

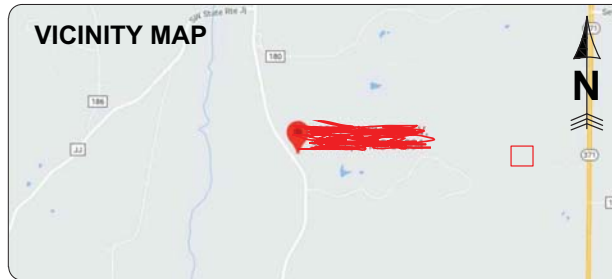
### PROJECT DESCRIPTION

THIS GROUND-MOUNTED PHOTOVOLTAIC (PV) SYSTEM IS TO BE INSTALLED AT THE SINGLE FAMILY RESIDENTIAL IN .  
THE ENERGY PRODUCED BY THE PV SYSTEM SHALL BE INTERCONNECTED WITH THE UTILITY GRID THROUGH THE EXISTING ON-SITE ELECTRICAL EQUIPMENT VIA A BACK-FED BREAKER IN THE MAIN SERVICE PANEL.

### GENERAL NOTES

1. LOCAL UTILITY PROVIDER SHALL BE NOTIFIED PRIOR TO USE AND ACTIVATION OF ANY SOLAR PHOTOVOLTAIC INSTALLATION.
2. BACK-FED BREAKER MUST BE AT THE OPPOSITE END OF BUS BAR FROM THE MAIN BREAKER OR MAIN LUG SUPPLYING CURRENT FROM THE UTILITIES.
3. ALL CONDUCTORS EXPOSED TO SUNLIGHT ARE LISTED AS SUNLIGHT RESISTANT.
4. NO SHEET METAL OR TECH SCREWS SHALL BE USED TO GROUND DISCONNECT ENCLOSURE WITH TIN-PLATED ALUMINUM LUGS; PROPER GROUNDING/GROUND BAR KITS SHOULD BE USED.
5. ALL EXTERIOR CONDUIT, FITTINGS, AND BOXES SHALL BE WITH RAIN TIGHT AND APPROVED FOR USE IN WET LOCATIONS.
6. DRAWINGS ARE DIAGRAMMATIC ONLY. THE LOCATION AND ROUTING OF RACEWAYS SHALL BE DETERMINED BY THE CONTRACTOR UNLESS OTHERWISE NOTED OR STANDARDIZED.
7. ALL EQUATIONS ACCOUNT FOR WORST CASE CONDITIONS.
8. INSTALLER TO FOLLOW ALL LOCAL JURISDICTION GUIDELINES.
9. GROUNDING BUSHINGS ARE REQUIRED AROUND PRE-PUNCHED CONCENTRIC KNOCKOUTS ON THE DC SIDE OF THE SYSTEM.
10. THE ELECTRICAL CONTRACTOR SHALL COMPLY WITH ANY AND ALL REQUIREMENTS GIVEN BY UTILITY COMPANIES.
11. ALL OUTDOOR EQUIPMENT SHALL BE MIN. NEMA 3R RATED.
12. IF A DISCREPANCY IN QUANTITY OR SIZE OF CONDUIT, WIRE, EQUIPMENT DEVICES, OVER CURRENT PROTECTION, GROUNDING SYSTEMS, ETC. (ALL EQUIPMENT AND MATERIALS) THE CONTRACTOR AND OR HOME OWNER SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING ALL MATERIALS AND SERVICES REQUIRED BY THE STRICTEST CONDITIONS IN THE SPECIFICATIONS OR NOTED ON THE PLANS TO ENSURE COMPLETE COMPLIANCE WITH ALL CODES AND TO ENSURE THE LONGEVITY AND SAFETY OF THE OPERABLE SYSTEM.
13. ALL LABELS AND MARKINGS SHALL BE ATTACHED ACCORDING TO REQUIREMENTS BY NEC AND THE LOCAL AHJ. THE AHJ MAY HAVE SPECIAL LABEL REQUIREMENTS BEYOND THE SCOPE OF THIS DOCUMENT.
14. FOR ADDITIONAL EQUIPMENT SPECIFICATIONS, SEE PROVIDED CUT SHEETS.
15. ALL ELECTRICAL MATERIAL SHALL BE LISTED BY "UL" FOR THE TYPE OF APPLICATION AND "UL" LABEL SHALL APPEAR ON ALL ELECTRICAL EQUIPMENT.

### VICINITY MAP



### AERIAL VIEW



### GOVERNING CODES

ALL MODULES AND RAIL ARE LISTED BY UNDERWRITERS LABORATORIES FOR ELECTRICAL AND FIRE SAFETY (CLASS A FIRE RATING)

#### NOTE:

- 1) NO DISCHARGE OF ANY POLLUTANTS TO ANY STORM DRAIN SYSTEM.
- 2) UL 1703 FOR MODULES & UL 1741 FOR INVERTERS PER CITY SOLAR REQUIREMENTS.

THIS PROJECT SHALL COMPLY WITH THE :  
2018 STATE BUILDING CODE  
2018 INTERNATIONAL PLUMBING CODE  
2018 INTERNATIONAL RESIDENTIAL CODE  
2018 INTERNATIONAL ENERGY CODE  
2018 INTERNATIONAL MECHANICAL CODE  
2018 INTERNATIONAL FIRE CODE  
2017 NATIONAL ELECTRICAL CODE AND  
ORDINANCES OF CITY AND OR COUNTY OF ST JOSEPH

### SCOPE OF WORK

SYSTEM SIZE:  
22.401 KW-AC  
24.600 KW-DC

GROUND MOUNT ARRAY  
ARRAY PITCH: 20°  
AZIMUTH: 180°

MODULES :  
(60) TRINA SOLAR,  
TSM-410DE15M (II) 410W

INVERTER :  
(2) FRONIUS PRIMO, 12.5-1 [240V]

RAPID SHUTDOWN :  
(2) FRONIUS,  
RAPID SHUTDOWN BOX-QUATTRO

MAIN PANEL/BUS-BAR: (E)400A  
MAIN BREAKER : (E)2-200A

PV RAIL:  
IRONRIDGE XR1000  
PV MOUNT:  
IRONRIDGE GROUND MOUNT  
SYSTEM

### INDEX SHEET

1. COVER PAGE
2. PLOT PLAN/ROOF PLAN
3. PLOT PLAN/ROOF PLAN
4. ARRAY LAYOUT
5. ARRAY LAYOUT
6. ELECTRICAL DIAGRAM
7. WARNING LABELS
8. SPECS
9. SPECS
10. SPECS
11. SPECS
12. SPECS
13. SPECS
14. SPECS
15. SPECS
16. SPECS

### HOME OWNER BUILDER

J  
1  
S  
PHONE:

### OWNER / ADDRESS

**JEREMY**  
1,  
S  
PHONE:

OCCUPANCY R3 /  
TYPE 5 STRU.  
APN#:

### SYSTEM SIZE

22.401 KW-AC  
24.600 KW-DC

MODULES :  
(60) TRINA SOLAR,  
TSM-410DE15M (II) 410W  
INVERTER(S) :  
(2) FRONIUS PRIMO, 12.5-1 [240V]

