PHOTOVOLTAIC ROOF MOUNT SYSTEM
8.500kWDC,11.000kWAC
27.000kWh ENERGY STORAGE SYSTEM
20 BARN LOFT CT, FUQUAY-VARINA, NC 27526

AHJ:
COUNTY OF HARNETT

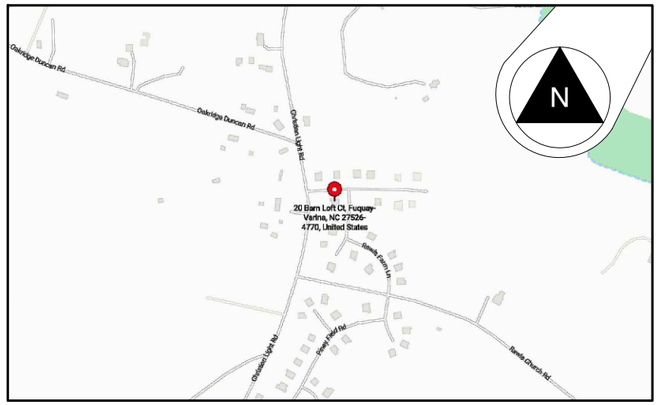
UTILITY:
DUKE ENERGY

GOVERNING CODES WITH NC AMENDMENTS:
2018 NORTH CAROLINA BUILDING CODE
2018 NORTH CAROLINA RESIDENTIAL CODE
2018 NORTH CAROLINA FIRE CODE
2017 NORTH CAROLINA ELECTRICAL CODE (NEC 2017)

WIND SPEED:116 MPH
SNOW LOAD: 15 PSF

SCOPE OF WORK
(N) 8.500KWDC,(N) 11.000KWAC ROOF MOUNTED PV SYSTEM
(N) 27.000KWH ENERGY STORAGE SYSTEM
(N) (20) QCELLS Q.TRON BLK M-G2+ 425W SOLAR MODULES
(N) (7) MID-CIRCUIT INTERRUPTER
(N) (2) TESLA 1707000-XX-Y (240V) BATTERIES WITH INTEGRATED INVERTER
(N) (1) TESLA BACKUP GATEWAY 2
(N) (1) EV OUTLET
(N) (1) ESS DISCONNECT SWITCH
(N) (1) 125A COMBINER PANEL

VICINITY MAP



GENERAL NOTES

1. MODULES ARE LISTED UNDER UL 61730 / UL 1703 AND CONFORM TO THE STANDARDS.
2. INVERTERS ARE LISTED UNDER UL 1741 AND CONFORM TO THE STANDARDS.
3. DRAWINGS ARE DIAGRAMMATIC, INDICATING GENERAL ARRANGEMENT OF THE PV SYSTEM AND THE ACTUAL SITE CONDITIONS MAY VARY.
4. WORKING CLEARANCES AROUND THE NEW PV ELECTRICAL EQUIPMENT SHALL BE MAINTAINED IN ACCORDANCE WITH NEC 110.26 .
5. ALL GROUND WIRING CONNECTED TO THE MAIN SERVICE GROUNDING IN MAIN SERVICE PANEL/ SERVICE EQUIPMENT.
6. ALL CONDUCTORS SHALL BE 600V, 90°C STANDARD COPPER UNLESS OTHERWISE NOTED.
7. WHEN REQUIRED, A LADDER SHALL BE IN PLACE FOR INSPECTION IN COMPLIANCE WITH OSHA REGULATIONS.
8. THE SYSTEM WILL NOT BE INTERCONNECTED BY THE CONTRACTOR UNTIL APPROVAL FROM THE UTILITY IS RECEIVED.
9. ROOF ACCESS POINT SHALL BE LOCATED IN AREAS THAT DO NOT REQUIRE THE PLACEMENT OF GROUND LADDERS OVER OPENINGS SUCH AS WINDOWS OR DOORS, AND LOCATED AT STRONG POINTS OF BUILDING CONSTRUCTION WHERE THE ACCESS POINT DOES NOT CONFLICT WITH OVERHEAD OBSTRUCTIONS SUCH AS TREES, WIRES OR SIGNS.
10. PV ARRAY COMBINER/JUNCTION BOX PROVIDES TRANSITION FROM ARRAY WIRING TO CONDUIT WIRING.
11. RACKING SYSTEM SHALL BE LISTED TO UL 2703.
12. FIRE RATING OF EXISTING ROOF ASSEMBLY SHALL BE MAINTAINED WITH ADDITION OF PHOTOVOLTAIC SYSTEM.

SHEET INDEX

CONTRACTOR INFORMATION

SOUTHERN ENERGY MANAGEMENT
5908 TRIANGLE DRIVE, RALEIGH, NC, 27617
PHONE: +1 919 306 9537

PHOTOVOLTAIC ROOF MOUNT SYSTEM & ENERGY STORAGE SYSTEM

8.500 kWDC, 11.000 kWAC **PV SYSTEM**
27.000kWh **ENERGY STORAGE**
JAY BISSETT RESIDENCE
20 BARN LOFT CT,
FUQUAY-VARINA, NC 27526

NORTH CAROLINA PROFESSIONAL SEAL 050478 ENGINEER ERMOCRATES E. CASTILLO

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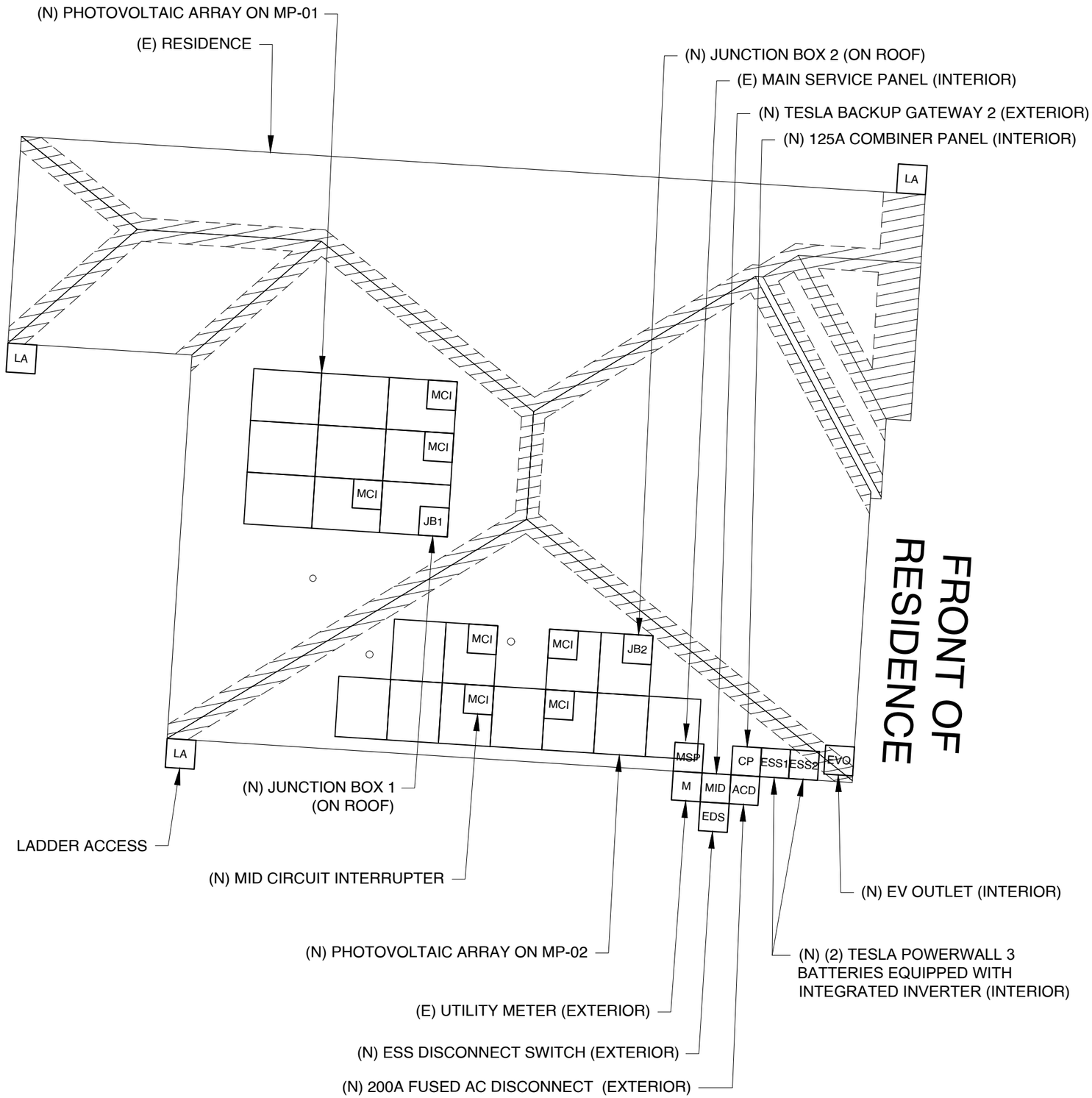
DATE	8/30/2024
CREATED BY	ART
SCALE	NTS

COVER SHEET

PV-1

LEGEND

- M — (E) UTILITY METER
- MSP — (E) 200A MAIN SERVICE PANEL
  (E) 200A MAIN BREAKER
- ACD — (N) 200A FUSED AC DISCONNECT
  VISIBLY OPEN, LOCKABLE
  240V NEMA-3R
- ESS1 — (N) TESLA POWERWALL 3 BATTERY 1
  EQUIPPED WITH INTEGRATED
  INVERTER
- ESS2 — (N) TESLA POWERWALL 3 BATTERY 2
  EQUIPPED WITH INTEGRATED
  INVERTER
- CP — (N) 125A COMBINER PANEL
- EVO — (N) EV OUTLET
- MID — (N) TESLA BACKUP GATEWAY 2
- EDS — (N) ESS DISCONNECT SWITCH
- MCI — (N) 7 MID-CIRCUIT INTERRUPTER
- LA — LADDER ACCESS
- JB1 — (N) JUNCTION BOX 1
  240V, NEMA 4X (ON ROOF)
- JB2 — (N) JUNCTION BOX 2
  240V, NEMA 4X (ON ROOF)
- (N) 20 QCELLS Q.TRON BLK M-G2+
  425W SOLAR MODULES
- FIRE SETBACKS
- (E) ROOF OBSTRUCTIONS



