

## SCOPE OF WORK

TO INSTALL A SOLAR PHOTOVOLTAIC (PV) SYSTEM AT THE BUSHEY RESIDENCE, LOCATED AT 271 HORSE WHISPERER LN, LILLINGTON, NORTH CAROLINA. THE POWER GENERATED BY THE PV SYSTEM WILL BE INTERCONNECTED WITH THE UTILITY GRID THROUGH THE EXISTING ELECTRICAL SERVICE EQUIPMENT. THE PV SYSTEM DOES NOT INCLUDE STORAGE BATTERIES.

## SYSTEM RATING

7.900 kW DC STC  
6.500 kW AC

## EQUIPMENT SUMMARY

(20) MISSION SOLAR MSE395SX9R (395W) PV MODULES  
(20) ENPHASE IQ8M-72-M-US [240V] PV INVERTERS  
(140) (10 X 14') LINEAR FEET PEGASUS RAIL  
(14) (02 X 7') LINEAR FEET PEGASUS RAIL

## SHEET INDEX

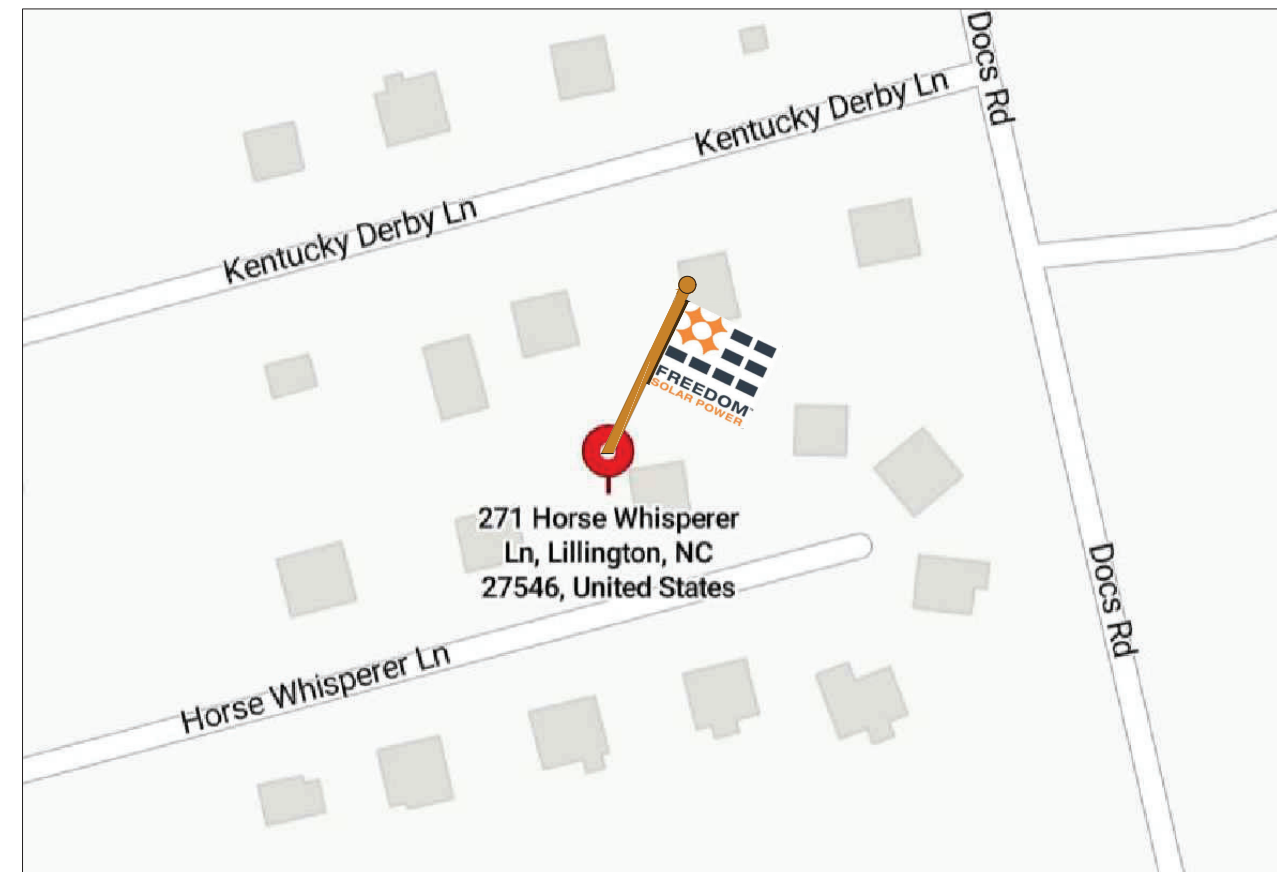
PV-0 COVER  
PV-1 SITE MAP AND PV LAYOUT  
PV1A RACKING PLAN  
PV-2 STRING MAP AND MONITORING LAYOUT  
PV-3 ELECTRICAL DIAGRAM  
PV-4 EQ WALL & MOUNTING DETAIL  
PV-5 SYSTEM LABELING DETAIL  
PV-6 SITE DIRECTORY PLACARD  
PV-7 SAFETY PLAN

## GOVERNING CODES

2017 NATIONAL ELECTRICAL CODE  
2018 INTERNATIONAL RESIDENTIAL CODE  
2018 NORTH CAROLINA STATE BUILDING CODE  
UNDERWRITERS LABORATORIES (UL) STANDARDS  
OSHA 29 CFR 1910.269



PROJECT LOCATION



VICINITY MAP

CONTRACTOR



FREEDOM SOLAR LLC  
4801 FREIDRICH LN, STE 100  
AUSTIN, TX 78744  
512-759-8313  
TECL # 28621

### REVISIONS

DESCRIPTION	DATE	REV
DESIGN PACKET	11/20/2023	

Richard Pantel



Reviewed and approved  
Richard Pantel, P.E.  
NC Lic. No. 043326

PROJECT NAME  
11/21/2023

FREDERICK J BUSHEY  
271 HORSE WHISPERER LANE  
LILLINGTON, NORTH CAROLINA,  
27546  
(757) 553-4118

SHEET NAME

COVER

SHEET SIZE

ANSI B  
11" x 17"

SHEET NUMBER

PV-0



LEAD ID: 113163

CONSTRUCTION SUMMARY

- (20) (MISSION SOLAR MSE395SX9R (395W)) SOLAR MODULES, 7.900 KW DC STC  
MODULE DIMENSIONS = 41.5" X 75.1" X 1.57"
- (20) ENPHASE IQ8M-72-M-US [240V] PV INVERTERS  
COMBINED INVERTER OUTPUT = 6.500 KW AC.
- (140) (10 X 14') LINEAR FEET PEGASUS RAIL
- (14) (02 X 7') LINEAR FEET PEGASUS RAIL
- (41) PEGASUS INSTAFLASH ROOF ATTACHMENTS

SITE DETAILS

ROOF TYPE: ASPHALT SHINGLE  
 ARRAY #1 - TILT = 34°, AZIMUTH = 166°

-WEIGHT OF ARRAY IS >3PSF  
 -MORE THAN 1-LAYER OF SHINGLE  
 -ROOF TYPE IS OTHER THAN COMP SHINGLES  
 -WIND SPEED IS GREATER THAN 140 MPH  
 IF DESIGN PACK IS NOT STAMPED, MUST INCLUDE EXCEPTION STATEMENT IN RED:

-PANEL WEIGHT EQUALS 2.5 LBS PER SQ FT,  
 LESS THAN 3 LBS PER SQ FT.

NO CUTTING AND COVERING PLUMBING VETS AT ALL,  
 PVC PIPES CAN BE RELOCATED WITH ROOF JACK

**FALL PROTECTION REQUIRED**

CONSTRUCTION NOTES

- 1.) ALL EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION INSTRUCTIONS.
- 2.) ALL OUTDOOR EQUIPMENT SHALL BE RAIN-TIGHT WITH MINIMUM NEMA 3R RATING.
- 3.) ALL LOCATIONS ARE APPROXIMATE AND REQUIRE FIELD VERIFICATION.

DUKE ENERGY  
 REVENUE METER  
 #325 521 443  
 GROUNDING ELECTRODE  
 METER/MAIN COMBO PANEL  
 SUBPANEL #2  
 ENPHASE IQ COMBINER 4C  
 PV AC DISCONNECT  
 -VISIBLE  
 -LOCKABLE  
 -LABELED  
 KNIFE BLADE DISCONNECT  
 (OUTSIDE HOUSE WALL)

PV ARRAY #1  
 (20) MODULES

SUB PANEL #1  
 (INSIDE GARAGE WALL)



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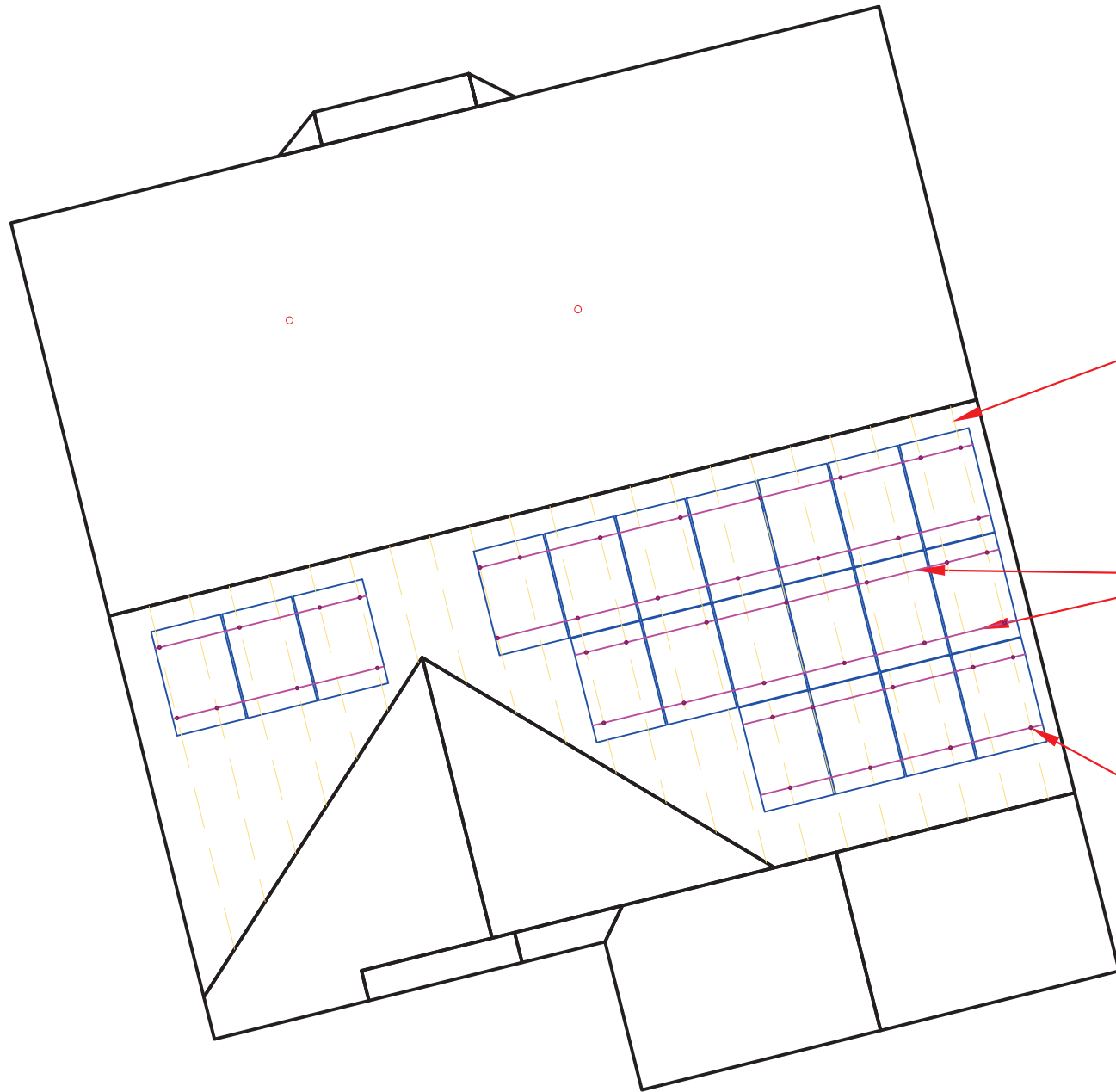
PROJECT NAME  
 FREDERICK J BUSHEY  
 271 HORSE WHISPERER LANE  
 LILLINGTON, NORTH CAROLINA,  
 27546  
 (757) 553-4118

SHEET NAME  
 SITE MAP &  
 PV LAYOUT

SHEET SIZE  
 ANSI B  
 11" x 17"

SHEET NUMBER  
 PV-1





2"X4" MANUFACTURED TRUSSES AT 24" O.C. TYP.

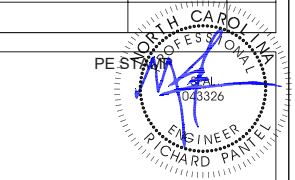
(2) PEGASUS RAIL SYSTEM REFER TO PEGASUS ENGINEERING PACKET FOR RAIL AND CLAMP LOCATIONS

PEGASUS INSTAFLASH BLACK, 5/16" X 4.0" SS LAG WITH MIN. 2.5" EMBEDMENT INTO THE TRUSSES AT MAX 48" O.C. ALONG RAILS

CONTRACTOR

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 FREEDOM SOLAR LLC  
 4801 FREDRICH LN, STE 100  
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FREDERICK J BUSHEY  
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 27546  
 (757) 553-4118

SHEET NAME

RACKING PLAN

SHEET SIZE

ANSI B  
 11" x 17"

SHEET NUMBER

PV-1A

CONSTRUCTION NOTES

- 1.) ALL EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION INSTRUCTIONS.
- 2.) ALL OUTDOOR EQUIPMENT SHALL BE RAIN-TIGHT WITH MINIMUM NEMA 3R RATING.
- 3.) ALL LOCATIONS ARE APPROXIMATE AND REQUIRE FIELD VERIFICATION.

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SUNPOWER SUPERVISOR S/N \_\_\_\_\_

CONTRACTOR



**FREEDOM<sup>™</sup>  
SOLAR POWER**

FREEDOM SOLAR LLC  
4801 FREIDRICH LN. STE 100  
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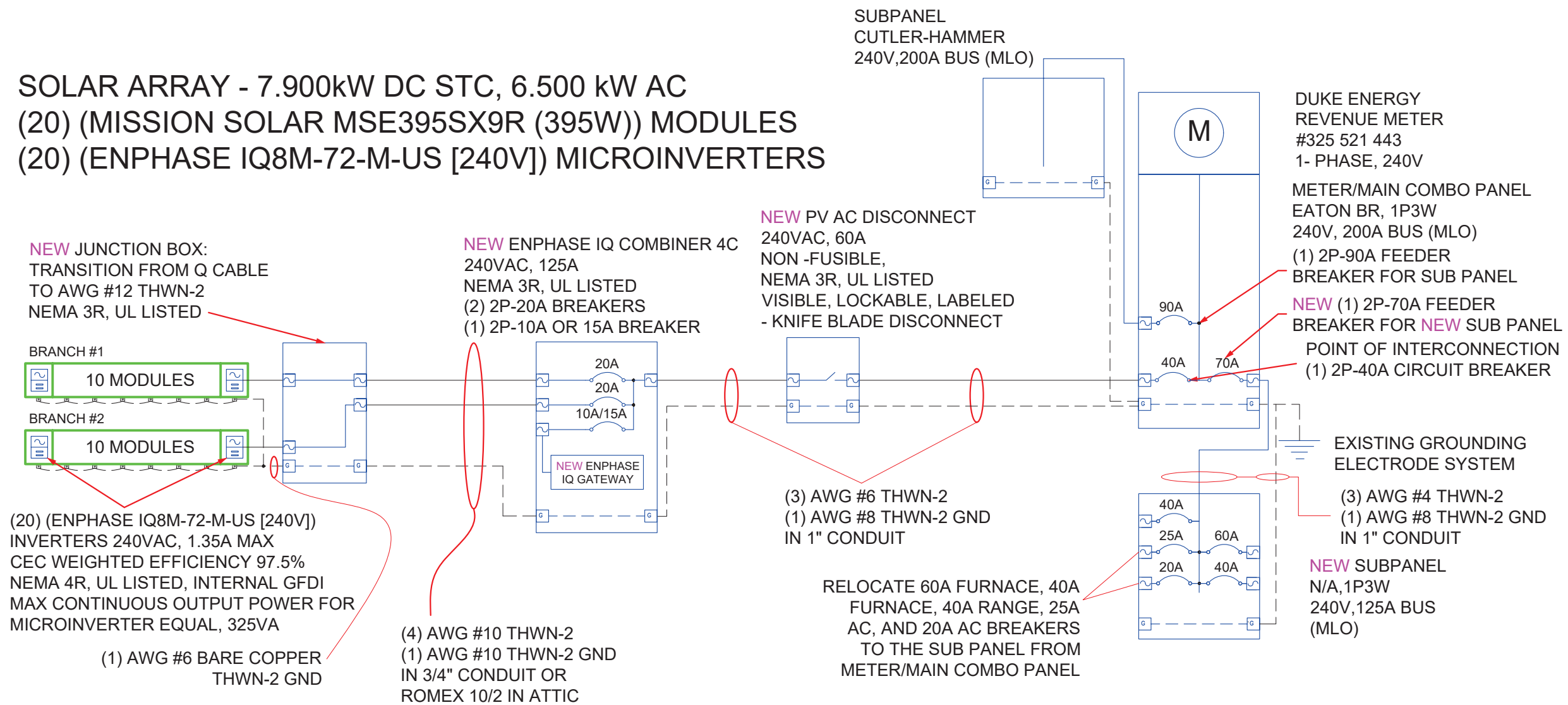
SHEET NAME  
STRING MAP &  
MONITORING  
LAYOUT

