PV SYSTEM SUMMARY:

SYSTEM SIZE (DC): 10.35kW

MODULES:[30] X [MISSION SOLAR MSE345SX5T 345W MODULE]

INVERTER:[30]X[ENPHASE IQ7PLUS-72-2-US 290W MICROINVERTERS]

MAIN SERVICE PANEL: [200AMP]

INTERCONNECTION: [PIERCE TAPS]

OCPD: [EATON DG222NRB OR EQUIV.PV SYSTEM AC 60A DISCONNECT SWITCH FUSED AT 50A, 120/240V 2P]

STRINGS: [3 STRINGS OF 10 MODULES]

POWER COMPANY: DUKE ENERGY PROGRESS

TABLE OF CONTENTS

CITY NOTES:

THIS PROJECT COMPLIES WITH THE FOLLOWING:

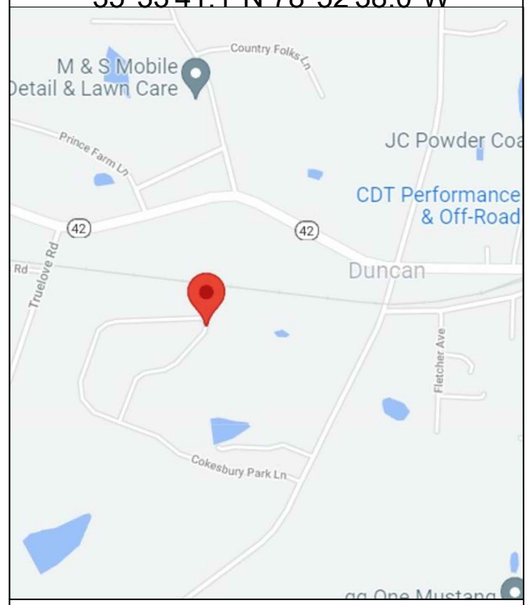
- 2018 INTERNATIONAL BUILDING CODE (IBC)
- 2017 NATIONAL ELECTRIC CODE (NEC)
- 2018 INTERNATIONAL FIRE CODE (IFC)
- 2018 INTERNATIONAL RESIDENTIAL CODE (IRC)
- 2018 NORTH CAROLINA RESIDENTIAL CODE (NCRC)
- NC STATEWIDE UNIFORM REQUIREMENTS OF INSPECTION PROCEDURES FOR SOLAR PHOTOVOLTAIC SYSTEMS INSTALLED ON ROOFTOPS

GENERAL NOTES:

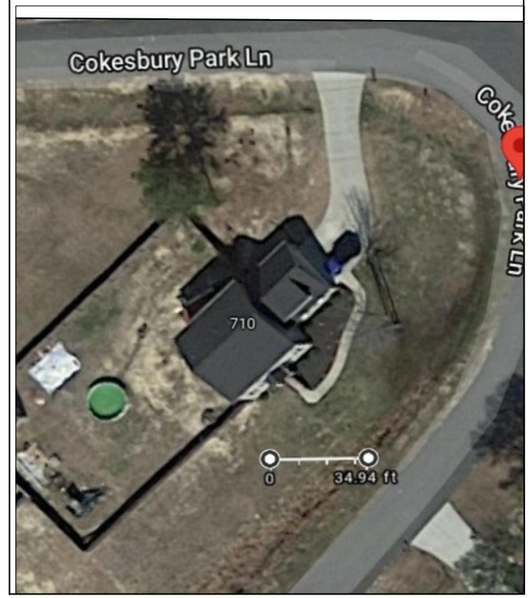
- ALL SOLAR ENERGY SYSTEMS EQUIPMENT WILL BE SCREENED TO THE MAXIMUM EXTENT POSSIBLE
- ROOF STRUCTURE WILL BE VERIFIED PRIOR TO INSTALLATION
- PHOTOVOLTAIC SYSTEMS SHALL BE PERMITTED TO SUPPLY A BUILDING OR OTHER STRUCTURE IN ADDITION TO ANY OTHER ELECTRICAL SUPPLY SYSTEM(S) (NEC 690.4(A))
- INVERTERS, MOTOR GENERATORS, PV MODULES, PV PANELS, AC MODULES, DC COMBINERS, DC-TO-DC CONVERTERS, AND CHARGE CONTROLLERS INTENDED FOR USE IN PV SYSTEMS SHALL BE LISTED OR FIELD LABELED FOR THE PV APPLICATION (NEC 690.4 (B))
- PV SYSTEM CIRCUIT CONDUCTORS SHALL BE IDENTIFIED AT ALL ACCESSIBLE POINTS OF TERMINATION, CONNECTION, AND SPLICED (NEC 690.31((B))(1))
- INSULATED CONDUCTORS OR CABLES USED WHERE EXPOSED TO DIRECT RAYS OF THE SUN SHALL BE LISTED OR COVERED WITH INSULATING MATERIAL THAT IS LISTED AS BEING SUNLIGHT RESISTANT (NEC 310.10(D)(1&2))
- ALL OUTDOOR EQUIPMENT SHALL BE NEMA 3R RATED
- VENTS ON ROOF SHALL NOT BE COVERED BY MODULES

GPS LOCATION:

35°33'41.1"N 78°52'38.0"W



AERIAL VIEW:



10.35kW ROOF MOUNT PHOTOVOLTAIC SYSTEM

ANNUAL SYSTEM PRODUCTION 11002kWH/YEAR

Customer:

ERIC KIESELHORST

Project location:

680 COKESBURY PARK LN, FUQUAY VARINA, NC 27526

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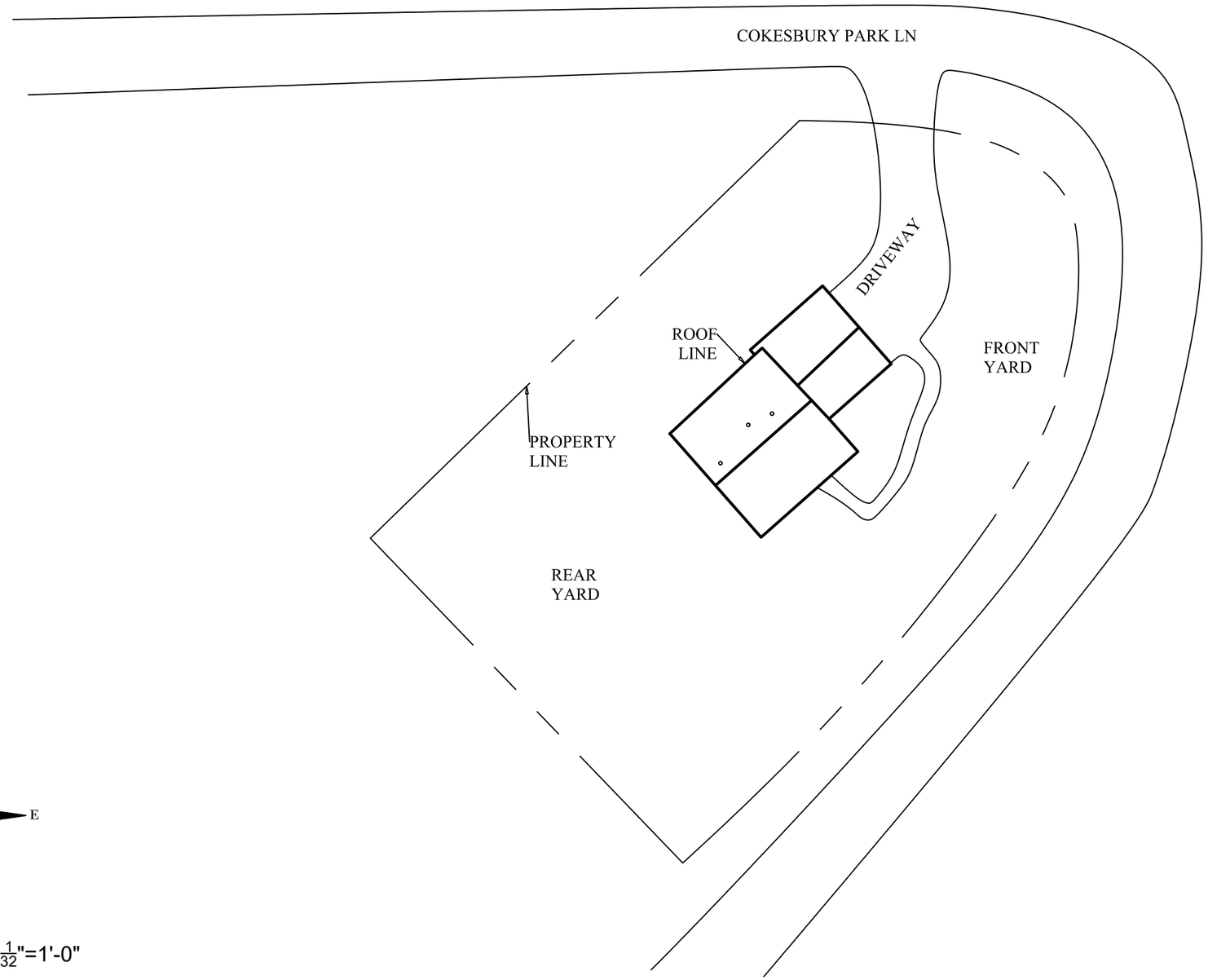
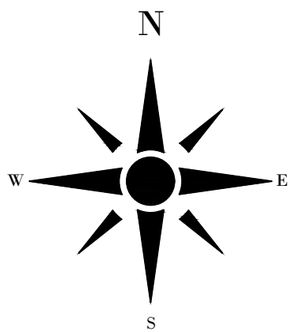
Power Co:	DUKE ENERGY PROGRESS
Project #:	----
Drawn By:	R.TINITALI
Date:	11/4/2021

Title: Cover Sheet

Sheet: S1

Rev: 0





SCALE: $\frac{1}{32}$"=1'-0"

10.35kW ROOF MOUNT
PHOTOVOLTAIC SYSTEM

ANNUAL SYSTEM PRODUCTION
11002kWH/YEAR

Customer:

ERIC KIESELHORST

Project location:

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Sheet: S2

Rev: 0

[3] STRING OF 10 MODULES] [MISSION SOLAR MSE345SX5T 345W MODULE MODULES USING ENPHASE IQ7PLUS-72-2-US 290W MICROINVERTERS

ROOF & MOUNTING

Roof Type: COMP. SHINGLE

Attachment Type:UNIRAC

Engineered RAFTER Size: 2X4

Arrays

Array	Azimuth	Pitch	QTY	AREA
1	150°	11/12	21	417ft²
2	330°	11/12	9	179ft²

TOTAL ARRAY AREA: 595ft²

TOTAL ROOF AREA: 1801ft²

%OF ARRAY COVERAGE: 33%

NOTES:

1. ATTACH CLAMPS AT 25% FROM EDGE AND 50% FROM THE CENTER OF MODULES
2. COMBINER BOX MOUNTED TO THE RAIL

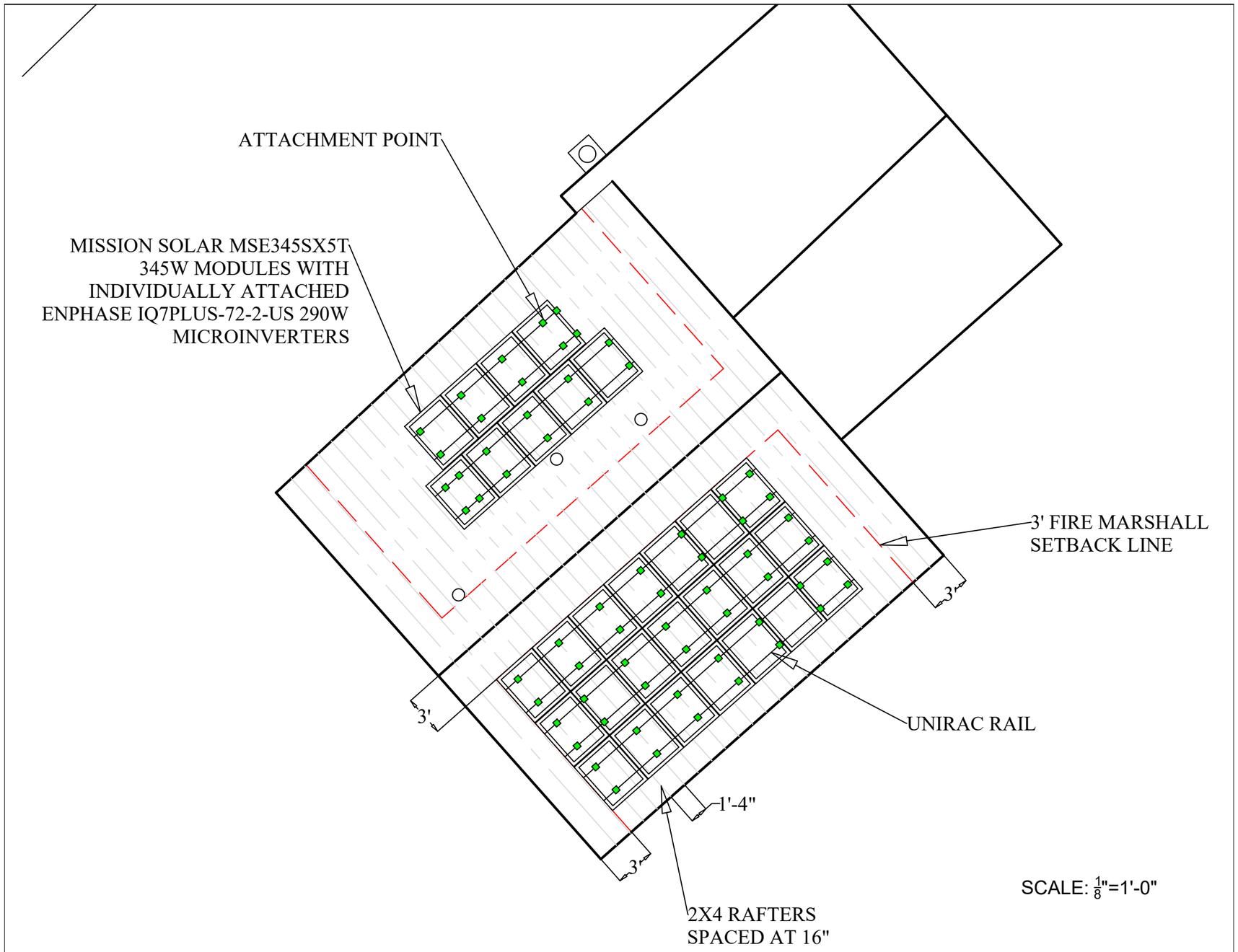
LEGEND:

VENT PIPES

DORMER VENTS

CHIMNEY

VENT/SKYLIGHT



SCALE: $\frac{1}{8}$"=1'-0"

10.35kW ROOF MOUNT PHOTOVOLTAIC SYSTEM

ANNUAL SYSTEM PRODUCTION 11002kWH/YEAR

Customer:

ERIC KIESELHORST

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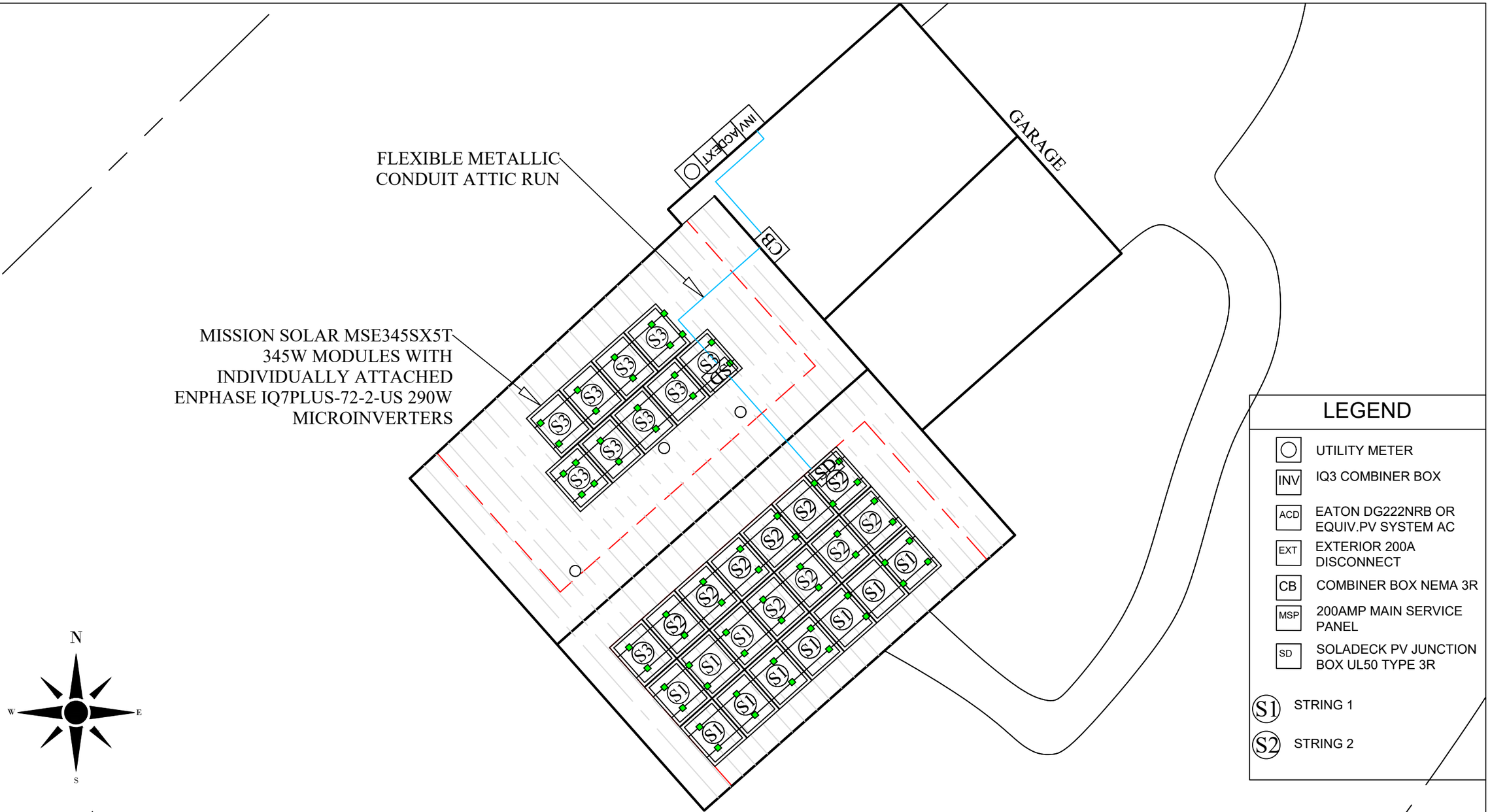
Drawn By:	R.TINITALI
Date:	11/4/2021

Title: ROOF MOUNT W/ MOD LAYOUT

Sheet: S2A

Rev: 0



10.35kW ROOF MOUNT PHOTOVOLTAIC SYSTEM

ANNUAL SYSTEM PRODUCTION 11002kWH/YEAR

Customer:

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Title: MODULE LAYOUT

Sheet: E3

Rev: 0

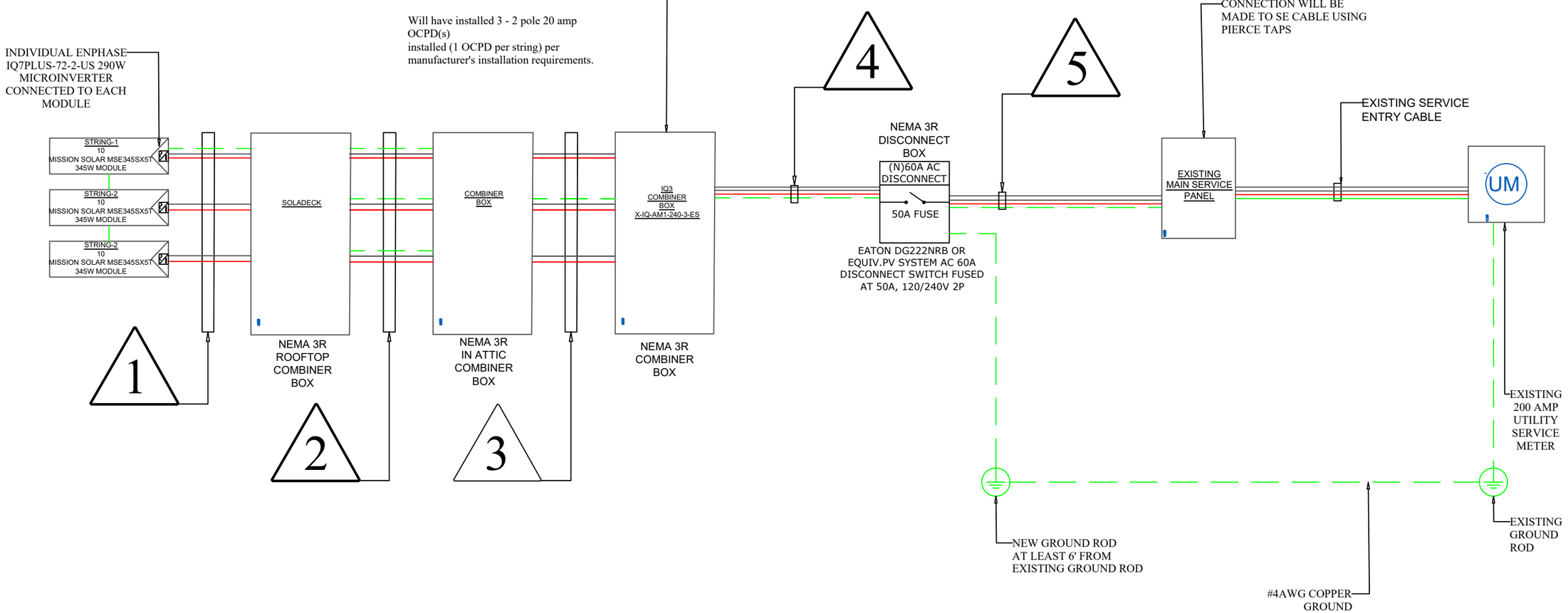
ALL COMPONENTS SHOWN ARE NEW UNLESS LABELED AS EXISTING

ENPHASE PV COMBINER BOX
Will contain a 2 pole 10 amp OCPD for/and ENVOY Communication system pre-installed by manufacturer.

