PHOTOVOLTAIC ROOF MOUNT SYSTEM

23 MODULES - SYSTEM SIZE STC (8.855 KW DC / 6.67 KW AC)

185 COOL SPRINGS ROAD, LILLINGTON, NC 27546, USA (35.4225288, -78.9358928)

SYSTEM SUMMARY STC DC/AC
(8.855 KW DC / 6.67 KW AC)

- 1X CIRCUIT OF 12 MODULES CONNECTED IN PARALLEL
- 1X CIRCUIT OF 11 MODULES CONNECTED IN PARALLEL
- (23) MISSION SOLAR ENERGY MSE385SX5R 385W MODULES
- (23) IQ8PLUS-72-2-US MICROINVERTERS

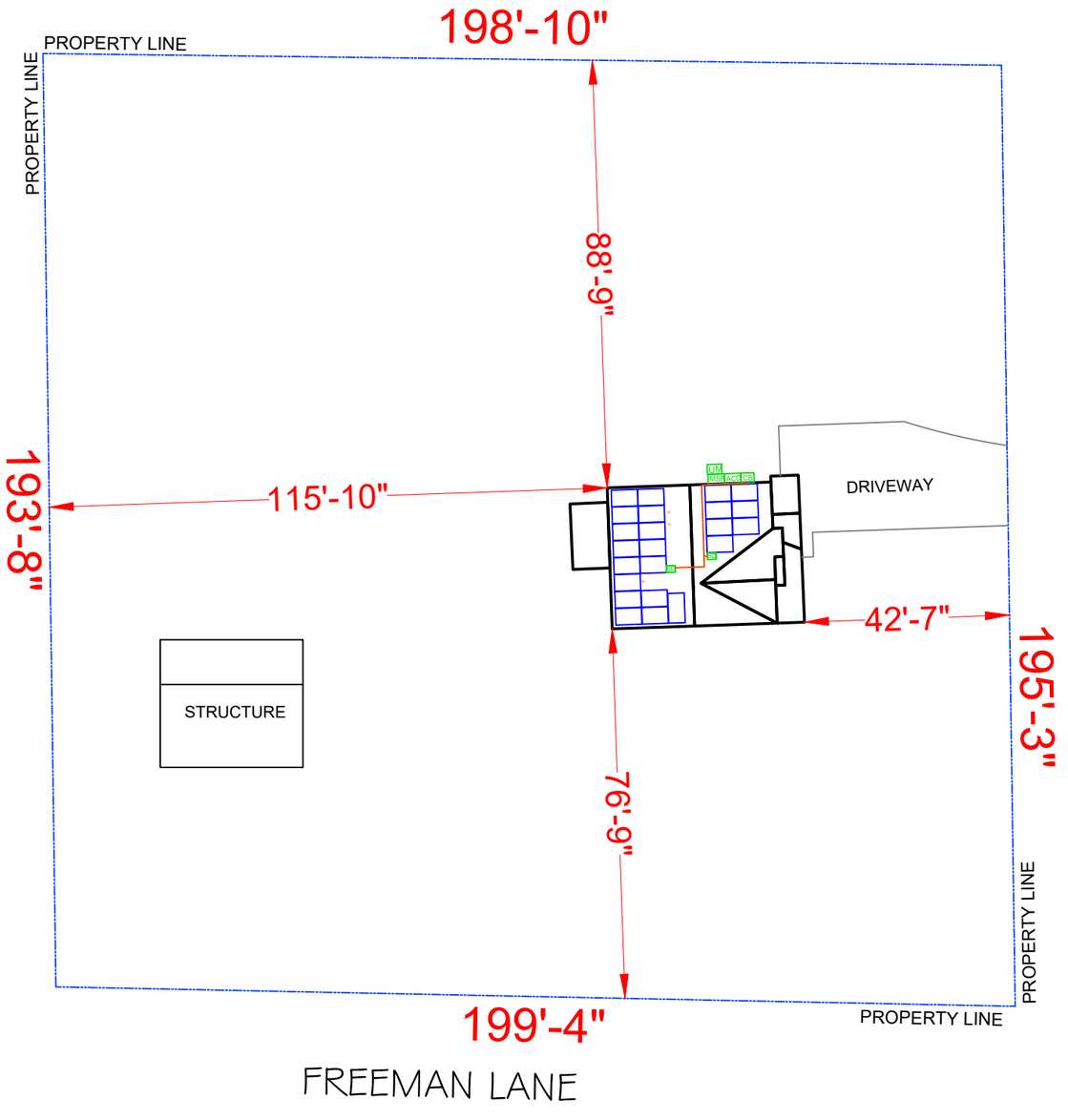
STC DC: (23) 385W = 8.855 KW
STC AC: (23) 290W = 6.67 KW

GOVERNING CODES
2018 NORTH CAROLINA STATE BUILDING CODE
2018 INTERNATIONAL BUILDING CODE
2018 INTERNATIONAL RESIDENTIAL CODE
2018 INTERNATIONAL FIRE CODE
2020 NATIONAL ELECTRICAL CODE

GENERAL NOTES
1) ALL PANELS, SWITCHES, ETC. SHALL HAVE SUFFICIENT GUTTER SPACE AND LUGS IN COMPLIANCE WITH UL REQUIREMENTS TO ACCOMMODATE CONDUCTORS SHOWN.
2) THIS SYSTEM WILL NOT BE INTERCONNECTED UNTIL APPROVAL FROM THE LOCAL JURISDICTION AND UTILITY IS OBTAINED.
3) ALL EXTERIOR ELECTRICAL DEVICES AND EQUIPMENT INCLUDING THOSE THAT ARE EXPOSED TO OUTSIDE ENVIRONMENT SHALL BE WEATHERPROOF AND SHALL BE LISTED BY 'UL' FOR THE TYPE OF APPLICATION AND 'UL' LABEL SHALL APPEAR ON ALL ELECTRICAL EQUIPMENT.
4) WIRING METHOD SHALL BE EMT ABOVE GROUND MOUNTED IN CONCEALED SPACES (UNLESS APPROVED OTHERWISE) AND SCHEDULE-40 PVC FOR BELOW GROUND INSTALLATIONS UNLESS NOTED OTHERWISE.
5) AN OSHA APPROVED LADDER PROVIDING ACCESS TO ALL PORTIONS OF THE ARRAY SHALL BE SECURED IN PRIOR TO REQUESTING INSPECTION.
6) IT IS THE CONTRACTOR'S RESPONSIBILITY TO INSTALL A SUPPLEMENTAL GROUNDING ELECTRODE CONDUCTOR IF NECESSARY.

SAFETY PLAN NOTES
- INSTALLERS SHALL DRAW IN DESIGNATED SAFETY AREA AROUND HOME.
- INSTALLERS SHALL UPDATE NAME, ADDRESS AND PHONE NUMBER OF NEAREST URGENT CARE FACILITY RELATIVE TO THE SITE BEFORE STARTING WORK.