SHEET SIZE  
ANSI B  
11" x 17"

SHEET NUMBER  
PV-2



# SOLAR ARRAY - 7.900kW DC STC, 6.500 kW AC (20) (MISSION SOLAR MSE395SX9R (395W)) MODULES (20) (ENPHASE IQ8M-72-M-US [240V]) MICROINVERTERS



## ELECTRICAL NOTES

- 1.) ALL EQUIPMENT TO BE LISTED BY UL OR OTHER NRTL, AND LABELED FOR ITS APPLICATION.
- 2.) ALL CONDUCTORS SHALL BE COPPER. ALUMINUM CONDUCTORS MAY BE USED IF CORRECTLY UPSIZED FOR AMPACITY RATING PER NEC 310.12 OR 310.16. ALL CONDUCTORS SHALL BE RATED FOR 600V AND 90°C WET ENVIRONMENT UNLESS OTHERWISE NOTED.
- 3.) WORKING CLEARANCES AROUND ALL NEW AND EXISTING ELECTRICAL EQUIPMENT SHALL COMPLY WITH NEC 110.26.
- 4.) DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS. CONTRACTOR SHALL FURNISH ALL NECESSARY OUTLETS, SUPPORTS, FITTINGS AND ACCESSORIES TO FULFILL APPLICABLE CODES AND STANDARDS.
- 5.) WHERE SIZES OF JUNCTION BOXES, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, THE CONTRACTOR SHALL SIZE THEM ACCORDINGLY. SPECIFIED CONDUIT AND WIRE SIZES ARE MINIMUM REQUIREMENTS AND LARGER SIZES SHALL BE PERMITTED.
- 6.) ALL WIRE TERMINATIONS SHALL BE APPROPRIATELY LABELED AND READILY VISIBLE.
- 7.) MAXIMUM MOUNTING HEIGHT FROM GRADE TO CENTER OF METER SOCKET SHALL BE 72" FOR RESIDENTIAL SINGLE PHASE METER SOCKETS 0-320 AMPS. MINIMUM MOUNTING HEIGHT IS 30" FROM FOR AUSTIN ENERGY, AND 48" FOR ALL OTHER JURISDICTIONS
- 8.) MINIMUM HORIZONTAL CLEARANCE FROM GAS REGULATOR TO ANY ELECTRICAL ENCLOSURE IS 36", EXCEPT AUSTIN ENERGY WHICH REQUIRES 48" CLEARANCE FROM GAS TO METER SOCKET
- 9.) PV DISCONNECT SHALL BE VISIBLE, LOCKABLE AND LABELED AND THE DOOR CANNOT BE OPENED WHEN HANDLE IS IN ON POSITION
- 10.) BY DEFAULT THE MONITORING DEVICE IS SHOWN CONNECTED TO A 20-AMP BREAKER IN THE SOLAR LOAD CENTER. ALTERNATIVELY, THE MONITORING DEVICE MAY BE CONNECTED TO A 20-AMP BREAKER AT THE MAIN DISTRIBUTION PANEL.
- 11.) ALL EQUIPMENT TERMINATIONS SHALL BE RATED FOR 75 DEGREES OR GREATER
- 12.) ALL CT WIRES SHALL BE CONSIDERED CLASS 1 PER NEC ARTICLE 725, AND BE MARKED AS RATED FOR 600V. PER 725.48(A) CLASS 1 CIRCUITS SHALL BE PERMITTED TO OCCUPY THE SAME RACEWAY AS OTHER CIRCUITS PROVIDED ALL CONDUCTORS ARE INSULATED FOR THE MAXIMUM VOLTAGE OF ANY CONDUCTOR IN THE RACEWAY.
- 13.) AWG #10 COPPER CONDUCTORS ARE SPECIFIED AS THE DEFAULT WIRE REQUIRED FROM THE PV ARRAY TO THE SOLAR LOAD CENTER, HOWEVER, AWG #12 COPPER CONDUCTORS MAY BE UTILIZED IF BOTH OF THE FOLLOWING CONDITIONS ARE MET: THE LENGTH OF THE CONDUCTOR IS LESS THAN 75 FT AND THERE ARE LESS THAN 8 CURRENT-CARRYING CONDUCTORS WITHIN THE RACEWAY.

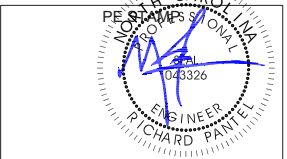
**WILL MOVE 60A FURNACE, 40A FURNACE, 40A RANGE, 20A AC, AND 25A AC BREAKERS FROM MDP TO NEW SUB.**

CALCULATIONS FOR CURRENT CARRYING CONDUCTORS	CALCULATIONS FOR OVERCURRENT DEVICES
<p>INVERTER OUTPUT WIRE AMPACITY CALCULATION [NEC 690.8(A)(3)]: 1.35A PER INVERTER (ENPHASE IQ8M-72-M-US [240V]) MAXIMUM INVERTER BRANCH CURRENT = (11)(1.35A) = 14.9A CONTINUOUS USE: #10 WIRE 75°C DERATED AMPACITY = (0.80)(35.0A) = 28.0A <b>28.0A &gt; 14.9A</b></p> <p>CONDITIONS OF USE: #10 WIRE 90°C DERATED AMPACITY = (0.91)(0.80)(40.0A) = 29.1A <b>29.1A &gt; 14.9A</b></p> <p>ENPHASE IQ COMBINER 4C OUTPUT WIRE AMPACITY CALCULATION [NEC 690.8(A)(3)]: 1.35A PER INVERTER (ENPHASE IQ8M-72-M-US [240V]) COMBINED CURRENT = (20)(1.35A) = 27.0A CONTINUOUS USE: #6 WIRE 75°C DERATED AMPACITY = (0.80)(65A) = 52.0A <b>52.0A &gt; 27.0A</b></p> <p>CONDITIONS OF USE: #6 WIRE 90°C DERATED AMPACITY = (0.91)(75A) = 68.3A <b>68.3A &gt; 27.0A</b></p>	<p>INVERTER BRANCH AC CURRENT CALCULATION [NEC 690.8(A)(3)]: 1.35A PER INVERTER (ENPHASE IQ8M-72-M-US [240V]) MAXIMUM BRANCH INVERTER CURRENT = (11)(1.35A) = 14.9A MINIMUM OCPD = (14.9A)(1.25) = 18.6A USE 2P-20A BREAKERS IN ENPHASE IQ COMBINER 4C FOR INVERTER BRANCH OCPD</p> <p>SYSTEM AC CURRENT CALCULATION [NEC 690.8(A)(3)]: 1.35A PER INVERTER (ENPHASE IQ8M-72-M-US [240V]) COMBINED CURRENT = (20)(1.35A) = 27.0A MINIMUM OCPD = (27.0A)(1.25A) = 33.8A USE 2P-40A BREAKER IN METER/MAIN COMBO PANEL FOR SYSTEM OCPD</p>

CONTRACTOR

**FREEDOM SOLAR POWER**  
FREEDOM SOLAR LLC  
4801 FREIDRICH LN, STE 100  
AUSTIN, TX 78744  
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TECL # 28621

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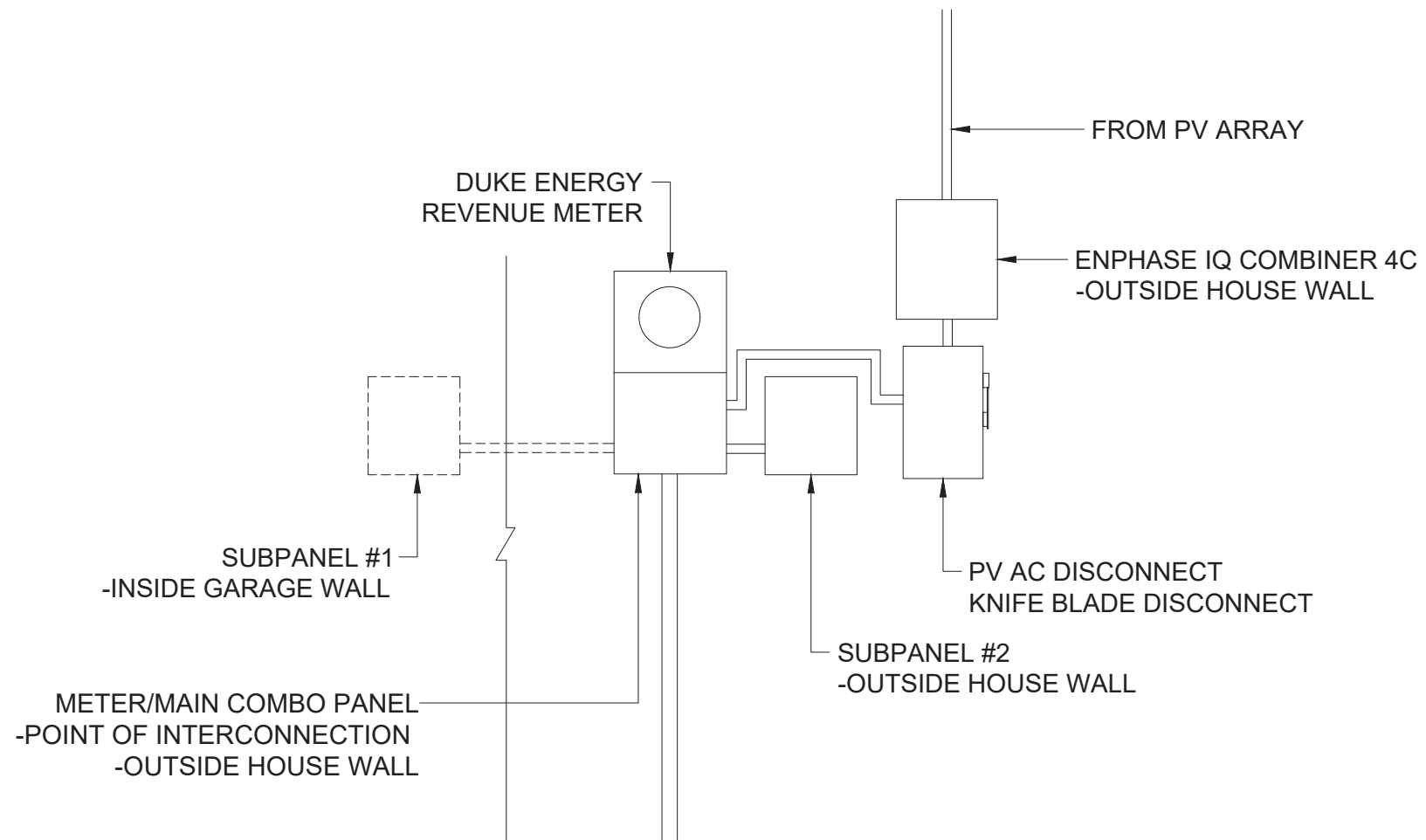
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271 HORSE WHISPERER LANE  
LILLINGTON, NORTH CAROLINA,  
27546  
(757) 553-4118

SHEET NAME  
**ELECTRICAL  
DIAGRAM**

SHEET SIZE  
**ANSI B  
11" x 17"**

SHEET NUMBER  
**PV-3**



CONTRACTOR

**FREEDOM™  
SOLAR POWER**

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AUSTIN, TX 78744  
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TECL # 28621

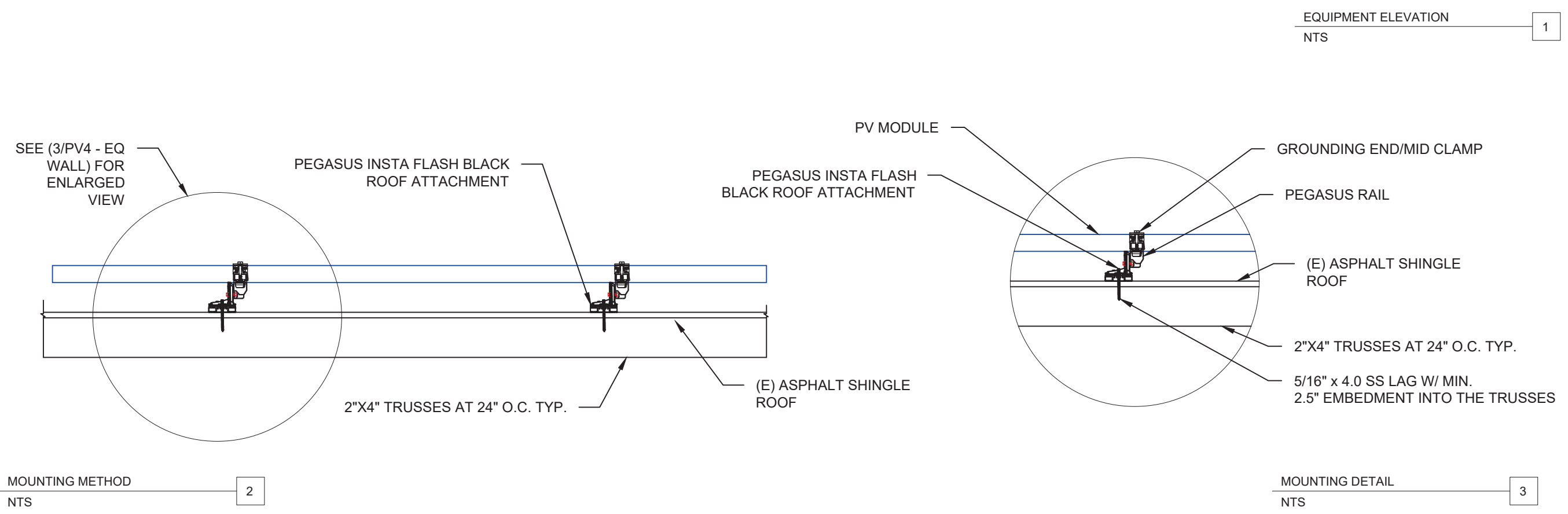
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NC Lic. No. 043326

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271 HORSE WHISPERER LANE  
LILLINGTON, NORTH CAROLINA,  
27546  
(757) 553-4118



SHEET NAME  
**EQ.WALL &  
MOUNTING DETAIL**

SHEET SIZE  
**ANSI B  
11" x 17"**

SHEET NUMBER  
**PV-4**



NOTE: NOT ALL LABELS MAY BE APPLICABLE

SIGNAGE REQUIREMENTS

- > RED BACKGROUND
- > WHITE LETTERING
- > MIN. 3/8" LETTER HEIGHT
- > ALL CAPITAL LETTERS
- > ARIAL OR SIMILAR FONT
- > REFLECTIVE, WEATHER RESISTANT MATERIAL, UL 969

**PV SYSTEM DISCONNECT**

REQ'D BY: NEC 690.13(B)  
APPLY TO:  
PV DISCONNECT

A

**WARNING**  
ELECTRIC SHOCK HAZARD.  
DO NOT TOUCH TERMINALS.  
TERMINALS ON THE LINE AND  
LOAD SIDES MAY BE  
ENERGIZED IN THE OPEN  
POSITION.

