

**SUPERIOR CHARTER TOWNSHIP  
ZONING BOARD OF APPEALS  
3040 N. PROSPECT RD., YPSILANTI, MI 48198**

**TUESDAY  
JANUARY 31, 2023  
7:00 P.M.  
AGENDA**

1. CALL TO ORDER
2. ROLL CALL
3. ADOPTION OF AGENDA
4. APPROVAL OF MINUTES
  - A. Approval of the November 03, 2022 minutes
5. CITIZEN PARTICIPATION
6. COMMUNICATIONS
7. PUBLIC HEARINGS AND CONSIDERATION OF APPEALS
  - A. **ZBA #23-01 10024 Ford Road - Solar**  
Variance from Section 6.03 (Accessory Structures and Uses) to allow for ground-mounted solar panels to be installed in front of the principal dwelling.
8. OLD BUSINESS
9. OTHER BUSINESS AS NECESSARY
  - A. Election of Officers for 2023
10. ADJOURNMENT

**SUPERIOR CHARTER TOWNSHIP  
ZONING BOARD OF APPEALS  
APPROVED MINUTES  
NOVEMBER 3, 2022  
PAGE 1 of 3**

1. CALL TO ORDER

The meeting of the Superior Charter Township Zoning Board of Appeals was called to order by Chairman Dail at 7:00 p.m.

2. ROLL CALL

The Zoning Board of Appeals members present were Brennan, Dail, Lewis and Parm. Craigmile, Deeds and Heningburg were absent. Bill Balmes, Building Official, and Laura Bennett, Planning & Zoning Administrator, were also in attendance. A quorum was present.

3. ADOPTION OF AGENDA

A motion was made by Member Parm and supported by Member Brennan to adopt the agenda as presented. The motion carried.

4. APPROVAL OF MINUTES

A motion was made by Member Brennan and supported by Member Parm to approve the minutes of October 19, 2022. The motion carried.

5. CITIZEN PARTICIPATION

None.

6. COMMUNICATIONS

Motion by Member Parm and supported by Member Lewis to receive and file a memo from Honigman Law Firm dated November 2, 2022.

7. PUBLIC HEARINGS AND CONSIDERATION OF APPEALS

None.

8. OLD BUSINESS

A. ZBA #22-04 Schuster Appeal

Appeal of the decision of the former Township Zoning Official; regarding 5766 Geddes Road.

Pat Lennon, Honigman Law, discussed the contents of the memo submitted on November 2, 2022, including providing defects in the

**SUPERIOR CHARTER TOWNSHIP  
ZONING BOARD OF APPEALS  
APPROVED MINUTES  
NOVEMBER 3, 2022  
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approval process, and explained why the right-of-way on the Mouliere's property can only be vacated by public act. He continued to state that Rick Mayernik, former Building & Zoning Official, interpreted it as an improved road and that interpretation was adopted by the ZBA, so the easement cannot be terminated by merger.

Adam Behrendt, Bodman Law, stated that the variance has already been granted by the ZBA at a previous meeting. Mr. Behrendt cited controlling Michigan law explaining that you cannot have an easement on your property. He went on to state that the ZBA has already decided that a home can be built in that location.

Member Dail explained that he discussed this issue with Rick Mayernik after the October 19, 2022, ZBA meeting. The issue of the building protruding into the right-of-way was well-known and indicated on the drawings and added that Mr. Mayernik knew when he issued the Zoning Compliance approval. Member Dail acknowledged that the variance approved by the ZBA on January 12, 2022, did not specify the dimensions.

Member Dail explained that the ZBA is not a court of law and must follow the Superior Township Zoning Ordinance. He read Section 13.06(6) of the Superior Township Zoning Ordinance regarding reversing decisions of the Zoning Official. He stated that there was much discussion at the October ZBA meeting but believes Rick did not make an erroneous decision.

There was no further discussion from the Members.

Motion by Member Brennan and supported by Member Parm to deny ZBA 22-04, Schuster Appeal, on the basis that the action of the former Building Official, Rick Mayernik, was not:

- (1) an abuse of discretion, or
- (2) arbitrary or capricious, or
- (3) based on an erroneous finding of a material fact or an erroneous interpretation of the Zoning Ordinance.

Mr. Lennon expressed his disagreement with the motion. He stated that having a conversation with the former Building Official does not solve where the right-of-way is, nor the defects. Mr. Lennon feels the ordinance violations are being brushed aside and hopes the Zoning Board of Appeals will reconsider and make a new motion.

**SUPERIOR CHARTER TOWNSHIP  
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PAGE 3 of 3**

Mr. Behrendt replied that there is a variance that has already been granted by the ZBA. Mr. Mayernik was aware of what was permitted, and the decision was not made in error.

Roll Call:

Yes: Brennan, Dail, Lewis, Parm.  
No: None.  
Absent: Craigmile, Deeds, Heningburg.  
Abstain: None.

The motion carried.

9. OTHER BUSINESS AS NECESSARY

None.

10. ADJOURNMENT

A motion was made by Member Brennan and supported by Member Lewis to adjourn the meeting at 7:25 p.m.

Respectfully submitted,

Doug Dail, Chairman Zoning Board of Appeals

Laura Bennett, Recording Secretary  
Superior Charter Township  
3040 N. Prospect, Ypsilanti, MI 48198

**ZONING BOARD OF APPEALS  
SUPERIOR CHARTER TOWNSHIP  
SUPERIOR TOWNSHIP HALL  
3040 N. PROSPECT, YPSILANTI, MI 48198  
TUESDAY, JANUARY 31, 2023  
7:00 p.m.**

**ZBA #23-01**

The Superior Township Zoning Board of Appeals will hold a public hearing on **Tuesday, January 31, 2023, at 7:00 p.m.** at the Superior Township Hall, 3040 N. Prospect, on a request for the following variance from the Superior Township Zoning Ordinance:

Variance from Section 6.03 (Accessory Structures and Uses) to allow for ground-mounted solar panels to be installed in front of the principal dwelling.

**The property is located at 10024 Ford Road** and is zoned A-1 (Agricultural District).

Parcel ID # J-10-13-200-005

A complete copy of the petition for variance is available for inspection or copying at the Township Hall 9:00 a.m. – 4:00 p.m. weekdays. Persons wishing to express their views may do so in person at the public hearing, or in writing addressed to the Zoning Board of Appeals at the above address. Superior Township will provide necessary reasonable auxiliary aids and services to individuals with disabilities upon four (4) business days notice to the Township. Individuals requiring auxiliary aids or services should contact Superior Charter Township by writing the Township Clerk.

Laura Bennett, Planning & Zoning Administrator  
3040 N. Prospect  
Ypsilanti, MI 48198  
[planning@superior-twp.org](mailto:planning@superior-twp.org)  
734-482-6099

## ZONING BOARD OF APPEALS APPLICATION

(This application must be typewritten or printed. All questions must be answered.)

**Request is hereby** made for one of the following:

- ☐ Interpretation of the Zoning Ordinance/Official Zoning Map (Section 13.07)
- ☒ Variance from the requirements of the following Zoning Ordinance  
Section(s): 6.03.02
- ☐ Appeal of the decision of the Township Zoning Official

### APPLICANT INFORMATION

Name Christine Domalik - Revolution Solar

Address 9960 W 191st Street Unit A Mokena, IL 60448

Phone Number 708-694-2321 Email permits.mi@revolutionsolar.com

Is the property owned by the applicant? ☐ YES ☒ NO

If "NO", what is the applicant's interest in the property? Contractor

Name, address and telephone number of owner(s): Jonathan Littlefield ph. 207-403-0056

Address: 10024 Ford Road Ypsilanti, MI 48198

### DESCRPTION OF THE PROPERTY

Address 10024 Ford Road Ypsilanti, MI 48198

Parcel ID# J01013200005 Parcel size 0.76 acres

Size of the proposed building or addition, if any In front yard, facing Ford Road

Use of existing building (if any) and property Solar panels - generate renewable energy for the home

Zoning classification of property A-1

If a new building is proposed, has the Building Inspection department examined the plans for the proposed building? ☐ YES ☒ NO

Has the department refused a permit? ☐ YES ☒ NO

Has there been any previous land use application involving this property? ☐ YES ☒ NO

If "YES", state the date of filing, the character of appeal and the disposition.

## DESCRIBE THE REASONS FOR YOUR APPEAL

Note: The Zoning Board of Appeals is required to use the standards listed in Section 13.08(B) of the Zoning Ordinance when considering an appeal. It is recommended that applicants review these standards and consider them in preparing a description of why the variance is needed. A copy of the standards is attached to the application.

We are appealing this because the front yard is the only place to put these solar panels. The sides and rear of the yard are heavily wooded, and that coverage would severely reduce the maximum production of the solar panels. The roof is not an option either, as it is shaded by all of the trees. You can see with some of the documentation provided that any other location would reduce the panel productivity.

YOU MAY WISH TO ASK YOUR NEIGHBORS TO SIGN THE FOLLOWING SECTION IF THEY HAVE NO OBJECTION TO THE APPEAL YOU ARE MAKING.