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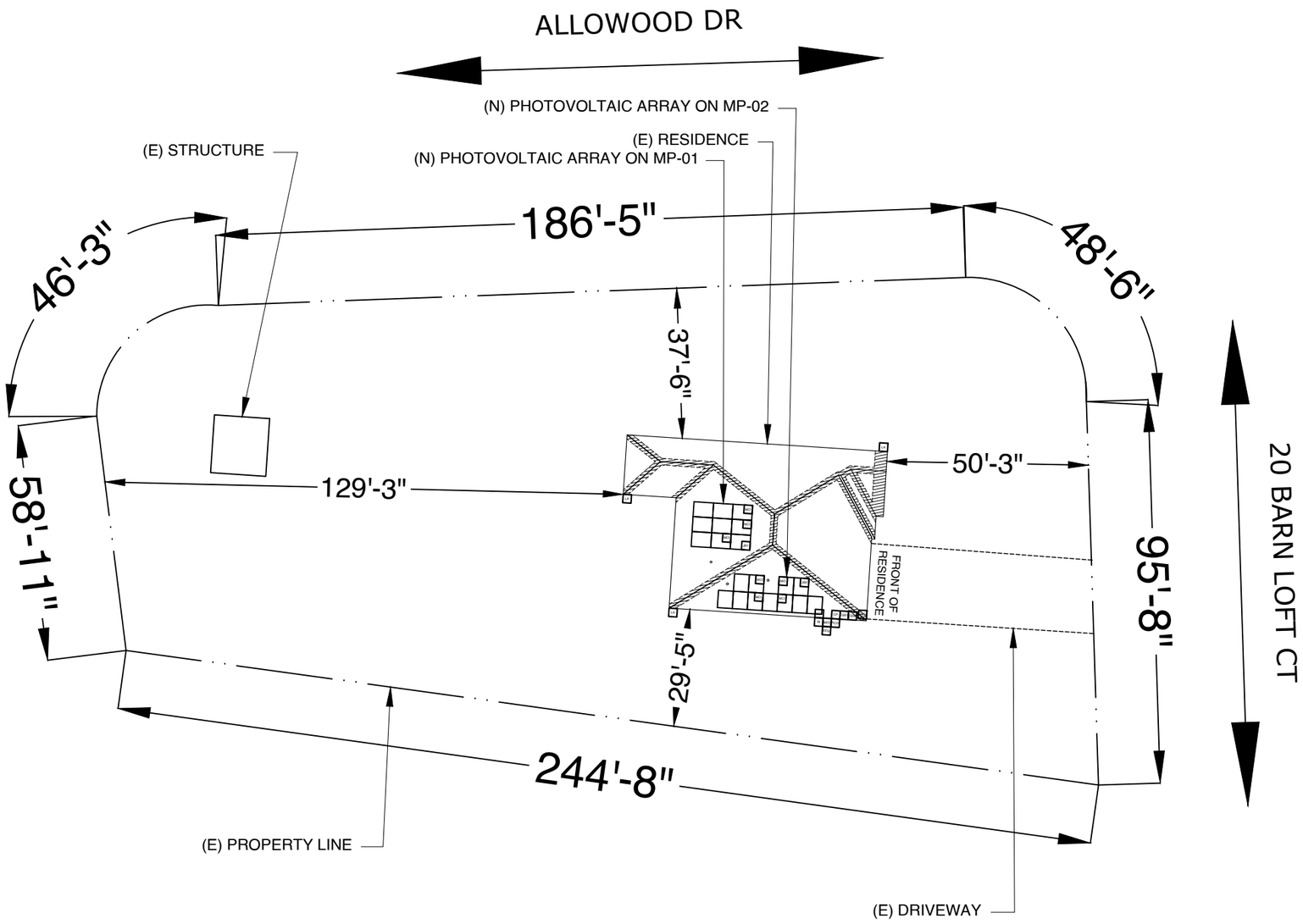
SITE PLAN

PV-2

LEGEND

PROPERTY LINE



N

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27.000kWh **ENERGY STORAGE**

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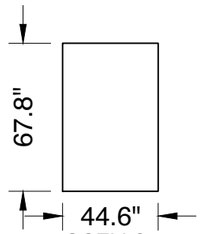
PROPERTY PLAN

PV-3

MODULE TYPE, DIMENSION & WEIGHT

NUMBER OF MODULES = 20 MODULES
MODULE TYPE = QCELLS: Q.TRON BLK M-G2+ 425W MODULES
MODULE WEIGHT = 46.7 LBS / 21.2KG
MODULE DIMENSIONS = 67.8"X 44.6" = 21.00 SF

51 ATTACHMENTS INSTALLED @ 48" O.C. MAX (TYP)
NOTE: PENETRATIONS ARE STAGGERED.



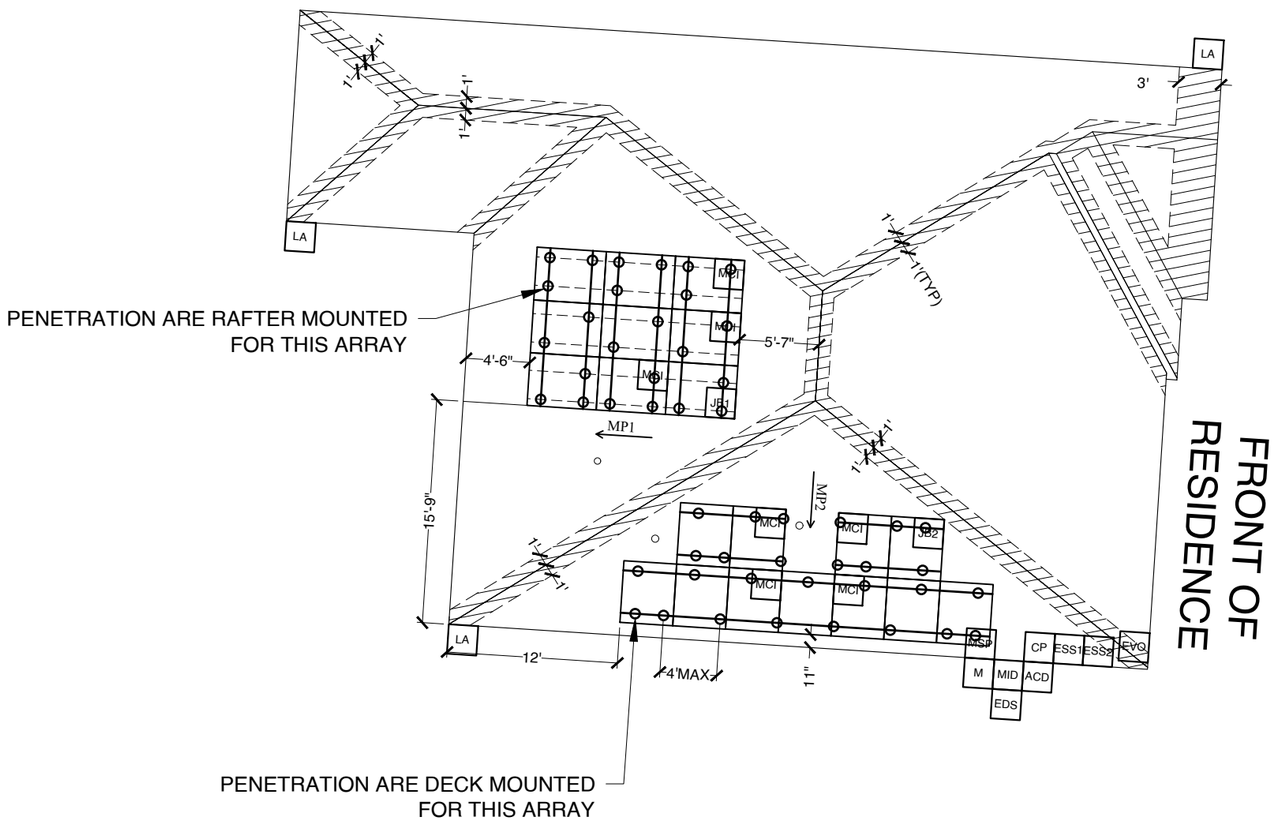
QCELLS
Q.TRON BLK M-G2+
425W
MODULES

ROOF DESCRIPTION

ROOF LAYER		1 LAYER				
ROOF	# OF MODULES	ROOF PITCH	AZIMUTH	TRUSS SIZE	TRUSS SPACING	ROOF TYPE
1	9	30°	274°	2" X 4"	24"	COMPOSITION SHINGLE
2	11	40°	184°	2" X 4"	24"	COMPOSITION SHINGLE

ARRAY & ROOF AREA CALC'S

TOTAL PV ARRAY AREA (Sq. Ft.)	TOTAL ROOF AREA (Sq. Ft.)	ROOF AREA COVERED BY ARRAY (%)
419.98	2334.29	18



N

LEGEND

M	(E) UTILITY METER
MSP	(E) 200A MAIN SERVICE PANEL (E) 200A MAIN BREAKER
ACD	(N) 200A FUSED AC DISCONNECT VISIBLY OPEN, LOCKABLE 240V NEMA-3R
ESS1	(N) TESLA POWERWALL 3 BATTERY 1 EQUIPPED WITH INTEGRATED INVERTER
ESS2	(N) TESLA POWERWALL 3 BATTERY 2 EQUIPPED WITH INTEGRATED INVERTER
CP	(N) 125A COMBINER PANEL
EVO	(N) EV OUTLET
MID	(N) TESLA BACKUP GATEWAY 2
EDS	(N) ESS DISCONNECT SWITCH
MCI	(N) 7 MID-CIRCUIT INTERRUPTER
LA	LADDER ACCESS
JB1	(N) JUNCTION BOX 1 240V, NEMA 4X (ON ROOF)
JB2	(N) JUNCTION BOX 2 240V, NEMA 4X (ON ROOF)
	(N) 20 QCELLS Q.TRON BLK M-G2+ 425W SOLAR MODULES
	FIRE SETBACKS
	(E) ROOF OBSTRUCTIONS
	(N) ROOF ATTACHMENTS
	TRUSS
	(N) RAIL