REQ'D BY: NEC 690.13(B)  
APPLY TO:  
PV DISCONNECT

B

**WARNING: PHOTOVOLTAIC  
POWER SOURCE**

REQ'D BY: NEC 690.31(G)(3)  
APPLY TO:  
RACEWAYS, CABLE TRAYS,  
OTHER WIRING METHODS, AND  
ENCLOSURES THAN CONTAIN  
PV SYSTEM DC CONDUCTORS

C

**WARNING**  
POWER SOURCE OUTPUT  
CONNECTION. DO NOT  
RELOCATE THIS  
OVERCURRENT DEVICE

REQ'D BY: NEC 705.12(B)(2)(3)(b)  
APPLY TO:  
DISTRIBUTION EQUIPMENT  
ADJACENT TO BACK-FED BREAKER

D

**2" ADDRESS NUMBERS**

REQ' BY: AHJ  
APPLY TO:  
REVENUE METER SOCKET  
(IF APPLICABLE)

E

**REVENUE METER**

REQ'D BY: AHJ  
APPLY TO:  
REVENUE METER SOCKET  
(IF APPLICABLE)

F

**MONITORING**

REQ'D BY: FREEDOM SOLAR  
APPLY TO:  
MONITORING DEVICE ENCLOSURE

G

**RAPID SHUTDOWN SWITCH  
FOR SOLAR PV SYSTEM**

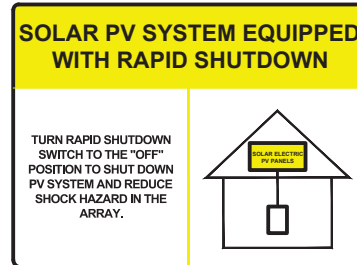
REQ'D BY: NEC 690.56(C)(2)  
APPLY TO:  
PV DISCONNECT

H

**PHOTOVOLTAIC SYSTEM  
AC DISCONNECT**  
OPERATING CURRENT: 27.0A  
OPERATING VOLTAGE: 240 VAC

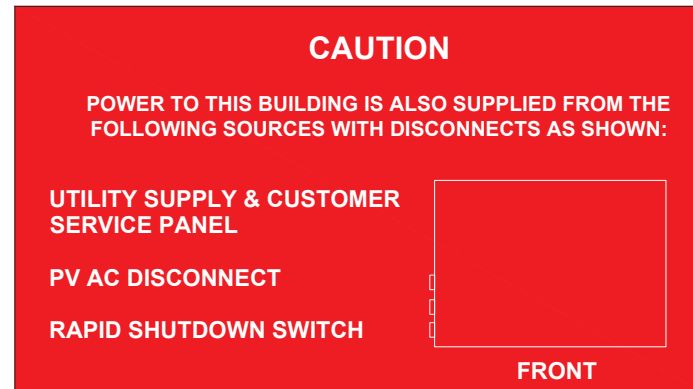
REQ'D BY: 690.56(1)(a)  
APPLY TO:  
PV DISCONNECT

I



REQ'D BY: NEC 690.56(C)(1)(a)  
UTILITY AC DISCONNECT

J



REQ'D BY: 705.10  
APPLY TO:  
MAIN DISTRIBUTION PANEL  
(\*ONLY REQUIRED IF PV SYSTEM  
DISCONNECT IS NOT GROUPED  
WITH MAIN SERVICE DISCONNECT)  
**SEE SHEET PV-6 FOR SITE  
SPECIFIC LABELS**

K

CONTRACTOR

**FREEDOM™  
SOLAR POWER**

FREEDOM SOLAR LLC  
4801 FREIDRICH LN, STE 100  
AUSTIN, TX 78744  
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LILLINGTON, NORTH CAROLINA,  
27546  
(757) 553-4118

SHEET NAME

SYSTEM LABELING  
DETAIL

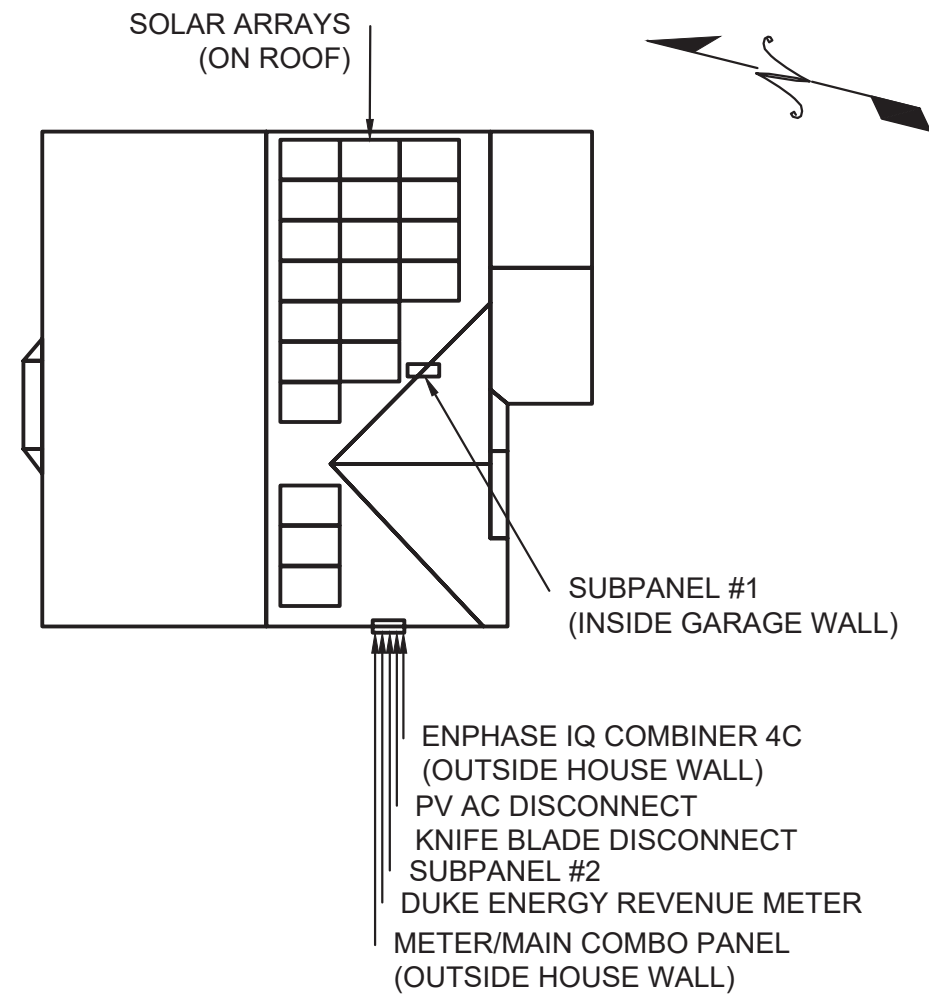
SHEET SIZE

ANSI B  
11" x 17"

SHEET NUMBER

PV-5

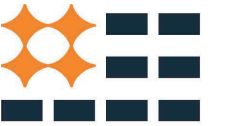
**CAUTION:**  
**MULTIPLE SOURCES OF POWER**  
**LOCATION OF EACH POWER SOURCE**  
**DISCONNECTING MEANS SHOWN BELOW**



QUESTIONS, CALL:  
 800-504-2337  
[www.freedomsolarpower.com](http://www.freedomsolarpower.com)

**FREEDOM**  
**SOLAR POWER**  
 271 HORSE WHISPERER LANE  
 PROJECT ID: 113163

CONTRACTOR

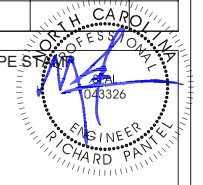


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 27546  
 (757) 553-4118

SHEET NAME

SITE  
 DIRECTORY  
 PLACARD

SHEET SIZE

ANSI B  
 11" x 17"

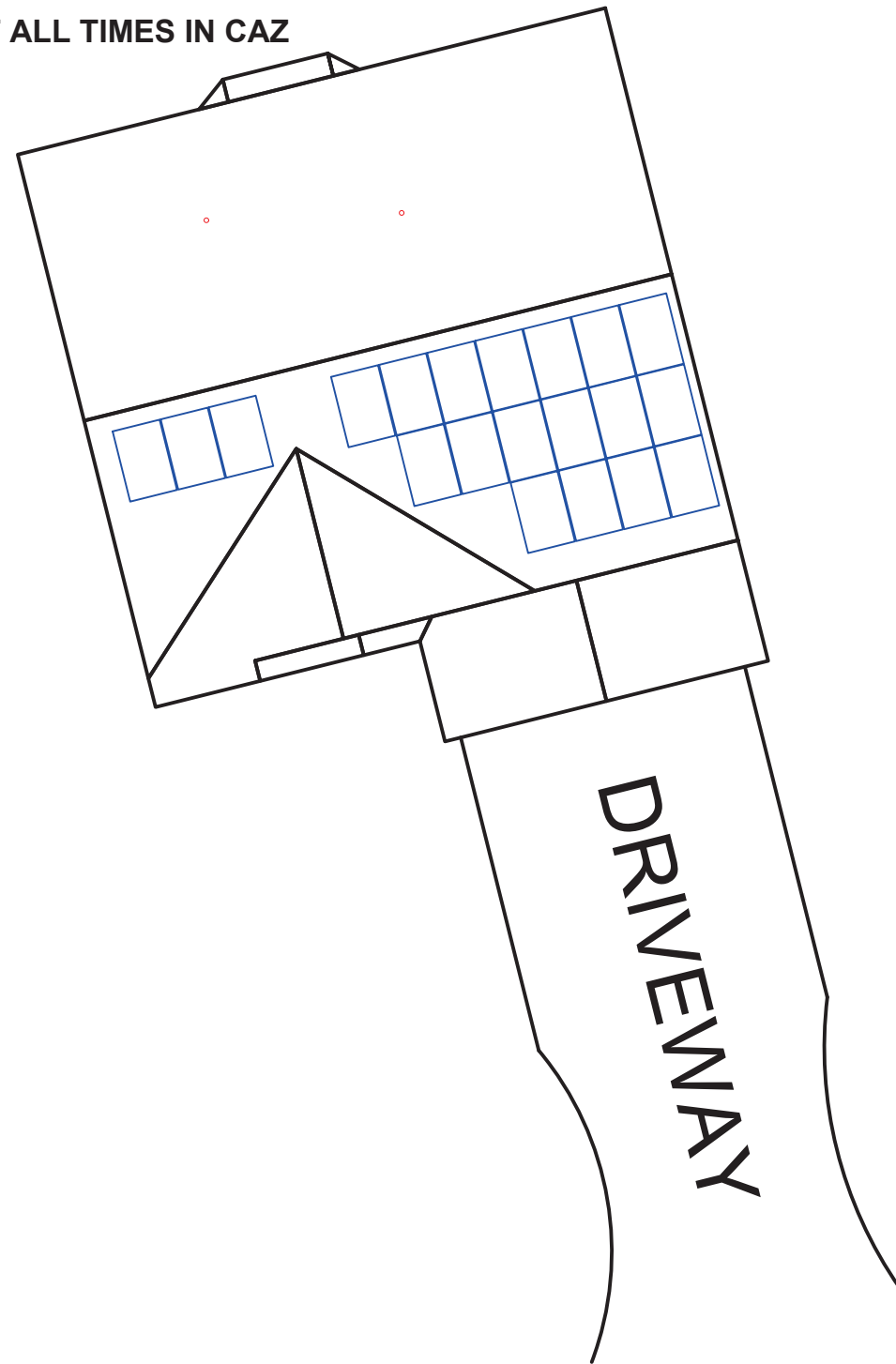
SHEET NUMBER

PV-6



USE THE SAFETY SYMBOL KEY TO DRAW IN THE CONTROLLED ACCESS ZONE (CAZ), LADDER PLACEMENT, METER LOCATION, FALL PROTECTION ANCHOR POINT, AND ANY OTHER HAZARD.

HARD HAT IS REQUIRED AT ALL TIMES IN CAZ



**SAFETY SYMBOL KEY**

- CAZ
- L LADDER
- M METER
- ==== POWER LINES
- R RESTRAINT ANCHOR
- A ARREST ANCHOR

**CONDUCT SAFETY MEETING WITH ALL CREW MEMBERS ON SITE AT THE BEGINNING OF EACH JOB. USE SIGN IN SHEET BELOW.**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

**GUEST SIGN IN**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

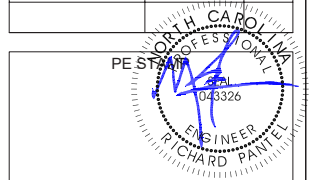
COMPETENT PERSON: \_\_\_\_\_ JOB START DATE: \_\_\_\_\_

CONTRACTOR

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SHEET NAME

SAFETY PLAN

SHEET SIZE

ANSI B  
 11" x 17"

SHEET NUMBER

PV-7



# MSE PERC 66

## MISSION SOLAR ENERGY



# 395W

Class leading power output -0 to +3%

Positive Power Tolerance

## True American Quality True American Brand

Mission Solar Energy is headquartered in San Antonio, Texas where we manufacture our modules. We produce American, high-quality solar modules ensuring the highest-in-class power output and best-in-class reliability. Our product line is tailored for residential, commercial and utility applications. Every Mission Solar Energy solar module is certified and surpasses industry standard regulations, proving excellent performance over the long term.

Demand the best. Demand Mission Solar Energy.



### Certified Reliability

- Tested to UL 61730 & IEC Standards
- PID resistant
- Resistance to salt mist corrosion



### Advanced Technology

- 9 Busbar
- Passivated Emitter Rear Contact
- Ideal for all applications



### Extreme Weather Resilience

- Up to 5,400 Pa front load & 3,600 Pa back load
- Tested load to UL 61730
- 40 mm frame



### BAA Compliant for Government Projects

- Buy American Act
- American Recovery & Reinvestment Act

### FRAME-TO-FRAME WARRANTY

Degradation guaranteed not to exceed 2% in year one and 0.58% annually from years two to 30 with 84.08% capacity guaranteed in year 25. For more information, visit [www.missionsolar.com/warranty](http://www.missionsolar.com/warranty)

### CERTIFICATIONS

CEC



UL 61730 / IEC 61215 / IEC 61730 / IEC 61701

If you have questions or concerns about certification of our products in your area, please contact Mission Solar Energy.

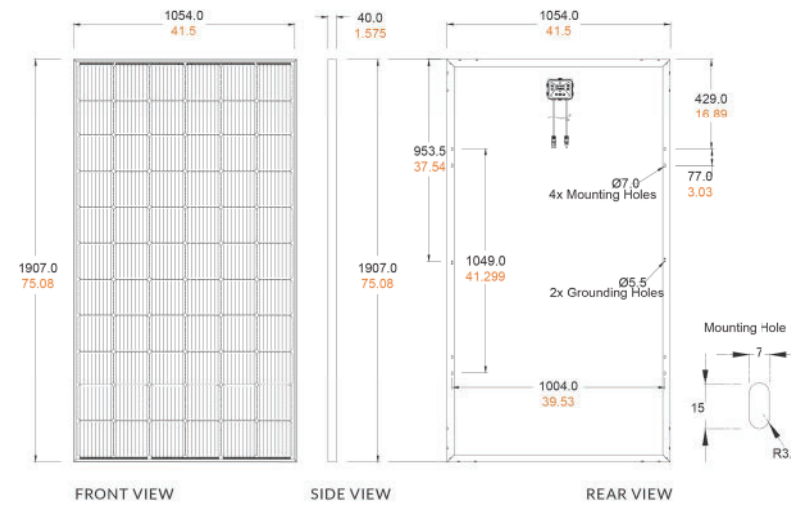


## Class Leading 390-400W

# MSE PERC 66

### BASIC DIMENSIONS

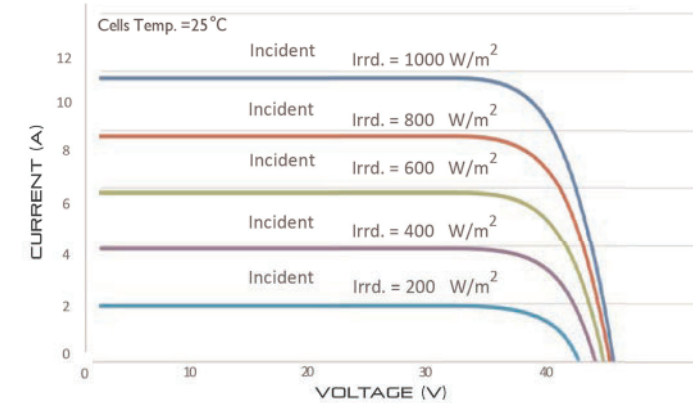
[UNITS: MM/IN]



### CURRENT-VOLTAGE CURVE

MSE385SX9R: 385WP, 66 CELL SOLAR MODULE

Current-voltage characteristics with dependence on irradiance and module temperature



### CERTIFICATIONS AND TESTS

IEC	61215, 61730, 61701
UL	61730



CEC



### ELECTRICAL SPECIFICATION

PRODUCT TYPE	MSExxxSX9R (xxx = P <sub>max</sub> )				
Power Output	P <sub>max</sub>	W <sub>p</sub>	390	395	400
Module Efficiency	%		19.4	19.7	19.9
Tolerance	%		0/+3	0/+3	0/+3
Short Circuit Current	I <sub>sc</sub>	A	11.19	11.24	11.31
Open Circuit Voltage	V <sub>oc</sub>	V	45.04	45.18	45.33
Rated Current	I <sub>mp</sub>	A	10.63	10.68	10.79
Rated Voltage	V <sub>mp</sub>	V	36.68	36.99	37.07
Fuse Rating	A		20	20	20
System Voltage	V		1,000	1,000	1,000

### TEMPERATURE COEFFICIENTS

Normal Operating Cell Temperature (NOCT)	43.7°C (103.7°F)
Temperature Coefficient of P <sub>max</sub>	-0.36%/°C (-0.20%/°F)
Temperature Coefficient of V <sub>oc</sub>	-0.25%/°C (-0.14%/°F)
Temperature Coefficient of I <sub>sc</sub>	0.033%/°C (0.018%/°F)

### OPERATING CONDITIONS

Maximum System Voltage	1,000Vdc
Operating Temperature Range	-40°F to 185°F (-40°C to 85°C)
Maximum Series Fuse Rating	20A
Fire Safety Classification	Type 1*
Front & Back Load (UL Standard)	Up to 5,400 Pa front and 3,600 Pa back load, Tested to UL 61730
Hail Safety Impact Velocity	25mm at 23 m/s

\*Mission Solar Energy uses quality sourced materials that result in a Type 1 fire rating. Please note, the 'Fire Class' Rating is designated for the fully-installed PV system, which includes, but is not limited to, the module, the type of mounting used, pitch and roof composition.

