PHOTOVOLTAIC SYSTEM

PV SYSTEM SUMMARY: 13.050 KW

GROUND MOUNT RESIDENTIAL PHOTOVOLTAIC SYSTEM

SYSTEM SIZE (DC)	:	STC: 45 X 290.00= 13050W DC
	:	PTC: 45 X 267.90 = 12055.50W DC
SYSTEM SIZE (AC)	:	10000W AC @ 240V
MODULES	:	45 X REC SOLAR: REC290TP-BLK
OPTIMIZERS	:	45 X SOLAR EDGE: P340
INVERTER	:	SOLAREDGE: SE10000H-USRGM [SI1]
TILT	:	15° PITCH
AZIMUTH	:	175°
ATTACHMENT TYPE	:	CONCRETE PIERS WITH IRON RIDGE XR1000 RAIL
MAIN SERVICE PANEL	:	EXISTING 200 AMPS MSP WITH 200 AMPS MAIN BREAKER ON END FEED
INTERCONNECTION	:	LINE SIDE TAP
OCPD RATING	:	60 AMPS
UTILITY	:	NATIONAL GRID

TABLE OF CONTENTS

CITY NOTES:

THIS PROJECT COMPLIES WITH THE FOLLOWING:
2018 INTERNATIONAL BUILDING CODE (IBC)
2018 INTERNATIONAL RESIDENTIAL CODE (IRC)
2018 INTERNATIONAL MECHANICAL CODE (IMC)
2018 INTERNATIONAL PLUMBING CODE (IPC)
2018 INTERNATIONAL FUEL GAS CODE (IFGC)
2018 INTERNATIONAL ENERGY CONSERVATION CODE (IECC)
2018 INTERNATIONAL EXISTING BUILDING CODE (IEBC)
2018 INTERNATIONAL SWIMMING POOL AND SPA CODE (ISPSC)
2020 NATIONAL ELECTRICAL CODE (NEC)
AS ADOPTED BY TOWN OF SPENCER

CONDUIT AND CONDUCTOR SPECIFICATIONS ARE BASED ON MINIMUM CODE REQUIREMENTS AND ARE NOT MEANT TO LIMIT UP-SIZING AS REQUIRED BY FIELD CONDITIONS.

ALL SOLAR ENERGY SYSTEM EQUIPMENT SHALL BE SCREENED TO THE MAXIMUM EXTENT POSSIBLE.

INSTALLATION NOTES:

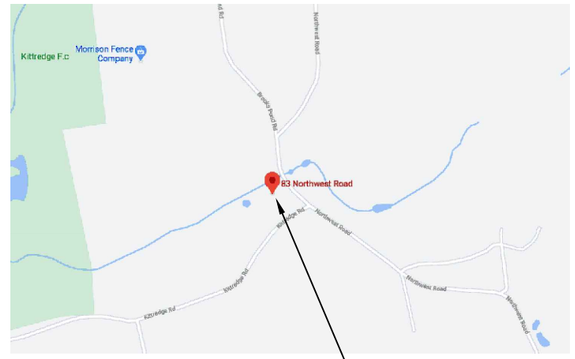
- PV WIRE SHALL BE USED ON DC RUNS FOR UNGROUNDED/TRANSFORMERLESS INVERTERS.
- INSTALL CREW TO VERIFY ROOF STRUCTURE PRIOR TO COMMENCING WORK.
- EMT CONDUIT ATTACHED TO THE ROOF USING CONDUIT MOUNTS
- DIG ALERT (811) TO BE CONTACTED AND COMPLIANCE WITH EXCAVATION SAFETY PRIOR TO ANY EXCAVATION TAKING PLACE

COMMONWEALTH OF MASSACHUSETTS
WILLIAM K. LOU
ELECTRICAL
No. 51522
EXP 6/30/22
REGISTERED
PROFESSIONAL ENGINEER

BILL LOU

Digitally signed by BILL LOU
Date: 2020.09.25 22:40:16 -07'00'

SITE LOCATION:



SITE LOCATION

HOUSE AERIAL VIEW:

MODULE LOCATION

freedom FOREVER

FREEDOM FOREVER LLC
43445 Business Park Dr Suite 110, Temecula, CA 92590
Tel: (800) 385-1075

Electrical Contractor No:
HIC 198080,
902-EL-A1
MATTHEW MARKHAM

CLIENT:

LUSIGNAN, CRAIG
83 NORTHWEST ROAD,
SPENCER, MA 01562
(508) 410-5111

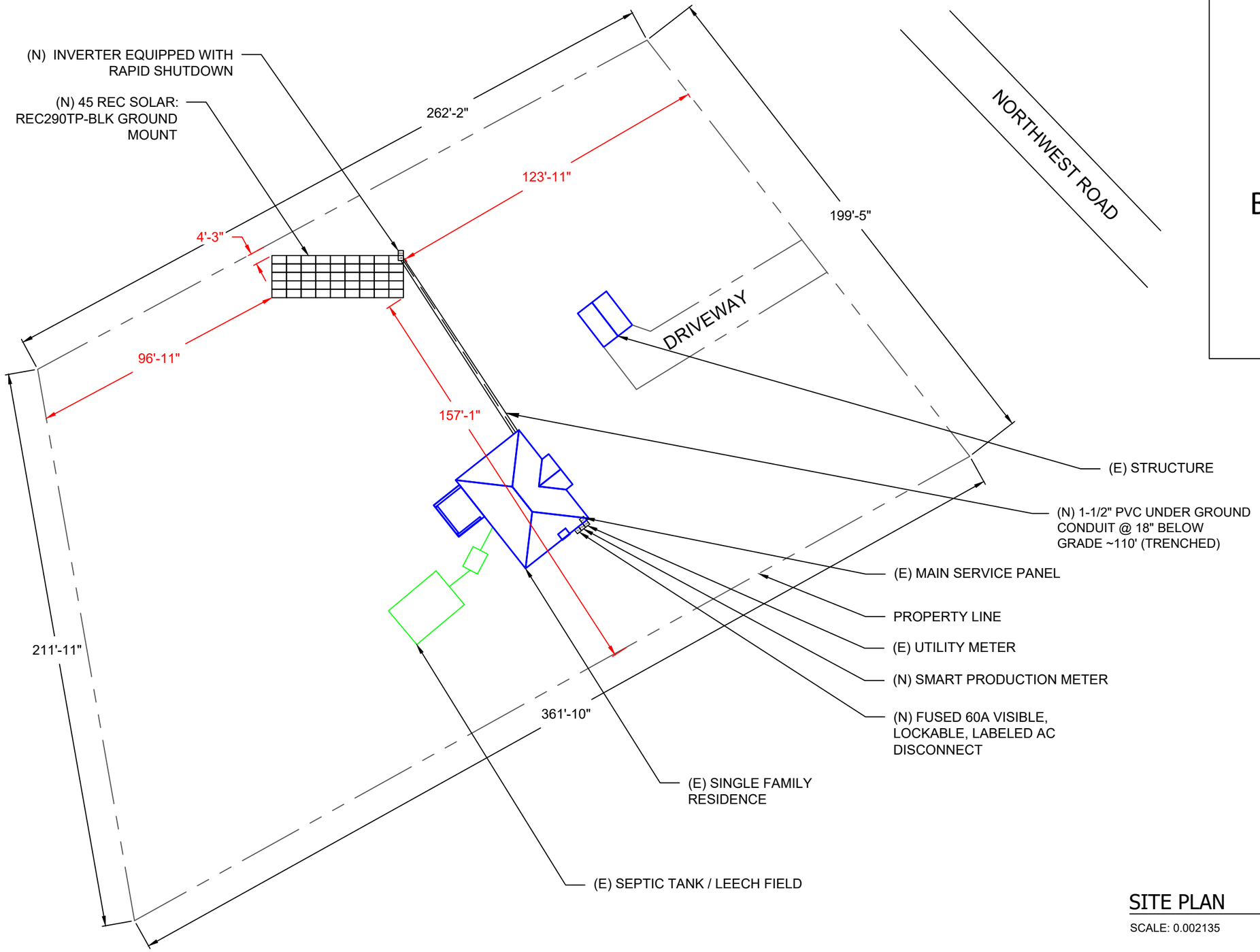
REVISIONS:

DESCRIPTION	DATE	REVISION

DATE:	09/24/2020
DESIGN BY:	GREG
JOB NO.:	F062600

TITLE:
SITE LOCATION AND HOUSE AERIAL VIEW

SHEET:
PV-1



COMMONWEALTH OF MASSACHUSETTS
WILLIAM K. LOU
ELECTRICAL
No. 51522
EXP 6/30/22
REGISTERED PROFESSIONAL ENGINEER

BILL LOU

Digitally signed by BILL LOU
Date: 2020.09.25 22:39:55 -07'00'

SITE PLAN

SCALE: 0.002135

1

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Tel: (800) 385-1075

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83 NORTHWEST ROAD,
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(508) 410-5111

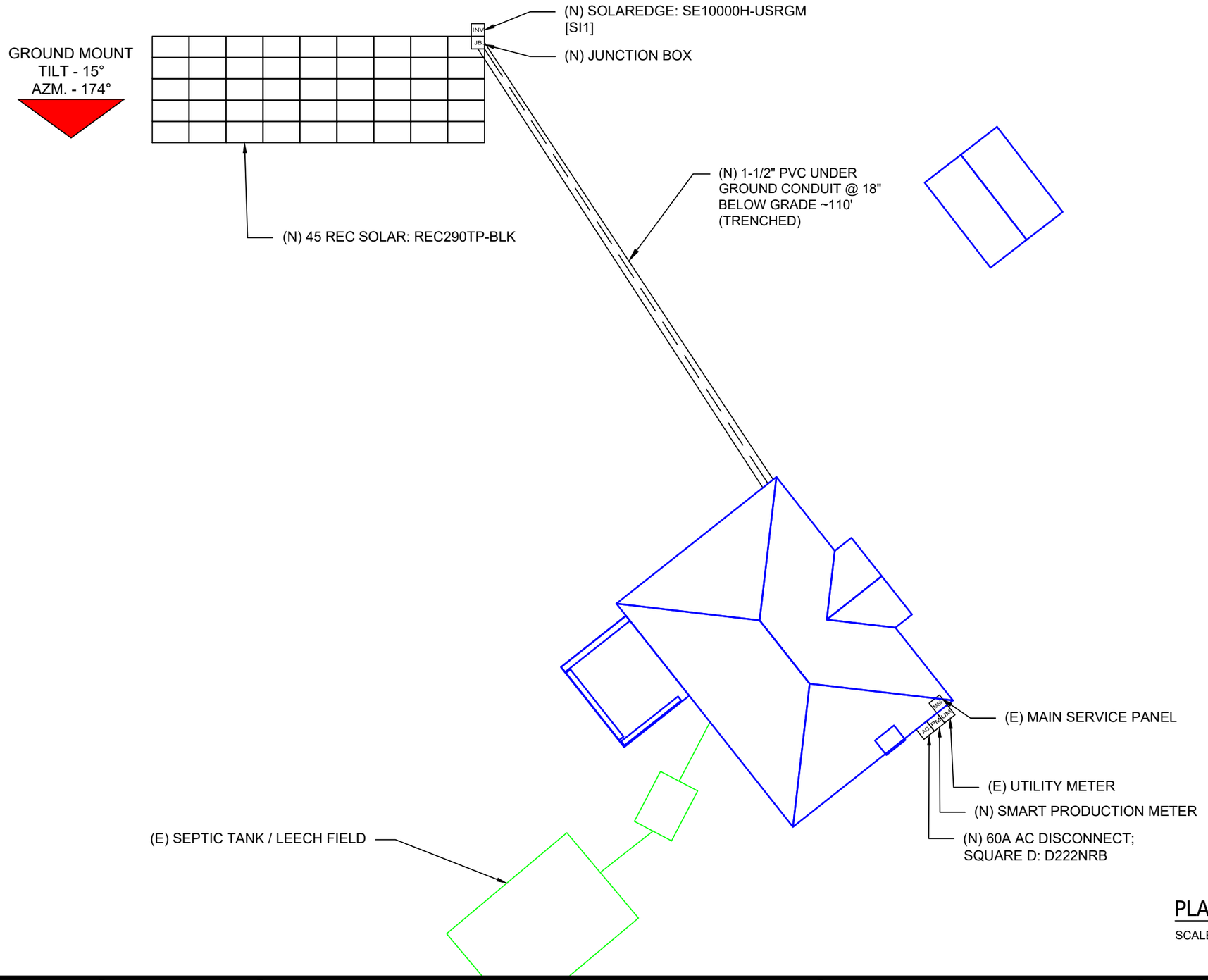
REVISIONS:

DESCRIPTION	DATE	REVISION

DATE:	09/24/2020
DESIGN BY:	GREG
JOB NO.:	F062600

TITLE: SITE PLAN

SHEET: PV-2



COMMONWEALTH OF MASSACHUSETTS
WILLIAM K. LOU
ELECTRICAL
No. 51522
EXP 6/30/22
REGISTERED PROFESSIONAL ENGINEER

BILL LOU

Digitally signed by BILL LOU
Date: 2020.09.25 22:39:37 -07'00'

LEGEND:

- MODULES
- CONDUIT
- AC — AC DISCONNECT
- MSP — MSP
- JB — JUNCTION BOX
- INV — INVERTER

PLAN WITH MODULES LAYOUT

SCALE: 1/16" = 1'-0"

1

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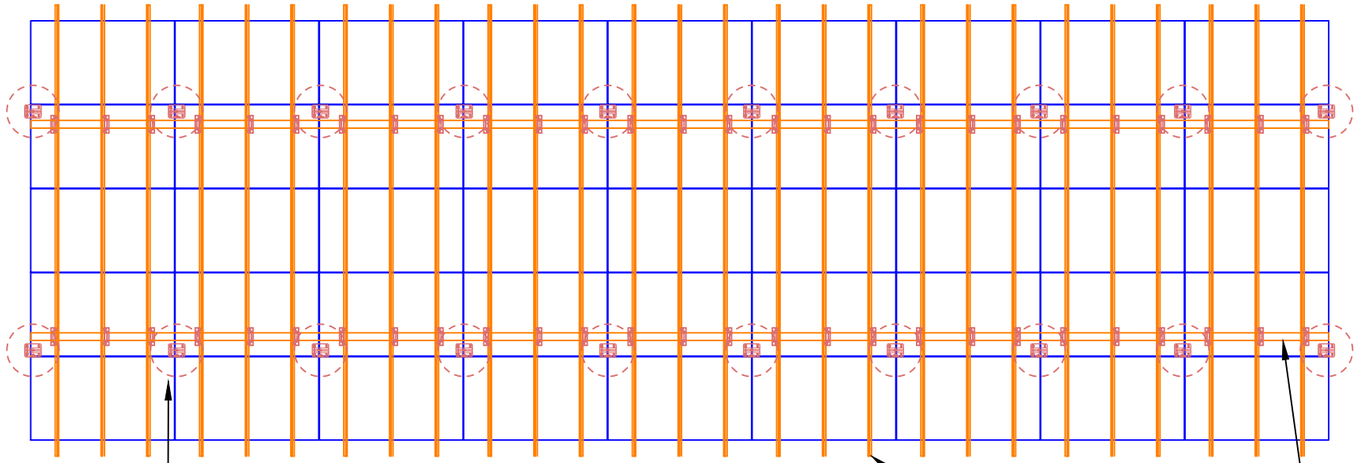
SPENCER, MA 01562
(508) 410-5111

