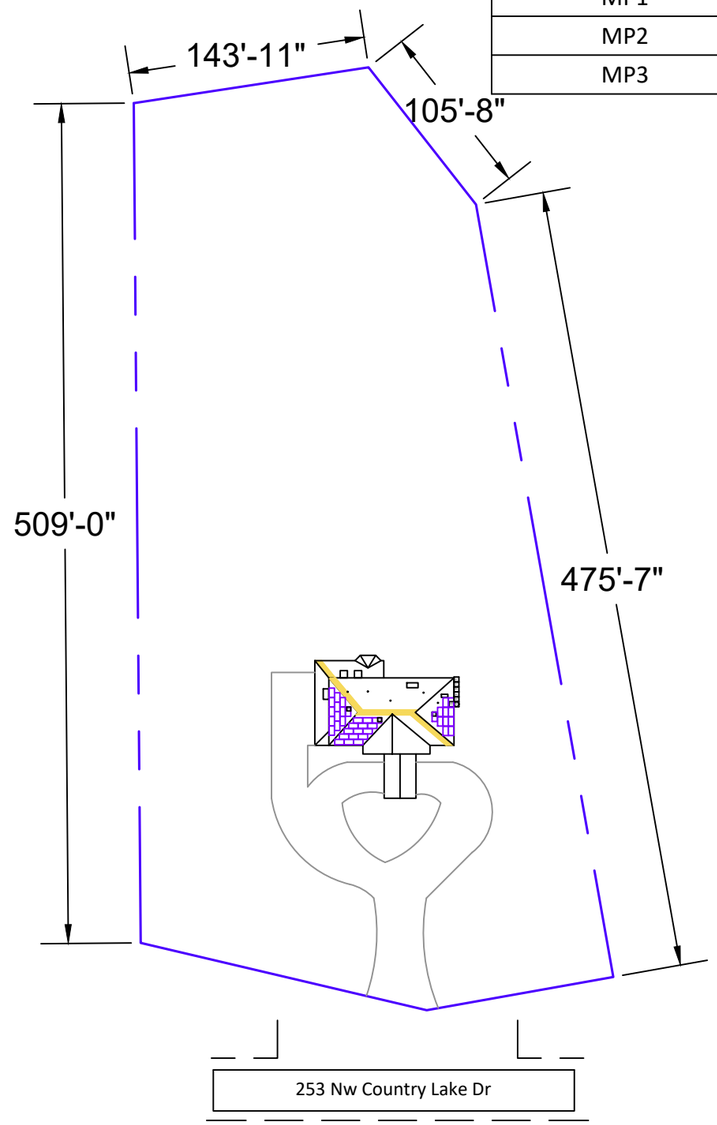
DRAWN BY: SoloCAD

10/13/2023

COVER - PV01



ARRAY DETAILS:		
MOUNTING PLANE:	AZIMUTH:	TILT:
MP1	90°	30°
MP2	180°	30°
MP3	270°	30°



ENCŌR

CONTRACTOR INFORMATION:

Encor Solar LLC
2392 N Orchard Way
Saratoga Springs UT 84045
License #CVC57229
(888)-543-6267

NICHOLAS J. BOWENS LICENSE No 95814 STATE OF FLORIDA PROFESSIONAL ENGINEER

THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY NICHOLAS BOWENS, PE USING A DIGITAL SIGNATURE. PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SHA AUTHENTICATION CODE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

10/13/23

SITE INFORMATION

JERRY PADRTA

253 NW COUNTRY LAKE DR

LAKE CITY, FL 32055

AC SYSTEM SIZE: 12.675 KW AC

DC SYSTEM SIZE: 15.21 KW DC

LAT, 30.206973

LONG, -82.6976787999999

(39) SOLARIA POWERX-390R PV MODULES

(39) ENPHASE IQ8M-72-2-US INVERTER(S)

FLORIDA POWER & LIGHT

EQUIPMENT LEGEND:

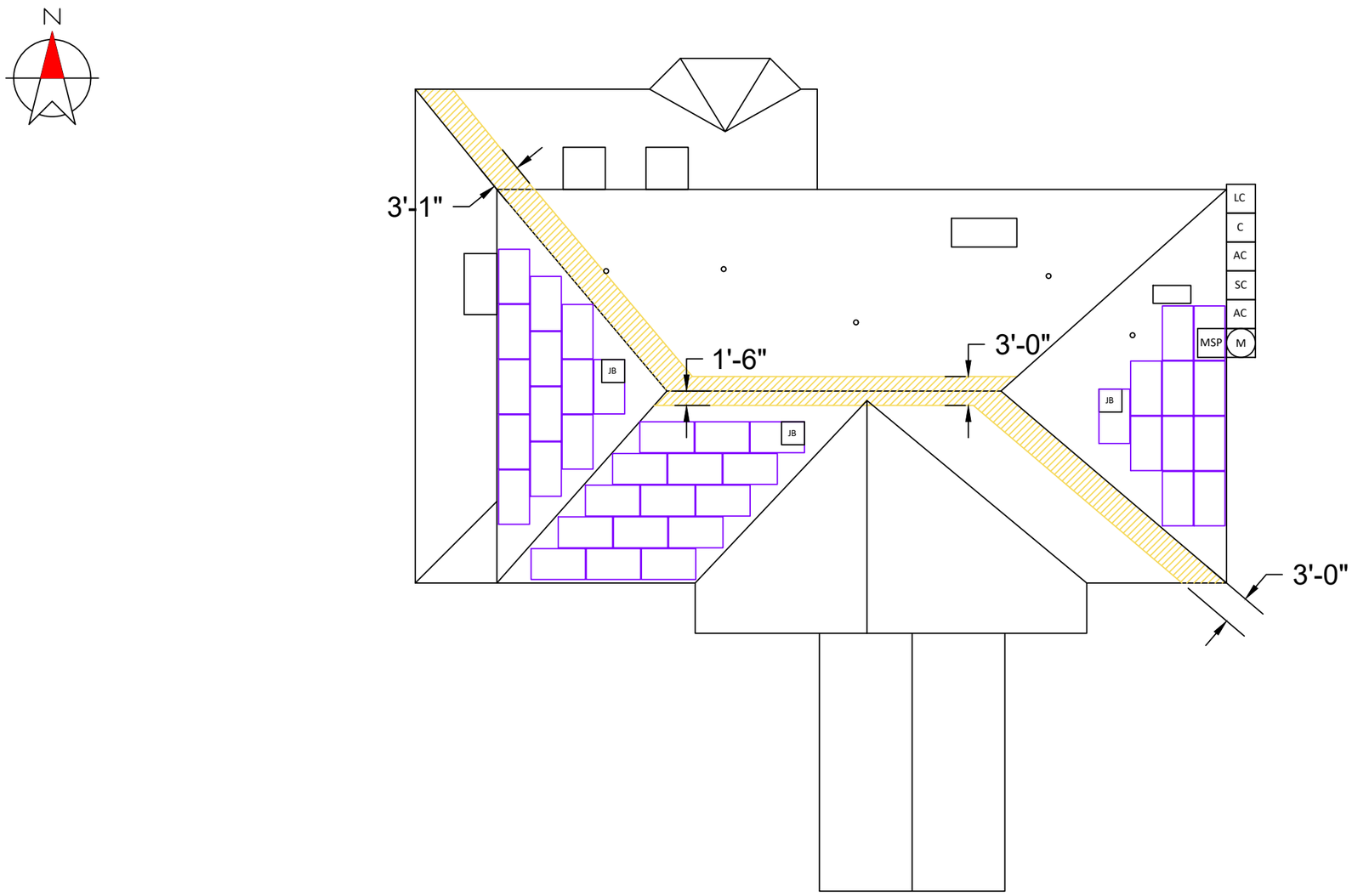
- M — UTILITY METER
- AC — VISIBLE, LOCKABLE, LABELED AC DISCONNECT
- INV — INVERTER
- SUB — SUB PANEL
- BATT — BATTERY(IES)
- SD — SERVICE DISCONNECT
- PROPERTY LINE
- PV MODULES
- MSP — MAIN SERVICE PANEL
- PV — METER SOCKET (FOR UTILITY PV METER)
- C — COMBINER BOX
- LC — LOAD CENTER
- SC — IQ SYSTEM CONTROLLER
- JB — JUNCTION BOX
- FIRE ACCESS PATHWAY (3' TYP)

VISIBLE, LOCKABLE, LABELED AC DISCONNECT LOCATED WITHIN 10' OF UTILITY METER

DRAWN BY: SoloCAD

10/13/2023

SITE PLAN - PV02



EQUIPMENT INFORMATION:		ROOF INFO:		PHOTOVOLTAIC ARRAY STRUCTURAL CRITERIA:	
RACKING MANUFACTURER:	UNIRAC	ROOF TYPE:	ASPHALT SHINGLE	PV MODULE COUNT:	39
RACKING PART NUMBER:	SM	ROOF FRAMING:	MANUFACTURED TRUSS	ARRAY AREA:	MODULE COUNT * 21.03 FT² = 820.17
ATTACHMENTS	UNIRAC - FLASHKIT PRO	RAFTER/TOP CHORD SIZE:	2x4	ROOF AREA:	4657 FT²
ATTACHMENT QTY:	140	RAFTER/TOP CHORD SPACING:	24"	PERCENT OF ROOF COVERED:	18%
SPLICE QTY:	22	ATTACHMENT SPACING:	48''	ARRAY WEIGHT:	MODULE COUNT * 49 LBS = 1911 LBS
MIDCLAMP QTY:	52			POINT LOAD:	ARRAY LBS/ATTACHMENTS = 13.65
ENDCLAMP QTY:	52			DISTRIBUTED LOAD: (lbs/ft²)	ARRAY WEIGHT/AREA = 2.33 LBS/FT²

ENCŌR

CONTRACTOR INFORMATION:
Encor Solar LLC
2392 N Orchard Way
Saratoga Springs UT 84045
License #CVC57229
(888)-543-6267

NICHOLAS J. BOWENS LICENSE No 95814 STATE OF FLORIDA PROFESSIONAL ENGINEER

THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY NICHOLAS J. BOWENS, PE USING A DIGITAL SIGNATURE. PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SHA AUTHENTICATION CODE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

10/13/23

SITE INFORMATION

JERRY PADRTA

253 NW COUNTRY LAKE DR

LAKE CITY, FL 32055

AC SYSTEM SIZE: 12.675 KW AC

DC SYSTEM SIZE: 15.21 KW DC

LAT, 30.206973

LONG, -82.6976787999999

(39) SOLARIA POWERX-390R PV MODULES

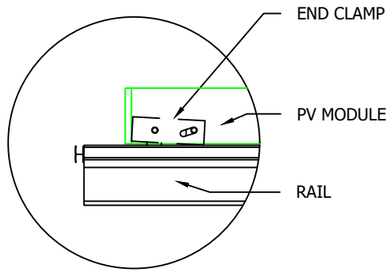
(39) ENPHASE IQ8M-72-2-US INVERTER(S)