### MECHANICAL DATA

Solar Cells	P-type mono-crystalline silicon
Cell Orientation	66 cells (6x11)
Module Dimension	1,907mm x 1,054mm x 40mm
Weight	48.5 lbs. (22 kg)
Front Glass	3.2mm tempered, low-iron, anti-reflective
Frame	40mm Anodized
Encapsulant	Ethylene vinyl acetate (EVA)
Junction Box	Protection class IP67 with 3 bypass-diodes
Cable	1.2m, Wire 4mm <sup>2</sup> (12AWG)
Connector	Staubli PV-KBT4/6II-UR and PV-KST4/6II-UR, MC4, Renhe 05-8

### SHIPPING INFORMATION

Container Feet	Ship To	Pallet	Panels	390W Bin
53'	Most States	30	780	304.20 kW
Double Stack	CA	26	676	263.64 kW

### PALLET [26 PANELS]

Weight	Height	Width	Length
1,300 lbs. (572 kg)	47.56 in (120.80 cm)	46 in (116.84 cm)	77 in (195.58 cm)

## Mission Solar Energy

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# IQ8M and IQ8A Microinverters

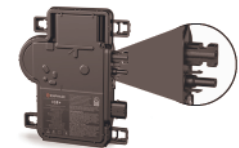
Our newest IQ8 Microinverters are the industry's first microgrid-forming, software defined microinverters with split-phase power conversion capability to convert DC power to AC power efficiently. The brain of the semiconductor-based microinverter is our proprietary application specific integrated circuit (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 superfast 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 IQ Battery, IQ Gateway, and the Enphase App monitoring and analysis software.



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



Connect PV modules quickly and easily to the IQ8 Series Microinverters that has integrated MC4 connectors.



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

\*Only when installed with IQ System Controller 2, meets UL 1741.  
\*\*IQ8M and IQ8A support split-phase, 240V installations only.

### 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) and IEEE 1547:2018 (UL 1741-SB 3<sup>rd</sup> Ed.)

### Note:

IQ8 Microinverters cannot be mixed together with previous generations of Enphase microinverters (IQ7 Series, IQ6 Series, etc) in the same system.

# IQ8M and IQ8A Microinverters

INPUT DATA (DC)		IQ8M-72-M-US	IQ8A-72-M-US
Commonly used module pairings <sup>1</sup>	W	260 – 460	295 – 500
Module compatibility		54-cell / 108 half-cell, 60-cell / 120 half-cell, 66-cell / 132 half-cell and 72-cell / 144 half-cell	
MPPT voltage range	V	30 – 45	32 – 45
Operating range	V	16 – 58	
Min. / Max. start voltage	V	22 / 58	
Max. input DC voltage	V	60	
Max. continuous input DC current	A	12	
Max. input DC short-circuit current	A	25	
Max. module I <sub>sc</sub>	A	20	
Overvoltage class DC port		II	
DC port backfeed current	mA	0	
PV array configuration		1 x 1 Ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit	
OUTPUT DATA (AC)		IQ8M-72-M-US	IQ8A-72-M-US
Peak output power	VA	330	366
Max. continuous output power	VA	325	349
Nominal (L-L) voltage / range <sup>2</sup>	V	240 / 211 – 264	
Max. continuous output current	A	1.35	1.45
Nominal frequency	Hz	60	
Extended frequency range	Hz	47 – 68	
AC short circuit fault current over 3 cycles	Arms	2	
Max. units per 20 A (L-L) branch circuit <sup>3</sup>		11	
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	%	97.8	97.7
CEC weighted efficiency	%	97.5	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		Stäubli MC4	
Dimensions (H x W x D)		212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")	
Weight		1.1 kg (2.43 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, IEEE 1547:2018 (UL 1741-SB 3 <sup>rd</sup> Ed.), 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 Shutdown 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.	



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11/21/2023

(1) Pairing PV modules with wattage above the limit may result in additional clipping losses. See the compatibility calculator at <https://lnk.enphase.com/module-compatibility>. (2) Nominal voltage range can be extended beyond nominal if required by the utility. (3) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

## Enphase Q Cable and Accessories

The **Enphase Q Cable™** and accessories are part of the sixth generation Enphase IQ System™. These products provide simplicity, reliability, and faster installation times.



### Enphase Q Cable

- Two-wire, double-insulated Enphase Q Cable is 50% lighter than the previous generation Enphase cable
- Four-wire (three-phase) option also available
- New cable numbering and plug and play connectors speed up installation and simplify wire management
- Link connectors eliminate cable waste



### Field-Wireable Connectors

- Easily connect Q cables on the roof without complex wiring
- Make connections from any open connector and center feed any section of cable within branch limits
- Available in male and female connector types

## Enphase Q Cable Accessories

### Q CABLE SPECIFICATIONS

Voltage rating	600V (connector rating up to 250 V)
Cable temperature rating	90° C wet/dry
UV exposure rating	EN ISO 492-2
Environmental protection rating	IEC 60529 IP67
Compliance	RoHS, OIL RES I, CE, UV resistant
Cable insulator rating	H07BQ-F
Flame rating	IEC 60332-1-2

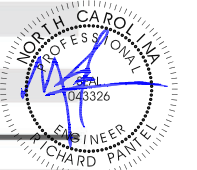
### Q CABLE TYPES / ORDERING OPTIONS




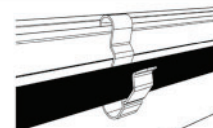
Model Number	Max Nominal Voltage	Ampacity Rating	Connector Spacing	PV Module Orientation	Connector Count per Box
Q-25-10-240 (single-phase)	250 VAC	25 A	1.3 m	Portrait	240
Q-25-17-240 (single-phase)	250 VAC	25 A	2.0 m	Landscape (60-cell)	240
Q-25-20-200 (single-phase)	250 VAC	25 A	2.3 m	Landscape (72-cell)	200
Q-25-10-3P-200 (three-phase)	250 VAC	25 A	1.3 m	Portrait	200
Q-25-17-3P-160 (three-phase)	250 VAC	25 A	2.0 m	Landscape (60-cell)	160
Q-25-20-3P-160 (three-phase)	250 VAC	25 A	2.3 m	Landscape (72-cell)	160

### ENPHASE Q CABLE ACCESSORIES

Name	Model Number	Description
Raw Q Cable (single-phase)	Q-25-RAW-300	300 meters cable with no connectors
Raw Q Cable (three-phase)	Q-25-RAW-3P-300	300 meters cable with no connectors
Field-wireable connector (male)	Q-CONN-R-10M	Make connections using single-phase cable
Field-wireable connector (male)	Q-CONN-3P-10M	Make connections using three phase cable
Field-wireable connector (female)	Q-CONN-R-10F	Make connections from any Q Cable (single-phase) open connector
Field-wireable connector (female)	Q-CONN-3P-10F	Make connections from any Q Cable (three-phase) open connector
Cable Clip	ET-CLIP-100	Used to fasten cabling to the racking or to secure looped cabling
Disconnect tool	Q-DISC-10	Disconnect tool for Q Cable connectors, DC connectors, and AC module mount
Disconnect tool	Q-DISC-3P-10	Disconnect tool for three-phase Field wireable connectors
Q Cable sealing caps (female)	Q-SEAL-10	One needed to cover each unused connector on the cabling
Terminator (single-phase)	Q-TERM-R-10	Terminator cap for unused single-phase cable ends
Terminator (three-phase)	Q-TERM-3P-10	Terminator cap for unused three phase cable ends
Replacement DC Adaptor (MC4)	Q-DCC-2-INT	DC adaptor to MC4 (max voltage 100 VDC)

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	<b>TERMINATOR</b> Terminator cap for unused cable ends, sold in packs of ten (Q-TERM-R-10 / Q-TERM-3P-10))		<b>SEALING CAPS</b> Sealing caps for unused cable connections, sold in packs of ten (Q-SEAL-10)
	<b>DISCONNECT TOOL</b> Plan to use at least one per installation, sold in packs of ten (Q-DISC-10) Three-phase model (Q-DISC-3P-10)		<b>CABLE CLIP</b> Used to fasten cabling to the racking or to secure looped cabling, sold in packs of one hundred (ET-CLIP-100)



## IQ Combiner 4/4C



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

### Smart

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

### Simple

- Mounts on single stud with centered brackets
- Supports bottom, back and side conduit entry
- Allows up to four 2-pole branch circuits for 240VAC plug-in breakers (not included)
- 80A total PV or storage branch circuits

### Reliable

- Durable NRTL-certified NEMA type 3R enclosure
- Five-year limited warranty
- Two years labor reimbursement program coverage included for both the IQ Combiner SKU's
- UL listed
- X2-IQ-AM1-240-4 and X2-IQ-AM1-240-4C comply with IEEE 1547:2018 (UL 1741-SB, 3<sup>rd</sup> Ed.)

## IQ Combiner 4/4C

### MODEL NUMBER

IQ Combiner 4 X-IQ-AM1-240-4 X2-IQ-AM1-240-4 (IEEE 1547:2018)	IQ Combiner 4 with IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 ± 0.5%) and consumption monitoring (± 2.5%). Includes a silver solar shield to match the IQ Battery and IQ System Controller 2 and to deflect heat.
IQ Combiner 4C X-IQ-AM1-240-4C X2-IQ-AM1-240-4C (IEEE 1547:2018)	IQ Combiner 4C with IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 ± 0.5%) and consumption monitoring (± 2.5%). Includes Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), a plug-and-play industrial-grade cell modem for systems up to 60 microinverters. (Available in the US, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.) Includes a silver solar shield to match the IQ Battery and IQ System Controller and to deflect heat.

### ACCESSORIES AND REPLACEMENT PARTS (not included, order separately)

Supported microinverters	IQ6, IQ7, and IQ8. (Do not mix IQ6/7 Microinverters with IQ8)
Communications Kit COMMS-CELLMODEM-M1-06 CELLMODEM-M1-06-SP-05 CELLMODEM-M1-06-AT-05	- Includes COMMS-KIT-01 and CELLMODEM-M1-06-SP-05 with 5-year Sprint data plan - 4G based LTE-M1 cellular modem with 5-year Sprint data plan - 4G based LTE-M1 cellular modem with 5-year AT&T data plan
Circuit Breakers BRK-10A-2-240V BRK-15A-2-240V BRK-20A-2P-240V BRK-15A-2P-240V-B BRK-20A-2P-240V-B	Supports Eaton BR210, BR215, BR220, BR230, BR240, BR250, and BR260 circuit breakers. Circuit breaker, 2 pole, 10A, Eaton BR210 Circuit breaker, 2 pole, 15A, Eaton BR215 Circuit breaker, 2 pole, 20A, Eaton BR220 Circuit breaker, 2 pole, 15A, Eaton BR215B with hold down kit support Circuit breaker, 2 pole, 20A, Eaton BR220B with hold down kit support
XA-SOLARSHIELD-ES	Replacement solar shield for IQ Combiner 4/4C
XA-PLUG-120-3	Accessory receptacle for Power Line Carrier in IQ Combiner 4/4C (required for EPLC-01)
X-IQ-NA-HD-125A	Hold-down kit for Eaton circuit breaker with screws
Consumption monitoring CT (CT-200-SPLIT/CT-200-CLAMP)	A pair of 200A split core current transformers

### ELECTRICAL SPECIFICATIONS

Rating	Continuous duty	Reviewed and approved Richard Pantel, P.E. NC Lic. No. 043326 11/21/2023
System voltage	120/240VAC, 60 Hz	
Eaton BR series busbar rating	125A	
Max. continuous current rating	65A	
Max. continuous current rating (input from PV/storage)	64A	
Max. fuse/circuit rating (output)	90A	
Branch circuits (solar and/or storage)	Up to four 2-pole Eaton BR series Distributed Generation (DG) breakers only (not included)	
Max. total branch circuit breaker rating (input)	80A of distributed generation/95A with IQ Gateway breaker included	
IQ Gateway breaker	10A or 15A rating GE/Siemens/Eaton included	
Production metering CT	200A solid core pre-installed and wired to IQ Gateway	

### MECHANICAL DATA

Dimensions (WxHxD)	37.5 cm x 49.5 cm x 16.8 cm (14.75 in x 19.5 in x 6.63 in). Height is 53.5 cm (21.06 in) with mounting brackets.
Weight	7.5 kg (16.5 lbs)
Ambient temperature range	-40°C to +46°C (-40°F to 115°F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction
Wire sizes	• 20A to 50A breaker inputs: 14 to 4 AWG copper conductors • 60A breaker branch input: 4 to 1/0 AWG copper conductors • Main lug combined output: 10 to 2/0 AWG copper conductors • Neutral and ground: 14 to 1/0 copper conductors • Always follow local code requirements for conductor sizing.
Altitude	Up to 3,000 meters (9,842 feet)

### INTERNET CONNECTION OPTIONS

Integrated Wi-Fi	IEEE 802.11b/g/n
Cellular	CELLMODEM-M1-06-SP-05, CELLMODEM-M1-06-AT-05 (4G based LTE-M1 cellular modem). Note that an Mobile Connect cellular modem is required for all Enphase Energy System installations.
Ethernet	Optional, IEEE 802.3, Cat5E (or Cat6) UTP Ethernet cable (not included)

### COMPLIANCE

Compliance, IQ Combiner	CA Rule 21 (UL 1741-SA) IEEE 1547:2018 - UL 1741-SB, 3 <sup>rd</sup> Ed. (X2-IQ-AM1-240-4 and X2-IQ-AM1-240-4C) CAN/CSA C22.2 No. 107.1, Title 47 CFR, Part 15, Class B, ICES 003 Production metering: ANSI C12.20 accuracy class 0.5 (PV production) Consumption metering: accuracy class 2.5
Compliance, IQ Gateway	UL 60601-1/CANCSA 22.2 No. 61010-1



To learn more about Enphase offerings, visit [enphase.com](https://enphase.com)  
IQ-C-4-4C-DS-0103-EN-US-12-29-2022



# IQ Gateway



## IQ Gateway

The IQ Gateway delivers solar production and energy consumption data to Enphase Installer Portal monitoring and analysis software for comprehensive, remote maintenance, and management of Enphase systems.

With integrated production metering and optional consumption monitoring, the IQ Gateway is the platform for total energy management. It integrates with the IQ System Controller and IQ Battery.



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



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



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



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

### Smart

- Enables web-based monitoring and control
- Provides bidirectional communications for remote upgrades
- Supports power export limiting and zero-export applications

### Simple

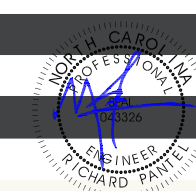
- Easy system configuration using Enphase Installer App
- Flexible networking with Wi-Fi, Ethernet, or cellular

### Reliable

- Designed for installation indoors or outdoors in a NEMA 3R rated enclosure
- 5-year limited warranty
- ENV2-IQ-AM1-240 complies with IEEE 1547:2018 (UL 1741-SB, 3<sup>rd</sup> Ed.)