LOCATION OF NEAREST URGENT CARE FACILITY
(FOR INSTALLER USE ONLY)
- NAME:
- ADDRESS:
- PHONE NUMBER:



SITE PLAN & SAFETY PLAN
SCALE: 1"=30'

LEGEND

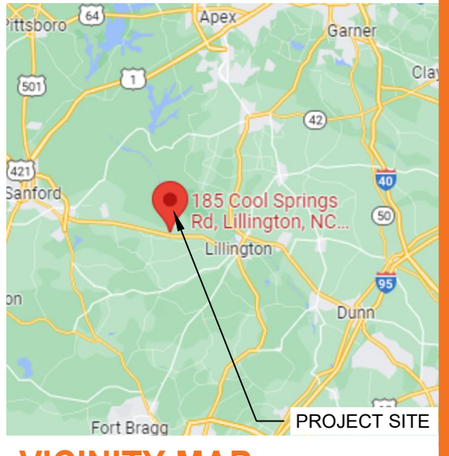
PV MODULE	DIMENSIONS
CONDUIT	PROPERTY LINE
DRIVEWAY	FENCE

MSP	MAIN SERVICE PANEL (EXISTING, 200A)	ACD	AC DISCONNECT UNFUSED (NEW)
UM	UTILITY METER (EXISTING)	ACF	AC DISCONNECT FUSED (N/A)
PM	PRODUCTION METER (N/A)	SD	SOLADECK (NEW)
BAT	BATTERY (N/A)	MSP	MAIN SERVICE PANEL (NEW)
INV	(0) INVERTER (N/A)	SUB	SUBPANEL (NEW)
CB	COMBINER PANEL (NEW)	DCD	DC DISCONNECT (N/A)
SM	SOLAREDGE METER (N/A)	DCC	DC COMBINER (N/A)
BLP	BACKUP LOAD PANEL (N/A)	EE	EXISTING EQUIPMENT

SHEET INDEX

AHJ: HARNETT COUNTY
UTILITY: DUKE ENERGY (PROGRESS ENERGY CAROLINAS INC)

HOUSE PHOTO
SCALE: NTS



VICINITY MAP
SCALE: NTS

TOP TIER SOLAR SOLUTIONS

CONTRACTOR
NAME: TOP TIER SOLAR SOLUTIONS
ADDRESS: 1530 CENTER PARK DR, CHARLOTTE, NC 28217, USA
PHONE: 855-997-1213
LICENSE #: SC - CLG.123883
ELECTRICALLICENSE #: NC - 87345
BDUNFORD@TOPTIERSOLARSOLUTIONS.COM

REVISIONS

DESCRIPTION	DATE	REV

SIGNATURE & SEAL

HOMEOWNER INFO

LISA BLACKFORD
185 COOL SPRINGS RD,
LILLINGTON, NC 27546, USA

APN: 7324754
EMAIL: -
PHONE: -

SHEET NAME
COVER PAGE

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-1

MODULE AREA & WEIGHT CALCULATIONS

PANEL TYPES (COUNT, AREA, WEIGHT):
- (23X) MISSION SOLAR ENERGY MSE385SX5R 385W (75.1" X 41.1", 49 LBS)

MICRO-INVERTER TYPES (COUNT, WEIGHT):
- (23X) IQ8PLUS-72-2-US (2.38 LBS)

ATTACHMENT COUNT: 51
MOUNTING SYSTEM WEIGHT/MODULE: 1.5 LBS
TOTAL ROOF AREA: 1447 SF

TOTAL ARRAY AREA: (23) 75.1" X 41.1" = 493.00 SF
TOTAL ARRAY WEIGHT: (23) 49.0 + (23) 2.4 + (23) 1.5 = 1216 LBS

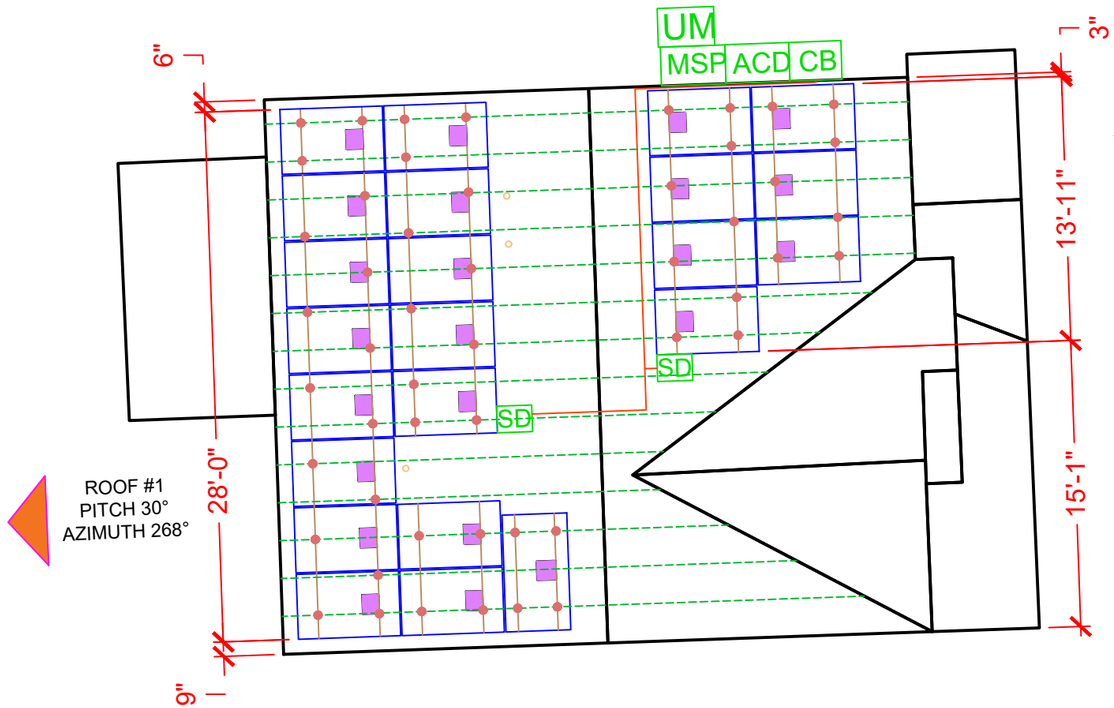
WEIGHT AT EACH CONNECTION: 682 LBS / 51 = 13.37 LBS
DISTRIBUTED LOAD: 1216 LBS / 493.00 SF = 2.47 PSF
ROOF AREA COVERED BY ARRAY: 493 SF / 1278.79 SF = 38.55%

