

GENERAL NOTES

1. ALL ELECTRICAL MATERIALS SHALL BE NEW AND LISTED BY RECOGNIZED ELECTRICAL TESTING LABORATORY

CUSTOM MADE EQUIPMENT SHALL HAVE COMPLETE TEST DATA SUBMITTED BY THE MANUFACTURER ATTESTING TO ITS SAFETY

2. OUTDOOR EQUIPMENT SHALL BE NEMA 3R RATED OR BETTER

3. ALL METALLIC EQUIPMENT SHALL BE GROUNDED

4. CONTRACTOR SHALL OBTAIN ELECTRICAL PERMITS PRIOR TO INSTALLATION AND SHALL COORDINATE ALL INSPECTIONS, TESTING COMMISSIONING AND ACCEPTANCE WITH THE CLIENT, UTILITY CO. AND CITY INSPECTORS AS NEEDED.

5. THE ELECTRICAL CONTRACTOR SHALL VERIFY THE EXACT LOCATIONS OF SERVICE POINTS AND SERVICE SIZES WITH THE SERVING UTILITY COMPANY AND COMPLY WITH ALL UTILITY COMPANIES REQUIREMENTS.

6. DRAWINGS ARE DIAGRAMMATIC ONLY, ROUTING OF RACEWAYS SHALL BE OPTION OF THE CONTRACTOR UNLESS OTHERWISE NOTED AND SHALL BE COORDINATED WITH OTHER TRADES.

7. IF THE ROOF MATERIAL OR ROOF STRUCTURE NOT ADEQUATE FOR PV INSTALLATION, CALL ENGINEER PRIOR TO INSTALL. THE CONTRACTOR IS RESPONSIBLE TO VERIFY THAT THE ROOF IS CAPABLE OF WITHSTANDING THE EXTRA WEIGHT.

8. IF THE DISTANCES FOR CABLE RUNS ARE DIFFERENT THAN SHOWN, THE CONTRACTOR SHALL NOTIFY THE ELECTRICAL ENGINEER TO VALIDATE THE WIRE SIZE. FINAL DRAWINGS WILL BE RED-LINED AND UPDATED AS APPROPRIATE.

9. WHENEVER A DISCREPANCY IN QUALITY OF EQUIPMENT ARISES ON THE DRAWING OR SPECIFICATIONS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING ALL MATERIAL AND SERVICES REQUIRED BY THE STRICTEST CONDITIONS NOTED ON THE DRAWINGS OR IN THE SPECIFICATIONS TO ENSURE COMPLETE COMPLIANCE AND LONGEVITY OF THE OPERABLE SYSTEM REQUIRED BY THE ARCHITECT/ENGINEERS.

10. ALL BROCHURES, OPERATION MANUALS, CATALOGS, SHOP DRAWINGS, ETC. SHALL BE HANDED OVER TO OWNER'S REPRESENTATIVE AT THE COMPLETION OF WORK

PHOTOVOLTAIC NOTES:

1. ROOFTOP MOUNTED PHOTOVOLTAIC PANELS AND MODULES SHALL BE TESTED, LISTED AND IDENTIFIED BY RECOGNIZED ELECTRICAL TESTING LABORATORY

2. SOLAR SYSTEM SHALL NOT COVER ANY PLUMBING OR MECHANICAL VENTS

3. MODULES AND SUPPORT STRUCTURES SHALL BE GROUNDED.

4. SOLAR INVERTER SHALL BE LISTED TO UL1741.

5. REMOVAL OF AN INTERACTIVE INVERTER OR OTHER EQUIPMENT SHALL NOT DISCONNECT THE BONDING CONNECTION BETWEEN THE GROUNDING ELECTRODE CONDUCTOR AND THE PHOTOVOLTAIC SOURCE AND/OR OUTPUT CIRCUIT GROUNDED CONDUCTORS.

6. ALL PV MODULES AND ASSOCIATED EQUIPMENT AND WIRING SHALL BE PROTECTED FROM PHYSICAL DAMAGE.

7. LIVE PARTS OF PV SOURCE CIRCUITS AND PV OUTPUT CIRCUITS OVER 150V TO GROUND SHALL NOT BE ACCESSIBLE TO OTHER THAN QUALIFIED PERSONS WHILE ENERGIZED.

8. INVERTER IS EQUIPED WITH INTEGRATED GFDI, THUS PROVIDING GROUND FAULT PROTECTION

9. ALL CONDUCTORS SHALL BE COPPER AND 90 DEG RATED

10. ALL ELECTRICAL EQUIPMENT SHALL BE LISTED BY A RECOGNIZED ELECTRICAL TESTING LABORATORY.

11. A SINGLE CONDUCTOR SHALL BE PERMITTED TO BE USED TO PERFORM THE MULTIPLE FUNCTIONS OF DC GROUNDING, AC GROUNDING AND BONDING BETWEEN AC AND DC SYSTEMS.

12. NON-CURRENT CARRYING METAL PARTS OF EQUIPMENT SHALL BE EFFECTIVELY BONDED TOGETHER. BOND BOTH ENDS OF RACEWAYS.

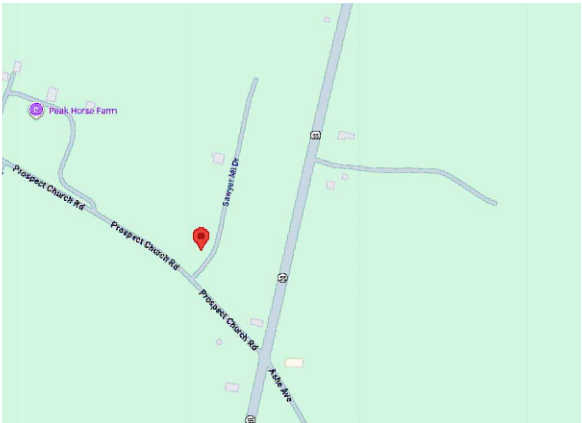
MAIN

THE INSTALLATION OF SOLAR ARRAYS AND PHOTOVOLTAIC POWER SYSTEMS SHALL COMPLY WITH THE FOLLOWING CODES:

- 2020 NATIONAL ELECTRICAL CODE
- 2018 NORTH CAROLINA STATE BUILDING CODE: RESIDENTIAL
- 2018 NORTH CAROLINA STATE BUILDING CODE: BUILDING
- 2018 NORTH CAROLINA STATE BUILDING CODE: FIRE

AS ADOPTED BY THE STATE OF NORTH CAROLINA
ALL OTHER ORDINANCE ADOPTED BY THE
LOCAL GOVERNING AGENCIES

VICINITY MAP
SCALE: NTS



SATELLITE VIEW
SCALE: NTS



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PV SOLAR SYSTEM DETAILS

SYSTEM SIZE: DC STC: 5.220 KW
SYSTEM SIZE: AC CEC: 11.500 KW
SOLAR MODULES: (12) Hyundai 435 WATT
SOLAR SHITDOWNS: (4) MCI-2 Solar Shutdowns

INVERTER: (1) TESLA MODEL #1707000-xx-y / 11.5KW
BATTERY: (1) POWERWALL 3 MODEL# 1707000-xx-y - 13.5KWH

ELECTRICAL INFORMATION:
EXISTING
MAIN SERVICE PANEL BUS SIZE: 200A
MAIN SERVICE BREAKER SIZE: 200A
MOUNTING SYSTEM: IRONRIDGE XR-10

BUILDING INFORMATION:
CONSTRUCTION TYPE: V-B
OCCUPANCY: R3
ROOF: COMP. SHINGLE
TRUSS:

Project Name:
Garrett Barefoot
Property address:
**29 Sawyer MI Dr
Dunn, NC 28334**



