THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY KIMANDY LAWRENCE, PE ON THE DATE ADJACENT TO THE SEAL. PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

ALEXANDER, JOHNNIE
NEW GRID-INTERACTIVE PHOTOVOLTAIC SYSTEM
WITH NEW WHOLE HOME BACKUP BATTERY ENERGY STORAGE SYSTEM
DC SYSTEM SIZE (17.010KW)

GENERAL NOTES

SCOPE OF WORK
1. THE PROJECT IS NEW PHOTOVOLTAIC SYSTEM CONSISTING OF SOLAR ARRAY(S) AND ASSOCIATED POWER CONDITIONING EQUIPMENT WITH BATTERY BACKUP SYSTEM.
2. ALL CONSTRUCTION SHALL COMPLY WITH THE ADOPTED EDITION OF THE FLORIDA BUILDING CODE AND NATIONAL ELECTRICAL CODE AS SPECIFIED IN THE PROJECT-SPECIFIC NOTES. ALL CONSTRUCTION SHALL ALSO COMPLY WITH ALL APPLICABLE CITY, COUNTY, STATE AND LOCAL ELECTRICAL UTILITY CODES, RULES AND REGULATIONS.
3. THE SYSTEM WILL BE INTERCONNECTED TO THE ELECTRICAL UTILITY GRID IN ACCORDANCE WITH THE REQUIREMENTS OF THE ADOPTED ELECTRIC AND THE ELECTRICAL UTILITY COMPANY.
4. THE CONTRACTOR SHALL PROVIDE LABOR FOR CONSTRUCTION OF THE ARRAY AND INSTALLATION OF ALL ELECTRICAL EQUIPMENT. THE CONTRACTOR WILL PROVIDE COMPETENT SUPERVISION FOR THE WORK TO BE ACCOMPLISHED. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR APPROVAL BY OWNER AS REQUESTED.
5. THERE WILL BE NO SUBMISSION FOR ANY EQUIPMENT WITH THE VENDOR PART NUMBER ON THE DRAWING WITHOUT WRITTEN APPROVAL OF THE PROFESSIONAL ENGINEER. COMMON ITEMS SUCH AS CONDUITS, WIRE, FITTINGS, ETC. ARE NOT SPECIFIED BY VENDOR BUT THE SIZES CANNOT BE REDUCED.
6. THE CONSTRUCTION CONTRACTOR AND HIS SUBCONTRACTORS AGREE THAT IN ACCORDANCE WITH THE GENERALLY ACCEPTED CONSTRUCTION PRACTICES CONSTRUCTION CONTRACTOR AND HIS SUBCONTRACTORS WILL BE REQUIRED TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR THE SAFETY OF ALL PERSON AND PROPERTY, AND THAT THIS REQUIREMENT SHALL BE MADE TO APPLY CONTINUOUSLY AND IS NOT LIMITED TO NORMAL WORKING HOURS.
7. CONSTRUCTION CONTRACTOR AND HIS SUBCONTRACTORS FURTHER AGREE TO DEFEND, INDEMNIFY AND HOLD HARMLESS THE DESIGN PROFESSIONAL FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPT LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE DESIGN PERSONNEL.
8. CONSTRUCTION CONTRACTOR AND HIS SUBCONTRACTORS WILL BE REQUIRE TO REPAIR ANY DAMAGE DONE TO BUILDINGS, GROUNDS OR UTILITIES AT NO ADDITIONAL COST TO THE CUSTOMER. DEFECTIVE MATERIAL OR WORKMANSHIP WILL NOT BE ALLOWED ON THIS PROJECT.RESONABLE HOUSEKEEPING AND CLEAN UP SHALL BE CONDUCTED BOTH DURING THE EXECUTION OF AND AT THE CONCLUSION OF THE PROJECT.
9. CONTRACTOR SHALL LOCATE ALL POST TENSION CABLES ON CONCRETE ROOFS AND SHALL VERIFY THAT SUCH CABLES DO NOT INTERFERE WITH THE LOCATIONS OF FASTENERS AS SHOWN IN THE ATTACHMENT DETAILS.

GENERAL
1. THE ACTUAL SYSTEM EQUIPMENT SPECIFICATIONS FOR THE PHOTOVOLTAIC SYSTEM ARE INCLUDED IN THE PV SYSTEM SPECIFICATION ON THE TITLE PAGE AND THROUGHOUT THE DRAWING AS NECESSARY FOR CLARITY.IN ADDITION THE ACTUAL VENDOR SPECIFICATION DATA SHEETS WILL BE INCLUDED AS PART OF THE PERMIT SUBMITTAL.
2. ONLY NEW MATERIAL WILL BE INSTALLED AS PART OF THE PROJECT. ALL NEW INSTALLED EQUIPMENT WILL BE APPROPRIATELY LISTED AND NEMA RATED. ALL NEW EQUIPMENT SHALL HAVE PERMANENT PLASTIC ENGRAVED IDENTIFICATION TAGS INSTALLED.
3. ALL CUTTING AND PATCHING REQUIRED FOR INSTALLATION OF NEW RACEWAYS AND EQUIPMENT SHALL BE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR. ALL WORK SHALL BE PERFORMED BY TRADESMAN EXPERIENCED IN WORK REQUIRED. ALL FINISHES SHALL MATCH THE EXISTING ADJACENT FINISHES. OPENING IN FIRE RATED WALLS WILL BE PATCHED IN A MANNER MAINTAINING THE ORIGINAL FIRE AND SMOKE RATING.
4. DRAWINGS ARE DIAGRAMMATIC IN NATURE AND CANNOT SHOW EVERY CONNECTION, JUNCTION BOX, WIRE,CONDUIT, THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING A COMPLETE AND FUNCTIONAL ELECTRICAL SYSTEM.
5. CONTRACTOR SHALL COORDINATE ALL POWER OUTAGES WITH THE OWNER'S REPRESENTATIVE IN ADVANCE.
6. PANEL DESIGNATIONS SHOWN ON THESE DRAWINGS ARE GIVEN FOR CLARIFICATION OF THE CIRCUITING ONLY AND MAY NOT CORRESPOND TO THE DESIGNATIONS FOUND IN THE FIELD.
7. ELECTRICAL TESTING SHALL BE IN COMPLIANCE WITH NFPA 70E.
8. SMOKE ALARMS SHALL BE INSTALLED INSIDE ALL SLEEPING ROOMS AND OUTSIDE EACH SEPARATE SLEEPING AREA IN THE IMMEDIATE VICINITY OF BEDROOMS. ADDITIONALLY, EACH STORY WITHIN THE DWELLING, INCLUDING BASEMENTS AND HABITABLE ATTICS, SHALL CONTAIN A SMOKE ALARM. SMOKE ALARMS SHALL BE INTERCONNECTED IN SUCH A MANNER THAT THE ACTIVATION OF ONE ALARM WILL ACTIVATE ALL OF THE ALARMS IN THE INDIVIDUAL UNIT. PHYSICAL INTERCONNECTION OF SMOKE ALARMS SHALL NOT BE REQUIRED WHERE LISTED WIRELESS ALARMS ARE INSTALLED AND ALL ALARMS SOUND UPON ACTIVATION OF ONE ALARM. INSTALL CARBON MONOXIDE ALARMS WITHIN 10 FEET OF EACH ROOM USED FOR SLEEPING PURPOSES WHEN THE HOME CONTAINS AN ATTACHED GARAGE OR FUEL-BURNING APPLIANCES. SMOKE ALARMS AND CARBON MONOXIDE ALARMS THAT ARE NOT HARDWIRED SHALL BE POWERED BY 10-YEAR, NON- REMOVABLE BATTERIES. FBCR 314.3, FBCR 314.6 [EXCEPTION 2], FBCR 315.1.

CONDUIT AND WIRE
1. ALL EXISTING CONDUIT RUNS ARE NOT SHOWN. CONTRACTOR SHALL VERIFY EXISTING CONDUIT LOCATIONS IN FIELD.
2. ALL CONDUCTORS SHALL BE INSTALLED IN A RACEWAY AS SPECIFIED IN THE DRAWINGS. THE EXCEPTION IS PV SOURCE CIRCUIT CONDUCTORS MADE OF PV WIRE CABLE. THESE CONDUCTORS MAY BE EXPOSED WITHIN THE PV ARRAY.
3. INDOOR EMT FITTINGS MAY BE COMPRESSION TYPE OR STEEL SET SCREW TYPE. OUTDOOR EMT FITTINGS MUST BE COMPRESSION RAINTIGHT TYPE.
4. A PULL ROPE SHALL BE INSTALLED IN ALL EMPTY CONDUITS.
5. CONDUCTORS MATERIAL, EITHER COPPER OR ALUMINUM IN SPECIFIED IN THE DRAWINGS. CONDUCTOR INSULATION TYPE SHALL BE THWN - 2 UNLESS OTHERWISE NOTED.

EQUIPMENT
1. ALL ELECTRICAL COMPONENTS INSTALLED OUTDOORS, EXPOSED TO WEATHER OR IN DAMP LOCATIONS SHALL BE RATED FOR NEMA 3R OR GREATER. INSTALLATION OF THESE COMPONENTS MUST COMPLY WITH THE MANUFACTURER'S INSTALLATION INSTRUCTIONS.
2. ALL RACEWAYS, CABINETS, BOXES, FIXTURES SHALL BE SUPPORTED FROM THE BUILDING STRUCTURE IN AN APPROVED MANNER.
3. AT THE COMPLETION OF THE PROJECT NEATLY TYPED ACCURATE PANEL BOARD DIRECTORIES INDICATING ALL BRANCH CIRCUITS AND SPARES WILL BE PROVIDED. ALL SPARES SHALL BE LEFT IN THE OFF POSITION.
4. ALL SAFETY SWITCHES SHALL BE HEAVY DUTY TYPE WITH COVER INTERLOCK AND HANDLE LOCK OFF PROVISIONS. SWITCHES SHALL BE MANUFACTURED BY A COMPANY CONSISTENT WITH OTHER INSTALLED EQUIPMENT WHENEVER POSSIBLE. PART NUMBERS, RATING AND FUSING SHALL BE AS SHOWN ON THE DRAWINGS.
5. CONTRACTOR SHALL ENSURE ALL NEC AND MAINTENANCE CLEARANCE REQUIREMENTS ARE MET FOR NEW EQUIPMENT AND MAINTAINED FOR EXISTING EQUIPMENT.
6. CONTRACTOR SHALL FIELD VERIFY EQUIPMENT CLEARANCE AND PLACEMENTS WHILE COORDINATING LOCATORS WITH OTHER TRADES, CONSTRUCTION MANAGERS, AND SITE SUPERVISORS PRIOR TO PURCHASING AND INSTALLING EQUIPMENT.
7. EVERY STRUCTURE AND PORTION THEREOF, INCLUDING NONSTRUCTURAL COMPONENTS THAT ARE PERMANENTLY ATTACHED TO STRUCTURES AND THEIR SUPPORTS AND ATTACHMENTS, SHALL BE DESIGNED AND CONSTRUCTED TO RESIST THE EFFECTS OF EARTHQUAKE MOTIONS IN ACCORDANCE WITH ASCE 7, EXCLUDING CHAPTER 14 AND APPENDIX
11A. THE SEISMIC DESIGN CATEGORY FOR A STRUCTURE IS PERMITTED TO BE DETERMINED IN ACCORDANCE WITH SECTION 1613 OR ASCE 7.
8. ALL CONTROLS AND SWITCHES INTENDED TO BE USED BY THE OCCUPANT OF THE ROOM OR AREA TO CONTROL
LIGHTING AND RECEPTACLE OUTLETS, APPLIANCE AND COOLING, HEATING AN D VENTILATING EQUIPMENT, SHALL BE LOCATED NO MORE THAN 48 INCHES MEASURED FROM THE TOP OF THE JUNCTION OR DEVICE BOX NOR LESS THAN 15 INCHES MEASURED TO THE BOTTOM OF THE JUNCTION OR DEVICE BOX ABOVE THE FINISHED FLOOR.
9. ALL RECEPTACLE OUTLETS ON BRANCH CIRCUITS OF 30 - AMPERES OR LESS AND COMMUNICATION SYSTEM RECEPTACLES SHALL BE LOCATED NO MORE THAN 48 INCHES MEASURED FROM THE TOP OF THE RECEPTACLE OUTLET BOX OR RECEPTACLE HOUSING NOR LESS THAN 15 INCHES MEASURED TO THE BOTTOM OF THE RECEPTACLE OUTLET BOX OR RECEPTACLE HOUSING ABOVE FINISHED FLOOR.

GROUNDING
1. THE GROUNDING SYSTEM SHALL MEET THE REQUIREMENTS OF THE NEC AND THE LOCAL ADOPTED CODE. ALL ELECTRICAL EQUIPMENT AND RACEWAYS SHALL BE PROPERLY GROUNDED.
2. AN INSULATED EQUIPMENT GROUNDING CONDUCTOR, IN ACCORDANCE WITH NEC CODE , SHALL BE PROVIDED IN ALL CONDUITS WITH CURRENT CARRYING CONDUCTORS. ALL LUGS AND CONNECTORS SHALL BE RATED FOR THE CONDUCTOR MATERIAL AND THE CONDITIONS OF USE.
3. THE GROUNDING RESISTIVITY WILL BE TESTED AFTER INSTALLATION TO CONFIRM 5 OHM OR LESS RESISTANCE FROM RACKING TO GROUND. IF GROUND RESISTANCE IS GREATER THAN 5 OHMS ADDITIONAL GROUNDING WILL BE INSTALLED UNTIL RESISTANCE IS LESS THAN 5 OHMS.

WIRING DEVICES
1. RECEPTACLES SHALL BE AS DESIGNED ON THE DRAWINGS AND SHOULD BE A BRAND CONSISTENT WITH OTHERS IN THE VICINITY WHENEVER POSSIBLE.
2. ALL WIRING DEVICES SHALL BE PROVIDED WITH APPROPRIATE COVER-PLATES. ANY EMPTY BOXES SHALL HAVE BLANK COVER PLATES. COVER-PLATES SHALL BE LEXAN, PLASTIC OR STAINLESS STEEL IN FINISHED AREA. GALVANIZED COVER-PLATES MAY BE USED IN EQUIPMENT ROOMS.