We the undersigned, as owners of property any part of which is located within 300 feet of any part of the property involved in this appeal, have no objections to the granting of the request made in this appeal:

NAME (PLEASE PRINT)

SIGNATURE

STREET ADDRESS


## INFORMATION REQUIRED TO BE SUBMITTED WITH APPEAL

The following must attached and submitted with the application:

- Ten (10) sets of drawings, all on sheets 8 ½ inches by 11 inches or 8 ½ inches by 14 inches, drawn to scale and showing all measurements, features and structures, including the general location of all natural features on the property, measurements to show distances between structures, measurements between structures and property lines, measurements for lot width and lot area, and height of structures. Rights-of-way and easements must also be shown.
- A letter of authority, or power of attorney, in the event the appeal is being made by a person other than the actual owner of the property.
- A complete legal description of the premises (as stated on the property deed or property tax bill.)

**APPLICANT'S DEPOSITION** – Must be completed by applicant.

*I hereby state that all of the statements and information contained in this application and the supporting documents herewith are true and correct.*

Signature of applicant \_\_\_\_\_ Date 12/21/2022

**NOTARY PUBLIC** – Applicant's signature must be notarized.

Sworn to before me this \_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_

My commission expires \_\_\_\_\_  
(Notary Public, Washtenaw County, Michigan)

\*\*\*\*\*

*To be filled in by Township Clerk (or designated Township Officer/Personnel)*

I hereby state that this petition was properly received and filed on \_\_\_\_\_(date)

Signature of Clerk (or designee)

\_\_\_\_\_

Fee paid \_\_\_\_\_

## **Notice to Applicants for the Zoning Board of Appeals**

### **Filing Applications**

You must call and schedule an appointment with the Township Planning & Zoning Administrator, Laura Bennett, to file an application. She may be reached at the Township Office at (734) 482-6099 or [planning@superior-twp.org](mailto:planning@superior-twp.org).

### **Meeting Schedule**

The Zoning Board of Appeals does not have a regular meeting schedule. Meetings are called whenever there is an application for a variance. Because variance requests require a public hearing, it generally takes four (4) weeks from the date an application is received until a meeting of Zoning Board of Appeals can be held. This time is needed to schedule the meeting date and to mail out notices of the public hearing.

### **Reasons for the Appeal**

The Zoning Board of Appeals is required to use the standards listed in Section 13.08 of the Zoning Ordinance when considering the appeals. It is recommended that applicants review these standards and consider them in preparing a description of why the variance is needed.

### **Site Visits**

Filing an application gives the implied consent for Township officials and/or consultants to visit the subject site.

### **Application Fees**

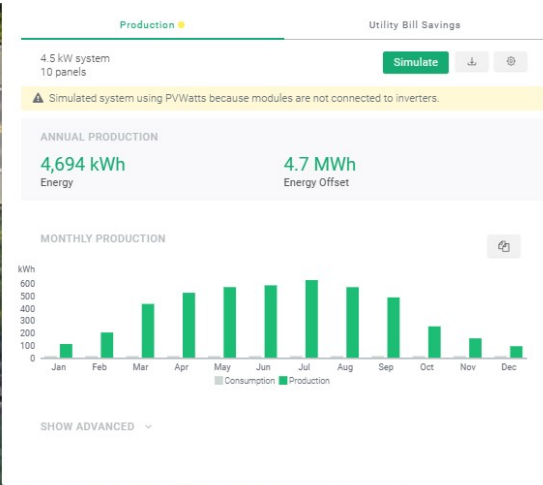
An application fee must be paid when you file your application. The fees are as follows:

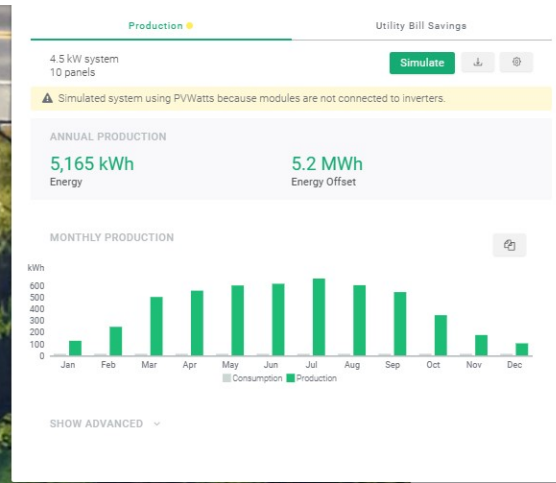
1. Appeals brought by the owner of a single-family dwelling for a variance from density and height regulations of the Zoning Ordinance = **\$175.00**
2. Any other appeal = **\$500.00**

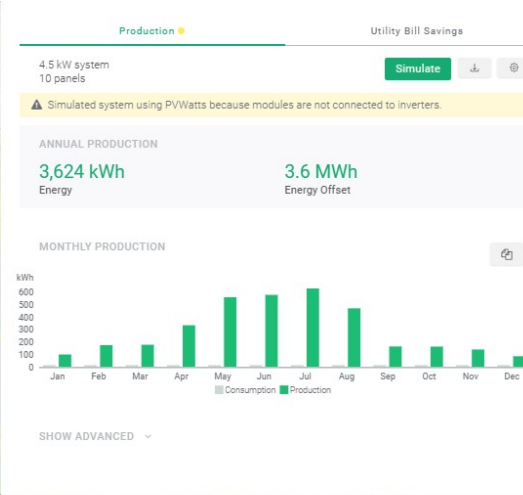
### **Applicant's Acknowledgement**

*I hereby acknowledge that I have read and agree to the above and that I have been given a copy of this notice.*

<hr style="border: 0; border-top: 1px solid black; margin-bottom: 5px;"/>	<hr style="border: 0; border-top: 1px solid black; margin-bottom: 5px;"/>
Signature	Date





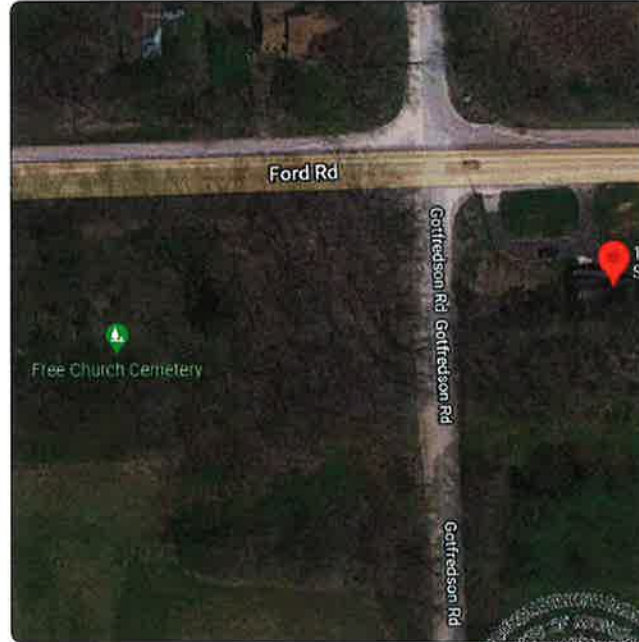




### AERIAL VIEW:



### MAP VIEW:



Revolution Energy Systems Inc.  
9981 West 190th St  
Unit K Mokena IL 60448  
T: 708-995-1643

### SITE INFORMATION

JONATHAN WAYNE LITTLEFIELD  
10024 FORD RD  
YPSILANTE, MI 48198

AC System Size: 2.90 kW AC / 2.90 kVA  
DC System Size: 4.50 kW DC

Lat, 42.3200478  
Long, -83.5654235

(10) CANADIAN SOLAR CS3W-450MS 450  
PV Modules

(10) ENPHASE IQ8PLUS-72-2-US (240V)  
Inverter(s)

(1) ENPHASE: IQ BATTERY 3T 3.5kWh

DTE

### SHEET INDEX:

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

DRAWN BY: J.DANIELES

DATE:  
12/7/2022

COVER PAGE - PV01

### 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

#### EQUIPMENT:

AC System Size: 2.90 kW AC / 2.90 kVA

DC SYSTEM SIZE: 4.50 kW DC

(10) CANADIAN SOLAR CS3W-450MS 450 PV Modules

(10) ENPHASE IQ8PLUS-72-2-US (240V) Inverters

(1) RACKING: IRONRIDGE G.M.