CONSUMPTION CTS TO BE INSTALLED

Will have installed 3 - 2 pole 20 amp OCPD(s)
installed (1 OCPD per string) per manufacturer's installation requirements.

INDIVIDUAL ENPHASE IQ7PLUS-72-2-US 290W MICROINVERTER CONNECTED TO EACH MODULE



CONDUIT AND CONDUCTOR SCHEDULE

TAG	DESCRIPTION OR CONDUCTOR TYPE	CONDUCTOR GAUGE	NUMBER OF CONDUCTORS	CONDUIT TYPE	CONDUIT SIZE	GROUND WIRE GAUGE	NUMBER OF GROUND CONDUCTORS
1	PV WIRE	12	6	N/A	N/A	4	1
2	THWN-2	12	6	FMC	3/4"	12	2
3	THWN-2	12	6	FMC	3/4"	10	1
4	THWN-2	8	3	EMT OR EQUIV	3/4"	10	1
5	THWN-2	8	3	EMT OR EQUIV	3/4"	10	1

10.35kW ROOF MOUNT PHOTOVOLTAIC SYSTEM

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Drawn By:	R.TINITALI
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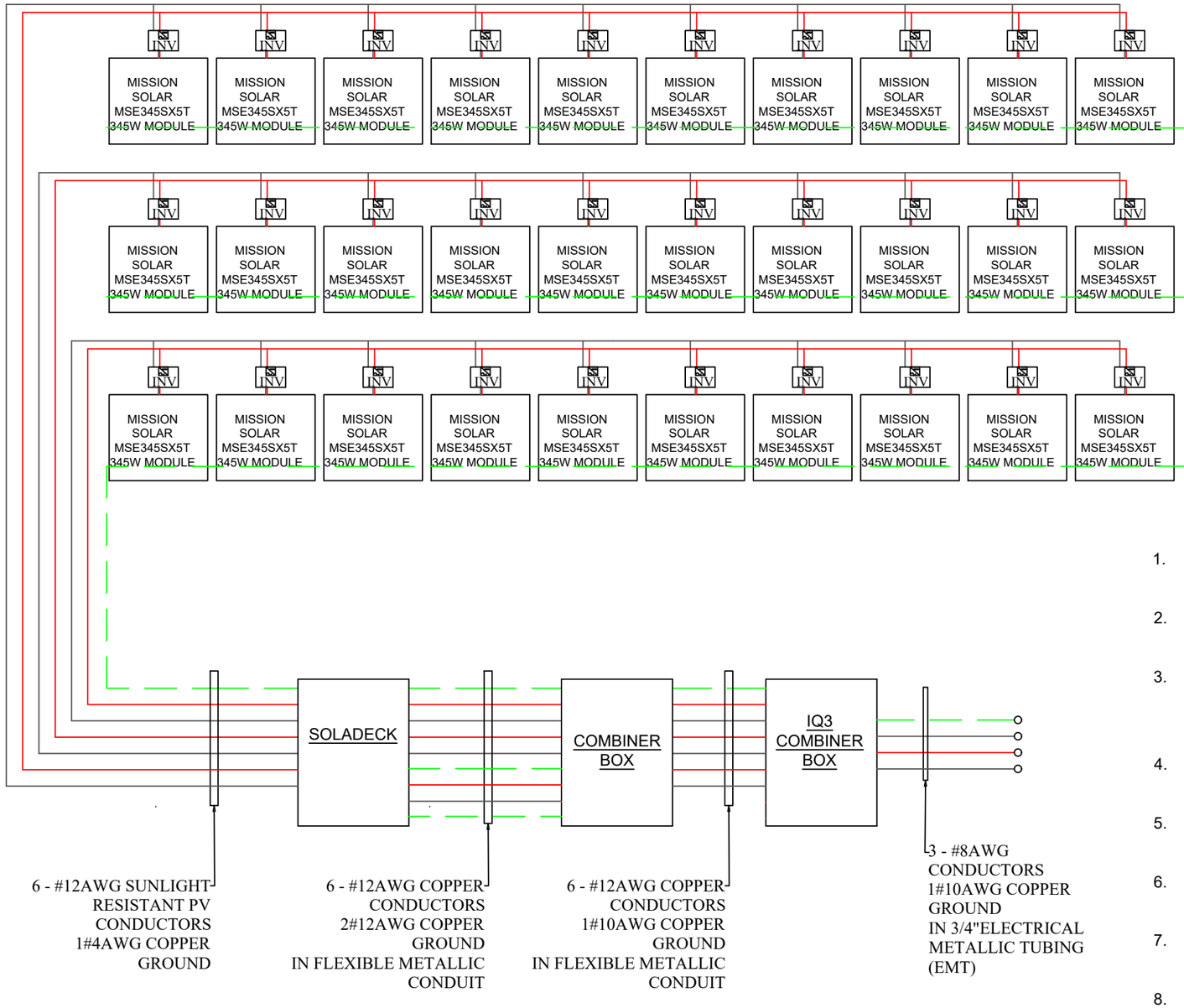
Title: POWER RISER DIAGRAM

Sheet: E4

Rev: 0



1. SOLAR ARRAY SHALL BE 30 MISSION SOLAR MSE345SX5T 345W MODULE MODULES WITH INDIVIDUALLY ATTACHED ENPHASE IQ7PLUS-72-2-US 290W MICROINVERTERS
2. GROUNDING MUST BE CONTINUOUS AND INSTALLED TO ALLOW FOR MODULE REMOVAL WITH DISRUPTING CONTINUITY
3. ALL EQUIPMENT INSTALLED IN ACCORDANCE WITH 2017 NEC. SPECIFICALLY SECTION 690 AND ALL APPLICABLE REQUIREMENTS OF SERVICE UTILITY AND AUTHORITY HOLDING JURISDICTION (AHJ)
4. PV SYSTEM SHALL BE INSTALLED PER MANUFACTURERS REQUIREMENTS AND INSTALLATION GUIDELINES
5. ALL CONDUIT BODIES RELATED TO PV ARRAY WILL BE LABELLED WITH STICKERS DESIGNATING THEM AS SOLAR CIRCUITS
6. LABEL INDICATING THE PV AC OUTPUT AMPACITY AND VOLTAGE WILL BE PLACED ON SOLAR DISCONNECT
7. THE POINT OF CONNECTION TO UTILITY SHALL BE LABELED AS HAVING A "DUAL POWER SUPPLY"
8. MANUFACTURERS INSTALLATION SPECIFICATIONS AND WIRING REQUIREMENTS WILL BE FOLLOWED ACCORDINGLY

10.35kW ROOF MOUNT PHOTOVOLTAIC SYSTEM

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Date:	11/4/2021

Title: STRING DIAGRAM

Sheet: E5

Rev: 0

WARNING PLACARDS

WARNING

ELECTRIC SHOCK HAZARD
THE DC CONDUCTORS OF THIS PHOTOVOLTAIC SYSTEM ARE UNGROUNDED AND MAY BE ENERGIZED

LABEL LOCATION
DC DISCONNECT,INVERTER
[PER CODE: NEC 690.41)]
[To be used when inverter is ungrounded]

WARNING

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

DC VOLTAGE IS ALWAYS PRESENT WHEN SOLAR MODULES ARE EXPOSED TO SUNLIGHT

LABEL LOCATION
AC DISCONNECT,POINT OF INTERCONNECTION
[PER CODE: NEC 690.13(B)]

WARNING

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

LABEL LOCATION
AC DISCONNECT,POINT OF INTERCONNECTION
[PER CODE: NEC 690.13(B)]

WARNING-Electric Shock Hazard
No User Serviceable Parts inside
Contact authorized service provide for assistance

LABEL LOCATION
INVERTER, JUNCTION BOXES(ROOF),
AC DISCONNECT
[PER CODE: NEC 690.13]

WARNING:PHOTOVOLTAIC POWER SOURCE

LABEL LOCATION
CONDUIT, COMBINER BOX
[PER CODE: NEC690.31(G)(3)]

WARNING
DUAL POWER SOURCE SECOND SOURCE IS PHOTOVOLTAIC SYSTEM

LABEL LOCATION
POINT OF INTERCONNECTION
[PER CODE: NEC705.12(D)(4)]

PHOTOVOLTAIC SYSTEM DC DISCONNECT

MAXIMUM VOLATAGE	480	VDC
MAXIMUM CIRCUIT CURRENT	30	ADC
MAX RATED OUTPUT CURRENT OF THE CHARGE CONTROLLER OR DC TO DC CONCERTER (IF INSTALLED)	15	ADC

LABEL LOCATION
DC DISCONNECT SWITCH, INVERTER
REF. CODE: NEC 690.14(C)(2), NEC 690.53

PHOTOVOLTAIC SYSTEM AC DISCONNECT SWITCH

RATED AC OPERATING CURRENT	32.00	AMPS AC
AC NOMINAL OPERATING VOLTAGE	240	VAC

LABEL LOCATION
AC DISCONNECT , POINT OF INTERCONNECTION
[PER CODE: NEC 690.54]

WARNING
INVERTER OUTPUT CONNECTION DO NOT RELOCATE THIS OVER-CURRENT DEVICE

LABEL LOCATION
POINT OF INTERCONNECTION
(PER CODE: NEC 705.12(2)(b)
[Not Required if Panel board is rated not less than sum of ampere ratings of all overcurrent devices supplying it]

CAUTION: SOLAR CIRCUIT

LABEL LOCATION
MARKINGS PLACED ON ALL INTERIOR AND EXTERIOR DC CONDUIT, RACEWAYS, ENCLOSURES AND CABLE ASSEMBLES AT LEAST EVERY 10 FT, AT TURNS AND ABOVE/BELOW PENETRATIONS AND ALL COMBINER/JUNCTION BOXES.
(PER CODE: IFC605.11.1.4)

SOLAR DISCONNECT

LABEL LOCATION
DISCONNECT, POINT OF INTERCONNECTION
[PER CODE: NEC690.13(B)]

CAUTION: SOLAR ELECTRIC SYSTEM CONNECTED

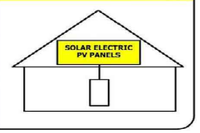
LABEL LOCATION
WEATHER RESISTANT MATERIAL, DURABLE ADHESDIVE, UL969 AS STANDARD TO WEATHER RATING (UL LISTING OF MARKINGS NOT REQUIRED), MIN ⅜" LETTER HEIGHT ARIAL OR SIMILAR FONT NON-BOLD,PLACED WITHIN THE MAIN SERVICE DISCONNECT,PLACED ON THE OUTSIDE OF THE COVER WHEN DISCONNECT IS OPERATED WITH THE SERVICE PANEL CLOSED.
(PWER CODE: NEC690.15 ,690.13(B))

RAPID SHUTDOWN SWITCH FOR SOLAR SYSTEM

LABEL LOCATION
INVERTER,POINT OF INTERCONNECTION
[PER CODE: NEC 690.56(C)(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