Wiring Solutions Plus LLC

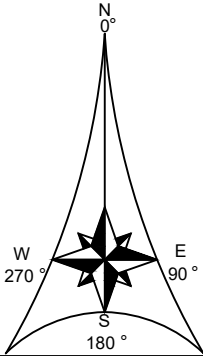
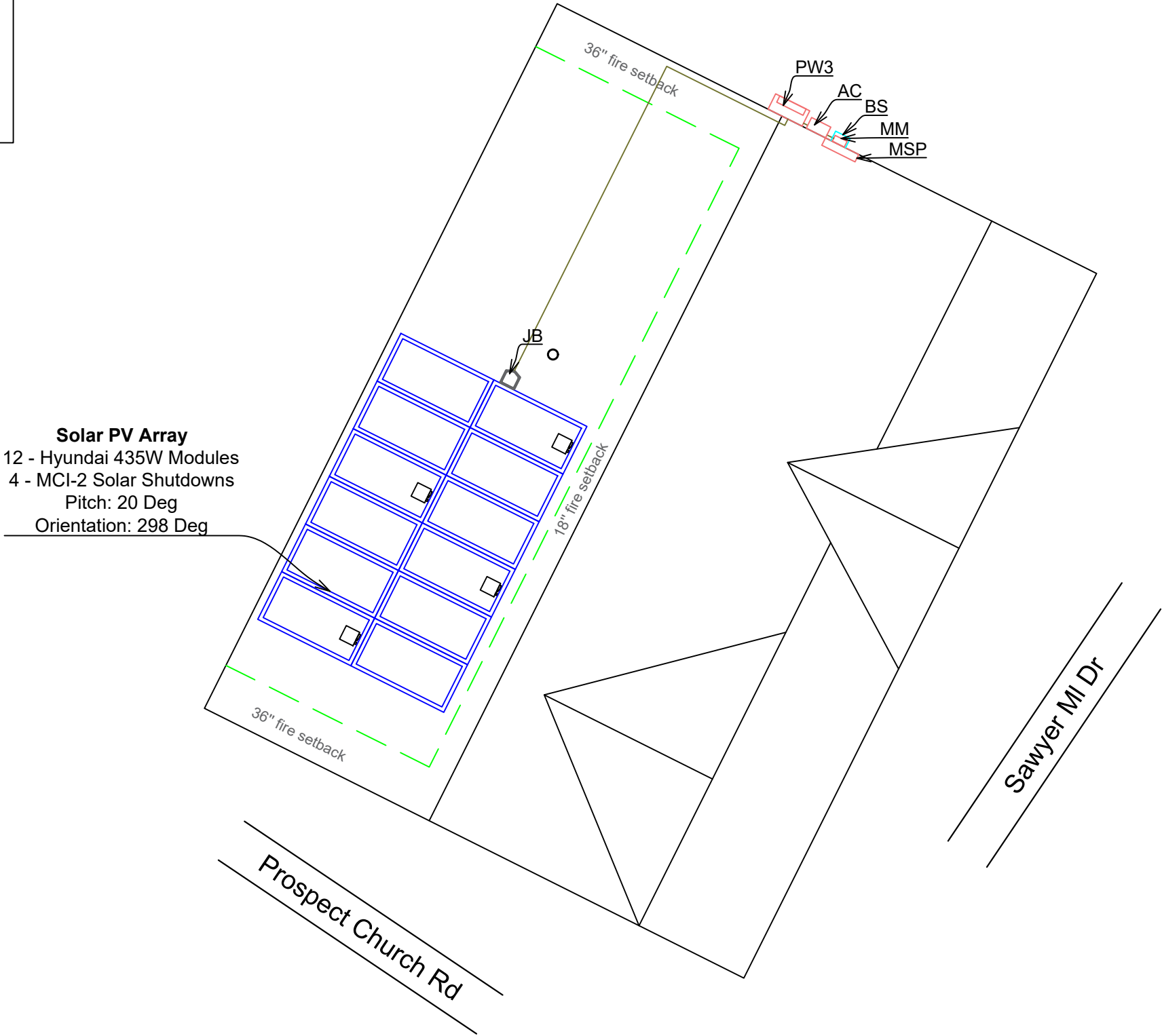
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License Number:
25181-L



DATE: 09/05/2025

INDEX	
MM	(E) Main Meter
MSP	(E) Main Service Panel
BS	(N) Backup Switch
PW3	(N) Powerwall 3
AC	(N) AC Disconnect
JB	(N) Junction Box
	(N) Solar Shutdowns
	(N) Solar Modules
	EMT Conduit
	Setback

Total Roof Area: 1858
Total Module Area:252.24
13.57% of Coverage



SCALE: 1/8" = 1'-0"

1 ROOF PLAN

Project Name:

Garrett Barefoot

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#	ITEM	DESCRIPTION	QTY
1	PV MODULE	HYUNDAI 435WATT HiN-T435NF(BK) Voc = 38.60V, Vmp = 32.10V Isc = 14.32A, Imp = 13.56A	12
2	POWERWALL 3	(N) TESLA POWERWALL 3 MODEL #1707000-xx-y MAX. CONTINUOUS CURRENT - 48A PV DC INPUT VOLTAGE RANGE 60-550V DC PV DC MPPT VOLTAGE RANGE 150-480V DC SOLAR TO HOME/GRID EFFICIENCY 97.5%	1
3	SOLAR SHUTDOWNS	MCI-2 SOLAR SHUTDOWNS MAX. INPUT DC CURRENT - 13A MAX. INPUT SHORT CIRCUIT CURRENT - 17A MAX. SYSTEM VOLTAGE - 1000V DC MAX. DISCONNECT VOLTAGE - 165V DC	4
4	JUNCTION BOX	4"x4"x2" UL LISTED WATER TIGHT NEMA TYPE 3	1
5	MAIN SERVICE PANEL	EXISTING MAIN SERVICE PANEL 200A BUSBAR & 200A BREAKER	1
6	MAIN METER	UTILITY METER	1
7	BACKUP SWITCH	(N)200A TESLA BACKUP SWITCH MODEL #1624171-xx-y, 120/240V	1
8	AC DISCONNECT	(N)60A NON-FUSED AC DISCONNECT	1

WIRE CHART						
#	CONTINUES CURRENT x NECMULT x COMBINED STRING =DESIGN AMPS	BREAKER SIZE (A)	WIRE TYPE	EGC	WIRE RATING X TEMP DERATE X CONDUCTOR DERATE = ERATED WIRE	CONDUIT SIZE
1	14.32 X 1.25 = 17.9A	20	(2) #10 AWG, PV WIRE	(1) #6 BARE SOLID COPPER GEC	40 X .71 X 1 = 28.4 >= 17.9	IN FREE AIR
2	14.32 X 1.25 = 17.9 A	20	(2) #10 AWG, CU-THWN-2	(1) #10 AWG CU-THWN-2 EGC	40 X .71 X 1 = 28.4 >= 17.9	3/4" EMT
3	48 X 1.25 = 60 A	60	(3) #6 AWG, CU-THWN-2	(1) #10 AWG CU-THWN-2 EGC	75 X .91 X 1 = 68.25 >= 60	3/4" EMT

600V CALCULATION		
MAX NUMBER MODULES PER STRING:	12	
Voc:	38.60	V
CORRECTION FACTOR:	1.12	
MAX SYSTEM VOLTAGE	12 x 38.60 x 1.12	= 518.78V