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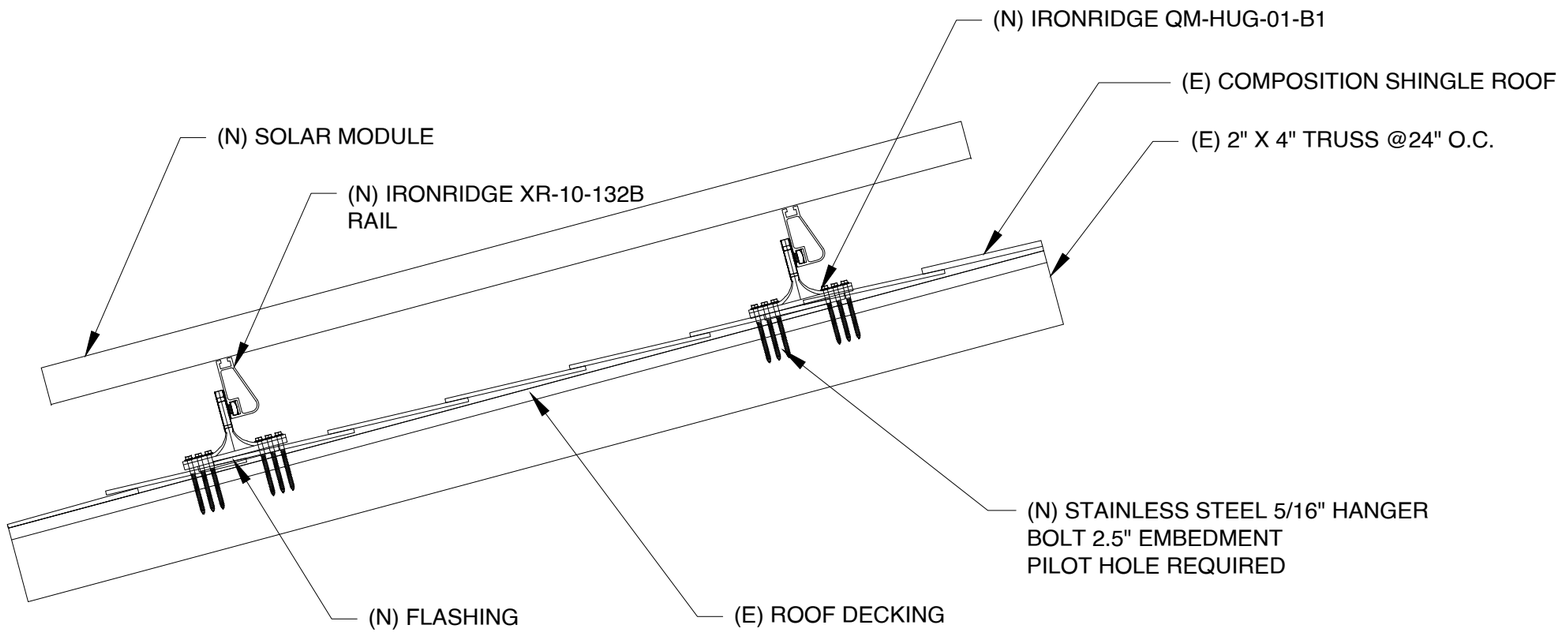
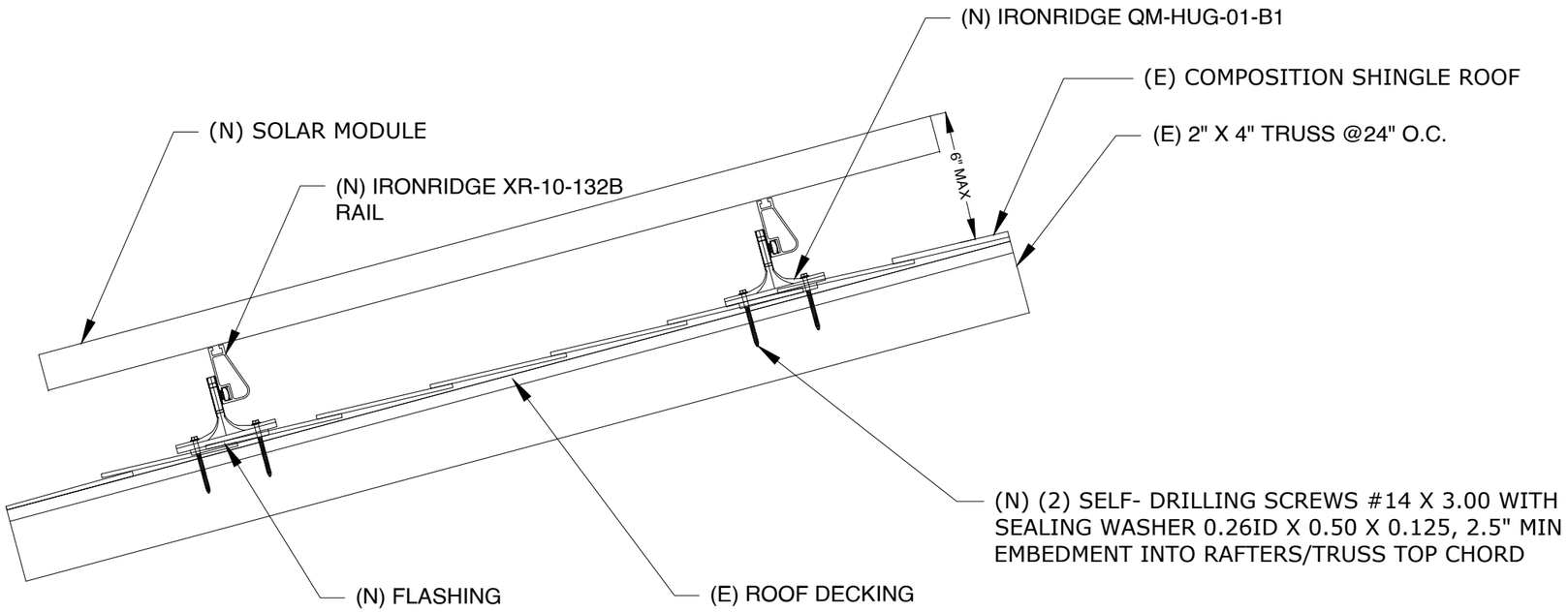
ROOF PLAN

PV-4

FOR DECK MOUNT:



FOR RAFTER MOUNT:



ATTACHMENT DETAIL:
SCALE: NTS

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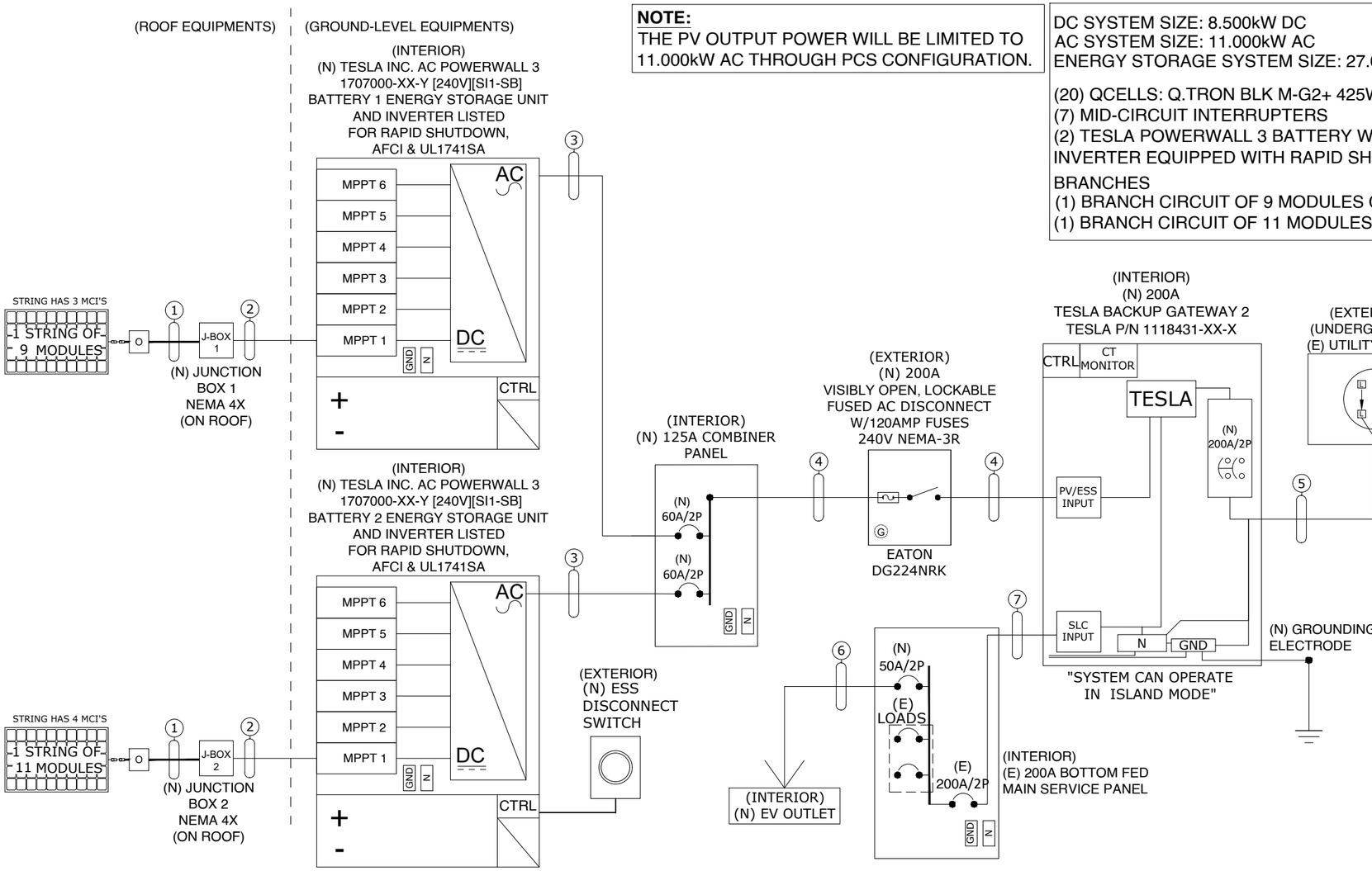
ATTACHMENT DETAIL

PV-5



NOTE:
THE PV OUTPUT POWER WILL BE LIMITED TO 11.000kW AC THROUGH PCS CONFIGURATION.