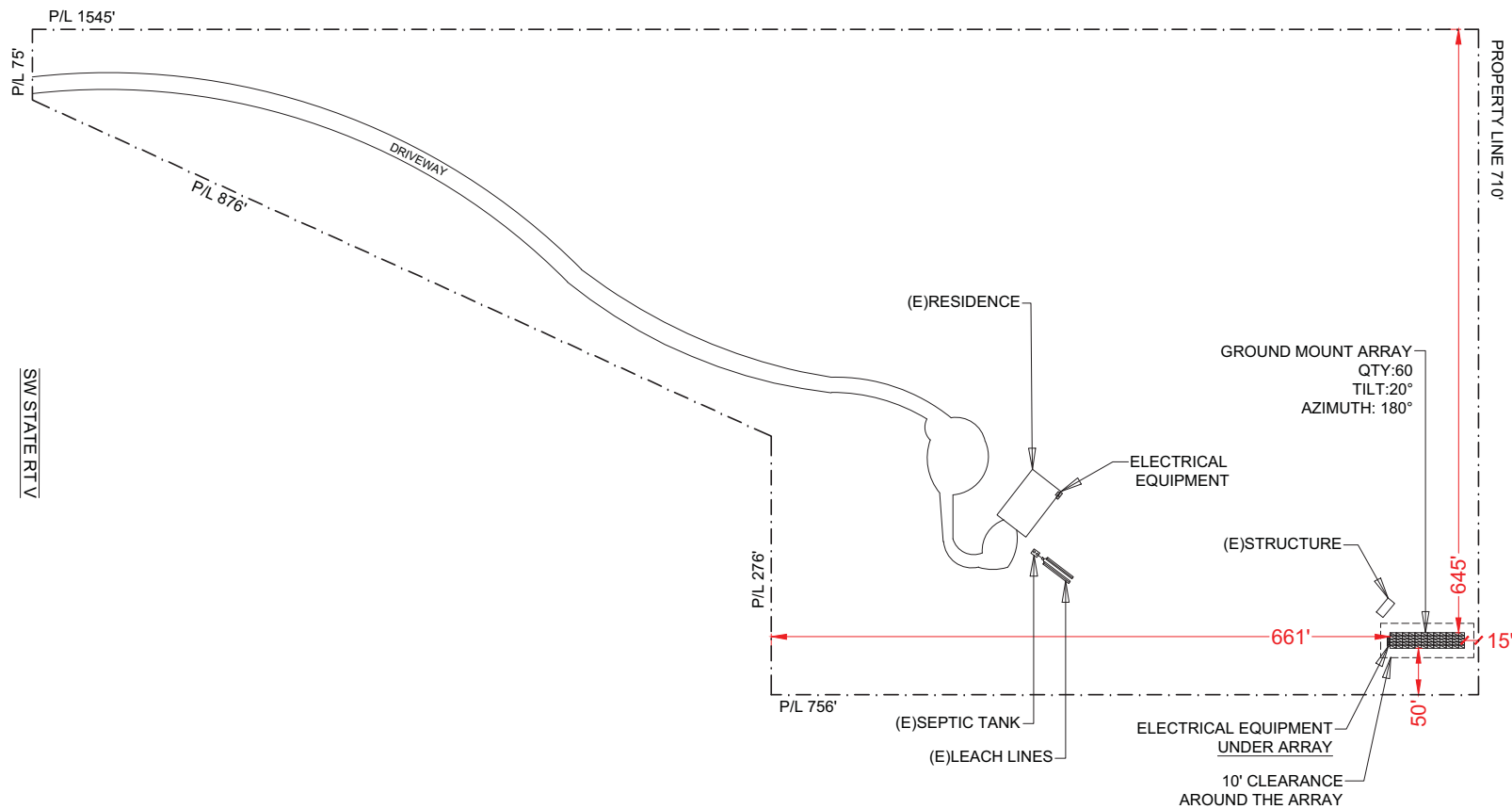
DATE: 03/30/21

REVISION :

### PAGE INFORMATION

TITLE:  
COVER PAGE

PV-01



SITE PLAN :

SCALE: 1"=125'-0"

**HOME OWNER BUILDER**

J  
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PHONE:

**OWNER / ADDRESS**

J  
1  
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PHONE:

OCCUPANCY R3 /  
TYPE 5 STRU.  
APN#:

**SYSTEM SIZE**

22.401 KW-AC  
24.600 KW-DC

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(60) TRINA SOLAR,  
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(2) FRONIUS PRIMO, 12.5-1 [240V]

DATE: 03/30/21

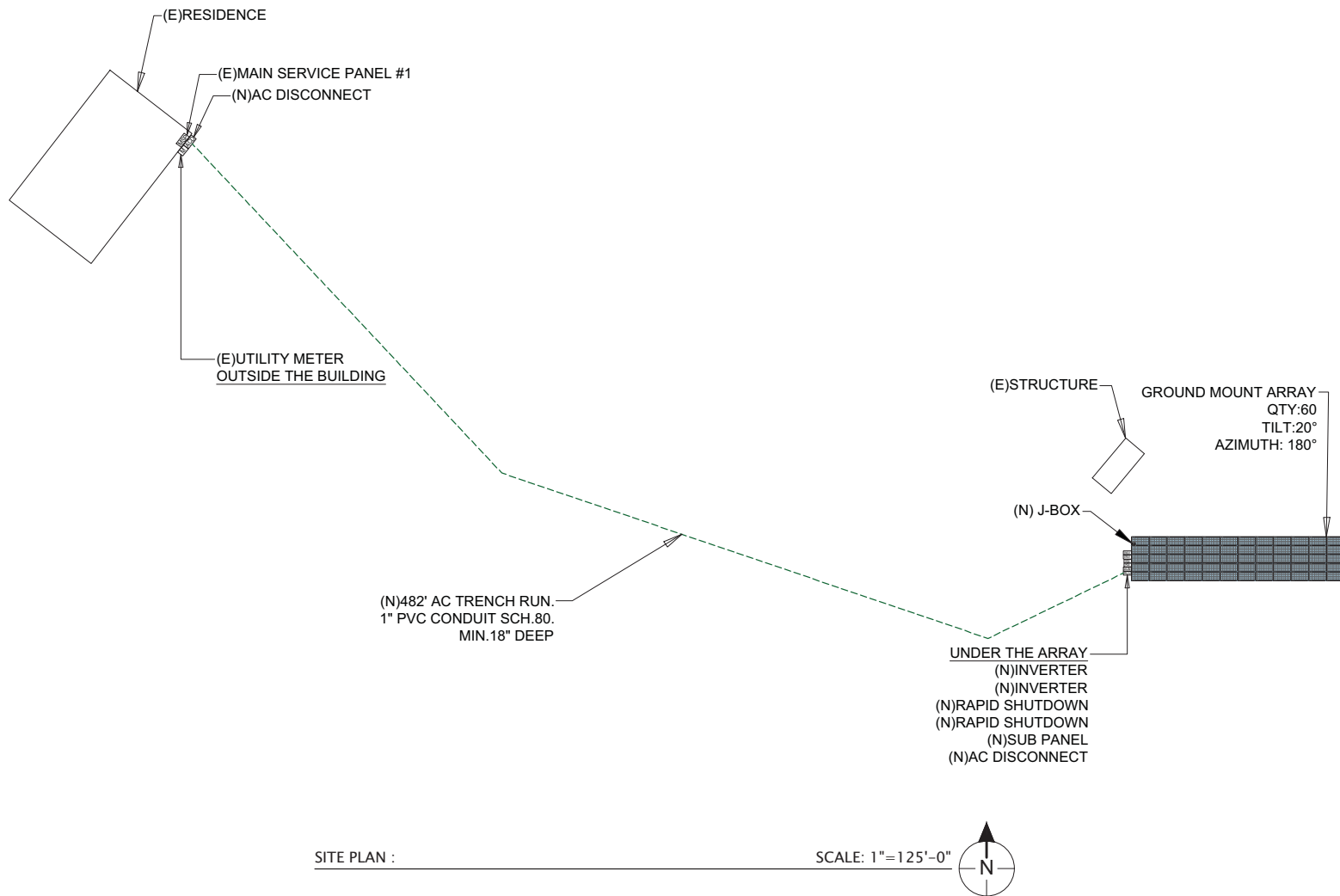
REVISION :

**PAGE INFORMATION**

TITLE:  
PLOT PLAN / ROOF PLAN

PV-02

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# HOME OWNER BUILDER

J  
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PHONE:

# OWNER / ADDRESS

J  
1  
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P  
OCCUPANCY R3 /  
TYPE 5 STRU.  
APN#:

# SYSTEM SIZE

22.401 KW-AC  
24.600 KW-DC  
MODULES :  
(60) TRINA SOLAR,  
TSM-410DE15M (II) 410W  
INVERTER(S) :  
(2) FRONIUS PRIMO, 12.5-1 [240V]

DATE: 03/30/21

REVISION :