(2) ENPHASE: BATTERY 3T 3.5kWh 1.28kVA

### APPLICABLE GOVERNING CODES

2014 NEC	2015 IMC
2015 IRC	2015 IECC
2015 IPC	2005 IEBC
2015 IBC	



Signed 12/07/2022

### SITE SPECIFICATIONS

OCCUPANCY: R-3

ZONING: RESIDENTIAL

### DESIGN CRITERIA

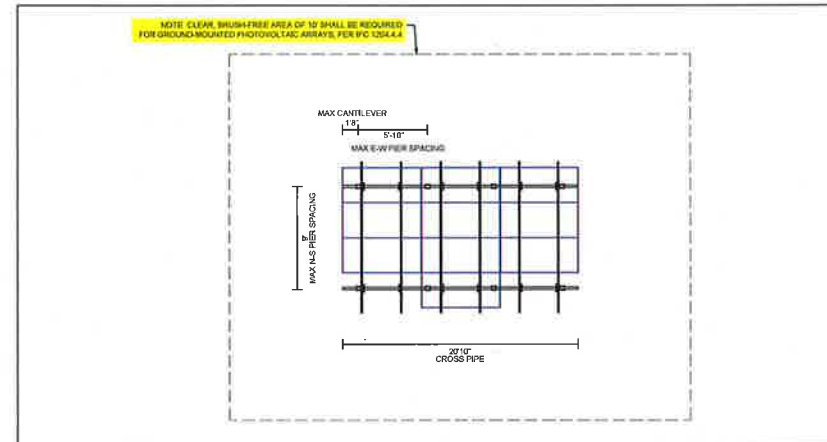
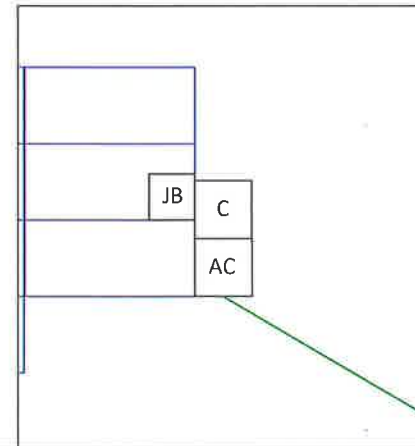
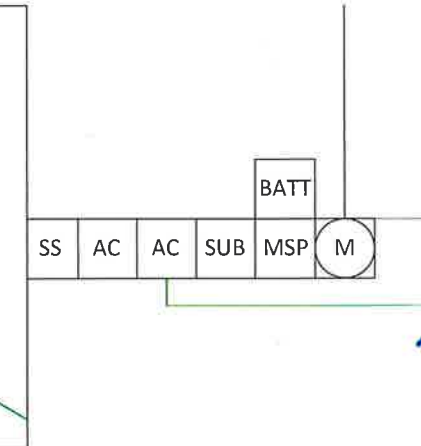
SNOWLOAD: 20 PSF

WINDSPEED: 105 MPH

EXPOSURE: CATEGORY B

**ARRAY DETAILS:**

MOUNTING PLANE:	AZIMUTH:	TILT:
MP1	180°	25°

**CLOSE UP OF PROPOSED GROUND MOUNT****CLOSE UP OF EQUIPMENT LOCATION AT PV ARRAY****CLOSE UP OF MSP AND UTILITY METER LOCATION AT MAIN HOUSE**

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DC System Size: 4.50 kW DC

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Long, -83.5654235

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(10) ENPHASE IQ8PLUS-72-2-US (240V) Inverter(s)

(1) ENPHASE: IQ BATTERY 3T 3.5kWh

DTE



Signed 12/07/2022

DRAWN BY: J. DANIELES

DATE:  
12/7/2022

SITE PLAN - PV02

**EQUIPMENT LEGEND:**

UTILITY METER	AC DISCONNECT	INVERTER	SUB PANEL	SERVICE DISCONNECT	SMART SWITCH (IQ System Controller)	PV MODULES	FIRE ACCESS PATHWAY (3' TYP)
MAIN SERVICE PANEL	METER SOCKET (For utility PV meter)	COMBINER BOX	LOAD CENTER	BATTERY(IES)	JUNCTION BOX	AUTOMATIC TRANSFER SWITCH	PROPERTY LINE

THE AC DISCONNECT FOR SOLAR AND BATTERY (VISIBLE BREAK, LOCKABLE, & BLADE STYLE DISCONNECT) AND UTILITY METER MUST ALL WITHIN 5' OF EACH OTHER.



NOTE CLEAR, BRUSH-FREE AREA OF 10' SHALL BE REQUIRED  
FOR GROUND-MOUNTED PHOTOVOLTAIC ARRAYS, PER IFC 1204.4.4

MAX CANTILEVER

1'8"  
5'-10"

MAX E-W PIER SPACING

MAX N-S PIER SPACING

9'

20'10"  
CROSS PIPE

EQUIPMENT INFORMATION:

RAILS:	IRONRIDGE
PIPE SIZE:	XR1000



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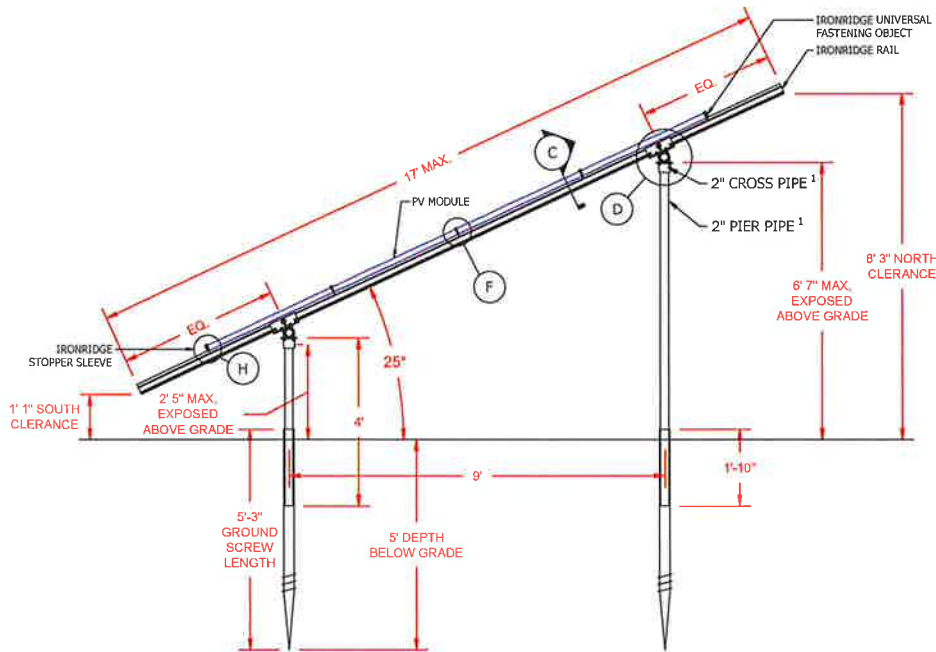


Signed 12/07/2022

DRAWN BY: J.DANIELES

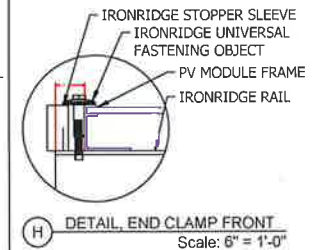
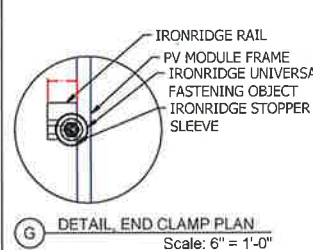
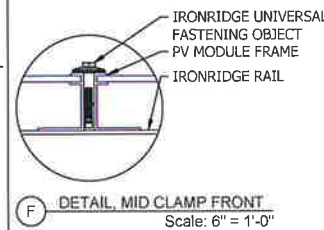
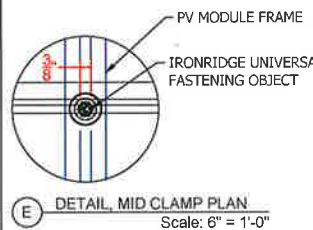
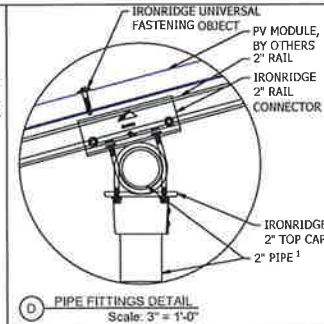
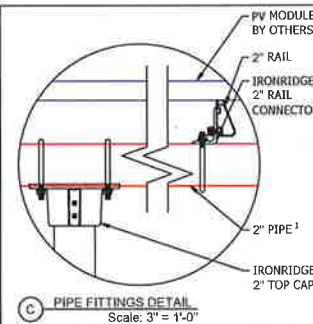
DATE:  
12/7/2022

PV MODULE LAYOUT



#### EQUIPMENT INFORMATION:

RAILS:	IRONRIDGE
PIPE SIZE:	XR1000



1. SCHEDULE 40 PIPE OR ALLIED MECHANICAL TUBING (8GA WALL THICKNESS)

**REVOLUTION**  
SOLAR

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(1) ENPHASE: IQ BATTERY 3T 3.5kWh