REVISIONS:		
DESCRIPTION	DATE	REVISION

DATE:	09/24/2020
DESIGN BY:	GREG
JOB NO.:	F062600

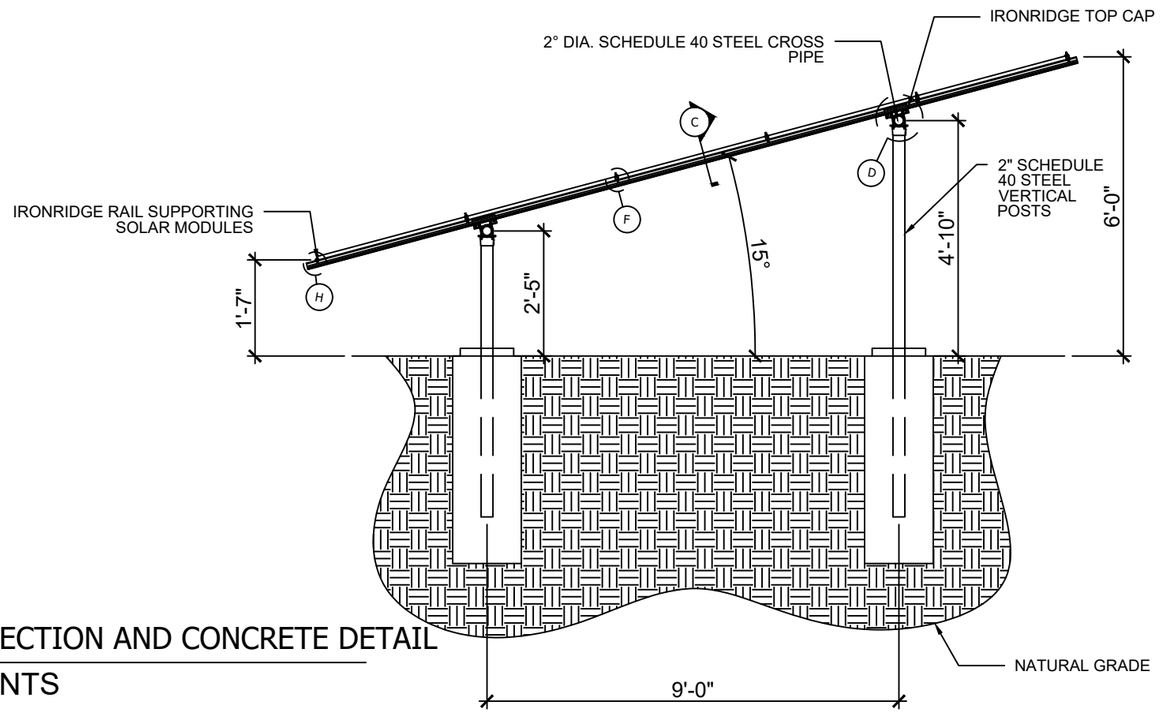
TITLE: PLAN WITH MODULES LAYOUT

SHEET: PV-2A



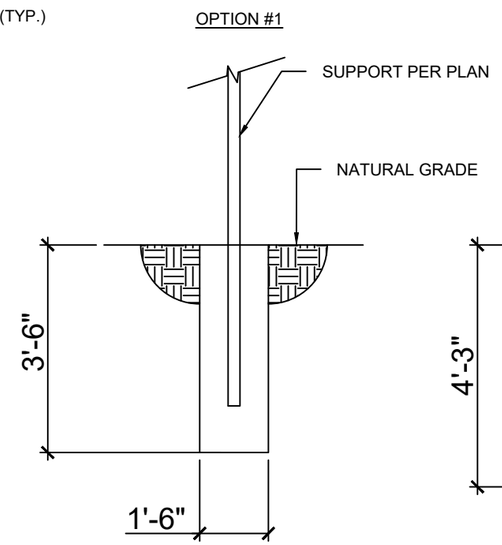
ARRAY DETAIL

Scale: NTS



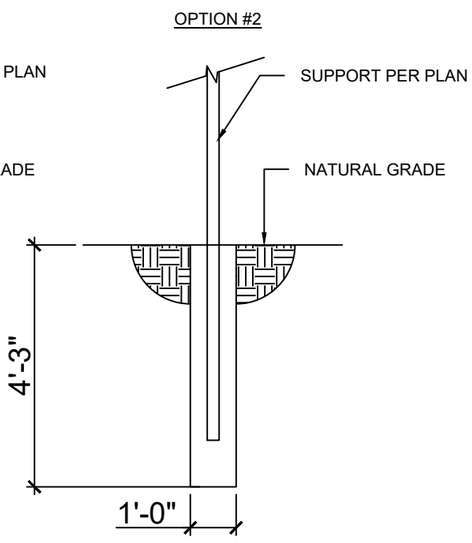
SIDE SECTION AND CONCRETE DETAIL

Scale: NTS



ARRAY FOUNDATION PIER DETAIL
SECTION VIEW

18" WIDE FOOTING 3'-6" DEEP



ARRAY FOUNDATION PIER DETAIL
SECTION VIEW

12" WIDE FOOTING 4'-3" DEEP

COMMONWEALTH OF MASSACHUSETTS
CHRIS H. KIM
No. 52430
REGISTERED PROFESSIONAL ENGINEER

Chris H Kim

Digitally signed by Chris H Kim
Date: 2020.10.01 11:15:10 -04'00'

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(508) 410-5111

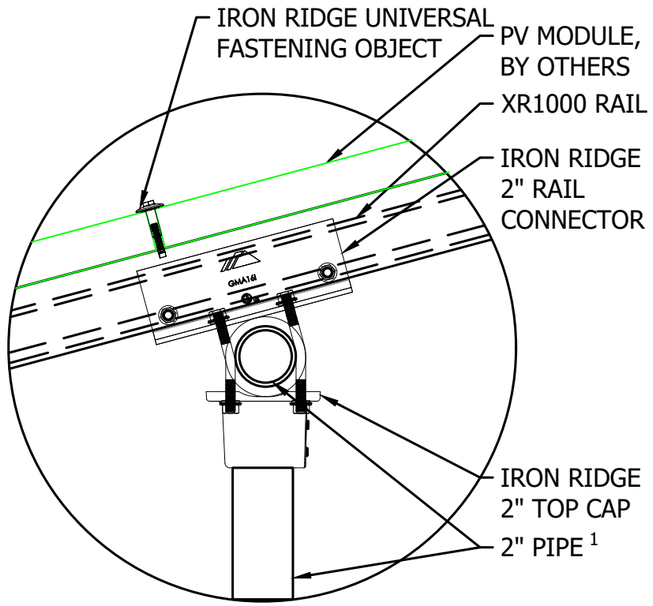
REVISIONS:

DESCRIPTION	DATE	REVISION

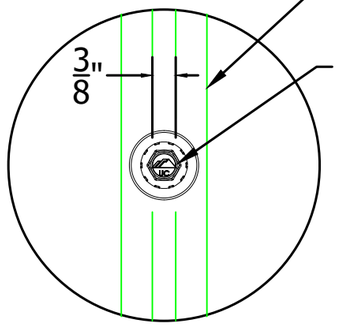
DATE:	09/24/2020
DESIGN BY:	GREG
JOB NO.:	F062600

TITLE: MOUNTING DETAIL

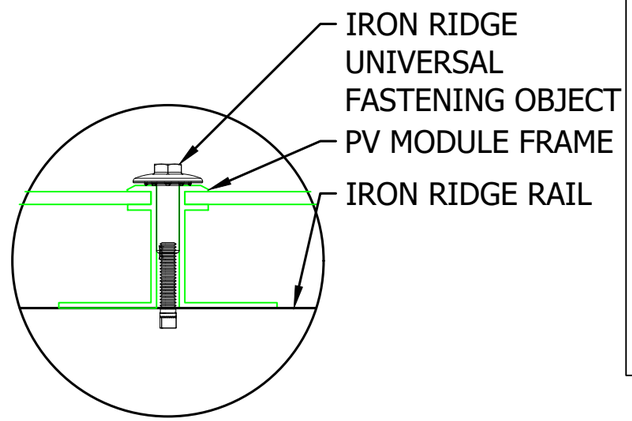
SHEET: PV-3



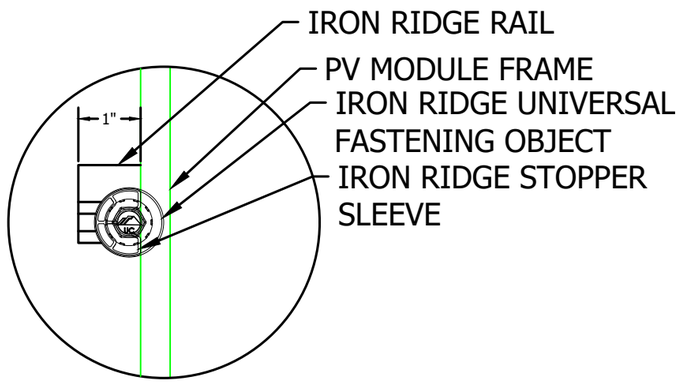
D PIPE FITTINGS DETAIL
Scale: 3" = 1'-0"



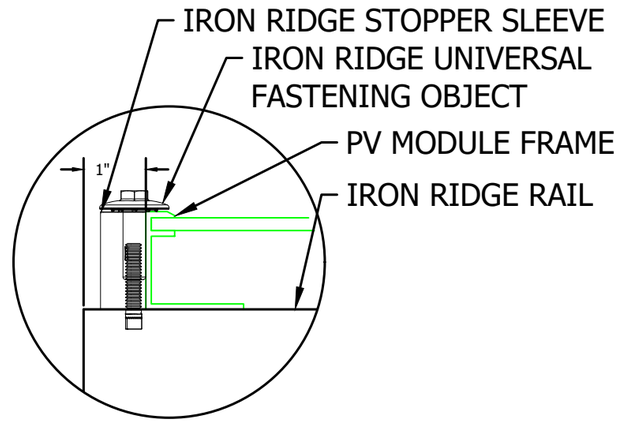
E DETAIL, MID CLAMP PLAN
Scale: 6" = 1'-0"



F DETAIL, MID CLAMP FRONT
Scale: 6" = 1'-0"



G DETAIL, END CLAMP PLAN
Scale: 6" = 1'-0"



H DETAIL, END CLAMP FRONT
Scale: 6" = 1'-0"

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Electrical Contractor No:
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902-EL-A1
MATTHEW MARKHAM

CLIENT:
LUSIGNAN, CRAIG
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SPENCER, MA 01562
(508) 410-5111

REVISIONS:

DESCRIPTION	DATE	REVISION

DATE:	09/24/2020
DESIGN BY:	GREG
JOB NO.:	F062600

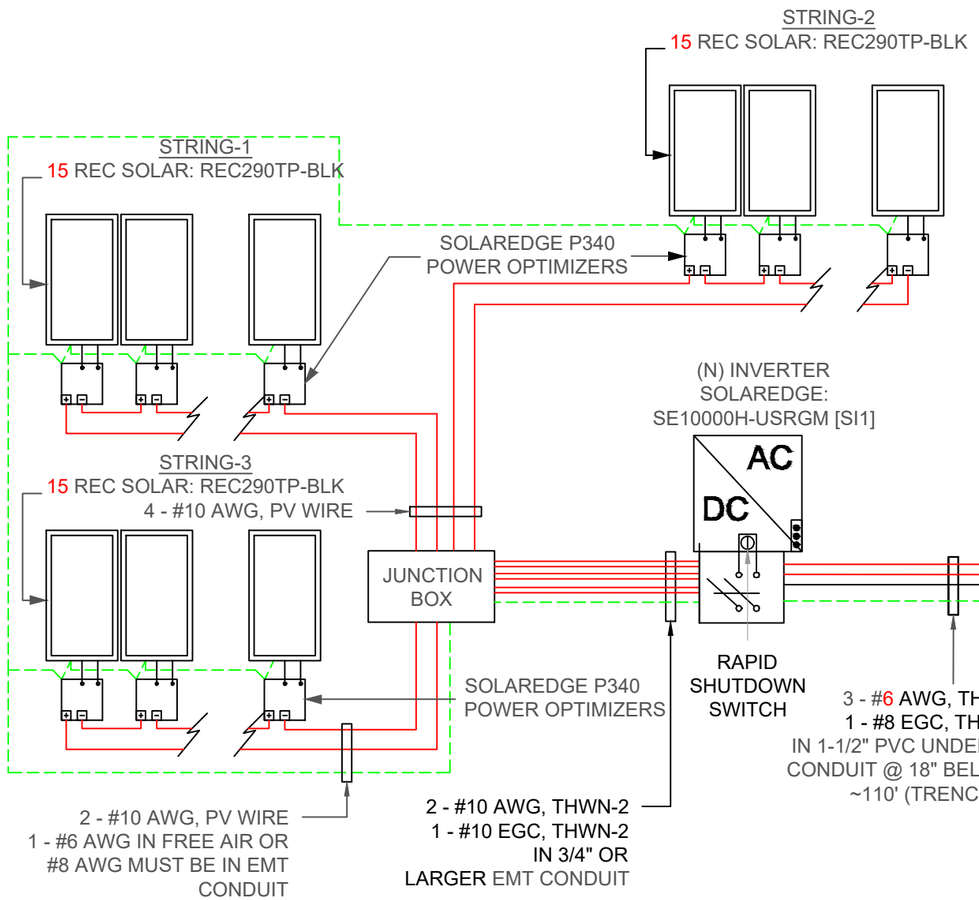
TITLE:
MOUNTING DETAIL CONT.

SHEET:
PV-3A

BACKFEED BREAKER SIZING
MAX. CONTINUOUS OUTPUT 42A @ 240V
42.0 X 1.25 = 52.50AMPS 60A FUSES - OK

PV SYSTEM
13.050 kW-DC
10.000 kW-AC

CONDUCTOR AMPACITY DE-RATE CALCULATION							
	Wire Location	CONDUCTOR QUANTITY	Circuit Conductor Size	NEC Factors Table 310.15(B)(16) Allowable Ampacity	NEC Factors Table 310.15(B)(2)(a) Ambient Temperature Correction	Adj. Conductor Ampacity @ 90°C	Conduit Fill Correction Per 310.15(B)(3)(a)
INVERTER TO AC DISCONNECT	WALL	3	6	75	1.00	75.00	1.00
AC DISCONNECT TO POI	WALL	3	6	75	1.00	75.00	1.00



NOTE:
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COMMONWEALTH OF MASSACHUSETTS
WILLIAM K. LOU
ELECTRICAL
No. 51522
EXP 6/30/22
REGISTERED PROFESSIONAL ENGINEER

BILL LOU
Digitally signed by BILL LOU
Date: 2020.09.25 22:39:15 -07'00'