# PAGE INFORMATION

TITLE:  
PLOT PLAN / ROOF PLAN

PV-03

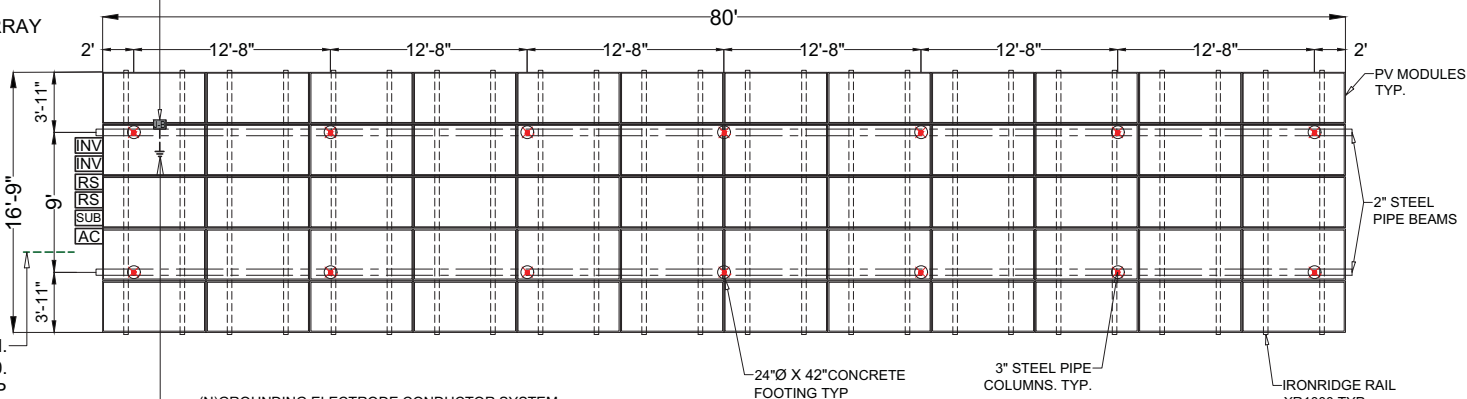
DISCLAIMER: If any Errors, Discrepancies or Omissions appear in these drawings, specifications or other contract documents; The Owner or General Contractor shall notify the Designer, in writing, of such error or omission. In the event that the Owner or General Contractor fails to give such notice, before construction and/or fabrication of the work, the Owner or General Contractor will be held responsible to the result of any errors, discrepancies or omissions and the cost of rectifying them.

GROUND MOUNT ARRAY  
QTY:61  
TILT:20°  
AZIMUTH: 180°

(N)481' AC TRENCH RUN.  
2" PVC CONDUIT SCH.80.  
MIN.18" DEEP

WIND SPEED: 105 MPH  
EXPOSURE CATEGORY: B  
RISK CATEGORY: 1  
SOIL PRESSURE: 2000 PSI  
SNOW LOAD: 20 PSF  
STEEL PIPE: SCH. 40 ASTM A53 GRADE B  
CONCRETE: 2,500 P.S.I.  
REBAR: ASTM A615 GRADE 40

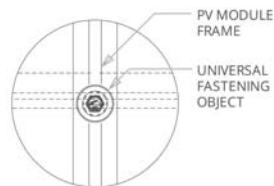
JUNCTION BOX



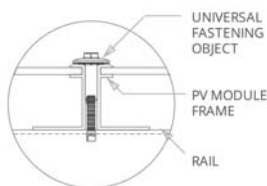
(N)GROUNDING ELECTRODE CONDUCTOR SYSTEM  
PER CEC 250.20 W/ MIN. # 8 COPPER FROM THE  
STRUCTURE TO THE GEC WITHOUT SPLICE PER  
CEC 250.64 (C) 5/8"Ø X 8' LONG GROUNDING ROD  
250.30, 250.52

GROUND MOUNT ARRAY

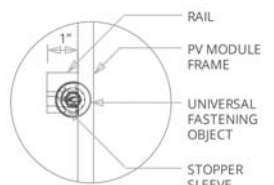
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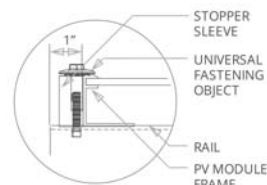
Mid Clamp, Plan



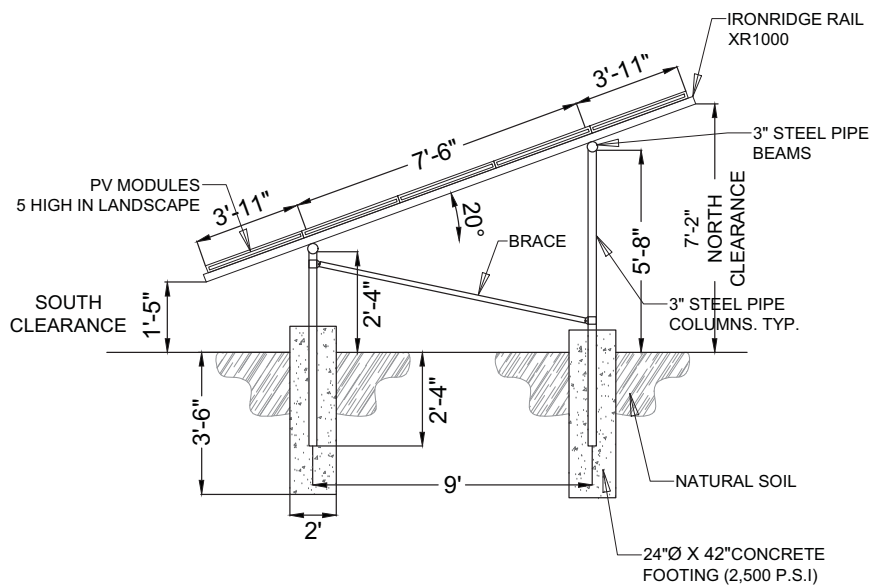
Mid Clamp, Front



End Clamp, Plan



End Clamp, Front



## HOME OWNER BUILDER

J  
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S  
PHONE:

## OWNER / ADDRESS

J  
1,  
S  
PHONE:

OCCUPANCY R3 /  
TYPE 5 STRU.  
APN#:

## SYSTEM SIZE

22.401 KW-AC  
24.600 KW-DC

MODULES :  
(60) TRINA SOLAR,  
TSM-410DE15M (II) 410W

INVERTER(S) :  
(2) FRONIUS PRIMO, 12.5-1 [240V]

DATE: 03/30/21

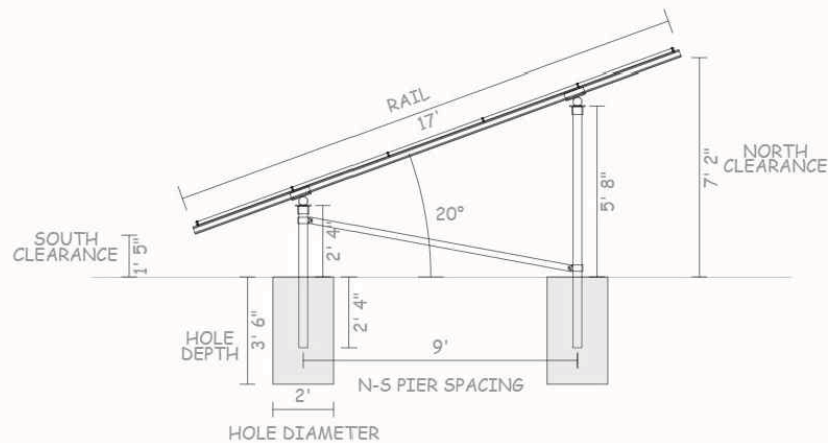
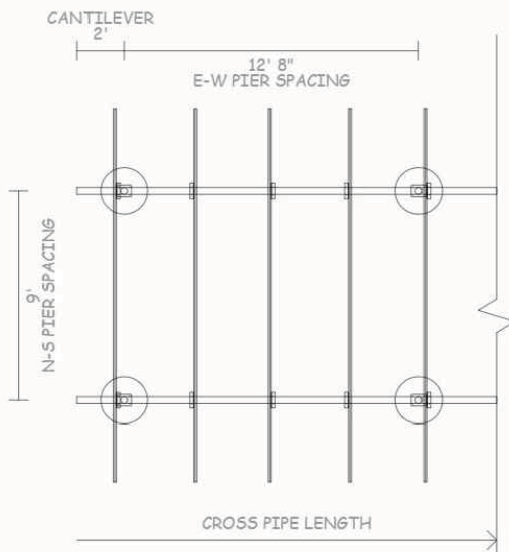
REVISION :

## PAGE INFORMATION

TITLE:  
ARRAY LAYOUT

PV-04

DISCLAIMER: If any Errors, Discrepancies or Omissions appear in these drawings, specifications or other contract documents; The Owner or General Contractor shall notify the Designer, in writing, of such error or omission. In the event that the Owner or General Contractor fails to give such notice, before construction and/or fabrication of the work, the Owner or General Contractor will be held responsible to the result of any errors, discrepancies or omissions and the cost of rectifying them.