FLORIDA POWER & LIGHT

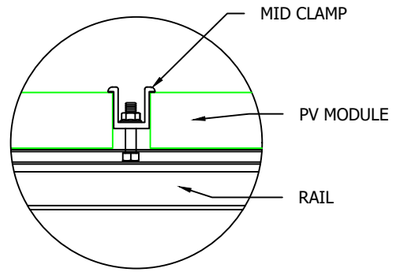
DRAWN BY: SoloCAD

10/13/2023

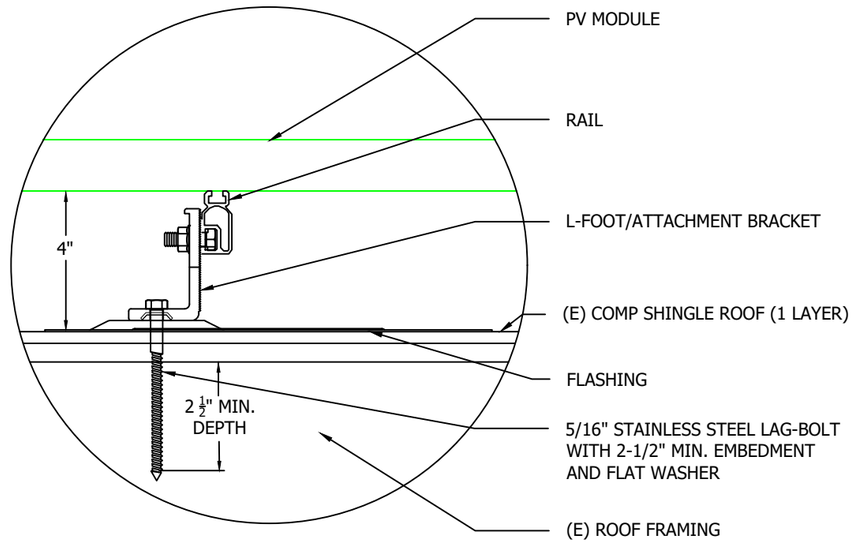
ROOF PLAN - PV03



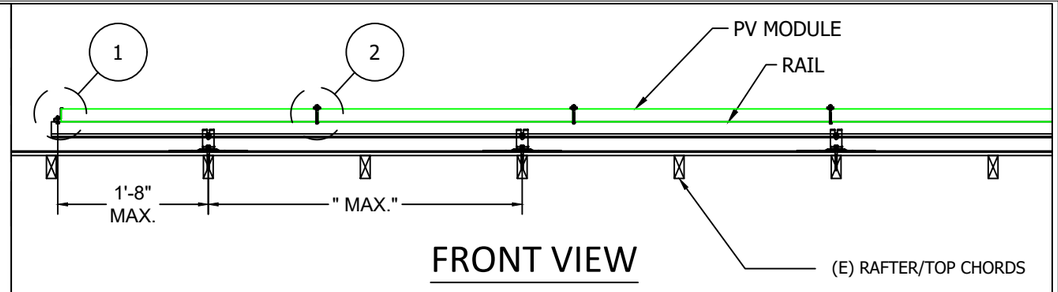
1 END CLAMP DETAILS



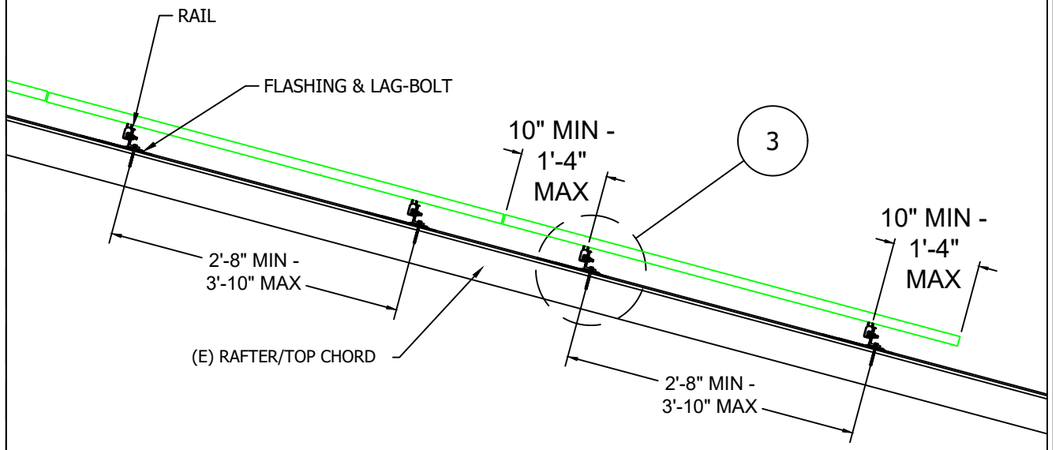
2 MID CLAMP DETAILS



3 DETAIL, MOUNTING AND FLASHING



FRONT VIEW



SIDE VIEW

EQUIPMENT INFORMATION:		ROOF INFO:		PHOTOVOLTAIC ARRAY STRUCTURAL CRITERIA:	
RACKING MANUFACTURER:	UNIRAC	ROOF TYPE:	ASPHALT SHINGLE	PV MODULE COUNT:	39
RACKING PART NUMBER:	SM	ROOF FRAMING:	MANUFACTURED TRUSS	ARRAY AREA:	MODULE COUNT * 21.03 FT² = 820.17
ATTACHMENTS	UNIRAC - FLASHKIT PRO	RAFTER/TOP CHORD SIZE:	2x4	ROOF AREA:	4657 FT²
ATTACHMENT QTY:	140	RAFTER/TOP CHORD SPACING:	24"	PERCENT OF ROOF COVERED:	18%
SPLICE QTY:	22	ATTACHMENT SPACING:	48''	ARRAY WEIGHT:	MODULE COUNT * 49 LBS = 1911 LBS
MIDCLAMP QTY:	52			POINT LOAD:	ARRAY LBS/ATTACHMENTS = 13.65
ENDCLAMP QTY:	52			DISTRIBUTED LOAD: (lbs/ft²)	ARRAY WEIGHT/AREA = 2.33 LBS/FT²

ENCŌR

CONTRACTOR INFORMATION:
Encor Solar LLC
2392 N Orchard Way
Saratoga Springs UT 84045
License #CVC57229
(888)-543-6267

NICHOLAS J. BOWENS LICENSE No 95814 STATE OF FLORIDA PROFESSIONAL ENGINEER

THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY NICHOLAS J. BOWENS, PE USING A DIGITAL SIGNATURE. PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SHA AUTHENTICATION CODE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

10/13/23

SITE INFORMATION

JERRY PADRTA

253 NW COUNTRY LAKE DR

LAKE CITY, FL 32055

AC SYSTEM SIZE: 12.675 KW AC

DC SYSTEM SIZE: 15.21 KW DC

LAT, 30.206973

LONG, -82.6976787999999

(39) SOLARIA POWERX-390R PV MODULES

(39) ENPHASE IQ8M-72-2-US INVERTER(S)

FLORIDA POWER & LIGHT

DRAWN BY: SoloCAD

10/13/2023

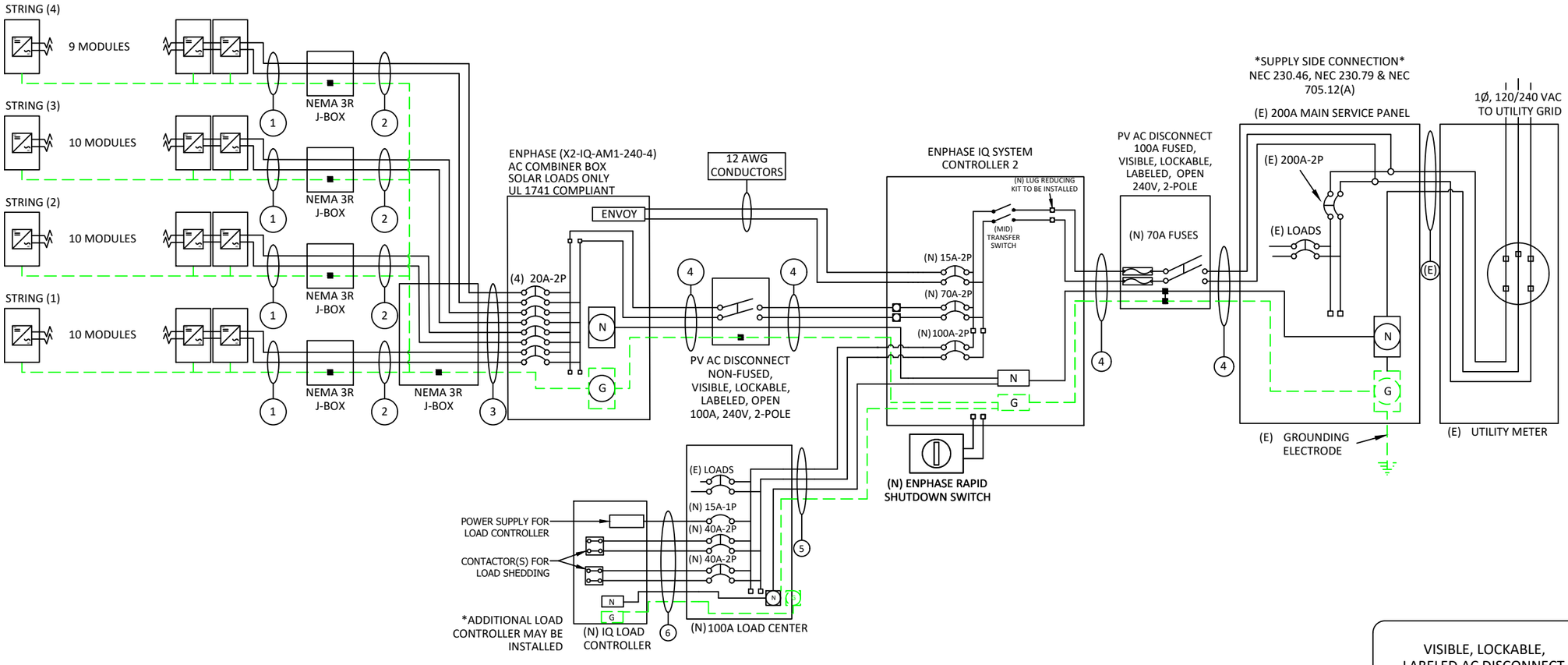
MOUNTING DETAIL - PV04

SOLARIA POWERX-390R SPECS	
POWER MAX (PMAX):	390 W
OPEN CIRCUIT VOLTAGE (VOC):	36.9 V
MAX POWER-POINT CURRENT (IMP):	12.73 A
MAX POWER-POINT VOLTAGE (VMP):	30.6 V
SHORT CIRCUIT CURRENT (ISC):	13.52 A
SERIES FUSE RATING:	20 A