<b>MODEL NUMBER</b>		ENV-IQ-AM1-240, ENV2-IQ-AM1-240
IQ Gateway ENV-IQ-AM1-240 ENV2-IQ-AM1-240 (IEEE 1547:2018)	IQ Gateway integrates revenue grade PV production metering (ANSI C12.20 ±0.5%), consumption metering (±2.5%), and battery metering (±2.5%) with IQ Battery 5P. Includes one 200 A continuous rated Production current transformer (CT).	
<b>ACCESSORIES - ORDER SEPARATELY</b>		
Mobile Connect COMMS-CELLMODEM-M1-06 CELLMODEM-M1-06-SP-05 CELLMODEM-M1-06-AT-05	- Includes COMMS-KIT-01 and CELLMODEM-M1-06-SP-05 with 5-year Sprint data plan - 4G based LTE-M1 cellular modem with 5-year Sprint data plan - 4G based LTE-M1 cellular modem with 5-year AT&T data plan	
Consumption monitoring CT and IQ Battery 5P metering CT CT-200-SPLIT CT-200-CLAMP	Split-core and clamp style CTs with 2.5% accuracy enable whole home and IQ Battery 5P metering	
Communications Kit COMMS-KIT-01 COMMS-KIT-02	Installed at the IQ Gateway. For communications with IQ Battery and IQ System Controller. Includes USB cable for connection to IQ Gateway or IQ Combiner and allows wireless communication with IQ Battery and IQ System Controller.	
<b>POWER REQUIREMENTS</b>		
Power requirements	120/240 VAC split-phase maximum 20 A overcurrent protection required	
Typical power consumption	5 W	
<b>CAPACITY</b>		
Number of microinverters polled	Up to 300	
<b>MECHANICAL &amp; ELECTRICAL DATA</b>		
Dimensions (W×H×D)	21.3 cm × 12.6 cm × 4.5 cm (8.4 in × 5 in × 1.8 in)	
Weight	1.09 lb	
Ambient temperature range	-40°C to 65°C (-40°F to 149°F) [ENV-IQ-AM1-240] -40°C to 50°C (-40°F to 122°F) [ENV2-IQ-AM1-240] -40°C to 46°C (-40°F to 115°F) if installed in an enclosure	
Environmental rating	IP30. For installation indoors or in an NRTL-certified, NEMA type 3R or better-rated enclosure, if installing outdoors.	
Altitude	Up to 2,600 meters (8,530 feet)	
<b>COMMUNICATION INTERFACES</b>		
Integrated Wi-Fi	802.11b/g/n (2.4 GHz, 5 GHz), for connecting the Enphase Cloud via the internet.	
Wi-Fi range (recommended)	10 m	
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, CELLMODEM-M1-06-AT-05 (to be purchased separately, mandatory for sites with IQ Battery)	
Digital I/O	Digital input/output for grid operator control	
USB 2.0	For Mobile Connect and Communications Kit	
Access point (AP) mode	For a connection between the IQ Gateway and a mobile device running the Enphase Installer App	
Metering ports	Up to two Consumption CTs, one Production CT, and one battery CT (for IQ Battery 5P)	
Power line communication (PLC)	90-110 kHz (Class B), to microinverters.	
Web API	Refer to <a href="https://developer-v4.enphase.com">https://developer-v4.enphase.com</a>	
Local API	Refer to <a href="#">guide for local API</a>	
LED indicators	From top to bottom: Cloud connectivity, Wi-Fi access point mode, PV production state, PLC communications state	
Configured via	Enphase Installer App and Enphase Installer Platform	



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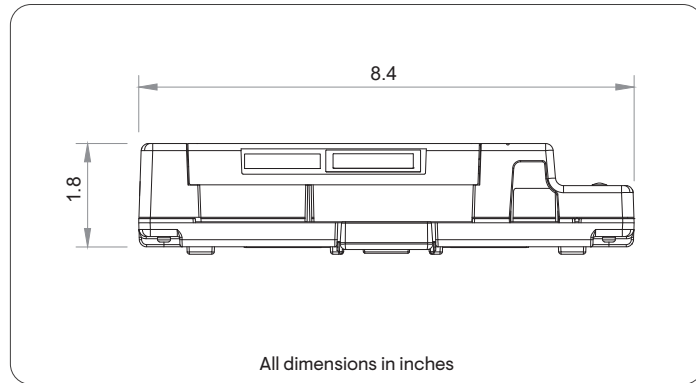
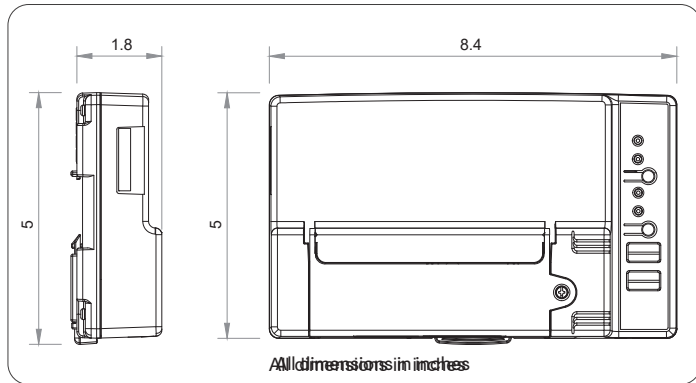


POWER PRODUCTION/EXPORT LIMITING VIA THE IQ GATEWAY'S DIGITAL IQ	
Maximum relays read	4
Capabilities supported	Power production limiting (Production CT/s required), power export limiting (Production CT/s required and Consumption CT/s – "Load with Solar" configuration)
Minimum IQ Gateway version	v7.3.120
Cable configurations	18 AWG, UL-Std. 62, 600 V, 105°C, and min 0.03 inches average thickness
Signal voltage range	2.5 V–5 V (digital high), 0 V–1.9 V (digital low)
Terminal blocks	Five terminals, up to 0.002 in <sup>2</sup>
Configuration via	Enphase Installer App, Enphase Installer Platform (site settings)

SCOPE OF DELIVERY	
Package dimensions (H x W x D)	6.3" x 10.8" x 3.9"
Package weight	2.2 lb
Aluminium DIN rail	4.9 in
Current transformers (CTs)	One CT-200-SOLID included

COMPLIANCE	
Compliance	CA Rule 21 (UL 1741-SA), IEEE 1547:2018 - UL 1741-SB, 3rd Ed.(ENV2-IQ-AM1-240), UL 61010-1 CAN/CSA C22.2 No. 61010-1 Title 47 CFR, Part 15, Class B, ICES 003 IEC/EN 61010-1:2010, EN50065-1, EN61000-4-5, EN61000-6-1, EN61000-6-2 Metering: ANSI C12.20 accuracy class 0.5 (PV production only)

COMPATABILITY	
IQ System Controller	SC200D111C240US01, SC200G111C240US01, EP200G101-M240US01, EP200G101-M240US00
IQ Battery	IQBATTERY-5P-1P-NA, ENCHARGE-3T-1P-NA, ENCHARGE-10T-1P-NA
Microinverter	IQ6, IQ7, and IQ8 Series Microinverters



## Accessories



### Enphase Mobile Connect

4G-based LTE-M1 cellular modem with a 5-year data plan  
(CELLMODEM-M1-06-SP-05 for Sprint and CELLMODEM-M1-06-AT-05 for AT&T)



### Circuit breakers

BRK-10A-2-240V Circuit breaker, 2-pole, 10 A, Eaton BR210  
BRK-15A-2-240V Circuit breaker, 2-pole, 15 A, Eaton BR215  
BRK-20A-2P-240V Circuit breaker, 2-pole, 20 A, Eaton BR220  
BRK-15A-2P-240V-B Circuit breaker, 2-pole, 15 A, Eaton BR215B with hold-down kit support  
BRK-20A-2P-240V-B Circuit breaker, 2-pole, 20 A, Eaton BR220B with hold-down kit support



### CT-200-SOLID

200 A revenue grade solid core Production CT with <0.5% error rate (replacement SKU)

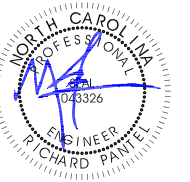


### CT-200-CLAMP

200 A clamp-style consumption and battery metering CT with <2.5% error rate (replacement SKU)

## Revision history

REVISION	DATE	DESCRIPTION
DSH-00111-2.0	August 2023	Updated temperature specification for ENV2-IQ-AM1-240
DSH-00111-1.0	June 2023	Updated altitude and recommended maximum microinverters on a site.



Reviewed and approved  
Richard Pantel, P.E.  
NC Lic. No. 043326  
11/21/2023



# INSTAFLASH™

## Never Deal With Caulking Again!

Factory-installed, non-hardening sealant



**Before InstaFlash Installed:**  
Sealant is contained above roof surface by a protective cage.



**After InstaFlash Installed:**  
Sealant is compressed to fill all holes and voids.

### Protective Cage

Prevents sealant from getting on hands or roof. Collapses upon lag installation.

## Effortless Lifetime Roof Protection

The non-hardening sealant completely fills any missed pilot holes, shingle rips, voids, or other potential water ingress points under the entire footprint of the 4.6" wide base.



### 25-Year Warranty

Manufactured with advanced materials and coatings to outlast the roof itself



### Code Compliant

Fully IBC/CBC Code Compliant Exceeds ASCE 7-16 Standards FL Cert of Approval FL41396 UL2703 Certified



### Self-Healing

The proprietary non-hardening sealant will flex and reseal over years of thermal expansion and contraction



### Larger Spans

The extra-large L-foot and proprietary lag screw result in larger spans between mounts



# INSTAFLASH™

**1**  
Drill pilot hole in the center of the rafter using a 7/32" bit.



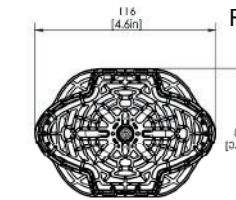
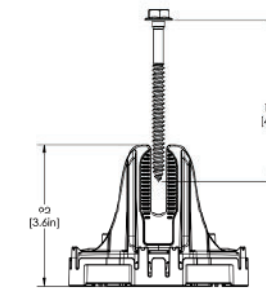
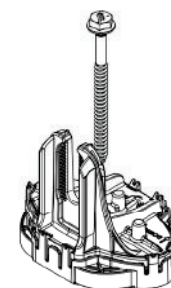
**2**  
Place the InstaFlash over the pilot hole. **Note:** the direction of the InstaFlash Down arrows should point down the roof.



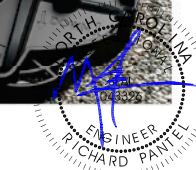
**3**  
Insert the lag screw through the center hole into the pilot hole.



**4**  
Drive the lag until the InstaFlash is fully seated to the roof.



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SPECIFICATIONS	INSTAFLASH KITS				
	PIF-RB0	PIF-RBDT	PIF-RBSH	PIF-RM0	PIF-RMDT
Finish	Black			Mill	
Kit Contents	Black InstaFlash, 5/16" x 4.0" SS Lag	Black InstaFlash, 5/16" x 4.0" SS Lag, Dovetail T-bolt w/ Nut	Black InstaFlash, 5/16" x 4.0" SS Lag, M10 Hex Bolt w/ Nut	Mill Insta-Flash, 5/16" x 4.0" SS Lag	Mill InstaFlash, 5/16" x 4.0" SS Lag, Dovetail T-bolt w/ Nut
Attachment Type	Rafter Attached				
Roof Type	Sloped Roof: Composition Shingle, Rolled Asphalt   Flat roof: Modified Bitumen Roof, Built-Up Roof				
Sealant Application	Factory Installed				
Installation Temperature	0°F to 170° F				
Cure Time	Instantly Waterproof; Non-hardening				
Service Temperature	-40°F to 195° F				
Certifications	IBC, ASCE/SEI 7-16, FL Cert of Approval FL41396, TAS 100(A), UL2703				
Install Application	Most Railed Systems, Pegasus Tilt Leg Kit				
Kit Quantity	24				
Boxes per Pallet	36				

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SCAN FOR INSTALLATION VIDEO



SCAN FOR FREE TRIAL





# RAIL SYSTEM

## Instant Bonding

The N-S Bonding Jumper bonds row to row with no tools.



## One Clamp Anywhere

The Multi-Clamp works as mid- or end-clamp, and fits standard 30-40mm frames.



## Lifetime Wire Management

Open rail channel holds and protects wires. Clamps won't pinch wires after tightening.



## Bonding Structural Splice

Connect rails instantly, without tools, interference or limitations.

## Next-Level Solar Mounting

A complete system for hassle-free rooftop installation, from watertight mounts to lifetime wire management.



### Simplicity

1/2" socket for everything. One clamp for mid or end. No tool splicing and bonding. Easy wire management.



### Code Compliant

UL 2703 listed  
LTR-AE-001-2012 listed  
Class A fire rating for any slope  
ASCE 7-16 PE Certified  
FL Cert of Approval FL41396



### Premium Aesthetics

The narrowest panel gap available. Optional Hidden End Clamps and End Caps provide a flush look on the edge of the array.



### Watertight for Life

Secured on industry-leading Pegasus Mounts, for composite shingle and tile roofs. Backed by a 25-year warranty.



# RAIL SYSTEM



Pegasus Rail	Pegasus Max Rail	Splice and Max Splice	Dovetail T-bolt
--------------	------------------	-----------------------	-----------------

Available in 14' and 7' lengths for easy layout and shipping.  
Open-channel design holds MC4 connectors, PV wire and trunk cables.  
Black and Mill finish

Maximum-strength design.  
Meets specifications for high snow-load and hurricane zones.  
Black and Mill finish

Installs by hand.  
Works over mounts.  
Structurally connects and bonds rails automatically; UL2703 listed as reusable.

Dovetail shape for extra strength.  
Uses 1/2" socket.



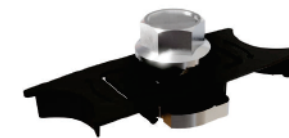
Multi-Clamp	Hidden End Clamp	Ground Lug	N-S Bonding Jumper
-------------	------------------	------------	--------------------

Fits 30-40mm PV frames, as mid- or end-clamp.  
Twist-locks into position; doesn't pinch wires in rail.  
Bonds modules to rail; UL2703 listed as reusable

Offers premium edge appearance.  
Preinstalled pull-tab grips rail edge, allowing easy, one-hand installation.  
Tucks away for reuse.

Holds 6 or 8 AWG wire.  
Mounts on top or side of rail.  
Assembled on MLPE Mount.  
UL2703 listed as reusable.

Installs by hand, eliminates row-to-row copper wire.  
UL2703 listed as reusable only with Pegasus Rail.  
Reviewed and approved  
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11/21/2023



MLPE Mount	Cable Grip	Wire Clip	End Cap and Max End Cap
------------	------------	-----------	-------------------------

Secures and bonds most micro-inverters and optimizers to rail.  
Connectors and wires easily route underneath after installation.  
UL2703 listed as reusable.

Secures four PV wires or two trunk cables.  
Stainless-steel backing provides durable grip.  
Eliminates sagging wires.

Hand operable.  
Holds wires in channel.  
Won't slip.

Fits flush to PV module and hides raw or angled cuts.  
Hidden drain quickly clears water from rail.

### Certifications:

- UL 2703, Edition 1
- LTR-AE-001-2012
- ASCE 7-16 PE certified
- Class A fire rating for any slope roof
- FL Cert of Approval FL41396



Quickly calculate the most efficient layout, spans and materials needed to suit your job. Visit the Pegasus Customer Portal. [pegasussolar.com/portal](http://pegasussolar.com/portal)

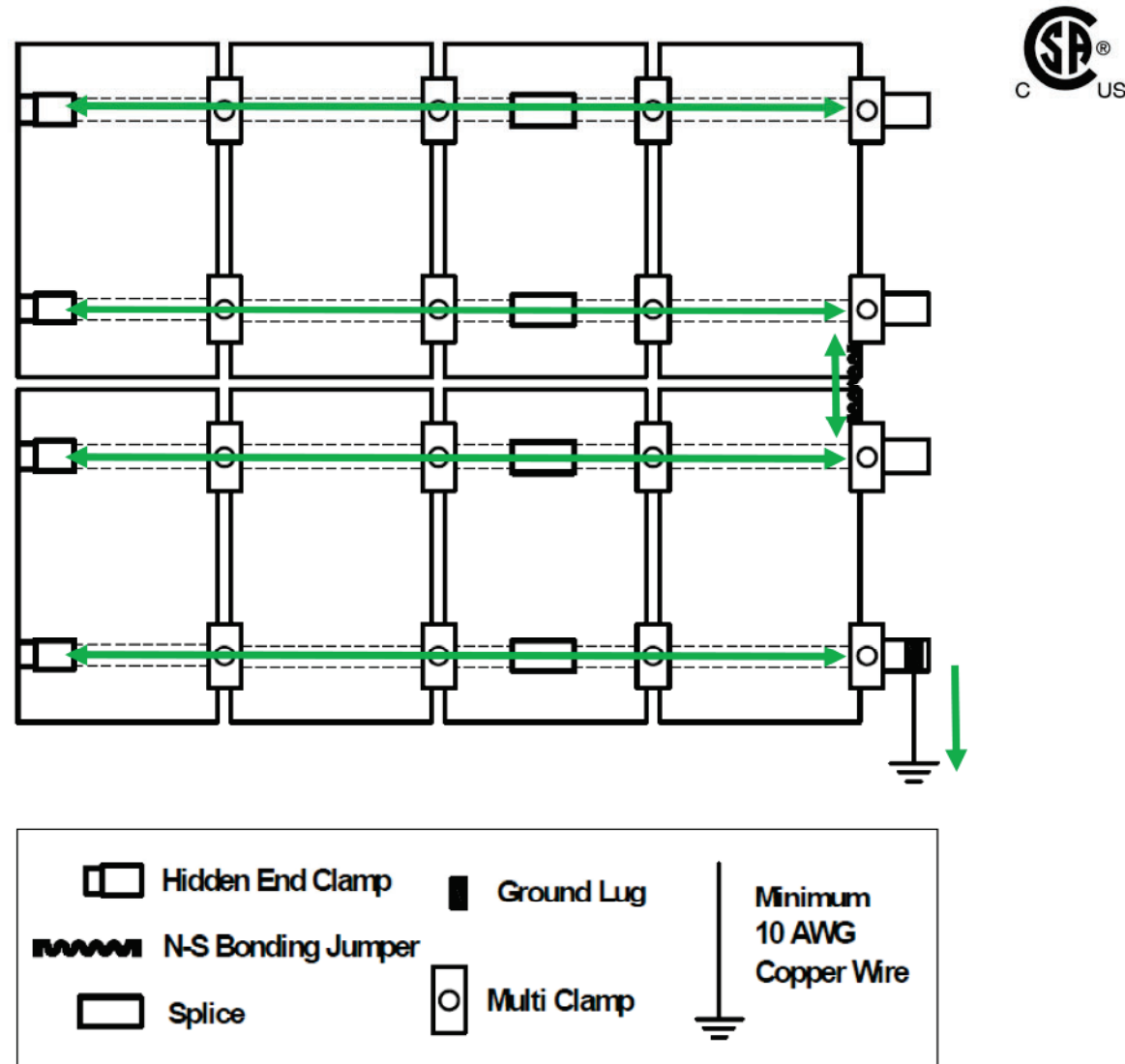
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LOAD		SPAN				
SNOW (psf)	WIND (MPH)	32"	48"	72"	96"	120"
0	100	Pegasus Rail	Pegasus Rail	Pegasus Rail	Pegasus Rail	Pegasus Rail
	130					
10	140	Pegasus Rail	Pegasus Rail	Pegasus Rail	Pegasus Rail	Pegasus Rail
	190					
30	190	Pegasus Rail	Pegasus Rail	Pegasus Rail	Pegasus Rail	Pegasus Rail
50						
100	190	Pegasus Rail	Pegasus Rail	Pegasus Rail	Pegasus Rail	Pegasus Rail
120						

For reference only. Spans above are calculated using 7-16 for a Gable Roof, Exposure Category B, 0-20deg roof angle, 30ft mean roof height with non-exposed modules. For PE certified span tables, visit [www.pegasussolar.com/spans](http://www.pegasussolar.com/spans).