DC SYSTEM SIZE: 8.500kW DC
AC SYSTEM SIZE: 11.000kW AC
ENERGY STORAGE SYSTEM SIZE: 27.000kWh

(20) QCELLS: Q.TRON BLK M-G2+ 425W MODULES
(7) MID-CIRCUIT INTERRUPTERS
(2) TESLA POWERWALL 3 BATTERY WITH INTEGRATED INVERTER EQUIPPED WITH RAPID SHUTDOWN

BRANCHES
(1) BRANCH CIRCUIT OF 9 MODULES CONNECTED IN SERIES
(1) BRANCH CIRCUIT OF 11 MODULES CONNECTED IN SERIES

CONDUCTOR SCHEDULE				
TAG ID	CONDUIT SIZE	CONDUCTOR	NEUTRAL	GROUND
1	OPEN AIR	(2) 10 AWG PV WIRE	NONE	(1) 6 AWG BARE COPPER, EGC
2	3/4" EMT	(2) 10 AWG THHN/THWN-2, Cu	NONE	(1) 10 AWG THHN/THWN-2, EGC
3	3/4"EMT	(2) 6 AWG THHN/THWN-2, Cu	(1) 6 AWG THHN/THWN-2, Cu	(1) 10 AWG THHN/THWN-2, EGC
4	1-1/2"EMT	(2) 1/0 AWG THHN/THWN-2, Cu	(1) 1/0 AWG THHN/THWN-2, Cu	(1) 8 AWG THHN/THWN-2, EGC
5	2"EMT	(2) 3/0 AWG THHN/THWN-2, Cu	(1) 3/0 AWG THHN/THWN-2, Cu	NONE
6	3/4"EMT	(2) 8 AWG THHN/THWN-2, Cu	(1) 8 AWG THHN/THWN-2, Cu	(1) 10 AWG THHN/THWN-2, EGC
7	2"EMT	(2) 3/0 AWG THHN/THWN-2, Cu	(1) 3/0 AWG THHN/THWN-2, Cu	(1) 6 AWG THHN/THWN-2, EGC
E	EXISTING	EXISTING	EXISTING	EXISTING

MODULE SPEC	
MODEL: Q.TRON BLK M-G2+ 425W	
QTY: 20	WATT. : 425
Voc: 39.03	Isc: 13.66
Vmp: 32.74	Imp: 12.98

INVERTER SPEC			
MODEL:	TESLA POWERWALL 3 BATTERY WITH INTEGRATED INVERTER EQUIPPED WITH RAPID SHUTDOWN		
MAX O/P VOLTAGE:	240V		
MAX O/P CURRENT:	45.83A		
DISCHARGE POWER:	11500W		
CHARGE POWER:	5000W		
CURTAILMENT OUTPUT	11000W		
CEC EFF:	97.5%	QTY.	1

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SINGLE LINE DIAGRAM

PV-6

WIRE SIZE CALCULATION

MAX BRANCH DC REQUIRED CONDUCTOR AMPACITY
(19)(1.25) = 23.75A

AWG #10, DERATED AMPACITY:
(40)x(0.91)x(1) = 36.40A

FROM TABLE 310.15(B)(16),90°C COLUMN

36.40A>23.75A , THEREFORE DC WIRE SIZE IS VALID

TAG ID 3

COMBINED SYSTEM AC REQUIRED CONDUCTOR AMPACITY
(1)(45.83)(1.25) = 57.2A PER NEC §690.8(A)

AWG #6, DERATED AMPACITY:
(65)x(0.88)x(1) = 57.2A

FROM TABLE 310.15(B)(16),75°C COLUMN

74.80A>57.29A , THEREFORE AC WIRE SIZE IS VALID

NOTE: CONDUIT SHALL BE INSTALLED MIN 7/8" ABOVE ROOF SURFACE

OCPD CALCULATION

ALLOWABLE BACKFEED:
MAIN SERVICE PANEL RATING = 200A
MAIN BREAKER RATING = 200A

INVERTER OVERCURRENT PROTECTION:
INVERTER OVERCURRENT PROTECTION = INVERTER O/P CURRENT * CONTINUOUS LOAD(1.25)
= 91.66 * 1.25
= 114.58 A
PV OVERCURRENT PROTECTION = 120A

THE DESIGNED INTERCONNECTION MEETS THE NEC 705.12(A) REQUIREMENTS.

TAG ID 4

COMBINED SYSTEM AC REQUIRED CONDUCTOR AMPACITY
(2)(45.83)(1.25) = 114.58A PER NEC §690.8(A)

AWG #1/0, DERATED AMPACITY:
(150)x(0.88)x(1) = 132.00A

FROM TABLE 310.15(B)(16),75°C COLUMN

132.00A>114.58A , THEREFORE AC WIRE SIZE IS VALID

NOTE: CONDUIT SHALL BE INSTALLED MIN 7/8" ABOVE ROOF SURFACE

ASHRAE 2021 -
HIGHEST MONTHLY 2% D.B. DESIGN TEMP.: 35.9°C
LOWEST MIN. MEAN EXTREME D.B.: -8.5°C

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

RACKING NOTE:
1. BOND AND GROUND RACKING AND MODULES IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION INSTRUCTIONS. MINIMUM ONE CONNECTION PER ARRAY

GROUNDING & GENERAL NOTES:
1. A SECOND FACILITY GROUNDING ELECTRODE IS NOT REQUIRED PER [NEC 690.47(C)(3)]
2. PV INVERTER IS UNGROUNDED, TRANSFORMER-LESS TYPE.
3. DC GEC AND AC EGC TO REMAIN UNSPLICED, OR SPLICED TO EXISTING ELECTRODE
4. ANY EXISTING WIRING INVOLVED WITH PV SYSTEM CONNECTION THAT IS FOUND TO BE INADEQUATE PER CODE SHALL BE CORRECTED PRIOR TO FINAL INSPECTION.
5. SOLADECK OR JUNCTION BOX QUANTITIES, AND PLACEMENT SUBJECT TO CHANGE IN THE FIELD - SOLADECK OR JUNCTION BOX DEPICTED ON ELECTRICAL DIAGRAM REPRESENT WIRE TYPE TRANSITIONS.
6. AC DISCONNECT NOTED IN EQUIPMENT SCHEDULE OPTIONAL IF OTHER AC DISCONNECTING MEANS IS LOCATED WITHIN 10' OF SERVICE DISCONNECT
7. RACEWAYS AND CABLES EXPOSED TO SUNLIGHT ON ROOFTOPS SHOULD BE INSTALLED MORE THAN 7/8" ABOVE THE ROOF USING CONDUIT SUPPORTS.
8. TEMPERATURE RATINGS OF ALL CONDUCTORS, TERMINATIONS, BREAKERS, OR OTHER DEVICES ASSOCIATED WITH THE SOLAR PV SYSTEM SHALL BE RATED FOR AT LEAST 75 DEGREE C.
9. WIRE IS SIZED PER NEC 310.15(B)(16), 310.15(B)(2)(a) and NEC 310.15(B)(3)(a)
10. ALL ROOF CONDUIT WILL HAVE A HEIGHT OF 7/8"

CONTRACTOR INFORMATION

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ELECTRICAL CALC. AND NOTES

PV-7

WARNING:PHOTOVOLTAIC POWER SOURCE

LABEL 1
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)

PHOTOVOLTAIC
DC DISCONNECT

LABEL 2
AT EACH PV DISCONNECTING MEANS
NEC 690.13(B)

MAXIMUM VOLTAGE 600V
MAXIMUM CIRCUIT CURRENT 19.00A
MAX RATED OUTPUT CURRENT OF THE CHARGE CONTROLLER OR DC-TO-DC CONVERTER (IF INSTALLED) 19A

LABEL 3 (FOR TESLA POWERWALL 3 WITH INTEGRATED INVERTER)
AT DC PV SYSTEM DISCONNECTING MEANS NRC 690.53

PHOTOVOLTAIC
AC DISCONNECT

LABEL 4
AT AC DISCONNECT
MEANS NEC 690.13(B)

PCS CONTROLLED OUTPUT POWER SETTING: 11.000kWAC,
PCS CONTROLLED CURRENT SETTING: 45.83A

THE MAXIMUM OUTPUT CURRENT FROM THIS SYSTEM TOWARDS THE MAIN PANEL IS CONTROLLED ELECTRONICALLY. REFER TO THE MANUFACTURER'S INSTRUCTIONS FOR MORE INFORMATION.

LABEL 5 (FOR TESLA POWERWALL 3 WITH INTEGRATED INVERTER)
AT AC DISCONNECTING MEANS
NEC 690.54

PHOTOVOLTAIC AC DISCONNECT
RATED AC OUTPUT CURRENT: 48A
NOMINAL OPERATING AC VOLTAGE: 240V

2 INVERTER X 48 AMP/INVERTER = 96.00AMP

LABEL 9
AT AC DISCONNECT NEC 690.56(C)(3)

RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

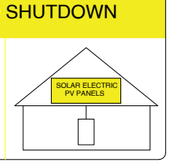
⚠ WARNING
INVERTER OUTPUT CONNECTION
DO NOT RELOCATE THIS OVERCURRENT DEVICE

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

⚠ WARNING: THREE POWER SOURCE
SECOND SOURCE IS PHOTOVOLTAIC SYSTEM
THIRD SOURCE IS ENERGY STORAGE SYSTEM

SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN

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



LABEL 8
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)]