BILL OF MATERIALS		
SOLAR PV MODULES	23	MISSION SOLAR ENERGY MSE385SX5R 385W
MICRO INVERTERS	23	IQ8PLUS-72-2-US
LOAD CENTER	01	AC COMBINER PANEL (MIN RATING 30A)
AC DISCONNECT	01	PV VISIBLE LOCKABLE LABELED DISCONNECT (60A UNFUSED 1PH 240VAC)
ATTACHMENTS	51	IRONRIDGE SLOTTED L-FEET
RAIL	13	IRONRIDGE RESOURCES - XR10
RAIL SPLICE	04	RAIL SPLICE
MID CLAMP	34	MID CLAMP
END CLAMP	24	END CLAMP
GROUNDING LUG	06	GROUNDING LUG

ROOF DESCRIPTION TABLE						
ROOF PLANE	TRUSS SIZE	TRUSS SPACING	MODULE COUNT	ARRAY TILT	AZIMUTH	MAX. ATTACHMENT SPACING
#1	2" x4"	48" O.C.	16	30°	268°	48"
#2	2" x4"	48" O.C.	7	30°	88°	48"

DESIGN CRITERIA

EXPOSURE CATEGORY = C
WIND SPEED = 115 MPH
SNOW LOAD = 15 PSF



LEGEND

- PV MODULE
- MICRO-INVERTER
- ROOF ATTACHMENT
- DIMENSIONS
- PROPERTY LINE
- FENCE

MSP	MAIN SERVICE PANEL (EXISTING, 200A)	ACD	AC DISCONNECT UNFUSED (NEW)
UM	UTILITY METER (EXISTING)	ACF	AC DISCONNECT FUSED (N/A)
PM	PRODUCTION METER (N/A)	SD	SOLADECK (NEW)
BAT	BATTERY (N/A)	MSP	MAIN SERVICE PANEL (NEW)
INV	(0) INVERTER (N/A)	SUB	SUBPANEL (NEW)
CB	COMBINER PANEL (NEW)	DCD	DC DISCONNECT (N/A)
SM	SOLAREDGE METER (N/A)	DCC	DC COMBINER (N/A)
BLP	BACKUP LOAD PANEL (N/A)	EE	EXISTING EQUIPMENT

ROOF PLAN WITH MODULES

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

N

TOP TIER SOLAR SOLUTIONS

CONTRACTOR
NAME: TOP TIER SOLAR SOLUTIONS
ADDRESS: 1530 CENTER PARK DR, CHARLOTTE, NC 28217, USA
PHONE: 855-997-1213
LICENSE #: SC - CLG.123883
ELECTRICALLICENSE #: NC - 87345
BDUNFORD@TOPTIERSOLARSOLUTIONS.COM

REVISIONS

DESCRIPTION	DATE	REV

SIGNATURE & SEAL

HOMEOWNER INFO

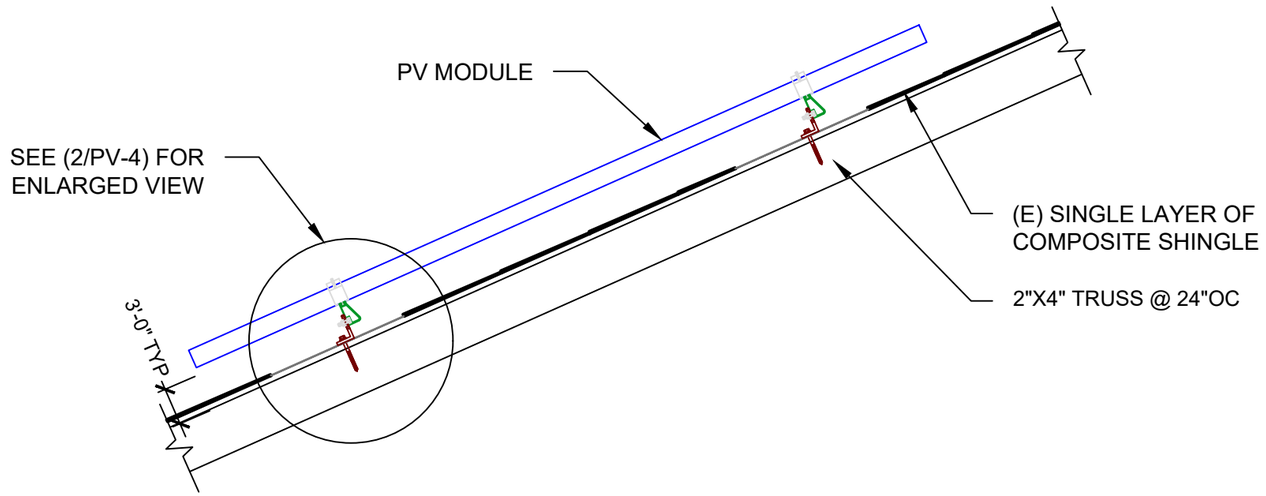
LISA BLACKFORD
185 COOL SPRINGS RD,
LILLINGTON, NC 27546, USA

APN: 7324754
EMAIL: -
PHONE: -

SHEET NAME
ROOF PLAN WITH MODULES

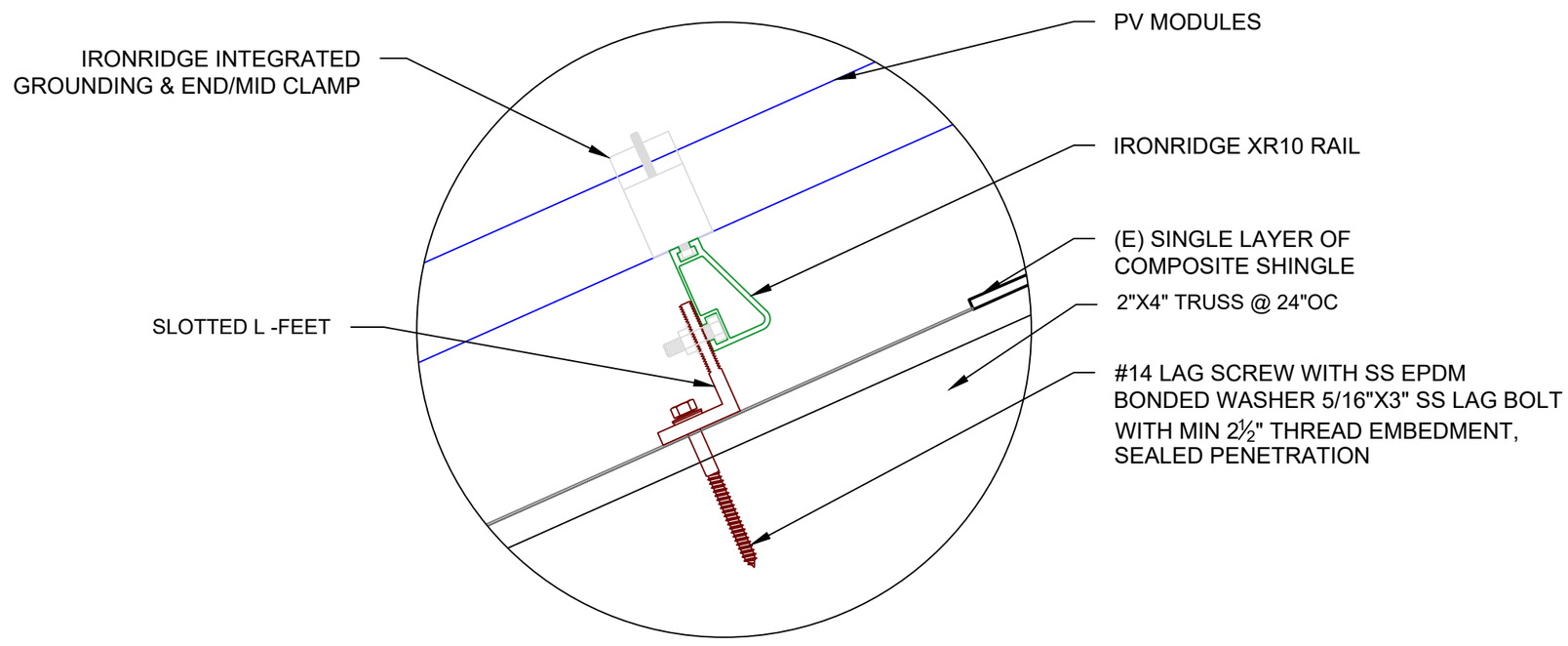
SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-2