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

- KEY NOTES:**
- SOLID BARE G.E.C (FREE-AIR) MOUNTED UNDER ARRAY
 - PER NEC ARTICLE 690.35 INVERTER GROUND FAULT PROTECTION PROVIDED
 - ALL GROUNDS AND NEUTRALS BONDED TO EXISTING GROUNDING CONDUCTOR W/IRREVERSIBLE CRIP CONNECTOR,
 - BACKFED BREAKERS MUST BE LOCATED @ OPPOSITE END OF BUS BAR FROM MAIN BREAKER OR MAIN LUG ON GRID SIDE. WHEN A BACKFED BREAKER IS THE METHOD OF UTILITY INTERCONNECTION, BREAKER SHALL NOT READ ' LINE OR LOAD'.
 - PER CEC 250.65(C): CONDUCTOR SPLICES ONLY ALLOWED WITH COMPRESSION CONNECTORS OR EXOTHERMIC WELDING
 - ALL GROUNDS AND NEUTRALS BONDED TO EXISTING GROUNDING CONDUCTOR W/IRREVERSIBLE CRIP CONNECTOR,
 - VERIFY (E) UFER GROUND NEAR MSP. IF (E) UFER IS NOT ACCESSIBLE OR VERIFIABLE, INSTALL A NEW 5/8" Ø X 8' LONG GROUNDING ROD AND BOND SOLAR SYSTEM EQUIPMENT GROUNDING ACCORDINGLY.

All DC Connectors to modules or inverters must be of matching manufacture brand and style. Do not use 'compatible' connectors which have not been UL listed for compatibility. Performance and fire damage may result from mismatched connector usage.

2 SINGLE LINE DIAGRAM

Project Name:
Garrett Barefoot
Property address:
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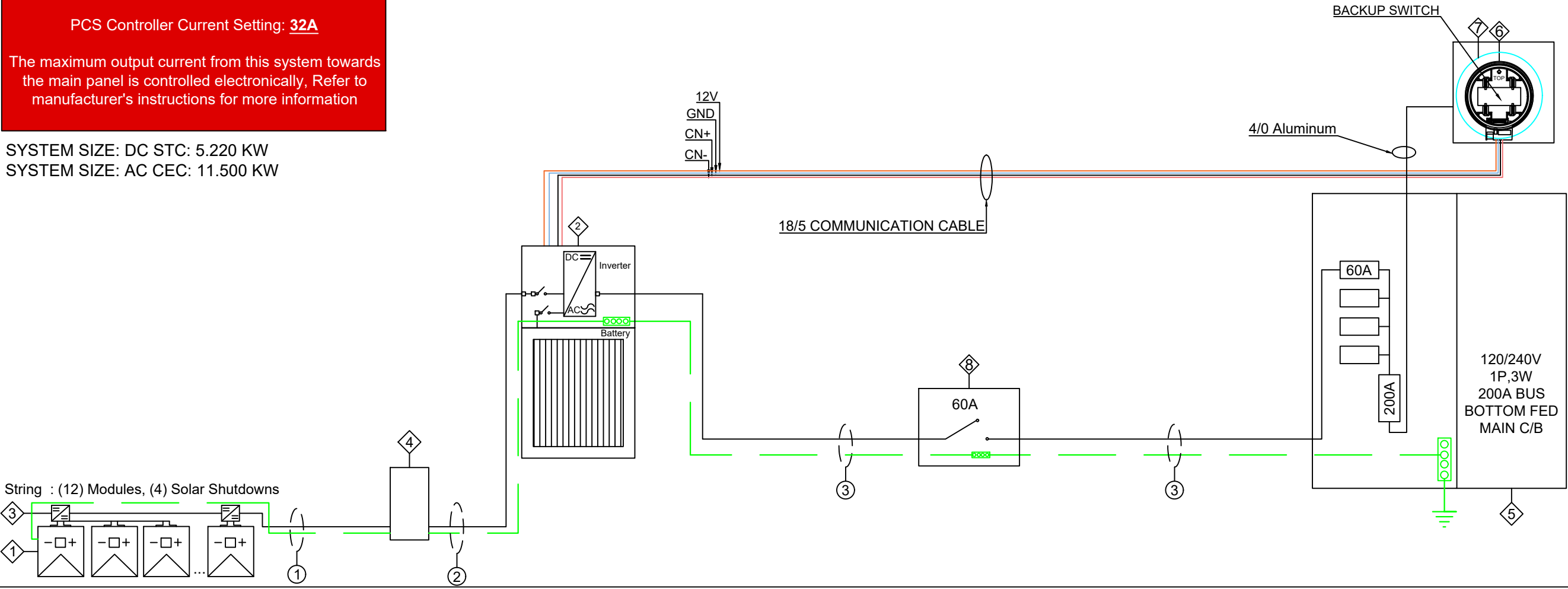


DATE: 09/05/2025

PCS Controller Current Setting: **32A**

The maximum output current from this system towards the main panel is controlled electronically, Refer to manufacturer's instructions for more information

SYSTEM SIZE: DC STC: 5.220 KW
SYSTEM SIZE: AC CEC: 11.500 KW



1

WARNING

SOURCES: UTILITY GRID AND
PV SOLAR ELECTRICAL SYSTEM

2

PHOTOVOLTAIC AC DISCONNECT

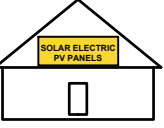
RATED OUTPUT CURRENT: **60A**

NOMINAL OPERATING VOLTAGE: **240V**

3

**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



4

**WARNING: PHOTOVOLTAIC
POWER SOURCE**

5

PV SOLAR BREAKER

DO NOT RELOCATE
THIS OVERCURRENT
DEVICE

6

WARNING

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

7

WARNING!

INVERTER OUTPUT CONNECTION. DO NOT
RELOCATE THIS OVERCURRENT DEVICE

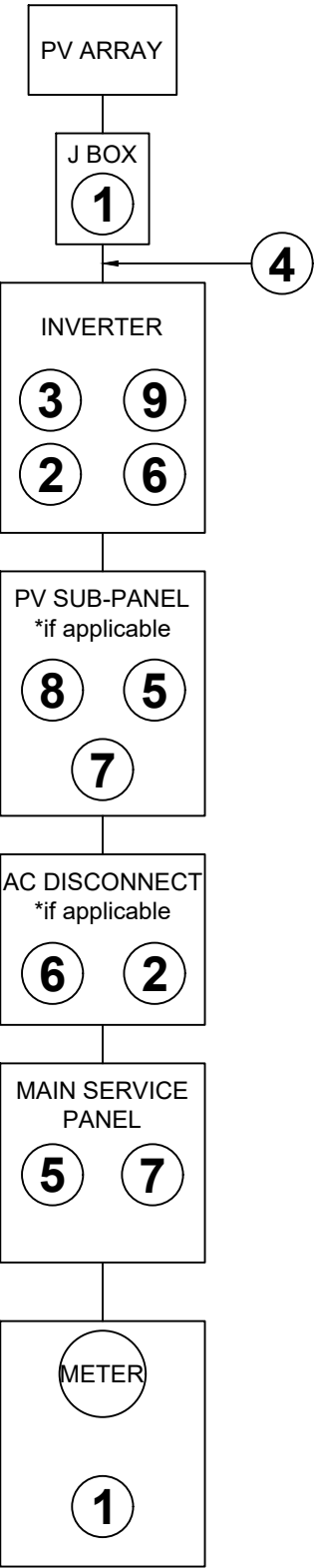
8

**PV LOAD CENTER SIZED FOR PV
BREAKERS ONLY OR RENDERED UNABLE
TO ACCEPT ANY ADDITIONAL LOADS.**

9

MAXIMUM VOLTAGE: V

MAXIMUM CIRCUIT CURRENT:
MAX RATED OUTPUT CURRENT OF
THE CHARGE CONTROLLER OR
DC-TO-DC CONVERTER
(IF INSTALLED): A



MARKINGS, LABELS AND WIRING SIGNS

A. Purpose: Provide emergency responders with appropriate warning and guidance with respect to isolating solar electric system.
This can facilitate identifying energized electrical lines that connect solar panels to the inverter, as these should not be cut when venting for smoke removal

B. Main Service Disconnect.

1. Residential buildings - The marking main be placed within the main service disconnect. The marking shall be placed outside cover if the main service disconnect is operable with the service panel closed.