# Pegasus Rail System - Bond Path to Ground

## Ground Lug & N-S Bonding Jumper



Multi-Clamps bond adjacent PV modules to one another and to the Rail. The Splice provides a bond connection between two Rail sections, including when a 1" thermal gap is utilized. The N-S Bonding Jumper will provide a bonding path between rows of PV modules, so that one Ground Lug per array is necessary for earth ground. If a thermal break is left between two sections or Rail, the Multi-Clamps will provide a bond path across the two Rails through the PV module frame.

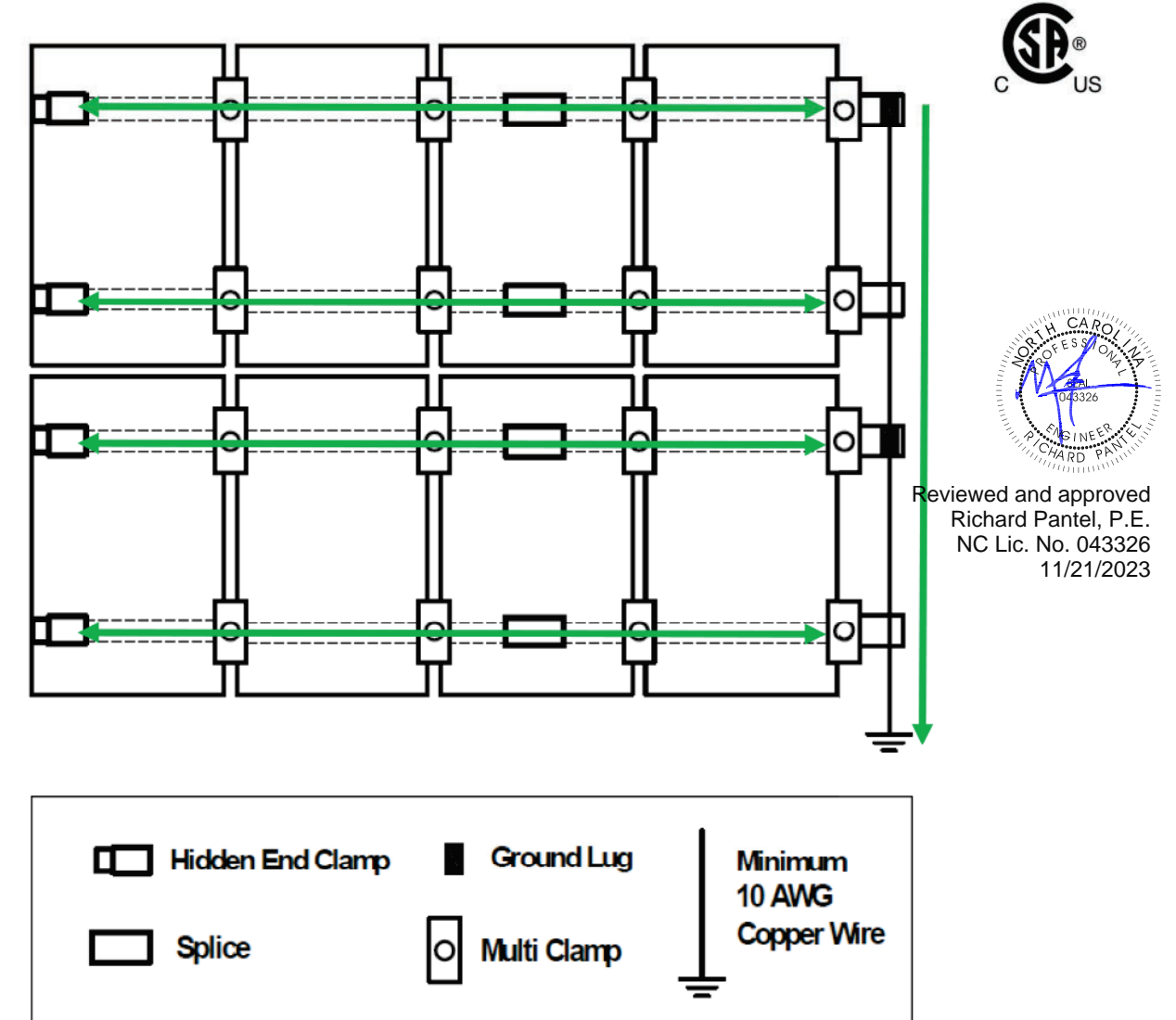
The N-S Bonding Jumper may only be used with the Pegasus Rail System, and is not certified for use with any other mounting system.

If the N-S Bonding Jumper needs to be removed during maintenance, a second N-S Bonding Jumper shall first be

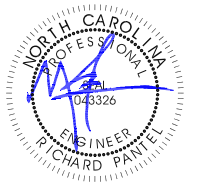


# Pegasus Rail System - Bond Path to Ground

## Ground Lug for each PV Module Row



Multi-Clamps bond adjacent PV modules to one another and to the Rail. The Splice provides a bond connection between two Rail sections, including when a 1" thermal gap is utilized. One Ground Lug is required per row of PV Modules, with a final earth ground connection at the terminal end of the ground wire. If a thermal break is left between two sections or Rail, the Multi-Clamps will provide a bond path across the two Rails through the PV module frame.



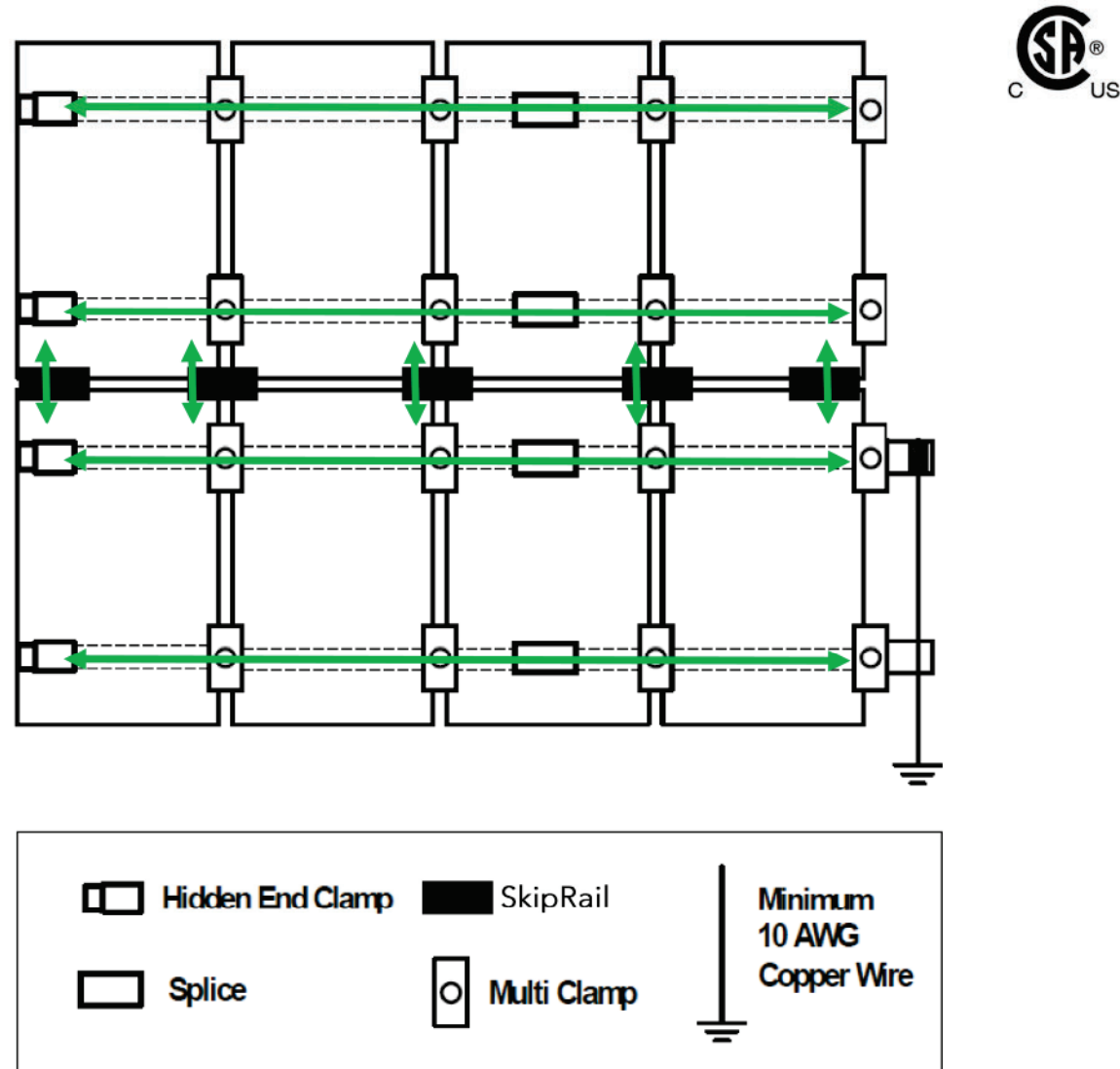
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# Pegasus Rail System - Bond Path to Ground

## SkipRail System

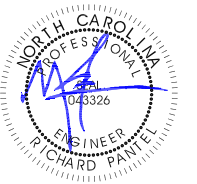
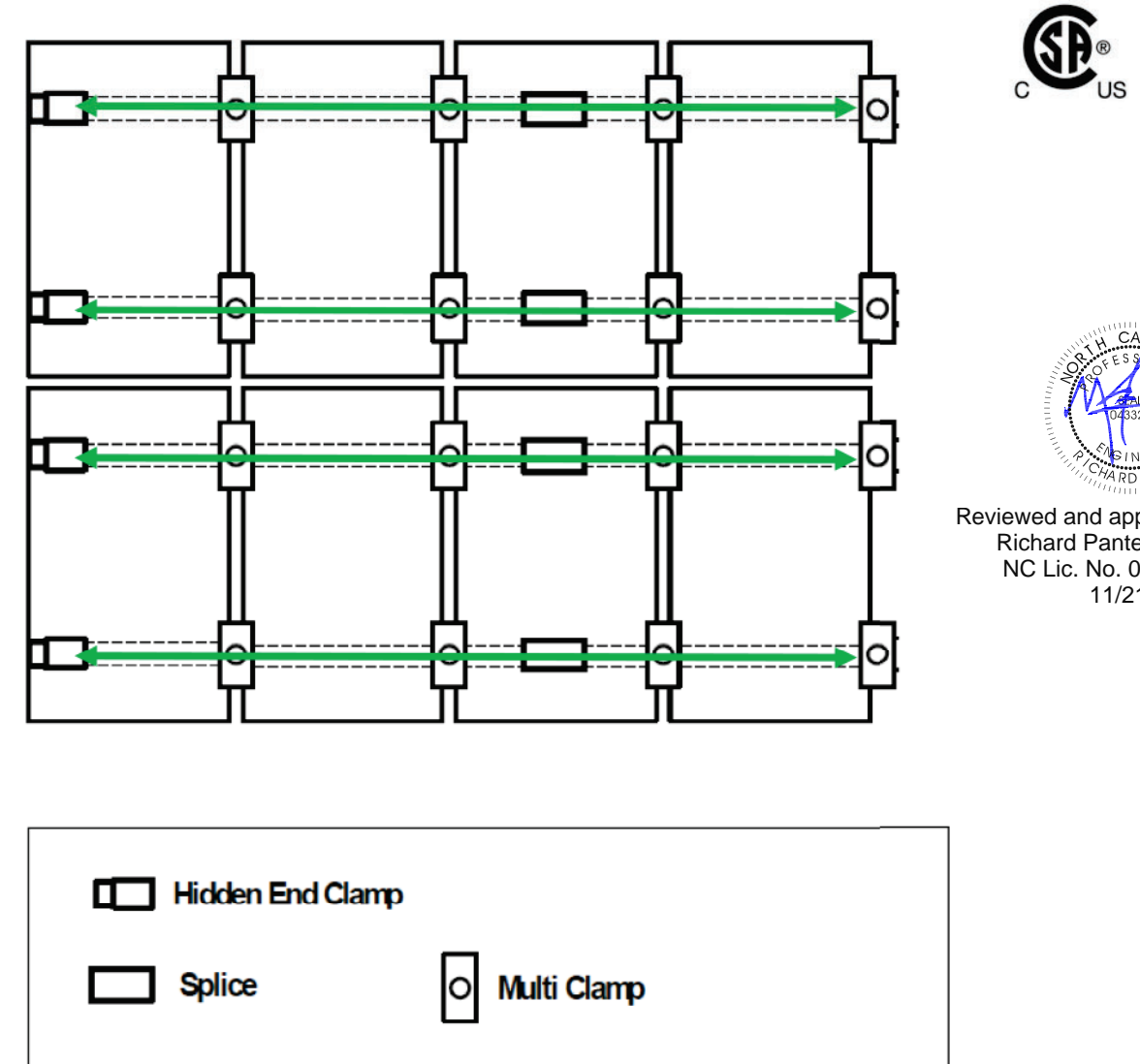


Multi-Clamps bond adjacent PV modules to one another and to the Rail. The Splice provides a bond connection between two Rail sections, including when a 1" thermal gap is utilized. The SkipRail Splices will provide a bonding path between rows of PV modules, so that one Ground Lug per array is necessary for earth ground. If a thermal break is left between two sections or Rail, the Multi-Clamps will provide a bond path across the two Rails through the PV module frame.



# Pegasus Rail System - Bond Path to Ground

## Using Enphase Products



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NC Lic. No. 043326  
11/21/2023

Multi-Clamps bond adjacent PV modules to one another and to the Rail. The Splice provides a bond connection between two Rail sections, including when a 1" thermal gap is utilized. The MLPE Mount creates a bond connection to the MLPE. When using Enphase products, Ground Lug, N-S Bonding Jumpers, or other equipment ground conductors (EGC) are not required, and the use of the Enphase products satisfies the UL2703 bonding and grounding requirements.

Compatible Enphase products:

- Microinverters M250-72, M250-60, M215-60, C250-72; with Engage cables ETXX-240, ETXX-208, ETXX-277



## Appendix A - Compatible PV Mod-

Pegasus Rail System may be used to ground a PV module complying with UL 2703 only when the specific module has been evaluated for grounding and/or mounting in compliance with this installation manual. Unless otherwise specified, "xxx" refers to the power rating of the PV module. Both black & silver frames are included in the UL2703 listing.