LABELING AND PHASING
1. FOR LABELING USE NUMBERED UV RATED LABELS TO INDICATE STRING NUMBER.
2. AS A SUBSTITUTE FOR LABELS YELLOW TAPE MAY BE USED FOR PHASING
3. EACH METHOD DESCRIBED ABOVE WILL NEED TO BE PERFORMED ON BOTH POSITIVE AND NEGATIVE AT POINTS WHERE CONDUCTORS ARE TERMINATED

SYSTEM DETAILS

DESCRIPTION	NEW GRID-INTERACTIVE PHOTOVOLTAIC SYSTEM WITH NEW WHOLE HOME BACKUP BATTERY ENERGY STORAGE SYSTEM.
DC RATING OF SYSTEM	SYSTEM SIZE : 17.010KW DC STC
AC RATING OF SYSTEM	12.18KW
MAX. AC OUT. CURRENT	50.82 A
NO. OF MODULES	(42) HANWHA Q.CELL Q.PEAK DUO BLK ML-G10+/TS 405 (405W) SOLAR MODULES
NO. OF INVERTERS	(42) ENPHASE IQ8PLUS-72-2-US MICROINVERTERS
ARRAY STRINGING	(2) BRANCHES OF 11 MODULES, (2) BRANCHES OF 10 MODULES
NO. OF BATTERIES	(02) TESLA POWERWALL 2
UTILITY COMPANY	FPL (FLORIDA POWER & LIGHT)
AC GROSS POWER RATING (GPR)	14.459 KW
PV SYSTEM TIER	II (10 KW AC < GPR ≤ 100 KW AC)

SITE DETAILS

ASHRAE EXTREME LOW	-5°C
ASHRAE 2% HIGH	34°C
GROUND SNOW LOAD	3 PSF
WIND SPEED	130 MPH (ASCE 7-22)
RISK CATEGORY	II
WIND EXPOSURE CATEGORY	C

GOVERNING CODES

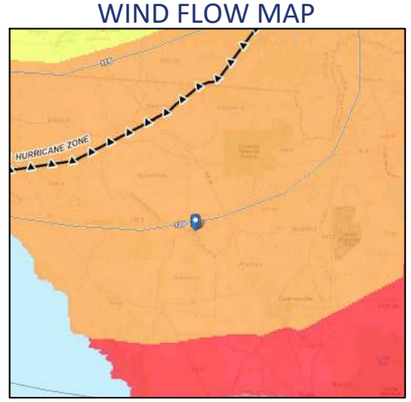
FLORIDA RESIDENTIAL CODE, 8TH EDITION 2023 (FRC)
FLORIDA BUILDING CODE, 8TH EDITION 2023 (FBC)
FLORIDA FIRE PREVENTION CODE, 8TH EDITION 2023 (FFPC)
NATIONAL ELECTRICAL CODE, NEC 2020 CODE BOOK

SHEET INDEX

SITE MAP (N.T.S)

VICINITY MAP

WIND FLOW MAP



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SIGNATURE WITH SEAL

KIMANDY LAWRENCE LICENSE No. 83317 STATE OF FLORIDA PROFESSIONAL ENGINEER

Digitally signed by Kimandy Lawrence
Date: 2024.06.14 14:29:37 -04'00'

COVER PAGE

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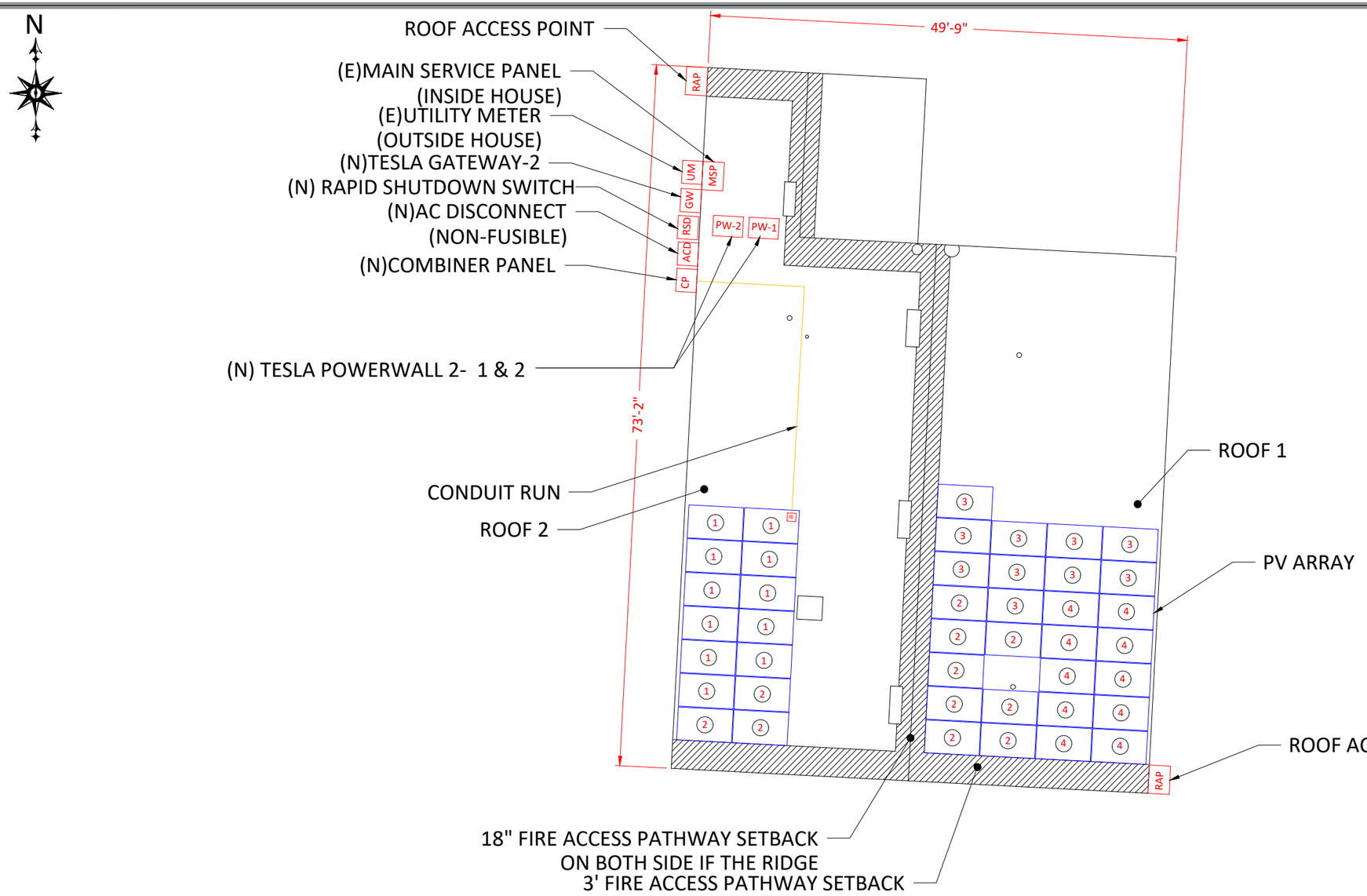

EQUIPMENT SPECIFICATIONS		
EQUIPMENT	DESCRIPTION	QUANTITY
MODULE	HANWHA Q.CELL Q.PEAK DUO BLK ML-G10+/TS 405 (405W) SOLAR MODULES	42
INVERTER	ENPHASE IQ8PLUS-72-2-US MICROINVERTERS	42
JUNCTION BOX	EZSOLAR JB-1.XL/JB-3	1
COMBINER PANEL	80A ENPHASE IQ COMBINER 5C	1
AC DISCONNECT	AC DISCONNECT 240V, 100 AMP, NON-FUSED, NEMA 3R, UL LISTED	1
ATTACHMENT	IRONRIDGE QUICKMOUNT HALOULTRAGRIP	89
RACKING SYSTEM	IRONRIDGE (XR100) RAILS	-

ROOF SPECIFICATIONS	
ROOF MATERIAL	ASPHALT SHINGLE
ROOF CONDITION	GOOD
RAFTERS	2"X 4"@24"OC

SYSTEM INFORMATION	
DC SYSTEM SIZE	17.010KW
AC SYSTEM SIZE	12.18KW

ROOF INFORMATION			
ROOF	QUANTITY	SLOPE	AZIMUTH
ROOF 1	28	22.62°(5/12)	93°
ROOF 2	14	22.62°(5/12)	273°

NOTES:
1. LOCATION OF JUNCTION BOX(ES), AC DISCONNECTS(S), AC COMBINER PANEL(S), AND OTHER ELECTRICAL EQUIPMENT(S) RELEVANT TO PV INSTALLATION SUBJECT TO CHANGE BASED ON SITE CONDITIONS.
2. SETBACKS AT RIDGES CAN BE REDUCED TO 18 INCHES IN COMPLIANCE WITH FBC R 324.6.2:
TOTAL PLAN VIEW AREA = 3124 SQFT
TOTAL PV AREA = 42(74.4 IN)(41.2 IN)/(144 IN^2)
= 894.04 SQFT
(894.04 SQFT/3124 SQFT)100 = 28.62 %
TOTAL PV AREA POPULATES 28.62 % OF TOTAL PLAN VIEW AREA AND IS WITHIN THE 33% REQUIREMENT.

LEGENDS

- UM - UTILITY METER
- MSP - MAIN SERVICE PANEL
- JB - JUNCTION BOX
- GW - TESLA GATEWAY
- ACD - AC DISCONNECT
- CP - COMBINER PANEL
- PW - TESLA POWERWALL 2
- RAP - ROOF ACCESS POINT
- (1) - STRING TAG
- - CONDUIT RUN
- - FIRE SETBACK
- - ROOF OBSTRUCTION

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FIRE SAFETY PLAN

PV-2

CONDUCTOR AND CONDUIT SCHEDULE

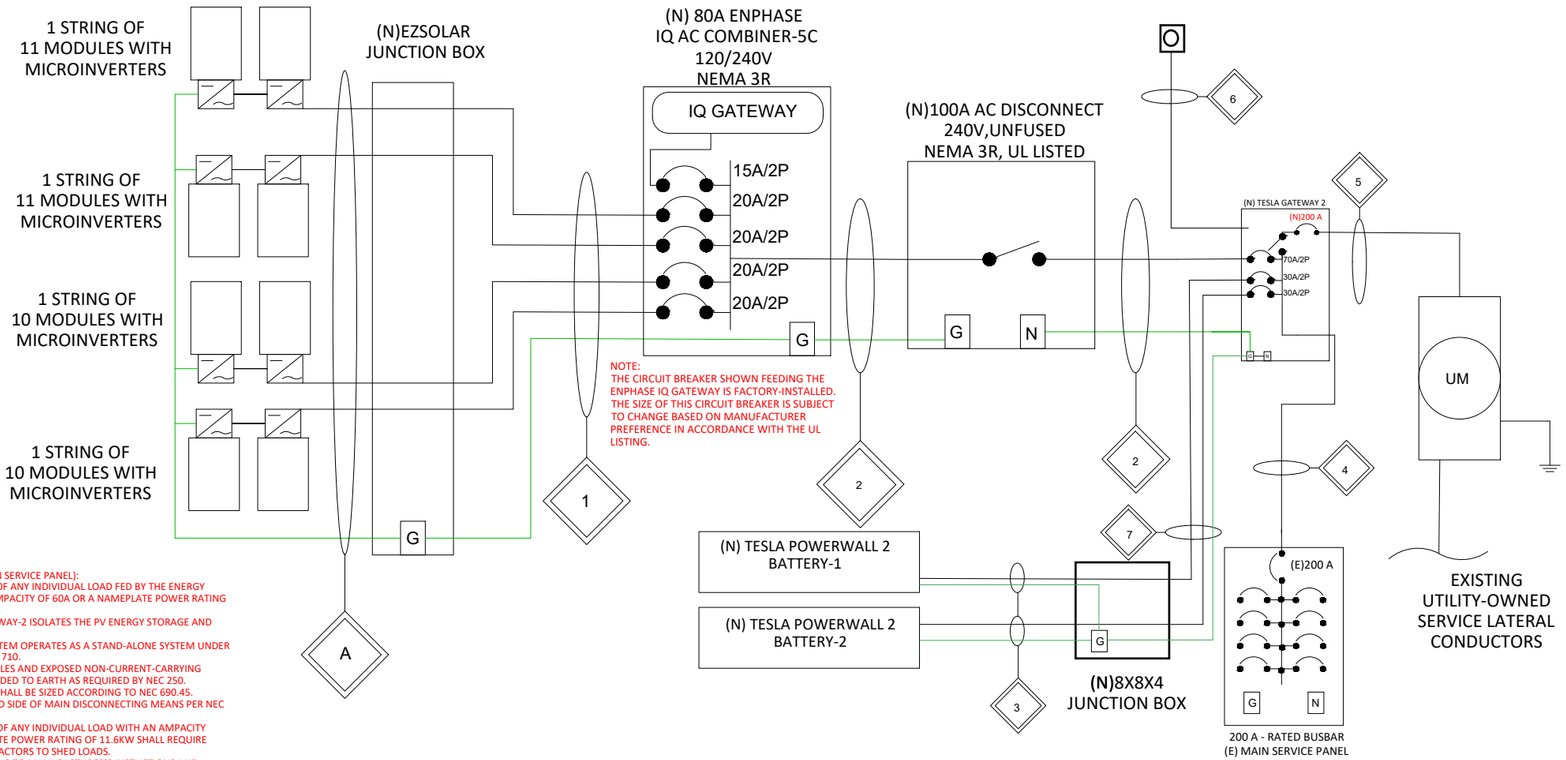
SR. NO.	DESCRIPTION	CONDUIT SIZE
A	ENPHASE Q CABLES, (1) #10 AWG THWN-2 (G)	
1	(4) #10 AWG THWN-2 (L1)CU ,(4) #10 AWG THWN-2 (L2)CU, (1) #10 AWG THWN-2 (G)CU	IN 1" CONDUIT RUN
2	(3) #4 AWG THWN-2 (L1,L2,N)CU , (1) #8AWG THWN-2 (G) CU	IN 1-1/4" CONDUIT RUN
3	(3) #10 AWG THWN-2 (L1,L2,N)CU , (1) #10 AWG THWN-2 (G) CU	IN 3/4" CONDUIT RUN
4	(3)2/0 AWG THWN-2 (L1,L2,N)CU, (1) #6 AWG THWN-2 (G)CU	IN 1-1/2" CONDUIT RUN
5	(3)2/0 AWG THWN-2 (L1,L2,N)CU	IN 1-1/2" CONDUIT
6	(2) #12 AWG THWN-2 (L1,L2)CU, (1) #10 AWG THWN-2 (G)CU	3/4" CONDUIT
7	(6) #10 AWG THWN-2 (L1,L2,N)CU , (1) #10 AWG THWN-2 (G) CU	3/4" CONDUIT

NOTE:
1.CONDUIT RUN - EMT, PVC, IMC, RMC, FMC, LFMC OR EQUIVALENT AS PER NEC.
2. ALL EQUIPMENT GROUNDING CONDUCTORS SMALLER THAN #6 AWG SHALL RUN BENEATH THE ARRAY(S) OR IN A CONDUIT RUN TO PROTECT FROM PHYSICAL DAMAGE PER NEC 690.46 AND NEC 250.120(C).
3. LEGEND: (E) = EXISTING, (N) = NEW; APPLICABLE TO CONDUCTORS, CONDUITS, ELECTRICAL ENCLOSURES, ETC.
4.VOLTAGE DROP CALCULAIONS SHALL BE PROVIDED FOR TRENCHED CONDUIT RUNS OF 75 FEET OR GREATER.
5.SOLAR CONTRACTOR SHALL ENSURE TRENCHED CONDUIT(S) MEET NEC TABLE 300.5 MINIMUM COVER REQUIREMENTS RESPECTIVE TO TYPE OF CONDUIT TRENCHED AND LOCATION OF TRENCHED CONDUIT.
6.SERVICE SUPPLYING DWELLING UNIT SHALL BE PROVIDED WITH SURGE-PROTECTIVE DEVICE (SPD) PER NEC 230.67.