Rail type	Diagonal bracing	E/W spacing	Rail cantilever	Size	Edge clearances	Shear ⓘ	Moment ⓘ	Uplift ⓘ
XR1000	yes	12' 8"	3' 9"	80' (EW) × 16' 9" (NS)	1' 5" (S); 7' 2" (N)	821 lbs	0 ft-lbs	-1,514 lbs
Rows	Columns	Repeats	Piers/repeat	Total South piers	Total North piers	Total cross pipes	Pipe cantilever	Total pipe length
5	12	1	14	7 (4' 8")	7 (8')	2 (80')	2'	248' 7"

## HOME OWNER BUILDER

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## OWNER / ADDRESS

J  
1  
S

PHONE:

OCCUPANCY R3 /  
TYPE 5 STRU.

APN#:

## SYSTEM SIZE

22.401 KW-AC  
24.600 KW-DC

MODULES :  
(60) TRINA SOLAR,  
TSM-410DE15M (II) 410W

INVERTER(S) :  
(2) FRONIUS PRIMO, 12.5-1 [240V]

DATE: 03/30/21

REVISION :

## PAGE INFORMATION

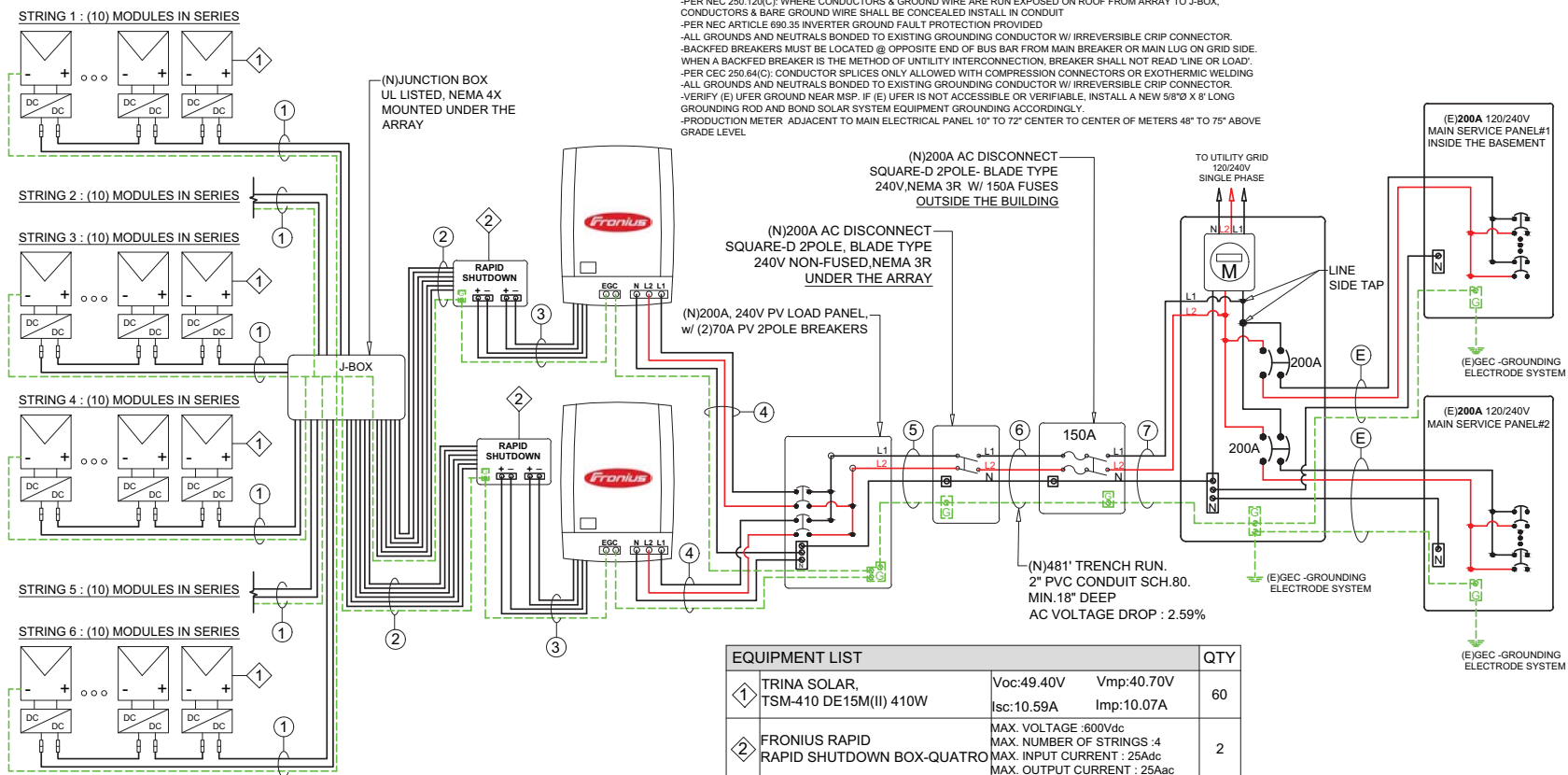
TITLE:  
SPECS

PV-05

WIRE TAG#	MAX AMPS X MULT=	NEC DESIGN AMPS	BREAKER SIZE AMPS	WIRE TYPE	EGC / GRND.SIZE	WIRE RATING IN 90° X DERATE X CONDUCTOR DERATE =	TEMP 60°C RATING	CONDUIT SIZE CONDUIT FILL
①	10.59 x	1.56 =16.55A	20A	(2) #10 PV WIRE	(1)#6 THWN-2 BARE COPPER EGC	40 x 0.65 x 1.0 =26.0 >=16.5	30> =16.5	OPEN AIR
②	10.59 x	1.56 =16.55A	20A	(6) #10 THWN-2	(1)#8 THWN-2 EGC	40 x 0.65 x 0.8 =20.8 >=16.5	30> =16.5	3/4" EMT FILL: 0.1632 , 31%
③	25.00 x	1.25 =31.25A	40A	(3) #8 THWN-2	(1)#8 THWN-2 EGC	55 x 0.91 x 0.8 =40.0 >=31.3	40> =31.3	1" EMT FILL: 0.1464 , 33%
④	52.10 x	1.25 =65.13A	70A	(3) #4 THWN-2	(1)#8 THWN-2 EGC	95 x 0.91 x 1.0 =86.5 >=65.1	70> =65.1	1" EMT FILL: 0.2838 , 33%
⑤	104.20 x	1.25 =130.25A	150A	(3) #2/O THWN-2	(1)#4 THWN-2 EGC	195 x 0.91 x 1.0 =177.5 >=130.3	145> =130.3	1 1/2" EMT FILL: 0.7493 , 37%
⑥	104.20 x	1.25 =130.25A	150A	(3) #4/O THWN-2	(1)#4 THWN-2 EGC	260 x 0.91 x 1.0 =236.6 >=130.3	195> =130.3	2" PVC FILL: 1.0535 , 37%
⑦	104.20 x	1.25 =130.25A	150A	(3) #2/O THWN-2	(1)#4 THWN-2 EGC	195 x 0.91 x 1.0 =177.5 >=130.3	145> =130.3	1 1/2" EMT FILL: 0.7493 , 37%