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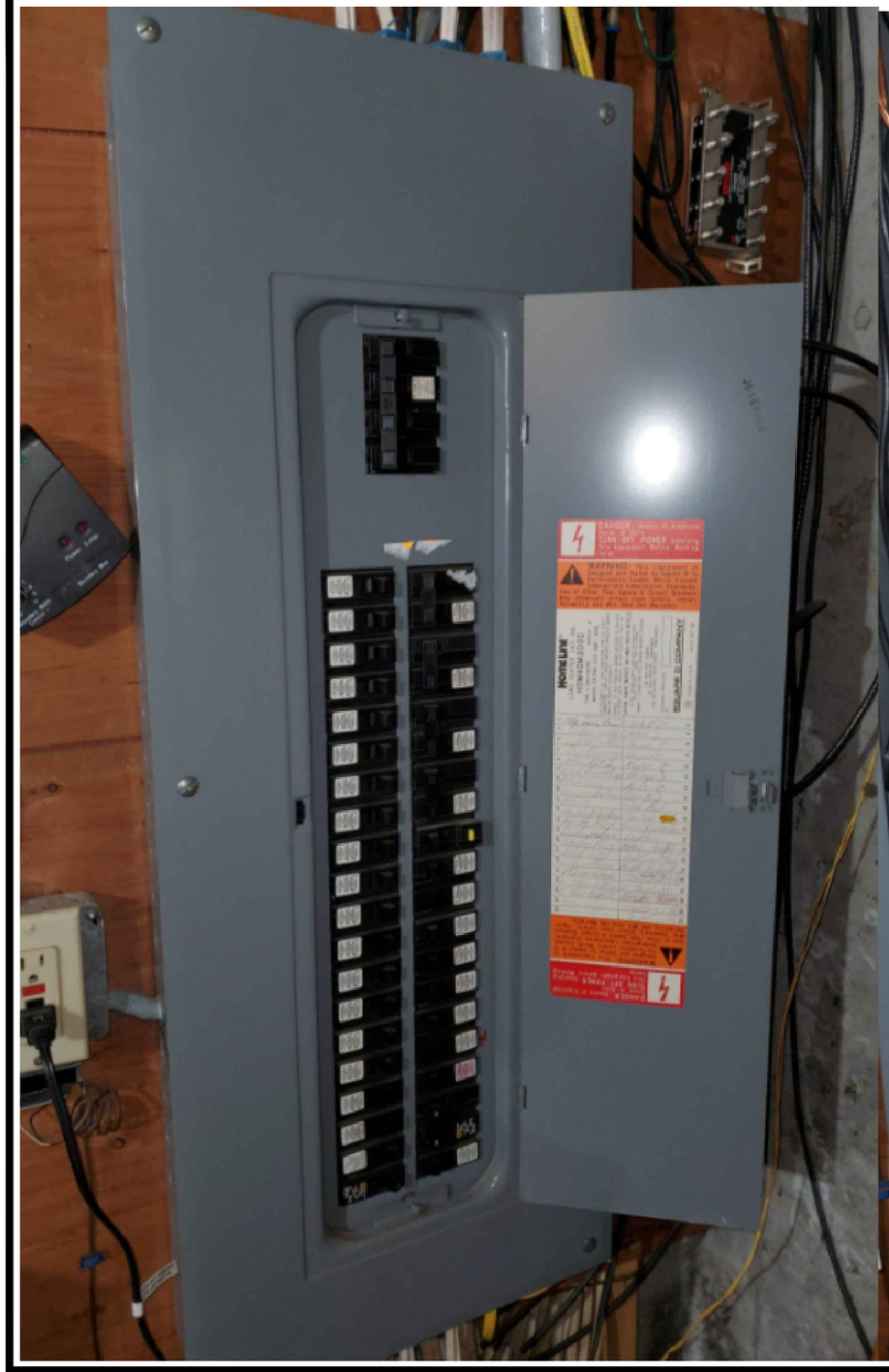
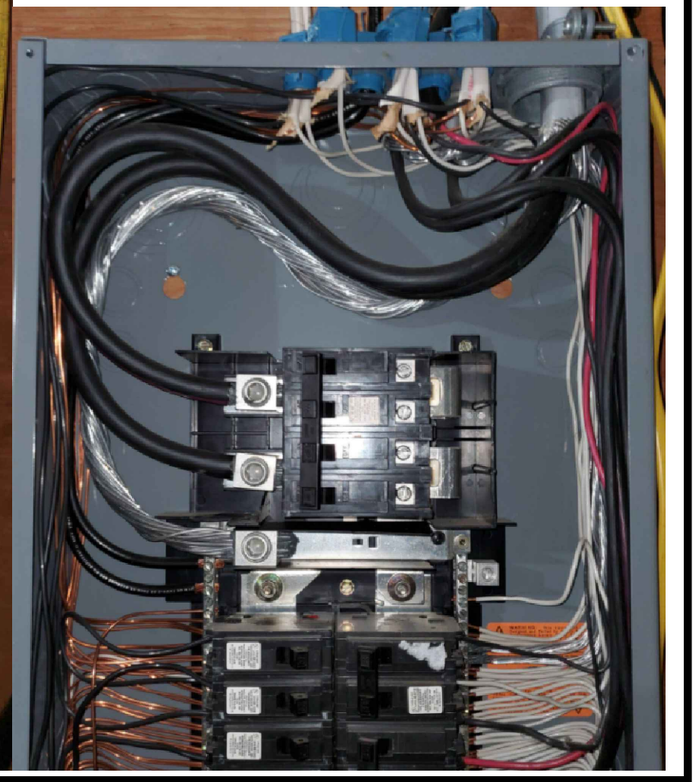
REVISIONS:		
DESCRIPTION	DATE	REVISION

DATE:	09/24/2020
DESIGN BY:	GREG
JOB NO.:	F062600

TITLE:
ELECTRICAL
LINE DIAGRAM

SHEET:
PV-4





COMMONWEALTH OF MASSACHUSETTS
WILLIAM K. LOU
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No. 51522
EXP 6/30/22
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BILL LOU

Digitally signed by BILL LOU
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REVISIONS:

DESCRIPTION	DATE	REVISION

DATE:	09/24/2020
DESIGN BY:	GREG
JOB NO.:	F062600

TITLE:

EXISTING / NEW SERVICE PANEL

SHEET:

PV-5

GENERAL NOTES :

1. (45) REC SOLAR: REC290TP-BLK WIRED AND LISTED TO UL1703 STANDARDS
2. THE SOLAREDGE: SE10000H-USRGM [SI1] INVERTER WITH INTEGRATED DC DISCONNECT AND ARC FAULT PROTECTION. ATTACHED WITH SYSTEM ELECTRICAL SPECIFICATIONS, GROUND FAULT PROTECTION & LISTED TO UL 1741 STANDARDS.
3. PHOTOVOLTAIC SYSTEM GROUND WILL BE TIED INTO EXISTING GROUND AT MAIN SERVICE AS PER NEC SEC. 250.166(A).
4. SOLAR PHOTOVOLTAIC SYSTEM EQUIPMENT WILL BE INSTALLED IN ACCORDANCE WITH REQUIREMENTS OF ART. 690 OF THE NEC
5. CONDUIT ABOVE ROOF SHALL BE NO LESS THAN 1" FROM TOP OF THE ROOF TO BOTTOM OF RACEWAY. TABLE NEC 310.15(B)(3)(C)
6. PHOTOVOLTAIC DC CONDUCTORS ENTERING THE BUILDING SHALL BE INSTALLED IN METALLIC RACEWAY AND SHALL BE IDENTIFIED EVERY 10 FEET -- AND WITHIN 1 FOOT ABOVE AND BELOW PENETRATIONS OF ROOF/CEILING ASSEMBLIES, WALLS, OR BARRIERS -- WITH MINIMUM 3/8-INCH-HIGH WHITE LETTERING ON RED BACKGROUND READING: “WARNING: PHOTOVOLTAIC POWER SOURCE"
7. SYSTEM GROUNDING ELECTRODE CONDUCTOR FOR PV SYSTEM TO BE SIZED TO MEET THE REQUIREMENTS OF NEC TABLE 250.66.
8. THE EXISTING MAIN SERVICE PANEL WILL BE EQUIPPED WITH A GROUND OR UFER.
9. UTILITY COMPANY WILL BE NOTIFIED PRIOR TO ACTIVATION OF THE SOLAR PV SYSTEM.
10. TERMINALS OF THE DISCONNECTING MEANS MAY BE ENERGIZED IN THE OPEN POSITION.
11. SOLAREDGE INVERTERS ARE LISTED TO UL 1741 AND UL 1699B STANDARDS.
12. SOLAREDGE OPTIMIZERS ARE LISTED TO IEC 62109-1 (CLASS II SAFETY) AND UL 1741 STANDARDS.

Part	Spares	Total Qty
Rails		
XR-1000-204A XR1000, Rail 204" (17 Feet) Clear	0 edit	27
Clamps & Grounding		
UFO-CL-01-A1 Universal Module Clamp, Clear	0 edit	162
UFO-STP-38MM-M1 Stopper Sleeve, 38MM, Mill	0 edit	54
XR-LUG-03-A1 Grounding Lug, Low Profile	0 edit	1
Substructure		
70-0200-SGA SGA Top Cap at 2"	0 edit	20
GM-BRC-002 Ground Mount Bonded Rail Connector - 2"	0 edit	54

MATERIAL LIST

QTY	EQUIPMENT	DESCRIPTION	
45	REC SOLAR: REC290TP-BLK	OPEN CIRCUIT VOLTAGE (Voc) : MAX. POWER VOLTAGE (Vmp) : SHORT CIRCUIT CURRENT (Isc) : MAX. POWER CURRENT (Imp) : PTC RATING :	38.80V 32.10V 9.71A 9.05A 267.9W
1	SOLAREDGE: SE10000H-USRGM [SI1]	DC MAX SYSTEM VOLTAGE : AC OUTPUT VOLTAGE RANGE : MAX. AC OUTPUT CURRENT : MAX. AC POWER OUPUT : WEIGHTED EFFICIENCY :	480V 211-240V 42.0A 10000W 99%
45	SOLAR EDGE P340 POWER OPTIMIZERS	RATED DC INPUT POWER : MAXIMUM INPUT VOLTAGE : MPPT RANGE : MAX. INPUT CURRENT : MAX. OUTPUT CURRENT :	340W 48VDC 8-48VDC 13.75ADC 15ADC
1	PV BREAKER	60A / 2P PV BREAKER, 1PH, 240VAC	
1	JUNCTION BOX	600VDC, NEMA 3R, UL LISTED	
1	AC DISCONNECT	60A RATED, 240VAC, NEMA 3R UL LISTED	
200 FT	CONDUIT	3/4" OR LARGER EMT CONDUIT	
110 FT	TRENCH	1.5" OR LARGER PVC	
20	ATTACHMENTS	GROUND MOUNT ATTACHMENTS	

COMMONWEALTH OF MASSACHUSETTS
WILLIAM K. LOU
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BILL LOU
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Date: 2020.09.25 22:38:32 -07'00'

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MATTHEW MARKHAM

CLIENT:
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SPENCER, MA 01562
(508) 410-5111

REVISIONS:

DESCRIPTION	DATE	REVISION

DATE:	09/24/2020
DESIGN BY:	GREG
JOB NO.:	F062600

TITLE:
NOTES AND EQUIPMENT LIST

SHEET:
PV-6

WARNING:
POWER SOURCE OUTPUT CONNECTION
DO NOT RELOCATE THIS OVERCURRENT DEVICE

705.12(B)(2)(3)(b)

M

"WARNING"
DUAL POWER SOURCES
SECOND SOURCE IS PHOTO- VOLTAIC SYSTEM
RATED AC OUTPUT CURRENT - 42.0 AMPS
AC NORMAL OPERATING VOLTAGE - 240 VOLTS

690.54

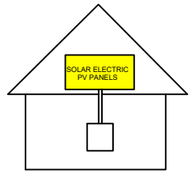
A
C

PV SYSTEM AC DISCONNECT
RATED AC OUTPUT CURRENT - 42.0 AMPS
AC NORMAL OPERATING VOLTAGE - 240 VOLTS

690.15, 690.54

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



690.56(C)(1)(A)

RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

690.56(C)(3)

INVERTER

ARRAY

J/B

DC

"WARNING"
ELECTRICAL SHOCK HAZARD.
TERMINALS ON BOTH LINE AND LOAD SIDES
MAY BE ENERGIZED IN THE OPEN POSITION

690.13 (B)

NEC 690.31(G)(3) & (4)

"WARNING"
PHOTOVOLTAIC POWER SOURCE

EVERY 10' ON CONDUIT AND ENCLOSURES

PV SYSTEM DC DISCONNECT
MAXIMUM VOLTAGE: 480V
MAXIMUM CIRCUIT CURRENT: 42.0A
MAX RATED OUTPUT CURRENT OF THE CONTROLLER OR DC-TO-DC CONVERTER: 15A

690.53

NOTES:

1. NEC ARTICLES 690 AND 705 AND IRC SECTION R324 MARKINGS SHOWN HEREON
2. ALL MARKING SHALL CONSIST OF THE FOLLOWING:
   A. UV RESISTANT SIGN MATERIAL WITH ENGRAVED OR MACHINE PRINTED LETTERS OR ELECTRO-PLATING.
   B. RED BACKGROUND COLOR WHITE TEXT AND LINE WORK.
   C. AERIAL FONT.
3. ALL SIGNS SHALL BE SIZED APPROPRIATELY AND PLACED IN THE LOCATIONS SPECIFIED. SIGNAGE CANNOT BE HAND-WRITTEN.

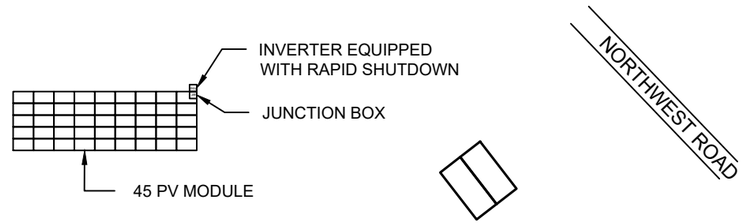
COMMONWEALTH OF MASSACHUSETTS
WILLIAM K. LOU
ELECTRICAL
No. 51522
REGISTERED
PROFESSIONAL ENGINEER
EXP 6/30/22

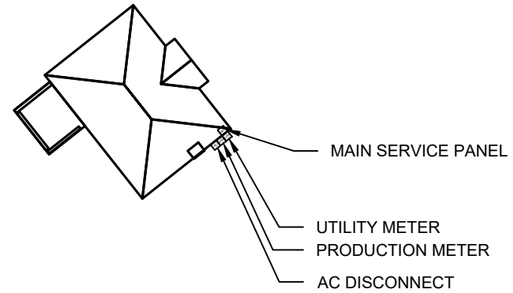
BILL LOU

Digitally signed by BILL LOU
Date: 2020.09.25 22:38:05 -07'00'

CAUTION:

POWER TO THIS BUILDING IS ALSO SUPPLIED FROM THE FOLLOWING SOURCES WITH DISCONNECT(S) LOCATED AS SHOWN.
DANGEROUS VOLTAGE MAY BE PRESENT AT ALL TIMES





6X8" TYP - NEC 705.10

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(508) 410-5111

REVISIONS:

DESCRIPTION	DATE	REVISION

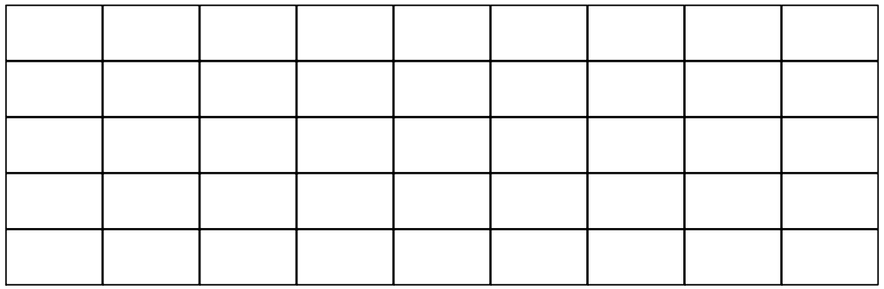
DATE:	09/24/2020
DESIGN BY:	GREG
JOB NO.:	F062600

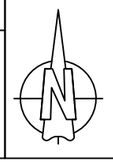
TITLE: LABELS

SHEET: PV-7

SOLAREDGE OPTIMIZER CHART

	1-10	11-20	21-30	31-40	41-50	51-60
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						





freedom FOREVER

FREEDOM FOREVER LLC
43445 Business Park Dr Suite 110, Temecula, CA 92590
Tel: (800) 385-1075

Electrical Contractor No:
HIC 198080,
902-EL-A1
MATTHEW MARKHAM

CLIENT:

LUSIGNAN, CRAIG
83 NORTHWEST ROAD,
SPENCER, MA 01562
(508) 410-5111

REVISIONS:

DESCRIPTION	DATE	REVISION

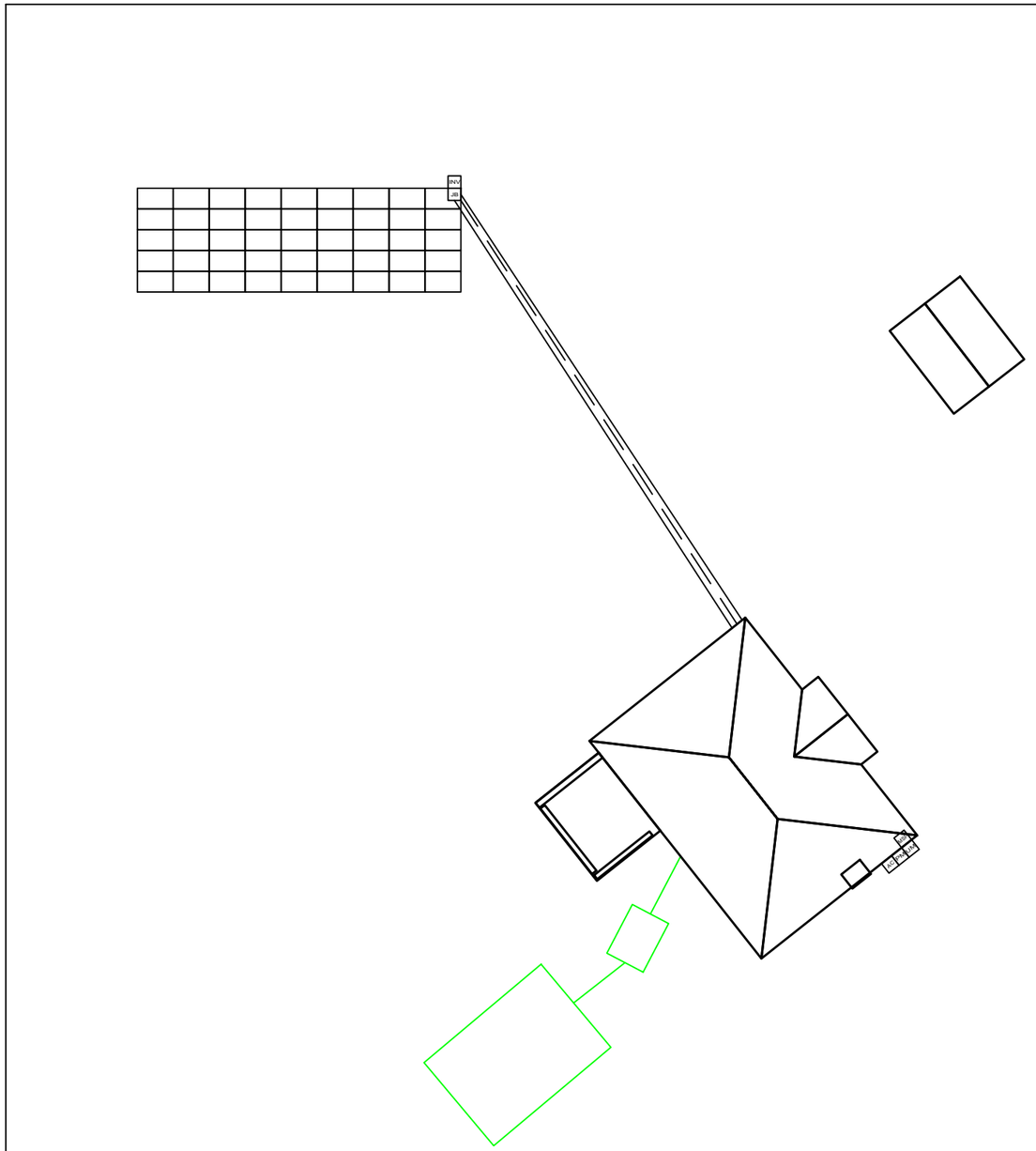
DATE:	09/24/2020
DESIGN BY:	GREG
JOB NO.:	F062600

TITLE:
OPTIMIZER CHART

SHEET:
PV-8

PPE INFORMATION

HAZARDS



MEDICAL INFORMATION:

CREW SIGNATURES:

SAFETY PLAN
SCALE: NTS

1

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CLIENT:

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83 NORTHWEST ROAD,
SPENCER, MA 01562
(508) 410-5111

REVISIONS:

DESCRIPTION	DATE	REVISION

DATE:	09/24/2020
DESIGN BY:	GREG
JOB NO.:	F062600

TITLE: SAFETY PLAN

SHEET: PV-9

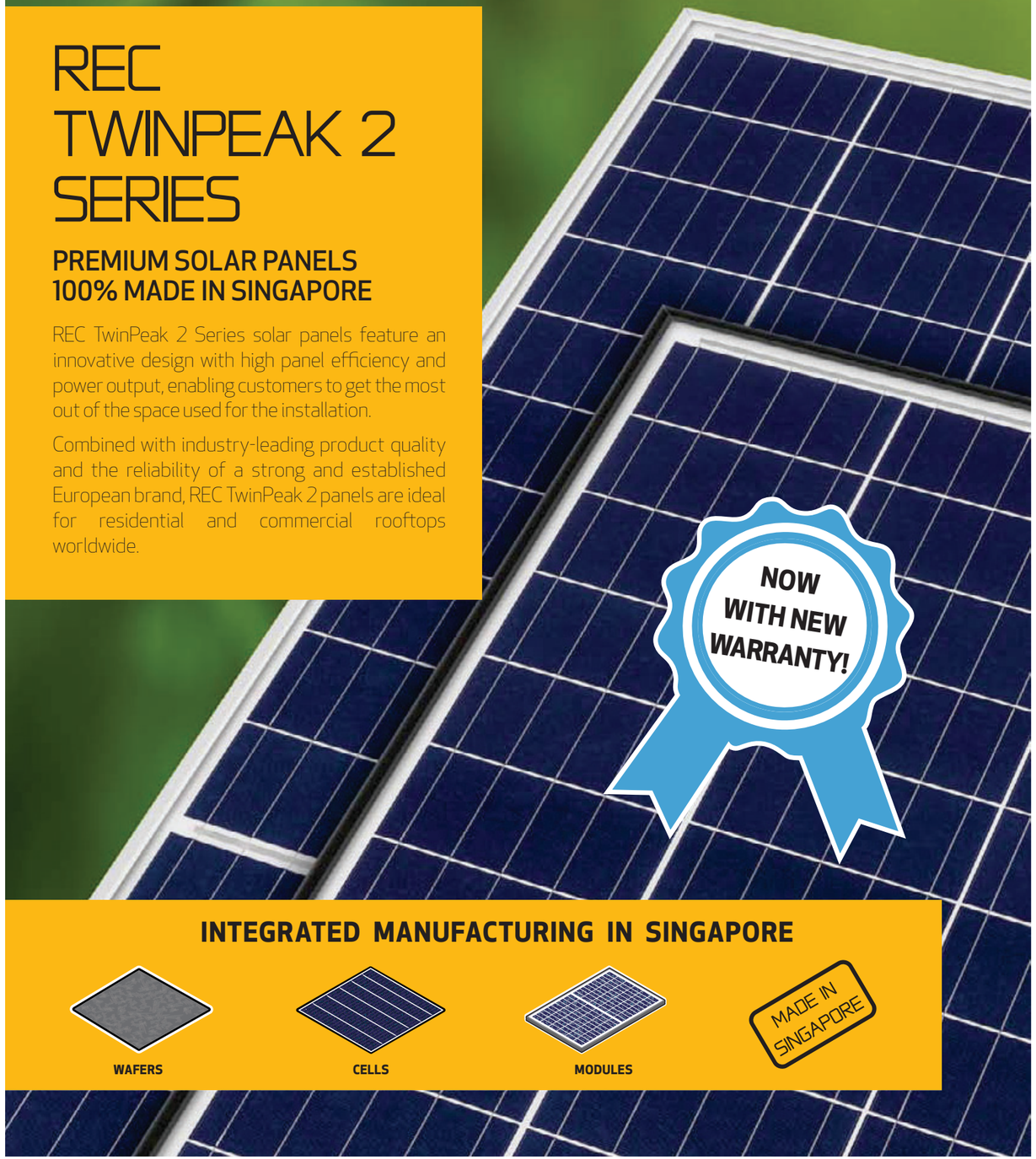
SOLAR'S MOST TRUSTED REC

REC TWINPEAK 2 SERIES

PREMIUM SOLAR PANELS 100% MADE IN SINGAPORE

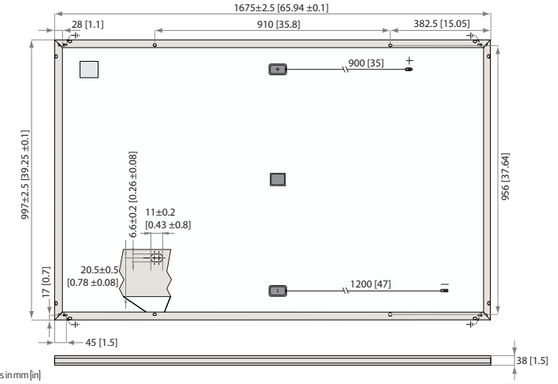
REC TwinPeak 2 Series solar panels feature an innovative design with high panel efficiency and power output, enabling customers to get the most out of the space used for the installation.

Combined with industry-leading product quality and the reliability of a strong and established European brand, REC TwinPeak 2 panels are ideal for residential and commercial rooftops worldwide.



INTEGRATED MANUFACTURING IN SINGAPORE

REC TWINPEAK 2 SERIES



Measurements in mm [in]

ELECTRICAL DATA @ STC	Product Code*: RECxxxTP2					
Nominal Power - P_{MPP} (Wp)	275	280	285	290	295	300
Watt Class Sorting - (W)	-0/+5	-0/+5	-0/+5	-0/+5	-0/+5	-0/+5
Nominal Power Voltage - V_{MPP} (V)	31.5	31.7	31.9	32.1	32.3	32.5
Nominal Power Current - I_{MPP} (A)	8.74	8.84	8.95	9.05	9.14	9.24
Open Circuit Voltage - V_{OC} (V)	38.2	38.4	38.6	38.8	39.0	39.2
Short Circuit Current - I_{SC} (A)	9.52	9.61	9.66	9.71	9.76	9.82
Panel Efficiency (%)	16.5	16.8	17.1	17.4	17.7	18.0

Values at standard test conditions STC (airmass AM 1.5, irradiance 1000 W/m², cell temperature 25°C).
At low irradiance of 200 W/m² (AM 1.5 and cell temperature 25°C) at least 95% of the STC module efficiency will be achieved.
*Where xxx indicates the nominal power class (P_{MPP}) at STC above, and can be followed by the suffix BLK for black framed modules.

ELECTRICAL DATA @ NOCT	Product Code*: RECxxxTP2					
Nominal Power - P_{MPP} (Wp)	206	210	214	218	223	226
Nominal Power Voltage - V_{MPP} (V)	29.2	29.4	29.6	29.8	30.0	30.1
Nominal Power Current - I_{MPP} (A)	7.07	7.15	7.24	7.32	7.43	7.51
Open Circuit Voltage - V_{OC} (V)	35.4	35.6	35.8	36.0	36.2	36.3
Short Circuit Current - I_{SC} (A)	7.52	7.59	7.68	7.75	7.85	7.91

Nominal operating cell temperature NOCT (800 W/m², AM 1.5, windspeed 1 m/s, ambient temperature 20°C).
*Where xxx indicates the nominal power class (P_{MPP}) at STC above, and can be followed by the suffix BLK for black framed modules.

CERTIFICATIONS

UL 1703, Fire classification Type 2; IEC 61215, IEC 61730, IEC 62804 (PID), IEC 62716 (Ammonia), IEC 61701 (Salt Mist level 6), IEC 60068-2-68 (Blowing Sand), ISO 11925-2 (Class E)
ISO 9001: 2015, ISO 14001: 2004, OHSAS 18001: 2007

WARRANTY

20 year product warranty
25 year linear power output warranty
(Max. performance degression of 0.5% p.a. from 97.5% in year 1)
See warranty conditions for further details.

18.0% EFFICIENCY

20 YEAR PRODUCT WARRANTY

25 YEAR LINEAR POWER OUTPUT WARRANTY

TEMPERATURE RATINGS

Nominal operating cell temperature (NOCT)	44.6°C (±2°C)
Temperature coefficient of P_{MPP}	-0.36 %/°C
Temperature coefficient of V_{OC}	-0.30 %/°C
Temperature coefficient of I_{SC}	0.066 %/°C

GENERAL DATA

Cell type:	6 strings of 20 REC HC multicrystalline PERC
Glass:	0.13" (3.2 mm) solar glass with anti-reflective surface treatment
Back sheet:	Highly resistant polyester polyolefin construction
Frame:	Anodized aluminum (Available in silver or black)
Junction box:	IP67 rated, 3-part with 3 bypass diodes 12 AWG (4 mm²) PV wire, 35" + 47" (0.9 m + 1.2 m)
Connectors:	Stäubli MC4 PV-KBT4/PV-KST4, 12 AWG (4 mm²)
Origins:	Silicon: Made in USA & Norway Wafer/Cell/Module: Made in Singapore

MAXIMUM RATINGS

Operational temperature:	-40 ... +185°F (-40 ... +85°C)
Maximum system voltage:	1000 V
Design Loads:	(+) 75.2 lbs/ft² (3600 Pa) (-) 33.4 lbs/ft² (1600 Pa) Refer to installation manual
Max series fuse rating:	20 A
Max reverse current:	20 A

MECHANICAL DATA

Dimensions:	65.9 x 39.25 x 1.5 (1675 x 997 x 38 mm)
Area:	17.98 ft² (1.67 m²)
Weight:	40.8 lbs (18.5 kg)

Note! Specifications subject to change without notice.

Ref NE-05-07-07Rev-H 01.19

REC

www.recgroup.com

Solar+Power award winner 2017

TOP PERFORMER 2018 DNV·GL PV MODULE RELIABILITY SCORECARD

Single Phase Inverter with HD-Wave Technology

for North America

SE3000H-US / SE3800H-US / SE5000H-US / SE6000H-US / SE7600H-US / SE10000H-US / SE11400H-US

INVERTERS

12-25 YEAR WARRANTY

Optimized installation with HD-Wave technology

- Specifically designed to work with power optimizers
- Record-breaking efficiency
- Fixed voltage inverter for longer strings
- Integrated arc fault protection and rapid shutdown for NEC 2014 and 2017, per article 690.11 and 690.12
- UL1741 SA certified, for CPUC Rule 21 grid compliance
- Extremely small
- Built-in module-level monitoring
- Outdoor and indoor installation
- Optional: Revenue grade data, ANSI C12.20 Class 0.5 (0.5% accuracy)

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Single Phase Inverter with HD-Wave Technology for North America

SE3000H-US / SE3800H-US / SE5000H-US / SE6000H-US/ SE7600H-US / SE10000H-US / SE11400H-US

	SE3000H-US	SE3800H-US	SE5000H-US	SE6000H-US	SE7600H-US	SE10000H-US	SE11400H-US	
OUTPUT								
Rated AC Power Output	3000	3800 @ 240V 3300 @ 208V	5000	6000 @ 240V 5000 @ 208V	7600	10000	11400 @ 240V 10000 @ 208V	VA
Maximum AC Power Output	3000	3800 @ 240V 3300 @ 208V	5000	6000 @ 240V 5000 @ 208V	7600	10000	11400 @ 240V 10000 @ 208V	VA
AC Output Voltage Min.-Nom.-Max. (211 - 240 - 264)	✓	✓	✓	✓	✓	✓	✓	Vac
AC Output Voltage Min.-Nom.-Max. (183 - 208 - 229)	-	✓	-	✓	-	-	✓	Vac
AC Frequency (Nominal)	59.3 - 60 - 60.5[1]							Hz
Maximum Continuous Output Current @240V	12.5	16	21	25	32	42	47.5	A
Maximum Continuous Output Current @208V	-	16	-	24	-	-	48.5	A
GFDI Threshold	1							A
Utility Monitoring, Islanding Protection, Country Configurable Thresholds	Yes							
INPUT								
Maximum DC Power @240V	4650	5900	7750	9300	11800	15500	17650	W
Maximum DC Power @208V	-	5100	-	7750	-	-	15500	W
Transformer-less, Ungrounded	Yes							
Maximum Input Voltage	480							Vdc
Nominal DC Input Voltage	380				400			Vdc
Maximum Input Current @240V[2]	8.5	10.5	13.5	16.5	20	27	30.5	Adc
Maximum Input Current @208V[2]	-	9	-	13.5	-	-	27	Adc
Max. Input Short Circuit Current	45							Adc
Reverse-Polarity Protection	Yes							
Ground-Fault Isolation Detection	600kΩ Sensitivity							
Maximum Inverter Efficiency	99	99.2						%
CEC Weighted Efficiency	99						99 @ 240V 98.5 @ 208V	%
Nighttime Power Consumption	< 2.5							W
ADDITIONAL FEATURES								
Supported Communication Interfaces	RS485, Ethernet, ZigBee (optional), Cellular (optional)							
Revenue Grade Data, ANSI C12.20	Optional[3]							
Rapid Shutdown - NEC 2014 and 2017 690.12	Automatic Rapid Shutdown upon AC Grid Disconnect							
STANDARD COMPLIANCE								
Safety	UL1741, UL1741 SA, UL1699B, CSA C22.2, Canadian AFCI according to T.I.L. M-07							
Grid Connection Standards	IEEE1547, Rule 21, Rule 14 (HI)							
Emissions	FCC Part 15 Class B							
INSTALLATION SPECIFICATIONS								
AC Output Conduit Size / AWG Range	3/4" minimum / 14-6 AWG					3/4" minimum /14-4 AWG		
DC Input Conduit Size / # of Strings / AWG Range	3/4" minimum / 1-2 strings / 14-6 AWG					3/4" minimum / 1-3 strings / 14-6 AWG		
Dimensions with Safety Switch (HxWxD)	17.7 x 14.6 x 6.8 / 450 x 370 x 174					21.3 x 14.6 x 7.3 / 540 x 370 x 185		in / mm
Weight with Safety Switch	22 / 10		25.1 / 11.4	26.2 / 11.9		38.8 / 17.6		lb / kg
Noise	< 25				<50			dBA
Cooling	Natural Convection							
Operating Temperature Range	-40 to +140 / -25 to +60[4] (-40°F / -40°C option)[5]							°F / °C
Protection Rating	NEMA 4X (Inverter with Safety Switch)							