ENPHASE IQ8M-72-2-US SPECS	
MAX INPUT VOLTAGE:	60 V
MAX DC SHORT CIRCUIT CURRENT:	15 A
MAXIMUM OUTPUT POWER:	325 W
MAXIMUM OUTPUT CURRENT:	1.35 A
NOM. OUTPUT VOLTAGE:	240 V
MAX UNITS PER 20A CIRCUIT:	11
1-PHASE, 60 HZ, UL 1741 LISTED	

EQUIPMENT SCHEDULE			
TYPE	QTY	DESCRIPTION	RATING
MODULES:	(39)	SOLARIA POWERX-390R	390 W
INVERTERS:	(39)	ENPHASE IQ8M-72-2-US	325 W
AC DISCONNECT(S):	(2)	PV AC DISCONNECT, 240V, 2-POLE	100 A
AC COMBINER:	(1)	ENPHASE (X2-IQ-AM1-240-4)	125 A

CONDUIT & CONDUCTOR SCHEDULE				
TAG	QTY	WIRE GAUGE	DESCRIPTION	CONDUIT SIZE
1	(2)	12-2	ENPHASE Q-CABLE COPPER - (L1, L2)	N/A - FREE AIR
	(1)	6 AWG	BARE COPPER - (GROUND)	
2	(2)	10 AWG	THHN/THWN-2 COPPER - (L1, L2)	3/4" EMT
	(1)	10 AWG	THWN-2 COPPER - (GROUND)	
3	(8)	10 AWG	THHN/THWN-2 COPPER - (L1, L2)	3/4" EMT
	(1)	10 AWG	THWN-2 COPPER -(GROUND)	
4	(3)	4 AWG	THWN-2 COPPER - (L1, L2, NEUTRAL)	1" EMT
	(1)	8 AWG	THWN-2 COPPER - (GROUND)	
5	(3)	2 AWG	THWN-2 COPPER - (L1, L2, NEUTRAL)	1.25" EMT
	(1)	8 AWG	THWN-2 COPPER -(GROUND)	
6	(6)	6 AWG	THWN-2 COPPER - (L1, L2)	1" EMT
	(1)	10 AWG	THWN-2 COPPER -(GROUND)	



VISIBLE, LOCKABLE, LABELED AC DISCONNECT LOCATED WITHIN 10' OF UTILITY METER

ENCŌR

CONTRACTOR INFORMATION:

Encor Solar LLC
2392 N Orchard Way
Saratoga Springs UT 84045
License #CVC57229
(888)-543-6267

NICHOLAS J. BOWENS LICENSE No 95814 STATE OF FLORIDA PROFESSIONAL ENGINEER

10/13/23

THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY NICHOLAS BOWENS, PE USING A DIGITAL SIGNATURE. PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SHA AUTHENTICATION CODE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

SITE INFORMATION

JERRY PADRTA

253 NW COUNTRY LAKE DR

LAKE CITY, FL 32055

AC SYSTEM SIZE: 12.675 KW AC

DC SYSTEM SIZE: 15.21 KW DC

LAT, 30.206973

LONG, -82.6976787999999

(39) SOLARIA POWERX-390R PV MODULES

(39) ENPHASE IQ8M-72-2-US INVERTER(S)

FLORIDA POWER & LIGHT

DRAWN BY: SoloCAD

10/13/2023

LINE DIAGRAM - PV05

STRING CALCULATIONS				
	STRING #1	STRING #2	STRING #3	STRING #4
MAX AC CURRENT:	13.50A	13.50A	13.50A	12.15A
MICRO INVERTERS IN SERIES	10	10	10	9
NOMINAL STRING VOLTAGE:	240V	240V	240V	240V
MAX AC OUTPUT POWER	3250W	3250W	3250W	2925W
ARRAY DC POWER:	15210W			
TOTAL MAX AC CURRENT:	52.65A			

NUMBER OF CURRENT CARRYING CONDUCTORS	PERCENT OF VALUES
4-6	.80
7-9	.70
10-20	.50

SYSTEM OCPD CALCULATIONS	
INVERTER MODEL(S):	ENPHASE IQ8M-72-2-US
# OF INVERTERS:	39
MAX OUTPUT CURRENT:	1.35A
(# OF INVERTERS) X (MAX OUTPUT CURRENT) X 125% <= OCPD RATING	
(39 X 1.35A X 1.25) = 66A <= 70A, OK	

SUPPLY SIDE INTERCONNECTION	
MAIN BUSBAR RATING:	200A
MAIN DISCONNECT RATING:	200A
PV OCPD RATING:	70A
SERVICE RATING >= PV OCPD	
200A >= 70A, OK	

CONDUIT & CONDUCTOR SCHEDULE

TAG	QTY	WIRE GAUGE	DESCRIPTION	CONDUIT SIZE	CONDUCTOR RATING	CONDUCTOR TEMP. RATE	AMBIENT TEMP	TEMP. DERATE	# OF CONDUCTORS DERATE	CONDUCTOR RATING W/DERATES	CONDUIT FILL
1	(2)	12-2	ENPHASE Q-CABLE COPPER - (L1, L2)	N/A - FREE AIR	30A	90°C	34°C	0.96	N/A - FREE AIR	28.8A	N/A - FREE AIR
	(1)	6 AWG	BARE COPPER - (GROUND)								
2	(2)	10 AWG	THHN/THWN-2 COPPER - (L1, L2)	3/4" EMT	40A	90°C	34°C	0.96	1	38.4A	11.9%
	(1)	10 AWG	THWN-2 COPPER - (GROUND)								
3	(8)	10 AWG	THHN/THWN-2 COPPER - (L1, L2)	3/4" EMT	40A	90°C	34°C	0.96	0.7	26.88A	35.7%
	(1)	10 AWG	THWN-2 COPPER -(GROUND)								
4	(3)	4 AWG	THWN-2 COPPER - (L1, L2, NEUTRAL)	1" EMT	85A	75°C	34°C	0.94	1	79.9A	32.9%
	(1)	8 AWG	THWN-2 COPPER - (GROUND)								
5	(3)	2 AWG	THWN-2 COPPER - (L1, L2, NEUTRAL)	1.25" EMT	115A	75°C	34°C	0.94	1	108.1A	25.6%
	(1)	8 AWG	THWN-2 COPPER -(GROUND)								
6	(6)	6 AWG	THWN-2 COPPER - (L1, L2)	1" EMT	65A	75°C	34°C	0.94	0.8	48.88A	37.7%
	(1)	10 AWG	THWN-2 COPPER -(GROUND)								

GROUNDING & GENERAL NOTES:

1. PV INVERTER IS UNGROUNDED, TRANSFORMER-LESS TYPE.
2. DC GEC AND AC EGC TO BE SPLICED TO EXISTING ELECTRODE
3. ANY EXISTING WIRING INVOLVED WITH PV SYSTEM CONNECTION THAT IS FOUND TO BE INADEQUATE PER CODE SHALL BE CORRECTED PRIOR TO FINAL INSPECTION.
4. JUNCTION BOX QUANTITIES, AND PLACEMENT SUBJECT TO CHANGE IN THE FIELD - JUNCTION BOXES DEPICTED ON ELECTRICAL DIAGRAM REPRESENT WIRE TYPE TRANSITIONS.
5. AC DISCONNECT NOTED IN EQUIPMENT SCHEDULE OPTIONAL IF OTHER AC DISCONNECTING MEANS IS LOCATED WITHIN 10' OF SERVICE DISCONNECT.

INTERCONNECTION NOTES:

1. GROUND FAULT PROTECTION IN ACCORDANCE WITH [NEC 215.9] & [NEC 230.95]
2. SUPPLY SIDE INTERCONNECTION ACCORDING TO [NEC 705.12] WITH SERVICE ENTRANCE CONDUCTORS IN ACCORDANCE WITH [NEC 240.21]

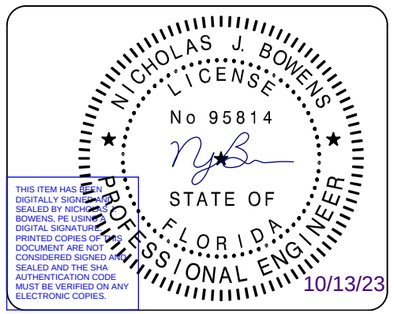
DISCONNECT NOTES:

1. DISCONNECTING SWITCHES SHALL BE WIRED SUCH THAT WHEN THE SWITCH IS OPENED THE CONDUCTORS REMAINING LIVE ARE CONNECTED TO THE TERMINALS MARKED “LINE SIDE” (TYPICALLY THE UPPER TERMINALS)
2. AC DISCONNECT MUST BE ACCESSIBLE TO QUALIFIED UTILITY PERSONNEL, BE LOCKABLE, AND BE A VISIBLE-BREAK SWITCH.
3. FUSED AC DISCONNECT TO BE USED.

ENCŌR

CONTRACTOR INFORMATION:

Encor Solar LLC
2392 N Orchard Way
Saratoga Springs UT 84045
License #CVC57229
(888)-543-6267



SITE INFORMATION

JERRY PADRTA

253 NW COUNTRY LAKE DR

LAKE CITY, FL 32055

AC SYSTEM SIZE: 12.675 KW AC

DC SYSTEM SIZE: 15.21 KW DC

LAT, 30.206973

LONG, -82.6976787999999

(39) SOLARIA POWERX-390R PV MODULES

(39) ENPHASE IQ8M-72-2-US INVERTER(S)

FLORIDA POWER & LIGHT

DRAWN BY: SoloCAD

10/13/2023

ELECTRICAL CALCS - PV06

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

LABEL 1
FOR PV DISCONNECTING MEANS WHERE THE LINE AND LOAD TERMINALS MAY BE ENERGIZED IN THE OPEN POSITION.
[NEC 690.13(B)]

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

LABEL 2
PLACED ADJACENT TO THE BACK-FED BREAKER FROM THE INVERTER IF TIE IN CONSISTS OF LOAD SIDE CONNECTION TO BUSBAR.
[NEC 705.12(B)(2)(3)(c)]

WARNING
INVERTER OUTPUT CONNECTION
DO NOT RELOCATE THIS OVERCURRENT DEVICE

LABEL 3
PLACED ADJACENT TO THE BACK-FED BREAKER FROM THE INVERTER IF TIE IN CONSISTS OF LOAD SIDE CONNECTION TO BUSBAR.
[NEC 705.12(B)(2)(3)(b)]

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

LABEL 4
EQUIPMENT CONTAINING OVERCURRENT DEVICES IN CIRCUITS SUPPLYING POWER TO A BUSBAR OR CONDUCTOR SUPPLIED FROM MULTIPLE SOURCES SHALL BE MARKED TO INDICATE THE PRESENCE OF ALL SOURCES
[NEC 705.12(B)(3)]