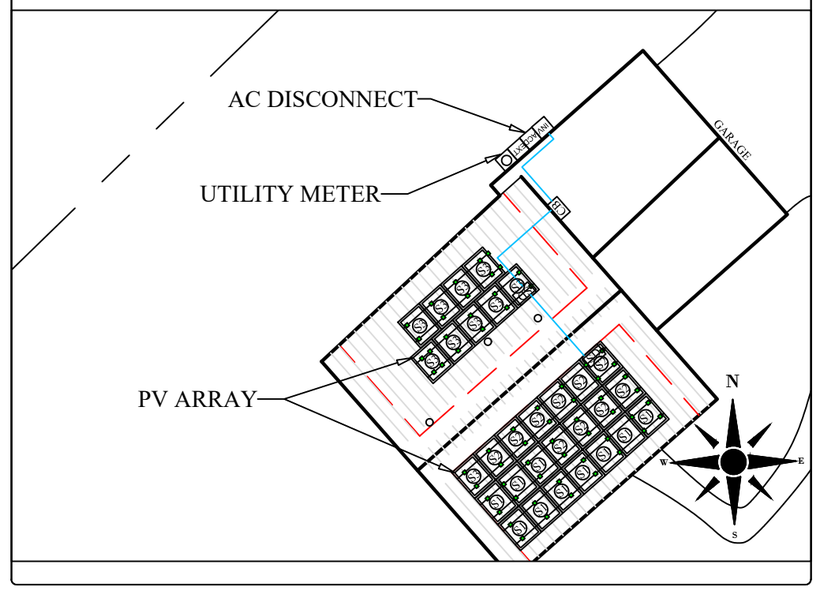


LABEL LOCATION
POINT OF INTERCONNECTION
(PER CODE: NEC690.56(C))

ALL PLACARDS SHALL BE OF WEATHER PROOF CONSTRUCTION, BACKGROUND ON ALL PLACARDS SHALL BE RED WITH WHITE LETTERING U.O.N.
PLACARD SHALL BE MOUNTED DIRECTLY ON THE EXISTING UTILITY ELECTRICAL SERVICE FASTENERS APPROVED BY THE LOCAL JURISDICTION
NOTE: ALL SIGNAGE CANNOT BE HAND WRITTEN NEC 110.21

⚠ CAUTION ⚠

POWER TO THIS BUILDING IS ALSO SUPPLIED FROM THE FOLLOWING SOURCES WITH DISCONNECTS AS SHOWN:



10.35kW ROOF MOUNT PHOTOVOLTAIC SYSTEM

ANNUAL SYSTEM PRODUCTION 11002kWH/YEAR

Customer:
ERIC KIESELHORST

Project location:
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Title:
LABELS

Sheet:
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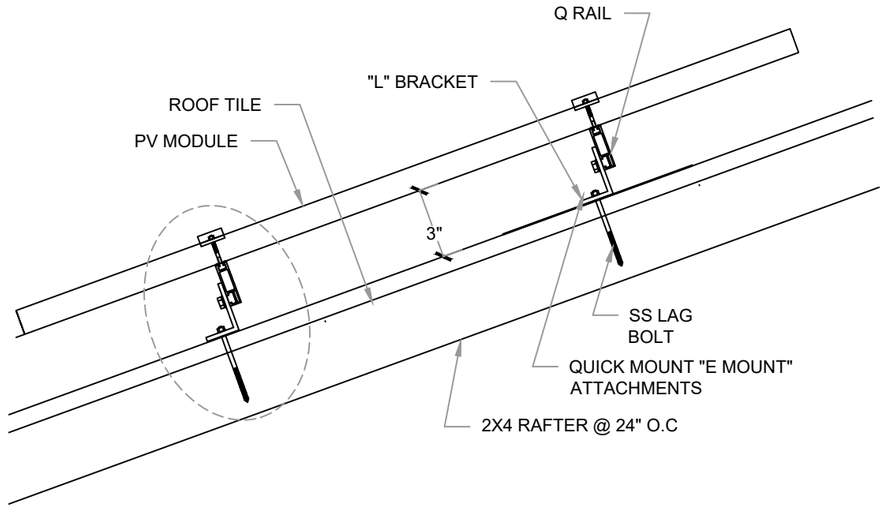
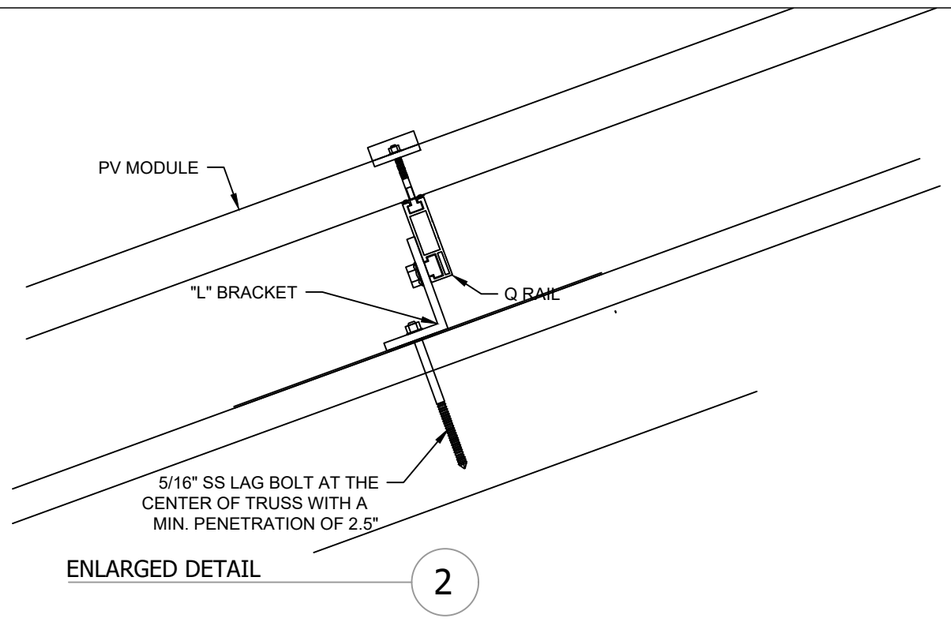
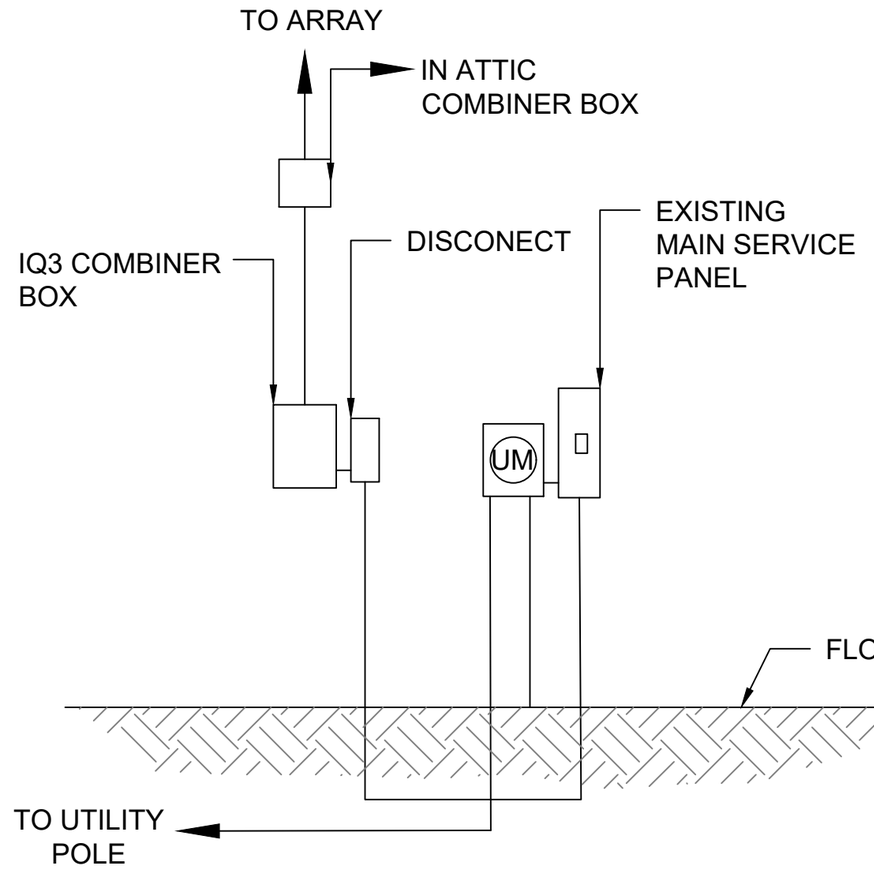


ATTACHMENT DETAIL 1



ENLARGED DETAIL 2



10.35kW ROOF MOUNT PHOTOVOLTAIC SYSTEM

Customer:
ERIC KIESELHORST

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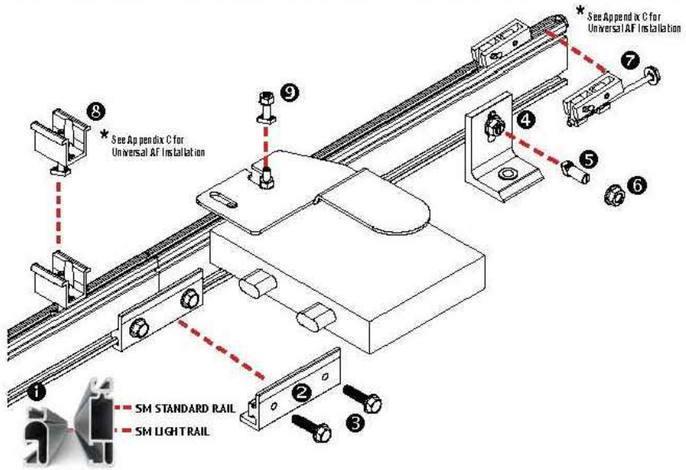
Title: ATTACHMENT DETAIL

Sheet: S7

Rev: 0

SM SOLAR MOUNT — PRO SERIES SYSTEM COMPONENTS — INSTALLATION GUIDE — A PAGE



❶ **RAIL:** Supports PV modules. Use at least two per row of modules. Aluminum extrusion, available in mill, clear anodized, or dark anodized.

❷❸ **RAIL SPLICE:** Non structural splice joins, aligns, and electrically bonds rail sections into single length of rail. Forms a rigid splice joint, 4 inches long, preassembled with bonding hardware. Available in dark anodized or mill finish.

❹ **L-FOOT:** Use to secure rails through roofing material to building structure. Refer to loading tables or U-Builder for spacing.

❺ **L-FOOT T-BOLT:** (3/8" x ¾" or 1") – Use one per L-foot to secure rail to L-foot. Stainless steel. Supplied with L-foot in combination with flange nut,
provides electrical bond between L-foot and rail.

❻ **SERRATED FLANGE NUT:** Use one per L-foot to secure and bond rail to Lfoot. Stainless steel. Supplied with L-foot.

❼ **MODULE ENDCLAMP:** Pre-assembled universal clamp that secures module to rail at module flange by tightening 1/2" hex head bolt.

❽ **MODULE MIDCLAMP:** Pre-assembled clamp provides module to module and module to rail bond. Aluminum clamp with stainless steel bonding pins and T-bolt. Available in clear or dark finish.

❾ **MICROINVERTER MOUNTING BOLT:** Preassembled bolt, nut, and captive star washer attaches and bonds microinverter to rail.

NOTE - POSITION INDICATOR: T-bolts have a slot in the hardware end corresponding to the direction of the T-Head.