2. Commercial buildings - Tha marking shall be placed adjacent to the main service disconnect clearly visible from the location where the level is operated

3. Markings: Verbiage, Format and Type of Material.

a. Verbiage: CAUTION: SOLAR ELECTRIC SYSTEM CONNECTED

b. Format: White lettering on a red background. Minimum 3/8 inches letter height. All letters shall be capitalized. Arial or similar font, non bold.

c. Material: Reflective, weather resistant material suitable for the environment (use UL - 969 as standard for weather rating). Durable adhesive materials meet this requirement.

C. Marking Requirements on DC conduit, raceways, enclosures, cable assemblies, DC combiners and junction boxes:

1. Markings: Verbiage, Format and Type of Material.

a. Placement : Markings shall be placed every 10 feet on all interior and exterior DC conduits, raceways, enclosures, and cable assemblies, at turns, above and for below penetrations, all DC combiners and junction boxes

b. Verbiage: CAUTION: SOLAR CIRCUIT Note: The format and type of material shall adhere to "V. V-3b, c" of this requirement.

c. Inverters are not required to have caution markings

1. Marking is required on all interior and exterior DC conduit raceways, enclosures, cable assemblies, and junction boxes, combiner boxes and disconnects.

2. The materials used for marking shall be reflective, weather resistant material suitable for the environment.

Minimum 3/8 "letter height; all upper case letters Arial or similar font; Red background with white lettering.

3. Marking shall contain the words: **WARNING : PHOTOVOLTAIC POWER SOURCE.**

4. Marking shall be placed adjacent to the main service disconnect in a location clearly visible from the location where the disconnect is operated

3 **SIGNAGE**

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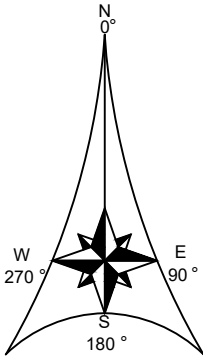
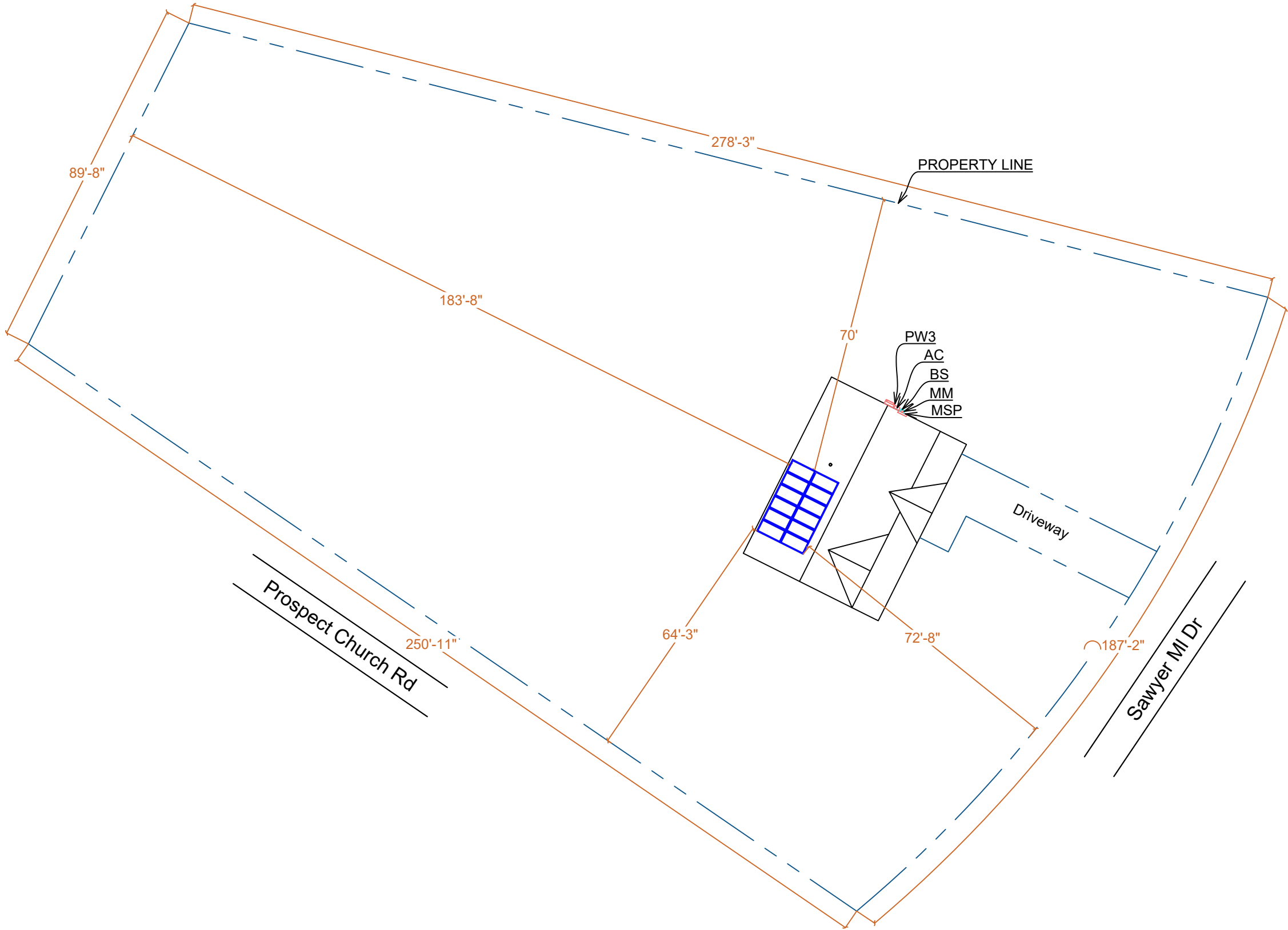


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SCALE: 1/32" = 1'-0"

4

SITE PLAN

Project Name:

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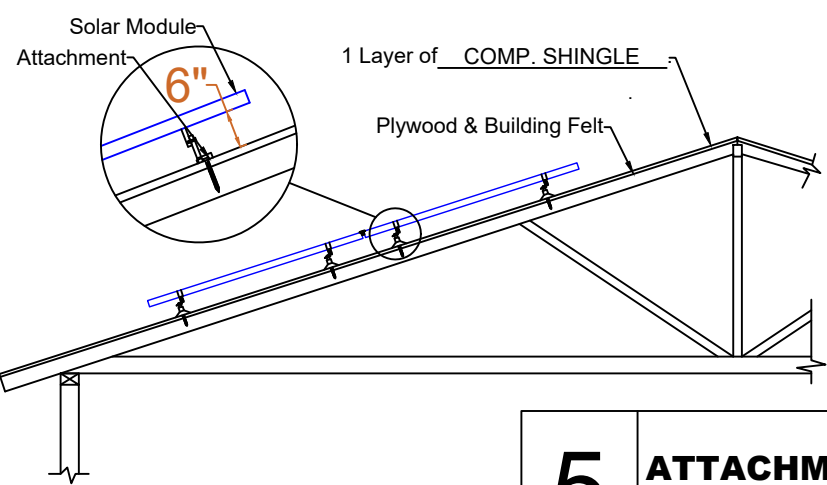
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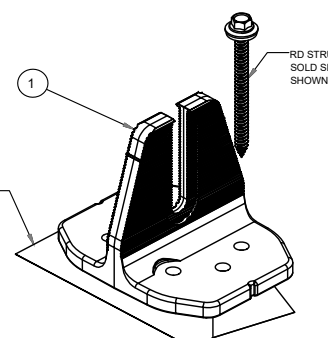
MODULE WEIGHT (lbs)	50.01
# OF MODULES	12
TOTAL MODULE WEIGHT (lbs)	600.12
RACK WEIGHT (lbs)	120.02
SOLAR SHUTDOWNS WEIGHT (lbs)	3.08
TOTAL SYSTEM WEIGHT (lbs)	723.22
# OF STANDOFFS	26
MAX SPAN BETWEEN STANDOFFS (in)	48
LOADING PER STANDOFF (lbs)	27.81
TOTAL AREA (sq.ft.)	252.24
LOADING (PSF)	2.86