ENERGY STORAGE SYSTEM
NOMINAL ESS VOLTAGE: 240 VAC
OPERATING CURRENT: 48.00 AAC

LABEL FOR ESS BATTERY , QTY-2

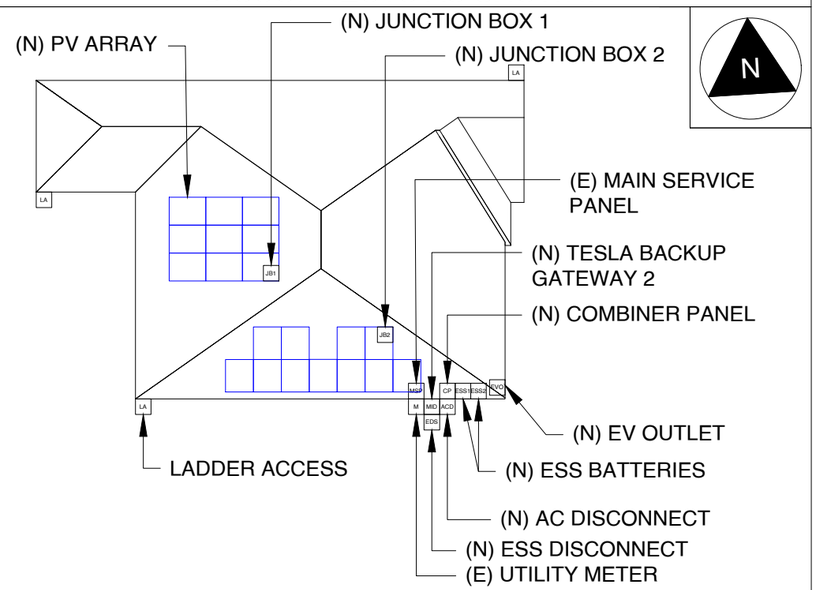
PHOTOVOLTAIC POWER SOURCE
OPERATING AC VOLTAGE: 240 V
MAXIMUM OPERATING AC OUTPUT CURRENT: 96.00 AMPS

THIS IS THE COMBINED AMPERAGE OF INVERTER AND BATTERY

LABEL FOR MAIN SERVICE PANEL COVER

CAUTION

POWER TO THIS BUILDING IS ALSO SUPPLIED FROM MULTIPLE SOURCES OF POWER WITH SAFETY DISCONNECTS AS SHOWN:



20 BARN LOFT CT,FUQUAY-VARINA, NC 27526

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])

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PHOTOVOLTAIC ROOF MOUNT SYSTEM & ENERGY STORAGE SYSTEM

8.500 kWDC, 11.000 kWAC **PV SYSTEM**
27.000kWh **ENERGY STORAGE**
JAY BISSETT RESIDENCE
20 BARN LOFT CT,
FUQUAY-VARINA, NC 27526

NORTH CAROLINA PROFESSIONAL SEAL 050478 ENGINEER ERMOCRATES E. CASTILLO

Digitally signed by: Ermocrates E Castillo
Date: 2024.08.30 11:36:13

DATE	8/30/2024
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SCALE	NTS

LABELS AND PLACARD

PV-8

Q.TRON BLK M-G2+ SERIES

405 - 425 Wp | 108 Cells
21.8 % Maximum Module Efficiency

PRELIMINARY

MODEL Q.TRON BLK M-G2+

High performance Qcells N-type solar cells

Q.ANTUM NEO Technology with optimized module layout boosts module efficiency up to 21.8 %.

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], Hot-Spot Protect.

Extreme weather rating

High-tech aluminium alloy frame, certified for high snow (5400 Pa) and wind loads (5400 Pa).

Innovative all-weather technology

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

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)

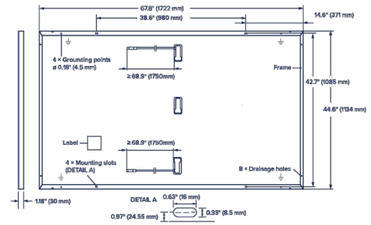
The ideal solution for:

Rooftop arrays on residential buildings

Q.TRON BLK M-G2+ SERIES

Mechanical Specification

Format	67.8 in × 44.6 in × 1.18 in (including frame) (1722 mm × 1134 mm × 30 mm)
Weight	46.7 lbs (21.2 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 × 18 monocrystalline Q.ANTUM NEO 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), Protection class IP67, with bypass diodes
Cable	4 mm² Solar cable; (+) ≥68.9 in (1750 mm), (−) ≥68.9 in (1750 mm)
Connector	Stäubli MC4; IP68

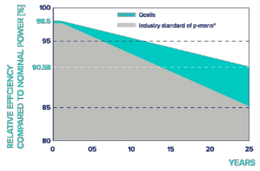


Electrical Characteristics

POWER CLASS				405	410	415	420	425
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC[1] (POWER TOLERANCE +5 W/−0 W)								
Minimum	Power at MPP[1]	P_{MPP}	[W]	405	410	415	420	425
Minimum	Short Circuit Current[1]	I_{SC}	[A]	13.33	13.41	13.49	13.58	13.66
Minimum	Open Circuit Voltage[1]	V_{OC}	[V]	37.91	38.19	38.47	38.75	39.03
Minimum	Current at MPP	I_{MPP}	[A]	12.69	12.76	12.83	12.91	12.98
Minimum	Voltage at MPP	V_{MPP}	[V]	31.93	32.13	32.34	32.54	32.74
Minimum	Efficiency[1]	η	[%]	≥20.7	≥21.0	≥21.3	≥21.5	≥21.8
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT[2]								
Minimum	Power at MPP	P_{MPP}	[W]	306.1	309.9	313.7	317.5	321.2
Minimum	Short Circuit Current	I_{SC}	[A]	10.74	10.81	10.87	10.94	11.00
Minimum	Open Circuit Voltage	V_{OC}	[V]	35.96	36.23	36.50	36.77	37.04
Minimum	Current at MPP	I_{MPP}	[A]	9.98	10.04	10.10	10.15	10.21
Minimum	Voltage at MPP	V_{MPP}	[V]	30.66	30.87	31.07	31.26	31.46

[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

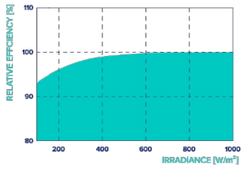


At least 98.5 % of nominal power during first year. Thereafter max. 0.33 % degradation per year. At least 95.53 % of nominal power up to 10 years. At least 90.58 % of nominal power up to 25 years.

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]	−0.24
Temperature Coefficient of P_{MPP}	γ	[%/K]	−0.30	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	C / TYPE 2
Max. Design Load, Push / Pull[3]		[lbs / ft²]	75 (3600 Pa) / 75 (3600 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]	113 (5400 Pa) / 113 (5400 Pa)		

[3] See Installation Manual

Qualifications and Certificates

Quality Controlled PV - TÜV Rheinland; IEC 61215:2016; IEC 61730:2016. This data sheet complies with DIN EN 50380.

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

Specifications subject to technical changes © Qcells Q.TRON_BLK_M-G2+_series_405-425_2023-01_Rev01_NA

CONTRACTOR INFORMATION

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MODULE SPEC SHEET

PV-9

Powerwall 3

Power Everything

—

Powerwall 3 is a fully integrated solar and battery system, designed to accelerate the transition to sustainable energy. Customers can receive whole home backup, cost savings, and energy independence by producing and consuming their own energy while participating in grid services. Once installed, customers can manage their system using the Tesla App to customize system behavior to meet their energy goals.

Powerwall 3 achieves this by supporting up to 20 kW DC of solar and providing 11.5 kW AC of continuous power per unit. It has the ability to start heavy loads up to 150 A LRA, meaning a single unit can support the power needs of most homes. Powerwall 3 is designed for mass production, fast and efficient installations, easy system expansion, and simple connection to any electrical service.

2023

Powerwall 3 Technical Specifications

System Technical Specifications

Model Number	1707000-xx-y
Nominal Grid Voltage (Input & Output)	120/240 VAC
Grid Type	Split phase
Frequency	60 Hz
Overcurrent Protection Device	Configurable up to 60 A
Solar to Battery to Grid Round Trip Efficiency	89% [1,2]
Solar to Grid Efficiency	97% [3]
Supported Islanding Devices	Backup Gateway 2, Backup Switch
Connectivity	Wi-Fi (2.4 and 5 GHz), Dual-port switched Ethernet, Cellular (LTE/4G [4])
Hardware Interface	Dry contact relay, Rapid Shutdown (RSD) certified switch and 2-pin connector, RS-485 for meters
AC Metering	Revenue Grade (+/- 0.5%)
Protections	Integrated arc fault circuit interrupter (AFCI), Isolation Monitor Interrupter (IMI), PV Rapid Shutdown (RSD) using Tesla Mid-Circuit Interrupters
Customer Interface	Tesla Mobile App
Warranty	10 years

Solar Technical Specifications

Maximum Solar STC Input	20 kW
Withstand Voltage	600 V DC
PV DC Input Voltage Range	60 — 550 V DC
PV DC MPPT Voltage Range	150 — 480 V DC
MPPTs	6
Maximum Current per MPPT (I_{mp})	13 A [5]
Maximum Short Circuit Current per MPPT (I_{sc})	15 A [5]

Battery Technical Specifications

Nominal Battery Energy	13.5 kWh AC [2]
Maximum Continuous Discharge Power	11.5 kW AC
Maximum Continuous Charge Power	5 kW AC
Output Power Factor Rating	0 - 1 (Grid Code configurable)
Maximum Continuous Current	48 A
Maximum Output Fault Current	10 kA
Load Start Capability (1 s)	150 A LRA
Power Scalability	Up to 4 Powerwall 3 units supported

[1] Typical solar shifting use case.
[2] Values provided for 25°C (77°F), at beginning of life. 3.3 kW charge/discharge power.
[3] Tested using CEC weighted efficiency methodology.
[4] Cellular connectivity subject to network service coverage and signal strength.
[5] Where the DC input current exceeds the MPPT rating, a jumper can be used to combine two MPPTs into a single input to intake DC current up to 26 A I_{MP} / 30 A I_{SC}.

2023 Powerwall 3 Datasheet 2

CONTRACTOR INFORMATION

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BATTERY &INVERTER SPEC SHEET

PV-10

Powerwall 3 Technical Specifications

Environmental Specifications

Operating Temperature	-20°C to 50°C (-4°F to 122°F) [6]
Operating Humidity (RH)	Up to 100%, condensing
Storage Temperature	-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 Rating	NEMA 3R
Ingress Rating	IPX7 (Battery & Power Electronics) IPX5 (Wiring Compartment)
Pollution Rating	PD3
Operating Noise @ 1 m	<50 db(A) typical <62 db(A) maximum

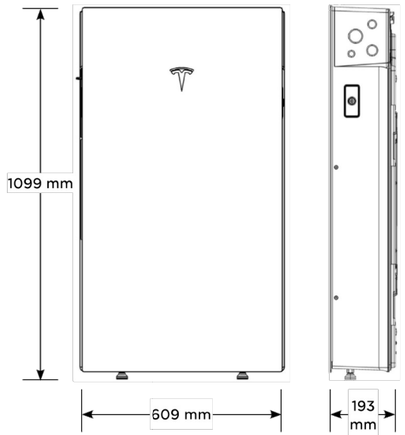
[6] Performance may be de-rated at operating temperatures above 40°C (104°F).