DTE



Signed 12/07/2022

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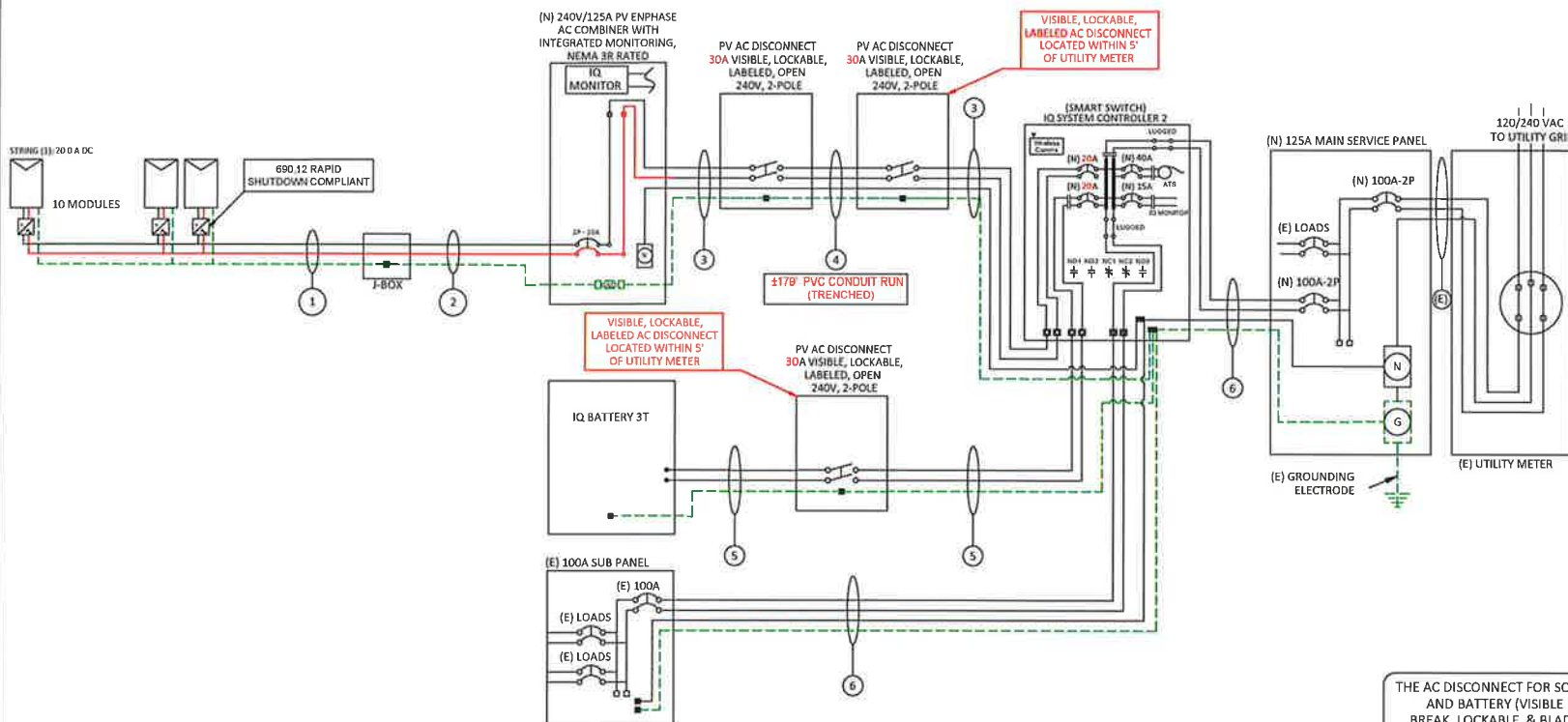
MOUNTING DETAIL - PV04

CANADIAN SOLAR CS3W-450MS 450 Specs	
POWER MAX (P <sub>MAX</sub> ):	450W
OPEN CIRCUIT VOLTAGE (V <sub>OC</sub> ):	49.1V
MAX POWER-POINT CURRENT (I <sub>MP</sub> ):	10.96A
MAX POWER-POINT VOLTAGE (V <sub>MP</sub> ):	41.1V
SHORT CIRCUIT CURRENT (I <sub>SC</sub> ):	11.6A
SERIES FUSE RATING:	20A

ENPHASE : IQ8PLUS-72-2-US (240V) Specs	
MAX INPUT VOLTAGE:	480 V
MAX INPUT CURRENT:	20 A
NOMINAL DC INPUT VOLTAGE:	400 V
MAXIMUM OUTPUT POWER:	290 W
NOM. OUTPUT VOLTAGE:	240 V
MAX OUTPUT CURRENT:	1.21 A
1-Phase, 60 HZ, UL 1741 Listed	

Equipment Schedule			
TYPE:	QTY:	DESCRIPTION:	RATING:
MODULES:	(10)	CANADIAN SOLAR CS3W-450MS 450	450 W
INVERTERS:	(10)	ENPHASE IQ8PLUS-72-2-US (240V)	290 W
AC DISCONNECTS:	(3)	PV AC Disconnect, 240V, 2-Pole	30 A
COMBINER BOX:	(1)	ENPHASE COMBINER 4/ 4C	125 A
BATTERY:	(1)	ENPHASE IQ BATTERY 3T	1280 W
SMART SWITCH:	(1)	ENPHASE IQ SYSTEM CONTROLLER 2	200A

Conduit & Conductor Schedule				
TAG	QTY	WIRE GAUGE	DESCRIPTION	CONDUIT SIZE
1	(2)	10 AWG (90°C)	Q-CABLE, COPPER (L1, L2)	N/A - FREE AIR
	(1)	6 AWG (90°C)	THWN-2 COPPER - (GROUND)	
2	(2)	10 AWG (90°C)	THHN/THWN-2, COPPER - (L1, L2)	3/4" EMT
	(1)	10 AWG (90°C)	THWN-2 COPPER - (GROUND)	
3	(3)	10 AWG (90°C)	THHN/THWN-2, COPPER - (L1, L2, NEUTRAL)	3/4" EMT
	(1)	10 AWG (90°C)	THWN-2 COPPER - (GROUND)	
4	(3)	10 AWG (90°C)	THHN/THWN-2, COPPER - (L1, L2, NEUTRAL)	1" PVC
	(1)	10 AWG (90°C)	THWN-2 COPPER - (GROUND)	
5	(2)	10 AWG (90°C)	THHN/THWN-2, COPPER - (L1, L2)	3/4" EMT
	(1)	10 AWG (90°C)	THWN-2 COPPER - (GROUND)	
6	(3)	1 AWG (75°C)	THHN/THWN-2, COPPER - (L1, L2, NEUTRAL)	1-1/4" EMT
	(1)	6 AWG (75°C)	THWN-2 COPPER - (GROUND)	



THE AC DISCONNECT FOR SOLAR AND BATTERY (VISIBLE BREAK, LOCKABLE, & BLADE STYLE DISCONNECT) AND UTILITY METER MUST ALL WITHIN 5' OF EACH OTHER.



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DTE

DRAWN BY: J.DANIELES

DATE:  
12/7/2022

LINE DIAGRAM - PV05

STRING CALCULATIONS	
ENPHASE : IQ8PLUS-72-2-US (240V)	STRING #1
MAX AC CURRENT	15.1A
MICRO INVERTER(S) IN SERIES:	10
NOMINAL VOLTAGE / RANGE <sup>2</sup> :	211V - 264V
MAX AC OUTPUT POWER:	2900W
ARRAY DC POWER:	4500W
TOTAL MAX AC CURRENT:	12.08A

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

SYSTEM OCPD CALCULATIONS	
INVERTER MODEL(S):	ENPHASE IQ8PLUS-72-2-US (240V)
# OF INVERTER(S):	10
MAX OUTPUT CURRENT:	1.21A
(# OF INVERTERS) X (MAX OUTPUT CURRENT) X 125% <= OCPD RATING (10 X 1.21A X 1.25) = 15.10A <= 20A, OK	

SYSTEM OCPD CALCULATIONS	
BATTERY MODEL(S):	ENPHASE IQ BATTERY 3T 3.5kWh
# OF BATTERY(S):	1
MAX OUTPUT CURRENT:	5.3A
(# OF BATTERIES) X (MAX OUTPUT CURRENT) X 125% <= OCPD RATING (1 X 5.3A X 1.25) = 6.63A=20A, OK	

BUSBAR CALCULATIONS - 120% RULE	
MAIN BUS BAR RATING:	125A
MAIN DISCONNECT RATING:	100A
PV OCPD RATING:	40A
PV OCPD RATING:(MAIN BUS RATING X 120%) - MAIN DISCONNECT RATING >= OCPD RATING (125A X 1.2) - 100A = 50A, >= 40A, 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)	10 AWG	Q-CABLE , COPPER (L1, L2)	N/A - FREE AIR	40A	90°C	32°C	0.96	N/A - FREE AIR	38.4A	N/A - FREE AIR
	(1)	6 AWG	THWN-2 COPPER - (GROUND)								
2	(2)	10 AWG	THHN/THWN-2, COPPER - (L1, L2)	3/4" EMT	40A	90°C	32°C	0.96	1.0	38.4A	11.45%
	(1)	10 AWG	THWN-2 COPPER - (GROUND)								
3	(3)	10 AWG	THHN/THWN-2, COPPER - (L1, L2, NEUTRAL)	3/4" EMT	40A	90°C	32°C	0.96	1.0	38.4A	15.27%
	(1)	10 AWG	THWN-2 COPPER - (GROUND)								
4	(3)	10 AWG	THHN/THWN-2, COPPER - (L1, L2, NEUTRAL)	1" PVC	40A	90°C	N/A	N/A	1.0	40A	9.79%
	(1)	10 AWG	THWN-2 COPPER - (GROUND)								
5	(2)	10 AWG	THHN/THWN-2, COPPER - (L1, L2)	3/4" EMT	40A	90°C	32°C	0.96	1.0	36.4A	11.45%
	(1)	10 AWG	THWN-2 COPPER - (GROUND)								
6	(3)	1 AWG	THHN/THWN-2, COPPER - (L1, L2, NEUTRAL)	1-1/4" EMT	130A	75°C	32°C	0.94	1.0	122.2A	39.74%
	(1)	6 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. INTERCONNECTION SIZING, LIMITATIONS AND COMPLIANCE DETERMINED IN ACCORDANCE WITH [NEC 705.12], AND [NEC 690.64].
2. GROUND FAULT PROTECTION IN ACCORDANCE WITH [NEC 215.9], [NEC 230.95] AND [NEC 690.5]
3. ALL EQUIPMENT TO BE RATED FOR BACKFEEDING.
4. PV BREAKER TO BE POSITIONED AT THE OPPOSITE END OF THE BUSBAR RELATIVE TO THE MAIN BREAKER.