# NOTES:

-SOLID BARE E.G.C. (FREE-AIR) MOUNTED UNDER ARRAY  
 -PER NEC 250.120(C): WHERE CONDUCTORS & GROUND WIRE ARE RUN EXPOSED ON ROOF FROM ARRAY TO J-BOX, CONDUCTORS & BARE GROUND WIRE SHALL BE CONCEALED INSTALL IN CONDUIT  
 -PER NEC ARTICLE 690.35 INVERTER GROUND FAULT PROTECTION PROVIDED  
 -ALL GROUNDS AND NEUTRALS BONDED TO EXISTING GROUNDING CONDUCTOR W/ IRREVERSIBLE CRIP CONNECTOR.  
 -BACKFED BREAKERS MUST BE LOCATED @ OPPOSITE END OF BUS BAR FROM MAIN BREAKER OR MAIN LUG ON GRID SIDE. WHEN A BACKFED BREAKER IS THE METHOD OF UTILITY INTERCONNECTION, BREAKER SHALL NOT READ 'LINE OR LOAD'.  
 -PER CEC 250.64(C): CONDUCTOR SPLICES ONLY ALLOWED WITH COMPRESSION CONNECTORS OR EXOTHERMIC WELDING  
 -ALL GROUNDS AND NEUTRALS BONDED TO EXISTING GROUNDING CONDUCTOR W/ IRREVERSIBLE CRIP CONNECTOR.  
 -VERIFY (E) UFER GROUND NEAR MSP. IF (E) UFER IS NOT ACCESSIBLE OR VERIFIABLE, INSTALL A NEW 5/8" X 8' LONG GROUNDING ROD AND BOND SOLAR SYSTEM EQUIPMENT GROUNDING ACCORDINGLY.  
 -PRODUCTION METER ADJACENT TO MAIN ELECTRICAL PANEL 10" TO 72" CENTER TO CENTER OF METERS 48" TO 75" ABOVE GRADE LEVEL



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## HOME OWNER BUILDER

J  
1  
S  
PHONE:

## OWNER / ADDRESS

J  
1  
S  
PHONE:

OCCUPANCY R3 /  
TYPE 5 STRU.  
APN#:

## SYSTEM SIZE

22.401 KW-AC  
24.600 KW-DC

MODULES :  
(60) TRINA SOLAR,  
TSM-410DE15M (II) 410W

INVERTER(S) :  
(2) FRONIUS PRIMO, 12.5-1 [240V]

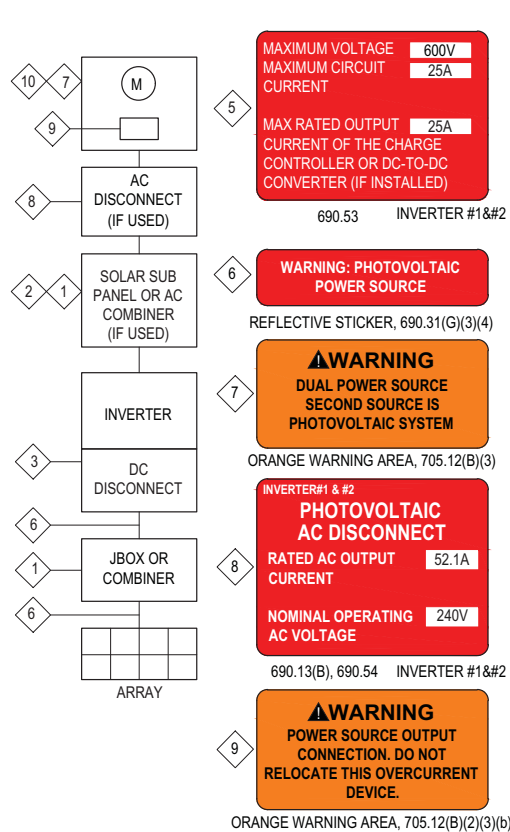
DATE: 03/30/21

REVISION :

## PAGE INFORMATION

TITLE:  
ELECTRICAL DIAGRAM

PV-06



- ARTICLES 690 AND 705 MARKINGS SHOWN HEREON
- ALL MARKINGS SHALL CONSIST OF THE FOLLOWING:
  - UV RESISTANT SIGN MATERIAL WITH ENGRAVED OR MACHINE PRINTED LETTERS OR ELECTRO-PLATING
  - RED BACKGROUND COLOR WITH WHITE TEXT AND LINE WORK UNO
  - ARIAL FONT
- ALL SIGNS SHALL BE SIZED APPROPRIATELY AND PLACED IN THE LOCATIONS SPECIFIED.
- SIGNS SHALL BE ATTACHED TO THE SERVICE EQUIPMENT USING PERMANENT ADHESIVE, POP-RIVETS, OR SCREWS

### SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN

TURN RAPID SHUTDOWN SWITCH TO THE "OFF" POSITION TO SHUTDOWN PV SYSTEM AND REDUCE SHOCK HAZARD IN THE ARRAY



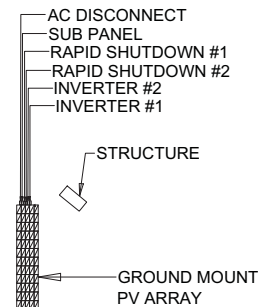
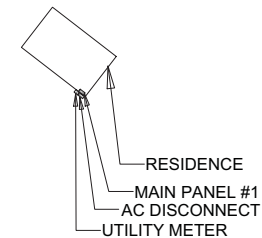
The title "SOLAR PV SYSTEM IS EQUIPPED WITH RAPID SHUTDOWN" shall utilize capitalized characters with a minimum height of 9.5 mm (3/8 in.) in black on yellow background and the remaining characters shall be capitalized with a minimum height of 4.8 mm (3/16 in.) in black on white background. 690.56(C)(1)(a)

MIN.6"X8" PLACARD SHALL BE IN RED COLOR WITH PRINTED IN WHITE TO GO ON MAIN SERVICE PANEL CEC 705.10

## 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.

SW STATE RTE V



STRUCTURE

GROUND MOUNT PV ARRAY



"WARNING"  
PHOTOVOLTAIC ARRAY  
DISCONNECTION OF NEUTRAL OR GROUNDED CONDUCTORS MAY  
RESULT IN OVERVOLTAGE ON ARRAY OR INVERTER

PLAQUE SHALL BE ATTACHED TO THE SERVICE EQUIPMENT WITH POP-RIVETS OR SCREWS.

### HOME OWNER BUILDER

J  
1  
S  
P

### OWNER / ADDRESS

J  
1,  
S

PHONE:

OCCUPANCY R3 /  
TYPE 5 STRU.

APN#:

### SYSTEM SIZE

22.401 KW-AC  
24.600 KW-DC

MODULES :  
(60) TRINA SOLAR,  
TSM-410DE15M (II) 410W

INVERTER(S) :  
(2) FRONIUS PRIMO, 12.5-1 [240V]

DATE: 03/30/21

REVISION :

### PAGE INFORMATION

TITLE:  
WARNING LABELS

PV-07

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Mono Multi Solutions

# TALLMAX<sup>M</sup>

## TSM-DE15M(II)

**144 HALF-CUT**  
MONOCRYSTALLINE CELLS

**390-415W**  
POWER OUTPUT RANGE

**20.4%**  
MAXIMUM EFFICIENCY

**0/+5W**  
POSITIVE POWER TOLERANCE

Founded in 1992, Trina Solar is the world's leading comprehensive solutions provider for solar energy. We believe close cooperation with our partners is critical to success. Trina Solar now distributes its PV products to over 60 countries all over the world. Trina Solar is able to provide exceptional service to each customer in each market and supplement our innovative, reliable products with the backing of Trina Solar as a strong, bankable partner. We are committed to building strategic, mutually beneficial collaboration with installers, developers, distributors and other partners.