Wrenches and Torque		
	Wrench or Socket Size	Recommended Torque (ft-lbs)
Mid Clamp ❽	1/2"	11
MLPE Mount ❾	1/2"	10
End Clamp ❼	1/2"	5
L-Foot to Rail ❹	1/2"	30
Rail Splice ❷	1/2"	10

Anti-Seize ❻❾

Stainless steel hardware can seize up, a process called galling. To significantly reduce its likelihood:
1. Apply minimal lubricant to bolts only where indicated in installation process, preferably Anti-Seize commonly found at auto parts stores (Anti-seize has been factory applied to mid clamp bolts)
2. Shade hardware prior to installation, and
3. Avoid spinning stainless nuts onto bolts at high speed.

SM SOLAR MOUNT — SYSTEM LAYOUT — INSTALLATION GUIDE — B PAGE

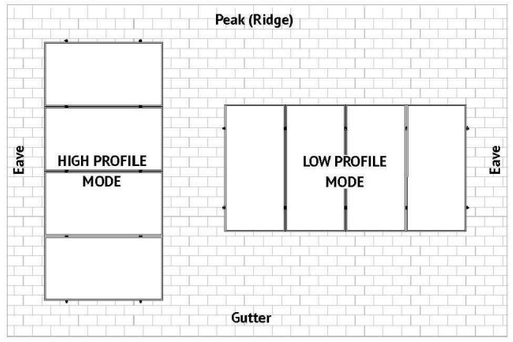
PLANNING YOUR SOLARMOUNT INSTALLATIONS

The installation can be laid out with rails parallel to the rafters or perpendicular to the rafters. Note that SOLARMOUNT rails make excellent straight edges for doing layouts.
Center the installation area over the structural members as much as possible.
Leave enough room to safely move around the array during installation. Some building codes and fire codes require minimum clearances around such installations, and the installer should check local building code requirements for compliance.
The length of the installation area is equal to:

Standard Series:
- the total width of the modules,
- plus 1/4" inch for each space between modules (for mid- clamp),
- plus approximately 3" (1½ inches for each Endclamp)

Pro Series:
- the total width of the modules,
- plus 1" inch for each space between modules (for mid- clamp),
- plus 0 to 1" (0 to ½ inches for each Endclamp)

RAILS MAY BE PLACED PARALLEL OR PERPENDICULAR TO RAFTERS



LAYING OUT L-FEET FOR TOP CLAMPS

L-feet, in conjunction with proper flashing equipment and techniques, can be used for attachment through existing roofing material, such as asphalt shingles, sheathing or sheet metal to the building structure.

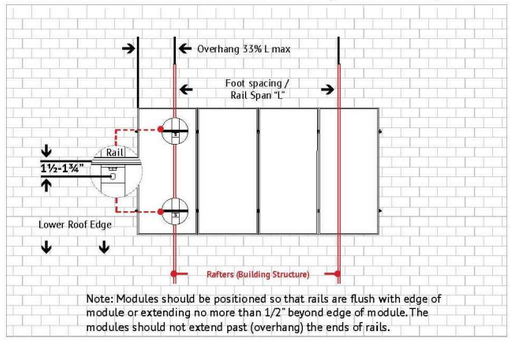
Locate and mark the position of the L-feet lag screw holes within the installation area as shown below. Follow manufacturer module installation guide for rail spacing based on appropriate mounting locations

NOTE: FOR EXPANSION JOINT REQUIREMENTS, REFER TO PAGE F. RAIL LENGTHS AND LOCATIONS OF L-FEET FOR EXPANSION JOINTS WILL NEED TO BE DETERMINED AT THIS STAGE IN PLANNING SYSTEM LAYOUT.

If multiple rows are to be installed adjacent to one another, it is not likely that each row will be centered above the rafters. Adjust as needed, following the guidelines below as closely as possible.

Refer to Unirac Solarmount D&E Guide & U-Builder for allowable spans and cantilevers.

LAYOUT WITH RAILS PERPENDICULAR TO RAFTERS (RECOMMENDED)



Note: Modules should be positioned so that rails are flush with edge of module or extending no more than 1/2" beyond edge of module. The modules should not extend past (overhang) the ends of rails.

10.35kW ROOF MOUNT PHOTOVOLTAIC SYSTEM

FOR REFERENCE ONLY

Customer:
ERIC KIESELHORST

Project location:
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Drawn By:	R.TINITALI
Date:	11/4/2021

Title:
DATA SHEET

Sheet: 8

Rev: 0

AMERICA'S MODULE COMPANY ™

MISSION SOLAR ENERGY

MSE PERC 60

CLASS LEADING POWER OUTPUT

345 W

POSITIVE POWER TOLERANCE

-0 to +3 %

The 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

› PERC and 6 busbar drive 18.7% module efficiency
› Ideal for all applications

EXTREME WEATHER RESILIENCE

› 5600 Pa front and 4800 Pa back load
› Tested load to UL 61730
› 40mm frame

BAA COMPLIANT FOR GOVERNMENT PROJECTS

› Buy American Act
› American Recovery & Reinvestment Act

25 YEAR FRAME-TO-FRAME WARRANTY

MODULES ASSEMBLED DESIGNED & ENGINEERED IN THE USA OF U.S. AND NON-U.S. PARTS

FRAME-TO-FRAME WARRANTY

Degradation guaranteed not to exceed 2% in year one and 0.7% annually from years two to 30 with 81.2% guaranteed in year 25.

CERTIFICATIONS

UL 61730
IEC 61215 - IEC 61730
IEC 61701

c UL us LISTED CEC TÜV SÜD

Please contact Mission Solar Energy if you have questions or concerns about certification of our products in your area.

*Standard 12-year product warranty extendable to 25 years with registration:
www.missionsolar.com/warranty/

www.missionsolar.com | info@missionsolar.com

PERC 60

CLASS LEADING 330-345 W

ELECTRICAL SPECIFICATION

Product Type	MSExxxSX5T (xxx=P_{max})					
Power Output	P_{max}	W_p	330	335	340	345
Module Efficiency		%	17.9	18.2	18.5	18.7
Tolerance		%	0/+3	0/+3	0/+3	0/+3
Short Circuit Current	I_{sc}	V	10.72	10.78	10.86	10.92
Open Circuit Voltage	V_{oc}	A	40.40	40.58	40.82	41.00
Rated Current	I_{mp}	V	10.05	10.14	10.24	10.34
Rated Voltage	V_{mp}	V	32.85	33.03	33.20	33.37
Fuse Rating		A	20	20	20	20
System Voltage		V	1000	1000	1000	1000

TEMPERATURE COEFFICIENTS

Normal Operating Cell Temperature (NOCT)	44.43°C (±3.7%)
Temperature Coefficient of P_{max}	-0.361%/°C
Temperature Coefficient of V_{oc}	-0.262%/°C
Temperature Coefficient of I_{sc}	0.039%/°C

OPERATING CONDITIONS

Maximum System Voltage	1,000Vdc
Operating Temperature Range	-40°C (-40°F) to +85°C (185°F)
Maximum Series Fuse Rating	20A
Fire Safety Classification	Type 1
Front & Back Load (UL Standard)	5600 Pa front and 4800 Pa back load Tested to UL 61730
Hail Safety Impact Velocity	25mm at 23 m/s

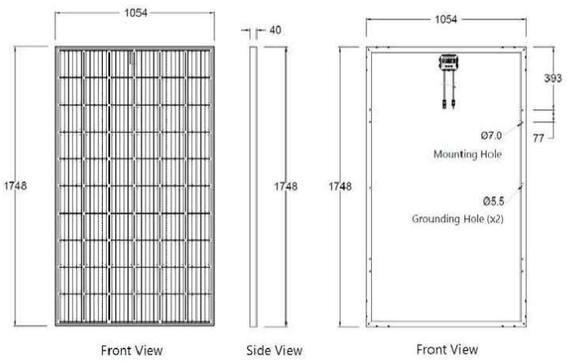
MECHANICAL DATA

Solar Cells	P-type mono-crystalline silicon
Cell Orientation	60 cells (6x10)
Module Dimension	1748mm x 1054mm x 40mm
Weight	20.3 kg (44.8 lbs.)
Front Glass	3.2mm, tempered, low-iron, anti-reflective
Frame	Anodized
Encapsulant	Ethylene vinyl acetate (EVA)
Junction Box	Protection class IP67 with 3 bypass-diodes
Cable	1.0m, Wire 4mm² (12AWG)
Connector	Staubli PV-KBT4/6II-UR and PV-KST4/6II-UR, MC4, Renhe 05-8

MSE345SX5T: 345WP, 60 CELL SOLAR MODULE CURRENT - VOLTAGE CURVE

Current-voltage characteristics with dependence on irradiance and module temperature

BASIC DIMENSIONS (UNITS: mm)



CERTIFICATIONS & TESTS

IEC	61215, 61730, 61701
UL	61730

c UL us LISTED CEC TÜV SÜD

SHIPPING INFORMATION

Container FT	Ship To	Pallet	Panels	345 W Bin
53'	Most states	34	884	304.98 kW
Double Stack	California	28	728	251.16 kW

Pallet [26 Panels]			
Weight	Height	Width	Length
1263 lbs. (573 kg)	47.5 in (120.65 cm)	46 in (116.84 cm)	70.25 in (178.43 cm)

Mission Solar Energy | 8303 S. New Braunfels Ave., San Antonio, Texas 78235
www.missionsolar.com | info@missionsolar.com

10.35kW ROOF MOUNT PHOTOVOLTAIC SYSTEM

FOR REFERENCE ONLY

Customer:

ERIC KIESELHORST

Project location:

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Sustainable Energy & Lighting Solutions
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Power Co:

DUKE ENERGY PROGRESS

Project #:	----
Drawn By:	R.TINITALI
Date:	11/4/2021

Title:

DATA SHEET

Sheet: 9

Rev: 0

Data Sheet
Enphase Microinverters
Region: AMERICAS

Enphase IQ 7 and IQ 7+ Microinverters

The high-powered smart grid-ready Enphase IQ 7 Micro™ and Enphase IQ 7+ Micro™ dramatically simplify the installation process while achieving the highest system efficiency.

Part of the Enphase IQ System, the IQ 7 and IQ 7+ Microinverters integrate with the Enphase IQ Envoy™, Enphase IQ Battery™, and the Enphase Enlighten™ monitoring and analysis software.

IQ Series Microinverters extend the reliability standards set forth by previous generations and undergo over a million hours of power-on testing, enabling Enphase to provide an industry-leading warranty of up to 25 years.

Easy to Install

- Lightweight and simple
- Faster installation with improved, lighter two-wire cabling
- Built-in rapid shutdown compliant (NEC 2014 & 2017)

Productive and Reliable

- Optimized for high powered 60-cell/120 half-cell and 72-cell/144 half-cell* modules
- More than a million hours of testing
- Class II double-insulated enclosure
- UL listed

Smart Grid Ready

- Complies with advanced grid support, voltage and frequency ride-through requirements
- Remotely updates to respond to changing grid requirements
- Configurable for varying grid profiles
- Meets CA Rule 21 (UL 1741-SA)

* The IQ 7+ Micro is required to support 72-cell/144 half-cell modules.

To learn more about Enphase offerings, visit **enphase.com**

ENPHASE.