**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



Revolution Energy Systems Inc.  
 9981 West 190th St  
 Unit K Mokena IL 60448  
 T: 708-995-1643

**SITE INFORMATION**

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 YPSILANTE, MI 48198  
 AC System Size: 2.90 kW AC / 2.90 kVA  
 DC System Size: 4.50 kW DC  
 Lat, 42.3200478  
 Long, -83.5654235  
 (10) CANADIAN SOLAR CS3W-450MS 450  
 PV Modules  
 (10) ENPHASE IQ8PLUS-72-2-US (240V)  
 Inverter(s)  
 (1) ENPHASE: IQ BATTERY 3T 3.5kWh

DTE

**DRAWN BY: J.DANIELES**

DATE:  
 12/7/2022

**ELECTRICAL CALCS - PV06**

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

**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.

**WARNING**  
INVERTER OUTPUT CONNECTION  
DO NOT RECOLCATE  
THIS OVERCURRENT  
DEVICE

**WARNING**  
TRIPLE POWER SUPPLY  
SOURCES: UTILITY GRID, PV & BATTERY  
SOLAR ELECTRIC SYSTEM

**PHOTOVOLTAIC AC DISCONNECT**  
RATED AC OUTPUT CURRENT: 12.08 A  
NOMINAL OPERATING AC VOLTAGE: 240 V

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

**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)(b)]

**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)(c)]

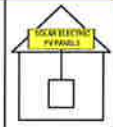
**LABEL 4**  
EQUIPMENT CONTAINING OVERCURRENT  
DEVICES IN CIRCUITS SUPPLYING POWER TO A  
BUSBAR OR CONDUCTOR SUPPLIED FROM  
MULTIPLE SOURCES SHALL BE MARKED TO  
INDICATE THE PRESENCE OF ALL SOURCES  
[NEC 705.12(B)(3)]

**LABEL 5**  
AT POINT OF INTERCONNECTION, MARKED AT  
AC DISCONNECTING MEANS.  
[NEC 690.54, NEC 690.13 (B)]

**WARNING: PHOTOVOLTAIC  
POWER SOURCE**

**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 ARRAY



**SOLAR PV SYSTEM EQUIPPED  
WITH RAPID SHUTDOWN**

TURN RAPID SHUTDOWN  
SWITCH TO THE "OFF"  
POSITION TO SHUT DOWN  
CONDUCTORS OUTSIDE  
THE ARRAY. CONDUCTORS  
WITHIN THE ARRAY REMAIN  
ENERGIZED IN SUNLIGHT



**RAPID SHUTDOWN  
SWITCH FOR  
SOLAR PV SYSTEM**

**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)]

**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)]

**LABEL 8**  
FOR PV SYSTEMS THAT ONLY SHUT DOWN 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)(B)]

**LABEL 9**  
SIGN LOCATED AT RAPID SHUT DOWN  
DISCONNECT SWITCH [NEC 690.56(C)(3)].

**NO BACKUP LOADS LARGER  
THAN 10A TO BE INSTALLED  
IN THIS SUB PANEL**

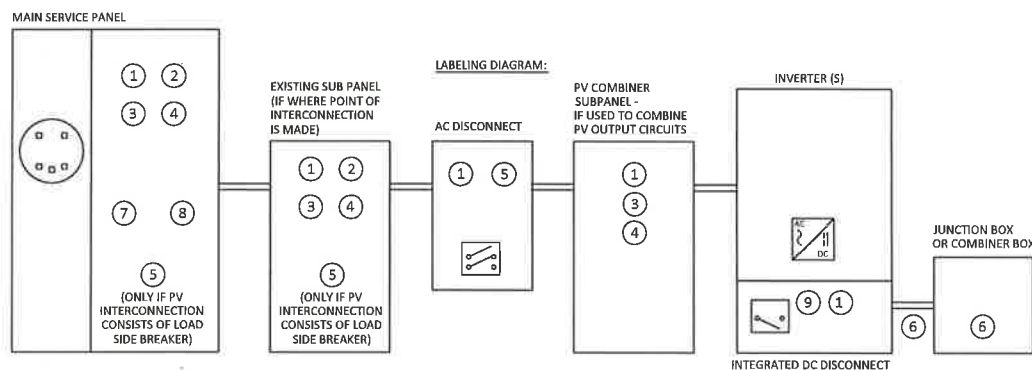
**LABEL 10**  
APPLY TO:  
BACKUP SUB PANEL

**ENERGY STORAGE SYSTEM  
DISCONNECT**  
NOMINAL VOLTAGE: 240 VAC  
MAX AVAILABLE ISC: 24.6 AAC  
ISC CLEARING TIME: N/A  
DATE: 12/7/2022

**LABEL 11**  
APPLY TO:  
ESS DISCONNECT  
[NEC 706.7(D)]

**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 1910.145, 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 [IFC 605.11.1.1]



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



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(10) ENPHASE IQ8PLUS-72-2-US (240V)  
Inverter(s)  
(1) ENPHASE: IQ BATTERY 3T 3.5kWh

DTE

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LABELS - PV07



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DTE

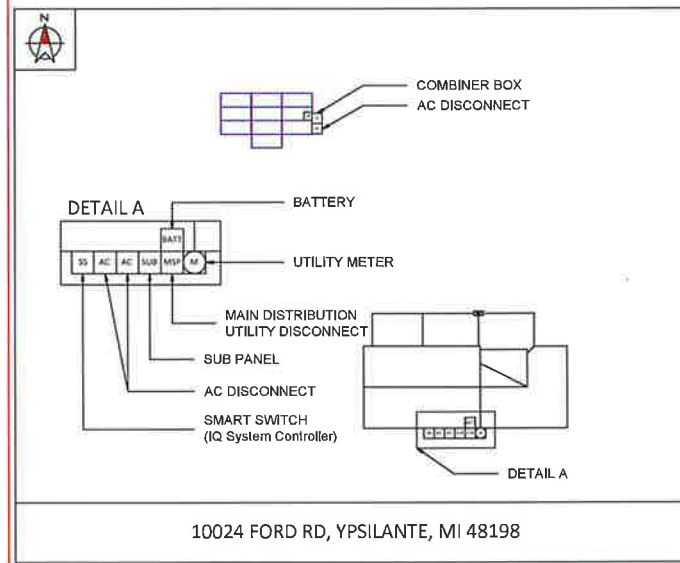
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DATE:  
12/7/2022

PLACARD - PV08

## CAUTION

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

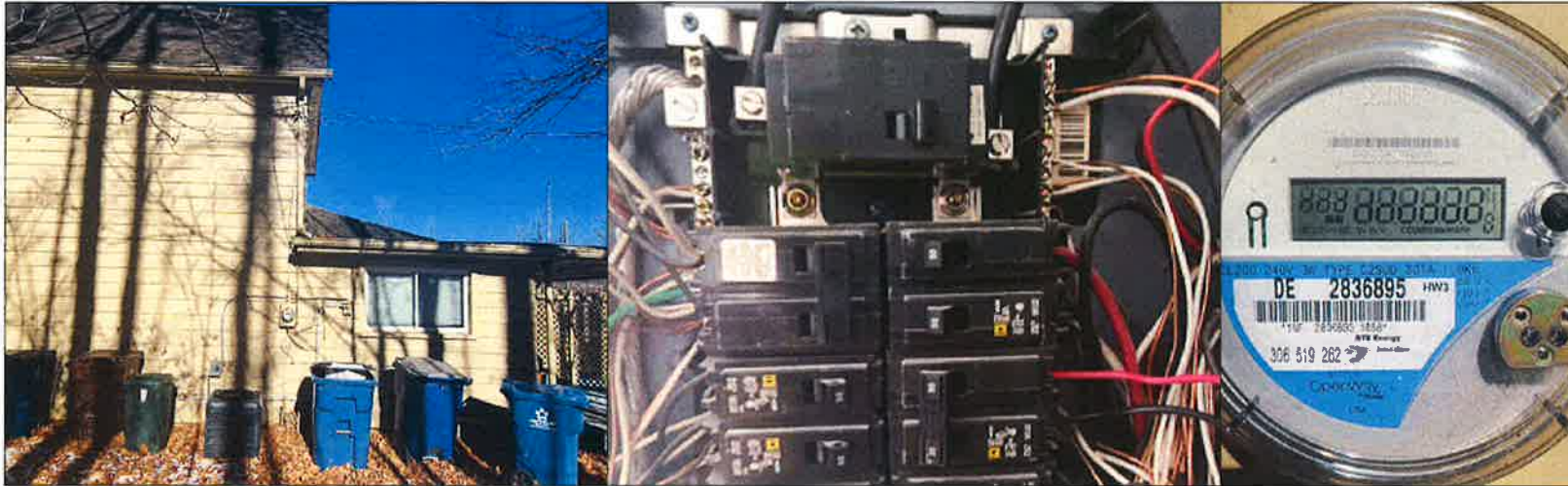


#### DIRECTORY

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])