[1] For other regional settings please contact SolarEdge support
[2] A higher current source may be used; the inverter will limit its input current to the values stated
[3] Revenue grade inverter P/N: SExxxxH-US000NNC2
[4] For power de-rating information refer to: https://www.solaredge.com/sites/default/files/se-temperature-derating-note-na.pdf
[5] -40 version P/N: SExxxxH-US000NNU4

RoHS

Power Optimizer

For North America

P320 / P340 / P370 / P400 / P405 / P505

POWER OPTIMIZER

PV power optimization at the module-level

- Specifically designed to work with SolarEdge inverters
- Up to 25% more energy
- Superior efficiency (99.5%)
- Mitigates all types of module mismatch losses, from manufacturing tolerance to partial shading
- Flexible system design for maximum space utilization
- Fast installation with a single bolt
- Next generation maintenance with module-level monitoring
- Meets NEC requirements for arc fault protection (AFCI) and Photovoltaic Rapid Shutdown System (PVRSS)
- Module-level voltage shutdown for installer and firefighter safety

solaredge.com

solaredge

Power Optimizer

For North America

P320 / P340 / P370 / P400 / P405 / P505

Optimizer model (typical module compatibility)	P320 (for 60-cell modules)	P340 (for high-power 60-cell modules)	P370 (for higher-power 60 and 72-cell modules)	P400 (for 72 & 96-cell modules)	P405 (for thin film modules)	P505 (for higher current modules)	
INPUT							
Rated Input DC Power[1]	320	340	370	400	405	505	W
Absolute Maximum Input Voltage (Voc at lowest temperature)	48		60	80	125[2]	83[2]	Vdc
MPPT Operating Range	8 - 48		8 - 60	8 - 80	12.5 - 105	12.5 - 83	Vdc
Maximum Short Circuit Current (Isc)	11			10.1		14	Adc
Maximum DC Input Current	13.75			12.63		17.5	Adc
Maximum Efficiency	99.5						%
Weighted Efficiency	98.8					98.6	%
Overvoltage Category	II						
OUTPUT DURING OPERATION (POWER OPTIMIZER CONNECTED TO OPERATING SOLAREDGE INVERTER)							
Maximum Output Current	15						Adc
Maximum Output Voltage	60				85		Vdc
OUTPUT DURING STANDBY (POWER OPTIMIZER DISCONNECTED FROM SOLAREDGE INVERTER OR SOLAREDGE INVERTER OFF)							
Safety Output Voltage per Power Optimizer	1 ± 0.1						Vdc
STANDARD COMPLIANCE							
EMC	FCC Part15 Class B, IEC61000-6-2, IEC61000-6-3						
Safety	IEC62109-1 (class II safety), UL1741						
RoHS	Yes						
INSTALLATION SPECIFICATIONS							
Maximum Allowed System Voltage	1000						Vdc
Compatible inverters	All SolarEdge Single Phase and Three Phase inverters						
Dimensions (W x L x H)	129 x 153 x 27.5 / 5.1 x 6 x 1.1			129 x 153 x 33.5 / 5.1 x 6 x 1.3	129 x 159 x 49.5 / 5.1 x 6.3 x 1.9	129 x 162 x 59 / 5.1 x 6.4 x 2.3	mm / in
Weight (including cables)	630 / 1.4			750 / 1.7	845 / 1.9	1064 / 2.3	gr / lb
Input Connector	MC4[3]						
Output Wire Type / Connector	Double Insulated; MC4						
Output Wire Length	0.95 / 3.0		1.2 / 3.9				m / ft
Input Wire Length	0.16 / 0.52						m / ft
Operating Temperature Range	-40 - +85 / -40 - +185						°C / °F
Protection Rating	IP68 / NEMA6P						
Relative Humidity	0 - 100						%

(1) Rated STC power of the module. Module of up to +5% power tolerance allowed
(2) NEC 2017 requires max input voltage be not more than 80V
(3) For other connector types please contact SolarEdge

PV System Design Using a SolarEdge Inverter[4][5]		Single Phase HD-Wave	Single phase	Three Phase 208V	Three Phase 480V	
Minimum String Length (Power Optimizers)	P320, P340, P370, P400	8		10	18	
	P405 / P505	6		8	14	
Maximum String Length (Power Optimizers)		25		25	50[6]	
Maximum Power per String		5700 (6000 with SE7600-US - SE11400-US)	5250	6000[7]	12750[8]	W
Parallel Strings of Different Lengths or Orientations		Yes				

(4) For detailed string sizing information refer to: http://www.solaredge.com/sites/default/files/string_sizing_na.pdf
(5) It is not allowed to mix P405/P505 with P320/P340/P370/P400 in one string
(6) A string with more than 30 optimizers does not meet NEC rapid shutdown requirements; safety voltage will be above the 30V requirement
(7) For SE14.4KUS/SE43.2KUS: It is allowed to install up to 6,500W per string when 3 strings are connected to the inverter (3 strings per unit for SE43.2KUS) and when the maximum power difference between the strings is up to 1,000W
(8) For SE30KUS/SE33.3KUS/SE66.6KUS/SE100KUS: It is allowed to install up to 15,000W per string when 3 strings are connected to the inverter (3 strings per unit for SE66.6KUS/SE100KUS) and when the maximum power difference between the strings is up to 2,000W

CE RoHS

Datasheet

Ground Mount System

Mount on all terrains, in no time.

The IronRidge Ground Mount System combines our XR1000 rails with locally-sourced steel pipes or mechanical tubing, to create a cost-effective structure capable of handling any site or terrain challenge.

Installation is simple with only a few structural components and no drilling, welding, or heavy machinery required. In addition, the system works with a variety of foundation options, including concrete piers and driven piles.

Rugged Construction

Engineered steel and aluminum components ensure durability.

PE Certified

Pre-stamped engineering letters available in most states.

UL 2703 Listed System

Meets newest effective UL 2703 standard.

Design Software

Online tool generates engineering values and bill of materials.

Flexible Architecture

Multiple foundation and array configuration options.

25-Year Warranty

Products guaranteed to be free of impairing defects.

Datasheet

360° Product Tour
Visit ironridge.com

Substructure

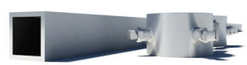
Top Caps

Connect vertical and cross pipes.

Bonded Rail Connectors

Attach and bond Rail Assembly to cross pipes.

Diagonal Braces



Optional Brace provides additional support.

Cross Pipe & Piers

Steel pipes or mechanical tubing for substructure.

Rail Assembly

XR1000 Rails

Curved rails increase spanning capabilities.

UFOs

Universal Fastening Objects bond modules to rails.

Stopper Sleeves

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

CAMO

Bond modules to rails while staying completely hidden.

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

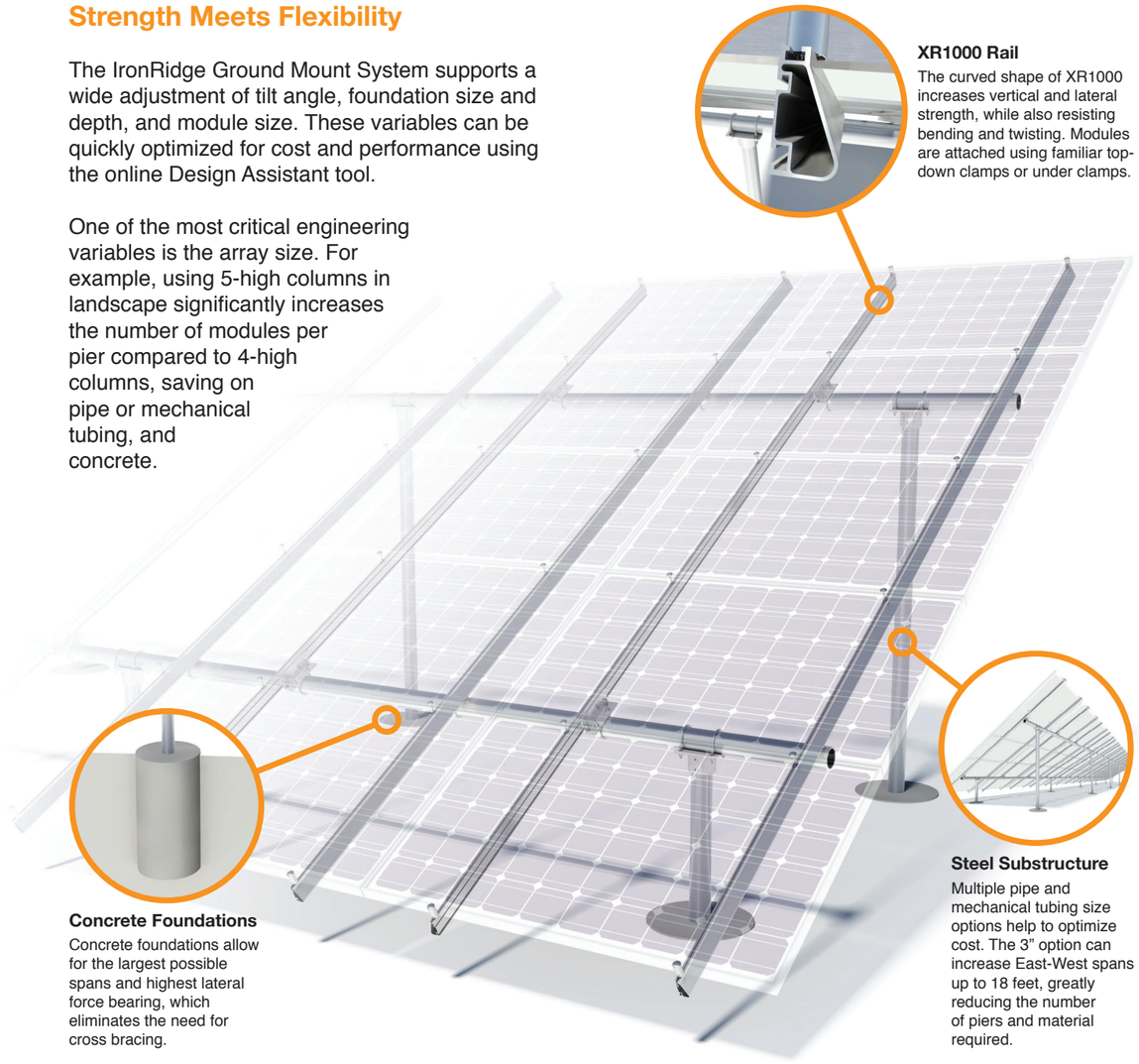
IRONRIDGE

Ground Mount Configurations

Strength Meets Flexibility

The IronRidge Ground Mount System supports a wide adjustment of tilt angle, foundation size and depth, and module size. These variables can be quickly optimized for cost and performance using the online Design Assistant tool.

One of the most critical engineering variables is the array size. For example, using 5-high columns in landscape significantly increases the number of modules per pier compared to 4-high columns, saving on pipe or mechanical tubing, and concrete.



XR1000 Rail

The curved shape of XR1000 increases vertical and lateral strength, while also resisting bending and twisting. Modules are attached using familiar top-down clamps or under clamps.

Concrete Foundations

Concrete foundations allow for the largest possible spans and highest lateral force bearing, which eliminates the need for cross bracing.

Steel Substructure

Multiple pipe and mechanical tubing size options help to optimize cost. The 3” option can increase East-West spans up to 18 feet, greatly reducing the number of piers and material required.

Compatible with Soil Classes 2-4

The size of Ground Mount foundations depends on a number of factors, including column height and site loading conditions. Stronger and sturdier soil classes (Class 2 and Class 3) allow for reduced foundation depth, saving on materials and labor.

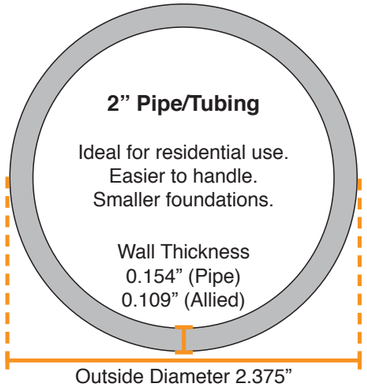
Wide Tilt Angle Range (0-45 Degrees)

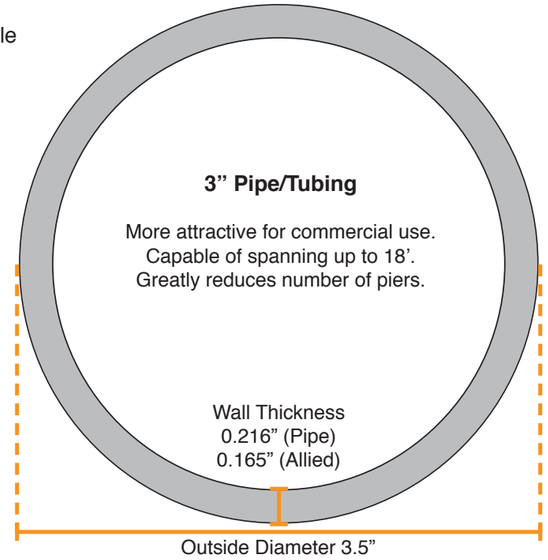
Lower tilt angles are an effective way of reducing wind loads on ground mount structures, resulting in increased East-West pipe spans and reduced number of foundations. Refer to table on backside to see how tilt angle affects spans.

Tech Brief

Substructure Selection

Ground Mount uses locally-sourced galvanized schedule 40 steel pipe (ASTM A53 Grade B, 35 ksi) or Allied mechanical tubing (2” – 50 ksi, 3” – 45 ksi) to reduce shipping costs. Mechanical tubing is lighter and can be easier to couple when building the substructure.





Refer to the following table to see how size impacts the East-West span between foundations. The table complies with ASCE 7-10 structural code. Values are based on 72-cell modules in Wind Exposure Category B.

Conditions				E-W Span							
Snow	Height	Tilt	Wind (MPH)	4’	6’	8’	10’	12’	14’	16’	18’
0 PSF	4-High	10°	100								
			120								
			140								
		30°	100		•	•					
			120	•	•						
			140	•	•						
	5-High	10°	100	2” Pipe/Tubing			3” Pipe/Tubing				
			120								
			140								
		30°	100		•	•					
			120	•	•			•			
30 PSF	4-High	10°	100								
			120								
			140								
		30°	100		•						
			120	•	•						
			140	•	•		•				
	5-High	10°	100								
			120								
			140								
		30°	100		•						

*Requires Diagonal Bracing

RATINGS

UL 2703 LISTED

c ETL LISTED us #5003225

Intertek

- Conforms to STD UL 2703 (2015) Standard for Safety First Edition: Mounting Systems, Mounting Devices, Clamping/ Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels.
- Certified to CSA STD LTR AE-001-2012 Photovoltaic Module Racking Systems.
- Max Overcurrent Protective Device (OCPD) Rating: 25A
- Max Module Size: 24ft²
- Max Frameless Module Size for Canadian LTR-AE: 19.5 ft²
- CAMO Specific Allowable Design Load Rating: 50 PSF downward, 50 PSF upward, 15 PSF lateral
- LTR AE Canadian Load Rating: 2400 Pa
- System Level Allowable Design Load Rating: meets minimum requirements of the standard (10 PSF downward, 5 PSF upward, 5 PSF lateral). Actual system structural capacity is defined by PE stamped certification letters.