PHOTOVOLTAIC AC DISCONNECT
RATED AC OUTPUT CURRENT: 53
NOMINAL OPERATING AC VOLTAGE: 240

LABEL 5
AT POINT OF INTERCONNECTION, MARKED AT AC DISCONNECTING MEANS.
[NEC 690.54]

WARNING: PHOTOVOLTAIC POWER SOURCE

LABEL 6
AT DIRECT-CURRENT EXPOSED RACEWAYS, CABLE TRAYS, COVERS AND ENCLOSURES OF JUNCTION BOXES, AND OTHER WIRING METHODS; SPACED AT MAXIMUM 10FT SECTION OR WHERE SEPARATED BY ENCLOSURES, WALLS, PARTITIONS, CEILINGS, OR FLOORS.
[NEC 690.31(G)(3&4)]

SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN

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

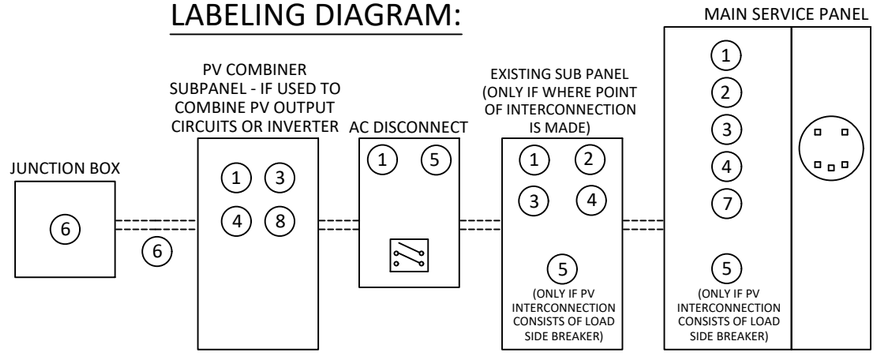
LABEL 7
FOR PV SYSTEMS THAT SHUT DOWN THE ARRAY AND CONDUCTORS LEAVING THE ARRAY:
SIGN TO BE LOCATED ON OR NO MORE THAN 3 FT AWAY FROM SERVICE DISCONNECTING MEANS TO WHICH THE PV SYSTEMS ARE CONNECTED AND SHALL INDICATE THE LOCATION OF ALL IDENTIFIED RAPID SHUTDOWN SWITCHES IF NOT AT THE SAME LOCATION.
[NEC 690.56(C)(1)(a)]

RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

LABEL 8
SIGN LOCATED AT RAPID SHUT DOWN DISCONNECT SWITCH [NEC 690.56(C)(3)].

LABELING NOTES:
1. LABELS CALLED OUT ACCORDING TO ALL COMMON CONFIGURATIONS. ELECTRICIAN TO DETERMINE EXACT REQUIREMENTS IN THE FIELD PER CURRENT NEC AND LOCAL CODES AND MAKE APPROPRIATE ADJUSTMENTS.
2. LABELING REQUIREMENTS BASED ON THE 2017 NATIONAL ELECTRIC CODE, OSHA STANDARD 19010.145, ANSI Z535.
3. MATERIAL BASED ON THE REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION.
4. LABELS TO BE OF SUFFICIENT DURABILITY TO WITHSTAND THE ENVIRONMENT INVOLVED [NEC 110.21(B)(3)]
5. LABELS TO BE A MINIMUM LETTER HEIGHT OF 3/8", WHITE ON RED BACKGROUND; REFLECTIVE, AND PERMANENTLY AFFIXED [NEC 690.31(G)]

LABELING DIAGRAM:



** ELECTRICAL DIAGRAM SHOWN ABOVE IS FOR LABELING PURPOSES ONLY. NOT AN ACTUAL REPRESENATION OF EQUIPMENT AND CONNECTIONS TO BE INSTALLED. LABEL LOCATIONS PRESENTED MAY VERY DEPENDING ON TYPE OF INTERCONNECTION METHOD AND LOCATION PRESENTED ELECTRICAL DIAGRAM PAGE. **

ENCŌR
CONTRACTOR INFORMATION:
Encor Solar LLC
2392 N Orchard Way
Saratoga Springs UT 84045
License #CVC57229
(888)-543-6267

NICHOLAS J. BOWENS LICENSE No 95814 STATE OF FLORIDA PROFESSIONAL ENGINEER
10/13/23

THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY NICHOLAS J. BOWENS, PE USING A DIGITAL SIGNATURE. PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SHA AUTHENTICATION CODE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

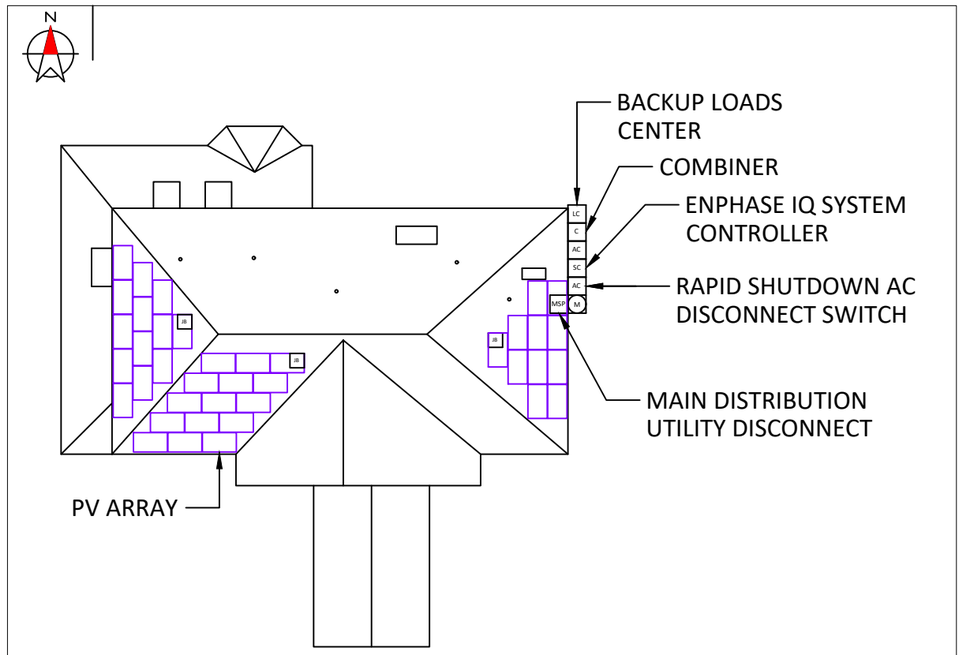
SITE INFORMATION
JERRY PADRTA
253 NW COUNTRY LAKE DR
LAKE CITY, FL 32055
AC SYSTEM SIZE: 12.675 KW AC
DC SYSTEM SIZE: 15.21 KW DC
LAT, 30.206973
LONG, -82.6976787999999
(39) SOLARIA POWERX-390R PV MODULES
(39) ENPHASE IQ8M-72-2-US INVERTER(S)

FLORIDA POWER & LIGHT

DRAWN BY: SoloCAD
10/13/2023
LABELS - PV07

CAUTION

POWER TO THIS BUILDING IS ALSO SUPPLIED FROM ROOF MOUNTED SOLAR ARRAYS WITH SAFETY DISCONNECTS AS SHOWN:



FRONT OF HOME

253 Nw Country Lake Dr, Lake City FL 32055

DIRECTORY:

PERMANENT PLAQUE OR DIRECTORY PROVIDING THE LOCATION OF THE SERVICE DISCONNECTING MEANS AND THE PHOTOVOLTAIC SYSTEM.
(ALL PLAQUES AND SIGNAGE WILL BE INSTALLED AS OUTLINED WITHIN: NEC 690.56(B)&(C), [NEC 705.10]

CONTRACTOR INFORMATION:

Encor Solar LLC
2392 N Orchard Way
Saratoga Springs UT 84045
License #CVC57229
(888)-543-6267

NICHOLAS J. BOWENS LICENSE No 95814 STATE OF FLORIDA PROFESSIONAL ENGINEER

THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY NICHOLAS J. BOWENS, PE USING A DIGITAL SIGNATURE. PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SHA AUTHENTICATION CODE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

10/13/23

SITE INFORMATION

JERRY PADRTA

253 NW COUNTRY LAKE DR

LAKE CITY, FL 32055

AC SYSTEM SIZE: 12.675 KW AC

DC SYSTEM SIZE: 15.21 KW DC

LAT, 30.206973

LONG, -82.6976787999999

(39) SOLARIA POWERX-390R PV MODULES

(39) ENPHASE IQ8M-72-2-US INVERTER(S)