## SITE PHOTOS:



Revolution Energy Systems Inc.  
9981 West 190th St  
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DTE

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DATE:  
12/7/2022

SITE PHOTOS - PV09



## HiKu

SUPER HIGH POWER MONO PERC MODULE

430 W ~ 455 W

CS3W-430|435|440|445|450|455MS

### MORE POWER



26 % more power than conventional modules



Up to 4.5 % lower LCOE  
Up to 2.7 % lower system cost



Low NMOT:  $42 \pm 3$  °C  
Low temperature coefficient (Pmax):  
-0.35 % / °C



Better shading tolerance

### MORE RELIABLE



Lower internal current,  
lower hot spot temperature



Minimizes micro-crack impacts



Heavy snow load up to 5400 Pa,  
wind load up to 3600 Pa\*



linear power output warranty\*



enhanced product warranty on materials  
and workmanship\*

\*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  
OHSAS 18001:2007 / International standards for occupational health & safety

### PRODUCT CERTIFICATES\*

IEC 61215 / IEC 61730; VDE / CE / MCS / INMETRO  
UL 1709; CSA / IEC 61701; ISO; VDE / IEC 62716; VDE / IEC 60068-2-68; SGS  
UN 9177 Reaction to Fire: Class 1 / Take e-way



\* As there are different certification requirements in different markets, please contact your local Canadian Solar sales representative for the specific certificates applicable to the products in the region in which the products are to be used.

CANADIAN SOLAR INC. is committed to providing high quality solar products, solar system solutions and services to customers around the world. No. 1 module supplier for quality and performance/price ratio in IHS Module Customer Insight Survey. As a leading PV project developer and manufacturer of solar modules with over 40 GW deployed around the world since 2001.

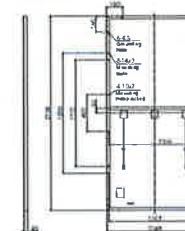
\* For detail information, please refer to Installation Manual.

### CANADIAN SOLAR INC.

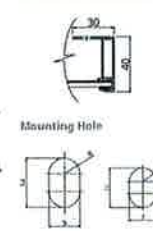
545 Speedvale Avenue West, Guelph, Ontario N1K 1E6, Canada, [www.canadiansolar.com](http://www.canadiansolar.com), [support@canadiansolar.com](mailto:support@canadiansolar.com)

### ENGINEERING DRAWING (mm)

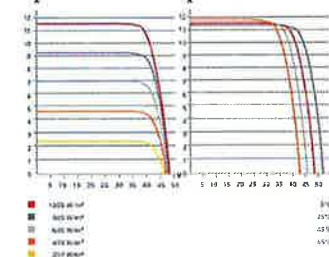
Rear View



Frame Cross Section A-A



### CS3W-435MS / I-V CURVES



### ELECTRICAL DATA | STC\*

CS3W	430MS	435MS	440MS	445MS	450MS	455MS
Nominal Max. Power (Pmax)	430 W	435 W	440 W	445 W	450 W	455 W
Opt. Operating Voltage (Vmp)	40.3 V	40.5 V	40.7 V	40.9 V	41.1 V	41.3 V
Opt. Operating Current (Imp)	10.68 A	10.75 A	10.82 A	10.89 A	10.96 A	11.02 A
Open Circuit Voltage (Voc)	48.3 V	48.5 V	48.7 V	48.9 V	49.1 V	49.3 V
Short Circuit Current (Isc)	11.37 A	11.42 A	11.48 A	11.54 A	11.60 A	11.66 A
Module Efficiency	19.5%	19.7%	19.9%	20.1%	20.4%	20.6%
Operating Temperature	-40°C ~ +85°C					
Max. System Voltage	1500V (IEC/UL) or 1000V (IEC/UL)					
Module Fire Performance	TYPE 1 (UL 1703) or CLASS C (IEC 61730)					
Max. Series Fuse Rating	20 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\*

CS3W	430MS	435MS	440MS	445MS	450MS	455MS
Nominal Max. Power (Pmax)	321 W	325 W	328 W	332 W	336 W	339 W
Opt. Operating Voltage (Vmp)	37.6 V	37.8 V	37.9 V	38.1 V	38.3 V	38.5 V
Opt. Operating Current (Imp)	8.54 A	8.59 A	8.65 A	8.71 A	8.76 A	8.82 A
Open Circuit Voltage (Voc)	45.4 V	45.6 V	45.8 V	46.0 V	46.2 V	46.4 V
Short Circuit Current (Isc)	9.17 A	9.21 A	9.26 A	9.31 A	9.36 A	9.41 A

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

### MECHANICAL DATA

Specification	Data
Cell Type	Mono-crystalline
Cell Arrangement	144 [2 X (12 X 6)]
Dimensions	2108 X 1048 X 40 mm (83.0 X 41.3 X 1.57 in)
Weight	24.9 kg (54.9 lbs)
Front Cover	3.2 mm tempered glass
Frame	Anodized aluminium alloy, crossbar enhanced
J-Box	IP68, 3 bypass diodes
Cable	4 mm² (IEC), 12 AWG (UL)
Cable Length (Including Connector)	Portrait: 500 mm (19.7 in) (+) / 350 mm (13.8 in) (-); Landscape: 1400 mm (55.1 in); leap-frog connection: 1670 mm (65.7 in)*
Connector	T4 series or H4 UTX or MC4-EVO2
Per Pallet	27 pieces
Per Container (40' HQ)	594 pieces

\* For detailed information, please contact your local Canadian Solar sales and technical representatives.

### TEMPERATURE CHARACTERISTICS

Specification	Data
Temperature Coefficient (Pmax)	-0.35 % / °C
Temperature Coefficient (Voc)	-0.27 % / °C
Temperature Coefficient (Isc)	0.05 % / °C
Nominal Module Operating Temperature	42 ± 3°C

### PARTNER SECTION



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

### CANADIAN SOLAR INC.

545 Speedvale Avenue West, Guelph, Ontario N1K 1E6, Canada, [www.canadiansolar.com](http://www.canadiansolar.com), [support@canadiansolar.com](mailto:support@canadiansolar.com)

May 2020. All rights reserved. PV Module Product Datasheet V5\_V9\_EN



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.



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.

### 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

\* Only when installed with IQ System Controller 2, meets UL 1741. IQ8H+200V operates only in grid-tied mode.  
\*\* IQ8 Series Microinverters support a split phase, 240V. IQ8H+200 supports split phase, 208V only.

## IQ8 Series Microinverters

INPUT DATA (DC)		IQ8-60-2-US	IQ8-60-2-US	IQ8-60-2-US	IQ8-60-2-US	IQ8-60-2-US	IQ8-60-2-US
Commonly used module pairings <sup>1</sup>	W	235 - 350	235 - 440	260 - 460	295 - 500	320 - 540*	295 - 500*
Module compatibility		60-cell/120 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 <sup>2</sup> (module IEC)	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	IQ8-60-2-US	IQ8-60-2-US	IQ8-60-2-US	IQ8-60-2-US	IQ8-60-2-US
Peak output power	VA	245	300	330	368	384	368
Max continuous output power	VA	240	280	325	349	380	360
Nominal (L-L) voltage/range <sup>3</sup>	V			240 / 278 - 264			208 / 183 - 250
Max continuous output current	A	1.0	1.21	1.35	1.45	1.68	1.73
Nominal frequency	Hz			60			
Extended frequency range	Hz			50 - 68			
AC short circuit fault current over 3 cycles	A rms			2			4.4
Max units per 20 A (L-L) branch circuit <sup>4</sup>		16	13	11	11	10	9
Total harmonic distortion					<5%		
Overvoltage class AC port					II		
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	1.06 kg (2.38 lbs)						
Cooling	Natural convection - no fans						
Approved for wet locations	Yes						
Pollution degree	PDS						
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, UL 1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO.107.3-01						
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) The IQ8H+200 variant will be operating in grid-tied mode only at 208V AC. (2) No enforced DC/AC ratio. See the compatibility calculator at <https://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-05-0001-01-EN-US-2022-03-17

# Enphase IQ Combiner 4/4C

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



X-IQ-AM1-240-4C

X-IQ-AM1-240-4

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

## Smart

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

## Simple

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

## Reliable

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

## 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 (4% ±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 (4% ±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 65 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 EPLC-01	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	Power line carrier (communication bridge pair), quantity - one pair. 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-ENH-PCBA-3	Replacement IQ Gateway printed circuit board (PCB) for Combiner 4/4C
X-IQ-NA-HU-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 (polar 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-200-5PLIF)	A pair of 200 A split core current transformers
MECHANICAL DATA	
Dimensions (WxHxD)	17.5 x 49.5 x 16.8 cm (6.875" x 19.5" x 6.625"). Height is 21.00" (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	Durable, 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 inputs: 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	802.11n/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. 197.3, 47 CFR, Part 15, Class B, FCC 003 Production metering: ANSI C12.20 accuracy class 0.5 (PV production) Consumption metering: accuracy class 2.5
Compliance, IQ Gateway	UL 6860-1, IEC 60335-2-2 No. 61010-1



To learn more about Enphase offerings, visit [enphase.com](https://enphase.com)



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## Enphase IQ Battery 3T

The **Enphase IQ Battery 3T** all-in-one AC-coupled storage system is **reliable, smart, simple, and safe**. It has a total usable energy capacity of 3.36 kWh and includes four embedded grid-forming microinverters with 1.28 kW power rating. It provides backup capability and installers can quickly design the right system size to meet the needs of both new and retrofit solar customers.