Enphase IQ 7 and IQ 7+ Microinverters

INPUT DATA (DC)	IQ7-60-2-US		IQ7PLUS-72-2-US	
Commonly used module pairings[1]	235 W - 350 W +		235 W - 440 W +	
Module compatibility	60-cell/120 half-cell PV modules only		60-cell/120 half-cell and 72-cell/144 half-cell PV modules	
Maximum input DC voltage	48 V		60 V	
Peak power tracking voltage	27 V - 37 V		27 V - 45 V	
Operating range	16 V - 48 V		16 V - 60 V	
Min/Max start voltage	22 V / 48 V		22 V / 60 V	
Max DC short circuit current (module Isc)	15 A		15 A	
Overvoltage class DC port	II		II	
DC port backfeed current	0 A		0 A	
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)	**IQ 7 Microinverter**		**IQ 7+ Microinverter**	
Peak output power	250 VA		295 VA	
Maximum continuous output power	240 VA		290 VA	
Nominal (L-L) voltage/range[2]	240 V / 211-264 V	208 V / 183-229 V	240 V / 211-264 V	208 V / 183-229 V
Maximum continuous output current	1.0 A (240 V)	1.15 A (208 V)	1.21 A (240 V)	1.39 A (208 V)
Nominal frequency	60 Hz		60 Hz	
Extended frequency range	47 - 68 Hz		47 - 68 Hz	
AC short circuit fault current over 3 cycles	5.8 Arms		5.8 Arms	
Maximum units per 20 A (L-L) branch circuit[3]	16 (240 VAC)	13 (208 VAC)	13 (240 VAC)	11 (208 VAC)
Overvoltage class AC port	III		III	
AC port backfeed current	18 mA		18 mA	
Power factor setting	1.0		1.0	
Power factor (adjustable)	0.85 leading ... 0.85 lagging		0.85 leading ... 0.85 lagging	
EFFICIENCY	**@240 V**	**@208 V**	**@240 V**	**@208 V**
Peak efficiency	97.6 %	97.6 %	97.5 %	97.3 %
CEC weighted efficiency	97.0 %	97.0 %	97.0 %	97.0 %
MECHANICAL DATA				
Ambient temperature range	-40°C to +65°C			
Relative humidity range	4% to 100% (condensing)			
Connector type	MC4 (or Amphenol H4 UTX with additional Q-DCC-5 adapter)			
Dimensions (HxWxD)	212 mm x 175 mm x 30.2 mm (without bracket)			
Weight	1.08 kg (2.38 lbs)			
Cooling	Natural convection - No fans			
Approved for wet locations	Yes			
Pollution degree	PD3			
Enclosure	Class II double-insulated, corrosion resistant polymeric enclosure			
Environmental category / UV exposure rating	NEMA Type 6 / outdoor			
FEATURES				
Communication	Power Line Communication (PLC)			
Monitoring	Enlighten Manager and MyEnlighten monitoring options. Both options require installation of an Enphase IQ Envoy.			
Disconnecting means	The AC and DC connectors have been evaluated and approved by UL for use as the load-break disconnect required by NEC 690.			
Compliance	CA Rule 21 (UL 1741-SA) UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01 This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020 section 690.12 and C22.1-2015 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according manufacturer's instructions.			

1. No enforced DC/AC ratio. See the compatibility calculator at https://enphase.com/en-us/support/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.

To learn more about Enphase offerings, visit **enphase.com**

ENPHASE.

10.35kW ROOF MOUNT PHOTOVOLTAIC SYSTEM

FOR REFERENCE ONLY

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SM SOLAR MOUNT — CODE COMPLIANCE NOTES

INSTALLATION GUIDE | C PAGE

SYSTEM LEVEL FIRE CLASSIFICATION

The system fire class rating requires installation in the manner specified in the SOLARMOUNT Installation Guide. SOLARMOUNT has been classified to the system level fire portion of UL 1703. This UL 1703 classification has been incorporated into our UL 2703 product certification. SOLARMOUNT has achieved system level performance for steep sloped roofs. System level fire performance is inherent in the SOLARMOUNT design, and no additional mitigation measures are required. The fire classification rating is only valid on roof pitches greater than 2:12 (slopes ≥ 2 inches per foot, or 9.5 degrees). The system is to be mounted over fire resistant roof covering rated for the application. There is no required minimum or maximum height limitation above the roof deck to maintain the system fire rating for SOLARMOUNT. Module Types & System Level Fire Ratings are listed below:

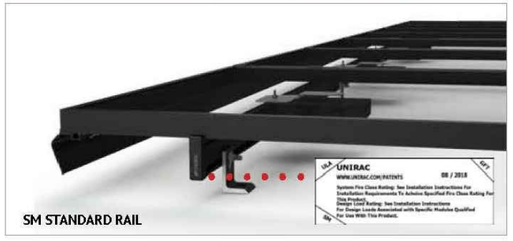
Rail Type	Module Type	System Level Fire Rating	Rail Direction	Module Orientation	Mitigation Required
Standard Rail	Type 1, Type 2, Type 3, Type 10, Type 19, Type 22, & Type 25	Class A, Class B & Class C	East-West	Landscape OR Portrait	None Required
			North-South	Landscape OR Portrait	None Required
Light Rail	Type 1 & Type 2	Class A, Class B & Class C	East-West	Landscape OR Portrait	None Required
			North-South	Landscape OR Portrait	None Required

This racking system may be used to ground and/or mount a PV module complying with UL1703 only when the specific module has been evaluated for grounding and/or mounting in compliance with the included instructions.

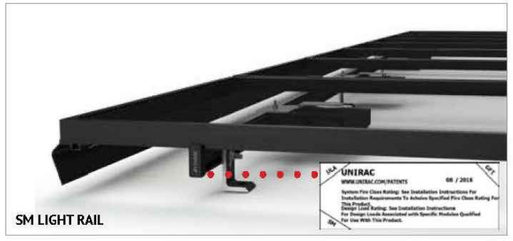
UL2703 CERTIFICATION MARKING LABEL

Unirac SOLARMOUNT is listed to UL 2703. Certification marking is embossed on all mid clamps as shown. Labels with additional information will be provided . After the racking system is fully assembled, a single label should be applied to the SOLARMOUNT rail at the edge of the array. **Before applying the label, the corners of the label that do not pertain to the system being installed must be removed so that only the installed system type is showing.**

Note: The sticker label should be placed such that it is visible, but not outward facing.



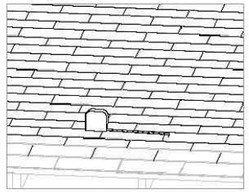
SM STANDARD RAIL



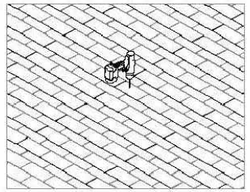
SM LIGHT RAIL

SM SOLAR MOUNT — ROOF ATTACHMENT & L-FEET

INSTALLATION GUIDE | D PAGE



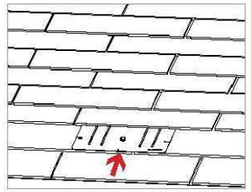
ROOF PREPARATION: Layout and install flashing at rafter locations determined per Design and Engineering Guide.



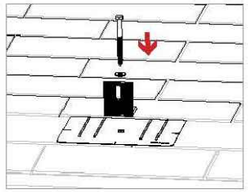
DRILL PILOT HOLES: Center the roof attachment over the rafter and drill a pilot hole(s) for the lag bolt(s).

NOTE: Determine lag bolt size and embedment depth.

Quick Tip: Pre-drill the pilot hole through the flat flashing lag bolt location for easier installation.

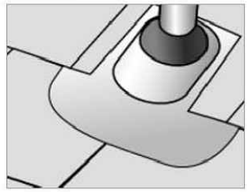


FLASHING INSTALLATION: Insert the flashing so the top part is under the next row of shingles and the hole lines up with the pilot hole.



INSTALL LAG BOLTS & L-FOOT: Insert the lag bolt through the L-Foot in the order shown in the illustration. Verify proper orientation before tightening lag bolts.

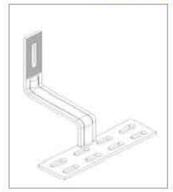
For high snow load conditions, install the L-foot as shown above, and install the rail on the downslope face of the L-Foot

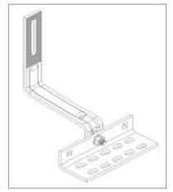


2 PIECE ALUMINUM STANDOFF WITH FLASHING & L-FOOT:

- If necessary cut an opening in the roofing material over a rafter to accommodate the flashing riser.
- Install the standoff, ensuring that both lag bolts are screwed into the rafter.
- Insert the flashing under the shingle above and over the shaft of the standoff. (No-Calk™ collar does not require sealing of the flashing and standoff shaft)
- Add L-Foot to top with bolt that secures the EPDM washer to the top of the standoff.

See Standoffs & Flashings Installation Manual 907.2 for Additional Details.





SIDE MOUNT SOLARHOOK:

- Remove or slide up the roof tile, position the roof hook above the roof rafter
- Place SolarHook in the middle of the underlying interlocking tile's valley. Drill 3/16 inch pilot holes through the underlayment into the center of the rafters. Securely fasten each tile hook to the rafters using included lag screws.
- Slide down or re-insert the tile.

See Unirac Solarhook Installation Manual for Additional Information.

10.35kW ROOF MOUNT PHOTOVOLTAIC SYSTEM

FOR REFERENCE ONLY

Customer:

ERIC KIESELHORST

Project location:

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Date:	11/4/2021

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SM SOLAR MOUNT

SPLICE INSTALLATION GUIDE

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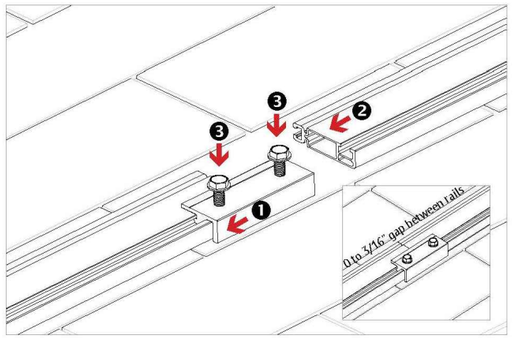
SPLICE INSTALLATION (IF REQUIRED PER SYSTEM DESIGN)

If your installation uses SOLARMOUNT splice bars, attach the rails together before mounting to the L-feet/footings. Use splice bars only with flush installation and those that use low-profile tilt legs. A rail must be supported by more than one footing on both sides of the splice. There can be a gap between rails, up to 3/16" at the splice connections. To install, slide T-feature on splice into the T-slot on each rail, centering the splice between the two rails. Tighten each bolt until the bolt-head is flush against the splice and torqued to 10 ft-lbs. Installation is complete when the bonding hardware penetrates the opposite side of the rail and the assembly torque is achieved. T-bolts should not be placed less than a distance of 1" from the end of the rail regardless of a splice.

TORQUE VALUE (See Note on PG. A)
Hex head socket size ½" – Do not exceed 10 ft-lbs. Do not use Anti-Seize.
See Table below for max length of spliced rails. An expansion joint is required above the lengths published in the table.

Rails in splice joint configurations are considered cantilevered and must follow the cantilever rule, on both sides of the splice, which states that the maximum amount of rail that can be cantilevered is 1/3 the respective adjacent span.