CLASS A SYSTEM FIRE RATING PER UL 2703

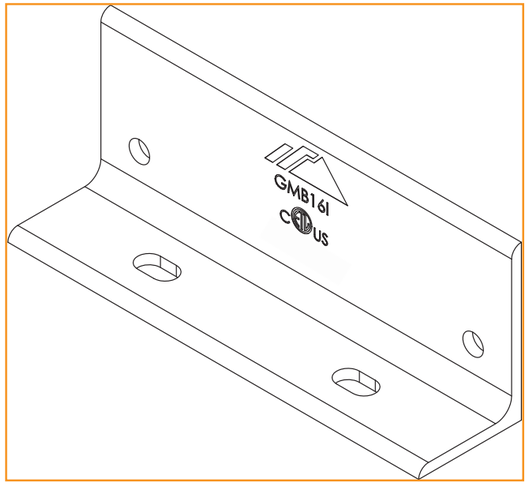
- Not Fire Rated

STRUCTURAL CERTIFICATION

- Designed and Certified for Compliance with the International Building Code & ASCE/SEI-7

MARKINGS

Product markings are located on the system's Rail Connectors.



CHECKLIST

PRE-INSTALLATION

- ☐ Verify module compatibility. See Page 12 for info.
- ☐ Purchase 2" or 3" ASTM A53 Grade B Schedule 40 Pipe, galvanized to a min of ASTM A653 G90 or ASTM A123 G35, or 2.375" or 3.500" Allied Mechanical Tubing with Gatorshield or FlowCoat Zinc coating (ASTM A1057).

TOOLS REQUIRED

- ☐ Post Hole Digger or Powered Auger
- ☐ Socket Drive (7/16", 9/16", and 1/2" Sockets)
- ☐ Torque Wrenches (0-240 in-lbs and 10-40 ft-lbs)
- ☐ Transit, String Line, or Laser Level
- ☐ 3/16" Allen Head

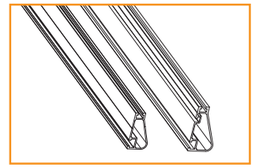
TORQUE VALUES

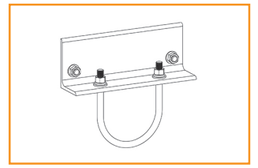
- ☐ Top Cap Set Screws (3/16" Allen Head)
- ☐ Schedule 40 Grade B Pipe: 20 ft-lbs
- ☐ 2." Allied Mechanical Tubing: 11 ft-lbs
- ☐ 3" Allied Mechanical Tubing: 16 ft-lbs
- ☐ Top Cap U-Bolt Nuts (9/16" Socket): 15 ft-lbs
- ☐ Rail Connector Bracket Nuts (9/16" Socket): 21 ft-lbs
- ☐ Rail Connector U-Bolt Nuts (9/16" Socket): 60 in-lbs
- ☐ Grounding Lug Nuts (7/16" Socket): 80 in-lbs
- ☐ Grounding Lug Terminal Screws (7/16 Socket): 20 in-lbs
- ☐ Universal Fastening Objects (7/16" Socket): 80 in-lbs
- ☐ Diagonal Brace Set Screws (1/2" Socket): 15 ft-lbs
- ☐ Diagonal Brace Bolts (1/2" Socket): 40 ft-lbs
- ☐ Microinverter Kit Nuts (7/16" Socket): 80 in-lbs
- ☐ Frameless Module Kit Nuts (7/16" Socket): 80 in-lbs

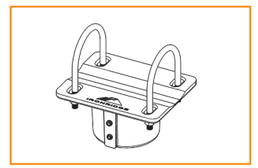
If using previous version of: Integrated Grounding Mid Clamps, Grounding Lug, End Clamps, and Expansion Joints please refer to Alternate Components Addendum (Version 1.30).

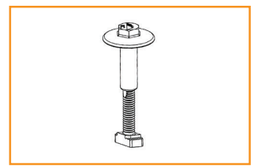
If installing on a low slope roof please refer to Ground Mount for Flat Roof Applications Addendum (Version 2.0).

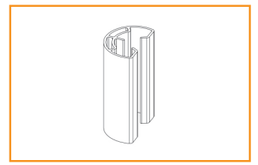
IRONRIDGE COMPONENTS

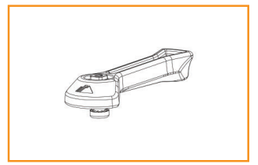

XR100 & XR1000 Rail

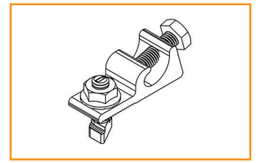

Rail Connector

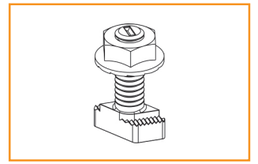

Top Cap

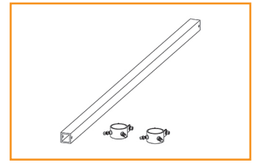

UFO


Stopper Sleeve


CAMO

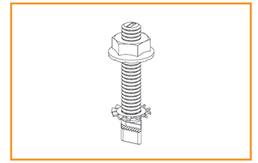

Grounding Lug

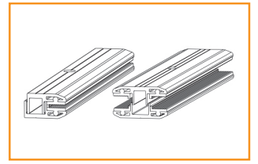

Microinverter Kit


Diagonal Brace

End Cap


Wire Clip


Frameless Module Kit


Frameless End/Mid Clamp

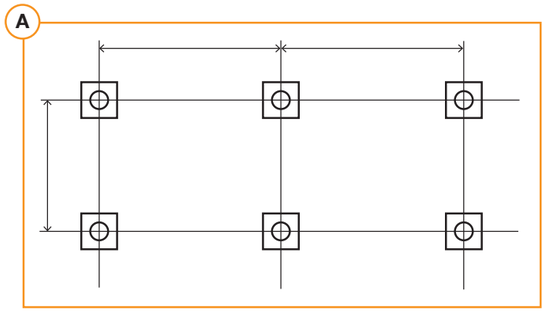
1. BUILD BASE

A. MARK LOCATIONS

Establish pier locations. Once grid of pier locations has been set, verify all angles are square.

Spacing varies with load conditions. Consult engineering specs.

A



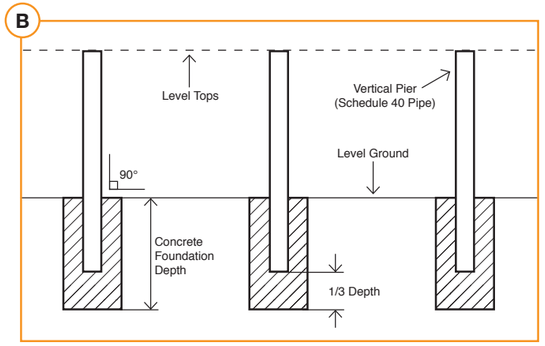
B. POSITION PIERS

Excavate the foundation holes. Insert vertical piers into foundation holes, and pour in concrete mixture. Ensure vertical piers are plumb, level, square, and placed in parallel rows. Level the tops so they are even.

Brace piers until concrete foundation has cured.

In some cases, cross bracing is required to provide extra support for piers. If required, install Diagonal Braces at this time.

B



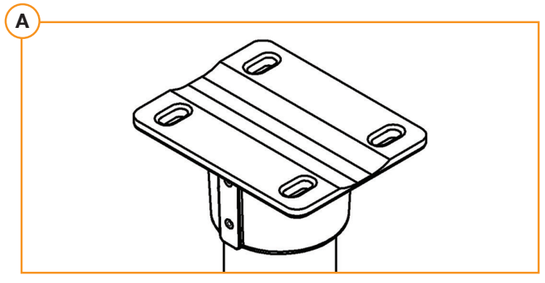
2. CONNECT SUBSTRUCTURE

A. MOUNT TOP CAPS

Mount a Top Cap on each pier. Wait to tighten set screws.

If using Diagonal Braces, install them prior to Top Caps.

A



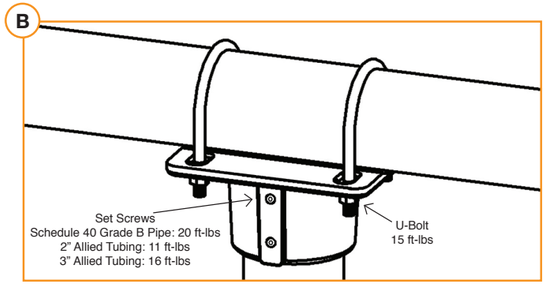
B. LAY CROSS PIPE

Set cross pipes or tubing in Top Cap grooves. Attach with 3/8" U-bolts, flange nuts, flat washers, and lock washers. Torque U-bolts to **15 ft-lbs** and align assembly.

Torque Top Cap set screws to **20 ft-lbs** for Schedule 40 Grade B Pipe, **11 ft-lbs** for 2" Allied Mechanical Tubing, and **16 ft-lbs** for 3" Allied Mechanical Tubing.

To join more than one section of cross pipe, see Page 10.

B



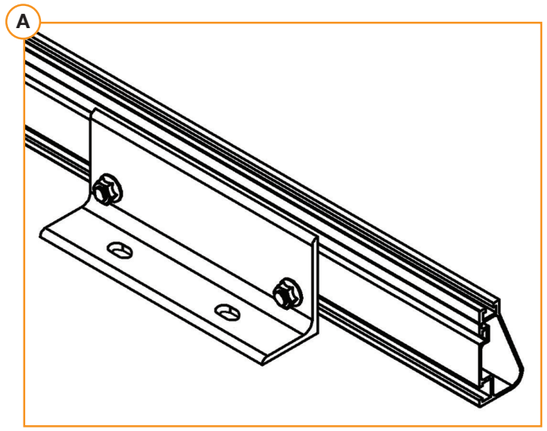
3. PLACE RAILS

A. ATTACH HARDWARE

On the ground, attach Rail Connector brackets to rail by sliding 3/8"-16 bonding bolts into side slot. Space out to match pier spacing. With brackets in place, finger tighten flange nuts onto bolts.

Tape ends of rail, to keep bolts from sliding out while moving.

A

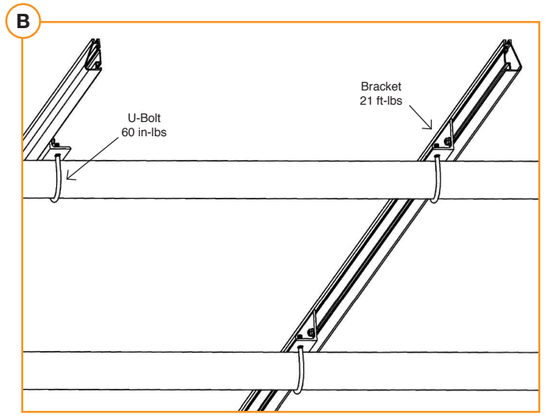


B. FASTEN CONNECTORS

Center rails on cross pipes, leaving equal distance on ends. Secure with Rail Connector hardware: 3/8"-16 U-bolts, flange nuts, flat washers, and lock washers. Torque U-bolt nuts to **60 in-lbs** and bracket to **21 ft-lbs**.

Spacing between rails should align with module manufacturer recommended clamping locations.

B



4. SECURE LUGS

GROUNDING LUGS

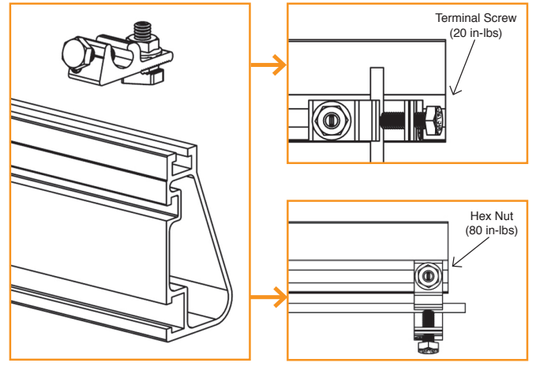
Insert T-bolt in top rail slot and torque hex nut to **80 in-lbs**. Install a minimum 10 AWG solid copper or stranded grounding wire. Torque terminal screw to **20 in-lbs**.

Only one Grounding Lug required per continuous subarray, regardless of subarray size (Unless frameless modules are used, see Page 10).

If using Enphase microinverters or Sunpower AC modules, Grounding Lugs may not be needed. See Page 11 for more info.

Grounding Lugs can be installed anywhere along the rail and in either orientation shown.

Grounding Lugs are intended to for use with one solid or stranded copper wire, conductor size 10-4AWG.



5. SECURE MODULES

A. SECURE FIRST END

Place first module in position on rails, a minimum of 1” from rail ends. Snap Stopper Sleeves onto UFO. Fasten module to rail using the UFO, ensuring that the UFO is hooked over the top of the module. Torque to **80 in-lbs**.

- **Ensure rails are square before placing modules.**
- **Hold Stopper Sleeves on end while torquing to prevent rotation.**
- **If using CAMO instead of UFO + Stopper Sleeve, refer to Page 7 for CAMO installation procedure.**

B. SECURE NEXT MODULES

Place UFO into each rail, placing them flush against first module. Slide second module against UFO. Torque to **80 in-lbs**. Repeat for each following module.

- **When reinstalling UFO, move modules a minimum of 1/16” so UFOs are in contact with a new section of module frame.**
- **When UFOs are loosened and re-tightened, ensure UFO T-bolt bottoms out in rail channel before re-torquing UFO to achieve full engagement between T-bolt and rail.**
- **If using Wire Clips, refer to Page 9.**

C. SECURE LAST END

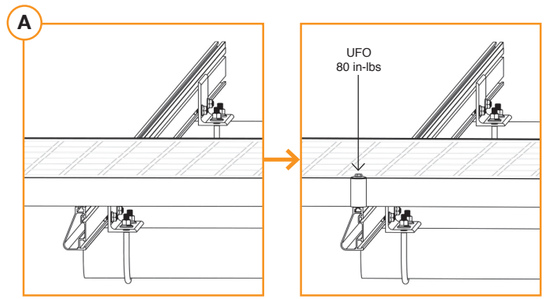
Place last module in position on rails, a minimum of 1” from rail ends. Snap Stopper Sleeves onto UFO. Secure UFO Clamps on rails, ensuring they are hooked over top of module. Torque to **80 in-lbs**.

- **Hold Stopper Sleeves on end while torquing to prevent rotation.**
- **If using CAMO instead of UFO + Stopper Sleeve, refer to Page 7 for CAMO installation procedure.**

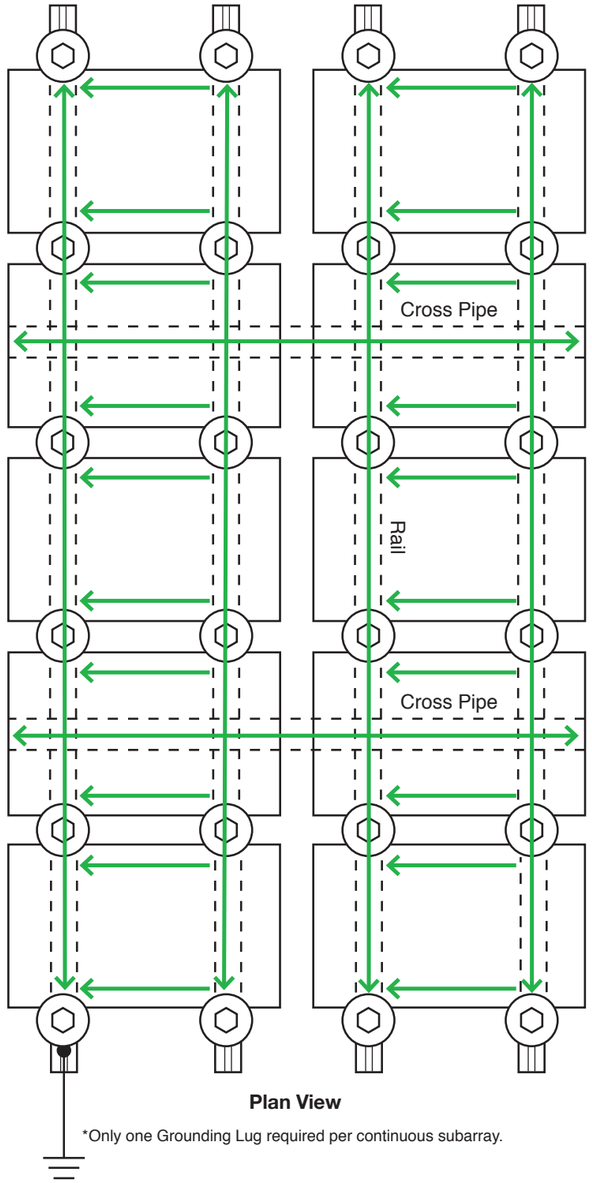
D. REPEAT STEPS

Secure remaining module rows, leaving a minimum 3/8” gap between rows.