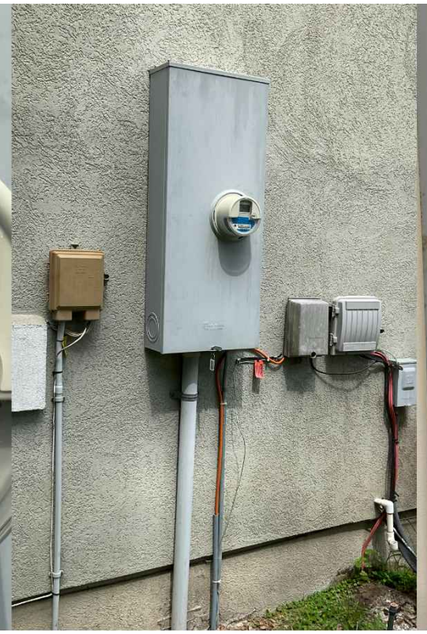
FLORIDA POWER & LIGHT

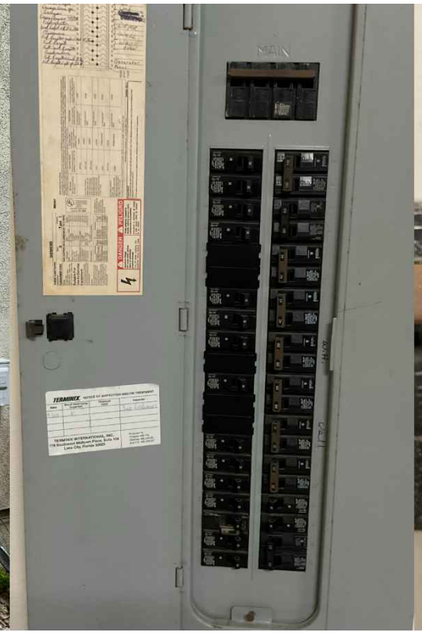
DRAWN BY: SoloCAD

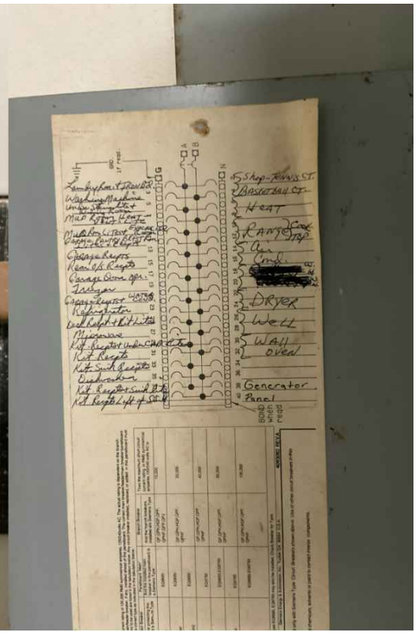
10/13/2023

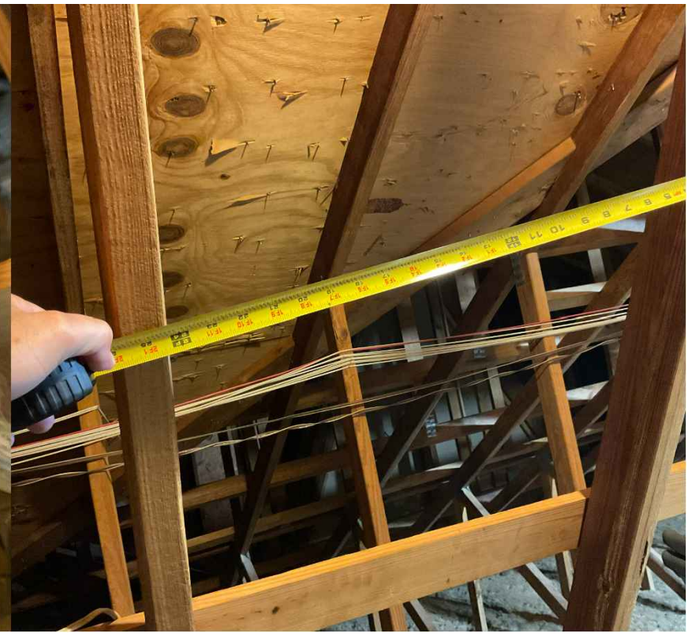
PLACARD - PV08

SITE PHOTOS:









CONTRACTOR INFORMATION:

Encor Solar LLC
2392 N Orchard Way
Saratoga Springs UT 84045
License #CVC57229
(888)-543-6267

NICHOLAS J. BOWENS
LICENSE
No 95814
STATE OF FLORIDA
PROFESSIONAL ENGINEER

THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY NICHOLAS J. BOWENS, PE USING A DIGITAL SIGNATURE. PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SHA AUTHENTICATION CODE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

10/13/23

SITE INFORMATION

JERRY PADRTA

253 NW COUNTRY LAKE DR

LAKE CITY, FL 32055

AC SYSTEM SIZE: 12.675 KW AC

DC SYSTEM SIZE: 15.21 KW DC

LAT, 30.206973

LONG, -82.6976787999999

(39) SOLARIA POWERX-390R
PV MODULES

(39) ENPHASE IQ8M-72-2-US INVERTER(S)

FLORIDA POWER & LIGHT

DRAWN BY: SoloCAD

10/13/2023

SITE PHOTOS - PV09

SOLARIA®

Solaria PowerX | DC Panel

Solaria PowerX-400R Performance Series

Achieving over 20.5% efficiency, Solaria PowerX Performance solar panels feature Solaria's core cell cutting technology, offering higher-power and attractive black-on-black aesthetics compared to conventional solar panels. Solaria has been the market leader in cut-cell technologies for over a decade. With a comprehensive 25-year warranty, PowerX delivers the latest in power and reliability for homeowners.

High Efficiency, High Power

At 400 watts and 20.5% efficiency, Solaria PowerX solar panels are one of the highest power residential panels available.

High Quality and Reliability

State-of-the art cell cutting technology and advanced panel construction ensure that PowerX panels are highly reliable and designed to far exceed the industry-leading 25-year warranty.

All Black Aesthetics

Compared to conventional panels, Solaria PowerX panels have a more uniform all-black appearance.

Best System Value

Solaria PowerX solar panels produce more power per square meter area. This reduces installation costs due to fewer balance of system components.

Improved Shading Tolerance

Sub-strings are interconnected in parallel, which dramatically lowers the shading losses and boosts energy yield.

Low Light Performance

PowerX maintains high efficiency at low irradiance further ensuring maximum energy yield.

About Solaria

Established in 2000, The Solaria Corporation has created one of the industry's most respected IP portfolios, with over 250 issued and pending patents in PV solar cell and module technology. Headquartered in California, Solaria has developed a technology platform that unlocks the potential of solar energy.

SOLARIA®

Solaria PowerX-400R

Performance at STC (1000W/m², 25° C, AM 1.5)

Solaria PowerX-		390R	395R	400R
Max Power (P_{max})	[W]	390	395	400
Efficiency	[%]	20.0	20.2	20.5
Open Circuit Voltage (V_{oc})	[V]	36.9	37.1	37.3
Short Circuit Current (I_{sc})	[A]	13.52	13.60	13.68
Max Power Voltage (V_{mp})	[V]	30.6	30.8	31.0
Max Power Current (I_{mp})	[A]	12.73	12.82	12.9
Power Tolerance	[%]	-0/+3	-0/+3	-0/+3

Performance at NOCT (800W/m², 20°C Amb, Wind 1 m/s, AM 1.5)

Max Power (Pmax)	[W]	290	293	297
Open Circuit Voltage (V_{oc})	[V]	34.3	34.5	34.7
Short Circuit Current (I_{sc})	[A]	11.01	11.10	11.13
Max Power Voltage (V_{mp})	[V]	28.50	28.60	28.76
Max Power Current (I_{mp})	[A]	10.20	10.26	10.32

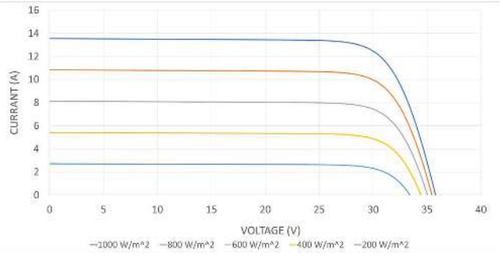
Temperature Characteristics

NOCT	[°C]	45 +/-2
Temp. Coeff. of P_{max}	[% / °C]	-0.36
Temp. Coeff. of V_{oc}	[% / °C]	-0.28
Temp. Coeff. of Isc	[% / °C]	0.048

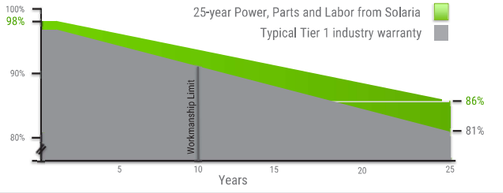
Design Parameters

Operating temperature	[°C]	-40 to +85
Max System Voltage	[V]	1000
Max Fuse Rating	[A]	25
Bypass Diodes	[#]	3

IV Curves vs. Irradiance (400W Panel)



Comprehensive 25-Year Warranty



Mechanical Characteristics

Cell Type	Monocrystalline Silicon
Dimensions (L x W x H)	67.8" x 44.7" x 1.4" 1723mm x 1134mm x 35mm
Weight	22.1 kg / 48.7 lbs
Glass Type / Thickness	AR Coated, Tempered / 3.2mm
Frame Type	Black Anodized Aluminum
Cable Type / Length	12 AWG PV Wire (UL) /1100mm
Connector Type	Staubli MC4
Junction Box	IP68 / 3 diodes
Front Load	5400 Pa / 113 psf*
Rear Load	2400 Pa / 50 psf*

* Refer to Solaria Installation Manual for details

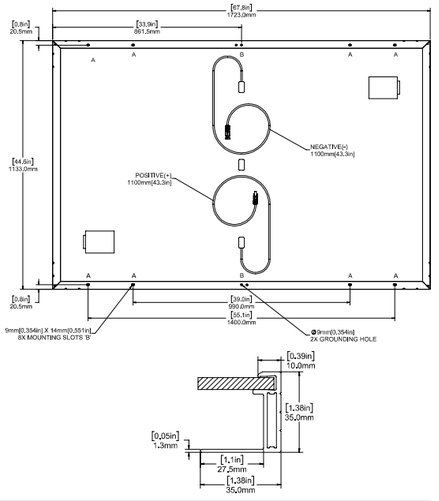
Certifications / Warranty

Certifications	UL 61730 / IEC 61215 / IEC 61730
Fire Type (UL 1703)	2
Power, Parts & Labor Warranty	25 years*

* Warranty details at www.solaria.com

Packaging

Stacking Method	Vertical / Palletized
Panels/ Pallet	31
Pallet Dims (L x W x H)	69.3" x 44.3" x 49.3" 1760mm x 1125mm x 1253mm
Pallet Weight	745 kg / 1642 lbs
Pallets / 40-ft Container	26
Panels / 40-ft Container	806



ENPHASE

DATA SHEET

IQ8 Series 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.

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.

IQ8SE-DS-0001-01-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 Series Microinverters

INPUT DATA (DC)		IQ8-60-2-US	IQ8PLUS-72-2-US	IQ8M-72-2-US	IQ8A-72-2-US	IQ8H-240-72-2-US	IQ8H-208-72-2-US[1]
Commonly used module pairings[2]	W	235 – 350	235 – 440	260 – 460	295 – 500	320 – 540+	295 – 500+
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	33 – 45	36 – 45	38 – 45	38 – 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[3] [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**	**IQ8M-72-2-US**	**IQ8A-72-2-US**	**IQ8H-240-72-2-US**	**IQ8H-208-72-2-US**
Peak output power	VA	245	300	330	366	384	366
Max continuous output power	VA	240	290	325	349	380	360
Nominal (L-L) voltage/range[4]	V	240 / 211 – 264					208 / 183 – 250
Max continuous output current	A	1.0	1.21	1.35	1.45	1.58	1.73
Nominal frequency	Hz	60					
Extended frequency range	Hz	50 – 68					
Max units per 20 A (L-L) branch circuit[5]		16	13	11	11	10	9
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	97.6	97.6	97.6	97.4
CEC weighted efficiency	%	97	97	97	97.5	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) The IQ8H-208 variant will be operating in grid-tied mode only at 208V AC. (2) No enforced DC/AC ratio. See the compatibility calculator at https://link.enphase.com/module-compatibility (3) Maximum continuous input DC current is 10.6A (4) Nominal voltage range can be extended beyond nominal if required by the utility. (5) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

IQ8SE-DS-0001-01-EN-US-2021-10-19

DATASHEET

IQ Load Controller

The IQ Load Controller, when used in conjunction with the IQ System Controller, enables control of up to two loads running 240 VAC L-L or shedding of up to two solar circuits when operating in an off-grid mode with the Enphase Energy System.
The IQ Load Controller can also be used for controlling four loads running 120 VAC L-L.
Up to two IQ Load Controllers can be integrated with each IQ System Controller on a site.