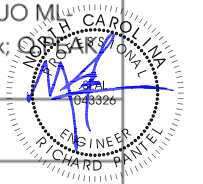
Manufacturer	Model
Auxin	AXN6M612Txxx
Aptos	DNA-144-BF26-xxxW; DNA-144-MF26-xxxW; DNA-120-BF26-xxxW; DNA-120-MF26-xxxW; DNA-120-MF10-xxxW; DNA-120-BF10-xxxW; DNA-108-BF10-xxxW; DNA-108-MF10-xxxW
Axitec	AC-xxxM/156-60S; AC-xxxM/60S; AC-xxxMH/120S; AC-xxxMH/144S
Boviet	BVM6610M-xxx; BVM6610P-xxx
Canadian Solar	CS1H-xxxMS; CS1K-xxxMS; CS1Y-xxxMS; CS3K-xxxMS; CS3U-xxxMS; CS6K-xxxM; CS6K-xxxP; CS6U-xxxM; CS6U-xxxP; CS6X-xxxM; CS6X-xxxP; BiHiKu CS3W-xxxMB-AG; CS3L-xxxMS; CS6R-xxxMS; CS3W-xxxPB-AG; CS3W-xxxP; CS3W-xxxMS; CS3L-xxxP; CS3L-xxxMS; CS3N-xxxMS; CS6W-xxxMB-AG; CS7N-xxxMB-AG
CertainTeed	CTxxxHC11-04; CTxxxM10-02; CTxxxM11-02; CTxxxM11-03; CTxxxHC00-04; CTxxxHC12-06; CTxxxHC11-06
Chint Solar	CHSM6612M-xxx
Freedom Forever	FF-MP-BBB-xxx
Hansol	HSxxxTD-AN3
Heliene	Heliene20M xxx; Heliene36M xxx; Heliene36P xxx; Heliene60M xxx; Heliene60P xxx; Heliene72M Bifacial xxx; Heliene72P xxx; Heliene96M xxx Bifacial; Heliene96M xxx; Heliene 96P xxx; HSPE-144M M6 HC Bifacial xxx; HSPE 120M M6 HC Monofacial xxx; 144HC-M10-Bifacial; 460-144M-HC-M6
Hyundai	HiD-SxxxRG(BK); HiS-MxxxRG; HiS-SxxxKI; HiS-SxxxRG; HiS-SxxxRG(BK); HiS-SxxxRI; HiS-SxxxTI; HiA-SxxxHI
JA Solar	JAM72S01-xxx/PR; JAP72S01-xxx/SC; JAM72D20-xxx/MB
Jinko	JKMxxxM-60; JKMxxxM-60B; JKMxxxM-60BL; JKMxxxM-60HBL; JKMxxxM-60HL; JKMxxxM-60L; JKMxxxM-60V; JKMxxxM-72; JKMxxxM-72HL-V; JKMxxxM-72H-V; JKMxxxM-72-V; JKMxxxP-60; JKMxxxPP-60; JKMxxxN-6RL3; JKMxxxM-6RL3-B; JKMxxxM-7RL3-TV
LG	LGN1K-G4; LGS1C-A5; LGxxxA1C-A5; LGxxxE1C-A5; LGxxxE1K-A5; LGxxxN1C-A3; LGxxxN1C-A5; LGxxxN1C-B3; LGxxxN1C-G3; LGxxxN1C-G4; LGxxxN1C-V5; LGxxxN1C-Z4; LGxxxN1K-A5; LGxxxN1K-G4; LGxxxN1K-V5; LGxxxN1K-Z4; LGxxxN2T-A5; LGxxxN2W-A5; LGxxxN2W-G4; LGxxxN2W-V5; LGxxxN2W-L5; LGxxxQ1C-A5; LGxxxQ1C-V5; LGxxxQ1K-A5; LGxxxQ1K-V5; LGxxxS1C-A5; LGxxxS1C-G4; LGxxxS2W-A5; LGxxxN1K-L5; LGxxxNIC-N5; LGxxxM1K-A6; LGxxxN1K-B6; LGxxxQ1C-A6; LGxxxQAC-A6; LGxxxQAK-A6; LGxxxM1C-A6; LGxxxN2W-E6; LGxxxN2T-E6; LGxxxN1K-E6; LGxxxN3K-V6; LGxxxN1C-A6
Longi	LR6-60BP-xxx; LR6-60HPB-xxx; LR6-60HPH-xxx; LR6-60PB-xxx; LR6-60PE-xxx; LR6-60-xxx; LR4-60HPH-xxxM; LR4-HPB-xxxM; LR4-72HPH-xxxM; LR4-72HBD-xxxM; LRS-54HPH-xxxM; LRS-72HBD-xxxM
Maxeon	SPR-MAX3-xxx-COM; SPR-MAX3-xxx-BLK; SPR-MAX5-xxx-COM; SPR-MAX6-xxx-COM; SPR-X21/22-xxx-COM; SPR-MAX3-XXX-BLK-R;
Mission Solar	MSE60Axxx; MSExxxSB1A; MSExxxSO6J; MSExxxSQ5K; MSExxxSQ5T; MSExxxSQ8K; MSExxxSQ8T; MSExxxSQ9S; MSExxxSX6S; MSExxxSX6W; MSExxxSX5T; MSExxxSX5K; MSExxxSX5R; MSExxxSX6Z; MSExxxSX9R; MSExxxSX9Z
Mitrex	Mxxx-L3H; Mxxx-I3H; Mxxx-H1H; Mxxx-B1F; Mxxx-A1F
Panasonic	VBHNxxxKA01; VBHNxxxKA03; VBHNxxxSA16; VBHNxxxSA16B; VBHNxxxSA17; VBHNxxxSA17E; EVPVxxx; EVPVxxxK; EVPVxxxPK; EVPVxxxH
Philadelphia Solar	PS-M60(BF)-xxx; PS-M72(BF)-xxx
QCells	Q.Peak 265; Q.PEAK BLK-G3.1 xxx; Q.PEAK BLK-G4.1 xxx; Q.PEAK DUO BLK-G5 xxx; Q.PEAK DUO BLK-G5/SC xxx; Q.PEAK DUO BLK-G6+ xxx; Q.PEAK DUO G6+ xxx AC ENP IQ7+; Q.PEAK DUO BLK G9+ xxx; Q.PEAK DUO L-G5.2 xxx; Q.PEAK DUO L-G5.3 xxx; Q.PEAK Duo-G5 xxx; Q.PEAK DUO-G5/SC xxx; Q.PEAK DUO-G7 xxx; Q.PEAK G4.1 xxx; Q.PEAK G4.1/ Max xxx; Q.PEAK G4.1/SC xxx; Q.PEAK G4.1/TAA xxx; Q.PEAK L-G4.2 xxx; Q.PLUS BFR G4.1 xxx; Q.PLUS BFR-G4.1/TAA xxx; Q.PLUS L-G4.1 xxx; Q.PLUS L-G4.2 xxx; Q.PLUS L-G4.2/TAA xxx; Q.PRO BFR-G4.1 xxx; Q.PEAK DUO L-G8.2 xxx; Q.PEAK DUO BLK-G8 xxx; Q.PEAK DUO BLK-G8+ xxx; Q.PEAK DUO BLK ML G9 xxx; Q.PEAK DUO BLK ML G9+ xxx; Q.PEAK DUO BLK-G10 xxx; Q.PEAK DUO BLK-G10+ xxx; Q.PEAK DUO ML-G10+; Q.PEAK DUO BLK ML-G10.a+; Q.PEAK Duo XL 10.d/BFG; Q.PEAK DUO-G10 xxx; Q.PEAK DUO-G10+ xxx; Q.PEAK DUO-G10.a xxx; Q.PEAK DUO-G10.a+ xxx; Q.PEAK DUO BLK-G10.a xxx; Q.PEAK DUO BLK-G10.a+ xxx; Q.PEAK DUO ML-G10 xxx; Q.PEAK DUO ML-G10.a xxx; Q.PEAK DUO ML-G10.a+ xxx; Q.PEAK DUO BLK ML-G10 xxx; Q.PEAK DUO BLK ML-G10+ xxx; Q.PEAK DUO BLK ML-G10.a xxx; Q.PEAK Duo ML-G10+ /t xxx; Q.Tron BLK M-G2+ xxx; Q.Tron M-G2+ xxx;
REC	RECxxxNP; RECxxxNP Black; RECxxxPE; RECxxxPE 72; RECxxxPE(BLK); RECxxxTP; RECxxxTP BLK; RECxxxTP2; RECxxxTP2 BLK; RECxxxTP2 BLK Q2; RECxxxTP2 BLK2; RECxxxTP2M; RECxxxTP2S 72; RECxxxAA; RECxxxAA Black; RECxxxAA Pure; RECxxxAA Black; RECxxxAA 72; RECxxxAA PURE-R;
S-Energy	SNxxxM-10; SNxxxM-10(B); SNxxxM-10T; SC20-60MBE-xxxM
SEG	SEG-xxx-BMA-HV; SEG-xxx-BMA-TB; SEG-xxx-BMA-BG; SEG-xxx-BMB-HV; SEG-xxx-BMA-BG; SEG-xxx-BMD-HV; SEG-xxx-BMD-TB; SEG-xxx-BMB-BG; SEG-xxx-BMC-HV; SEG-xxx-BMC-TB; SEG-xxx-BMC-BG
Silfab	SILxxxBL; SILxxxNL; SLAxxxM; SLAxxxM; SLGxxxM; SSAxxxM; SIL-xxxNX; SIL-xxxHL; SIL-xxxNX; SIL-xxxBK; SIL-xxxHC; SIL-xxxHC+; SIL-xxxBG; SIL-xxxHN; SIL-xxxHM
Solar4America	S4A410 72MH5BB, S4A33 60MH5BB



## Appendix B - SkipRail Compatible PV Modules

The following PV modules are structurally compatible with the SkipRail installation method.

Manufacturer	Model
Aptos	DNA-144-BF26-xxxW; DNA-144-MF26-xxxW; DNA-120-BF26-xxxW; DNA-120-MF26-xxxW; DNA-120-MF10-xxxW; DNA-120-BF10-xxxW; DNA-108-BF10-xxxW; DNA-108-MF10-xxxW
Jinko	JKMxxxM-72HL-V; JKMxxxM-72HBL-V; JKMxxxM-6RL3-V; JKMxxxM-6RL3-B
Longi	LR6-60BP-xxx; LR6-60HPB-xxx; LR6-60HPH-xxx; LR6-60PB-xxx; LR6-60PE-xxx; LR6-60-xxx; LR4-60HPH-xxxM; LR4-60HPB-xxxM; LR4-72HPH-xxxM; LR4-72HBD-xxxM; LRS-54HPH-xxxM; LRS-54HPB-xxxM; LRS-54HABB-xxxM; LRS-54HABD-xxxM; LRS-66HPH-xxxM
QCells	Q.PEAK DUO BLK-G10 xxx; Q.PEAK DUO BLK-G10+ xxx; Q.PEAK DUO ML-G10+; Q.PEAK DUO BLK ML-G10.a+; Q.PEAK Duo XL 10.d/BFG; Q.PEAK DUO-G10 xxx; Q.PEAK DUO-G10+ xxx; Q.PEAK DUO-G10.a xxx; Q.PEAK DUO-G10.a+ xxx; Q.PEAK DUO BLK-G10.a xxx; Q.PEAK DUO BLK-G10.a+ xxx; Q.PEAK DUO ML-G10 xxx; Q.PEAK DUO ML-G10.a xxx; Q.PEAK DUO ML-G10.a+ xxx; Q.PEAK DUO BLK ML-G10 xxx; Q.PEAK DUO BLK ML-G10.a xxx; Q.PEAK Duo ML-G10+ /t xxx
Mission Solar	MSExxxSX6W; MSExxxSX5T; MSExxxSX5K; MSExxxSX6Z; MSExxxSX6S; MSExxxSX9R; MSExxxSX9Z
REC	RECxxxNP; RECxxxNP Black; RECxxxPE; RECxxxPE 72; RECxxxPE(BLK); RECxxxTP; RECxxxTP BLK; RECxxxTP2; RECxxxTP2 BLK; RECxxxTP2 BLK Q2; RECxxxTP2 BLK2; RECxxxTP2M; RECxxxTP2S 72; RECxxxAA; RECxxxAA Black; RECxxxAA 72; RECxxxNP3; RECxxxNP3 Black; RECxxxNP2; RECxxxNP2 Black; RECxxxAA Pure; RECxxxAA Pure-R
SEG Solar	SEG-xxx-BTB-BG; SEG-xxx-BTD-BG; SEG-xxx-BMB-HV; SEG-xxx-BMD-HV; SEG-xxx-BMB-BG; SEG-xxx-BMD-BG; SEG-xxx-BMB-TB; SEG-xxx-BMD-TB
Silfab	SIL-xxxHC
URE Co.	FBMxxxMFG; FBMxxxMFG-BB
Waaree	WSMDi-xxx
ZN Shine	ZXM7-UHLDD144-xxx/N; ZXM7-SHLDD144-xxx/M; ZXM6-NHLDD144xxx/M



Reviewed and approved  
Richard Pantel, P.E.  
NC Lic. No. 043326  
11/21/2023





# Non-Fusible Switching Devices & Safety Switches

## Product Selection

UL listed File No. E5239

**1**

DG321NRB

### 120/240 Vac General-Duty, Fusible, Single-Throw, continued



System	Ampere Rating	Fuse Type Provision	Maximum Horsepower Ratings <sup>①</sup>			DC 250V	NEMA 1 Enclosure Indoor Catalog Number	NEMA 3R Enclosure Rainproof Catalog Number
			Single-Phase AC 120V	240V	Three-Phase AC 240V			
<b>Cartridge Type—Three-Pole, Three-Wire (Three Blades, Three Fuses)—240 Vac</b>								
	30	—	—	—	—	—	②	②
	60	—	—	—	—	—	②	②
	100	—	—	—	—	—	②	②
	200	H	—	15	25-60	—	DG324FGK ③④	②
	400	H	—	—	50-125	—	DG325FGK ③④	DG325FRK ③④
	600	H	—	—	75-200	—	DG326FGK ③④	DG326FRK ③④
<b>Cartridge Type—Four-Wire (Three Blades, Three Fuses, S/N)—120/240 Vac</b>								
	30	H	—	1-1/2-3	3-7-1/2	—	DG321NGB	DG321NRB
	60	H	—	3-10	7-1/2-15	—	DG322NGB	DG322NRB
	100	H	—	7-1/2-15	15-30	—	DG323NGB	DG323NRB
	200	H	—	15	25-60	—	DG324NGK	DG324NRK
	400	H	—	—	50-125	—	DG325NGK	DG325NRK
	600	H	—	—	75-200	—	DG326NGK	DG326NRK

DG322URB

### 120/240 Vac General-Duty, Non-Fusible, Single-Throw



System	Ampere Rating	Maximum Horsepower Ratings			DC 250V	NEMA 1 Enclosure Indoor Catalog Number	NEMA 3R Enclosure Rainproof Catalog Number
		Single-Phase AC 120V	240V	Three-Phase AC 240V			
<b>Two-Pole, Two-Wire (Two Blades)—240 Vac</b>							
	30	2	3	—	—	DG221UGB ④	DG221URB ④
	60	3	10	—	—	DG222UGB ④	DG222URB ④
	100	—	15	—	—	DG223UGB ④	DG223URB ④
	200	—	15	—	—	④⑤	DG224URK ④
<b>Three-Pole, Three-Wire (Three Blades)—240 Vac</b>							
	30	2	3	7-1/2	—	DG321UGB ④	DG321URB ④
	60	3	10	15	—	DG322UGB ④	DG322URB ④
	100	—	15	30	—	DG323UGB ④	DG323URB ④
	200	—	15	60	—	DG324UGK ④	DG324URK ④
	400	—	—	125	—	DG325UGK ④	DG325URK ④
	600	—	—	200	—	DG326UGK ④	DG326URK ④

**Notes**

- ① Maximum hp ratings apply only when dual element time delay fuses are used.
- ② Use four-wire catalog numbers below.
- ③ Solid neutral bars are not included. Order separately from table on Page V2-T1-13.
- ④ **WARNING!** Switch is not approved for service entrance unless a neutral kit is installed.
- ⑤ Use three-wire catalog numbers below.

All general-duty safety switches are individually packaged.

Accessories are limited in scope on general-duty safety switches. See Page V2-T1-13 for availability. In addition, clear line shields are available as an accessory on 200-600A general-duty switches. Catalog Numbers: 200A = 70-7759-11, 400A = 70-8063-8, 600A = 70-8064-8.

# Fusible Switching Devices & Safety Switches

## Product Selection

### 120/240 Vac General-Duty, Fusible, Single Throw

#### Specifications

- 30 – 600 amperes.
- Suitable for service entrance applications unless otherwise noted.
- Horsepower rated.
- Bolt-on hub provision. Provided for general-duty switches in a NEMA 3R enclosure. See Page 8-7 for selection.
- UL listed File No. E5239. Meets UL 98 for enclosed switches and NEMA Std. KS-1.
- 200 – 600 ampere switches incorporate K-Series design.