### Reliable

- Proven high-reliability IQ series microinverters
- Ten-years limited warranty, extendable to 15 years<sup>1</sup>
- Four embedded IQ8X-BAT microinverters
- Passive cooling (no moving parts/fans)

### Smart

- Grid-forming capability for backup operation
- Remote software and firmware upgrade
- Mobile app-based monitoring and control
- Support for self consumption
- Utility time of use (TOU) optimization

### Simple

- Fully integrated AC battery system
- Quick and easy plug-and-play installation
- Interconnects with standard household AC wiring

### Safe

- Safety tested battery cells and module
- Lithium iron phosphate (LFP) chemistry for maximum safety and longevity

## Enphase IQ Battery 3T

MODEL NUMBER	
ENCHARGE-3T-1P-NA	IQ Battery 3T battery storage system with integrated Enphase IQ series microinverters and battery management unit (BMU). Includes: - One IQ Battery 3T base unit (B03-T01-US00-1-3) - One IQ Battery 3T cover kit with cover and wall mounting bracket (B03T-C-0430-G)
OUTPUT (AC)	
Rated (continuous) output power	1.28 kVA
Peak output power	1.92 kVA (10 seconds)
Nominal voltage / range	240/211–264 VAC
Nominal frequency / range	60/57–63 Hz
Rated output current	5.3 A
Peak output current	8.2A (10 seconds)
Power factor (adjustable)	0.85 leading ... 0.85 lagging
Maximum units per 20 A branch circuit	Three units (single phase)
Interconnection	Single phase
Maximum AC short circuit fault current over 3 cycles	23.2 Arms
Round trip efficiency <sup>2</sup>	89%
BATTERY	
Total capacity	3.5 kWh
Usable capacity	3.36 kWh
Round trip efficiency	96%
Nominal DC voltage	67.2 V
Maximum DC voltage	75.6 V
Ambient operating temperature range	-15° C to 55° C (5° F to 131° F) non-condensing
Optimum operating temperature range	0° C to 30° C (32° F to 86° F)
Chemistry	Lithium iron phosphate (LFP)
MECHANICAL DATA	
Dimensions (WxHxD)	430 x 775 x 188 mm (16.9 x 30.5 x 7.4 in)
Weight	One individual 40.5 kg (89.3 lbs) base unit plus 8.3 kg (18.3 lbs) cover and mounting bracket, total 48.8 kg (107.6 lbs)
Enclosure	Outdoor – NEMA 3R
IQ8X-BAT microinverter enclosure	NEMA type 6
Cooling	Natural convection – No fans
Altitude	Up to 2500 meters (8200 feet)
Mounting	Wall mount
FEATURES AND COMPLIANCE	
Compatibility	Compatible with grid-tied PV systems. Compatible with Enphase M215/M250 and IQ series micros, Enphase IQ System Controller, and Enphase IQ Gateway for backup operation.
Communication	Wireless 2.4 GHz
Services	Backup, self-consumption, TOU, Demand Charge, NEM Integrity
Monitoring	Enphase Installer Platform monitoring options; API integration
Compliance	UL 9540, UL 9540A, UN 38.3, UL 1998, UL 991, NEMA Type 3R, AC156 EMC: 47 CFR Part 15, Class B, ICES 003 Cell Module: UL 1073, UN 38.3 Inverters: UL 62109-1, IEC 62109-2, UL 1741SA, CAN/CSA C22.2 No. 107.1-16, and IEEE 1547
LIMITED WARRANTY	
Limited Warranty	>70% capacity, up to 10 years or 4000 cycles <sup>1</sup> ; extendable to 15 years <sup>1</sup>
<sup>1</sup> Supported in both grid-connected and backup operation. <sup>2</sup> AC to battery to AC at 50% power rating. <sup>3</sup> Whichever occurs first. Restrictions apply. <sup>4</sup> Terms and conditions apply.	

## Enphase IQ System Controller 2

The **Enphase 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.

### Reliable

- Durable NEMA type 3R enclosure
- Ten-year limited warranty

### Smart

- Controls safe connectivity to the grid
- Automatically detects grid outages
- Provides seamless transition to backup

### Simple

- Connects to the load or service equipment<sup>1</sup> side of the main load panel
- Centered mounting brackets support single stud mounting
- Supports conduit entry from the bottom, bottom left side, and bottom right side
- Supports whole home and partial home backup and subpanel backup
- Up to 200A main breaker support
- Includes neutral-forming transformer for split phase 120/240V backup operation
- IQ System Controller supports backward compatibility with older generation of PV microinverters (M215, M250 and S series), making it simple for home owners to upgrade their systems
- Easy integration with generator from major manufacturers

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



To learn more about Enphase offerings, visit [enphase.com](https://enphase.com)



## Enphase IQ System Controller 2

MODEL NUMBER	
CP200010-M24G501	Enphase IQ System Controller 2 with neutral-forming transformer (NFT), Microgrid Interconnect Device (MID), breakers, and screws. Streamlines grid-independent capabilities of PV and battery installations.
ACCESSORIES AND REPLACEMENT PARTS	
CP2000-N4-XA-43 CP2000-N4-HD-200A CT-200-SPLIT	Replacement IQ System Controller 2 printed circuit board Eaton type BR circuit breaker or hold down screw kit, BRH-GK125 200A split-phase current transformer for generator monitoring (+/- 2.5%) Not included, must order separately: • BRK-20A 2P-240V 9 Circuit breaker, 2 pole, 20A, 10kAIC, BR20B • BRK-30A 2P-240V Circuit breaker, 2 pole, 30A, 10kAIC, BR20B • BRK-40A 2P-240V Circuit breaker, 2 pole, 40A, 10kAIC, BR20B • BRK-60A 2P-240V Circuit breaker, 2 pole, 60A, 10kAIC, BR20B • BRK-80A 2P-240V Circuit breaker, 2 pole, 80A, 10kAIC, BR20B IQ System Controller 2 installation handle kit (order separately) IQ System Controller 2 literature kit, including labels, feed-through headers, screws, filter plates, and QIO
• Circuit breakers (see compatibility) • BRK-100A 2P-240V Main breaker, 2 pole, 100A, 25kAIC, CSR2100 • BRK-125A 2P-240V Main breaker, 2 pole, 125A, 25kAIC, CSR2125N • BRK-150A 2P-240V Main breaker, 2 pole, 150A, 25kAIC, CSR2150N • BRK-175A 2P-240V Main breaker, 2 pole, 175A, 25kAIC, CSR2175N • BRK-200A 2P-240V Main breaker, 2 pole, 200A, 25kAIC, CSR2200N EP2000-HNDLR1 EP2000-LITKIT BRK-20A-40A-2P-240V	
ELECTRICAL SPECIFICATIONS	
Assemblies rating	Continuous operation at 100% of its rating
Nominal voltage / range (L-L)	240 VAC / 100–310 VAC
Voltage measurement accuracy	±1% V nominal (±1.2V L-N and 1.2.4V L-L)
Accuracy contact for load control, excess PV control, and generator low-voltage control	24V, 1A
Nominal frequency / range	60 Hz / 56–62 Hz
Frequency measurement accuracy	±0.1 Hz
Maximum continuous current rating	160A
Maximum input overcurrent protection device	200A
Maximum output overcurrent protection device	200A
Maximum overcurrent protection device rating for generator circuit <sup>4</sup>	80A
Maximum overcurrent protection device rating for storage branch circuit <sup>4</sup> (the storage branch circuit can be replaced with PV)	80A
Maximum overcurrent protection device rating for IQB PV combiner branch circuit <sup>4</sup>	80A
Neutral-Forming Transformer (NFT) 1:1	• Breaker rating (pre-installed): 40A between L1 and Neutral, 40A between L2 and Neutral • Continuous rated power: 3600 VA • Maximum continuous unbalance current: 30A @ 120V • Peak rated power: 8800 VA for 30 seconds • Peak unbalanced current: 80A @ 120V for 30 seconds
MECHANICAL DATA	
Dimensions (WxHxD)	50cm x 91.6cm x 24.1cm (19.7 in x 36.1 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, plus local chiller
Enclosure environmental rating	Outdoor, NEMA type 3R, single enclosure construction
Altitude	To 2500 meters (8200 feet)
WIRE SIZES	
Centerlines (All lugs are rated to 90C)	• Main lugs and backup load lugs • CSP service bottom wiring lugs • BR breakers (wire provided) • AC combiner lugs, in-charger lugs, and generator lugs • Neutral (lug lugs) CUAL 1 AWG – 300 KCMIL Cu/Al 8 AWG – 300 KCMIL 6 AWG 1A AWG – 3 AWG Cu/Al 8 AWG – 300 KCMIL
Neutral and ground bars	Large holes (5/16–3/4 IUF) Small holes (10–12 IUF) 1A AWG – 1/0 AWG 1A AWG – 6 AWG
COMPLIANCE	
Compliance	UL 1741, UL 1741 CA, UL 1741 PCS, UL 1998, UL 6947, UL 671, UL 507 CSA 22.2 No. 107.1, 47 CFR, Part 115 Class B, ICES 003, AC156 IQ System Controller 2 is approved for use as Service Equipment in the United States <sup>5</sup>

2. Compatible with BRH-GK125 Hold-Down Kit to comply with 2017 NEC 7.10.15E for lock-fed circuit breakers.  
3. The IQ System Controller 2 is rated 122 kAIC.  
4. Not included. Installation must provide properly rated breaker per circuit breaker list above.  
5. Sections from these standards were used during the safety evaluation and included in the UL 1741 listing.