1. Ironridge XR-10 Racking System
2. Ironridge Halo Ultragrip Attachment
3. Roof attachment hardware to be mounted to existing structure with 48" O.C.rail spans less.
4. Roof sheathed with 1/2" plywood and upper surface is faced with felt paper. Finished roof surface is One layer of COMP. SHINGLE .



		ATTACHMENT RAIL TRUSS
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QUICKMOUNT® HALO ULTRAGRIP

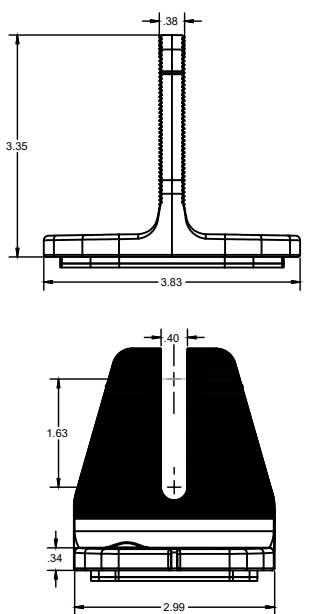


RD STRUCTURAL SCREW PN RD-1430-01-M1
SOLD SEPARATELY
SHOWN FOR REFERENCE

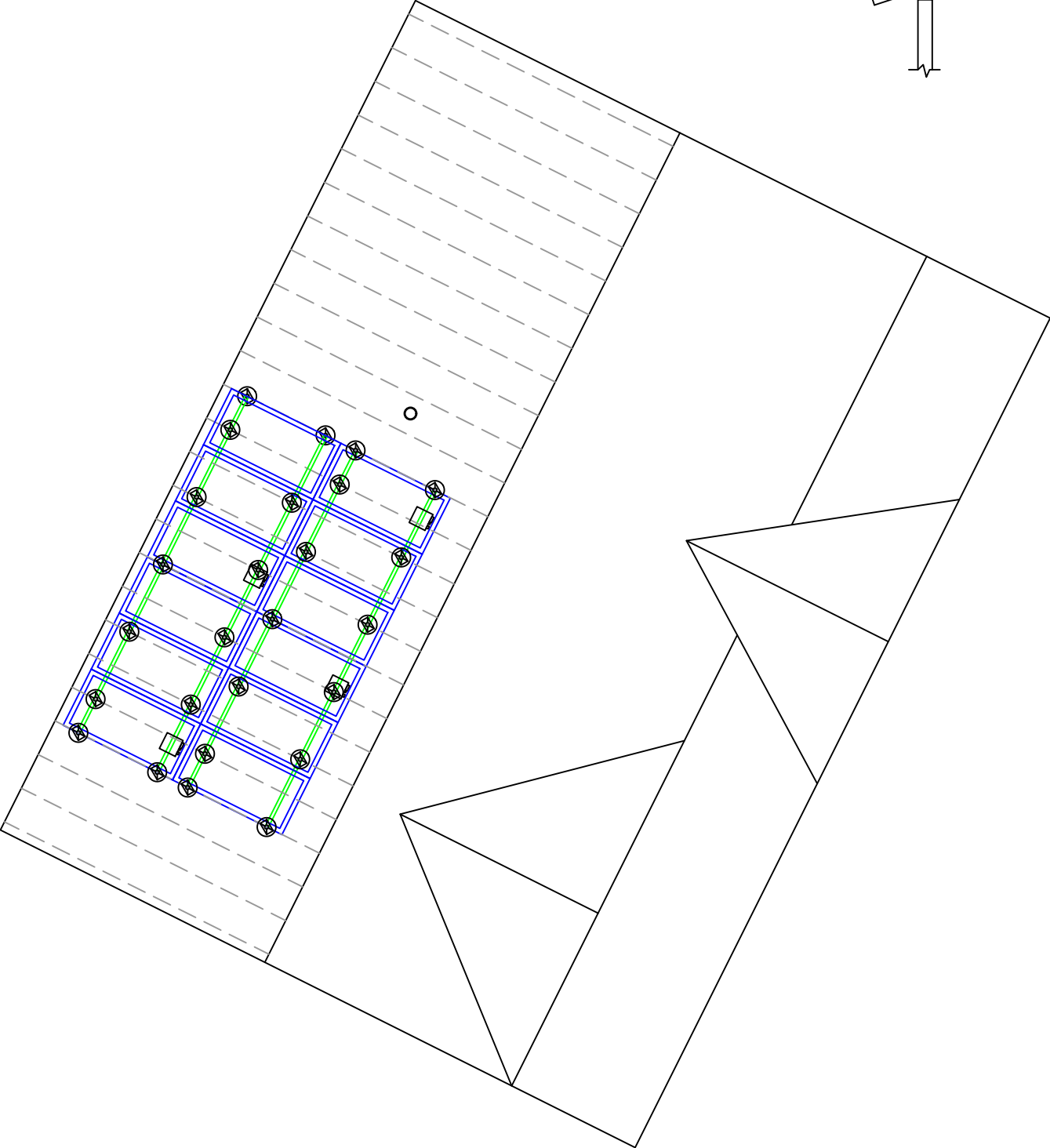
ITEM NO	DESCRIPTION	QTY IN KIT
1	QM Halo UltraGrip(Mill or Black)	1

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

Release Liner
shown for reference



Property	Value
Material	3000 Series Aluminium
Finish	Mill or Black



5 ATTACHMENT LAYOUT

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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 up to 11.5 kW AC of continuous power per unit. It has the ability to start heavy loads rated up to 185 LRA, meaning a single unit can support the power needs of most homes. Powerwall 3 Expansions make it easier and more affordable to scale up customers' systems to meet their current or future needs. Powerwall 3 is designed for fast and efficient installations, modular system expansion, and simple connection to any electrical service.