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

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

IQ Battery
The Enphase IQ Battery is an all-in-one AC-coupled storage system that is reliable, smart, simple, and safe. It provides backup capability, and installers can quickly design the right system size to meet the needs of both new and retrofit solar customers.

IQ Combiner
Consolidates interconnection equipment into a single enclosure and streamlines IQ Series Microinverters and IQ Gateway installation by providing a consistent, pre-wired solution for residential applications.

Enphase 5 year limited warranty
5-year limited warranty

Powerful

- Compatible with IQ6, IQ7, IQ8 and M Series Microinverters
- Helps prioritize essential appliances during a grid outage to optimize energy consumption and prolong battery life
- Choose from three load control modes for flexibility or manually control loads from the Enphase App

Simple

- A complete solution for use with the IQ System Controller's load control feature
- DIN rail mounted components enable easy installation and servicing
- Easy configuration via the Enphase App

Reliable

- Designed for indoor or outdoor installations
- 5-year limited warranty

Enphase IQ Load Controller

MODEL NUMBER	EP-NA-LK02-040
EP-NA-LK02-040	IQ Load Controller for use with IQ System Controller's auxiliary contacts to shed non-essential loads or M Series and IQ Series Microinverters
INPUT DATA	
DC power supply input voltage	120 VAC
DC power supply input current rating	12 A
CAPACITY	
Total loads controlled	Two loads running at 240 VAC or four loads at 120 VAC
VOLTAGE RATING	
Load circuits	240/120 VAC, 60 Hz
PV circuits	240 VAC, 60 Hz
CURRENT RATING	
Maximum current rating	• 36 A resistive/25 A inductive/3HP with 45 A OCPD for dedicated load circuits • 32 A resistive/25 A inductive/3HP with 40 A OCPD for branch circuits supplying more than one load
MECHANICAL DATA	
Ambient temperature range	-25°C to 40°C (-13°F to 104°F)
Dimensions (WxHxD)	12.58 in x 14.58 in x 5.96 in
Weight	3 kg (6.61 lbs)
Cooling	Natural convection
Enclosure	Outdoor, NEMA type 4X, polycarbonate construction
WIRE SIZES	
Line/Load power terminals Coil terminals	• Torque 2.5 N m (22 lb-in) • Torque 1.2 N m (11 lb-in)
Wire gauge • Power terminals • Wire gauge coil terminals	 14 AWG–8 AWG 18 AWG–16 AWG
Power supply • 120 V L–N input terminals • 24 V V+/V- output terminals	 14 AWG–12 AWG 18 AWG–16 AWG
Ground terminal block	24 AWG–6 AWG
Neutral terminal block	24 AWG–6 AWG
COMPLIANCE	
Compliance	UL1741
WARRANTY	
Limited warranty	5 years
COMPATIBILITY	
IQ System Controller	IQ System Controller (EP200G101-M240US00) IQ Sytem Controller 2 (EP200G101-M240US01 and EP200G-SC2-RSD-KIT) IQ System Controller 3/3G (SC200D111C240US01 and SC200G111C240US01)

IQLC-DSH-00022-1.0-EN-US-2023-07-19

Revision history

REVISION	DATE	DESCRIPTION
DSH-00022-1.0	July 2023	Updated to new Enphase template.
Previous release		

Data Sheet
Enphase Networking

IQ Combiner 4/4C

The **IQ Combiner 4/4C** with IQ Gateway and integrated LTE-M1 cell modem (included only with IQ Combiner 4C) consolidates interconnection equipment into a single enclosure. It 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.

X-IQ-AM1-240-4C
X2-IQ-AM1-240-4C (IEEE 1547:2018)

X-IQ-AM1-240-4
X2-IQ-AM1-240-4 (IEEE 1547:2018)

Smart

- Includes IQ Gateway for communication and control
- Includes 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
- Supports Wi-Fi, Ethernet, or cellular connectivity
- Optional AC receptacle available for PLC bridge
- Provides production metering and consumption monitoring

Simple

- Mounts on single stud with centered brackets
- Supports bottom, back and side conduit entry
- Allows up to four 2-pole branch circuits for 240VAC 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
- X2-IQ-AM1-240-4 and X2-IQ-AM1-240-4C comply with IEEE 1547:2018 (UL 1741-SB, 3rd Ed.)

UL LISTED

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

ENPHASE

IQ Combiner 4/4C

MODEL NUMBER	
IQ Combiner 4 X-IQ-AM1-240-4 X2-IQ-AM1-240-4 (IEEE 1547:2018)	IQ Combiner 4 with 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 and IQ System Controller 2 and to deflect heat.
IQ Combiner 4C X-IQ-AM1-240-4C X2-IQ-AM1-240-4C (IEEE 1547:2018)	IQ Combiner 4C with IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 ± 0.5%) and consumption monitoring (± 2.5%). Includes 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)
Supported microinverters	IQ6, IQ7, and IQ8. (Do not mix IQ6/7 Microinverters with IQ8)
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 - 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
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)
X-IQ-NA-HD-125A	Hold-down kit for Eaton circuit breaker with screws
Consumption monitoring CT (CT-200-SPLIT/CT-200-CLAMP)	A pair of 200A split core current transformers
ELECTRICAL SPECIFICATIONS	
Rating	Continuous duty
System voltage	120/240VAC, 60 Hz
Eaton BR series busbar rating	125A
Max. continuous current rating	65A
Max. continuous current rating (input from PV/storage)	64A
Max. fuse/circuit rating (output)	90A
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
IQ Gateway breaker	10A or 15A rating GE/Siemens/Eaton included
Production metering CT	200A solid core pre-installed and wired to IQ Gateway
MECHANICAL DATA	
Dimensions (WxHxD)	37.5 cm x 49.5 cm x 16.8 cm (14.75 in x 19.5 in x 6.63 in). Height is 53.5 cm (21.06 in) with mounting brackets.
Weight	7.5 kg (16.5 lbs)
Ambient temperature range	-40°C to +46°C (-40°F to 115°F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction
Wire sizes	• 20A to 50A breaker inputs: 14 to 4 AWG copper conductors • 60A 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	Up to 3,000 meters (9,842 feet)
INTERNET CONNECTION OPTIONS	
Integrated Wi-Fi	IEEE 802.11b/g/n
Cellular	CELLMODEM-M1-06-SP-05, CELLMODEM-M1-06-AT-05 (4G based LTE-M1 cellular modem). Note that an Mobile Connect cellular modem is required for all Enphase Energy System installations.
Ethernet	Optional, IEEE 802.3, Cat5E (or Cat6) UTP Ethernet cable (not included)
COMPLIANCE	
Compliance, IQ Combiner	CA Rule 21 (UL 1741-SA) IEEE 1547:2018 - UL 1741-SB, 3rd Ed. (X2-IQ-AM1-240-4 and X2-IQ-AM1-240-4C) CAN/CSA C22.2 No. 107.1, Title 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

Enphase P/N: EP200G-NA-02-RSD
IMO P/N: SI16-PEL64R-2-ENP

IMO

Technical Datasheet

Key Features

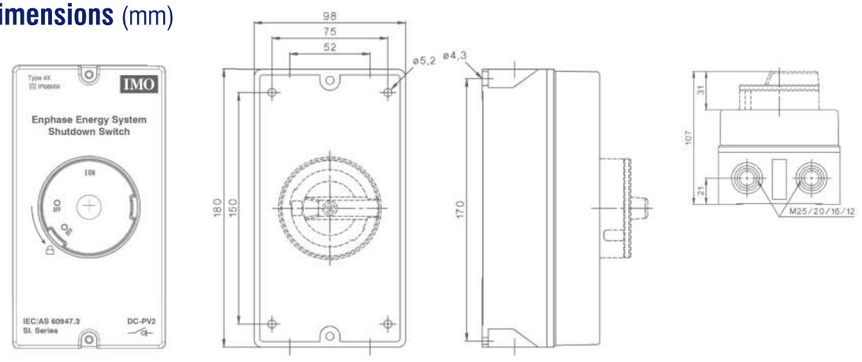
- Enclosed Solar Isolator
- 600VDC, 16A
- IP66 / NEMA 4X Protection Rating
- 2 Pole, 1 String
- Grey/Black Enclosure Cover & Handle

Technical Data for DC

Main Contacts	DC	Units	SI16 DC-PV1 (acc. to IEC 60947-3)	SI16 (acc. to UL508i)
Rated Thermal Current I_{th}		A	16	
Rated Insulation Voltage Ui [1])		V	1000	
Rated Insulation Voltage Ui [2])		V	1500	
Distance of Contacts (per pole)		mm	8	
Rated Operational Current I_e	300V	A	16	16
	350V	A	16	16
	400V	A	16	16
	500V	A	16	16
	600V	A	16	16
Rated Conditional Short Circuit Current		kA_{rms}	5	
Max. Fuse Size	gL (gG)	A	40	
Mechanical Life		Ops	10,000	
Rated Short-time Withstand Current (1s) I_{cw}		A	800	
Short Circuit Making Capacity I_{cm}		A	800	
Size of Terminal Screw			M4 Pz2	
Cable Cross Sections (solid or stranded)		mm / AWG	4 - 16 / 12-10	
Tightening Torque		Nm / lb.in	1.7 - 1.8 / 9 - 16	
Maximum Operation Ambient Temperature		°C	-40 to +45	
Maximum Storage Ambient Temperature		°C	-50 to +90	
Power Loss at I_{max}		(A) / W	(16) / 1	

Contact Resistance per pole 1,75mΩ
1) Suitable at overvoltage category I to III, pollution degree 3 (standard-industry); Uimp = 8kV.
2) Suitable at overvoltage category I to III, pollution degree 2 (min. IP55); Uimp = 8kV.

Dimensions (mm)



Data Sheet
Enphase Energy System

Compatible with M-Series, IQ6, IQ7, or IQ8 Microinverters

IQ System Controller 2

The **IQ System Controller 2** connects the home to grid power, the IQ Battery system, and solar PV. It provides microgrid interconnection device (MID) functionality by automatically detecting and seamlessly transitioning the home energy system from grid power to backup power in the event of a grid failure. It consolidates interconnection equipment into a single enclosure and streamlines grid independent capabilities of PV and storage installations by providing a consistent, pre-wired solution for residential applications.

Easy to Install

- Connects to service entrance[1] or main load center
- Supports main breaker
- Includes neutral-forming transformer
- Mounts on single stud with centered brackets
- Provides conduit entry from bottom, left, or right
- Includes color coded wires for ease of wiring Enphase Energy System Shutdown Switch

Flexible

- Can be used for Sunlight Backup, Home Essentials Backup, or Full Energy Independence
- Integrates with select AC standby generators. See Generator Integration Tech Brief for list of generators

Safe and Reliable

- Enphase Energy System Shutdown Switch can be used to disconnect PV, battery, and generator systems
- It acts as a rapid shutdown initiator of grid forming IQ8 PV Microinverters for safety of maintenance technicians/first responders
- IQ System Controller 2 has a 10-year limited warranty

1. IQ System Controller 2 is not suitable for use as service equipment in Canada.

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

ENPHASE.