ATTACHMENT DETAIL

SCALE: NTS



ATTACHMENT DETAIL (ENLARGED SECTION VIEW)

SCALE: NTS

TOP TIER SOLAR SOLUTIONS

CONTRACTOR

NAME: TOP TIER SOLAR SOLUTIONS

ADDRESS: 1530 CENTER PARK DR, CHARLOTTE, NC 28217, USA

PHONE: 855-997-1213

LICENSE #: SC - CLG.123883

ELECTRICALLICENSE #: NC - 87345
BDUNFORD@TOPTIERSOLARSOLUTIONS.COM

REVISIONS

DESCRIPTION	DATE	REV

SIGNATURE & SEAL

HOMEOWNER INFO

LISA BLACKFORD

185 COOL SPRINGS RD,
LILLINGTON, NC 27546, USA

APN: 7324754
EMAIL: -
PHONE: -

SHEET NAME

ATTACHMENT DETAIL

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-3

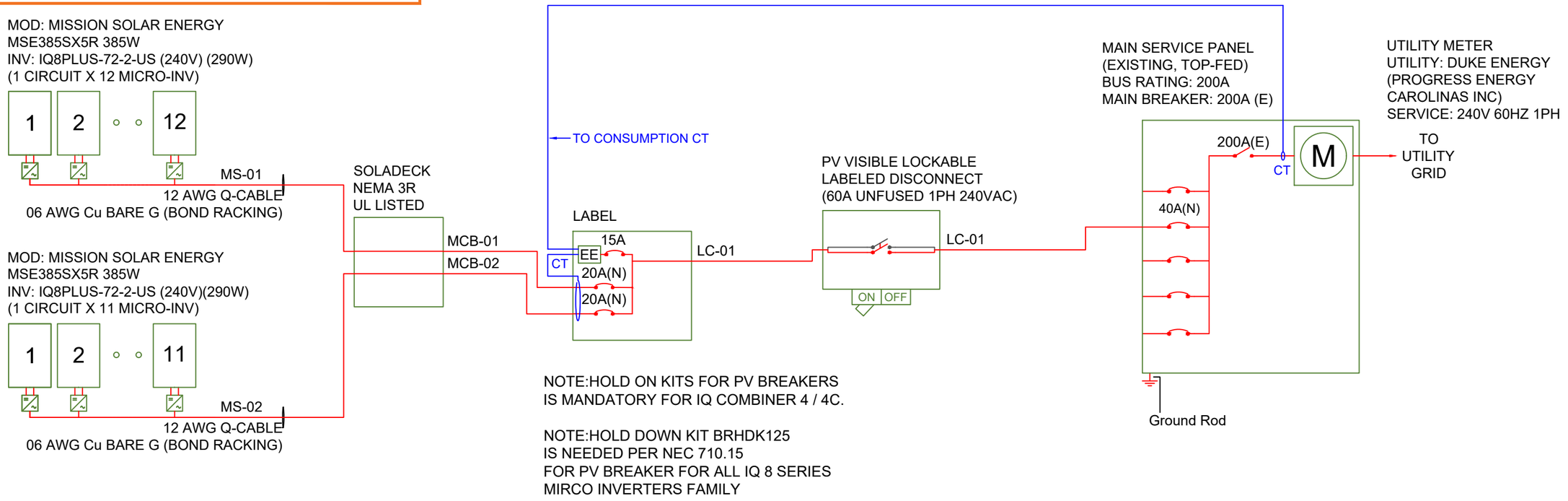
SYSTEM SUMMARY STC DC/AC
(8.855 KW DC / 6.67 KW AC)

- 1X CIRCUIT OF 12 MODULES MODULES CONNECTED IN PARALLEL
- 1X CIRCUIT OF 11 MODULES CONNECTED IN PARALLEL

- (23) MISSION SOLAR ENERGY MSE385SX5R 385W MODULES
- (23) IQ8PLUS-72-2-US MICROINVERTERS

STC DC: (23) 385W = 8.855 KW
STC AC: (23) 290W = 6.67 KW

NOTE:
- ALL GROUNDING TO COMPLY WITH NEC 690.47.
- ROOF TOP CONDUIT SHALL BE LOCATED MIN. 7/8" ABOVE ROOF SURFACE.
- ALL TERMINALS SHALL BE MIN. 75 DEG. C RATED.



NOTE:HOLD ON KITS FOR PV BREAKERS
IS MANDATORY FOR IQ COMBINER 4 / 4C.