MODULE SPECIFICATION	
MANUFACTURER	HANWHA Q.CELL
MODEL NO.	Q.PEAK DUO BLK ML-G10+/TS 405
PEAK POWER (Pmpp)	405 W
PEAK VOLTAGE (Vmpp)	37.39 V
PEAK CURRENT (Impp)	10.83 A
OPEN CIRCUIT VOLTAGE (Voc)	45.34 V
SHORT CIRCUIT CURRENT (Isc)	11.17 A
TOTAL QUANTITY	42

BATTERY SPECIFICATION	
MANUFACTURER	TESLA
MODEL NO.	POWERWALL 2
CAPACITY	14 KWH
MAX. CONT. POWER OUTPUT	5.8 KVA
MAXIMUM OUTPUT CURRENT	21.6 A
NOMINAL OPERATING VOLTAGE	240 V
TOTAL QUANTITY	02

ARRAY DETAILS	
DC SYSTEM SIZE	17.010KW
AC SYSTEM SIZE	12.18KW
TOTAL NO. OF MODULES	42
NO. OF MODULE PER STRING	02@11,02@10
NO. OF STRING	04



NOTE:
A UTILITY SERVICE SHUTDOWN IS REQUIRED TO SAFELY PERFORM THE WORK

MINIMUM #6 AWG COPPER GEC FROM UTILITY METER SERVICE PANEL RUN TO TWO 5/8" X 8" GROUND RODS. GROUND RODS ARE AT A MINIMUM SEPARATION OF 6' BOND TO COLD WATER PIPE AND INTER-SYSTEM BONDING JUMPER PER NEC 250.66(A) AND NEC 250.52(A)(5).

ENERGY STORAGE SYSTEM NOTES (PER MAIN SERVICE PANEL):
1. THE OVERCURRENT PROTECTION DEVICE OF ANY INDIVIDUAL LOAD FED BY THE ENERGY STORAGE SYSTEM SHALL NOT EXCEED AN AMPACITY OF 60A OR A NAMEPLATE POWER RATING OF 10 KW.
2. IF THE UTILITY IS DOWN, THE TESLA GATEWAY-2 ISOLATES THE PV ENERGY STORAGE AND UNINTERRUPTIBLE LOADS.
3. IF THE UTILITY IS DOWN, THE BACKUP SYSTEM OPERATES AS A STAND-ALONE SYSTEM UNDER THE CONDITIONS OF NEC ARTICLES 706 AND 710.
4. ALL METAL ENCLOSURES, RACEWAYS, CABLES AND EXPOSED NON-CURRENT-CARRYING METAL PARTS EQUIPMENT SHALL BE GROUNDED TO EARTH AS REQUIRED BY NEC 250.
5. EQUIPMENT GROUNDING CONDUCTORS SHALL BE SIZED ACCORDING TO NEC 690.45.
6. PV SYSTEM INTERCONNECED ON THE LOAD SIDE OF MAIN DISCONNECTING MEANS PER NEC 705.12(B).
7. THE OVERCURRENT PROTECTION DEVICE OF ANY INDIVIDUAL LOAD WITH AN AMPACITY RATING GREATER THAN 60A OR A NAMEPLATE POWER RATING OF 11.6KW SHALL REQUIRE INSTALLATION OF ENPHASE AUXILARY CONTACTORS TO SHED LOADS.
8. BATTERIES SHALL BE INSTALLED ACCORDING TO MANUFACTURER'S INSTUCTIONS AND PROVIDE THE MINIMUM FRONT AND SIDE CLEARANCE REQUIREMENTS AS WELL AS THE MINIMUM FLOOR, ADJACENT BATTERY (VERTICAL OR HORIZONTAL) AND CEILING SETBACK REQUIREMENTS, AS APPLICABLE TO INSTALLATION LOCATION.
9. BATTERIES INSTALLED IN THE PATH OF MOTOR VEHICLES SHALL BE PROTECTED FROM DAMAGE BY FOLLOWING MANUFACTURER'S INSTRUCTIONS FOR MINIMUM DISTANCE FROM FLOOR OR BY INSTALLATION OF BOLLARDS.

PER FL. STATUE 377.705 (REVISED 7/1/2017) I, KIMANDY LAWRENCE PE#83317, AN ENGINEER LICENSED PURSUANT TO CHAPTER 471, CERTIFY THAT THE PV ELECTRICAL SYSTEM AND ELECTRICAL COMPONENTS ARE DESIGNED AND APPROVED USING THE STANDARDS CONTAINED IN THE MOST RECENT VERSION OF THE FLORIDA BUILDING CODE.

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SIGNATURE WITH SEAL

ELECTRICAL LINE DIAGRAM

PV-3

ELECTRICAL CALCULATIONS :

1. CURRENT CARRYING CONDUCTOR

(A) BEFORE IQ COMBINER PANEL :

AMBIENT TEMPERATURE = 34°C
CONDUIT INSTALLED AT MINIMUM DISTANCE OF 7/8 INCHES ABOVE ROOF .....NEC 310.15(B)(2)

TEMPERATURE DERATE FACTOR - (0.96) .....NEC 310.15(B)(1)
GROUPING FACTOR - (0.7) .....NEC 310.15(C)(1)

CONDUCTOR AMPACITY:

= (INV O/P CURRENT) x 1.25 / A.T.F / G.F ...NEC 690.8(B)
= [(11 x 1.21) x 1.25] / 0.96 / 0.7
= 24.76 A
SELECTED CONDUCTOR - #10 THWN-2 ...NEC 310.16

(B) AFTER IQ COMBINER PANEL :

TEMPERATURE DERATE FACTOR - (0.96)
GROUPING FACTOR - (1)

CONDUCTOR AMPACITY
= (TOTAL INV O/P CURRENT) x 1.25 / 0.96 / 1 ...NEC 690.8(B)
= [(42 x 1.21) x 1.25] / 0.96 / 1
= 66.17 A
SELECTED CONDUCTOR - #4 THWN-2 ...NEC 310.16

2. PV OVER CURRENT PROTECTION ...NEC 690.9(B)

= TOTAL INVERTER O/P CURRENT x 1.25
= (42 x 1.21) x 1.25 = 63.53 A
SELECTED OCPD IS 70 A

SELECTED EQUIPMENT GROUNDING CONDUCTOR (EGC) = #10 THWN-2 ...NEC 250.122

3. INDIVIDUAL BATTERY BACKUP OVER CURRENT PROTECTION ...NEC 690.9(B)

= TOTAL BATTERY O/P CURRENT X 1.25
= (21.6)X 1.25 = 27.00 A
SELECTED OCPD IS 30 A.

SELECTED CONDUCTOR - #10 THWN-2 ... NEC 310.16

SELECTED EQUIPMENT GROUNDING CONDUCTOR (EGC) = #10 THWN-2 ...NEC 250.122

GENERAL ELECTRICAL NOTES:

1. THE DC AND AC CONNECTORS OF THE ENPHASE IQ8PLUS-72-2-US MICROINVERTERS ARE LISTED TO MEET REQUIREMENTS AN EQUIPMENT DISCONNECTING MEANS SHALL BE PERMITTED TO BE REMOTE FROM THE EQUIPMENT WHERE THE EQUIPMENT DISCONNECTING MEANS CAN BE REMOTELY OPERATED FROM WITHIN 3 M (10 FT) OF THE EQUIPMENT BY NEC 690.15(A).
2. MICROINVERTER BRANCH CIRCUIT CONDUCTORS ARE MANUFACTURED ENPHASE Q CABLES LISTED FOR USE IN 20A OR LESS CIRCUITS OF ENPHASE IQ MICROINVERTERS. THEY ARE ROHS, OIL RESISTANT, AND UV RESISTANT. THEY CONTAIN AWG CONDUCTORS OF TYPE THHN/THWN-2 DRY/WET AND CERTIFIED TO UL3003 AND UL 9703. THE CABLE'S DOUBLE INSULATED RATING REQUIRES NO NEUTRAL OR GROUNDED CONDUCTOR.
3. ALL METAL ENCLOSURES, RACEWAYS, CABLES AND EXPOSED NONCURRENT-CARRYING METAL PARTS OF EQUIPMENT SHALL BE GROUNDED TO EARTH AS REQUIRED BY NEC 250.4(B) AND PART III OF NEC ARTICLE 250 AND EQUIPMENT GROUNDING CONDUCTORS SHALL BE SIZED ACCORDING TO NEC 690.45. THE GROUNDING ELECTRODE SYSTEM SHALL ADHERE TO 690.47(A).
4. PV SYSTEM DISCONNECT SHALL BE READILY ACCESSIBLE.
5. POINT-OF-CONNECTION SHALL BE MADE IN COMPLIANCE WITH NEC 705.11 or 705.12
6. UTILITY HAS 24-HR UNRESTRICTED ACCESS TO ALL PHOTOVOLTAIC SYSTEM COMPONENTS LOCATED AT THE SERVICE ENTRANCE.
7. MODULES CONFORM TO AND ARE LISTED UNDER UL 1703, UL 61730 , 61730-1 AND 61730-2. MICROINVERTERS CONFORM TO AND ARE LISTED UNDER UL 1741 AND IEEE 1547 - 2018.
8. CONDUCTORS EXPOSED TO SUNLIGHT SHALL BE LISTED AS SUNLIGHT RESISTANT PER NEC ARTICLE 300.6(C)(1) AND ARTICLE 310.10 (D).
9. CONDUCTORS EXPOSED TO WET LOCATIONS SHALL BE SUITABLE FOR USE IN WET LOCATIONS PER NEC ARTICLE 310.10 (C).
10. LINE SIDE TAP DISCONNECTS MUST BE LOCATED NO MORE THAN 10 FEET FROM THE TAP POINT PER NEC 690.15(A)
11. ALL PHOTOVOLTAIC SYSTEM DC CIRCUITS RAN INSIDE OR ON ALL BUILDINGS AND STRUCTURES SHALL BE ENCLOSED IN METALLIC CONDUIT IN COMPLIANCE WITH NEC 690.31(D). THIS REQUIREMENT SHALL APPLY TO OPTIMIZER-BASED SYSTEMS, BUT SHALL NOT APPLY TO MICROINVERTER-BASED SYSTEMS.
12. A 10 AWG COPPER EQUIPMENT GROUNDING CONDUCTOR SIZED IN ACCORDANCE WITH NEC 690.45 SHALL BE USED TO BOND RAILS AND OTHER ROOFTOP EQUIPMENT. THE CONDUCTOR SHALL BE PROTECTED FROM PHYSICAL DAMAGE IN ACCORDANCE WITH NEC 250.120(C) BY RUNNING WITHIN THE HOLLOW SPACE BENEATH THE SOLAR STRUCTURE OR BY RUNNING WITHIN AN IDENTIFIED RACEWAY OR CABLE ARMOR. IF THE EQUIPMENT GROUNDING CONDUCTOR IS UNPROTECTED FROM PHYSICAL DAMAGE AT ANY POINT IN ITS CONDUCTOR RUN THE CONDUCTOR SHALL BE INCREASED TO A MINIMUM OF 6 AWG COPPER IN ACCORDANCE WITH NEC 250.120(C).

GROUNDING NOTES:

PV MODULE AND RACKING GROUNDING AS PER APPROVED INSTALLATION PRACTICE AND IN LINE WITH MANUFACTURE'S GUIDELINES.

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ELECTRICAL CONTRACTOR LICENSE:EC13002600

ALEXANDER, JOHNNIE

608 SW ROBERTS AVE
FORT WHITE, FL 32038
29.941978, -82.758846

SIGNATURE WITH SEAL

ELECTRICAL CALCULATIONS

PV-4

Columbia County Property Appraiser

Jeff Hampton | Lake City, Florida | 386-758-1083

Owner & Property Info — Parcel ID: **30-6S-16-03999-008 (20741)**

Name	ALEXANDER CHRISTOPHER LEE (exempt: HX-HB-13-)
Site Addr	608 SW ROBERTS, FORT WHITE
Mailing	608 SW ROBERTS AVE FORT WHITE, FL 32038
Description	COMM NW COR OF NW1/4, RUN E 410.22 FT FOR POB, CONT E 410.78 FT, S 529.21 FT, W 410.79 FT, N 530.37 FT TO POB. (LOT 1B) ALSO BEG 30-6S-16-03999-008

	Bldg Item	Bldg Desc	Year Blt	Base S.F.	Actual S.F.	Bldg Value
Show Sub-Area Codes	1	SINGLE FAM (0100)	1998	1817	3315	$240,598.00

Parcel: << **30-6S-16-03999-008 (20741)** >>

Owner & Property Info — Result: 1 of 1

Owner	**ALEXANDER CHRISTOPHER LEE** **ALEXANDER JOHNNIE W** 608 SW ROBERTS AVE FORT WHITE, FL 32038
Site	608 SW ROBERTS AVE, FORT WHITE
Description*	COMM NW COR OF NW1/4, RUN E 410.22 FT FOR POB, CONT E 410.78 FT, S 529.21 FT, W 410.79 FT, N 530.37 FT TO POB. (LOT 1B) ALSO BEG NW COR OF NW1/4, RUN E 410.22 FT, S 530.37 FT, W 410.21 FT, N 531.37 FT TO POB. (LOT 1C) 850-1252, 855-578, DC 857-2213, WD 11 ...more>>>
Area	10 AC — S/T/R: 30-6S-16
Use Code**	SINGLE FAMILY (0100) — Tax District: 3

*The Description above is not to be used as the Legal Description for this parcel in any legal transaction.
**The Use Code is a FL Dept. of Revenue (DOR) code and is not maintained by the Property Appraiser's office. Please contact your city or county Planning & Zoning office for specific zoning information.

Residential Electrical Service Calculation

General Load [per NEC 220.82(B)]		
Square Feet (Total Area Under Air)		
3315 x 3 VA / sq. ft	9,945	VA
Two 20-A appliance outlet circuits at 1500 VA each	3,000	VA
(2) Additional 20-A appliance outlet circuits at 1500 VA each	3,000	VA
Laundry Circuit	1,500	VA
Range (at nameplate rating)	12,000	VA
Cooktop (at nameplate rating)	5,000	VA
Tank Water Heater (at nameplate rating)	4,500	VA
Microwave (at nameplate rating)	1,000	VA
Refrigerator	1,000	VA
Garage Door Opener	1,000	VA
Disposal (at nameplate rating)	900	VA
Clothes Dryer (at nameplate rating)	4,500	VA
Total	47,345	VA
First 10 kVA of general load at 100%	10,000	VA
Remainder of general load at 40%	14,938	VA
Total of general load	24,938	VA

Heating and Air Conditioning Load [per NEC 220.82(C)]			
Air Conditioner @ 100% - per NEC 220.82(C)	3,500	VA	Non coincidential Load
10 kVA of Heat at 100% - per NEC 220.82(C)	10,000	VA	Non coincidential Load
Total	34,938	VA	

Electric Vehicle Supply Equipment @ 100% [per NEC 625.42]		
EV Charger	0	VA

Calculated Load for Service Size [per NEC 230.42 & 230.79]			
	34938 VA ÷ 240V =	145.58	A
Continuous Load 1			
Continuous Load 2			
Minimum Required Service Rating		**150**	**A**

Feeder Neutral Load [per NEC 220.61]		
Square Feet		
3315 x 3 VA / sq. ft	9,945	VA
Three 20-A circuits at 1500	4,500	VA
Total	14,445	VA
3,000 VA at 100%	3,000	VA
14445 VA - 3000 VA = 1144	4,006	VA
Subtotal	7,006	VA
Range: 12 kVA at 70%	8,400	VA
Clothes Dryer: 5 kVA at 70%	3,150	VA
Dishwasher	-	VA
Total	18,556	VA