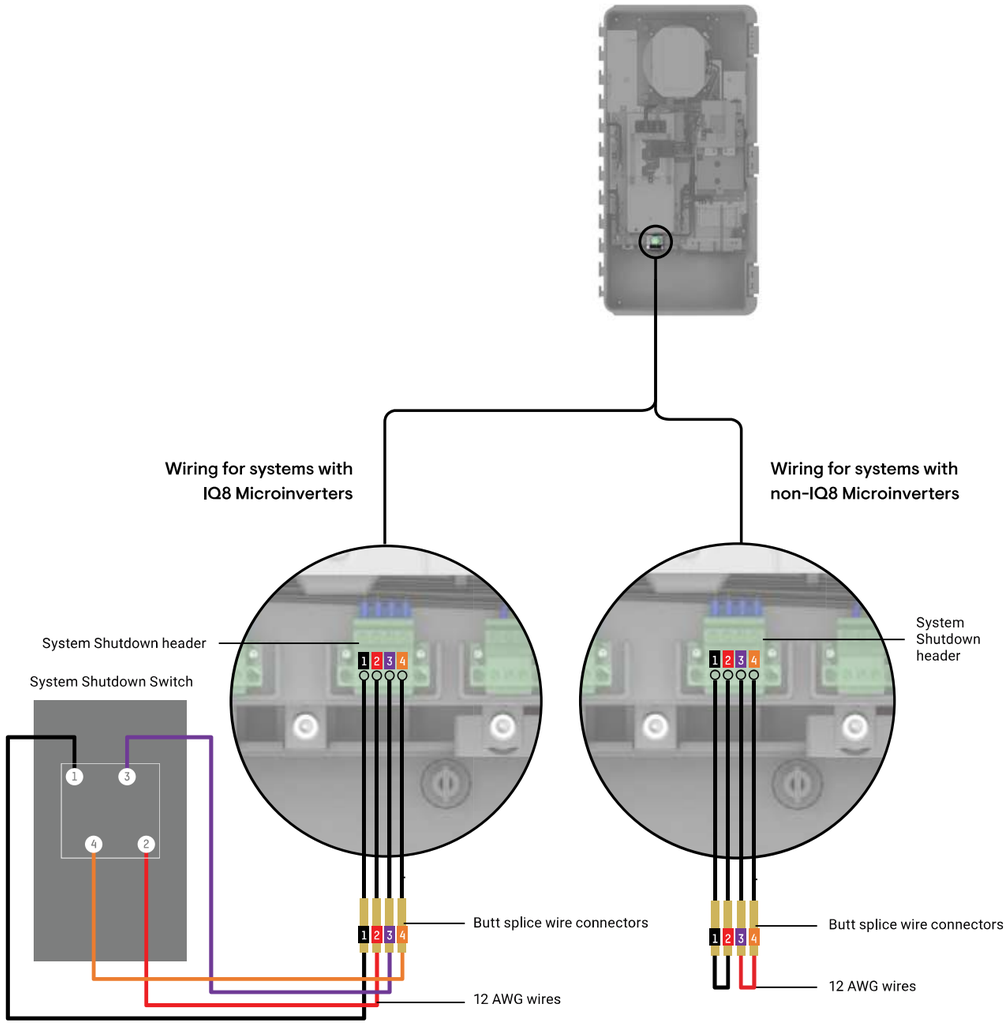
IQ System Controller 2

MODEL NUMBERS		
EP200G101-M240US01 **NOTE:** No longer sold separately.	IQ System Controller 2 with neutral-forming transformer (NFT), and microgrid interconnect device (MID). Streamlines grid-independent capabilities of PV and storage installations.	
EP200G-SC2-RSD-KIT	Includes above plus Enphase Energy System Shutdown Switch (EP200G-NA-02-RSD) with red, black, orange and purple 12 AWG wires, and breaker for powering IQ Gateway (refer to figure 1).	
EP200G-SC2-RSD-BRK-KIT	Includes above plus three Eaton BR220B breakers for either IQ System Controller 2 or IQ Combiner, two BR240B breakers and one BR260 breaker for IQ System Controller 2, two X-IQ-NA-HD-125A hold-down kits for IQ Combiner, and two EP200G-NA-HD-200A hold-down kits for IQ System Controller 2 (refer to figures 2A and 2B).	
ACCESSORIES and REPLACEMENT PARTS (ORDER SEPARATELY AS NEEDED)		
EP200G-NA-XA-E3	Replacement IQ System Controller 2 printed circuit board	
EP200G-NA-HD-200A	Eaton type BR circuit breaker hold-down kit, BRHDK125	
CT-200-SPLIT	200A split core current transformer for generator metering (± 2.5% accuracy)	
Circuit breakers (as needed)[2,3]		
• BRK-100A-2P-240V: Main breaker, 2 pole, 100A, 25kAIC, Eaton CSR2100N • BRK-125A-2P-240V: Main breaker, 2 pole, 125A, 25kAIC, Eaton CSR2125N • BRK-150A-2P-240V: Main breaker, 2 pole, 150A, 25kAIC, Eaton CSR2150N • BRK-175A-2P-240V: Main breaker, 2 pole, 175A, 25kAIC, Eaton CSR2175N • BRK-200A-2P-240V: Main breaker, 2 pole, 200A, 25kAIC, Eaton CSR2200N	• BRK-20A-2P-240V-B: Circuit breaker, 2 pole, 20A, 10kAIC, Eaton BR220B • BRK-30A-2P-240V-B: Circuit breaker, 2 pole, 30A, 10kAIC, Eaton BR230B • BRK-40A-2P-240V-B: Circuit breaker, 2 pole, 40A, 10kAIC, Eaton BR240B • BRK-60A-2P-240V: Circuit breaker, 2 pole, 60A, 10kAIC, Eaton BR260 • BRK-80A-2P-240V: Circuit breaker, 2 pole, 80A, 10kAIC, Eaton BR280	
BRK-20A40A-2P-240V	Quad breaker, 20A/40A, 10kAIC, Eaton BQC220240	
EP200G-HNDL-R1	IQ System Controller 2 installation handle kit	
EP200G-LITKIT	IQ System Controller 2 literature kit, including labels, feed-through headers, screws, filler plates, and QIG	
EP200G-NA-02-RSD	2 pole Enphase Energy System Shutdown Switch	
ELECTRICAL SPECIFICATIONS		
Nominal voltage/range (L-L)	240 VAC/±20%	
Voltage measurement accuracy	±1% (±1.2V L-N and ±2.4V L-L)	
Auxiliary/Dry contact for load control, excess PV control, and generator two-wire control	24V, 1A	
Nominal frequency/range	60 Hz/56 - 63 Hz	
Frequency measurement accuracy	±0.1 Hz	
Maximum continuous current rating	160A	
Maximum input overcurrent protection device[4]	200A	
Maximum output overcurrent protection device[4]	200A	
Maximum overcurrent protection device rating for generator circuit	80A	
Maximum overcurrent protection device rating for storage circuit	80A	
Maximum overcurrent protection device rating for PV combiner circuit	80A	
Internal busbar rating	200A	
Neutral Forming Transformer (NFT) • Breaker rating (pre-installed): 40A between L1 and neutral; 40A between L2 and neutral • Continuous rated power: 3600VA	• Maximum continuous unbalanced current: 30A @ 120V • Peak rated power: 8800VA for 30 seconds • Peak unbalanced current: 80A @ 120V for 30 seconds	
MECHANICAL DATA		
Dimensions (WxHxD)	50cm x 91.6cm x 24.6cm (19.7 in x 36 in x 9.7 in)	
Weight	39.4 kg (87 lbs)	
Ambient temperature range	-40° C to +50° C (-40° F to 122° F)	
Cooling	Natural convection, solar shield	
Enclosure environmental rating	Outdoor, NEMA type 3R, polycarbonate construction	
Maximum altitude	2500 meters (8200 feet)	
WIRE SIZES		
Connections (All lugs are rated to 90C)	• Main lugs and backup load lugs • CSR breaker bottom wiring lugs • AC combiner lugs, IQ Battery lugs, and generator lugs • Neutral lugs	Cu/Al: 1 AWG – 300 KCMIL Cu/Al: 2 AWG – 300 KCMIL 14 AWG – 2 AWG Cu/Al: 6 AWG – 300 KCMIL
Neutral and ground bars	Large holes (5/16-24 UNF) Small holes (10-32 UNF)	14 AWG – 1/0 AWG 14 AWG – 6 AWG
COMPLIANCE		
Compliance	UL1741, UL1741 SA, UL1741 SB, UL1741 PCS CRD, UL1998, UL869A[5], UL67[5], UL508[5], UL50E[5] CSA 22.2 No. 107.1, 47 CFR Part 15 Class B, ICES 003, ICC ES AC156. IQ System Controller 2 is approved for use as service equipment in the United States IFETEL homologation number: RCPENEP22-2078	

2. Compatible with BRHDK125 hold-down kit to comply with 2017 NEC 710.15E for back-fed circuit breakers.
3. The IQ System Controller 2 is rated at 22 kAIC.
4. CSR breakers are not included in EP200G-SC2-RSD-BRK-KIT. Installer must provide correctly rated breakers.
5. Sections from these standards were used during the safety evaluation and included in the UL1741 listing.