NOTE:HOLD DOWN KIT BRHDK125
IS NEEDED PER NEC 710.15
FOR PV BREAKER FOR ALL IQ 8 SERIES
MIRCO INVERTERS FAMILY

AC wire details							
Wire	Min Ampacity	Live	Neutral	Ground	Min EMT	Min PVC	Min RMC
MS-01	18.15A	12 AWG (Q-Cable)	-	06 AWG BARE (NOT IN CONDUIT)	-	-	-
MS-02	16.64A	12 AWG (Q-Cable)	-	06 AWG BARE (NOT IN CONDUIT)	-	-	-
MCB-01	18.15A	(2) 10 AWG THWN-2	-	10 AWG THWN-2	0.50 in	0.50 in	0.50 in
MCB-02	16.64A	(2) 10 AWG THWN-2	-	10 AWG THWN-2	0.50 in	0.50 in	0.50 in
LC-01	34.79A	(2) 08 AWG THWN-2	08 AWG THWN-2	10 AWG THWN-2	0.75 in	0.75 in	0.75 in

INTERCONNECTION 120% RULE
(MAIN PANEL)

UTILITY FEED + TOTAL BACKFEED
200A + 40A = 240A
LESS OR EQUAL TO
BUS RATING x 120%
200A x 120% = 240A

CALCULATION ENSURES BUS IS
SAFE REGARDLESS OF LOADS

EXTREME CASE MODULE OUTPUT
(MISSION SOLAR ENERGY MSE385SX5R 385W)

Isc(25°C) = 10.97A, Tisc = 0.039%/°C
Isc(T) = Isc(25°C) x [1 + Tisc x (T-25°C)]
Isc(-11°C) = 10.82A, Isc(34°C) = 11.01A

Voc(25°C) = 45.03V, Tvoc = -0.262%/°C
Voc(T) = Voc(25°C) x [1 + Tvoc x (T-25°C)]
Voc(-11°C) = 49.28V, Voc(34°C) = 43.97V

ELECTRICAL SINGLE LINE DIAGRAM

SCALE: NTS

TOP TIER SOLAR SOLUTIONS

CONTRACTOR
NAME: TOP TIER SOLAR SOLUTIONS
ADDRESS: 1530 CENTER PARK DR, CHARLOTTE, NC 28217, USA
PHONE: 855-997-1213
LICENSE #: SC - CLG.123883
ELECTRICALLICENSE #: NC - 87345
BDUNFORD@TOPTIERSOLARSOLUTIONS.COM

REVISIONS

DESCRIPTION	DATE	REV

SIGNATURE & SEAL

HOMEOWNER INFO

LISA BLACKFORD
185 COOL SPRINGS RD,
LILLINGTON, NC 27546, USA
APN: 7324754
EMAIL: -
PHONE: -

SHEET NAME
SINGLE LINE DIAGRAM

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-4

SYSTEM SUMMARY STC DC/AC
(8.855 KW DC / 6.67 KW AC)

- 1X CIRCUIT OF 12 MODULES CONNECTED IN PARALLEL
- 1X CIRCUIT OF 11 MODULES CONNECTED IN PARALLEL

- (23) MISSION SOLAR ENERGY MSE385SX5R 385W MODULES
- (23) IQ8PLUS-72-2-US MICROINVERTERS

STC DC: (23) 385W = 8.855 KW
STC AC: (23) 290W = 6.67 KW

AC wire details

WireID	#Modules	Nominal Voltage	Backfeed *1.25 /cond. set	Min OCPD	Total Power	Conductor sets	ccConductors /conduit	Expected max temp	Adjusted ampacity (ampacity x temp derate x conduit fill derate)	Conductor size	EGC size (Cu)	Conductor metal	Max length	V drop	Min EMT size	Min PVC size	Min RMC size
MS-01	12	240 V	18.15 A	20 A	3.5 kW	1	2	34	25 x 0.94 x 1.00 = 23.50 A	12 AWG (Q-Cable)	06 AWG BARE (NOT IN CONDUIT)	Cu	50 ft	1.05 %	-	-	-
MS-02	11	240 V	16.64 A	20 A	3.2 kW	1	2	34	25 x 0.94 x 1.00 = 23.50 A	12 AWG (Q-Cable)	06 AWG BARE (NOT IN CONDUIT)	Cu	50 ft	0.96 %	-	-	-
MCB-01	12	240 V	18.15 A	20 A	3.5 kW	1	2	34	35 x 0.94 x 1.00 = 32.90 A	10 AWG THWN-2	10 AWG THWN-2	Cu	50 ft	0.63 %	0.50 in	0.50 in	0.50 in
MCB-02	11	240 V	16.64 A	20 A	3.2 kW	1	2	34	35 x 0.94 x 1.00 = 32.90 A	10 AWG THWN-2	10 AWG THWN-2	Cu	50 ft	0.58 %	0.50 in	0.50 in	0.50 in
LC-01	23	240 V	34.79 A	35 A	6.7 kW	1	2	34	50 x 0.94 x 1.00 = 47.00 A	08 AWG THWN-2	10 AWG THWN-2	Cu	10 ft	0.16 %	0.75 in	0.75 in	0.75 in

INTERCONNECTION 120% RULE
(MAIN PANEL)

UTILITY FEED + TOTAL BACKFEED
200A + 40A = 240A
LESS OR EQUAL TO
BUS RATING x 120%
200A x 120% = 240A

CALCULATION ENSURES BUS IS
SAFE REGARDLESS OF LOADS

EXTREME CASE MODULE OUTPUT
(MISSION SOLAR ENERGY MSE385SX5R 385W)

Isc(25°C) = 10.97A, Tisc = 0.039%/°C
Isc(T) = Isc(25°C) x [1 + Tisc x (T-25°C)]
Isc(-11°C) = 10.82A, Isc(34°C) = 11.01A

Voc(25°C) = 45.03V, Tvoc = -0.262%/°C
Voc(T) = Voc(25°C) x [1 + Tvoc x (T-25°C)]
Voc(-11°C) = 49.28V, Voc(34°C) = 43.97V

ELECTRICAL NOTES

1) ALL EQUIPMENT TO BE LISTED BY UL OR OTHER NRTL, AND LABELED FOR ITS APPLICATION.
2) ALL CONDUCTORS SHALL BE COPPER, RATED FOR 600 V AND 90 DEGREE C WET ENVIRONMENT.
3) WIRING, CONDUIT, AND RACEWAYS MOUNTED ON ROOFTOPS SHALL BE ROUTED DIRECTLY TO, AND LOCATED AS CLOSE AS POSSIBLE TO THE NEAREST RIDGE, HIP, OR VALLEY.
4) WORKING CLEARANCES AROUND ALL NEW AND EXISTING ELECTRICAL EQUIPMENT SHALL COMPLY WITH NEC 110.26.
5) DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS. CONTRACTOR SHALL FURNISH ALL NECESSARY OUTLETS, SUPPORTS, FITTINGS AND ACCESSORIES TO FULFILL APPLICABLE CODES AND STANDARDS.
6) WHERE SIZES OF JUNCTION BOXES, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, THE CONTRACTOR SHALL SIZE THEM ACCORDINGLY.
7) ALL WIRE TERMINATIONS SHALL BE APPROPRIATELY LABELED AND READILY VISIBLE.
8) MODULE GROUNDING CLIPS TO BE INSTALLED BETWEEN MODULE FRAME AND MODULE SUPPORT RAIL, PER THE GROUNDING CLIP MANUFACTURER'S INSTRUCTION.
9) MODULE SUPPORT RAIL TO BE BONDED TO CONTINUOUS COPPER G.E.C.VIA WEEB LUG OR ILSCO GBL-4DBT LAY-IN LUG.
10) PV EQUIPMENT SHALL BE DESIGNED AND INSTALLED IN ACCORDANCE WITH NEC 690.
11) EXACT LOCATION OF AUXILIARY GROUNDING TO BE DETERMINED AT TIME OF INSTALL.
12) EXISTING WIRES MUST BE REPLACED IF SMALLER THAN LISTED MINIMUM SIZES PER NEC 310.15(B)(16).
13) AC DISCONNECT LOCATED WITHIN 10' OR LESS FROM UTILITY METER
14) IF ENVOY PRESENT, ENVOY BREAKER DETERMINED AT FACTORY BY MANUFACTURER.
15) IF ENVOY PRESENT, FOR IQ COMBINER USE SINGLE CT ON L1. AT SYSTEM CONTROLLER MAIN USE DOUBLE CT ON L1 AND L2.