Compliance Information

Certifications	UL 1642, UL 1699B, UL 1741, UL 1741 SA, UL 1741 SB, UL 3741, UL 1973, UL 1998, UL 9540, IEEE 1547-2018, IEEE 1547.1, UN 38.3
Grid Connection	United States
Emissions	FCC Part 15 Class B
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	1099 x 609 x 193 mm (43.25 x 24 x 7.6 in)
Weight	130 kg (287 lb)
Mounting Options	Floor or wall mount



Solar Shutdown Device Technical Specifications

The Solar Shutdown Device is a Mid-Circuit Interrupter (MCI) and is part of the PV system rapid shutdown (RSD) function in accordance with Article 690 of the applicable NEC. When paired with Powerwall 3, solar array shutdown is initiated by any loss of AC power.

Electrical Specifications

Model	**MCI-1**	**MCI-2**
Nominal Input DC Current Rating (I_{MP})	12 A	13 A
Maximum Input Short Circuit Current (I_{SC})	19 A	17 A
Maximum System Voltage (PVHCS)	600 V DC	1000 V DC [7]

[7] Maximum System Voltage is limited by Powerwall to 600 V DC.

RSD Module Performance

Maximum Number of Devices per String	5	5
Control	Power Line Excitation	Power Line Excitation
Passive State	Normally Open	Normally Open
Maximum Power Consumption	7 W	7 W
Warranty	25 years	25 years

Environmental Specifications

Operating Temperature	-40°C to 50°C (-40°F to 122°F)	-45°C to 70°C (-49°F to 158°F)
Storage Temperature	-30°C to 70°C (-22°F to 158°F)	-30°C to 70°C (-22°F to 158°F)
Enclosure Rating	NEMA 4X / IP65	NEMA 4X / IP65

Mechanical Specifications

Electrical Connections	MC4 Connector	MC4 Connector
Housing	Plastic	Plastic
Dimensions	125 x 150 x 22 mm (5 x 6 x 1 in)	173 x 45 x 22 mm (6.8 x 1.8 x 1 in)
Weight	350 g (0.77 lb)	120 g (0.26 lb)
Mounting Options	ZEP Home Run Clip M4 Screw (#10) M8 Bolt (5/16") Nail / Wood screw	Wire Clip

Compliance Information

Certifications	UL 1741 PVRSE, UL 3741, PVRSA (Photovoltaic Rapid Shutdown Array)
RSD Initiation Method	External System Shutdown Switch or Powerwall 3 Enable Switch

UL 3741 PV Hazard Control (and PVRSA) Compatibility

The following categories of solar module meet the UL 3741 PVHCS listing when installed with Powerwall 3 and Solar Shutdown Devices.

Tesla Solar Roof	PV Hazard Control System: BIPV compliance document
Tesla or Hanwha (Q.Peak Duo BLK or BLK-G6+) Modules certified for use with ZEP racking	PV Hazard Control System: ZS PVHCS compliance document
Other module and racking combinations	PV Hazard Control System: Generic PV Array compliance document

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BATTERY &INVERTER SPEC SHEET

PV-10.1

Backup Gateway 2

—

Backup Gateway 2 controls connection to the grid when paired with Powerwall 3, automatically detecting outages and providing seamless transition to backup power. Backup Gateway 2 also provides energy metering for solar self-consumption, time-based control, and backup operation.

In this system configuration, Powerwall 3 acts as the Site Controller, with the Backup Gateway 2 Site Controller disabled.

Performance Specifications

Model Number	1232100-xx-y
AC Voltage (Nominal)	120/240 V
Feed-in Type	Split phase
Grid Frequency	60 Hz
Current Rating	200 A
Maximum Supply Short Circuit Current	10 kA [8]
Overcurrent Protection Device	100 - 200 A, Service entrance rated [8]
Overvoltage Category	Category IV
AC Meter	Revenue accurate (+/- 0.2%)

[8] When protected by Class J fuses, Backup Gateway 2 is suitable for use in circuits capable of delivering not more than 22kA symmetrical amperes.

Primary Connectivity	Ethernet, Wi-Fi
Secondary Connectivity	Cellular (3G, LTE/4G) [9]
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	200 A 6-space / 12 circuit Eaton BR circuit breakers
Warranty	10 years

[9] 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.

Environmental Specifications

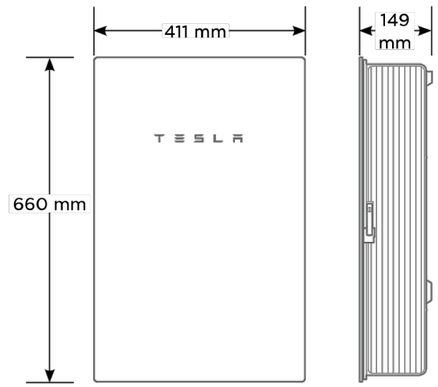
Operating Temperature	-20°C to 50°C (-4°F to 122°F)
Operating Humidity (RH)	Up to 100%, condensing
Maximum Elevation	3000 m (9843 ft)
Environment	Indoor and outdoor rated
Enclosure Type	NEMA 3R

Compliance Information

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

Mechanical Specifications

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



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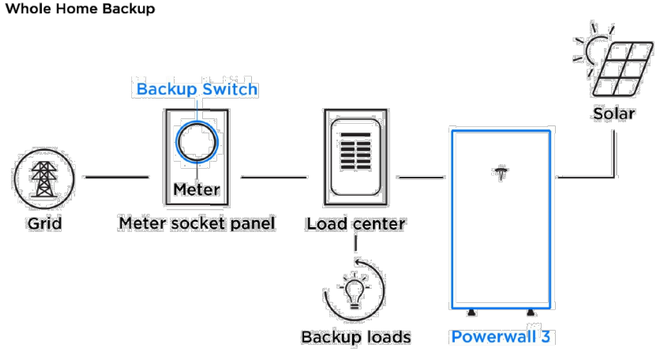
BACKUP GATEWAY 2 SPEC SHEET

PV-10.2

Powerwall 3 Example System Configurations

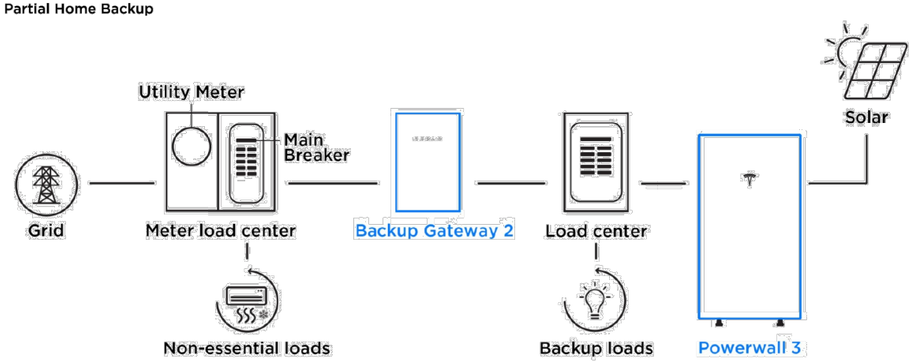
Powerwall 3 with Backup Switch

Whole Home Backup



Powerwall 3 with Backup Gateway 2

Partial Home Backup



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BATTERY &INVERTER SPEC SHEET

PV-10.3

Tech Brief

IRONRIDGE

QuickMount® HUG

The Respect Your Roof Deserves

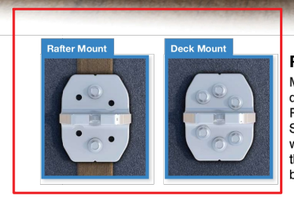
When integrating with a home, solar attachments must be dependable for the lifetime of the rooftop. Due to recent innovations, many asphalt shingles have bonded courses. A mount that protects without the need to pry shingles can really speed things up.

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).



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.

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

Intertek

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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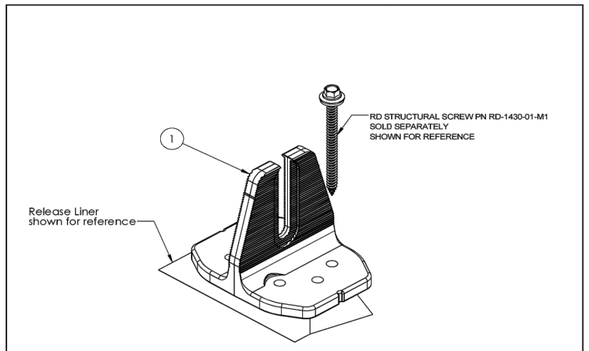
MOUNT SPEC SHEET

PV-11

Cut Sheet

IRONRIDGE

QuickMount® Halo UltraGrip®



ITEM NO	DESCRIPTION	QTY IN KIT
1	QM Halo UltraGrip(Mill or Black)	1

PART NUMBER	DESCRIPTION
QM-HUG-01-M1	Halo UltraGrip - Mill
QM-HUG-01-B1	Halo UltraGrip - Black