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			
	Nominal Battery Energy	13.5 kWh AC ¹			
	Nominal Output Power (AC)	5.8 kW	7.6 kW	10 kW	11.5 kW
	Maximum Apparent Power	5,800 VA	7,600 VA	10,000 VA	11,500 VA
	Maximum Continuous Current	24 A	31.7 A	41.7 A	48 A
	Overcurrent Protection Device ²	30 A	40 A	60 A	60 A
	Configurable Maximum Continuous Discharge Power Off-Grid (PV Only, -20°C to 25°C)	15.4 kW ³			
	Maximum Continuous Charge Current / Power (Powerwall 3 only)	20.8 A AC / 5 kW			
	Maximum Continuous Charge Current / Power (Powerwall 3 with up to (3) Expansion units)	33.3 A AC / 8 kW			
	Output Power Factor Rating	0 - 1 (Grid Code configurable)			
	Maximum Output Fault Current (1 s)	160 A			
	Maximum Short-Circuit Current Rating	10 kA			
	Load Start Capability	185 LRA			
	Solar to Battery to Home/Grid Efficiency	89% ^{1,4}			
	Solar to Home/Grid Efficiency	97.5% ⁵			
Compliance Information	Power Scalability	Up to 4 Powerwall 3 units supported			
	Energy Scalability	Up to 3 Expansion units (for a maximum total of 7 units)			
	Supported Islanding Devices	Gateway 3, Backup Switch, Backup Gateway 2			
	Connectivity	Wi-Fi (2.4 and 5 GHz), Ethernet, Cellular (LTE/4G ⁶)			
	Hardware Interface	Dry contact relay, Rapid Shutdown (RSD) certified switch and 2-pin connector, RS-485 for meters			
	AC Metering	Revenue Grade (+/- 0.5%, ANSI C12.20)			
	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			

¹Values provided for 25°C (77°F), at beginning of life. 3.3 kW charge/discharge power.
²See [Powerwall 3 Installation Manual](#) for fuse requirements if using fuse for overcurrent protection.
³If enabling the 15.4 kW off-grid maximum continuous discharge power, Powerwall 3 must be installed with an 80 A breaker and appropriately sized conductors.
⁴Typical solar shifting use case.
⁵Tested using CEO weighted efficiency methodology.
⁶The customer is expected to provide Internet connectivity for Powerwall 3; cellular should not be used as the primary mode of connectivity. Cellular connectivity subject to network operator service coverage and signal strength.

Powerwall 3 Technical Specifications

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	60 — 480 V DC
	MPPTs	6
	Maximum Current per MPPT (I _{mp})	13 A ⁷
	Maximum Short Circuit Current per MPPT (I _{sc})	15 A ⁷

⁷Where 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_{sc} / 30 A I_{sc}.

Environmental Specifications	Operating Temperature	-20°C to 50°C (-4°F to 122°F) ⁸
	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	IP67 (Battery & Power Electronics) IP55 (Wiring Compartment)

Pollution Rating PD3
Operating Noise @ 1 m
< 50 db(A) typical
< 62 db(A) maximum

⁸Performance may be de-rated at operating temperatures above 40°C (104°F).

Compliance Information	Certifications	UL 1741, UL 9540, UL 9540A, UL 3741, UL 1741 PCS, UL 1741 SA, UL 1741 SB, UL 1973, UL 1699B, UL 1998, CSA C22.2 No. 0.8, CSA C22.2 No. 107.1, CSA C22.2 No. 330, CSA 22.3 No. 9, IEEE 1547, IEEE 1547A, IEEE 1547.1, CA Rule No.21
	Grid Connection	United States and Canada
	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

6POWERWALL 3
DATA SHEET

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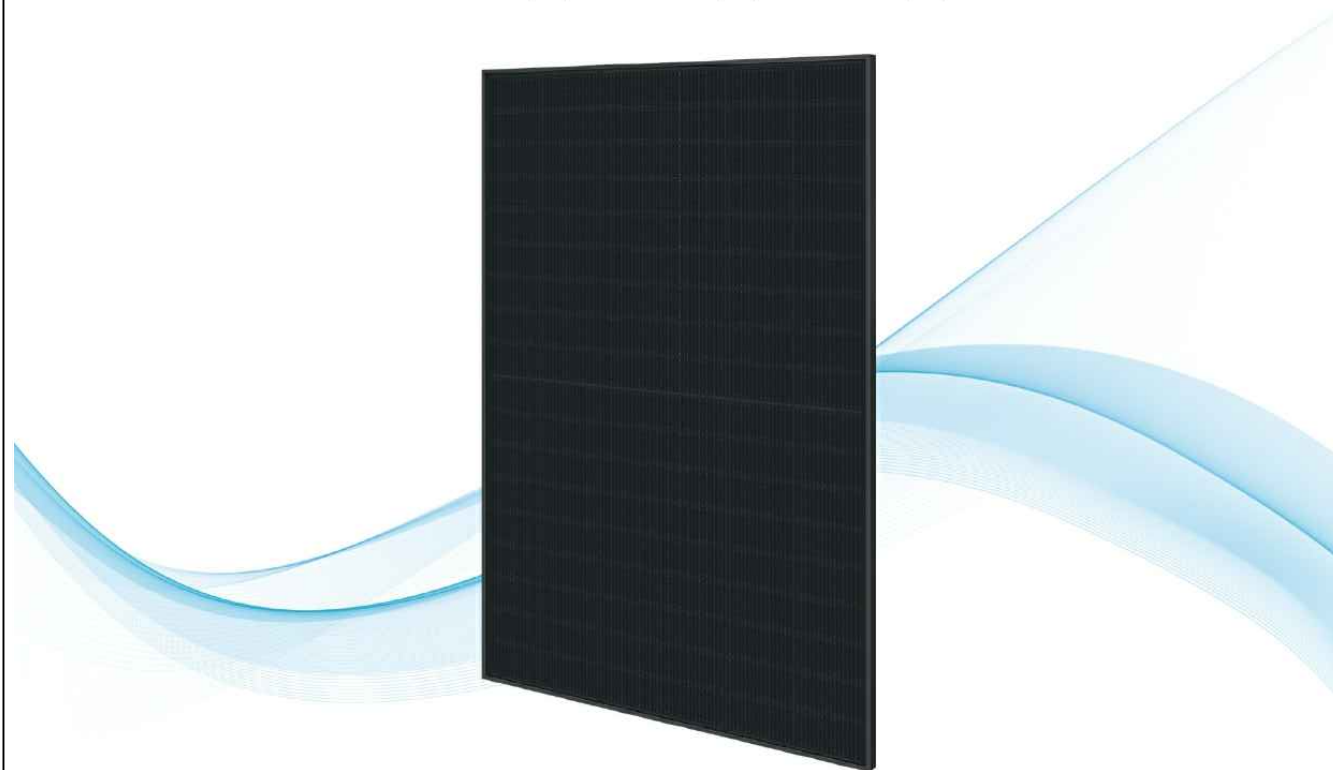


HD HYUNDAI SOLAR MODULE

NF(BK) Series

Premium N-Type TOPCon Module

HiN-T430NF(BK) | HiN-T435NF(BK) | HiN-T440NF(BK)



22.53%
High Efficiency



High-End
TOPCon
Technology



Higher
Bifaciality



Long-Term
Reliability



Compatible
with Carport
Applications



For Residential
(Full Black Design)

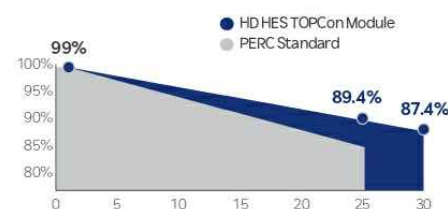
HD Hyundai's Warranty Provisions

25
YEARS

- 25-Year Product Warranty
- Materials and workmanship

30
YEARS

- 30-Year Performance Warranty
- First year degradation: 1%
- Linear warranty after initial year: with 0.4% annual degradation, 87.4% is guaranteed up to 30 years



*Refer to HD HES standard warranty for details.