Calculated Load for Neutral		
18555.75 VA ÷ 240 V=	**77.32**	**A**

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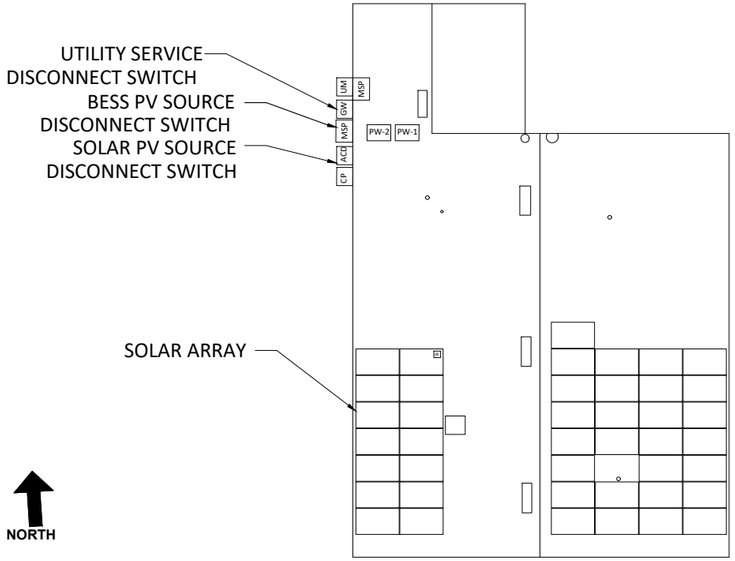
ELECTRICAL CALCULATIONS

PV-4.1

CAUTION:MULTIPLE SOURCES OF POWER

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



SITE-SPECIFIC DIRECTORY PLACARD(S) SHALL BE INSTALLED AT THE FOLLOWING LOCATION(S):
UTILITY SERVICE DISCONECT SWITCH (MSP) AND SOLAR PV SOURCE DISCONNECT SWITCH (ACD)
NEC 2020 EDITION 705.10

SOLAR AC DISCONNECT

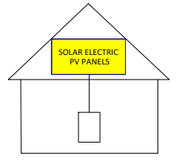
NOTICE

RAPID SHUTDOWN SWITCH
FOR SOLAR PV SYSTEM

NEC 2020 EDITION 690.56 (C)(2)

SOLAR PV SYSTEM IS EQUIPPED WITH RAPID SHUTDOWN

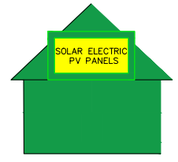
TURN RAPID SHUTDOWN SWITCH TO THE "OFF" POSITION TO SHUTDOWN PV SYSTEM AND REDUCE SHOCK HAZARD IN THE ARRAY



NEC 2020 EDITION 690.56 (C)

EMERGENCY RESPONDER:
THIS SOLAR PV SYSTEM IS EQUIPPED WITH RAPID SHUTDOWN

TURN RAPID SHUTDOWN SWITCH TO THE "OFF" POSTION TO SHUTDOWN ENTIRE PV SYSTEM.



FLORIDA FIRE PREVENTION CODE EIGHTH EDITION 11.12.2.1.1.1.1
NFPA 1 2021 EDITION 11.12.2.1.1.1.1 AND FIGURE A.11.12.2.1.1.1.1(a)

AC COMBINER PANEL

NOTICE

AC COMBINER PANEL AND DATA ACQUISITION FOR SOLAR PV SYSTEM ONLY.
DO NOT ADD LOADS.

WARNING

AC VOLTAGE : 240V
MAX. CURRENT: 50.82 A

EMERGENCY CONTACT

RACK ELECTRIC
(561)-391-3550

FLORIDA FIRE PREVENTION CODE EIGHTH EDITION 11.12.2.1.5

⚠ WARNING

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

ESS (BATTERY)

NOMINAL ESS VOLTAGE :	240 V
MAX AVAILABLE SHORT CIRCUIT FROM ESS:	139.2 A
ARC FAULT CLEARING TIME:	0.05 SEC
DATE OF CALCULATION:	06/11/2024

NOTES:
1.THE MATERIAL USED FOR THE PHOTOVOLTAIC SYSTEM LABELS SHALL BE REFLECTIVE, WEATHER RESISTANT, AND CONSTRUCTED OF DURABLE ADHESIVE MATERIAL OR ANOTHER APPROVED MATERIAL SUITABLE FOR THE ENVIRONMENT IN COMPLIANCE WITH NFPA 1-11.12.
2. FONT, TEXT HEIGHT , CAPITALIZATION , FONT COLOR(S), BACKGROUND COLOR(S), DIAGRAM COLOR(S)AND CONTEXT OF PHOTOVOLTAIC SYSTEMS LABELS SHALL COMPLY WITH NFPA 1-11.12 AND NEC 2020 690.56 AS APPLICABLE FOR THE PHOTOVOLTAIC SYSTEM TO BE INSTALLED.

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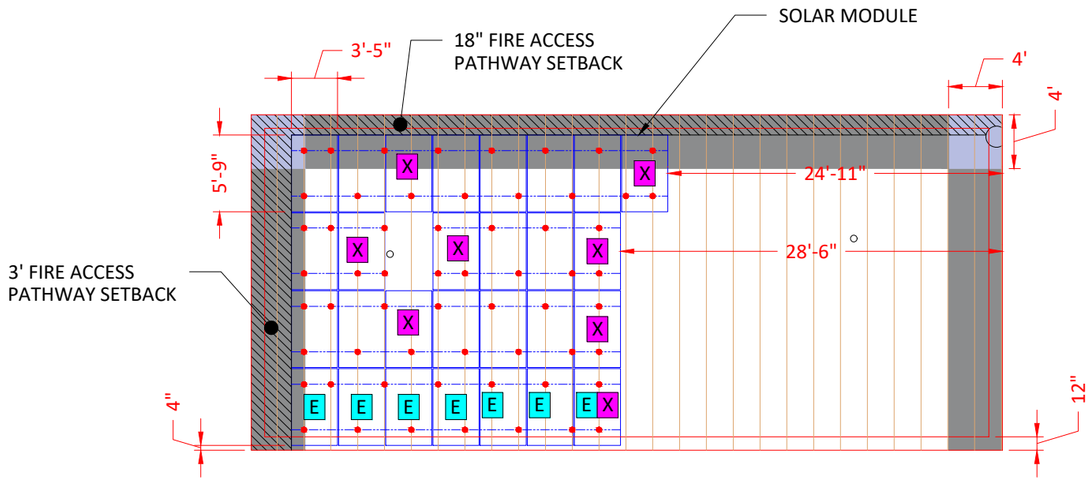
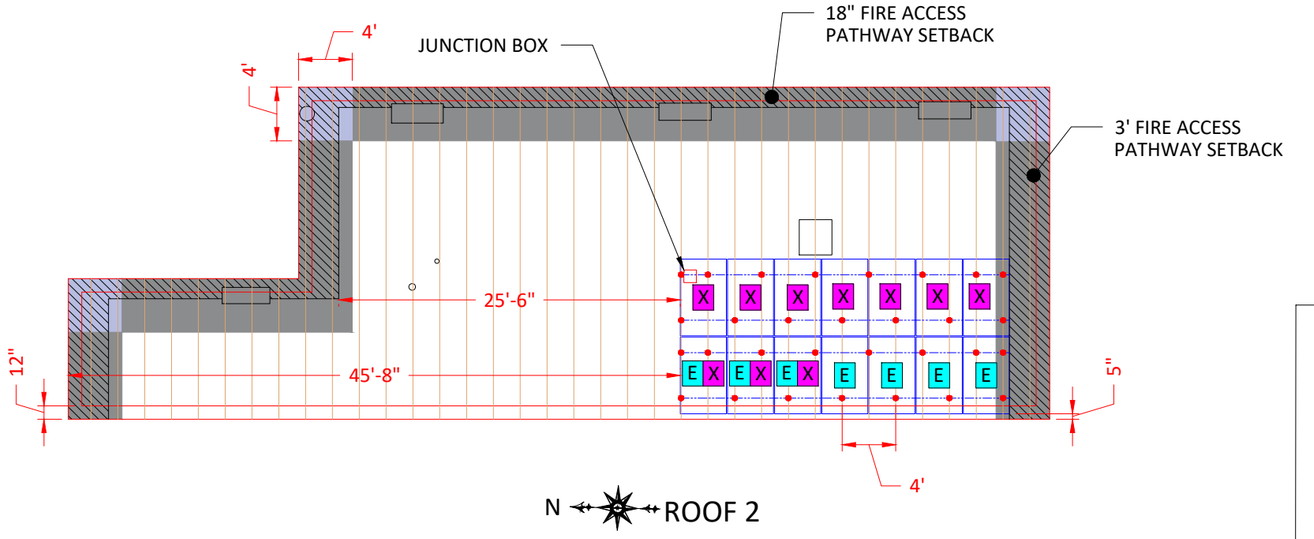
LABELS
PV-5



N ROOF 1



N ROOF 2

EQUIPMENT SPECIFICATIONS		
EQUIPMENT	DESCRIPTION	QUANTITY
MODULE	HANWHA Q.CELL Q.PEAK DUO BLK ML-G10+/TS 405 (405W) SOLAR MODULES	42
INVERTER	ENPHASE IQ8PLUS-72-2-US MICROINVERTERS	42
JUNCTION BOX	EZSOLAR JB-1.XL/JB3	1
COMBINER PANEL	80A ENPHASE IQ COMBINER 5C	1
AC DISCONNECT	AC DISCONNECT 240V, 100 AMP, NON-FUSED, NEMA 3R, UL LISTED	1
ATTACHMENT	IRONRIDGE QUICKMOUNT HALOULTRAGRIP	89
RACKING SYSTEM	IRONRIDGE (XR100) RAILS	-

ROOF SPECIFICATIONS	
ROOF MATERIAL	ASPHALT SHINGLE
ROOF CONDITION	GOOD
RAFTERS	2"X 4"@24"OC

SYSTEM INFORMATION	
DC SYSTEM SIZE	17.010KW
AC SYSTEM SIZE	12.18KW

ROOF INFORMATION			
ROOF	QUANTITY	SLOPE	AZIMUTH
ROOF 1	28	22.62°(5/12)	93°
ROOF 2	14	22.62°(5/12)	273°

NOTES:
1. LOCATION OF JUNCTION BOX(ES), AC DISCONNECTS(S), AC COMBINER PANEL(S), AND OTHER ELECTRICAL EQUIPMENT(S) RELEVANT TO PV INSTALLATION SUBJECT TO CHANGE BASED ON SITE CONDITIONS.
2. TRUSS LOCATIONS ARE APPROXIMATE. ACTUAL LOCATIONS MAY DIFFER AND CONTRACTOR MAY NEED TO ADJUST MOUNT LOCATIONS. IN NO CASE SHALL THE MOUNT SPACING EXCEED "MAX. MOUNT SPACING"
3. PROPOSED PHOTOVOLTAIC LAYOUT IN COMPLIANCE WITH NFPA 1,2021 EDITION

LEGENDS
- WIND ZONE 1
- WIND ZONE 1'

WIND ZONE 2
- WIND ZONE (2)

WIND ZONE 3
- WIND ZONE (3)

WIND LOAD INFORMATION:
THIS SYSTEM HAS BEEN DESIGN TO MEET THE REQUIREMENTS OF THE 8TH EDITION OF THE FLORIDA BUILDING CODE AND USED THE FOLLOWING DESIGN PARAMETERS:
ULTIMATE WIND SPEED: 130 MPH
EXPOSURE CATEGORY: C
RISK CATEGORY: II
MEAN ROOF HEIGHT: 15 FT
ROOF SLOPE: 20°-27°

LEGENDS
- PV ROOF ATTACHMENT
- RAILS
- RAFTERS/TRUSSES
- STANDING SEAMS
- ROOF OBSTRUCTION
- JUNCTION BOX
- FIRE SETBACK
- EXPOSED MODULE
- EDGE MODULES

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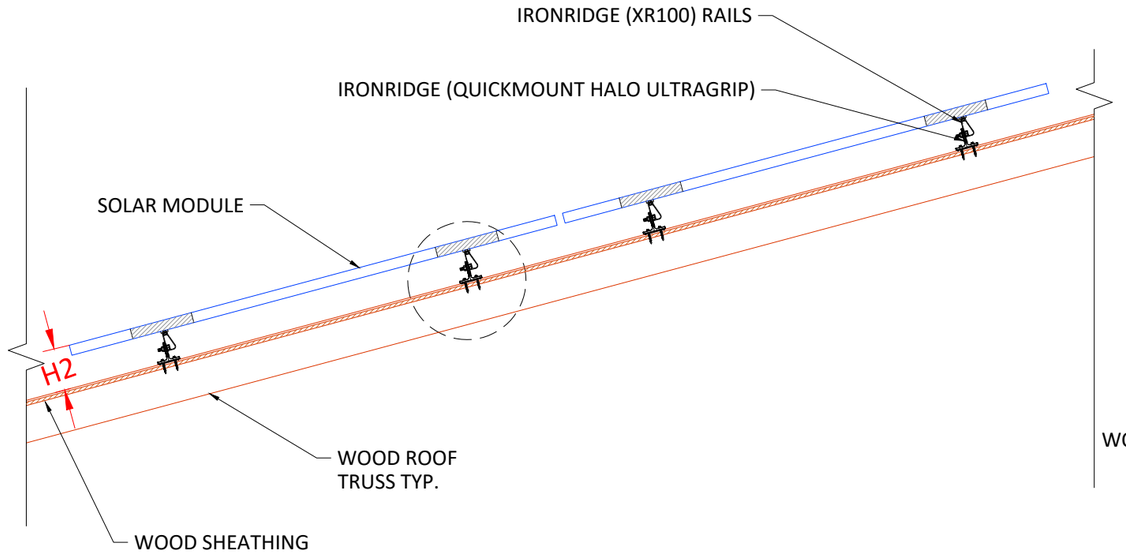
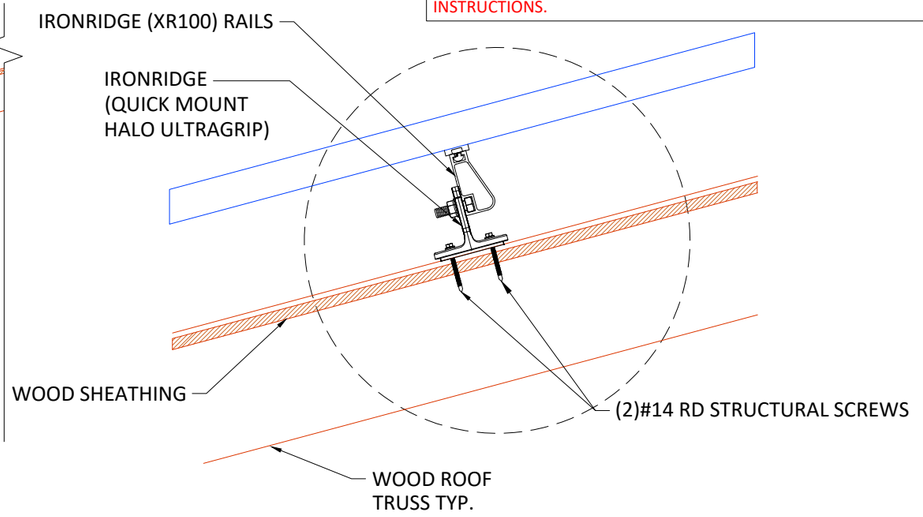
RACKING LAYOUT

PV-6



NOTE:
1.H2 IS LESS THAN OR EQUAL TO 6 INCHES.
2.IRONRIDGE QUICKMOUNT HALO ULTRAGRIP EMPLOYED AS A TRUSS-ANCHORED ATTACHMENT WITH (2) #14 RD STRUCTURAL SCREWS.
3.CONTRACTOR SHALL INSTALL TRUSS-ANCHORED HUG SOLAR ROOF ATTACHMENTS IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS.