TOP TIER SOLAR SOLUTIONS

CONTRACTOR
NAME: TOP TIER SOLAR SOLUTIONS
ADDRESS: 1530 CENTER PARK DR, CHARLOTTE, NC 28217, USA
PHONE: 855-997-1213
LICENSE #: SC - CLG.123883
ELECTRICALLICENSE #: NC - 87345
BDUNFORD@TOPTIERSOLARSOLUTIONS.COM

REVISIONS

DESCRIPTION	DATE	REV

SIGNATURE & SEAL

HOMEOWNER INFO

LISA BLACKFORD
185 COOL SPRINGS RD,
LILLINGTON, NC 27546, USA

APN: 7324754
EMAIL: -
PHONE: -

SHEET NAME
WIRING CALCULATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-6

1

⚠WARNING

ELECTRICAL SHOCK HAZARD

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

LABEL LOCATION: INVERTERS, AC DISCONNECTS, AC COMBINER BOXES
CODE REF: NEC 2020 - 690.13(B)

2

RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

LABEL LOCATION: UTILITY SERVICE ENTRANCE (MSP OR AC DISCONNECT IF LINE SIDE TAP), AND WHEREVER REQUIRED BY AHJ (INVERTERS, DC DISCONNECTS, OTHER)
CODE REF: NEC 2020 - 690.56(C)(2)

3

PV SYSTEM DISCONNECT

MAXIMUM AC OPERATING CURRENT: 27.83 AMPS
NOMINAL OPERATING AC VOLTAGE: 240.0 VAC

LABEL LOCATION: INTERCONNECTION Placard (MSP BACKFEED BREAKER OR TAP BOX IF LINE SIDE TAP), AC DISCONNECTS
CODE REF: NEC 2020 - 690.54

4

PHOTOVOLTAIC

AC DISCONNECT

LABEL LOCATION: INTERCONNECTION Placard (MSP BACKFEED BREAKER OR TAP BOX IF LINE SIDE TAP), AC DISCONNECTS
CODE REF: NEC 2020 - 690.13(B)

5

MAIN PHOTOVOLTAIC SYSTEM DISCONNECT

LABEL LOCATION: AC DISCONNECTS FOR UTILITY ACCESS
CODE REF: NEC 2020 - 690.13(B)

6

⚠WARNING

POWER SOURCE OUTPUT CONNECTION

DO NOT RELOCATE THIS OVERCURRENT DEVICE

LABEL LOCATION: FIRST BACKFEED BREAKER (MSP/SUBPANEL) IF NO LINE SIDE TAP
CODE REF: NEC 2020 - 705.12(B)(3)(2), CEC 2019 - 705.12(B)(2)(3)(b), CEC 2019 - 705.12(B)(3)

7

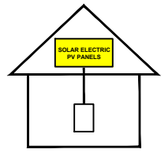
CAUTION: MULTIPLE POWER SOURCES

LABEL LOCATION: N/A
CODE REF: NEC 2020 - 690.56(B), NEC 2020 - 705.10

8

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: INTERCONNECTION POINT (MSP OR AC DISCONNECT IF LINE SIDE TAP)
CODE REF: NEC 2020 - 690.56(C)

9

WARNING

SOLAR SYSTEM CONNECTED AND ENERGISED

LABEL LOCATION: UTILITY METER
CODE REF: NEC 2020 - 690.13(B)

10

⚠ WARNING

TURN OFF PHOTOVOLTAIC AC DISCONNECT PRIOR TO WORKING INSIDE PANEL

LABEL LOCATION: MSP
CODE REF: NEC 2020 - 110.27(C)

11

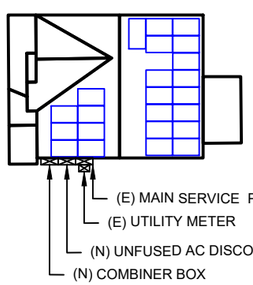
CAUTION:

MULTIPLE SOURCES OF POWER

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

MAIN SERVICE PANEL & UTILITY METER
AC DISCONNECT
COMBINER PANEL

185 COOL SPRINGS ROAD



LABEL LOCATION: MSP
CODE REF: NEC 2020 - 705.10, NEC 2020 - 710.10

TOP TIER SOLAR SOLUTIONS

CONTRACTOR

NAME: TOP TIER SOLAR SOLUTIONS
ADDRESS: 1530 CENTER PARK DR, CHARLOTTE, NC 28217, USA
PHONE: 855-997-1213
LICENSE #: SC - CLG.123883

ELECTRICALLICENSE #: NC - 87345
BDUNFORD@TOPTIERSOLARSOLUTIONS.COM

REVISIONS

DESCRIPTION	DATE	REV

SIGNATURE & SEAL

HOMEOWNER INFO

LISA BLACKFORD
185 COOL SPRINGS RD,
LILLINGTON, NC 27546, USA

APN: 7324754
EMAIL: -
PHONE: -

SHEET NAME

PLACARDS

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

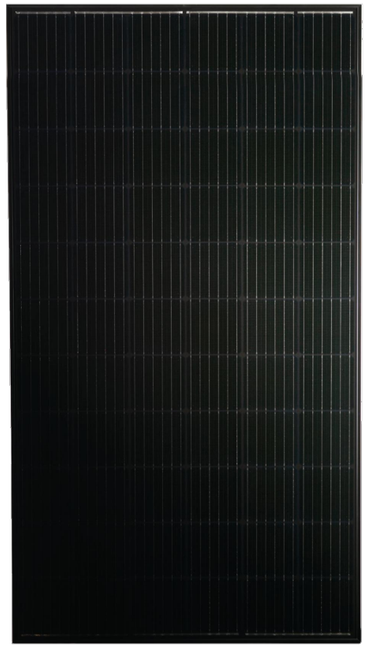
PV-7

MSE PERC 66

MISSION SOLAR ENERGY

385W Positive Power Tolerance

Class leading power output **-0 to +3%**



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
- 6 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