SM SOLAR MOUNT

THERMAL BREAK INSTALLATION GUIDE

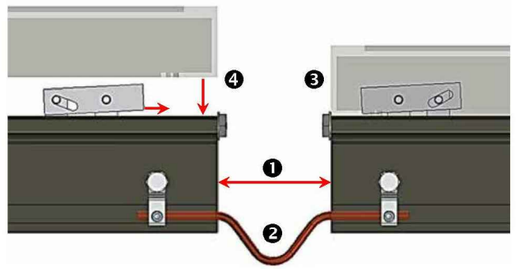
F PAGE

EXPANSION JOINT USED AS THERMAL BREAK

Expansion joints prevent buckling of rails or system failure due to thermal expansion. Determine location of expansion joints prior to installation of L-feet and rails. To create a thermal expansion joint, set gap between rails that is sufficient for proper installation of end clamps and tooling to achieve required torque. **A thermal break is required when a continuous length of spliced rails exceeds the length, in feet, shown in the table to the right. For additional concerns on thermal breaks in your specific project, please consult a licensed structural engineer.**

Rails in expansion joint configurations are considered cantilevered and must follow the cantilever rule, on both sides of the expansion joint, which states that the maximum amount of rail that can be cantilevered is 1/3 the respective adjacent span. An expansion joint must not be spanned by a PV module. Installing a module over an expansion joint would defeat the goal of a thermal break and could result in damage to the array.

Bonding connection for splice used as a thermal break. Option shown uses two Ilsco lugs (Model No. GBL-4DBT P/N GBL-4DBT - see product data sheet for more details) and solid copper wire. Optional grounding may be achieved through Enphase MI. See PG. J.



	Maximum Continuous Length (ft.) of Spliced Rails			
	Solarmount Standard		Solarmount Light	
	Attachment Span		Attachment Span	
ΔT (°F)	48"	72"	48"	72"
0-40	86	105	70	81
40-50	70	93	62	81
50-60	70	81	54	69
60-70	62	69	54	69
70-80	54	69	46	57
80-90	54	69	46	57
90-100	54	57	46	57
100-120	46	57	38	45
120-140	38	45	38	45

The values displayed are the maximum allowed rail length, in feet, without a thermal break.
These values apply only to the Flashkit Pro L-foot. For Flashloc Comp Mount, or if your span is less than 48", refer to the Solarmount Design & Engineering Guide for max lengths of continuous rail before a thermal break is required.
The installer is responsible for determining the maximum temperature difference (ΔT) used to establish the maximum rail length, without expansion joint, at the install location.
As spans increase, so does the maximum reaction force that the rail exerts on the L-foot. It is the responsibility of the installer to ensure that Maximum Reaction Force does not exceed the shear capacity of the roof connection. See SM Design and Engineering Guide for corresponding reaction forces.
ΔT refers to the maximum difference in the temperature of the rail between installation and the extreme high or low temperature. The Extreme Annual Design Conditions table at the following url can be used as a reference when determining ΔT.
http://ashrae-meteo.info/

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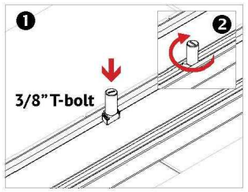
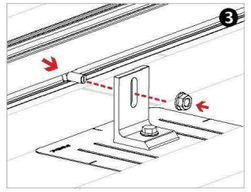
SM SOLAR MOUNT

ATTACH RAIL TO L-FEET

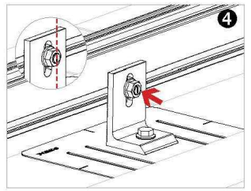
INSTALLATION GUIDE | G PAGE



PLACE T-BOLT INTO RAIL & SECURE BOLT: Insert 3/8" T-bolt into rail at L-foot locations. Apply Anti-Seize to bolt. Rotate T-bolt into position.



SECURE T-BOLT: Apply Anti-Seize to bolt. Rotate T-bolt into position.



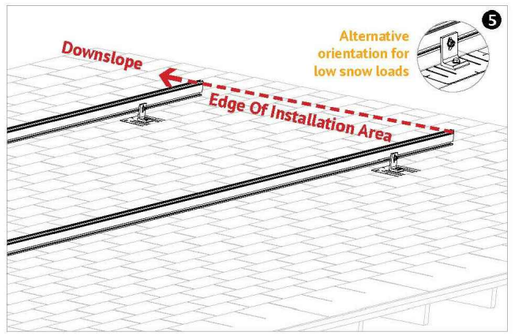
ALIGN POSITION INDICATOR: Hand tighten nut until rail alignment is complete. Verify that position indicator on bolt is vertical (perpendicular to rail)

TORQUE VALUE (See Note on PG. A)
3/8" nut to 30 ft-lbs

ALIGN RAILS: Align one pair of rail ends to the edge of the installation area. The opposite pair of rail ends will overhang installation area. Do not Trim them off until the installation is complete. If the rails are perpendicular to the rafters, either end of the rails can be aligned, but the first module must be installed at the aligned end.

If the rails are parallel to the rafters, the aligned end of the rails must face the lower edge of the roof. Securely tighten all hardware after alignment is complete.

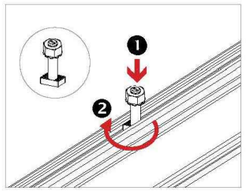
Mount modules to the rails as soon as possible. Large temperature changes may bow the rails within a few hours if module placement is delayed.



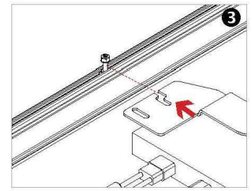
SM SOLAR MOUNT

MICROINVERTER MOUNTING

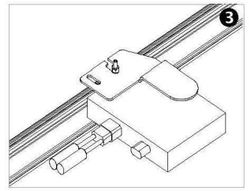
INSTALLATION GUIDE | H PAGE



INSTALL MICROINVERTER MOUNT T-BOLT: Apply Anti-Seize and install pre-assembled ¼" dia. bonding T-bolts into top ¼" rail slot at microinverter locations. Rotate bolts into position.

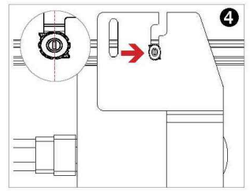


INSTALL MICROINVERTER: Install microinverter on to rail. Engage with bolt.



INSTALL MICROINVERTER:

TORQUE VALUE (See Note on PG. A)
1/4" nut to 10 ft-lbs w/Anti-Seize



ALIGN POSITION INDICATOR: Verify that position indicator on bolt is perpendicular to rail.

10.35kW ROOF MOUNT PHOTOVOLTAIC SYSTEM

FOR REFERENCE ONLY

Customer:

ERIC KIESELHORST

Project location:

680 COKESBURY PARK LN, FUQUAY VARINA, NC 27526

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Date:	11/4/2021

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FLASHKIT PRO

UNIRAC
FEATURING SHED & SEAL TECHNOLOGY

FLASHKIT PRO is the complete attachment solution for composition shingle roofs. Featuring Unirac's patented **SHED & SEAL** technology, a weather proof system which provides the ultimate protection against roof leaks. Kitted in 10 packs for maximum convenience, flashings and hardware are available in Mill or Dark finishes. With **FLASH**KIT pro, you have everything you need for a quick, professional installation.

TRUSTED WATER SEAL FLASHINGS
FEATURING SHED & SEAL TECHNOLOGY

YOUR COMPLETE SOLUTION
Flashings, lags, continuous slot L-Feet and hardware

CONVENIENT 10 PACKS
Packaged for speed and ease of handling

THE COMPLETE ROOF ATTACHMENT SOLUTION

FOR QUESTIONS OR CUSTOMER SERVICE VISIT UNIRAC.COM OR CALL (505) 248-2702

FLASHKIT PRO

INSTALLATION GUIDE

UNIRAC
FEATURING SHED & SEAL TECHNOLOGY

FLASHKIT PRO IS THE COMPLETE FLASHING AND ATTACHMENT SOLUTION FOR COMPOSITION ROOFS.

INSTALL **FLASH**KIT PRO FLASHING

INSTALL L-FOOT

ATTACH L-FOOT TO RAIL

PRE-INSTALL

- Locate roof rafters and snap chalk lines to mark the installation point for each roof attachment.
- Drill a 7/32" pilot hole at each roof attachment. Fill each pilot hole with sealant.

STEP 1 INSTALL **FLASH**KIT PRO FLASHING

- Add a U-shaped bead of roof sealant to the underside of the flashing with the open side of the U pointing down the roof slope. Slide the aluminum flashing underneath the row of shingles directly up slope from the pilot hole as shown. Align the indicator marks on the lower end of the flashing with the chalk lines on the roof to center the raised hole in the flashing over the pilot hole in the roof. When installed correctly, the flashing will extend under the two courses of shingles above the pilot hole.

STEP 2 INSTALL L-FOOT

- Fasten L-foot and Flashing into place by passing the included lag bolt and pre-installed stainless steel-backed EPDM washer through the L-foot EPDM grommet, and the raised hole in the flashing, into the pilot hole in the roof rafter.
- Drive the lag bolt down until the L-foot is held firmly in place. It is normal for the EPDM on the underside of the stainless steel backed EPDM washer to compress and expand beyond the outside edge of the steel washer when the proper torque is applied.

TIP:

- Use caution to avoid over-torqueing the lag bolt if using an impact driver.
- Repeat Steps 1 and 2 at each roof attachment point.

STEP 3 ATTACH L-FOOT TO RAIL

- Insert the included 3/8"-16 T-bolts into the lower slot on the Rail (sold separately), spacing the bolts to match the spacing between the roof attachments.
- Position the Rail against the L-Foot and insert the threaded end of the T-Bolt through the continuous slot in the L-Foot. Apply anti-seize to bolt threads to prevent galling of the T-bolt and included 3/8" serrated flange nut. Place the 3/8" flange nut on the T-bolt and finger tighten. Repeat STEP 3 until all L-Feet are secured to the Rail with a T-bolt. Adjust the level and height of the Rail and torque each bolt to 30ft-lbs.

FASTER INSTALLATION. 25-YEAR WARRANTY.

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Data Sheet
Enphase Networking

Enphase IQ Combiner 3-ES/3C-ES

X-IQ-AM1-240-3-ES
X-IQ-AM1-240-3C-ES

The **Enphase IQ Combiner 3-ES/3C-ES**™ with Enphase IQ Envoy™ and integrated LTE-M1 cell modem (included only with IQ Combiner 3C-ES) consolidates interconnection equipment into a single enclosure and streamlines PV 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.

X-IQ-AM1-240-3C-ES

X-IQ-AM1-240-3-ES

Smart

- Includes IQ Envoy for communication and control
- Includes LTE-M1 cell modem (included only with IQ Combiner 3C-ES)
- Includes solar shield to match Ensemble esthetics and deflect heat
- Flexible networking supports Wi-Fi, Ethernet, or cellular
- Optional AC receptacle available for PLC bridge
- Provides production metering and consumption monitoring

Simple

- Reduced size from IQ Combiner+ (X-IQ-AM1-240-2)
- Centered mounting brackets support single stud mounting
- Supports back and side conduit entry
- Up to four 2-pole branch circuits for 240 VAC plug-in breakers (not included)
- 80 A 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
- UL listed

LISTED

To learn more about Enphase offerings, visit **enphase.com**

ENPHASE.