### Comprehensive Product And System Certificates

IEC61215/IEC61730/UL1709  
IEC61701 Salt Mist Corrosion  
IEC62716 Ammonia Corrosion  
IEC60068 Blowing Sand  
ISO9001 ISO14001 OHSAS18001



**Trina solar**



### High power output

- Multi busbar technology combined with mono PERC cells
- Reduced BOS costs with higher power bins and 1500V system voltage
- Consistently high bankability ratings by BNEF, banks and investors



### Half-cut cell design brings higher efficiency

- Optimized power output under inter-row shading conditions
- Low thermal coefficients for higher energy yield at elevated operating temperatures
- Reduced interconnection losses



### Highly reliable due to stringent quality control

- Over 30 in-house tests (UV, TC, HF, and many more)
- In-house testing goes well beyond certification requirements
- PID resistant
- 2x100% inline EL inspection

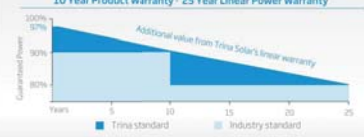


### Certified to withstand challenging environmental conditions

- Salt Mist Corrosion
- Ammonia Corrosion
- Blowing Sand

### LINEAR PERFORMANCE WARRANTY

10 Year Product Warranty - 25 Year Linear Power Warranty

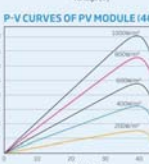
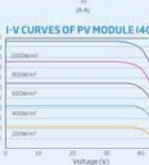
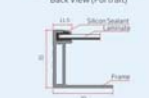
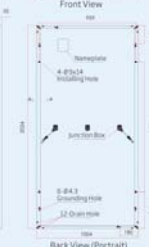
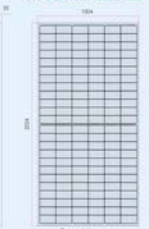


**TALLMAX<sup>M</sup>**

TSM-DE15M(II)

### DIMENSIONS OF PV MODULE

TSM-DE15M(II) (unit: mm)



**Trina solar**

ELECTRICAL DATA @ STC	TSM-390 DE15M(II)	TSM-395 DE15M(II)	TSM-400 DE15M(II)	TSM-405 DE15M(II)	TSM-410 DE15M(II)	TSM-415 DE15M(II)
Peak Power Watts- $P_{max}$ (W)*	390	395	400	405	410	415
Power Output Tolerance- $P_{max}$ (W)	0/+5	0/+5	0/+5	0/+5	0/+5	0/+5
Maximum Power Voltage- $V_{mp}$ (V)	40.0	40.1	40.3	40.5	40.7	40.9
Maximum Power Current- $I_{mp}$ (A)	9.75	9.86	9.92	10.0	10.07	10.15
Open Circuit Voltage- $V_{oc}$ (V)	48.5	48.7	49.0	49.2	49.4	49.6
Short Circuit Current- $I_{sc}$ (A)	10.30	10.37	10.45	10.52	10.59	10.66
Module Efficiency $\eta$ (%)	19.2	19.4	19.7	19.9	20.2	20.4

STC: Irradiance 1000 W/m<sup>2</sup>, Cell Temperature 25 °C, Air Mass AM1.5  
\* Measuring tolerance: ±3%

ELECTRICAL DATA @ NMOT	TSM-390 DE15M(II)	TSM-395 DE15M(II)	TSM-400 DE15M(II)	TSM-405 DE15M(II)	TSM-410 DE15M(II)	TSM-415 DE15M(II)
Maximum Power- $P_{max}$ (W)	294	298	301	305	309	313
Maximum Power Voltage- $V_{mp}$ (V)	37.6	37.7	37.9	38.1	38.3	38.4
Maximum Power Current- $I_{mp}$ (A)	7.83	7.90	7.96	8.02	8.08	8.13
Open Circuit Voltage- $V_{oc}$ (V)	45.6	45.8	46.1	46.3	46.5	46.7
Short Circuit Current- $I_{sc}$ (A)	8.30	8.36	8.43	8.48	8.54	8.60

NMOT: Irradiance 800 W/m<sup>2</sup>, Ambient Temperature 20 °C, Wind Speed 1 m/s.

### MECHANICAL DATA

Solar Cells	Monocrystalline
Cell Orientation	144 cells (6 x 24)
Module Dimensions	2024 × 1004 × 35 mm
Weight	22.8 kg
Glass	3.2 mm, High Transmission, AR Coated Heat Strengthened Glass
Encapsulant Material	EVA
Backsheet	White
Frame	35 mm Anodized Aluminium Alloy
J-Box	IP68 rated
Cables	Photovoltaic Cable 4.0mm <sup>2</sup> , Portrait: N 140mm/P 205mm, Landscape: N 140mm/P 140mm
Connector	TS4

### TEMPERATURE RATINGS

NMOT (Nominal Module Operating Temperature)	41°C (±3K)
Temperature Coefficient of $P_{max}$	-0.37%/K
Temperature Coefficient of $V_{oc}$	-0.29%/K
Temperature Coefficient of $I_{sc}$	0.05%/K

### MAXIMUM RATINGS

Operational Temperature	-40 to +85°C
Maximum System Voltage	1500VDC (IEC)
Max Series Fuse Rating	20A
Snow Load	5400 Pa (3600 Pa*)
Wind Load	2400 Pa (1500 Pa*)

\*Designed with safety factor 1.5  
(DO NOT connect 1 Fuse in Combiner Box with two or more strings in parallel connection)

### PACKAGING CONFIGURATION

Modules per box:	30 pieces
Modules per 40' container:	660 pieces

### WARRANTY

10 year Product Workmanship Warranty
25 year Linear Performance Warranty

(Please refer to product warranty for details)

CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.

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## HOME OWNER BUILDER

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## OWNER / ADDRESS

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OCCUPANCY R3 /  
TYPE 5 STRU.  
APN#:

## SYSTEM SIZE

22.401 KW-AC  
24.600 KW-DC

MODULES :  
(60) TRINA SOLAR,  
TSM-410DE15M (II) 410W

INVERTER(S) :  
(2) FRONIUS PRIMO, 12.5-1 [240V]

DATE: 03/30/21

REVISION :

## PAGE INFORMATION

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PV-08

## CERTIFICATE OF COMPLIANCE

Certificate Number 20140510-E306515  
Report Reference E306515-20130329  
Issue Date 2014-May-10

Issued to: TRINA SCLAR LTD  
2 TIAN HE RD,  
ELECTRONICS PARK NEW DISTRICT,  
CHANGZHOU,  
JIANGSU 213031 CHINA.

This is to certify that  
representative samples of PHOTOVOLTAIC MODULES AND PANELS WITH  
SYSTEM VOLTAGE RATINGS OVER 600 VOLTS  
See Addendum page.


Have been investigated by UL in accordance with the  
Standard(s) indicated on this Certificate.

Standard(s) for Safety: Standard for Safety for Flat-Plate Photovoltaic Modules and  
Panels - UL 1703. Flat-Plate Photovoltaic Modules and  
Panels - ULC/ORD-C1703-01.  
Guidelines for California's Solar Electric Incentive  
Programs', CEC-300-2013-008-ED5-CMF.  
Crystalline Silicon Terrestrial Photovoltaic (PV) Modules --  
Design Qualification and Type Approval", IEC 61215

Additional Information: See the UL Online Certifications Directory at  
[www.ul.com/database](http://www.ul.com/database) for additional information

Only those products bearing the UL Listing Mark for the US and Canada should be considered as  
being covered by UL's Listing and Follow-Up Service meeting the appropriate requirements for US  
and Canada.

The UL Listing Mark for the US and Canada generally includes: the UL in a circle symbol with "C" and

"US" identifiers:  the word "LISTED"; a control number (may be alphanumeric) assigned by UL;  
and the product category name (product identifier) as indicated in the appropriate UL Directory.

Look for the UL Listing Mark on the product.



William R. Carney, Director, North American Certification Programs

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contact a local UL Customer Service Representative at [www.ul.com/30186248](http://www.ul.com/30186248)

Page 1 of 3



### HOME OWNER BUILDER

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## FRONIUS PRIMO



/ Snap/Novert mounting system



/ Wireless monitoring



/ Open data communication



/ Smart Grid Ready



/ Arc Fault Circuit Interruption



The transformerless Fronius Primo is the ideal compact single-phase inverter for residential and small-scale commercial applications with power categories from 3.8 to 8.2 kW. In accordance with ESA rules for residential applications, the Fronius Primo can operate efficiently at a maximum input voltage of 600 V. And for increased efficiency and additional cost savings for commercial applications, the Fronius Primo can operate at the maximum input voltage of 1,000 V. Industry-leading features now come standard with the Fronius Primo, including: dual maximum power point tracking, arc fault protection, integrated wireless monitoring and SunSpec Modbus interfaces for seamless monitoring and datalogging via Fronius' online and mobile platform, Fronius Solarweb.