- **If using End Caps, refer to Page 9.**

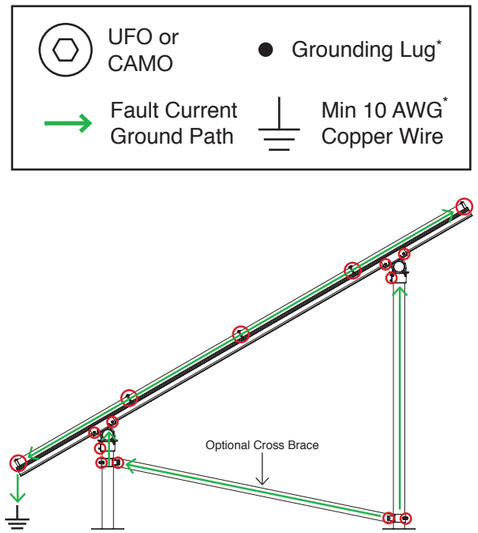


ELECTRICAL DIAGRAM



Plan View

*Only one Grounding Lug required per continuous subarray.



Section View

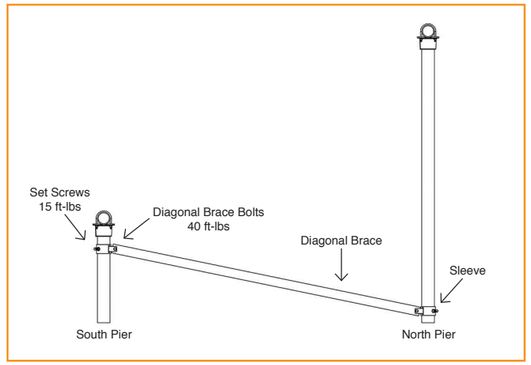
*Grounding Lugs and wire are not required in systems using certain Enphase microinverters or certain Sunpower modules. Equipment grounding is achieved with the Engage cable for Enphase or the AC module cable system for Sunpower via their integrated EGC.

DIAGONAL BRACES (OPTIONAL)

Slide sleeve on north pier 2-3” above the ground (6” max). Attach Diagonal Brace to sleeve with 1/2” hardware.

Slide second sleeve up on south pier 2-3” below top cap (6” max). Raise Diagonal Brace to align holes in sleeve and brace. Attach hardware and raise sleeve to full extent.

Torque Diagonal Brace bolts to **40 ft-lbs**. Torque set screws to **15 ft-lbs**.

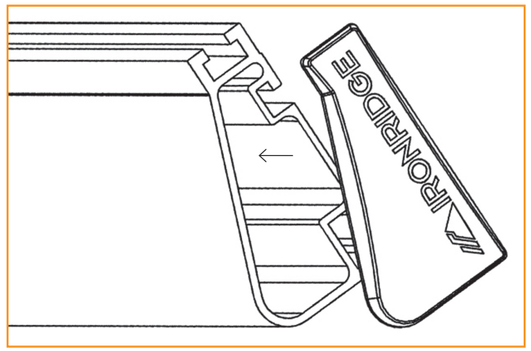


END CAPS

End Caps add a completed look and keep debris and pests from collecting inside rail.

Firmly press End Cap onto rail end.

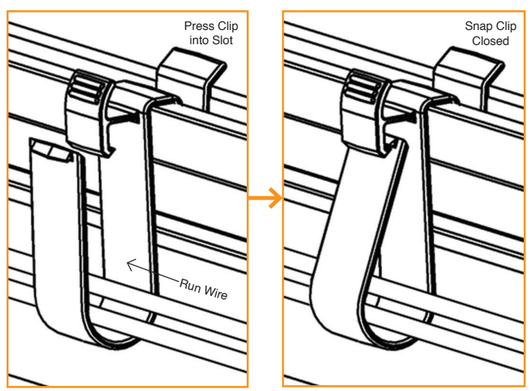
- **End Caps come in sets of left and right. Check that the proper amount of each has been provided.**
- **For open-structure installations, you can use adhesive to secure the End Caps.**



WIRE CLIPS

Wire Clips offer a simple wire management solution.

Firmly press Wire Clip into top rail slot. Open clip and insert electrical wire accordingly. Close clip once complete.



SPLICING CROSS PIPE

The following instructions should be followed, when required, to join more than one section of cross pipe together to ensure bonding is maintained throughout the system.

A. ALLIED MECHANICAL TUBING SPLICES

Mechanical tube splices shown in the table below shall be of equivalent Allied Flowcoat or Gatorshield zinc coating.

Mechanical Tube Size of the Structure	Splice Tube Size
2.375” OD, 12 Gauge	2.000” OD, 9 Gauge, Minimum 12” Long
3.500” OD, 8 Gauge	3.000” OD, 12 Gauge, Minimum 12” Long

Insert splice tube 6” into first section of cross pipe and secure with 2 self-drilling screws (1/4”-14 x ¾”), spacing them approximately 1.25” from end of pipe and approximately 3.50” apart, tightening screws to 9 ft-lbs.

Slide second section of cross pipe over splice tube and secure with two more self-drilling screws. Tighten screws to 9 ft-lbs.

- **Pre-drill 5/32” pilot holes through cross pipe and splice tube for easier installation of self-drilling screws.**

B. SCHEDULE 40 GRADE B PIPE SPLICES

Use galvanized threaded pipe couplings that match the pipe size used for the structure. Threaded Schedule 40 Grade B Pipe must be used when splicing cross pipe together.

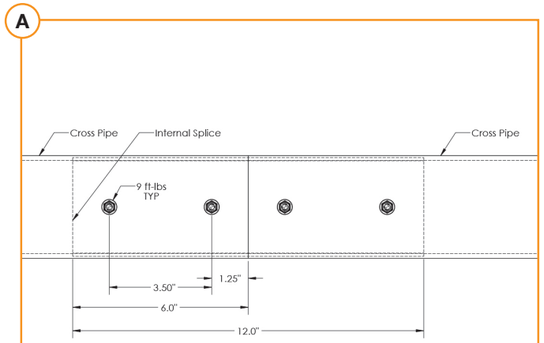
Fully thread coupling onto both sections of pipe being spliced together.

- **To ensure structural integrity of cross pipes, mechanical tube or coupling splices are not permitted in end spans or in middle 1/3 of interior cross pipe spans.**

C. CROSS PIPES CAN BE JOINED OVER AN INTERIOR TOP CAP WITH A MAXIMUM GAP OF 1/2”

- **To avoid potential problems from the effects of thermal expansion, a maximum total continuous cross pipe length of 100 ft is recommended.**

A



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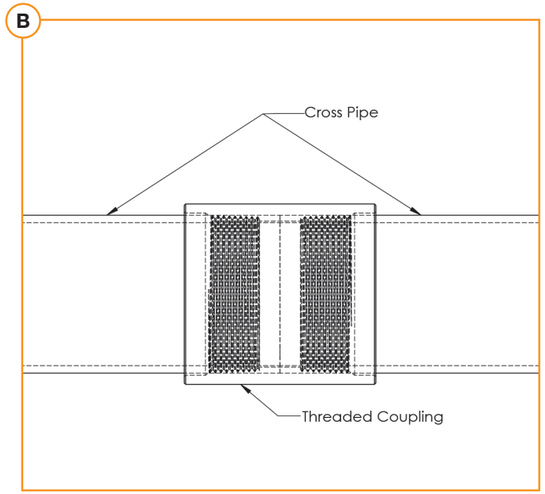
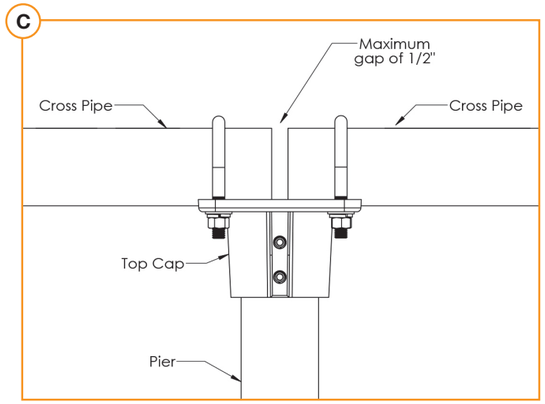


C



MODULE COMPATIBILITY

The Ground Mount System may be used to ground and/or mount a PV module complying with UL 2703 only when the specific module has been evaluated for grounding and/or mounting in compliance with the included instructions. Unless otherwise noted, “xxx” refers to the module power rating and both black and silver frames are included in the certification.

MAKE	MODELS
Amerisolar	Amerisolar modules with 35, 40 and 50 mm frames AS-bYxxxZ Where "b" can be 5 or 6; "Y" can be M, P, M27, P27, M30, or P30; "xxx" is the module power rating; and "Z" can be blank, W or WB
Aptos	Aptos modules with 35 and 40 mm frames DNA-yy-zz23-xxx Where "yy" can be 120 or 144; "zz" can be MF or BF; and ""xxx" is the module power rating
Astronergy Solar	Astronergy modules with 30, 35, 40 and 45 mm frames aaSMbbyyC/zz-xxx Where “aa” can be CH or A; "bb" can be 60, 66, or 72; “yy” can be blank, 10 or 12; "C" can M, P, M(BL), M-HC, M(BL)-HC, P-HC, M(DG), or M(DGT); “zz” can be blank, HV, F-B, or F-BH ; and “xxx” is the module power rating Astronergy frameless modules CHSM6610P(DG)-xxx Where “xxx” is the module power rating
ASUN	ASUN modules with 35 and 40 mm frames ASUN-xxx-YYZZ-aa Where "xxx" is the module power rating;" YY" can be 60 or 72; "ZZ" can be M,or MH5; and "aa" can be blank or BB
Auxin	Auxin modules with 40 mm frames AXN6y6zAxxx Where "y" can be M or P; "z" can be 08, 09, 10, 11, or 12; "A" can be F or T; and "xxx" is the module power rating
Axitec	Axitec Modules with 35 and 40 mm frames AC-xxxY/aaZZb Where "xxx" is the module power rating; "Y" can be M, P or MH; "aa" can be blank, 125- or 156-; "ZZ" can be 54, 60, 72, 120, or 144; "b" can be S or SB
Boviet	Boviet modules with 35 and 40mm frames BVM66aaYY-xxxBB Where "aa" can be 9, 10 or 12; "YY" is M or P; "xxx" is the module power rating; and "BB" can be blank or L
BYD	BYD modules with 35 mm frames BYDxxxAY-ZZ Where "xxx" is the module power rating; "A" can be M6, P6, MH or PH; "Y" can be C or K; and "ZZ" can be 30 or 36
Canadian Solar	Canadian Solar modules with 30, 35 and 40 mm frames CSbY-xxxZ Where "b" can be 1, 3 or 6; "Y" can be H, K, P, U, V, W, or X; "xxx" refers to the module power rating; and "Z" can be M, P, MS, PX , M-SD, P-AG, P-SD, MB-AG, PB-AG, MS-AG, or MS-SD Canadian Solar frameless modules CSbY-xxx-Z Where "b" can be 3 or 6; "Y" is K, P, U, or X; "xxx" is the module power rating, and "Z" can be M-FG, MS-FG, P-FG, MB-FG, or PB-FG
CertainTeed	CertainTeed modules with 35 and 40 frames CTxxxYZZ-AA Where "xxx" is the module power rating; "Y" can be M, P or HC; "ZZ" can be 00,01, 10, or 11; and "AA" can be 01, 02, 03 or 04
CSUN	Csun modules with 35 and 40 mm frames YYxxx-zzAbb Where "YY" is CSUN or SST; xxx is the module power rating; "zz" is blank, 60, or 72; and "A" is blank, P or M; "bb" is blank, BB, BW, or ROOF
Ecosolargy	Ecosolargy modules with 35, 40 and 50 mm frames ECOxxxYzzA-bbD Where "xxx" is the module power rating; "Y" can be A, H, S, or T; "zz" can be 125 or 156; "A" can be M or P; "bb" can be 60 or 72; and "D" can be blank or B

MODULE COMPATIBILITY

ET Solar	ET Solar modules with 35, 40 and 50 mm frames ET-Y6ZZxxxAA Where “Y” can be P, L, or M; “ZZ” can be 60 or 72; “xxx” refers to the module power rating; and “AA” can be WB, WW, BB, WBG, WWG, WBAC, WBCO, WWCO, WWBCO or BBAC
Flex	Flex modules with 35, 40 and 50 mm frames and model identifier FXS-xxxYY-ZZ; where "xxx" is the module power rating; "YY" can be BB or BC; and "ZZ" can be MAA1B, MAA1W, MAB1W, SAA1B, SAA1W, SAC1B, SAC1W, SAD1W, SBA1B, SBA1W, SBC1B, or SBC1W
GCL	GCL modules with 35 mm and 40 mm frames GCL-ab/YY xxx Where "a" can be M or P; "b" can be 3 or 6; "YY" can be 60, 72, 72H, or 72DH; and xxx is the module power rating
GigaWatt Solar	Gigawatt modules with 40 mm frames GWxxxYY Where “xxx” refers to the module power rating; and “YY” can be either PB or MB
Hansol	Hansol modules with 35 and 40 frames HSxxxYY-zz Where "xxx" is the module power rating; "YY" can be PB, PD, PE, TB, TD, UB, UD, or UE; and "zz" can be AH2, AN1, AN3, AN4, HV1, or JH2
Hanwha Solar	Hanwha Solar modules with 40, 45, and 50 mm frames HSLaaP6-YY-1-xxxZ Where "aa" can be either 60 or 72; "YY" can be PA or PB; "xxx" refers to the module power rating; and "Z" can be blank or B
Hanwha Q CELLS	Hanwha Q CELLS Modules with 32, 35, 40, and 42mm frames and model identifier aaYY-ZZ-xxx where "aa" can be Q. or B.; "YY" can be PLUS, PRO, PEAK, LINE PRO, LINE PLUS, PLUS DUO or PEAK DUO; and "ZZ" can be G3, G3.1, G4, G4.1, L-G2, L-G2.3, L-G3, L-G3.1, L-G3y, L-G4, L-G4.2, L-G4y, LG4.2/TAA, BFR-G3, BLK-G3, BFR-G3.1, BLK-G3.1, BFR-G4, BFR-G4.1, BFR G4.3, BLK-G4.1, G4/SC, G4.1/SC, G4.1/TAA, G4.1/MAX, BFR G4.1/TAA, BFR G4.1/MAX, BLK G4.1/TAA, BLK G4.1/SC, EC-G4.4, G5, BLK-G5, L-G5, L-G5.1, L-G5.2, L-G5.2/H, L-G5.3, G6, G6+, BLK-G6, L-G6, L-G6.1, L-G6.2, L-G6.3, G7, BLK-G6+, BLK-G7, G7.2, G8, BLK-G8, G8+, BLK-G8+ L-G7, L-G7.1, L-G7.2, L-G7.3, L-G8, L-G8.1, L-G8.2, or L-G8.3; and "xxx" is the module power rating
Heliene	Heliene modules with 40 mm frames YYZZxxxA Where "YY" can be 36, 60, 72, or 96; "ZZ" can be M, P, or MBLK; "xxx" is the module power rating; and "A" can be blank, HomePV, or Bifacial
HT-SAAE	HT-SAAE modules with 40 mm frames HT72-156Z-xxx Where "Z" can be M, P, M-C, P-C, M(S), M(VS), M(V), P(V), M(V)-C, P(V)-C; and "xxx" is the module power rating
Hyundai	Hyundai modules with 33, 35, 40 and 50 mm frames HiY-SxxxZZ Where "Y" can be A, D, M or S; "xxx" refers to the module power rating; and "ZZ" can be HG, HI, KI, MI, MF, MG, RI, RG, RG(BF), RG(BK), SG, TI, or TG
Itek	Itek Modules with 40 and 50 mm frames IT-xxx-YY Where "xxx" is the module power rating; and "YY" can be blank, HE, or SE, or SE72
JA Solar	JA Solar modules with 30, 35, 40 and 45 mm frames JAyyzz-bbww-xxx/aa Where “yy” can be M, P, M6 or P6; “zz” can be blank, (K), (L), (R), (V), (BK), (FA), (TG), (FA)(R), (L)(BK), (L)(TG), (R)(BK), (R)(TG), (V)(BK), (BK)(TG), or (L)(BK)(TG); “bb” can be 48, 60, or 72; "ww" can be D09, S01, S02, S03, S06, S09, or S10; “xxx” is the module power rating; and “aa” can be BP, MP, SI, SC, PR, 3BB, 4BB, 4BB/RE, 5BB
Jinko	Jinko modules with 35 and 40 mm frames JKMYxxxZZ-aa Where "Y" can either be blank or S; "xxx" is the module power rating; "ZZ" can be M, P, or PP; and "aa" can be blank, 60, 60B, 60H, 60L, 60BL, 60HL, 60HBL, 60-J4, 60B-J4, 60B-EP, 60(Plus), 60-V, 60-MX, 72, 72-V, 72H-V, 72L-V, 72HL-V, 72-MX, 72H-BDVP, or 72HL-TV Jinko frameless modules JKMxxxPP-DV Where "xxx" is the module power rating
Kyocera	Kyocera Modules with 46mm frames KYxxxZZ-AA Where "Y" can be D or U; "xxx" is the module power rating; "ZZ" can be blank, GX, or SX; and "AA" can be LPU, LFU, UPU, LPS, LPB, LFB, LFBS, LFB2, LPB2, 3AC, 3BC, 3FC, 4AC, 4BC, 4FC, 4UC, 5AC, 5BC, 5FC, 5UC, 6BC, 6FC, 8BC, 6MCA, or 6MPA
LG	LG modules with 35, 40, and 46 mm frames LGxxxYaZ-bb Where "xxx" is the module power rating; "Y" can be A, E, N, Q, S; "a" can be 1 or 2; "Z" can be C, K, T, or W; and "bb" can be A3, A5, B3, G3, G4, J5, K4, or V5
Longi	Longi modules with 30, 35 and 40 mm frames LRa-YYZZ-xxxM Where "a" can be 4 or 6; "YY" can be blank, 60 or 72; "ZZ" can be blank, BK, BP, HV, PB, PE, PH, HBD, HPB, or HPH; "xxx" is the module power rating