I CERTIFY THAT THE EXISTING ROOF AND BUILDING STRUCTURE CAN WITHSTAND ALL DEAD LOADS IMPOSED BY THE PHOTOVOLTAIC SYSTEM AND ALL WIND LOADS OF SPECIFIED INTENSITY IN ACCORDANCE WITH THE FLORIDA BUILDING CODE.

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STRUCTURAL DETAILS

PV-7

WIND LOAD CALCULATIONS FOR MODULES INSTALLED ON ROOFS WITH A HEIGHT LESS THAN 60'
BASED ON ASCE 7-22

SITE INFORMATION

BUILDING CODE VERSION	2023 FLORIDA BUILDING CODE	RISK CATEGORY	II	
MEAN ROOF HEIGHT (ft)	15	EXPOSURE CATEGORY	C	PITCH
LEAST HORIZONTAL DIMENSION (ft)	50	ROOF SLOPE (°)	22.6	5 / 12
PARAPET HEIGHT (ft)	0	ROOF TYPE	GABLE	
MODULE	Hanwha ML-G10+/TS	ULTIMATE WIND SPEED	130 mph	
MODULE LENGTH (in)	74.41	NOMINAL WIND SPEED	101 mph	
MODULE WIDTH (in)	41.18	K_D	0.85	
MODULE DEPTH (mm)	40	K_{ZT}	1.00	
MODULE DEPTH (in)	1.57	K_h	0.85	
MODULE VERTICAL AREA = A_f (ft^2)	21.28	K_e	1.00	
MODULE HORIZONTAL AREA = A_r (ft^2)	0.81	γ_E	1.0 OR 1.5	
HIGH VELOCITY HURRICANE ZONE?	NO	γ_a	0.67	
RACKING SYSTEM	IRONRIDGE: XR100			
MIN. MODULE SPACING (in)	0.37			

NOTES

1. MODULE ALLOWABLE WIND PRESSURE OBTAINED FROM MANUFACTURER DATASHEET.
2. SEE ATTACHMENT PLAN FOR ACTUAL ATTACHMENT SPACING IN EACH ZONE
3. HVHZ DEFINED AS MIAMI-DADE AND BROWARD COUNTIES
4. LAG SCREW WITHDRAWAL RESISTANCE OBTAINED FROM THE USDA WOOD HANDBOOK, WOOD AS AN ENGINEERING MATERIAL.
5. ROOF TRUSSES ARE #2 SOUTHERN YELLOW PINE
6. USE TWO #14 X 3" WOOD SCREWS TO SECURE MOUNT TO THE CENTER OF EACH TRUSS. SCREWS SHALL FULLY EMBED INTO THE CENTER OF THE TRUSS.
7. RAIL SPANS OBTAINED FROM MANUFACTURER'S PUBLISHED DATA.
8. ANY EDGE AND/OR EXPOSED MODULES PRESENT IN PROPOSED INSTALLATION WHERE ANY WIND ZONE'S DESIGN PRESSURE EXCEEDS THE MODULE ALLOWABLE PRESSURE SHALL BE VERIFIED WITH WEIGHTED AVERAGE PRESSURE CALCULATIONS RESPECTIVE TO EACH MODULE CASE, AS APPLICABLE.

DESIGN CALCULATIONS PER ASCE 7-22 SECTION 29.4.4

VELOCITY PRESSURE (q_h) = $.00256*K_Z*K_{ZT}*K_D*V^2$ — VELOCITY PRESSURE (ASD) = 18.7 psf

WIDTH OF PRESSURE COEFFICIENT

50' * 10%	=	5'	ZONE WIDTH 'a' 4FT
15' * 40%	=	6'	a = 4ft per FBC R301.2(7)

EXTERNAL PRESSURE COEFFICIENT

Zone 1	0.52	-1.32
Zone 2	0.52	-2.07
Zone 3	0.52	-2.48

DESIGN PRESSURES

	EDGE OR EXPOSED MODULES?	DOWN	UP NORMAL	UP EDGE/EXPOSED	
Zone 1	YES	16.0	-16.5	-24.7	(psf)
Zone 2	YES	16.0	-25.8	-38.7	(psf)
Zone 3	YES	16.0	-30.8	-46.2	(psf)

MODULE ALLOWABLE PRESSURE **75.0** psf

RAILS

RAILS PER MODULE	2-RAIL SYSTEM		
RAIL ORIENTATION	PORTRAIT		
PV SYSTEM TOTAL WEIGHT		2419.64	(lb)
PV SYSTEM DISTRIBUTED WEIGHT		2.7	(psf)

ATTACHMENTS

ATTACHMENT TYPE	QUICKMOUNT HUG (TRUSS-ANCHORED)			
NOMINAL RAFTER SPACING	24" O.C.			
	NORMAL MODULES		EDGE/EXPOSED MODULES	
MAX DISTANCE BETWEEN ATTACHMENTS ZONE 1	48.0		48.0	(in)
MAX UPLIFT FORCE PER ATTACHMENT IN ZONE 1	204.5		306.7	(lb)
MAX DISTANCE BETWEEN ATTACHMENTS ZONE 2	48.0		48.0	(in)
MAX UPLIFT FORCE PER ATTACHMENT IN ZONE 2	320.3		480.5	(lb)
MAX DISTANCE BETWEEN ATTACHMENTS ZONE 3	48.0		48.0	(in)
MAX UPLIFT FORCE PER ATTACHMENT IN ZONE 3	382.4		573.6	(lb)
ALLOWABLE UPLIFT FORCE PER ATTACHMENT	1004.0	(lb)		
MIN. LAG PENETRATION INTO TRUSS	1.25	(in)	*WITHDRAWAL = 8100*G^(3/2)*D^(3/4)*L*	
SCREW WITHDRAWAL RESISTANCE	950	(lb)	*G = Specific gravity of wood (0.55 for Southern Pine)*	
MAX LATERAL FORCE PER ATTACHMENT	29	(lb)	*L = Depth of penetration*	
ALLOWABLE LATERAL FORCE PER ATTACHMENT	240	(lb)	*D = Diameter of lag screw*	
ALLOWABLE UPLIFT PER MID/END CLAMP	945.5	(lb)		

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WIND LOAD CALCULATIONS

PV-8

Q.PEAK DUO BLK ML-G10+ SERIES

385 - 405 Wp | 132 Cells
20.5 % Maximum Module Efficiency

MODEL Q.PEAK DUO BLK ML-G10+ / TS

Breaking the 20 % efficiency barrier
Q.ANTUM DUO Z Technology with zero gap cell layout boosts module efficiency up to 20.5 %.

A reliable investment
Inclusive 25-year product warranty and 25-year linear performance warranty[1].

Enduring high performance
Long-term yield security with Anti LeTID Technology, Anti PID Technology[2] and Hot-Spot Protect.

Innovative all-weather technology
Optimal yields, whatever the weather with excellent low-light and temperature behaviour.

Zep compatible™ frame design
High-tech black Zep CompatibleTM frame, for improved aesthetics, easy installation and increased safety.

The most thorough testing programme in the industry
Qcells is the first solar module manufacturer to pass the most comprehensive quality programme in the industry: The new "Quality Controlled PV" of the independent certification institute TÜV Rheinland.

[1] See data sheet on rear for further information.
[2] APT test conditions according to IEC/TS 62804-1:2015, method A (−1500 V, 96 h)

The ideal solution for:

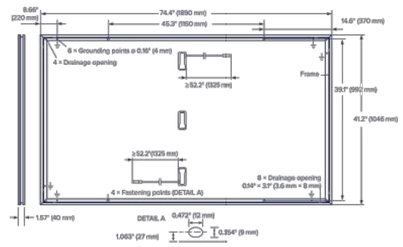
Rooftop arrays on residential buildings

Rooftop arrays on commercial / industrial buildings

Q.PEAK DUO BLK ML-G10+ SERIES

Mechanical Specification

Format	74.4 in × 41.2 in × 1.57 in (including frame) (1890 mm × 1046 mm × 40 mm)
Weight	51.8 lbs (23.5 kg)
Front Cover	0.13 in (3.2 mm) thermally pre-stressed glass with anti-reflection technology
Back Cover	Composite film
Frame	Black anodised aluminium
Cell	6 × 22 monocrystalline Q.ANTUM solar half cells
Junction box	2.09-3.98 in × 1.26-2.36 in × 0.59-0.71 in (53-101 mm × 32-60 mm × 15-18 mm), IP67, with bypass diodes
Cable	4 mm² Solar cable; (+) ≥ 52.2 in (1325 mm), (−) ≥ 52.2 in (1325 mm)
Connector	Stäubli MC4; IP68

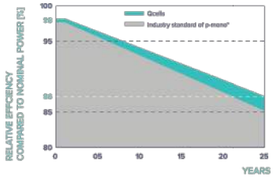


Electrical Characteristics

POWER CLASS			385	390	395	400	405
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC[1] (POWER TOLERANCE +5 W / −0 W)							
Minimum	Power at MPP[3]	P_{MPP} [W]	385	390	395	400	405
	Short Circuit Current[1]	I_{SC} [A]	11.04	11.07	11.10	11.14	11.17
	Open Circuit Voltage[1]	V_{OC} [V]	45.19	45.23	45.27	45.3	45.34
	Current at MPP	I_{MPP} [A]	10.59	10.65	10.71	10.77	10.83
	Voltage at MPP	V_{MPP} [V]	36.36	36.62	36.88	37.13	37.39
	Efficiency[1]	η [%]	≥ 19.5	≥ 19.7	≥ 20.0	≥ 20.2	≥ 20.5
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT[2]							
Minimum	Power at MPP	P_{MPP} [W]	288.8	292.6	296.3	300.1	303.8
	Short Circuit Current	I_{SC} [A]	8.90	8.92	8.95	8.97	9.00
	Open Circuit Voltage	V_{OC} [V]	42.62	42.65	42.69	42.72	42.76
	Current at MPP	I_{MPP} [A]	8.35	8.41	8.46	8.51	8.57
	Voltage at MPP	V_{MPP} [V]	34.59	34.81	35.03	35.25	35.46

[1] Measurement tolerances P_{MPP} ±3 %; I_{SC}; V_{OC} ±5 % at STC: 1000 W/m², 25 ± 2 °C, AM 1.5 according to IEC 60904-3 • [2] 800 W/m², NMOT, spectrum AM 1.5

Qcells PERFORMANCE WARRANTY

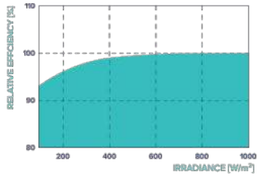


At least 98 % of nominal power during first year. Thereafter max. 0.5 % degradation per year. At least 93.5 % of nominal power up to 10 years. At least 86 % of nominal power up to 25 years.

All data within measurement tolerances. Full warranties in accordance with the warranty terms of the Qcells sales organisation of your respective country.

*Standard terms of guarantee for the 5 PV companies with the highest production capacity in 2021 (February 2021)

PERFORMANCE AT LOW IRRADIANCE



Typical module performance under low irradiance conditions in comparison to STC conditions (25 °C, 1000 W/m²).

TEMPERATURE COEFFICIENTS

Temperature Coefficient of I_{SC}	α	[%/K]	+0.04	Temperature Coefficient of V_{OC}	β	[%/K]	−0.27
Temperature Coefficient of P_{MPP}	γ	[%/K]	−0.34	Nominal Module Operating Temperature	NMOT	[°F]	109 ± 5.4 (43 ± 3 °C)

Properties for System Design

Maximum System Voltage	V_{SYS}	[V]	1000 (IEC) / 1000 (UL)	PV module classification	Class II
Maximum Series Fuse Rating		[A DC]	20	Fire Rating based on ANSI / UL 61730	TYPE 2
Max. Design Load, Push / Pull[3]		[lbs / ft²]	85 (4080 Pa) / 85 (4080 Pa)	Permitted Module Temperature on Continuous Duty	−40 °F up to +185 °F (−40 °C up to +85 °C)
Max. Test Load, Push / Pull[3]		[lbs / ft²]	128 (6120 Pa) / 128 (6120 Pa)		

[3] See Installation Manual

Qualifications and Certificates

UL 61730, CE-compliant,
Quality Controlled PV -
TÜV Rheinland; IEC 61215:2016,
IEC 61730:2016,
U.S. Patent No. 9,893,215
(solar cells)

Qcells pursues minimizing paper output in consideration of the global environment.

Note: Installation instructions must be followed. Contact our technical service for further information on approved installation of this product.
Hanwha Q CELLS America Inc. 400 Spectrum Center Drive, Suite 1400, Irvine, CA 92618, USA | TEL +1 949 748 59 96 | EMAIL hqc-inquiry@qcells.com | WEB www.qcells.com

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MODULE DATASHEET
PV-9

ENPHASE.

DATA SHEET

IQ8 and IQ8+ Microinverters

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

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

Enphase 25 year limited warranty

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

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

UL CERTIFIED SAFETY

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

Easy to install

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

High productivity and reliability

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

Microgrid-forming

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

IQ8SP-DS-0002-01-EN-US-2022-03-17

* Only when installed with IQ System Controller 2, meets UL 1741.
** IQ8 and IQ8Plus supports split phase, 240V installations only.

IQ8 and IQ8+ Microinverters

INPUT DATA (DC)		IQ8-DC-2-US	IQ8PLUS-72-2-US
Commonly used module pairings[1]	W	235 - 350	235 – 440
Module compatibility		60-cell/120 half-cell	60-cell/120 half-cell, 66-cell/132 half-cell and 72-cell/144 half-cell
MPPT voltage range	V	27 - 37	29 – 45
Operating range	V	25 - 48	25 – 58
Min/max start voltage	V	30 / 48	30 / 58
Max input DC voltage	V	50	60
Max DC current[2] [module Isc]	A	15	
Overvoltage class DC port		II	
DC port backfeed current	mA	0	
PV array configuration		1x1 Ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit	
OUTPUT DATA (AC)		**IQ8-DC-2-US**	**IQ8PLUS-72-2-US**
Peak output power	VA	245	300
Max continuous output power	VA	240	290
Nominal (L-L) voltage/range[3]	V	240 / 211 - 264	
Max continuous output current	A	1.0	1.21
Nominal frequency	Hz	60	
Extended frequency range	Hz	50 – 68	
AC short circuit fault current over 3 cycles	Arms	2	
Max units per 20 A (L-L) branch circuit[4]		16	13
Total harmonic distortion		<5%	
Overvoltage class AC port		III	
AC port backfeed current	mA	30	
Power factor setting		1.0	
Grid-tied power factor (adjustable)		0.85 leading – 0.85 lagging	
Peak efficiency	%	97.5	97.6
CEC weighted efficiency	%	97	97
Night-time power consumption	mW	60	
MECHANICAL DATA			
Ambient temperature range		-40°C to +60°C (-40°F to +140°F)	
Relative humidity range		4% to 100% (condensing)	
DC Connector type		MC4	
Dimensions (HxWxD)		212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")	
Weight		1.08 kg (2.38 lbs)	
Cooling		Natural convection – no fans	
Approved for wet locations		Yes	
Pollution degree		PD3	
Enclosure		Class II double-insulated, corrosion resistant polymeric enclosure	
Environ. category / UV exposure rating		NEMA Type 6 / outdoor	
COMPLIANCE			
Certifications		CA Rule 21 (UL 1741-SA), UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01 This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020 section 690.12 and C22.1-2018 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to manufacturer's instructions.	