Enphase IQ Combiner 3-ES / 3C-ES

MODEL NUMBER	
IQ Combiner 3-ES (X-IQ-AM1-240-3-ES)	IQ Combiner 3-ES with Enphase IQ Envoy 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 Encharge storage system and Enpower smart switch and to deflect heat.
IQ Combiner 3C-ES (X-IQ-AM1-240-3C-ES)	IQ Combiner 3C-ES with Enphase IQ Envoy printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes Enphase Mobile Connect LTE-M1 (CELLMODEM-M1), 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 Encharge storage system and Enpower smart switch and to deflect heat.
ACCESSORIES and REPLACEMENT PARTS	(not included, order separately)
Ensemble Communications Kit (COMMS-CELLMODEM-M1)	Includes COMMS-KIT-01 and CELLMODEM-M1 with 5-year data plan for Ensemble sites
Circuit Breakers BRK-10A-2-240 BRK-15A-2-240 BRK-20A-2P-240	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
EPLC-01	Power line carrier (communication bridge pair), quantity - one pair
XA-SOLARSHIELD-ES	Replacement solar shield for Combiner 3-ES / 3C-ES
XA-PLUG-120-3	Accessory receptacle for Power Line Carrier in IQ Combiner 3-ES / 3C-ES (required for EPLC-01)
XA-ENV-PCBA-3	Replacement IQ Envoy printed circuit board (PCB) for Combiner 3-ES / 3C-ES
ELECTRICAL SPECIFICATIONS	
Rating	Continuous duty
System voltage	120/240 VAC, 60 Hz
Eaton BR series busbar rating	125 A
Max. continuous current rating	65 A
Max. continuous current rating (input from PV/storage)	64 A
Max. fuse/circuit rating (output)	90 A
Branch circuits (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 / 90A with IQ Envoy breaker included
Production metering CT	200 A solid core pre-installed and wired to IQ Envoy
Consumption monitoring CT (CT-200-SPLIT)	A pair of 200 A split core current transformers
MECHANICAL DATA	
Dimensions (WxHxD)	37.5 x 49.5 x 16.8 cm (14.75" x 19.5" x 6.63"). Height is 21.06" (53.5 cm) with mounting brackets.
Weight	7.5 kg (16.5 lbs)
Ambient temperature range	-40° C to +46° C (-40° to 115° F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction
Wire sizes	• 20 A to 50 A breaker inputs: 14 to 4 AWG copper conductors • 60 A breaker branch input: 4 to 1/0 AWG copper conductors • Main lug combined output: 10 to 2/0 AWG copper conductors • Neutral and ground: 14 to 1/0 copper conductors Always follow local code requirements for conductor sizing.
Altitude	To 2000 meters (6,560 feet)
INTERNET CONNECTION OPTIONS	
Integrated Wi-Fi	802.11b/g/n
Cellular	CELLMODEM-M1 4G based LTE-M1 cellular modem (included only with IQ Combiner 3C-ES). Note that an Enphase Mobile Connect cellular modem is required for all Ensemble installations.
Ethernet	Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included)
COMPLIANCE	
Compliance, Combiner	UL 1741, CAN/CSA C22.2 No. 107.1, 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 Envoy	UL 60601-1/CANCSA 22.2 No. 61010-1

To learn more about Enphase offerings, visit **enphase.com**

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10.35kW ROOF MOUNT PHOTOVOLTAIC SYSTEM

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MIKE CAUSEY, INSURANCE COMMISSIONER & STATE FIRE MARSHAL
BRIAN TAYLOR, CHIEF STATE FIRE MARSHAL

April 23, 2019

Statewide Uniform Requirement of Inspection Procedures for Solar Photovoltaic Systems Installed on Residential Rooftops

Notice: This document replaces the document dated March 20, 2019 with the title of "Inspection Procedures for Solar Photovoltaic Systems Installed on Residential Rooftops".

This document is intended to provide local inspection departments and installers of solar photovoltaic (PV) systems with a Statewide uniformed inspection procedure where PV equipment is to be installed on a residential rooftop. Because a typical residential rooftop is constructed in a manner that creates unusual safety risks while accessing equipment located on the roof's surface, the State Electrical Division has authored the following procedure intended to prevent an inspector from being elevated over eight (8) feet in height from grade while adequately performing his or her duties.

A violation of any Code shall not be created in the installment of a PV system. It shall be the duty of the installer to comply with State and local regulations including conforming to all State Building Codes. Because the inspector will not be required to access the surface of the roof in-person, an inspector cannot be held accountable for any violation of any regulation that cannot be seen while performing inspections in accordance with the following procedure.

The following procedure does not include the alteration of other building systems that may cause additional permits and inspections that may be imposed on the project. Relocation or alteration of a plumbing vent is an example of such modification to the plumbing system that results in a plumbing permit and inspection.

Though this document specifically addresses residential rooftops installations, this logic is not prohibited to be applied to a commercial structure that has a residential type roofing system without access to the equipment. However, permission must be granted from the local inspection department prior to any installation.

The provisions of this document are not optional. No inspections department shall knowingly disregard the provisions within this document. Local inspection departments are required to implement the provisions within this document upon receiving knowledge of its existence. Inspection departments shall notify installers of PV systems of these requirements no

later than at the time of issuance of the permit. Attachment of this document with the permit application(s) is the suggested method. There are two (2) options concerning the electrical inspection; one has a rough-in inspection requirement. The applicant shall notify the inspections department on the electrical permit application for the option sought.

Permits for a PV installation issued by a local inspections department prior to the department's knowledge of this document will be allowed to implement the local department's existing procedures. It is the responsibility of an inspections department to obtain knowledge of all laws, regulations, and memorandums issued by the Department of Insurance, Office of State Fire Marshal within a reasonable amount of time. Therefore, the State Electrical Division does not anticipate any PV installations permitted after sixty (60) days from the creation of this document (June 23, 2019) that do not adhere to these provisions.

In order to create a single document for simplicity that addresses the inspection procedures for both electrical and structural systems effected by a PV installation, these requirements reflect a joint effort between the State Electrical Division and the Engineering and Codes Division. Questions concerning the electrical provisions of this document shall be addressed to the staff of the State Electrical Division. Questions concerning the building and structural provisions of this document shall be addressed to Deputy Commissioner Cliff Isaac, or a building code consultant within the Engineering and Codes Division.

State Electrical Division Contacts		**Building & Structural Contacts of the Engineering and Codes Division**	
Joe Starling	919-647-0020	Cliff Isaac	919-715-0067
Danny Thomas	919-647-0062	Barry Gupton	919-647-0004
Janet Whitaker	919-810-5511	Carl Martin	919-647-0009
Chris Faucette	919-218-7621	Ali Kojoori	919-647-0030
Tommy Green	919- 218-0811	Mike Page	919-647-0017

Joseph Daniel Starling
Chief State Electrical Engineer & Inspector
Chief Electrical Code Consultant

N.C. Department of Insurance
Office of State Fire Marshal
1202 Mail Service Center
Raleigh, NC 27699-1202
919.647.0020

10.35kW ROOF MOUNT PHOTOVOLTAIC SYSTEM

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BRIAN TAYLOR, CHIEF STATE FIRE MARSHAL

Statewide Uniform Requirement of Inspection Procedures for Solar Photovoltaic Systems Installed on Residential Rooftops
Option No. 1

1. **Application for Electrical and Building Permit must include:**
   a. Sketch of the electrical design that complies with the NEC
   b. Sketch of the equipment's structural mounting design. A North Carolina registered design professional will be required to seal the structural design at the time of application if any of the following exist and are attested to by the applicant:
      i. The weight of the PV system exceeds three (3) pounds per square foot (psf),
      ii. The roof possesses more than one (1) layer of asphalt shingles,
      iii. The roofing material consists of a type other than asphalt shingles or metal, or
      iv. The roof is located in a 140 mph or greater wind zone

2. **Electrical Rough-in Inspection at the Project's Location includes:**
   a. PV equipment must be present on-site with the manufacturer's instructions
   b. Listing and labeling of all parts to be assembled on the roof
   c. Detailed instructions for the rapid shutdown of the system at the roof
   d. Inverter location
   e. Type and size of conductors to be used
   f. Details for how the metal frame(s) and the PV electrical system is to be grounded

3. **Electrical Final Inspection Requirements:**
   a. All equipment exceeding 8 feet above grade must be clearly photographed or recorded to show the following: (Hard copy provided to field inspector at final inspection, to be kept on file)
      i. All connections (splices, terminations, joints, etc.)
      ii. The measurement of any items that have a distance value within the NEC
      iii. Mounting hardware
      iv. The equipment in the photographs are actually located at the property where the work is being inspected (neighboring or landmark items in some of the images should be noted)
   b. All electrical equipment not exceeding 8 feet from grade shall be inspected in the usual manner

4. **Building Final Inspection Requirements:**
   a. A field inspection of the installation has been performed by a North Carolina registered design professional or a person under the direct supervisory control of the registered design professional. This field inspection must be definitively acknowledged in the required document below.
   b. Present a signed written document from a North Carolina registered design professional with a valid seal stating all of the following:
      i. The PV equipment's structural installation has been designed and inspected,
      ii. The equipment will not create a negative impact on the building's structural design, including any additional loads imposed (dead, snow, wind), and
      iii. The installation is in compliance with the North Carolina Residential Code

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MIKE CAUSEY, INSURANCE COMMISSIONER & STATE FIRE MARSHAL
BRIAN TAYLOR, CHIEF STATE FIRE MARSHAL

Statewide Uniform Requirement of Inspection Procedures for Solar Photovoltaic Systems Installed on Residential Rooftops
Option No. 2

1. **Application for Electrical and Building Permit must include:**
   a. Sketch of the electrical design that complies with the NEC
   b. Electrical details of the equipment including:
      i. Manufacturer's instructions
      ii. Documentation that the equipment is listed by a qualified evaluation laboratory
      iii. Instructions for the rapid shutdown of the system at the roof
      iv. Inverter location
      v. Type and size of conductors to be used
      vi. How the metal frame(s) and the PV electrical system is to be grounded

   c. Sketch of the equipment's structural mounting design. A North Carolina registered design professional will be required to seal the structural design at the time of application if any of the following exist and are attested to by the applicant:
      i. The weight of the PV system exceeds three (3) pounds per square foot (psf),
      ii. The roof possesses more than one (1) layer of asphalt shingles,
      iii. The roofing material consists of a type other than asphalt shingles or metal, or
      iv. The roof is located in a 140 mph or greater wind zone

2. **Electrical Final Inspection Requirements:**
   a. All equipment exceeding 8 feet above grade must be clearly photographed or recorded to show the following: (Hard copy provided to field inspector at final inspection, to be kept on file)
      i. Verification of all details described in Part 1.b. of the electrical permit application procedure (this includes photos of the listing laboratory's marking(s) on the equipment)
      ii. All connections (splices, terminations, joints, etc.)
      iii. The measurement of any items that have a distance value within the NEC
      iv. Mounting hardware
      v. The equipment in the photographs are actually located at the property where the work is being inspected (neighboring or landmark items in some of the images should be noted)
   b. All electrical equipment not exceeding 8 feet from grade shall be inspected in the usual manner

3. **Building Final Inspection Requirements:**
   a. A field inspection of the installation has been performed by a North Carolina registered design professional or a person under the direct supervisory control of the registered design professional. This field inspection must be definitively acknowledged in the required document below.
   b. Present a signed written document from a North Carolina registered design professional with a valid seal stating all of the following:
      i. The PV equipment's structural installation has been designed and inspected,
      ii. The equipment will not create a negative impact on the building's structural design, including any additional loads imposed (dead, snow, wind), and
      iii. The installation is in compliance with the North Carolina Residential Code

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