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

25 YEAR FRAME-TO-FRAME WARRANTY

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

CERTIFICATIONS

CEC · TÜV SUD · c UL us LISTED

UL 61730 / IEC 61215 / IEC 61730 / IEC 61701

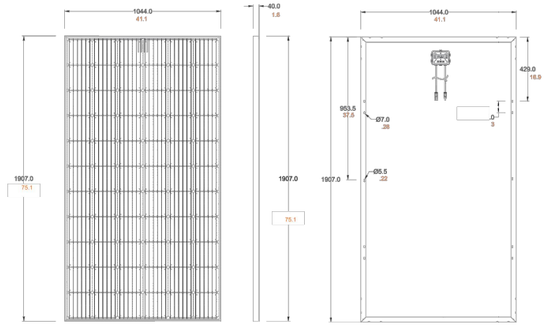
If you have questions or concerns about certification of our products in your area, please contact Mission Solar Energy.

Class Leading
375-385W

MSE PERC 66

BASIC DIMENSIONS

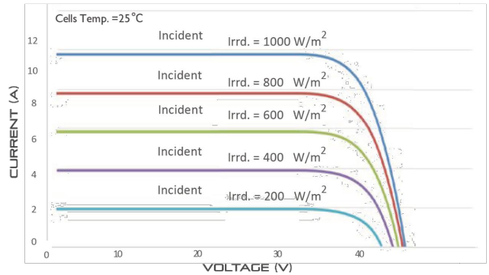
[UNITS: MM/IN]



CURRENT-VOLTAGE CURVE

MSE385SX5R: 385WP, 66 CELL SOLAR MODULE

Current-voltage characteristics with dependence on irradiance and module temperature



CERTIFICATIONS AND TESTS

IEC	61215, 61730, 61701
UL	61730

TÜV SUD · CEC · c UL us LISTED

ELECTRICAL SPECIFICATION

PRODUCT TYPE	MSExxxSX5R (xxx = P_{max})			
Power Output	P_{max}	W_p	375	380	385
Module Efficiency		%	18.8	19.1	19.3
Tolerance		%	0/+3	0/+3	0/+3
Short Circuit Current	I_{sc}	V	10.85	10.91	10.97
Open Circuit Voltage	V_{oc}	A	44.64	44.84	45.03
Rated Current	I_{mp}	V	10.26	10.34	10.42
Rated Voltage	V_{mp}	V	36.56	36.75	36.93
Fuse Rating		A	20	20	20
System Voltage		V	1,000	1,000	1,000

TEMPERATURE COEFFICIENTS

Normal Operating Cell Temperature (NOCT)	44.43°C (±3.7%)
Temperature Coefficient of Pmax	-0.361%/°C
Temperature Coefficient of Voc	-0.262%/°C
Temperature Coefficient of Isc	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)	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

MECHANICAL DATA

Solar Cells	P-type mono-crystalline silicon
Cell Orientation	66 cells (6x11)
Module Dimension	1,907mm x 1,044mm x 40mm
Weight	22 kg (49 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

SHIPPING INFORMATION

Container Feet	Ship To	Pallet	Panels	380 W Bin
53'	Most States	30	780	296.40 kW
Double Stack	CA	26	676	256.88 kW

PALLET [26 PANELS]

Weight	Height	Width	Length
1,274 lbs. (572 kg)	47.56 in (120.80 cm)	46 in (116.84 cm)	77 in (195.58 cm)

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

Mission Solar Energy reserves the right to make specification changes without notice.

TOP TIER SOLAR SOLUTIONS

CONTRACTOR

NAME: TOP TIER SOLAR SOLUTIONS
ADDRESS: 1530 CENTER PARK DR, CHARLOTTE, NC 28217, USA
PHONE: 855-997-1213
LICENSE #: SC - CLG.123883

ELECTRICALLICENSE #: NC - 87345
BDUNFORD@TOPTIERSOLARSOLUTIONS.COM

REVISIONS

DESCRIPTION	DATE	REV

SIGNATURE & SEAL

HOMEOWNER INFO

LISA BLACKFORD
185 COOL SPRINGS RD,
LILLINGTON, NC 27546, USA

APN: 7324754
EMAIL: -
PHONE: -

SHEET NAME

EQUIPMENT SPECIFICATION

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-8

ENPHASE.

DATA SHEET

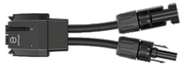
IQ8 and IQ8+ Microinverters

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

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

Enphase 25 year limited warranty

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



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

UL CERTIFIED SAFETY

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

IQ8SP-DS-0002-01-EN-US-2021-10-19

Easy to install

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

High productivity and reliability

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

Microgrid-forming

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

IQ8 and IQ8+ Microinverters

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

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

IQ8SP-DS-0002-01-EN-US-2021-10-19

TOP TIER SOLAR SOLUTIONS

CONTRACTOR

NAME: TOP TIER SOLAR SOLUTIONS
ADDRESS: 1530 CENTER PARK DR, CHARLOTTE, NC 28217, USA
PHONE: 855-997-1213
LICENSE #: SC - CLG.123883

ELECTRICALLICENSE #: NC - 87345
BDUNFORD@TOPTIERSOLARSOLUTIONS.COM

REVISIONS

DESCRIPTION	DATE	REV

SIGNATURE & SEAL

HOMEOWNER INFO

LISA BLACKFORD
185 COOL SPRINGS RD,
LILLINGTON, NC 27546, USA

APN: 7324754
EMAIL: -
PHONE: -

SHEET NAME

EQUIPMENT SPECIFICATION

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-9

Data Sheet
Enphase Networking

Enphase IQ Combiner 4/4C

X-IQ-AM1-240-4
X-IQ-AM1-240-4C

X-IQ-AM1-240-4C

X-IQ-AM1-240-4

The **Enphase 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 and 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 Enphase 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
- Flexible networking supports Wi-Fi, Ethernet, or cellular
- Optional AC receptacle available for PLC bridge
- Provides production metering and consumption monitoring

Simple

- Centered mounting brackets support single stud mounting
- Supports bottom, back and side conduit entry
- Up to four 2-pole branch circuits for 240 VAC 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

UL LISTED

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

ENPHASE.