Certification



- ISO 9001 : Quality management systems
- ISO 14001 : Environmental management systems
- ISO 45001 : Occupational health and safety management systems
- UL 61730 : Photovoltaic (PV) module safety qualification (CSA)
- IEC 61701 : Salt mist corrosion testing
- IEC 62716 : Ammonia corrosion testing
- IEC 62804 : Potential Induced Degradation (PID) testing
- IEC 60068-2-68 : Sand and dust testing for environmental durability

Electrical Characteristics

HiN-TxxxNF(BK)		HiN-T430NF(BK)		HiN-T435NF(BK)		HiN-T440NF(BK)	
Item	Unit	BNPI		BNPI		BNPI	
Nominal output (Pmax)	W	430	476	435	482	440	488
Open circuit voltage (Voc)	V	38.4	38.4	38.6	38.6	38.8	38.8
Short circuit current (Isc)	A	14.25	15.79	14.32	15.87	14.39	15.94
Voltage at Pmax (Vmpp)	V	31.9	31.9	32.1	32.1	32.3	32.3
Current at Pmax (Impp)	A	13.48	14.94	13.56	15.01	13.63	15.10
Module efficiency	%	22.02	24.40	22.28	24.68	22.53	25.00
Power Class Sorting	W	0 ~ +5					
Temperature coefficient of Pmax	%/K	-0.30					
Temperature coefficient of Voc	%/K	-0.25					
Temperature coefficient of Isc	%/K	0.046					
Bifaciality	%	80%±10%					

*STC : Irradiance 1,000 W/m², cell temperature 25°C, AM=1.5 / Test uncertainty for Pmax ±3%; Voc ±3%; Isc ±3%

**The electrical properties of BNPI are measured under the irradiance corresponding to 1000 W/m² on the module front and 135 W/m² on the module rear.

Additional Power Gain from rear side					
Pmpp gain	Pmpp[W]	Vmpp[V]	Impp[A]	Voc[V]	Isc[A]
5%	458	32.30	14.18	38.80	14.97
15%	493	32.30	15.27	38.80	16.12
25%	528	32.40	16.36	38.90	17.27

*Electrical characteristics with different rear power gain (reference to 440W)

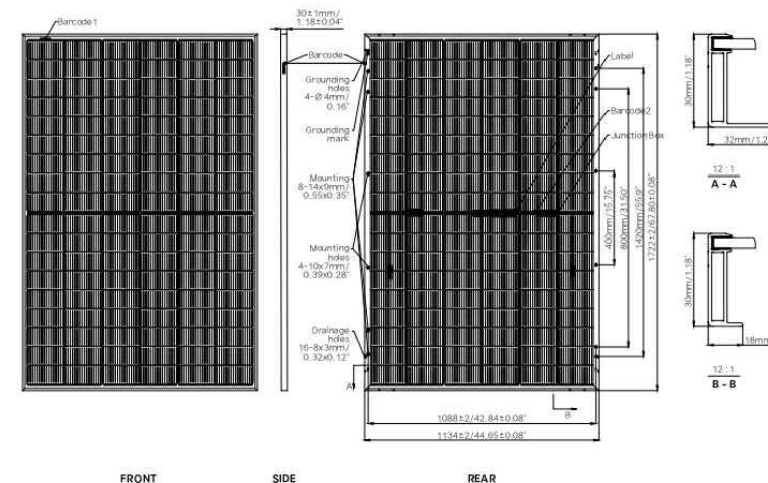
Mechanical Characteristics

Dimensions	1,722mm (L) x 1,134mm (W) x 30mm (H) (67.8in x 44.6in x 1.2in)
Weight	24.5 kg (50.01lbs)
Solar Cells	N-Type TOPCon, 108 (6x18) monocrystalline 16BB half-cut bifacial cells
Output Cables	Cable : (+)1,200mm(47.2in), (-)1,200mm(47.2in) / Customized length available Connector : Staubli MC 4 genuine Connector / Compatible, IP68
Junction Box	3-part, 3 bypass diodes, IP68 rated
Construction	Front : 2.0mm(0.08in) semi-tempered solar glass with high transmittance and anti-reflective coating Rear : 2.0mm(0.08in) semi-tempered solar glass
Frame	Anodized aluminum alloy

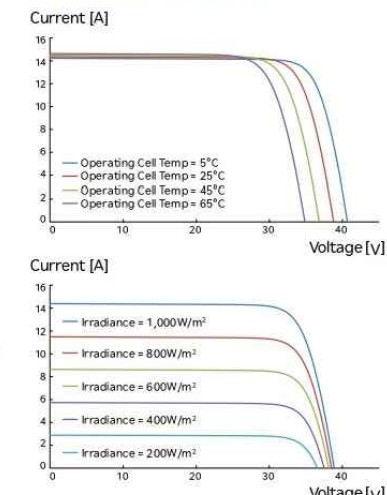
Shipping Configurations

Packing Direction	Vertical	Packing pallet weight (kg)	912
Container Size (HC)	40'	Modules Per Pallet (pcs)	36
Pallets Per Container	26	Modules Per Container (pcs)	936

Module Diagram (unit : mm)



I-V Curves (HiN-T440NF(BK))



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MODULE DATA SHEET

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HD Hyundai Energy Solutions reserves the right to update or modify the specifications and features listed in this datasheet without prior notice. Always check the latest version of the datasheet for accurate information. Before using the product, please refer to the Installation and Operation Manual and Warranty. We retain the right of final interpretation.



DATE: 09/05/2025



Datasheet

Flush Mount System



Built for solar's toughest roofs.

IronRidge builds the strongest mounting system for pitched roofs 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 25-year warranty.



Strength Tested

All components evaluated for superior structural performance.



Class A Fire Rating

Certified to maintain the fire resistance rating of the existing roof.



UL 2703 Listed System

Entire system and components meet newest effective UL 2703 standard.



PE Certified

Pre-stamped engineering letters available in most states.



Design Assistant

Online software makes it simple to create, share, and price projects.



25-Year Warranty

Products guaranteed to be free of impairing defects.

Datasheet

XR Rails ☺

XR10 Rail



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

- 6' spanning capability
- Moderate load capability
- Clear and black finish

XR100 Rail



The ultimate residential solar mounting rail.

- 8' spanning capability
- Heavy load capability
- Clear and black finish

XR1000 Rail



A heavyweight mounting rail for commercial projects.

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

Bonded Splices



All rails use internal splices for seamless connections.

- Self-drilling screws
- Varying versions for rails
- Forms secure bonding

Clamps & Grounding ☺

UFOs



Universal Fastening Objects bond modules to rails.

- Fully assembled & lubed
- Single, universal size
- Clear and black finish

Stopper Sleeves



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

- Bonds modules to rails
- Sized to match modules
- Clear and black finish

CAMO



Bond modules to rails while staying completely hidden.

- Universal end-cam clamp
- Tool-less installation
- Fully assembled

Grounding Lugs



Connect arrays to equipment ground.

- Low profile
- Single tool installation
- Mounts in any direction

Attachments ☺

FlashFoot2



Flash and mount XR Rails with superior waterproofing.

- Twist-on Cap eases install
- Wind-driven rain tested
- Mill and black finish

Conduit Mount



Flash and mount conduit, strut, or junction boxes.

- Twist-on Cap eases install
- Wind-driven rain tested
- Secures 3/4" or 1" conduit

Slotted L-Feet



Drop-in design for rapid rail attachment.

- Secure rail connections
- Slot for vertical adjusting
- Clear and black finish

Bonding Hardware



Bond and attach XR Rails to roof attachments.

- T & Square Bolt options
- Nut uses 7/16" socket
- Assembled and lubricated

Resources



Design Assistant

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

Go to IronRidge.com/design



NABCEP Certified Training

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

Go to IronRidge.com/training

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RACKING DATA SHEET

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DATE: 09/05/2025



Tech Brief

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®.



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).

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.



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.

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

Adaptive, Rafter-Friendly Installation

Tech Brief



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 & 2703A

Systems conform to UL 2703 and HUG® also conforms to UL 2703A. See Flush Mount Manual for more info.