IQSC-2-DS-0087-01-EN-US-12-06-2022

Figure 1: Wiring Enphase Energy System Shutdown Switch



IQ System Controller 2

Figure 2A: Installing DER breakers for IQ8 System without generator

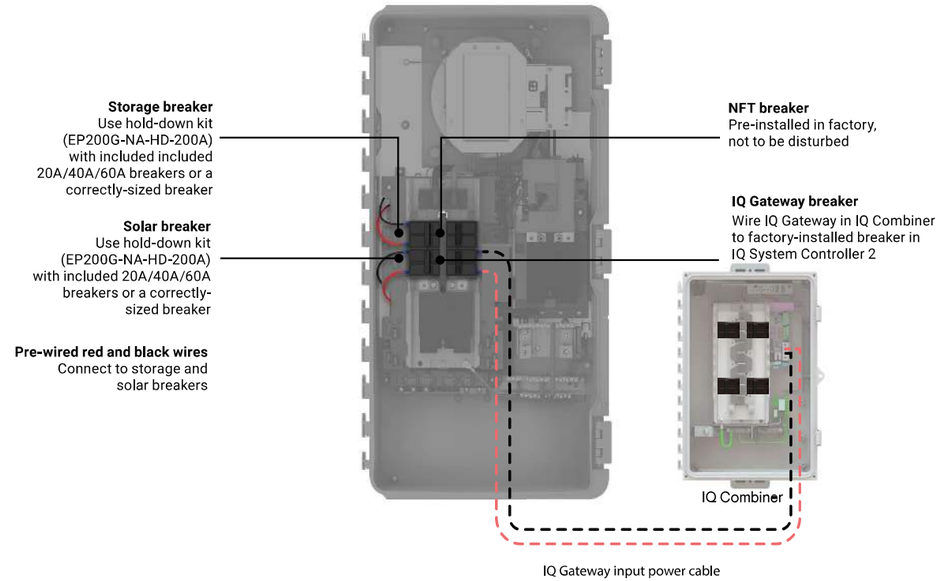
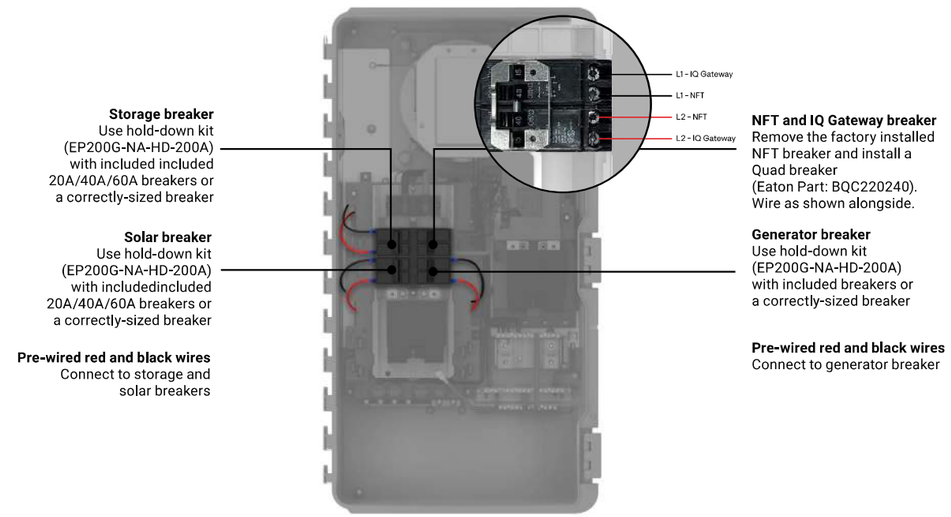


Figure 2B: Installing DER breakers for IQ8 System with generator



IQSC-2-DS-0087-01-EN-US-12-06-2022

SOLARMOUNT

UNIRAC

SOLARMOUNT defined the standard in solar racking. Features are designed to get installers off the roof faster. Our grounding & bonding process eliminates copper wire and grounding straps to reduce costs. Systems can be configured with standard or light rail to meet your design requirements at the lowest cost possible. The superior aesthetics package provides a streamlined clean edge for enhanced curb appeal, with no special brackets required for installation.

Now Featuring:

THE NEW FACE OF SOLAR RACKING

Superior Aesthetics Package

LOSE ALL OF THE COPPER & LUGS

System grounding through Enphase microinverters and trunk cables

SMALL IS THE NEXT NEW BIG THING

Light Rail is Fully Compatible with all SM Components

ENHANCED DESIGN & LAYOUT TOOLS

Featuring Google Map Capabilities within U-Builder

FAST INSTALLATION. SUPERIOR AESTHETICS

OPTIMIZED COMPONENTS • VERSATILITY • DESIGN TOOLS • QUALITY PROVIDER

SOLARMOUNT

UNIRAC

OPTIMIZED COMPONENTS

INTEGRATED BONDING & PRE-ASSEMBLED PARTS

Components are pre-assembled and optimized to reduce installation steps and save labor time. Our new grounding & bonding process eliminates copper wire and grounding straps or bonding jumpers to reduce costs. Utilize the microinverter mount with a wire management clip for an easier installation.

VERSATILITY

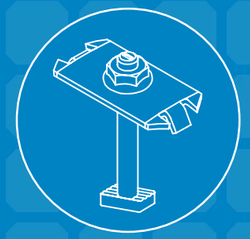
ONE PRODUCT - MANY APPLICATIONS

Quickly set modules flush to the roof or at a desired tilt angle. Change module orientation to portrait or landscape while securing a large variety of framed modules on flat, low slope or steep pitched roofs. Available in mill, clear and dark anodized finishes to outperform your projects financial and aesthetic aspirations.

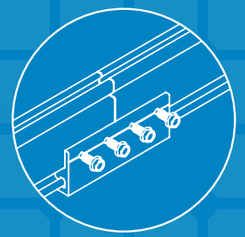
AUTOMATED DESIGN TOOL

DESIGN PLATFORM AT YOUR SERVICE

Creating a bill of materials is just a few clicks away with U-Builder, a powerful online tool that streamlines the process of designing a code compliant solar mounting system. Save time by creating a user profile, and recall preferences and projects automatically when you log in. You will enjoy the ability to share projects with customers: there's no need to print results and send to a distributor, just click and share.

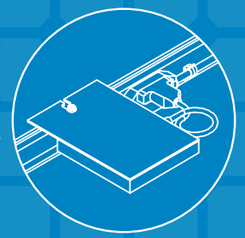


INTEGRATED BONDING MIDCLAMP



INTEGRATED BONDING SPLICE BAR

INTEGRATED BONDING L-FOOT w/ T-BOLT



INTEGRATED BONDING MICROINVERTER MOUNT w/ WIRE MANAGEMENT

LISTED **UL2703**

BONDING & GROUNDING
MECHANICAL LOADING
SYSTEM FIRE CLASSIFICATION

UNIRAC CUSTOMER SERVICE MEANS THE HIGHEST LEVEL OF PRODUCT SUPPORT

UNMATCHED EXPERIENCE | CERTIFIED QUALITY | ENGINEERING EXCELLENCE | BANKABLE WARRANTY | DESIGN TOOLS | PERMIT DOCUMENTATION

TECHNICAL SUPPORT

Unirac's technical support team is dedicated to answering questions & addressing issues in real time. An online library of documents including engineering reports, stamped letters and technical data sheets greatly simplifies your permitting and project planning process.

CERTIFIED QUALITY PROVIDER

Unirac is the only PV mounting vendor with ISO certifications for 9001:2015, 14001:2015 and OHSAS 18001:2007, which means we deliver the highest standards for fit, form, and function. These certifications demonstrate our excellence and commitment to first class business practices.

BANKABLE WARRANTY

Don't leave your project to chance, Unirac has the financial strength to back our products and reduce your risk. Have peace of mind knowing you are receiving products of exceptional quality. SOLARMOUNT is covered by a twenty five (25) year limited product warranty and a five (5) year limited finish warranty.

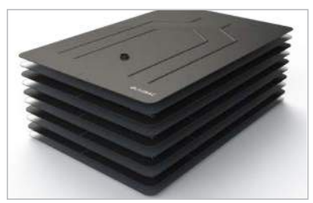
PROTECT YOUR REPUTATION WITH QUALITY RACKING SOLUTIONS BACKED BY ENGINEERING EXCELLENCE AND A SUPERIOR SUPPLY CHAIN

PUB201TFEB28-PRINTED

FLASHKIT PRO

UNIRAC®
FEATURING SHED & SEAL TECHNOLOGY

FLASHKIT PRO is the complete attachment solution for composition shingle roofs. Featuring Unirac's patented **SHED & SEAL** technology, a weather proof system which provides the ultimate protection against roof leaks. Kitted in 10 packs for maximum convenience, flashings and hardware are available in Mill or Dark finishes. With **FLASH**KIT pro, you have everything you need for a quick, professional installation.



TRUSTED WATER SEAL FLASHINGS
FEATURING SHED & SEAL TECHNOLOGY

YOUR COMPLETE SOLUTION
Flashings, lags, continuous slot L-Feet and hardware

CONVENIENT 10 PACKS
Packaged for speed and ease of handling

THE COMPLETE ROOF ATTACHMENT SOLUTION

FOR QUESTIONS OR CUSTOMER SERVICE VISIT UNIRAC.COM OR CALL (505) 248-2702

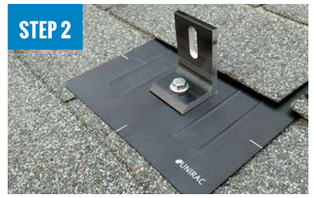
FLASHKIT PRO

INSTALLATION GUIDE

UNIRAC®
FEATURING SHED & SEAL TECHNOLOGY

FLASHKIT PRO IS THE COMPLETE FLASHING AND ATTACHMENT SOLUTION FOR COMPOSITION ROOFS.

INSTALL **FLASH**KIT PRO FLASHING



INSTALL L-FOOT

ATTACH L-FOOT TO RAIL

PRE-INSTALL

- Locate roof rafters and snap chalk lines to mark the installation point for each roof attachment.
- Drill a 7/32" pilot hole at each roof attachment. Fill each pilot hole with sealant.

STEP 1 INSTALL **FLASH**KIT PRO FLASHING

- Add a U-shaped bead of roof sealant to the underside of the flashing with the open side of the U pointing down the roof slope. Slide the aluminum flashing underneath the row of shingles directly up slope from the pilot hole as shown. Align the indicator marks on the lower end of the flashing with the chalk lines on the roof to center the raised hole in the flashing over the pilot hole in the roof. When installed correctly, the flashing will extend under the two courses of shingles above the pilot hole.

STEP 2 INSTALL L-FOOT

- Fasten L-foot and Flashing into place by passing the included lag bolt and pre-installed stainless steel-backed EPDM washer through the L-foot EPDM grommet, and the raised hole in the flashing, into the pilot hole in the roof rafter.
- Drive the lag bolt down until the L-foot is held firmly in place. It is normal for the EPDM on the underside of the stainless steel backed EPDM washer to compress and expand beyond the outside edge of the steel washer when the proper torque is applied.

TIP:

- Use caution to avoid over-torqueing the lag bolt if using an impact driver.
- Repeat Steps 1 and 2 at each roof attachment point.

STEP 3 ATTACH L-FOOT TO RAIL

- Insert the included 3/8"-16 T-bolts into the lower slot on the Rail (sold separately), spacing the bolts to match the spacing between the roof attachments.
- Position the Rail against the L-Foot and insert the threaded end of the T-Bolt through the continuous slot in the L-Foot. Apply anti-seize to bolt threads to prevent galling of the T-bolt and included 3/8" serrated flange nut. Place the 3/8" flange nut on the T-bolt and finger tighten. Repeat STEP 3 until all L-Feet are secured to the Rail with a T-bolt. Adjust the level and height of the Rail and torque each bolt to 30ft-lbs.

FASTER INSTALLATION. 25-YEAR WARRANTY.

FOR QUESTIONS OR CUSTOMER SERVICE VISIT UNIRAC.COM OR CALL (505) 248-2702