MODULE COMPATIBILITY

Mission Solar	Mission Solar modules with 33 and 40 mm frames MSEbbxxxZZaa Where “bb” can be blank or 60A; “xxx” is the module power rating; “ZZ” can be blank, MM, SE, SO, SQ , SR, or TS; and “aa” can be blank, 1J, 4J, 4S, 5K, 5T, 60, 6J, 6S, 6W, 8K, 8T, or 9S
Mitsubishi	Mitsubishi modules with 46 mm frames PV-MYYxxxZZ Where "YY" can be LE or JE; xxx is the module power rating; and "ZZ" can be either HD, HD2, or FB
Motech	IM and XS series modules with 40, 45 and 50 mm frames
Neo Solar Power	Neo Solar Power modules with 35 mm frames D6YxxxZZaa Where "Y" can be M or P; xxx is the module power rating; "ZZ" can be B3A, B4A, E3A, E4A, H3A, H4A; and "aa" can be blank, (TF), ME or ME (TF)
Panasonic	Panasonic modules with 35 and 40 mm frames VBHNxxxYYzzA Where "xxx" refers to the module power rating; "YY" can be either KA, RA, SA or ZA; "zz" can be either 01, 02, 03, 04, 06, 06B, 11, 11B, 15, 15B, 16, 16B, 17, or 18; and "A" can be blank, E, G, or N
Peimar	Peimar modules with 40 mm frames SbxxxYzz Where "b" can be G or P; “xxx” is the module power rating; “Y” can be M or P; and “zz” can be blank, (BF), or (FB)
Phono Solar	Phono Solar modules with 35, 40, and 45 mm frames PSxxxY-ZZ/A Where xxx refers to the module power rating; "Y" can be M, M1, MH, or M1H or P; "ZZ" can be 20 or 24; and "A" can be F, T, U, or TH
Prism Solar	Prism Solar frameless modules BiYY-xxxBSTC Where "YY" can be 48, 60, 60S, 72 or 72S; and "xxx" is the module power rating
REC Solar	REC modules with 30, 38 and 45 mm frames RECxxxYYZZ Where “xxx” is the module power rating; “YY” can be AA, M, NP, PE, PE72, TP, TP2, TP2M, TP2SM, or TP2S; and “ZZ” can be blank, Black, BLK, BLK2, SLV, or 72
Renesola	ReneSola modules with 35, 40 and 50 mm frames AAxxxY-ZZ Where "AA" can be SPM(SLP) or JC; "xxx" refers to the module power rating; "Y" can be blank, F, M or S; and "ZZ" can be blank, Ab, Ab-b, Abh, Abh-b, Abv, Abv-b, Bb, Bb-b, Bbh, Bbh-b, Bbv, Bbv-b, Db, Db-b, or 24/Bb
Renogy	Renogy Modules with 40 and 50 mm frames RNG-xxxY Where "xxx" is the module power rating; and "Y" can be D or P
Risen	Risen Modules with 35 and 40 mm frames RSMyy-6-xxxZZ Where "yy" can be 60, 72, 120 or 144; "xxx" is the module power rating; and "ZZ" can be M or P Frameless modules RSMyy-6-xxxZZ Where "yy" can be 60, 72, 120 or 144; "xxx" is the module power rating; and "ZZ" can be MDG or PDG
S-Energy	S-Energy modules with 40 frames SNxxxY-ZZ Where "xxx" is the module power rating; "Y" can be M or P; and "ZZ" can be 10, or 15
Seraphim Energy Group	Seraphim modules with 35 and 40 mm frames SEG-aYY-xxxZZ Where "a" can be blank, 6 or B; "YY" can be blank, MA, MB, PA, or PB; "xxx" is the module power rating; and "ZZ" can be blank, BB, BG, BW, HV, WB, WW, BMB, BMB-HV
Seraphim USA	Seraphim modules with 40 and 50 mm frames SRP-xxx-6YY Where "xxx" is the module power rating; and "YY" can be MA, MB, PA, PB, QA-XX-XX, and QB-XX-XX
Sharp	Sharp modules with 35 and 40 mm frames NUYYxxx Where “YY” can be SA or SC; and "xxx" is the module power rating
Silfab	Silfab Modules with 38 mm frames SYY-Z-xxxAb Where “YY” can be IL, SA, LA, SG or LG; “Z” can be blank, M, P, or X; “A” can be blank, B, H, M, or N; and “b” can be A, L, G, or T
Solaria	Solaria modules with 40 mm frames PowerXT xxxY-ZZ Where "xxx" is the module power rating; "Y" can be R or C; and "ZZ" can be AC, BD, BX, BY, PD, PX, PZ, WX or WZ
Solarcity (Tesla)	Solarcity modules with 40 mm frames SCxxxYY Where "xxx" is the module power rating; and "YY" can be blank, B1 or B2
SolarTech	SolarTech modules with 42 mm frames STU-xxxYY Where "xxx" is the module power rating; and "YY" can be PERC or HJT

MODULE COMPATIBILITY

SolarWorld AG / Industries GmbH	SolarWorld Sunmodule Plus, Protect, Bisun, XL, Bisun XL, may be followed by mono, poly, duo, black, bk, or clear; modules with 31, 33 or 46 mm frames SW-xxx Where "xxx" is the module power rating
SolarWorld Americas Inc.	SolarWorld Sunmodule Plus, Protect, Bisun, XL, Bisun XL, may be followed by mono, poly, duo, black, bk, or clear; modules with 33 mm frames SWA-xxx Where "xxx" is the module power rating
Stion	Stion Thin film modules with 35 mm frames STO-xxx or STO-xxxA Thin film frameless modules STL-xxx or STL-xxxA Where "xxx" is the module power rating
SunEdison	SunEdison Modules with 35, 40 and 50 mm frames SE-YxxxZABCDE Where "Y" can be B, F, H, P, R, or Z; "xxx" refers to the module power rating; "Z" can be 0 or 4; "A" can be B,C,D,E,H,I,J,K,L,M, or N ; "B" can be B or W; "C" can be A or C; "D" can be 3, 7, 8, or 9; and "E" can be 0, 1 or 2
Suniva	Suniva modules with 35, 38, 40, 46 and 50 mm frames OPTxxx-AA-B-YYY-Z MVXxxx-AA-B-YYY-Z Where "xxx" is the module power rating; "AA" is either 60 or 72; "B" is either 4 or 5; "YYY" is either 100,101,700,1B0, or 1B1; and "Z" is blank or B
Sunpower	Sunpower standard (G3 or G4) or InvisiMount (G5) 40 and 46 mm frames SPR-Zb-xxx-YY Where "Z" is either A, E, P or X; “b” can be blank, 17, 18, 19, 20, 21, or 22; “xxx” is the module power rating and “YY” can be blank, BLK, COM, C-AC, D-AC, E-AC, G-AC, BLK-C-AC, or BLK-D-AC
Sunpreme	Sunpreme frameless modules GXB-xxxYY Where "xxx" is the module power rating; and "YY" can be blank or SL
Sunspark	Sunspark modules with 40 mm frames SYY-xxxZ Where “YY” can be MX or ST; “xxx” is the module power rating; and “Z” can be M, P or W
Suntech	Vd, Vem, Wdb, Wde, and Wd series modules with 35, 40 and 50 mm frames
Talesun	Talesun modules with 35 and 40 frames TP6yZZaaxxx-b Where “yy” can be blank, F or H; “ZZ” can be 60 or 72; “aa” can be M or P; and “b” can be blank, B, T, or (H)
Trina	Trina Modules with 30, 35, 40 and 46mm frames TSM-xxxYYZZ Where "xxx" is the module power rating; "YY" can be DD05, DD06, DD14, DE14, DE15, DEG15, PA05, PC05, PD05, PD06, PA14, PC14, PD14, PE14, or PE15 ; and "ZZ" can be blank, .05, .08, .10, .18, .08D, .18D, 0.82, .002, .00S, 05S, 08S, A, A.05, A.08, A.10, A.18, A(II), A.05(II), A.08(II), A.082(II), A.10(II), A.18(II), H, H(II), H.05(II), H.08(II), HC.20(II), HC.20(II), or M Frameless modules TSM-xxxYY Where "YY" can be either DEG5(II), DEG5.07(II), DEG5.40(II), DEG5.47(II), DEG14(II), DEG14C(II), DEG14C.07(II), DEG14.40(II), PEG5, PEG5.07, PEG5.40, PEG5.47, PEG14, or PEG14.40
URE	URE modules with 35 mm frames DyZxxxHaa Where "y" can be 6 or 7; "Z" can be K or M; "xxx" is the module power rating; and "aa" can be H3A, H4A, or H8A
Vikram	Vikram solar modules with 40 mm frames VSyy.ZZ.AAA.bb Where "yy" can be M, P, MBB, MH, MS, MHBB, or PBB; "ZZ" can be 60 or 72; "AAA" is the module power rating; and "bb" can be 03.04 or 05
VSUN	VSUN modules with 35 and 40 mm frames, VSUNxxx-YYz-aa, Where "YY" can be 60, 72, 120, or 144; "z" can be M, P, MH, PH, or BMH; and "aa" can be blank, BB, or DG
Winaico	Winaico modules with 35 and 40 mm frames Wsy-xxxZa Where "y" can be either P or T; "xxx" is the module power rating; "Z" can be either M, P, or MX; and "a" can be blank or 6
Yingli	Panda, YGE, YGE-U, and YLM series modules with 35, 40, and 50 mm frames

Address: Intertek 3933 US 11
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Subject: ETL Evaluation of SolarEdge Products to NEC 2017 Rapid Shutdown Requirements

To, whom it may concern

This letter represents the testing results of the below listed products to the requirements contained in the following standards:

National Electric Code, 2017, Section 690.12 requirement for rapid shutdown.

UL 1741, UL 1741 CRD for rapid shutdown

The evaluation was done on the PV Rapid Shutdown System (PVRSS), and covers installations consisting of optimizers and inverters with part numbers listed below.

The testing done has verified that controlled conductors are limited to:

- Not more than 30 volts and 240 voltamperes within 30 seconds of rapid shutdown initiation outside the array.
- Not more than 80 volts and 240 voltamperes within 30 seconds of rapid shutdown initiation inside the array.

The rapid shutdown initiation is performed by either disconnecting the AC feed to the inverter, or – if the inverter DC Safety switch is readily accessible – by turning off the DC Safety switch.

Applicable products:

- Power optimizers:
  - PB followed by 001 to 350; followed by -AOB or -TFI.
    OP followed by 001 to 500; followed by -LV, -MV, -IV or -EV.
    P followed by 001 to 850.
    SP followed by 001 to 350.
    *When optimizers are connected to 2 or more modules in series, the max input voltage may exceed 80V. Following the implementation of the NEC 2017 rapid shutdown value of 80V max inside of the array at the beginning of 2019 , modules exceeding this combined input max voltage will be required to use optimizers with parallel inputs.

- 1-ph Inverters:

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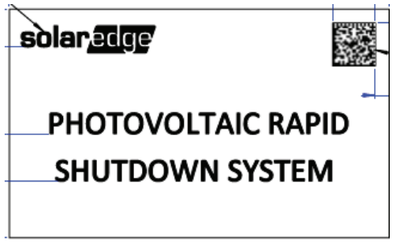
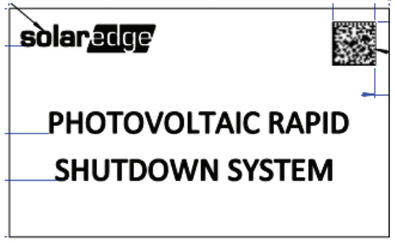
- SE3000A-US / SE3800A-US / SE5000A-US / SE6000A-US / SE7600A-US / SE10000A-US / SE11400A-US / SE3000H-US / SE3800H-US / SE5000H-US / SE6000H-US / SE7600H-US / SE10000H-US / SE11400H-US when the following label is labeled on the side of the inverter:



Inverter part number may be followed by a suffix

- 3-ph Inverters:
  - SE9KUS / SE10KUS / SE14.4KUS / SE20KUS / SE30KUS / SE33.3KUS /SE43.2KUS / SE66.6KUS / SE100KUS ; when the following label is labeled on the side of the inverter:



Inverter part number may be followed by a suffix

If there are any questions regarding the results contained in this report, or any of the other services offered by Intertek, please do not hesitate to contact the undersigned.

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Test Verification of Conformity

In the basis of the tests undertaken, the sample(s) of the below product have been found to comply with the requirements of the referenced specifications at the time the tests were carried out.

Applicant Name & Address:	IronRidge, Inc. 1495 Zephyr Ave. Hayward, CA 94544 USA
Product Description:	Flush Mount System with XR Rails.
Ratings & Principle Characteristics:	Fire Class Resistance Rating: -Flush Mount (Symmetrical). Class A Fire Rated for Low Slope applications when using Type 1, 2 and 3, listed photovoltaic modules. Class A Fire Rated for Steep Slope applications with Type1, 2 and 3, listed photovoltaic modules. Tested with a 5" gap (distance between the bottom the module frame and the roof covering), per the standard this system can be installed at any gap allowed by the manufacturers installation instructions. No perimeter guarding is required. This rating is applicable with any IronRidge or 3'rd party roof anchor.
Models:	IronRidge Flush Mount with XR Rails
Brand Name:	IronRidge Flush Mount
Relevant Standards:	UL 2703 (Section 15.2 and 15.3) Standard for Safety Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels, First Edition dated Jan. 28, 2015 **Referencing** UL1703 Third Edition dated Nov. 18, 2014, (Section 31.2) Standard for Safety for Flat-Plate Photovoltaic Modules and Panels.
Verification Issuing Office:	Intertek Testing Services NA, Inc. 8431 Murphy Drive Middleton, WI 53562
Date of Tests:	08/27/2014 to 03/17/2015
Test Report Number(s):	101769343MID-001r1, 101769343MID-001a, 101915978MID-001 & 101999492MID-001ar1-cr1.

This verification is part of the full test report(s) and should be read in conjunction with them. This report does not automatically imply product certification.

Completed by:	Chris Zimbrich	**Reviewed by:**	Chad Naggs
Title:	Technician II, Fire Resistance	**Title:**	Technician I, Fire Resistance
Signature:		**Signature:**	
Date:	05/25/2016	**Date:**	05/25/2016