DP221NGB



DG321NRB

**2**

**Table 8-40. 120/240 Vac General-Duty, Fusible, Single Throw**

System	Ampere Rating	Fuse Type Provision	Maximum Horsepower Ratings <sup>①</sup>				NEMA 1 Enclosure Indoor		NEMA 3R Enclosure Rainproof	
			Single-Phase ac		3-Phase ac	dc	Catalog Number	Price U.S. \$	Catalog Number	Price U.S. \$
			120 Volt	240 Volt	240 Volt	250 Volt				

**Fusible — Plug Type <sup>②</sup>**

**2-Wire (One Blade, One Fuse, S/N) — 120 Vac**

	30	Plug (Type S, T or W)	1/2-2	—	—	—	DP111NGB	—	—	—
--	----	-----------------------	-------	---	---	---	----------	---	---	---

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**3-Wire (Two Blades, Two Fuses, S/N) — 120/240 Vac**

	30	Plug (Type S, T or W)	1/2-2	1-1/2-3	—	—	DP221NGB	—	Use cartridge-type fuse catalog number DG221NRB	—
--	----	-----------------------	-------	---------	---	---	----------	---	---	---

**Fusible — Cartridge Type**

**2-Pole 2-Wire (Two Blades, Two Fuses) — 240 Vac**

	30	—	—	1-1/2-3	3-7-1/2	—	③	—	③	—
	60	—	—	3-10	7-1/2-15	—	③	—	③	—
	100	—	—	7-1/2-15	15-30	—	③	—	③	—
	200	—	—	15	25-60	—	③	—	③	—
	400	H	—	—	50-125	—	DG225FGK ④⑤	—	DG225FRK ④⑤	—
	600	H	—	—	75-200	—	DG226FGK ④⑤	—	DG226FRK ④⑤	—

**3-Wire (Two Blades, Two Fuses, S/N) — 120/240 Vac**

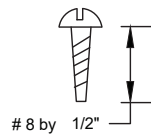
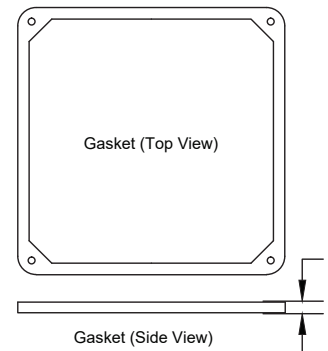
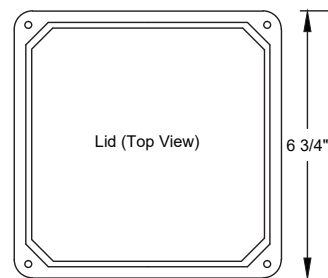
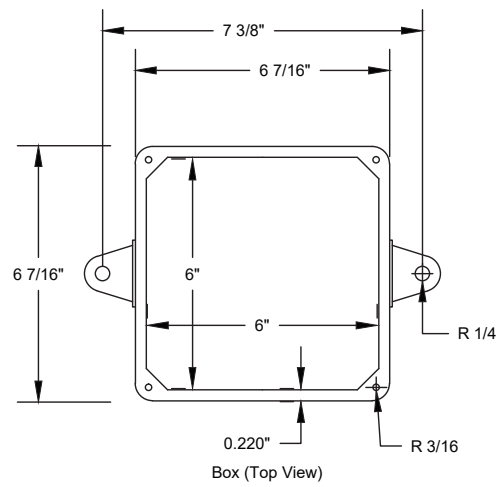
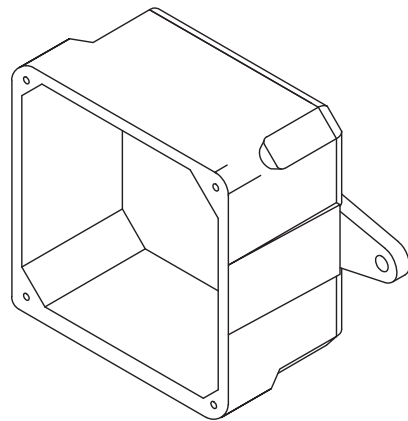
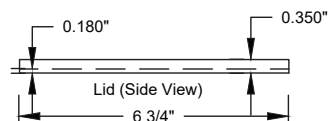
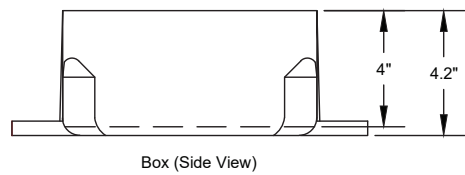
	30	H	—	1-1/2-3	3-7-1/2 ⑥	—	DG221NGB	—	DG221NRB	—
	60	H	—	3-10	7-1/2-15 ⑥	—	DG222NGB	—	DG222NRB	—
	100	H	—	7-1/2-15	15-30 ⑥	—	DG223NGB	—	DG223NRB	—
	200	H	—	15	25-60 ⑥	—	DG224NGK	—	DG224NRK	—
	400	H	—	—	50-125 ⑥	50	DG225NGK	—	DG225NRK	—
	600	H	—	—	75-200 ⑥	—	DG226NGK	—	DG226NRK	—

- ① Maximum hp ratings apply only when dual element time delay fuses are used.
- ② These switches do not have an interlock which prevents door from being opened when switch is in the ON position.
- ③ Use 3-wire catalog numbers below.
- ④ Solid neutral bars are not included. Order separately from Table 8-1 on Page 8-5.
- ⑤ **WARNING!** Switch is not approved for service entrance unless a neutral kit is installed.
- ⑥ Grounded B phase rating, UL listed.

**Note:** All general-duty safety switches are individually packaged.

**Note:** Accessories are limited in scope on general-duty safety switches. See Page 8-5 for availability. In addition, clear line shields are available as an accessory on 200 – 600 ampere general-duty switches. Catalog Numbers: 200 A = 70-7759-11, 400 A = 70-8063-8, 600 A = 70-8064-8.

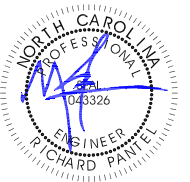
Discount Symbol ..... **22CD**



UL Listed  
 Marine Listed  
 UL File # E205935 (QCUP)  
 UL Control # 92CM  
 Material is Rigid PVC  
 132 cu in Volume (2163 cu cm)  
 Screws are Zinc Plated Steel  
 Gasket is neoprene



<b>CANTEX</b> INC. Fort Worth, TEXAS		
<b>Junction Box 6 x 6 x 4</b>		
Drawn By: O.M.	Date: 6/19/17	5133710



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**Project information**

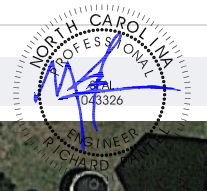
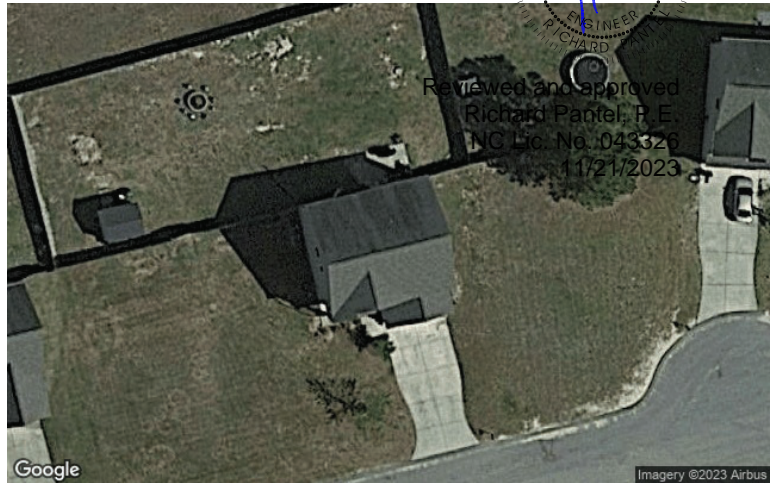
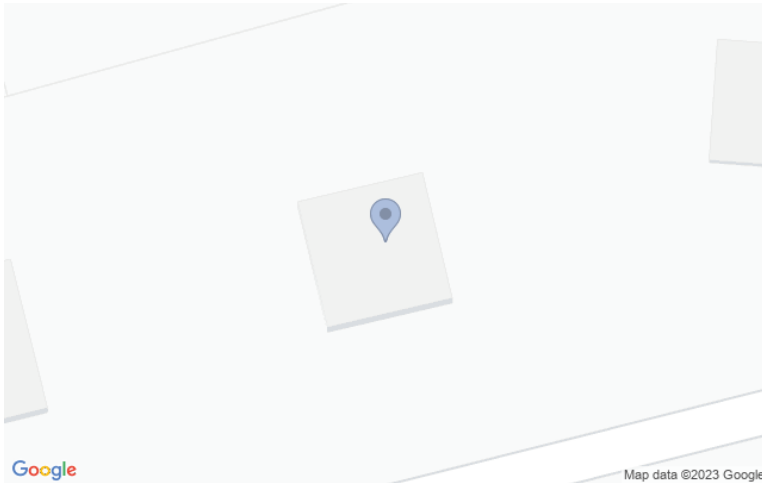
Address	<b>271 Horse Whisperer Lane, Lillington, NC 27546</b>	Project Name	<b>NC Frederick Bushey</b>	AHJ	<b>Harnett County</b>
		Project Number	<b>113163</b>	Wind Speed	<b>120.0 mph</b>
		ASCE	<b>7-16</b>	Wind Exposure	<b>B</b>
		Risk Category	<b>II</b>	Snow Load	<b>10 psf</b>

**Equipment type**

PV Module	<b>Mission Solar MSE395SX9R</b>
Inverter type	<b>Enphase Energy Inc. IQ8X-BAT-US-NB [240V]</b>

**Summary**

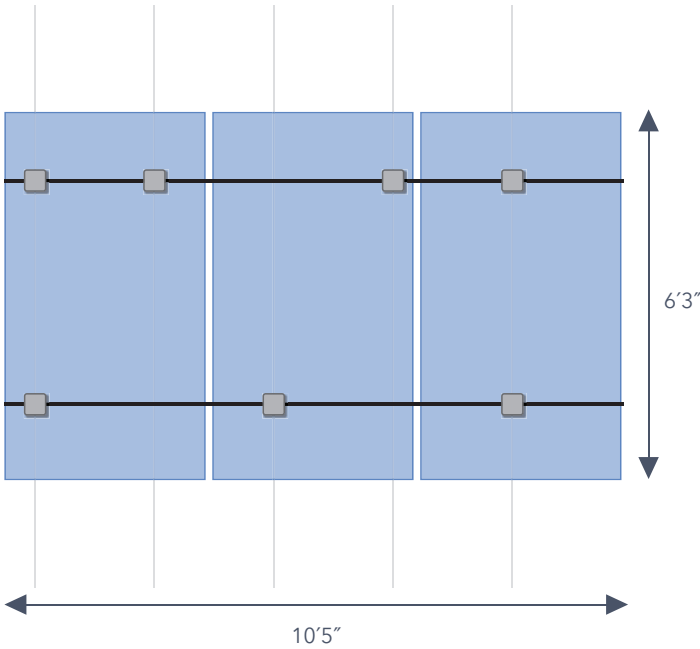
Total Modules	<b>20</b>
Total Watts	<b>7900 W</b>
Total Attachments	<b>41</b>

**Location preview**


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**Arrays**

<b>Array 1</b> 	Roof Type: <b>Gable</b> Roof Material: <b>Comp</b>	SkipRail: <b>No</b> Roof Slope: <b>34°</b>	<b>Array 2</b> 	Roof Type: <b>Gable</b> Roof Material: <b>Comp</b>	SkipRail: <b>No</b> Roof Slope: <b>34°</b>
--------------------	---	---	--------------------	---	---

**Array 1 Dual Rail**

**Zones: Details**

- 1 Roof Type: **34° Comp Gable**
- 2 Rafter Spacing: **24.0"**
- 3 SkipRail: **No**
- Use Scrap Rail: **Yes**

Hidden End Clamp: **Yes**  
 Attachment Type: **Instaflash**  
 Rail: **0 x 7ft, 2 x 14ft**

**Layout**

 Panels: **3**

 Panel Size: **75.08" x 41.5" x 40mm**
**Design Notes**

System Weight: **172.0 lbs**  
 Attachments: **7**

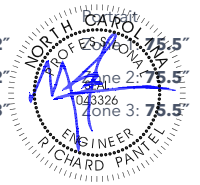
System Weight/Attachment: **24.6 lbs**  
 Total Area: **433 sqft**

**Engineering**
**Exposed Mounts:**

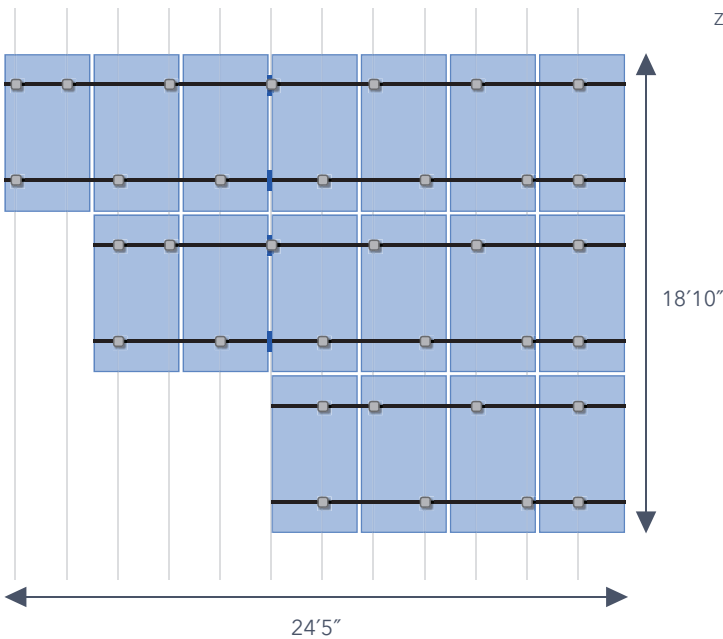
Landscape	Portrait
Zone 1: <b>100.0"</b>	Zone 1: <b>75.5"</b>
Zone 2: <b>100.0"</b>	Zone 2: <b>71.0"</b>
Zone 3: <b>100.0"</b>	Zone 3: <b>62.0"</b>

**Non-exposed Mounts:**

Landscape	Portrait
Zone 1: <b>102.2"</b>	Zone 1: <b>75.5"</b>
Zone 2: <b>102.2"</b>	Zone 2: <b>75.5"</b>
Zone 3: <b>101.3"</b>	Zone 3: <b>75.5"</b>



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**Array 2 Dual Rail**

**Zones: Details**

- 1 Roof Type: **34° Comp Gable**
- 2 Rafter Spacing: **24.0"**
- 3 SkipRail: **No**
- Use Scrap Rail: **Yes**

Hidden End Clamp: **Yes**  
 Attachment Type: **Instaflash**  
 Rail: **2 x 7ft, 8 x 14ft**

**Layout**

 Panels: **17**

 Panel Size: **75.08" x 41.5" x 40mm**
**Design Notes**

System Weight: **952.7 lbs**  
 Attachments: **34**

System Weight/Attachment: **28.0 lbs**  
 Total Area: **433 sqft**

**Engineering**
**Exposed Mounts:**

Landscape	Portrait
Zone 1: <b>100.0"</b>	Zone 1: <b>75.5"</b>
Zone 2: <b>100.0"</b>	Zone 2: <b>71.0"</b>
Zone 3: <b>100.0"</b>	Zone 3: <b>62.0"</b>

**Non-exposed Mounts:**

Landscape	Portrait
Zone 1: <b>102.2"</b>	Zone 1: <b>75.5"</b>
Zone 2: <b>102.2"</b>	Zone 2: <b>75.5"</b>
Zone 3: <b>101.3"</b>	Zone 3: <b>75.5"</b>



**Bill of Materials**

Part Info	Array 1	Array 2	Spares	Total QTY
<b>PSR-B84</b>   Pegasus Rail - Black 84"	-	2	-	2
<b>PSR-B168</b>   Pegasus Rail - Black 168"	2	8	-	10
<b>PSR-SPL</b>   Pegasus - Bonded Structural Splice	-	4	-	4
<b>PSR-MCB</b>   Pegasus - Multi-Clamp - Mid/End 30-40mm - Full Black	4	28	-	32
<b>PSR-HEC</b>   Pegasus - Hidden End Clamp	4	12	-	16
<b>PSR-MLP</b>   Pegasus - MLPE Mount	3	17	-	20
<b>PSR-LUG</b>   Pegasus - Ground Lug	1	1	-	2
<b>PSR-NSJ</b>   Pegasus - North-South Bonding Jumper	-	2	-	2
<b>PSR-WMC</b>   Pegasus - Wire Management Clip	5	26	-	31
<b>PSR-CBG</b>   Pegasus - Cable Grip	1	3	-	4
<b>PSR-CAP</b>   Pegasus - End Cap	4	12	-	16
<b>PIF-RBDT</b>   Pegasus InstaFlash - Black - Dovetail T-bolt	7	34	-	41



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**Service Load Calculation**

271 Horse Whisperer Lane Lillington, NC 27546

**220.83(A)** An existing dwelling unit has electrical service with a main service disconnect of None

**Solution**

Step 1. Following 220.83(A), calculate the existing dwelling unit load before the addition:

[Max Load (A) / 1.25 \* 240 (V) = Existing Load (VA)]

General Lighting:

0 sqft x 3 VA per sqft 0 VA

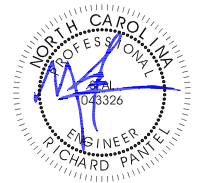
Non-Lighting Small-Appliance Circuits:

0 x 1500 VA 0 VA

Large-Appliance Circuits:

Subpanel #1 17280 VA

Subpanel #2 13440 VA



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**TOTAL EXISTING LOAD 30720 VA**

Step 2. Determine new loads of the dwelling unit:

0 x # of Tesla Powerwalls (5000 VA each) 0 VA

---

**TOTAL NEW LOAD 0 VA**

Step 3. Following 220.83(A), calculate dwelling unit total load after the addition:

First 8 kVA of other load at 100% = 8000 VA

Remainder of other load at 40%

30720 + 0 - 8000 = 22720 x .4 = 9088 VA

---

**TOTAL LOAD 17088 VA**

Step 4. Determine if service is properly rated to handle additional load:

17088 VA ÷ 240 V = 71.2 A or **72 Amps**

**ERROR - YOUR SYSTEM MUST HAVE A MAIN BREAKER FOR LOAD CALCULATIONS None A**