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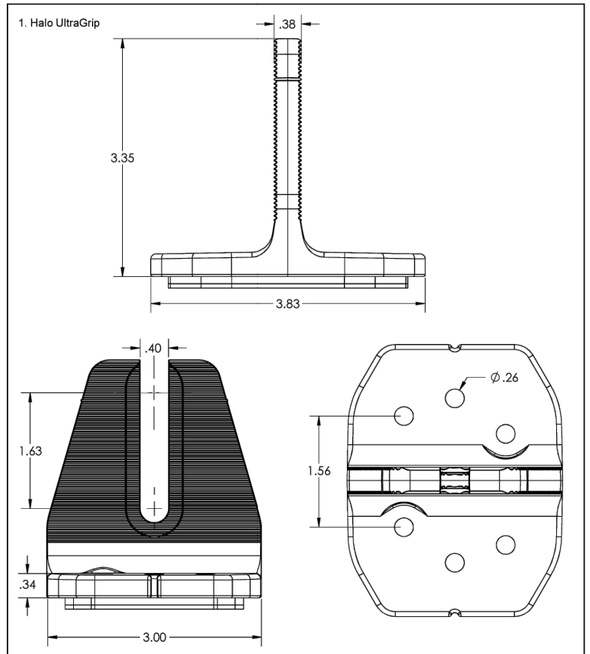
Cut Sheet

1. Halo UltraGrip



Property	Value
Material	300 Series Aluminium
Finish	Mill or Black

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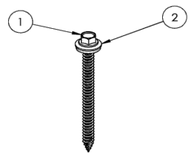
Cut Sheet

IRONRIDGE

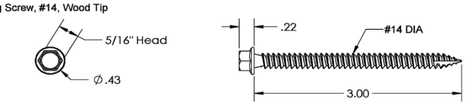
QuickMount® RD Structural Screw



ITEM NO	DESCRIPTION	QTY IN KIT
1	Self Drilling Screw, #14, Wood Tip	1
2	Washer, EPDM Backed	1

PART NUMBER	DESCRIPTION
RD-1430-01-M1	RD Structural Screw

1. Self Drilling Screw, #14, Wood Tip



Property	Value
Material	300 Series Stainless Steel
Finish	Clear

2. Washer, EPDM Backed

Property	Value
Material	300 Series Stainless Steel
Finish	Clear

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CONTRACTOR INFORMATION

SOUTHERN ENERGY MANAGEMENT
5908 TRIANGLE DRIVE, RALEIGH, NC, 27617
PHONE: +1 919 306 9537

PHOTOVOLTAIC ROOF MOUNT SYSTEM & ENERGY STORAGE SYSTEM

8.500 kWDC, 11.000 kWAC **PV SYSTEM**
27.000kWh **ENERGY STORAGE**
JAY BISSETT RESIDENCE
20 BARN LOFT CT,
FUQUAY-VARINA, NC 27526

DATE	8/30/2024
CREATED BY	ART
SCALE	NTS

MOUNT SPEC SHEET

PV-11.1

Tech Brief

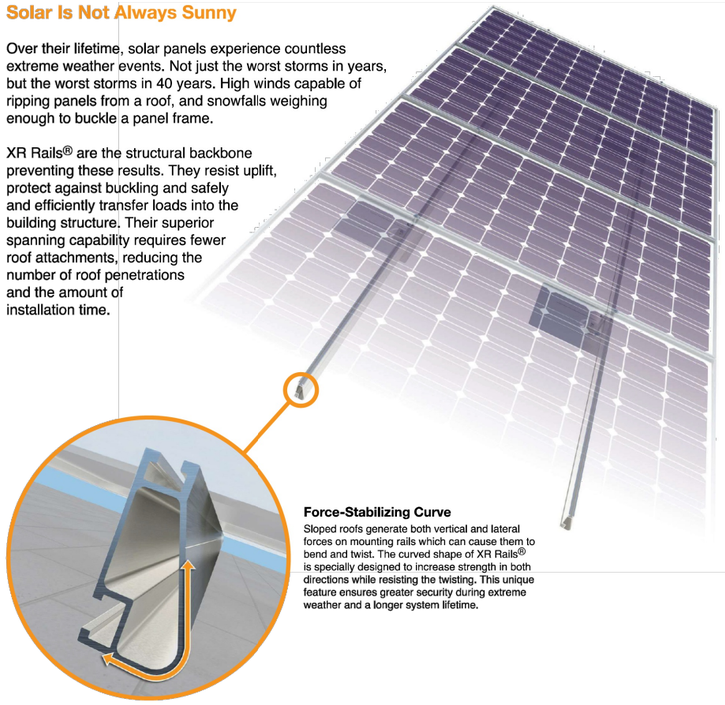
IRONRIDGE

XR Rail® Family

Solar Is Not Always Sunny

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

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



Force-Stabilizing Curve

Sloped roofs generate both vertical and lateral forces on mounting rails which can cause them to bend and twist. The curved shape of XR Rails® is specially designed to increase strength in both directions while resisting the twisting. This unique feature ensures greater security during extreme weather and a longer system lifetime.

Compatible with Flat & Pitched Roofs

XR Rails® are compatible with FlashFoot® and other pitched roof attachments.

IronRidge® offers a range of tilt leg options for flat roof mounting applications.

Corrosion-Resistant Materials

All XR Rails® are made of 6000-series aluminum alloy, then protected with an anodized finish. Anodizing prevents surface and structural corrosion, while also providing a more attractive appearance.

Tech Brief

XR Rail® Family

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

XR10

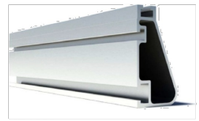
XR10 is a sleek, low-profile mounting rail, designed for regions with light or no snow. It achieves spans up to 6 feet, while remaining light and economical.

- 6' spanning capability
- Moderate load capability
- Clear & black anodized finish
- Internal splices available

XR100

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

- 10' spanning capability
- Heavy load capability
- Clear & black anodized finish
- Internal splices available



XR1000

XR1000 is a heavyweight among solar mounting rails. It's built to handle extreme climates and spans up to 12 feet for commercial applications.

- 12' spanning capability
- Extreme load capability
- Clear anodized finish
- Internal splices available

Rail Selection

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

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

*Table is meant to be a simplified span chart for conveying general rail capabilities. Use approved certification letters for actual design guidance.

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8.500 kWDC, 11.000 kWAC **PV SYSTEM**

27.000kWh **ENERGY STORAGE**

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FUQUAY-VARINA, NC 27526

DATE	8/30/2024
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SCALE	NTS

RAIL SPEC SHEET

PV-12

MODULE COMPATIBILITY

Hanwha Q CELLS	Hanwha Q CELLS Modules with 32, 35, 40 mm frames aaYY-ZZ-xxx where "aa" can be Q. or B.; "YY" can be PLUS, PRO, PEAK, LINE PRO, LINE PLUS, PLUS DUO, PEAK DUO or Tron; and "ZZ" can be G3, G3.1, G4, G4.1, L-G2, L-G2.3, L-G3, L-G3.1, L-G3y, L-G4, L-G4.2, L-G4y, LG4.2/TAA, BFR-G3, BLK-G3, BFR-G3.1, BLK-G3.1, BFR-G4, BFR-G4.1, BFR G4.3, BLK-G4.1, G4/SC, G4.1/SC, G4.1/TAA, G4.1/MAX, BFR G4.1/TAA, BFR G4.1/MAX, BLK G4.1/TAA, BLK G4.1/SC, EC-G4.4, G5, G5/SC, G5/TS, BLK-G5, BLK-G5/SC, BLK-G5/TS, L-G5, L-G5.1, L-G5.2, L-G5.2/H, L-G5.3, G6, G6/SC, G6/TS, G6+/TS, G6+, BLK-G6, L-G6, L-G6.1, L-G6.2, L-G6.3, G7, BLK-G6+, BLK-G6+/AC, BLK-G6+/HL, BLK-G6+/SC, BLK-G6/TS, BLK-G6+/TS, BLK-G7, G7.2, G8, BLK-G8, G8+, BLK-G8+ L-G7, L-G7.1, L-G7.2, L-G7.3, L-G8, L-G8.1, L-G8.2, L-G8.3, L-G8.3/BFF, L-G8.3/BFG, L-G8.3/BGT, M-G2+, BLK M-G2+, ML-G9, BLK ML-G9, ML-G9+, BLK ML-G9+, BLK-G10, BLK-G10+, BLK G10+/AC, BLK-G10+/HL, ML-G10, BLK ML-G10, ML-G10+, BLK ML-G10+, ML-G10.a, BLK ML-G10.a, ML-G10.a+, BLK ML-G10.a+, BLK ML-G10 +/t, BLK ML-G10+/TS, XL-G9, XL-G9.2, XL-G9.3, XL-G9.3/BFG, XL-G10.2, XL-G10.3, XL-G10.c, XL-G10.d, XL-G10.d/BFG, XL-G10.3/BFG, XL-G11.2, XL-G11.3, XL-G11.3/BFG or XL-G11S.3/BFG
Heliene	Heliene modules with 35 and 40 mm frames YYZZxxxA Where "YY" can be 36, 60, 72, 96, 108, 120, 132, 144 or 156; "ZZ" can be HC, M, P, or MBLK; and "A" can be blank, HomePV, Bifacial, M10-SL, M10-SL-BLK, M10 Bifacial or M10 SL-Bifacial
HT-SAAE	HT-SAAE modules with 35 and 40 mm frames HTyy-aaaZ-xxx Where "yy" can be 60, 66, 72 or 78, "aaa" can be 18, 156 or 166, "Z" can be M, P, M-C, P-C, M(S), M(VS), M(V), P(V), M(V)-C, P(V)-C, or X
Hyperion Solar (Runergy)	Hyperion modules with 30 and 35 mm frames HY-DHzzzA8-xxxB Where "zzz" can be 108 or 144; "A" can be N or P; and "B" can be blank or B
Hyundai	Hyundai modules with 32, 33, 35 and 40 mm frames HiY-SxxxZZ Where "Y" can be A, D or S; "S" can be M or S; and "ZZ" can be GI, HG, HI, KI, MI, MF, MG, PI, RI, RG, RG(BF), RG(BK), SG, TI, TG, YH(BK) or XG(BK)
Itek	Itek Modules with 40 mm frames IT-xxx-YY Where "YY" can be blank, HE, or SE, or SE72
JA Solar	JA Solar modules with 30, 35 and 40 mm frames JAyyzz-bbww-xxx/aa Where "yy" can be M, P, M6 or P6; "zz" can be blank, (K), (L), (R), (V), (BK), (FA), (TG), (FA)(R), (L)(BK), (L)(TG), (R)(BK), (R)(TG), (V)(BK), (BK)(TG), or (L)(BK)(TG); "bb" can be 48, 54, 60, 66, 72 or 78; "ww" can be D09, D10, D20, D30, S01, S02, S03, S06, S09, S10, S12, S17, S20, S30 or S31; and "aa" can be BP, MB, MR, SI, SC, PR, 3BB, 4BB, 4BB/RE, 5BB
Jinko	Jinko modules with 35 and 40 mm frames JKMYxxxZZ-aa Where "Y" can either be blank or S; "ZZ" can be M, N, P, or PP; and "aa" can be blank, 54HL4-B, 60, 60B, 60H, 60L, 60BL, 60HL, 60HB, 60HBL, 6HBL-EP, 60-J4, 60B-J4, 60B-EP, 60(Plus), 60-V, 60-MX, 6RL3, 6RL3-B, 6TL3-B, 7RL3-V, 7RL3-TV, 72, 72B, 72-J4, 72B-J4, 72(Plus), 72-V, 72H-V, 72L-V, 72HL-V, 72HBL-V, 72HL4-V, 72HL4-BDV, 72HL4-TV, 72-MX, 72H-BDVP, 72HL-TV, or 72HL-V-MX3
KB Solar	KB Solar modules with 35 mm frames KBS-xxx-Mono-YY Where "YY" can be blank or BF
Kyocera	Kyocera Modules KYxxxZZ-AA Where "Y" can be D or U; "ZZ" can be blank, GX, or SX; and "AA" can be LPU, LFU, UPU, LPS, LPB, LFB, LFBS, LFB2, LPB2, 3AC, 3BC, 3FC, 4AC, 4BC, 4FC, 4UC, 5AC, 5BC, 5FC, 5UC, 6BC, 6FC, 8BC, 6MCA, or 6MPA
LA Solar	LA Solar modules with 35 mm frames LSxxxYY Where "YY" can be BF, BL, BLA, HC or ST