### TECHNICAL DATA FRONIUS PRIMO

GENERAL DATA	FRONIUS PRIMO 3.8 - 8.2	FRONIUS PRIMO 10.0-15.0
Dimensions (width x height x depth)	16.9 x 24.7 x 8.1 in / 42.9 x 62.7 x 20.6 cm	20.1 x 28.5 x 8.9 in / 51.1 x 72.4 x 20.6 cm
Weight	47.4 lb / 21.5 kg	82.5 lb / 37.4 kg
Degree of protection	NEMA 4X	
Night time consumption	< 1 W	
Inverter topology	Transformerless	
Cooling	Controlled forced ventilation, variable speed fan	
Installation	Indoor and outdoor installation	
Ambient operating temperature range	-40 to 131 F / -40 to 55 C	-40 to 140 F / -40 to 60 C
Permitted humidity	0 - 100 %	
DC connection terminals	2x DC-1, 2x DC-2 and 4x DC screw terminals for solid copper and aluminum stranded / fine stranded copper and aluminum	4x DC-1, 2x DC-2 and 4x DC screw terminals for copper (solid / stranded / fine stranded) or aluminum (solid / stranded)
AC connection terminals	Screw terminals 12 - 6 AWG	
Reverse Grade Metering	Optional (ANSI C12.1 accuracy)	
Certificates and compliance with standards	UL 1741-2015, UL1998 (for functions: AFCI, RCMU and isolation monitoring), IEEE 1547-2003, IEEE 1547.1-2003, ANS/IEEE C42.41, IEC Part 15 A & B, NEC 2014 Article 690, C22.2 No. 107.1-01 (September 2001), UL1699B Issue 2-2013, CSA T11.31 Issue 1-2013	UL 1741-2015, UL1998 (for functions: AFCI, RCMU and isolation monitoring), IEEE 1547-2003, IEEE 1547.1-2003, ANS/IEEE C42.41, IEC Part 15 A & B, NEC Article 690-2014, C22.2 No. 107.1-01 (September 2001), UL1699B Issue 2-2013, CSA T11.31 Issue 1-2013
PROTECTIVE DEVICES		
STANDARD WITH ALL PRIMO MODELS		
AFCI	Yes	
Ground Fault Protection with Isolation Monitor Interrupter	Yes	
DC disconnect	Yes	
DC reverse polarity protection	Yes	
INTERFACES		
AVAILABILITY	AVAILABLE WITH ALL FRONIUS PRIMO MODELS	
USB (A socket)	Standard	Datalogging and inverter update via USB
2x RS482 (B/B5 socket)	Standard	Fronius Solar Net, interface protocol
Wi-Fi* Ethernet Serial Datalogger and webserver	Optional	Wired Solar-net, SunSpec Modbus TCP, IECN / SunSpec Modbus RTU
5 inputs for 4 digital inputs/outputs	Optional	External relay contacts

\*The term Wi-Fi is a registered trademark of the Wi-Fi Alliance.

### TECHNICAL DATA FRONIUS PRIMO 3.8-1 TO 8.2-1

INPUT DATA	PRIMO 3.8-1	PRIMO 5.0-1	PRIMO 6.0-1	PRIMO 7.6-1	PRIMO 8.2-1
Max. permitted PV power (kWp)	5.7 kW	7.5 kW	9.0 kW	11.4 kW	12.3 kW
Max. usable input current (MPPT 1/MPPT 2)	18 A / 18 A	18 A / 18 A	18 A / 18 A	18 A / 18 A	18 A / 18 A
Total max. DC current	36 A				
Max. admissible input current (MPPT 1/MPPT 2)	27 A				
Operating voltage range	80 V - 1,000 V				
Max. input voltage	1,000 V				
Nominal input voltage	410 V	420 V	420 V	420 V	420 V
Admissible conductor size DC	AWG 14 - AWG 6				
MPPT voltage range	200 - 800 V	240 - 800 V	240 - 800 V	250 - 800 V	270 - 800 V
Number of MPPT	2				
OUTPUT DATA	PRIMO 3.8-1	PRIMO 5.0-1	PRIMO 6.0-1	PRIMO 7.6-1	PRIMO 8.2-1
Max. output power	240 V 3,800 W	5,000 W	6,000 W	7,600 W	8,200 W
208 V	3,800 W	5,000 W	6,000 W	7,600 W	7,900 W
Max. output fault current / Duration	240 V 584 A Peak / 154 ms	584 A Peak / 154 ms	584 A Peak / 154 ms	584 A Peak / 154 ms	584 A Peak / 154 ms
Max. continuous output current	240 V 15.8 A	20.8 A	23.0 A	31.7 A	34.2 A
208 V	18.3 A	24.6 A	28.9 A	38.5 A	40.8 A
Recommended OCPD/AC breaker size	240 V 20 A	30 A	35 A	40 A	45 A
208 V	25 A	30 A	40 A	50 A	50 A
Max. efficiency (Line version)	97.9 %				
CEC efficiency (Line version)	240 V 95.5 %	96.5 %	96.5 %	97.0 %	97.0 %
Admissible conductor size AC	AWG 14 - AWG 6				
Grid connection	208 / 240 V				
Frequency	60 Hz				
Total harmonic distortion	< 5.0 %				
Power factor (cos φ <sub>u</sub> )	0.95 - 1 ind./cap.				

### TECHNICAL DATA FRONIUS PRIMO 10.0-1 TO 15.0-1

INPUT DATA	PRIMO 10.0-1	PRIMO 11.4-1	PRIMO 12.5-1	PRIMO 15.0-1
Max. permitted PV power (kWp)	15.00 kW	17.10 kW	18.75 kW	22.50 kW
Max. usable input current (MPPT 1/MPPT 2)	33.0 A / 18.0 A			
Total max. DC current	51 A			
Max. admissible input current (MPPT 1/MPPT 2)	49.5 A / 27.0 A			
Operating voltage range	80 V - 1,000 V			
Max. input voltage	1,000 V			
Nominal input voltage	655 V	660 V	665 V	680 V
Admissible conductor size DC	AWG 14 - AWG 6 copper direct, AWG 6 aluminum direct, AWG 4 - AWG 2 copper or aluminum with optional input combiner			
MPPT Voltage Range	220 - 800 V	240 - 800 V	260 - 800 V	320 - 800 V
Number of MPPT	2			
OUTPUT DATA	PRIMO 10.0-1	PRIMO 11.4-1	PRIMO 12.5-1	PRIMO 15.0-1
Max. output power	240 V 9,975 W	11,400 W	12,500 W	15,000 W
208 V	9,995 W	11,400 W	12,500 W	13,290 W
Max. output fault current / Duration	240 V 916 A Peak / 6.46 ms	916 A Peak / 6.46 ms	916 A Peak / 6.46 ms	916 A Peak / 6.46 ms
Max. continuous output current	240 V 41.6 A	47.5 A	52.1 A	62.5 A
208 V	48.1 A	54.8 A	60.1 A	66.1 A
Recommended OCPD/AC breaker size	240 V 60 A	60 A	70 A	80 A
208 V	60 A	70 A	80 A	90 A
Max. efficiency (Line version)	97.9 %			
CEC efficiency (Line version)	240 V 96.5 %	96.5 %	96.5 %	97.3 %
Admissible conductor size AC	AWG 10 - AWG 2 copper (solid / stranded) / fine stranded; AWG 6 - AWG 2 copper (solid / stranded)			
Grid connection	208 / 240 V			
Frequency	60 Hz			
Total harmonic distortion	< 2.5 %			
Power factor (cos φ <sub>u</sub> )	0.91 ind./cap.			