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ATTACHMENT DATA SHEET

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Solar Shutdown Device Technical Specifications

The Solar Shutdown Device is a Mid-Circuit Interrupter (MCI) and is integral to the rapid shutdown (RSD) function required for rooftop PV systems in accordance with Article 690 of the NEC. When paired with Powerwall 3, solar array shutdown is initiated by an External System Shutdown Switch or the On/Off Enable switch located on Powerwall 3. Systems not subject to rapid shutdown requirements must still install one or more MCIs for functional purposes; see the Powerwall 3 installation manual for details.

Electrical Specifications	Model	MCI-1	MCI-2	MCI-2 High Current
	Nominal Input DC Current Rating (I_{MP})	13 A	13 A	15 A
	Maximum Input Short Circuit Current (I_{SC})	19 A	17 A	19 A
	Maximum System Voltage	600 V DC	1000 V DC ¹⁴	1000 V DC ¹⁴
	Maximum Disconnect Voltage ¹⁵	600 V DC	165 V DC	165 V DC
¹⁴ Maximum System Voltage is limited by Powerwall to 600 V DC.				
¹⁵ Maximum Disconnect Voltage is the maximum voltage allowed across each MCI in the open position (Rapid Shutdown Initiated). An individual MCI-2 has a voltage rating of 165V but in combination (connected in the same string) their voltage ratings are additive.				
RSD Module Performance	Maximum Number of Devices per String	5		
	Control	Power Line Excitation		
	Passive State	Normally Open		
	Maximum Power Consumption	7 W		
	Warranty	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		
Mechanical Specifications	Electrical Connections	MC4 Connector		
	Housing	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		See UL 3741 Application Addendum		

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MCI DATA SHEET

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Wiring Solutions Plus

DATE: 09/05/2025



Keep Solar Wires Nested & Protected

JayBox® is an ever-adaptable junction box, designed to securely enclose wires on nearly any solar project—with ample space to shelter up to 4 module strings.

The box is UL-listed, NEMA-3R-rated, and supports up to 1500-volt systems. It is made of a NORYL™ resin, known for its long-lasting UV-resistance and impact strength.

JayBox® is available in two options: Roof Mount and Rail Mount. When installed on the roof deck, its low profile allows it to safely fit under the wings of the module array.



Multiple Configuration Options

Threaded standoffs give you the freedom to mount electrical components—including DIN rail, grounding bars, and terminal blocks—in any orientation. Easy-to-drill guides also come on three sides of the box for running conduit into the enclosure.



10-Year Warranty
Product guaranteed free of impairing defects.

Tech Brief

QuickMount® JayBox®



Two Mounting Types: Roof & Rail

The roof-mounted JayBox® comes with two deck screws and a simple flashing that only goes under one shingle course—without the need to cut shingles or remove nails. The rail-mounted JayBox® comes with two interlocking hangers that attach to the rail using our Microinverter Bonding Hardware.

This component is part of the QuickMount® product line.

Durable NORYL™ Resin

JayBox® is fabricated from SABIC's NORYL™ resin, giving it greater strength and resistance to UV radiation. It is well known for its lasting stability and performance in extreme environments.

SABIC and brands marked with ™ are trademarks of SABIC or its subsidiaries or affiliates.

Abundant Feature Set

Trustworthy Flashing & Waterproofing

The JayBox® Roof Mount utilizes QuickMount's Elevated Water Seal Technology®, coming with a raised flashing that integrates with an EPDM sealing gasket on the underside of the box to fully protect roof penetrations. This waterproof assembly has passed the TAS-100 wind-driven rain test.

The flashing only installs in one direction, with an “upslope” marking to ensure proper placement. Simply align the box with the flashing and secure it to the roof with the supplied deck screws. No need to cut shingles or remove nails.

Hassle-Free Lid & Captive Hardware

JayBox® has a detachable, hinged lid to reduce interference and deliver maximum ease—staying open and out of the way even on up to 70° roof slopes.

Once the lid is closed, the single, pre-installed, captive screw and nut keeps it snug and secure. Because this hardware is embedded into the lid, there is no need to worry about it getting lost on the roof.

Drilling Guides & Draining Weep Holes

The enclosure includes easy-to-drill guide marks on three sides of the box. In addition, it has guides on the interior when drilling through the bottom for attic conduit runs. Weep holes also prevent any condensation from accumulating inside the box.

Certification & Performance

Technical Specifications	
Maximum System Voltage	1500V
Max Current (Isc)	100A
Max Current per Circuit (String)	30A
Max Number of Input Circuits	4
Ambient Operating Conditions	-40°C to 75°C
Enclosure Rating (NEMA)	Type 3R - Rainproof
Allowable Wire Inputs	12 - 10 AWG
Allowable Wire Outputs	12 - 8 AWG
Equipment Grounding Conductor	10 - 6 AWG



Tech Brief



Water Seal Ratings

Passed the UL 441 Section 27 “Rain Test” and TAS 100-95 “Wind-Driven Rain Test”.



UL Electrical Rating

Tested and evaluated to conform to UL 1741 by Intertek Group plc.



Durable NORYL™ Resin

Made of a high-strength Noryl resin, with stability that surpasses polycarbonate.

11 JUNCTION BOX DATA SHEET

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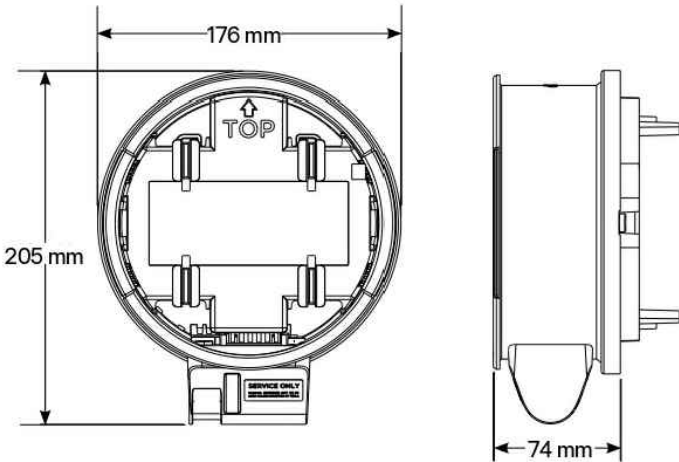
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Backup Switch

The Tesla Backup Switch controls connection to the grid in a Powerwall system, and can be easily installed behind the utility meter or in a standalone meter panel downstream of the utility meter.

The Backup Switch automatically detects grid outages, providing a seamless transition to backup power. It communicates directly with Powerwall, allowing home energy usage monitoring from any mobile device with the Tesla app.

Performance Specifications	Model Number	1624171-xx-y
	Continuous Load Rating	200 A, 120/240 V split phase
	Maximum Supply Short Circuit Current	22 kA with breaker ¹⁷
	Communication	CAN
	AC Meter	+/- 0.5%
	Expected Service Life	21 years
	Warranty	10 years
¹⁷ Breaker maximum supply short circuit current rating must be equal to or greater than the available fault current.		
Environmental Specifications	Operating Temperature	−40°C to 50°C (−40°F to 122°F)
	Storage Temperature	−40°C to 85°C (−40°F to 185°F)
	Enclosure Rating	NEMA 3R
	Pollution Rating	PD3
Compliance Information	Safety Standards	USA: UL 414, UL 414 SB, UL 2735, UL 916, CA Prop 65
	Emissions	FCC Part 15, Class B, ICES 003
Mechanical Specifications	Dimensions	176 x 205 x 74 mm (6.9 x 8.1 x 2.9 in)
	Weight	2.8 lb
	Meter and Socket Compatibility	ANSI Type 2S, ringless or ring type
	External Service Interface	Contactor manual override ¹⁸ Reset button
	Conduit Compatibility	1/2-inch NPT
¹⁸ Manually overrides the contactor position during a service event.		



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BACKUP SWITCH DATA SHEET

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