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## 10024 Ford Road

10024 Ford Road  
Superior Charter Township, MI 48198

MSRP (-8%)

\$2,119.52

Modules

12

Ground Screws

8

Watts

5.40 kW

\$/Watt

\$0.39

Piers

8

Bill of materials



## Project Information

Project name

10024 Ford Road

Location

10024 Ford Road, Superior Charter Township, MI 48198

ASCE code

7-10

Snow load (psf)

20

ASD

Wind speed (mph)

105

ASD

Wind exposure

B

C

D

Panel

Canadian Solar

CS3W-450MS (40mm)

Dimensions: 62.99" x 41.26" x 1.57" (2108.0mm x 1048.0mm x 40.0mm)

Panel finish

Clear

Black

End clamp

UFO + Stopper Sleeve

## Substructure &amp; Foundation

Foundation type

Ground Screws

Array tilt angle

25

DGC

South facing grade

0

DGC

Pipe/Tubing diameter

2

IN

Screw length (in)

63

IN

Freeze thaw depth

IN

Hex-Head Set Screws

4

Soil class

2-5

## Arrays

Rows

#1

4

Columns

3

Modules cut back

0

# Arrays

1

Rail type

XR1000

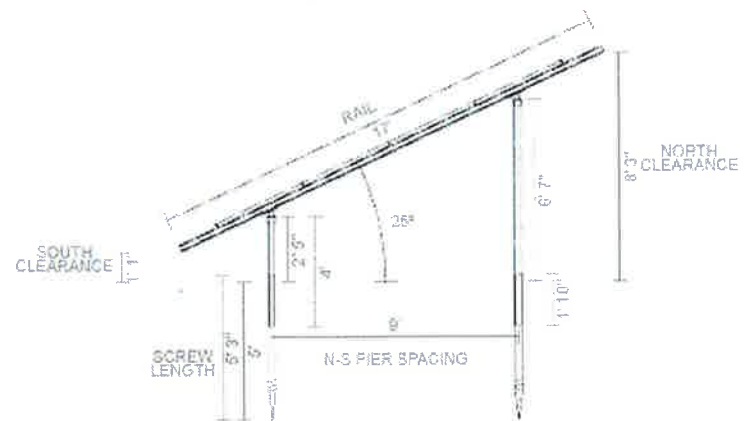
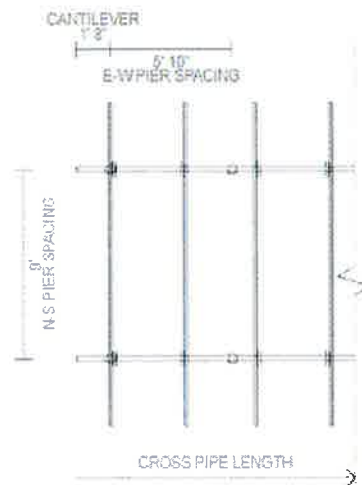
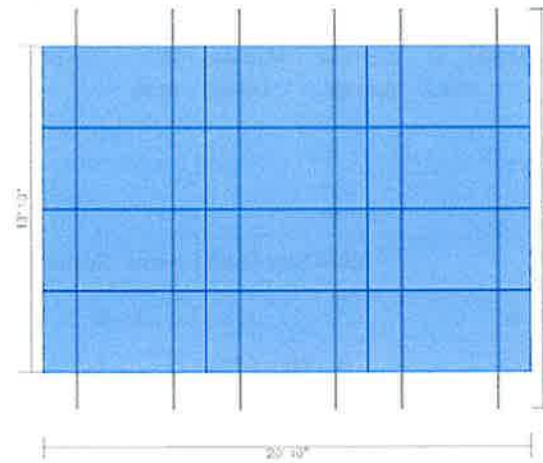
B/W pier span

Max span: 5' 10"

Custom

Delete

+ Add



Rail type		E/W spacing	Rail cantilever		Size		Edge clearances	Shear ①	Moment ②	Uplift ③
XR1000		5' 10"	3' 6"		20' 10" (EW) × 14' (NS)		1' 1" (S); 8' 3" (N)	500 lbs	1,250 ft-lbs	-607 lbs
Rows	Columns	# Arrays	Piers/array	Total South piers	Total North piers	Total cross pipes	Pipe cantilever	Total pipe length		
4	3	1	8	4 (4')	4 (8' 2")	2 (20' 10")	1' 6"	90' 3"		



## Ground Mount System

Datasheet



### Mount on all terrains, in no time.

The IronRidge Ground Mount System combines our XR1000 rails with locally-sourced steel pipes or mechanical tubing, to create a cost-effective structure capable of handling any site or terrain challenge.

Installation is simple with only a few structural components and no drilling, welding, or heavy machinery required. In addition, the system works with a variety of foundation options, including concrete piers and driven piles.



#### Rugged Construction

Engineered steel and aluminum components ensure durability.



#### UL 2703 Listed System

Meets newest effective UL 2703 standard.



#### Flexible Architecture

Multiple foundation and array configuration options.



#### PE Certified

Pre-stamped engineering letters available in most states.



#### Design Software

Online tool generates engineering values and bill of materials.



#### 20-Year Warranty

Twice the protection offered by competitors.



360° Product Tour  
Visit [ironridge.com](http://ironridge.com)

### Substructure

#### Top Caps



Connect vertical and cross pipes.

#### Bonded Rail Connectors



Attach and bond Rail Assembly to cross pipes.

#### Diagonal Braces



Optional Brace provides additional support.

#### Cross Pipe & Piers



Steel pipes or mechanical tubing for substructure.

### Rail Assembly

#### XR1000 Rails



Curved rails increase spanning capabilities.

#### UFOs



Universal Fastening Objects bond modules to rails.

#### Stopper Sleeves



Snap onto the UFO to turn into a bonded end clamp.

#### Accessories



Wire Clips and End Caps provide a finished look.

### Resources



#### Design Assistant

Go from rough layout to fully engineered system. For free.

Go to [ironridge.com/design](http://ironridge.com/design)



#### NABCEP Certified Training

Earn free continuing education credits, while learning more about our systems.

Go to [ironridge.com/training](http://ironridge.com/training)



## Technical Data Sheet G Series

### Basic Info

KSF G 76x2100-3xM16	KSF G 76x1600-3xM16	KSF G 76x1300-3xM16
Nominal length (mm)		
2100	1600	1300
Tube diameter (mm)		
76.10	76.10	76.10
Weight (kg)		
14.00	10.50	8.50
Item number		
25456	25455	25454

### Construction

- Nut: DIN EN ISO 4032 - 8
- Continuous welded helix
- Coating: Hot-dip galvanized according to DIN EN ISO 1461

### Applications

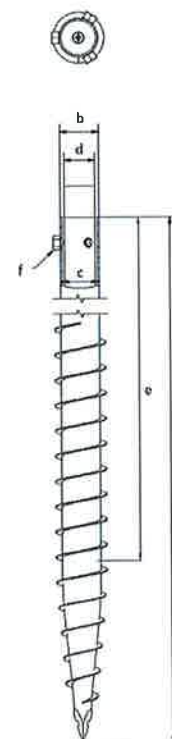


KSF G 76x  
1300-3xM16



## Technical Data

	KSF G 76x2100-3xM16	KSF G 76x1600-3xM16	KSF G 76x1300-3xM16
a Length (mm) (±25 mm)	2080	1580	1280
b Shaft outer diameter (mm)	76.10	76.10	76.10
c Inner diameter (mm)	68.90	68.90	68.90
d Diameter setting (mm)	60	60	60
e Depth setting (mm) (±25 mm)	1815	1315	1020
f Thread	3 x M16	3 x M16	3 x M16



## Online Service

KSF G 76x2100-3xM16	KSF G 76x1600-3xM16	KSF G 76x1300-3xM16
Webkey		
G2545611D	G2545511D	G2545411D