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

IQ8SP-DS-0002-01-EN-US-2022-03-17

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INVERTER DATASHEET

PV-10

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JB-1.2, JB-1.XL
Specification Sheet
PV Junction Box for Composition/Asphalt Shingle Roofs

A. System Specifications and Ratings

- Maximum Voltage: 1,000 Volts
- Maximum Current: **JB-1.2:** 80 Amps; **JB-1.XL:** 120 Amps
- Allowable Wire: 14 AWG – 6 AWG
- Spacing: Please maintain a spacing of at least ½" between uninsulated live parts and fittings for conduit, armored cable, and uninsulated live parts of opposite polarity.
- Enclosure Rating: Type 3R
- Roof Slope Range: 2.5 – 12:12
- Max Side Wall Fitting Size: 1"
- Max Floor Pass-Through Fitting Size: 1"
- Ambient Operating Conditions: (-35°C) - (+75°C)
- Compliance:
  - **JB-1.2:** UL1741, CSA C22.2 No. 290; **JB-1.XL:** UL1741, CSA C22.2 No. 290
  - Approved wire connectors: must conform to UL1741, CSA C22.2 No. 290
- System Marking: **Interek Symbol and File #5019942**
- Periodic Re-inspections: If re-inspections yield loose components, loose fasteners, or any corrosion between components, components that are found to be affected are to be replaced immediately.

Table 1: Typical Wire Size, Torque Loads and Ratings

	1 Conductor	2 Conductor	Torque				
			Type	NM	Inch Lbs	Voltage	Current
ABB ZS6 terminal block	10-24 awg	16-24 awg	Sol/Str	0.5-0.7	6.2-8.85	600V	30 amp
ABB ZS10 terminal block	6-24 awg	12-20 awg	Sol/Str	1.0-1.6	8.85-14.16	600V	40 amp
ABB ZS16 terminal block	4-24 awg	10-20 awg	Sol/Str	1.6-2.4	14.6-21.24	600V	60 amp
ABB M6/8 terminal block	8-22 awg		Sol/Str	.08-1	8.85	600V	50 amp
Ideal 452 Red WING-NUT Wire Connector	8-18 awg		Sol/Str	Self-Torque	Self-Torque	600V	
Ideal 451 Yellow WING-NUT Wire Connector	10-18 awg		Sol/Str	Self-Torque	Self-Torque	600V	
Ideal, In-Sure Push-In Connector Part #30	10-14 awg		Sol/Str	Self-Torque	Self-Torque	600V	
WAGO, 2204-1201	10-20 awg	16-24 awg	Sol/Str	Self-Torque	Self-Torque	600V	30 amp
WAGO, 221-612	10-20 awg	10-24 awg	Sol/Str	Self-Torque	Self-Torque	600V	30 amp
Dottie DRC75	6-12 awg		Sol/Str	Snap-In	Snap-In		
ESP NG-53	4-6 awg		Sol/Str		45	2000V	
	10-14 awg		Sol/Str		35		
ESP NG-717	4-6 awg		Sol/Str		45	2000V	
	10-14 awg		Sol/Str		35		
Brumall 4-5,3	4-6 awg		Sol/Str		45	2000V	
	10-14 awg		Sol/Str		35		

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

Wire size, AWG or kcmil (mm2)	Wires per terminal (pole)							
	1		2		3		4 or More	
	mm	(inch)	mm	(inch)	mm	(inch)	mm	(inch)
14-10 (2.1-5.3)	Not Specified		-		-		-	
8 (8.4)	38.1	(1-1/2)	-		-		-	
6 (13.3)	50.8	(2)	-		-		-	

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making solar simple.

JB-3
Specification Sheet
PV Junction Box for Composition/Asphalt Shingle Roofs

A. System Specifications and Ratings

- Maximum Voltage: 1,000 Volts
- Maximum Current: 80 Amps
- Allowable Wire: 14 AWG – 6 AWG
- Spacing: Please maintain a spacing of at least ½" between uninsulated live parts and fittings for conduit, armored cable, and uninsulated live parts of opposite polarity.
- Enclosure Rating: Type 3R
- Roof Slope Range: 2.5 – 12:12
- Max Side Wall Fitting Size: 1"
- Max Floor Pass-Through Fitting Size: 1"
- Ambient Operating Conditions: (-35°C) - (+75°C)
- Compliance:
  - JB-3: UL1741, CSA C22.2 No. 290
  - Approved wire connectors: must conform to UL1741
- System Marking: **Interek Symbol and File #5025824**
- Periodic Re-inspections: If re-inspections yield loose components, loose fasteners, or any corrosion between components, components that are found to be affected are to be replaced immediately.

Table 1: Typical Wire Size, Torque Loads and Ratings

	1 Conductor	2 Conductor	Torque				
			Type	NM	Inch Lbs	Voltage	Current
ABB ZS6 terminal block	10-24 awg	16-24 awg	Sol/Str	0.5-0.7	6.2-8.85	600V	30 amp
ABB ZS10 terminal block	6-24 awg	12-20 awg	Sol/Str	1.0-1.6	8.85-14.16	600V	40 amp
ABB ZS16 terminal block	4-24 awg	10-20 awg	Sol/Str	1.6-2.4	14.6-21.24	600V	60 amp
ABB M6/8 terminal block	8-22 awg		Sol/Str	.08-1	8.85	600V	50 amp
Ideal 452 Red WING-NUT Wire Connector	8-18 awg		Sol/Str	Self-Torque	Self-Torque	600V	
Ideal 451 Yellow WING-NUT Wire Connector	10-18 awg		Sol/Str	Self-Torque	Self-Torque	600V	
Ideal, In-Sure Push-In Connector Part #30	10-14 awg		Sol/Str	Self-Torque	Self-Torque	600V	
WAGO, 2204-1201	10-20 awg	16-24 awg	Sol/Str	Self-Torque	Self-Torque	600V	30 amp
WAGO, 221-612	10-20 awg	10-24 awg	Sol/Str	Self-Torque	Self-Torque	600V	30 amp
Dottie DRC75	6-12 awg		Sol/Str	Snap-In	Snap-In		
ESP NG-53	4-6 awg		Sol/Str		45	2000V	
	10-14 awg		Sol/Str		35		
ESP NG-717	4-6 awg		Sol/Str		45	2000V	
	10-14 awg		Sol/Str		35		
Brumall 4-5,3	4-6 awg		Sol/Str		45	2000V	
	10-14 awg		Sol/Str		35		

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

Wire size, AWG or kcmil (mm2)	Wires per terminal (pole)							
	1		2		3		4 or More	
	mm	(inch)	mm	(inch)	mm	(inch)	mm	(inch)
14-10 (2.1-5.3)	Not Specified		-		-		-	
8 (8.4)	38.1	(1-1/2)	-		-		-	
6 (13.3)	50.8	(2)	-		-		-	

Intertek
5025824

BUILDING DEPARTMENT SEAL STAMP

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JUNCTION BOX DATASHEET

PV-11

POWERWALL

Tesla Powerwall is a fully-integrated AC battery system for residential or light commercial use. Its rechargeable lithium-ion battery pack provides energy storage for solar self-consumption, time-based control, and backup.

Powerwall's electrical interface provides a simple connection to any home or building. Its revolutionary compact design achieves market-leading energy density and is easy to install, enabling owners to quickly realize the benefits of reliable, clean power.

PERFORMANCE SPECIFICATIONS

AC Voltage (Nominal)	120/240 V
Feed-in Type	Split Phase
Grid Frequency	60 Hz
Total Energy	14 kWh[1]
Usable Energy	13.5 kWh[1]
Real Power, max continuous	5 kW (charge and discharge)
Real Power, peak (10s, off-grid/backup)	7 kW (charge and discharge)
Apparent Power, max continuous	5.8 kVA (charge and discharge)
Apparent Power, peak (10s, off-grid/backup)	7.2 kVA (charge and discharge)
Maximum Continuous Current	24 A
Maximum Output Fault Current	32 A
Overcurrent Protection Device	30 A
Load Start Capability	88 - 106 A LRA[2]
Imbalance for Split-Phase Loads	100%
Power Factor Output Range	+/- 1.0 adjustable
Power Factor Range (full-rated power)	+/- 0.85
Internal Battery DC Voltage	50 V
Maximum Supply Fault Current	10 kA
Round Trip Efficiency	90%[1,3]
Warranty	10 years

[1]Values provided for 25°C (77°F), 3.3 kW charge/discharge power.
[2]Load start capability may vary.
[3]AC to battery to AC, at beginning of life.

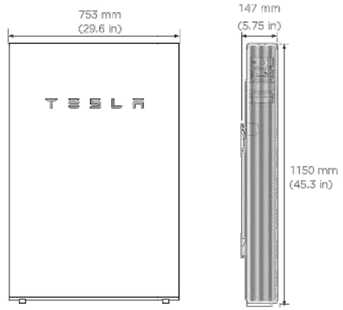
COMPLIANCE INFORMATION

Certifications	UL 1642, UL 1741, UL 1741 SA, UL 1741 SB, UL 1973, UL 9540, IEEE 1547-2018, UN 38.3
Grid Connection	Worldwide Compatibility
Emissions	FCC Part 15 Class B, ICES 003
Environmental	RoHS Directive 2011/65/EU
Seismic	AC156, IEEE 693-2005 (high)
Fire Testing	Meets the unit level performance criteria of UL 9540A

MECHANICAL SPECIFICATIONS

Dimensions	1150 x 753 x 147 mm (45.3 x 29.6 x 5.75 in)[4]
Weight	114 kg (251.3 lbs)[4]
Mounting options	Floor or wall mount

[4]Dimensions and weight differ slightly if manufactured before March 2019. Contact Tesla for additional information.



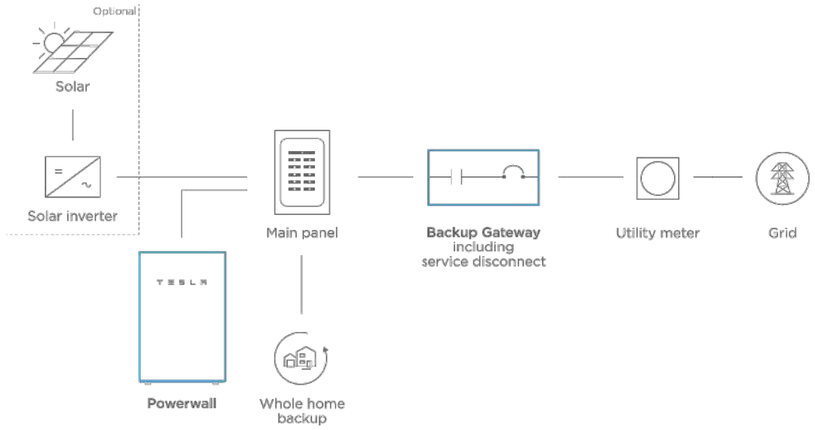
ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	-20°C to 50°C (-4°F to 122°F)[5]
Operating Humidity (RH)	Up to 100%, condensing
Storage Conditions	-20°C to 30°C (-4°F to 86°F) Up to 95% RH, non-condensing State of Energy (SoE): 25% initial
Maximum Elevation	3000 m (9843 ft)
Environment	Indoor and outdoor rated
Enclosure Type	NEMA 3R
Ingress Rating	IP67 (Battery & Power Electronics) IP56 (Wiring Compartment)
Wet Location Rating	Yes
Noise Level @ 1m	< 40 dBA at 30°C (86°F)

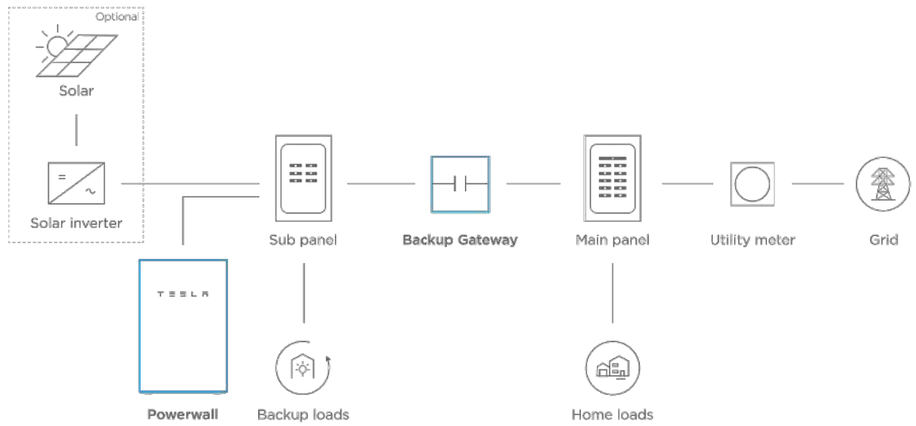
[5]Performance may be de-rated at operating temperatures below 10°C (50°F) or greater than 43°C (109°F).

TYPICAL SYSTEM LAYOUTS

WHOLE HOME BACKUP



PARTIAL HOME BACKUP



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BATTERY DATASHEET

PV-12

Product	Powerwall
Last Revised	February 8, 2022
Revision	1

*Specifications may differ from project to project.

TESLA

AHJ POWERWALL RESIDENTIAL

Residential Use of Powerwall

Designed to be reviewed side-by-side with the following:

- CFC 2022 edition, Section 1207.11
- CRC 2022 edition, Section R328
- IFC 2021 edition, Section 1207.11
- IRC 2021 edition, Section R328
- NFPA 855 2023 edition, Chapter 15 (free access at nfpa.org/855)

Tesla is committed to helping the fire departments and first responders safely handle emergency situations involving all Tesla products, reference Tesla's Emergency Response Guide.