Enphase IQ Combiner 4/4C

MODEL NUMBER	
IQ Combiner 4 (X-IQ-AM1-240-4)	IQ Combiner 4 with Enphase 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 system and IQ System Controller 2 and to deflect heat.
IQ Combiner 4C (X-IQ-AM1-240-4C)	IQ Combiner 4C with Enphase IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes Enphase 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)
Ensemble 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 for Ensemble sites - 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
EPLC-01	Power line carrier (communication bridge pair), quantity - one pair
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)
XA-ENV-PCBA-3	Replacement IQ Gateway printed circuit board (PCB) for Combiner 4/4C
X-IQ-NA-HD-125A	Hold down kit for Eaton circuit breaker with screws.
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 / 95A with IQ Gateway breaker included
IQ Gateway breaker	10A or 15A rating GE/Siemens/Eaton included
Production metering CT	200 A solid core pre-installed and wired to IQ Gateway
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	Up to 3000 meters (9,842 feet)
INTERNET CONNECTION OPTIONS	
Integrated Wi-Fi	802.11b/g/n
Cellular	CELLMODEM-M1-06-SP-05, CELLMODEM-M1-06-AT-05 (4G based LTE-M1 cellular modem). 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, IQ 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 Gateway	UL 60601-1/CANCSA 22.2 No. 61010-1

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

ENPHASE.

TOP TIER SOLAR SOLUTIONS

CONTRACTOR

NAME: TOP TIER SOLAR SOLUTIONS
ADDRESS: 1530 CENTER PARK DR, CHARLOTTE, NC 28217, USA
PHONE: 855-997-1213
LICENSE #: SC - CLG.123883

ELECTRICALLICENSE #: NC - 87345
BDUNFORD@TOPTIERSOLARSOLUTIONS.COM

REVISIONS

DESCRIPTION	DATE	REV

SIGNATURE & SEAL

HOMEOWNER INFO

LISA BLACKFORD
185 COOL SPRINGS RD,
LILLINGTON, NC 27546, USA

APN: 7324754
EMAIL: -
PHONE: -

SHEET NAME

EQUIPMENT SPECIFICATION

SHEET SIZE

ANSI B
11" X 17"

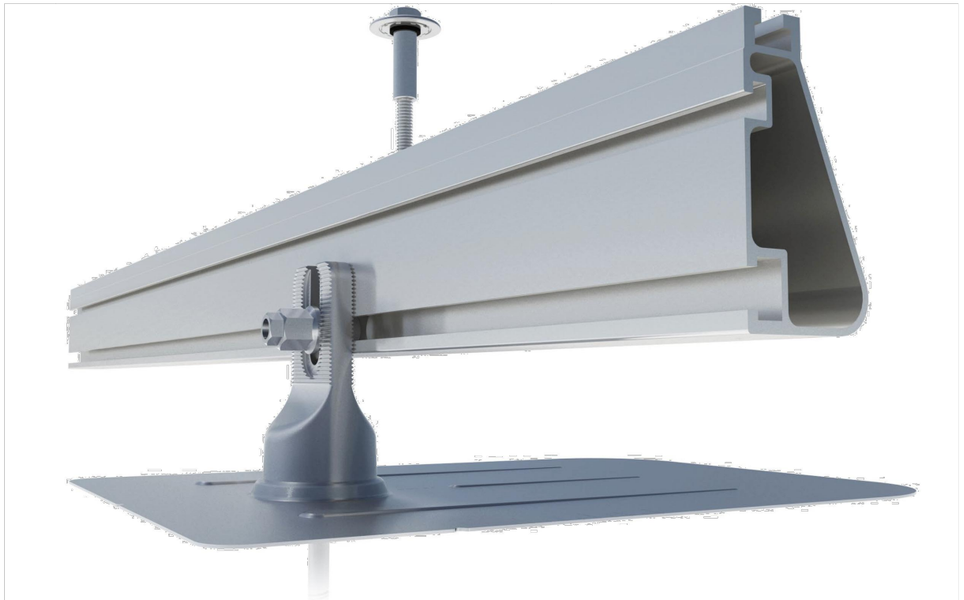
SHEET NUMBER

PV-10

Datasheet

IRONRIDGE

Flush Mount System



Built for solar's toughest roofs.

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

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

Strength Tested
All components evaluated for superior structural performance.

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

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

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

UL 2703 Listed System
Entire system and components meet newest effective UL 2703 standard.

20-Year Warranty
Twice the protection offered by competitors.

Datasheet

XR Rails

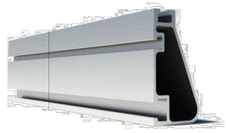
XR10 Rail

A low-profile mounting rail for regions with light snow.
- 6' spanning capability
- Moderate load capability
- Clear and black finish

XR100 Rail

The ultimate residential solar mounting rail.
- 8' spanning capability
- Heavy load capability
- Clear and black finish

XR1000 Rail



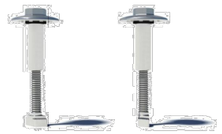
A heavyweight mounting rail for commercial projects.
- 12' spanning capability
- Extreme load capability
- Clear anodized finish

Bonded Splices

All rails use internal splices for seamless connections.
- Self-drilling screws
- Varying versions for rails
- Forms secure bonding

Clamps & Grounding

UFOs



Universal Fastening Objects bond modules to rails.
- Fully assembled & lubed
- Single, universal size
- Clear and black finish

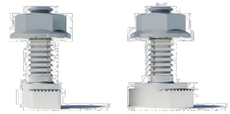
Stopper Sleeves

Snap onto the UFO to turn into a bonded end clamp.
- Bonds modules to rails
- Sized to match modules
- Clear and black finish

Grounding Lugs

Connect arrays to equipment ground.
- Low profile
- Single tool installation
- Mounts in any direction

Microinverter Kits



Mount MIs or POs to XR Rails.
- Bonds devices to rails
- Kit comes assembled
- Listed to UL 2703

Attachments

FlashFoot2

Flash and mount XR Rails with superior waterproofing.
- Twist-on Cap eases install
- Wind-driven rain tested
- Mill and black finish

Slotted L-Feet

Drop-in design for rapid rail attachment.
- Secure rail connections
- Slot for vertical adjusting
- Clear and black finish

Bonding Hardware

Bond and attach XR Rails to roof attachments.
- T & Square Bolt options
- Nut uses 7/16" socket
- Assembled and lubricated

Flush Standoffs

Raise Flush Mount System to various heights.
- Works with vent flashing
- 4" and 7" lengths
- Ships assembled

Resources

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

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

TOP TIER SOLAR SOLUTIONS

CONTRACTOR

NAME: TOP TIER SOLAR SOLUTIONS
ADDRESS: 1530 CENTER PARK DR, CHARLOTTE, NC 28217, USA
PHONE: 855-997-1213
LICENSE #: SC - CLG.123883

ELECTRICALLICENSE #: NC - 87345
BDUNFORD@TOPTIERSOLARSOLUTIONS.COM

REVISIONS

DESCRIPTION	DATE	REV

SIGNATURE & SEAL

HOMEOWNER INFO

LISA BLACKFORD
185 COOL SPRINGS RD,
LILLINGTON, NC 27546, USA

APN: 7324754
EMAIL: -
PHONE: -

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-11