MODULE COMPATIBILITY

LG	LG modules with 35 and 40 mm frames LGxxxYaZ-bb Where "Y" can be A, E, M, N, Q, S; "a" can be A, 1, 2 or 3 "Z" can be C, K, T, or W; and "bb" can be A3, A5, A6, B3, B6, E6, E6.AW5, G3, G4, J5, K4, L5, N5, V5, V6
Longi	Longi modules with 30, 35 and 40 mm frames LRa-YYZZ-xxxM Where "a" can be 4, 5 or 6; "YY" can be blank, 54, 60, 66, or 72; and "ZZ" can be blank, BK, BP, HV, PB, PE, PH, HBD, HIB, HIH, HPB, HPH, HIBD, HABB or HABD
Maxeon	Maxeon modules with 35, 40 and 46 mm frames SPR-AAAY-xxx-zzz Where "AAA" can be MAX, P or X; "Y" can be 3, 5, 6, 21 or 22; and "zzz" can be R, BLK, BLK-R, COM or UPP
Meyer Burger	Meyer Burger Modules with 35 mm frames Meyer Burger Black, White or Glass
Mission Solar (mSolar)	Mission Solar modules with 33, 35 and 40 mm frames YYYbb-xxxZZaa Where "YYY" can be MSE, TXI or TXS; "bb" can be blank, 6, 10 or 60A; "ZZ" can be blank, HT, MM, SE, SO, SQ , SR, SX, TS, 108, 120 or 144; and "aa" can be blank, 0B, 2B, BB, BW, 1J, 4J, 4S, 5K, 5R, 5T, 60, 6J, 6S, 6W, 6Z, 8K, 8T, 9R, 9S or 9Z
Mitrex	Mitrex modules with 30 and 40 mm frames Mxxx-XYZ Where "X" can be A, B, I or L; "Y" can be 1 or 3; and "Z" can be F or H
Mitsubishi	Mitsubishi modules PV-MYYxxxZZ Where "YY" can be LE or JE; and "ZZ" can be either HD, HD2, or FB
Moltech	IM and XS series modules with 40 mm frames
Navitas	Navitas Modules with 35 mm frames NSMxxx-yyy Where "yyy" can be 120, 132 or 144
Next Energy Alliance	Next Energy Alliance modules with 35 and 40 mm frames yyNEA-xxxZZ where "yy" can be blank or US; "ZZ" can be M, MB or M-60
NE Solar	NE Solar modules with 30, 35 and 40 mm frames NESExxx-zzMHX-yy Where "zz" can be 54, 60 or 72; "X" can be blank or B; and "yy" can be M6 or M10
Neo Solar Power	Neo Solar Power modules with 35 mm frames D6YxxxZZaa Where "Y" can be M or P; "ZZ" can be B3A, B4A, E3A, E4A, H3A, H4A; and "aa" can be blank, (TF), ME or ME (TF)
Panasonic (HIT)	Panasonic modules with 35 and 40 mm frames VBHNxxxYYzzA Where "YY" can be either KA, RA, SA or ZA; "zz" can be either 01, 02, 03, 04, 06, 06B, 11, 11B, 15, 15B, 16, 16B, 17, or 18; and "A" can be blank, E, G, or N
Panasonic (EverVolt)	Panasonic modules with 30 mm frames EVPVxxxA Where "A" can be blank or H, K, HK or PK
Peimar	Peimar modules with 40 mm frames SbxxxYzz Where "b" can be G, M or P; "Y" can be M or P; and "zz" can be blank, (BF) or (FB)
Philadelphia Solar	Philadelphia modules with 30, 35 and 40 mm frames PS-YzzAA-xxxW Where "Y" can be M or P; "zz" can be 60, 72, 108 or 144; "AA" can be blank, (BF), (HC) or (HCBF); and "W" can be blank or W

CONTRACTOR INFORMATION

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DATE	8/30/2024
CREATED BY	ART
SCALE	NTS

INSTALLATION MANUAL

PV-13

Tech Brief

IRONRIDGE

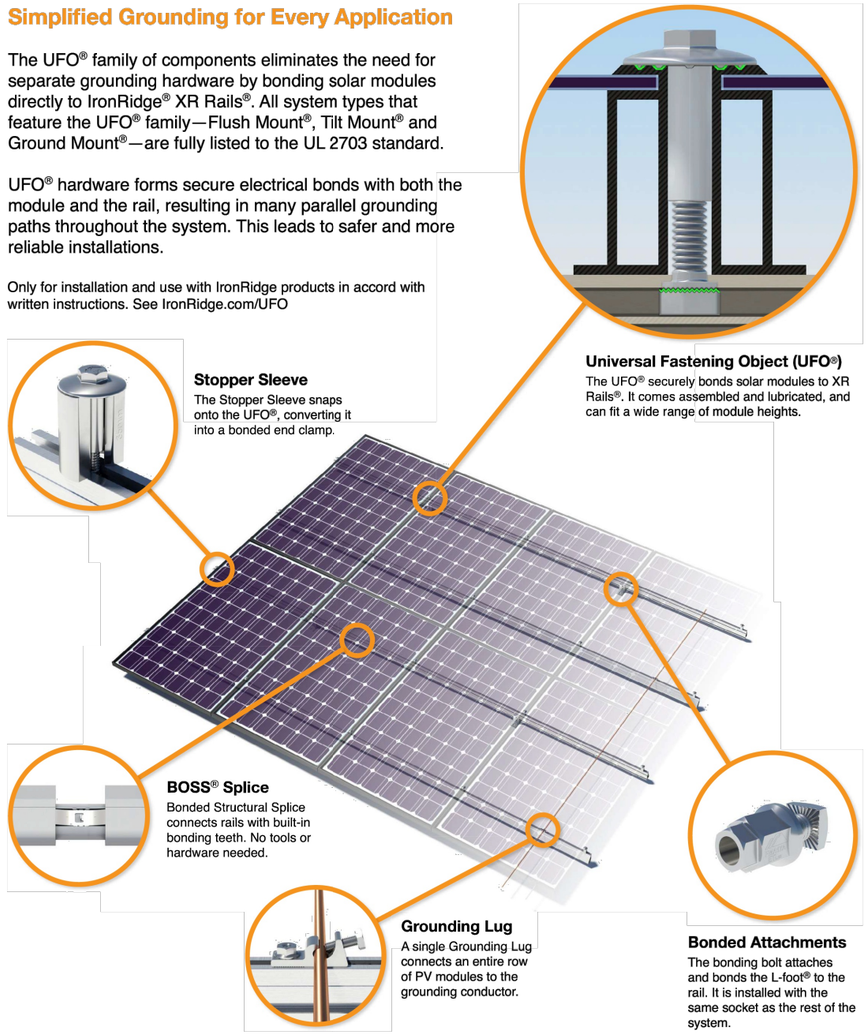
UFO® Family of Components

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.

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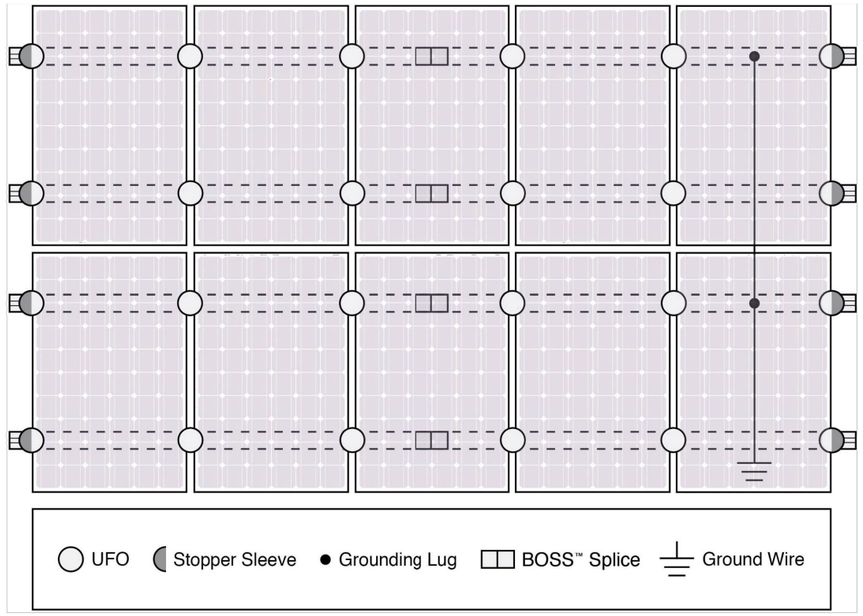
Tech Brief

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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PV-14