Topic	Code Reference	Code Section	Let's talk about Powerwall...
General	CFC	1207.11	In group R-3 and R-4 occupancies, Powerwall is installed and maintained per sections 1207.11.1 through 1207.11.9
	CRC	R328.1	Complies with the provisions of section R328
	IFC	1207.11	In group R-3 and R-4 occupancies, Powerwall is installed and maintained per sections 1207.11.1 through 1207.11.9
	IRC	R328.1	Complies with the provisions of section R328
	NFPA 855	15.1	In one-or-two family dwellings or townhouse units, Powerwall installation complies with the requirements of chapter 15
Equipment Listings	CFC	1207.11.1	Powerwall has been listed to ANSI/UL 9540A. **NOTE:** Powerwall is not listed/labeled specifically for Residential or commercial use.
	CRC	R328.2	
	IFC	1207.11.1	
	IRC	R328.2	
	NFPA 855	15.2.1	
Installation	CFC	1207.11.2	Installed in accordance with Tesla's instructions and listing. Check out the plan submittal – this information will be included. Technical specifications and owners' information available at: https://www.tesla.com/support/energy/powerwall/documents/documents **NOTE:** Tesla is committed to helping the fire departments and first responders safely handle emergency situations involving all Tesla products, reference Tesla's Emergency Response Guide.
	CRC	R328.3	
	IFC	1207.11.2	
	IRC	R328.3	
	NFPA 855	15.3	
	CRC		
	IFC		
	IRC		
	NFPA 855		

Topic	Code Reference	Code Section	Let's talk about Powerwall...
Spacing	CFC	1207.11.2.1	Testing per 1207.1.5. Testing per 9.1.5 We've done the required large scale fire testing UL9540A. Our test was conducted by CSA Group at RTL. UL9540A testing has demonstrated stacking Powerwall units or mounting units side-by-side 6" apart is safe. The installation manual has documented these findings. The UL 9540A Unit Level Checklist and Test Result for issued by CSA Group includes data supporting a reduction in the 3ft minimum unit-to-unit spacing as allowed by current codes and standards. As tested, and when installed in accordance with the manufacturer's instructions, the surface temperatures of the modules within the target units adjacent to the initiating unit did not exceed 176°C. This is the temperature at which thermally initiated cell venting may occur. Unit spacing may be reduced to 6" side to side and approximately 1" in stacked configurations. Additionally, temperature measurements on wall surfaces did not exceed 97°C of temperature rise above ambient. Therefore, a noncombustible substrate or mounting material is not required If you need to see a copy of our results, email codecompliance@tesla.com and let's connect.
	CRC	R328.3.1	
	IFC	1207.11.2.1	
	IRC	R328.3.1	
	NFPA 855	15.3.1	
Locations	CFC	1207.11.3	Our plan sets will show location to be installed along with any of the required setbacks or wall finishing per applicable code
	CRC	R328.4	
	IFC	1207.11.3	
	IRC	R328.4	
	NFPA 855	15.4	
Energy Ratings	CFC	1207.11.4	One Powerwall is less than the individual maximum energy stored energy requirement of 20kWh. See technical specifications. Plan set will have installation location and information complying to the aggregate energy rating.
	CRC	R328.5	
	IFC	1207.11.4	
	IRC	R328.5	
	NFPA 855	15.5	
Electrical Installation	CFC	1207.11.5	Plan set will have appropriate electrical installation per applicable code. Inverters are included in 9540 listing: online certification database. Inverters are listed for utility interaction.
	CRC	R328.6	
	IFC	1207.11.5	
	IRC	R328.6	
	NFPA 855	15.6	

AHJ POWERWALL RESIDENTIAL

Topic	Code Reference	Code Section	Let's talk about Powerwall...
Toxic and Highly Toxic Gas	CFC	1207.11.9	Engineered design and 9540A testing allows Powerwall installation within Group R-3 or R-4 occupancies.
	CRC	R328.12	
	IFC	1207.11.9	
	IRC	n/a	
	NFPA 855	15.10	
Documentation and Labeling	CFC	n/a	n/a
	CRC	R328.11	Tesla will provide required documents and label in accordance with the section.
	IFC	n/a	n/a
	IRC	328.11	Technical specifications and owners' information available here.
	NFPA 855	n/a	n/a
Fire Detection	CFC	1207.11.6	Outside installation: n/a Inside installation: Check the plan set – a smoke detectpr or heat alarm will be installed in the appropriate location, as applicable
	CRC	R328.7	
	IFC	1207.11.6	
	IRC	R328.7	
	NFPA 855	15.7	
Protection from Impact	CFC	1207.11.7	The ideal location is not subject to vehicle damage but occasionally this is not possible. No worries, we have a plan and vehicle protection in accordance with applicable sections will be included in plans as needed.
	CRC	R328.8	
	IFC	1207.11.7	
	IRC	R328.8	
	NFPA 855	15.10	
Ventilation	CFC	1207.11.8	Per Section 1207.6.1, Lithium-Ion battery technology does not require ventilation.
	CRC	R327.9	Lithium-Ion technology does not require ventilation as Li-ion batteries do not produce hydrogen or other flammable gases during charging.
	IFC	1207.11.8	Per Section 1207.6.1, Lithium-Ion battery technology does not require ventilation.
	IRC	R328.9	Lithium-Ion technology does not require ventilation as Li-ion batteries do not produce hydrogen or other flammable gases during charging.
	NFPA 855	15.9	Per Section 9.6.5.1 to Table 9.6.5, Lithium-Ion battery technology does not require ventilation.

Contact

Still have code questions? Email codecompliance@tesla.com

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BATTERY DATASHEET

PV-12.1

POWERWALL
Backup Gateway 2

The Backup Gateway 2 for Tesla Powerwall provides energy management and monitoring for solar self-consumption, time-based control, and backup.

The Backup Gateway 2 controls connection to the grid, automatically detecting outages and providing a seamless transition to backup power. When equipped with a main circuit breaker, the Backup Gateway 2 can be installed at the service entrance. When the optional internal panelboard is installed, the Backup Gateway 2 can also function as a load center.

The Backup Gateway 2 communicates directly with Powerwall, allowing you to monitor energy use and manage backup energy reserves from any mobile device with the Tesla app.

PERFORMANCE SPECIFICATIONS

Model Number	1232100-xx-y
AC Voltage (Nominal)	120/240V
Feed-In Type	Split Phase
Grid Frequency	60 Hz
Current Rating	200 A
Maximum Input Short Circuit Current	10 kA[1]
Overcurrent Protection Device	100-200A; Service Entrance Rated[1]
Overvoltage Category	Category IV
Internal Primary AC Meter	Revenue accurate (+/- 0.2 %)
Internal Auxiliary AC Meter	Revenue accurate (+/- 2 %)
Primary Connectivity	Ethernet, Wi-Fi
Secondary Connectivity	Cellular (3G, LTE/4G)[2]
User Interface	Tesla App
Operating Modes	Support for solar self-consumption, time-based control, and backup
Backup Transition	Automatic disconnect for seamless backup
Modularity	Supports up to 10 AC-coupled Powerwalls
Optional Internal Panelboard	200A 6-space / 12 circuit breakers Siemens QP or Square D HOM breakers rated 10 - 80A or Eaton BR breakers rated 10 - 125A
Warranty	10 years

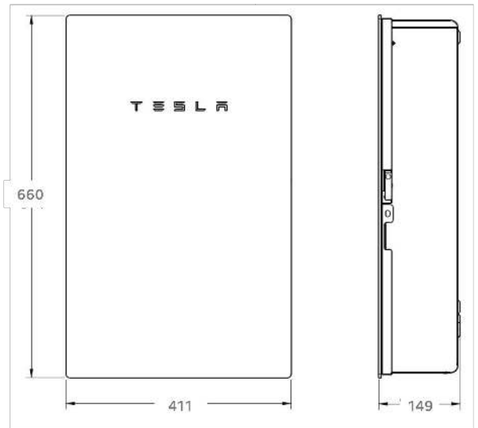
[1] When protected by Class J fuses, Backup Gateway 2 is suitable for use in circuits capable of delivering not more than 22kA symmetrical amperes.
[2] The customer is expected to provide internet connectivity for Backup Gateway 2; cellular should not be used as the primary mode of connectivity. Cellular connectivity subject to network operator service coverage and signal strength.

COMPLIANCE INFORMATION

Certifications	UL 67, UL 869A, UL 916, UL 1741 PCS CSA 22.2 0.19, CSA 22.2 205
Emissions	FCC Part 15, ICES 003

MECHANICAL SPECIFICATIONS

Dimensions	660 mm x 411 mm x 149 mm (26 in x 16 in x 6 in)
Weight	20.4 kg (45 lb)
Mounting options	Wall mount, Semi-flush mount



ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	-20°C to 50°C (-4°F to 122°F)
Operating Humidity (RH)	Up to 100%, condensing
Maximum Elevation	3000 m (9843 ft)
Environment	Indoor and outdoor rated
Enclosure Type	NEMA 3R

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TESLA GATEWAY 2 DATASHEET

PV-13

ENPHASE.

DATASHEET

X-IQ-AM1-240-5
X-IQ-AM1-240-5C

IQ Combiner 5/5C

The IQ Combiner 5/5C 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. IQ Combiner 5/5C uses wired control communication and is compatible with IQ System Controller 3/3G and IQ Battery 5P.

The IQ Combiner 5/5C, along with IQ Series Microinverters, IQ System Controller 3/3G, and IQ Battery 5P provides you with a complete grid-agnostic Enphase Energy System.

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 3/3G
Provides microgrid interconnection device (MID) functionality by automatically detecting grid failures and seamlessly transitioning the home energy system from gridpower to backup power

IQ Battery 5P
Fully integrated AC battery system. Includes six field-replaceable IQ8D-BAT Microinverters

IQ Load Controller
Helps prioritize essential appliances during a grid outage to optimize energy consumption and prolong battery life

Enphase 5 year limited warranty

5-year limited warranty

UL LISTED

Smart
- Includes IQ Gateway for communication and control
- Includes Enphase Mobile Connect (CELLMODEM-M1-06-SP-05), only with IQ Combiner 5C
- Supports flexible networking: Wi-Fi, Ethernet, or cellular
- Provides production metering (revenue grade) and consumption monitoring

Easy to install
- Mounts to one stud with centered brackets
- Supports bottom, back, and side conduit entry
- Supports up to four 2-pole branch circuits for 240 VAC plug-in breakers (not included)
- 80 A total PV branch circuits
- Bluetooth based Wi-Fi provisioning for easy Wi-Fi setup

Reliable
- Durable NRTL-certified NEMA type 3R enclosure
- 5-year limited warranty
- Two years labor reimbursement program coverage included for both the IQ Combiner 5KUs
- UL1741 listed

IQ Combiner 5/5C

MODEL NUMBER	
IQ Combiner 5 (X-IQ-AM1-240-5)	IQ Combiner 5 with IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 ±0.5%), consumption monitoring (± 2.5%) and IQ Battery monitoring (±2.5%). Includes a silver solar shield to deflect heat
IQ Combiner 5C (X-IQ-AM1-240-5C)	IQ Combiner 5C with IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 ±0.5%), consumption monitoring (±2.5%) and IQ Battery monitoring (±2.5%). Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05)[1]. Includes a silver solar shield to deflect heat
WHAT'S IN THE BOX	
IQ Gateway printed circuit board	IQ Gateway is the platform for total energy management for comprehensive, remote maintenance and management of the Enphase IQ System
Busbar	125A busbar with support for 1 x IQ Gateway breaker and 4 x 20A breaker for installing IQ Series Microinverters and IQ Battery 5P
IQ Gateway breaker	Circuit breaker, 2-pole, 10 A/15 A
Production CT	Prewired revenue-grade solid core CT, accurate up to 0.5%
Consumption CT	Two consumption metering clamp CTs, shipped with the box, accurate up to 2.5%
IQ Battery CT	One battery metering clamp CT, shipped with the box, accurate up to 2.5%
CTRL board	Controlboard for wired communication with IQ System Controller 3/3G and the IQ Battery 5P
Enphase Mobile Connect (only with IQ Combiner 5C)	4G-based LTE-M1 cellular modem (CELLMODEM-M1-06-SP-05) with a 5-year T-Mobile data plan
Accessories kit	Spare control headers for CTRL board
ACCESSORIES AND REPLACEMENT PARTS (NOT INCLUDED, ORDER SEPARATELY)	
CELLMODEM-M1-06-SP-05	4G-based LTE-M1 cellular modem with a 5-year T-Mobile data plan
CELLMODEM-M1-06-AT-05	4G-based LTE-M1 cellular modem with a 5-year AT&T data plan
Circuit breakers (off-the-shelf)	Supports Eaton BR210, BR215, BR220, BR230, BR240, BR250, and BR260 circuit breakers Supports Eaton BR220S, BR230S, and BR240S circuit breakers compatible with hold-down kit
Circuit breakers (provided by Enphase)	BRK-10A-2-240V, BRK-15A-2-240V, BRK-20A-2P-240V, BRK-15A-2P-240V-B, and BRK-20A-2P-240V-B(More details in "Accessories" section)
XA-SOLARSHIELD-ES	Replacement solar shield for IQ Combiner 5/5C
XA-ENV2-PCBA-5	IQ Gateway replacement printed circuit board (PCB) for Combiner 5/5C
X-IQ-NA-HD-125A	Hold-down kit compatible with Eaton BR-S series circuit breakers (with screws)
ELECTRICAL SPECIFICATIONS	
Rating	80 A
System voltage	120/240 VAC, 60 Hz
Busbar rating	125 A
Fault current rating	10 kAIC
Maximum continuous current rating (input from PV/storage)	64 A
Branch circuits (solar and/or storage)	Up to four 2-pole Eaton BR series distributed generation (DG) breakers only (not included)
Maximum total branch circuit breaker rating (input)	80 A of distributed generation/95 A with IQ Gateway breaker included
IQ Gateway breaker	10 A or 15 A rating GE/Siemens/Eaton included
Production metering CT	200 A solid core pre-installed and wired to IQ Gateway
Consumption monitoring CT (CT-200-CLAMP)	A pair of 200 A clamp-style current transformers is included with the box
IQ Battery metering CT	200 A clamp-style current transformer for IQ Battery metering, included with the box

[1] 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.)

MECHANICAL DATA	
Dimensions (WxHxD)	37.5 cm x 49.5 cm x 16.8 cm (14.75" x 19.5" x 6.63"). Height is 21.06" (53.5 cm) with mounting brackets
Weight	7.5 kg (16.5 lbs)
Ambient temperature range	-40°C to 46°C (-40°F to 115°F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction
Wire sizes	• 20 A to 50 A breaker inputs: 14 to 4 AWG copper conductors • 60 A breaker branch input: 4 to 1/0 AWG copper conductors • Main lug combined output: 10 to 2/0 AWG copper conductors • Neutral and ground: 14 to 1/0 copper conductors • Always follow local code requirements for conductor sizing
Communication (In-premise connectivity)	Built-in CTRL board for wired communication with IQ Battery 5P and IQ System Controller 3/3G. Integrated Power Line Communication for IQ Series Microinverters
Altitude	Up to 2,000 meters (6,560 feet)
COMMUNICATION INTERFACES	
Integrated Wi-Fi	802.11b/g/n (dual band 2.4 GHz/5 GHz), for connecting the Enphase cloud via the internet
Wi-Fi range (recommended)	10 m
Bluetooth	BLE 4.2, 10 m range to configure Wi-Fi SSID
Ethernet	Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included), for connecting to the Enphase Cloud via the internet
Mobile Connect	CELLMODEM-M1-06-SP-05 or CELLMODEM-M1-06-AT-05 (included with IQ Combiner 5C)
Digital I/O	Digital input/output for grid operator control
USB 2.0	For Mobile Connect
Access point (AP) mode	For connection between the IQ Gateway and a mobile device running the Enphase Installer App
Metering ports	Up to two Consumption CTs, one IQ Battery CT, and one Production CT
Power line communication	90-110 kHz
Web API	Refer to https://developer-v4.enphase.com
Local API	Refer to guide for local API
COMPLIANCE	
IQ Combiner	UL1741, CAN/CSA C22.2 No. 107.1, Title 47 CFR, Part 15, Class B, ICES 003
IQ Gateway	UL 50601-1/CAN/CSA 22.2 No. 61010-1, IEEE 1547: 2018 (UL 1741-SB, 3rd Ed.) IEEE 2030.5/CSIP Compliant Production metering: ANSI C12.20 accuracy class 0.5 (PV production)
COMPATIBILITY	
IQ System Controller 3/3G	SC100D111C240US01, SC200G111C240US01
IQ Battery 5P	IQBATTERY-5P-1P-NA
Microinverter	IQ6, IQ7, and IQ8 Series Microinverters

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COMBINER DATASHEET

PV-14

Datasheet

IRONRIDGE

Roof Mount System

Built for solar's toughest roofs.

IronRidge builds the strongest roof mounting system in solar. Every component has been tested to the limit and proven in extreme environments.

Our rigorous approach has led to unique structural features, such as curved rails and reinforced flashings, and is also why our products are fully certified, code compliant and backed by a 20-year warranty.

Strength Tested
All components evaluated for superior structural performance.

PE Certified
Pre-stamped engineering letters available in most states.

Class A Fire Rating
Certified to maintain the fire resistance rating of the existing roof.

Design Software
Online tool generates a complete bill of materials in minutes.

Integrated Grounding
UL 2703 system eliminates separate module grounding components.

20 Year Warranty
Twice the protection offered by competitors.

Datasheet

XR Rails

XR10 Rail

A low-profile mounting rail for regions with light snow.

- 6' spanning capability
- Moderate load capability
- Clear & black anod. finish

XR100 Rail

The ultimate residential solar mounting rail.

- 8' spanning capability
- Heavy load capability
- Clear & black anod. finish

XR1000 Rail

A heavyweight mounting rail for commercial projects.

- 12' spanning capability
- Extreme load capability
- Clear anodized finish

Internal Splices

All rails use internal splices for seamless connections.

- Self-tapping screws
- Varying versions for rails
- Grounding Straps offered

Attachments

FlashFoot

Anchor, flash, and mount with all-in-one attachments.

- Ships with all hardware
- IBC & IRC compliant
- Certified with XR Rails

Slotted L-Feet

Drop-in design for rapid rail attachment.

- High-friction serrated face
- Heavy-duty profile shape
- Clear & black anod. finish

Standoffs

Raise flush or tilted systems to various heights.

- Works with vent flashing
- Ships pre-assembled
- 4" and 7" Lengths

Tilt Legs

Tilt assembly to desired angle, up to 45 degrees.

- Attaches directly to rail
- Ships with all hardware
- Fixed and adjustable

Clamps & Grounding

End Clamps

Slide in clamps and secure modules at ends of rails.

- Mill finish & black anod.
- Sizes from 1.22" to 2.3"
- Optional Under Clamps

Grounding Mid Clamps

Attach and ground modules in the middle of the rail.

- Parallel bonding T-bolt
- Reusable up to 10 times
- Mill & black stainless

T-Bolt Grounding Lugs

Ground system using the rail's top slot.

- Easy top-slot mounting
- Eliminates pre-drilling
- Swivels in any direction

Accessories

Provide a finished and organized look for rails.

- Snap-in Wire Clips
- Perfected End Caps
- UV-protected polymer

Free Resources

Design Assistant
Go from rough layout to fully engineered system. For free.
Go to IronRidge.com/rm

NABCEP Certified Training
Earn free continuing education credits, while learning more about our systems.
Go to IronRidge.com/training

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RACKING DATASHEET

PV-15

Tech Brief

IRONRIDGE

QuickMount® HUG

The Respect Your Roof Deserves

When integrating with a home, solar attachments must be dependable for the lifetime of the rooftop. Due to recent innovations, many asphalt shingles have bonded courses. A mount that protects without the need to pry shingles can really speed things up.

Halo UltraGrip™ (HUG™) is here to respect the roof. Its Halo is a cast-aluminum barrier that encases the UltraGrip, our industrial-grade, foam-and-mastic seal. This allows HUG to accelerate the installation process and provide the utmost in waterproofing protection. Give your roof a HUG.™

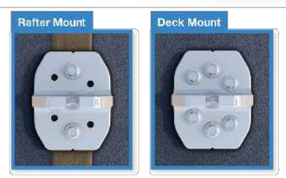
Multi-Tiered Waterproofing
HUG utilizes a multi-tiered stack of components to provide revolutionary waterproofing protection. The Halo cast-aluminum, raised-perimeter foundation surrounds the UltraGrip base—a foam-backed mastic seal combination that prevents water intrusion by adhering and sealing with the shingle surface.

Halo UltraGrip™ is part of the QuickMount® product line.

UltraGrip™ Seal Technology
HUG UltraGrip utilizes a state-of-the-art seal design that uses a unique, foam-and-mastic combination. The foam-backed adhesive provides an entirely new flashing system that conforms and adheres to every nook and cranny of composition shingles, filling gaps and shingle step-downs (up to 1/8" in height).

Triple Rated & Certified to Respect the Roof™
UL 2703, 441 (27)
TAS 100(A)-95

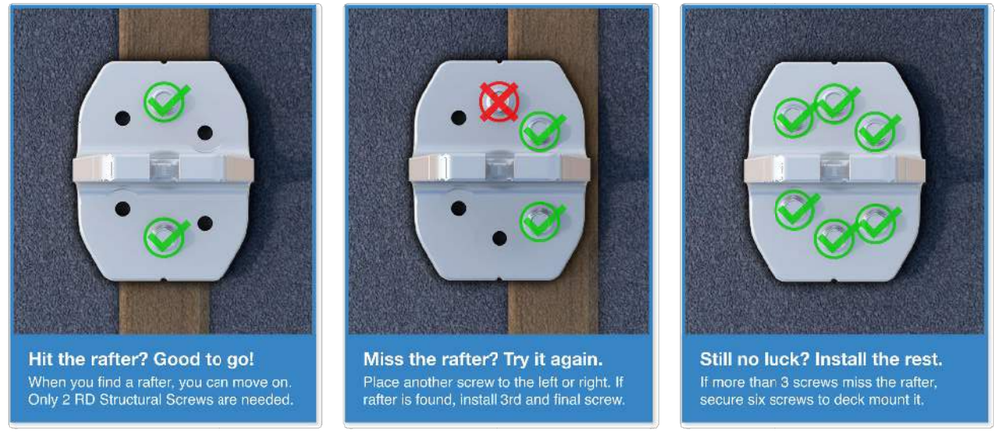
Intertek



Rafter & Deck Mounting Options
Mount HUG to the roof rafters, the roof deck, or both with our custom-engineered RD (rafter-or-deck) Structural Screw. The RD Structural Screw anchors HUG to the roof with an EPDM sealing washer, completing the stack of waterproofing barriers. See backside for more installation information.

Tech Brief

Adaptive, Rafter-Friendly Installation



Hit the rafter? Good to go!
When you find a rafter, you can move on. Only 2 RD Structural Screws are needed.

Miss the rafter? Try it again.
Place another screw to the left or right. If rafter is found, install 3rd and final screw.

Still no luck? Install the rest.
If more than 3 screws miss the rafter, secure six screws to deck mount it.

Trusted Strength & Less Hassle

25-Year Warranty
Product guaranteed free of impairing defects.

Structural capacities of HUG™ were reviewed in many load directions, with racking rail running cross-slope or up-slope in relation to roof pitch.

For further details, see the HUG certification letters for attaching to rafters and decking.

IronRidge designed the HUG, in combination with the RD Structural Screw to streamline installs, which means the following:

- No prying shingles
- No roof nail interference
- No pilot holes necessary
- No sealant (in most cases)
- No butyl shims needed

Attachment Loading

The rafter-mounted HUG has been tested and rated to support 1004 (lbs) of uplift and 368 (lbs) of lateral load.

Structural Design

Parts are designed and certified for compliance with the International Building Code & ASCE/SEI-7.

Water Seal Ratings

HUG passed both the UL 441 Section 27 "Rain Test" and TAS 100(A)-95 "Wind Driven Rain Test" by Intertek.

UL 2703 System

Systems conform to UL 2703 mechanical and bonding requirements. See Flush Mount Manual for more info.

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ATTACHMENT DATASHEET

PV-16

Tech Brief

IRONRIDGE

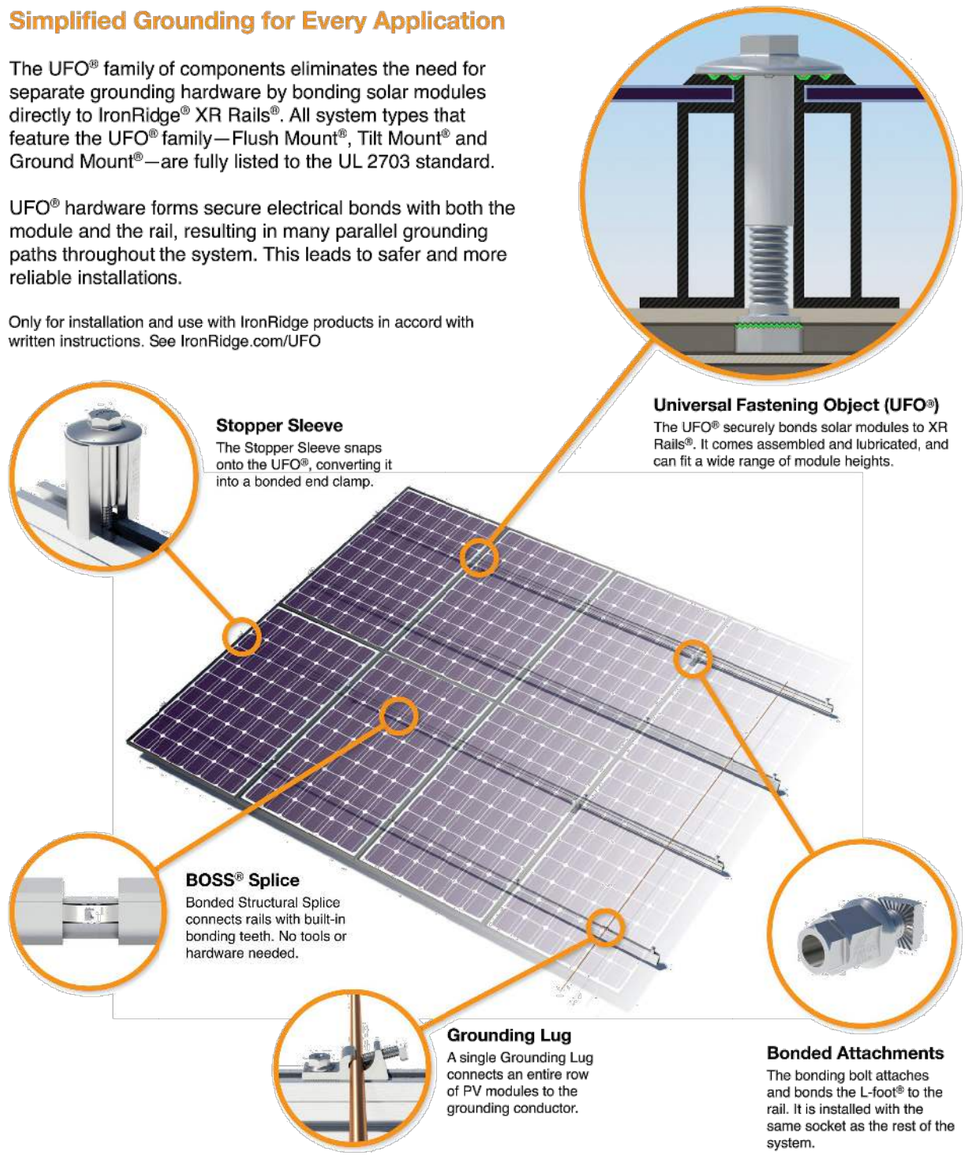
UFO® Family of Components

Simplified Grounding for Every Application

The UFO® family of components eliminates the need for separate grounding hardware by bonding solar modules directly to IronRidge® XR Rails®. All system types that feature the UFO® family—Flush Mount®, Tilt Mount® and Ground Mount®—are fully listed to the UL 2703 standard.

UFO® hardware forms secure electrical bonds with both the module and the rail, resulting in many parallel grounding paths throughout the system. This leads to safer and more reliable installations.

Only for installation and use with IronRidge products in accord with written instructions. See IronRidge.com/UFO



Stopper Sleeve
The Stopper Sleeve snaps onto the UFO®, converting it into a bonded end clamp.

Universal Fastening Object (UFO®)
The UFO® securely bonds solar modules to XR Rails®. It comes assembled and lubricated, and can fit a wide range of module heights.

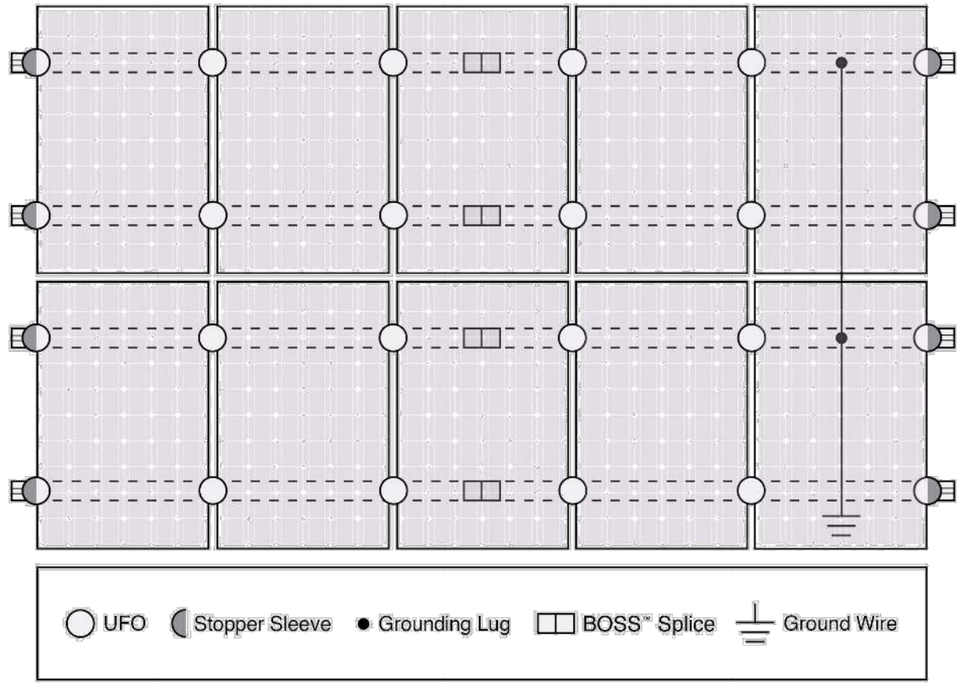
BOSS® Splice
Bonded Structural Splice connects rails with built-in bonding teeth. No tools or hardware needed.

Grounding Lug
A single Grounding Lug connects an entire row of PV modules to the grounding conductor.

Bonded Attachments
The bonding bolt attaches and bonds the L-foot® to the rail. It is installed with the same socket as the rest of the system.

Tech Brief

System Diagram



Approved Enphase microinverters can provide equipment grounding of IronRidge systems, eliminating the need for grounding lugs and field installed equipment ground conductors (EGC). A minimum of two microinverters mounted to the same rail and connected to the same Engage cable is required. Refer to installation manuals for additional details.

UL Certification

The IronRidge® Flush Mount®, Tilt Mount®, and Ground Mount Systems have been listed to UL 2703 by Intertek Group plc.

UL 2703 is the standard for evaluating solar mounting systems. It ensures these devices will maintain strong electrical and mechanical connections over an extended period of time in extreme outdoor environments.

Go to IronRidge.com/UFO

Cross-System Compatibility

Feature	Flush Mount	Tilt Mount	Ground Mount
XR Rails®	✔	✔	XR100 & XR1000
UFO®/Stopper	✔	✔	✔
BOSS® Splice	✔	✔	N/A
Grounding Lugs	1 per Row	1 per Row	1 per Array
Microinverters & Power Optimizers	Compatible with most MLPE manufacturers. Refer to system installation manual.		
Fire Rating	Class A	Class A	N/A
Modules	Tested or Evaluated with over 400 Framed Modules Refer to installation manuals for a detailed list.		

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GROUNDING & BONDING DATASHEET

PV-17