Fronius Canada Ltd. / 2875 Argentea Road, Units 3 - 6 / Mississauga, ON L5N 8G6 / www.fronius.ca / 905-288-2100

## HOME OWNER BUILDER

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OCCUPANCY R3 /  
TYPE 5 STRU.  
APN#:

## SYSTEM SIZE

22.401 KW-AC  
24.600 KW-DC

MODULES :  
(60) TRINA SOLAR,  
TSM-410DE15M (II) 410W

INVERTER(S) :  
(2) FRONIUS PRIMO, 12.5-1 [240V]

DATE: 03/30/21

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## RAPID SHUTDOWN BOX

/ The convenient rapid shutdown solution for Fronius inverters.

### EASY AND COST-EFFECTIVE NEC 2014 COMPLIANCE

/ The Fronius Rapid Shutdown Box (RSB) provides a convenient solution for NEC 2014 (690.12) compliance, while enhancing overall rooftop and firefighter safety. Low-profile design, a small foot print installer-friendly mounting and wiring, make the Fronius Rapid Shutdown Box the ultimate solution for all Fronius SnapInverters\* in systems up to 600 V. Directly connected to the inverter through the same conduit as the DC homeruns and powered by the array, the Fronius solution minimizes the number of components and eliminates the need for an external power supply and control button.

/ The low profile design allows for installation underneath the modules, ensuring a clean system look. Thanks to the NEMA 4X rating, the box is built for severe outdoor conditions. MC4 connectors, spring loaded terminals and external equipment ground lug make wiring easy. 25A rated inputs for up to two strings per input channel (via MC4 "Y" connectors, not included). Rapid Shutdown Box replaces your junction box / PV-powered: no extra power supply needed / No additional control button needed

#### SLEEK DESIGN

/ Low-profile design that fits underneath a module for clean system look  
/ Mounting bracket with multiple mounting options for maximum flexibility  
/ NEMA 4X rated for severe outdoor conditions

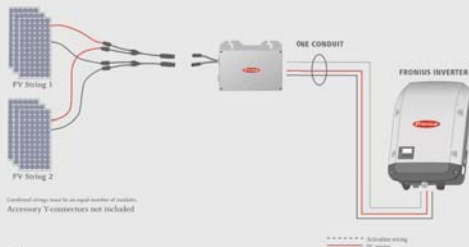
#### EASY WIRING

/ MC4 connectors, spring loaded terminals and external equipment ground lug make wiring easy  
/ 25A rated inputs for up to two strings per input channel (via MC4 "Y" connectors, not included)

#### SMALL NUMBER OF COMPONENTS

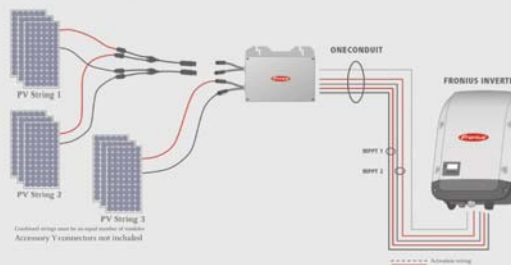
/ Rapid Shutdown Box replaces your junction box  
/ PV-powered: no extra power supply needed  
/ No additional control button needed

### SAMPLE CONFIGURATION DUO



\* Excluding the Fronius Symo 15.0-3 20S

### SAMPLE CONFIGURATION QUATTRO



### TECHNICAL DATA

GENERAL DATA	RAPID SHUTDOWN BOX-DUO	RAPID SHUTDOWN BOX-QUATTRO
Maximum voltage	600 VDC	600 VDC
Start voltage	80 VDC	80 VDC
Maximum input current	25A	25A/ 25A
Power Supply	DC (from the PV array)	DC (from the PV array)
Typ. self-consumption during operation	2 W	2 W
Input Circuits: MC-4	1 (2 if used with MC-4 Y connector)	2 (4 if used with MC-4 Y connectors)
Max. number of strings	2	4
Max. output current	25A	25A/ 25A
Output circuits: Spring clips	1	2
Max. DC homerun wire size	AWG 8	AWG 8
Max. communication wire size	AWG 14	AWG 14
Number of conduit ports	2	2
Conduit size	3/4in. and 1in.	3/4in. and 1in.
For use with Amphenol H4/other connectors	Remove MC-4 connectors and replace with UL listed connectors	Remove MC-4 connectors and replace with UL listed connectors
External hardware required	Appropriate "Y" connectors if combining two strings	Appropriate "Y" connectors if combining two strings
Permissible operating temperature range	-40F to +149F (-40C to +65C)	-40F to +149F (-40C to +65C)
Rel. humidity	0 - 100% (non condensing)	0 - 100% (non condensing)
Maximum installation elevation	13123 ft (4000m)	13123 ft (4000m)
Enclosure Type	Type 4X	Type 4X
Unit dimensions	11.3 x 9.7 x 2.8 inch (286 x 246.5 x 71.5 mm)	13.8 x 11.5 x 2.8 inch (351 x 293 x 71.5 mm)
Unit weight	4 lbs. (1.8 kg)	6 lbs. (2.7 kg)
Compliance	UL1741; LTR AE 004-2015; FCC 15 Class B	UL1741; LTR AE 004-2015; FCC 15 Class B
Compatible inverters	Fronius Galvo, Fronius Primo*, Fronius Symo (excluding the Fronius Symo 15.0-3 20S) up to 600V	Fronius Galvo, Fronius Primo*, Fronius Symo (excluding the Fronius Symo 15.0-3 20S) up to 600V

\*\* Note: If Fronius Rapid Shutdown Box is added to an existing system with a Fronius Primo 10.0 to 15.0, make sure that inverter software is up to date. Updates are available through software update file version frs27350.apd and can be easily downloaded at [www.fronius-usa.com/PrimoUpdate](http://www.fronius-usa.com/PrimoUpdate) and installed via USB stick or remote update via Fronius Solarweb. Updates are available through software update file version frs27350.apd and can be easily downloaded at [www.fronius-usa.com/PrimoUpdate](http://www.fronius-usa.com/PrimoUpdate) and installed via USB stick or remote update via Fronius Solarweb.



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### THREE BUSINESS UNITS, ONE GOAL: TO SET THE STANDARD THROUGH TECHNOLOGICAL ADVANCEMENT.

What began in 1945 as a one-man operation now sets technological standards in the fields of welding technology, photovoltaics and battery charging. Today, the company has around 3,800 employees worldwide and 1,242 patents for product development show the innovative spirit within the company. Sustainable development means for us to implement environmentally relevant and social aspects equally with economic factors. Our goal has remained constant throughout: to be the innovation leader.

Further information about all Fronius products and our global sales partners and representatives can be found at [www.fronius.com](http://www.fronius.com)

10th Aug 2017 09

Fronius USA LLC  
6797 Fronius Drive  
Portage, IN 46368  
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[www.fronius.us/pv](http://www.fronius.us/pv)

MAG-0141 EN-US Version 1/15/17

### HOME OWNER BUILDER

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### OWNER / ADDRESS

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OCCUPANCY R3 /  
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24.600 KW-DC

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# Certificate of Compliance

Certificate: 70043748 Master Contract: 203213  
Project: 70143515 Date Issued: 2017-08-03  
Issued to: Fronius International GmbH  
Guenter Fronius Strasse 1  
Wels-Thalheim, 4600  
AUSTRIA  
Attention: Josef Feichtinger

*The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US or with adjacent indicator 'US' for US only or without either indicator for Canada only.*



Issued by: *Sadia Mahboob*  
Sadia Mahboob, P.Eng.

## PRODUCTS

CLASS – 5311 09 - POWER SUPPLIES-Distributed Generation Power Systems Equipment  
CLASS – 5311 89 - POWER SUPPLIES - Distributed Generation-Power Systems Equipment - Certified to U.S. Standards

Rapid Shutdown Box, models Single, Duo, Multi, Quattro, rack mounted, permanently connected for use with Fronius Galvo, Primo and Symo series inverters.

For details related to rating, size, configuration, etc. reference should be made to the CSA Certification Record, Annex A, or the descriptive report.

## APPLICABLE REQUIREMENTS

CSA-C22.2 No. 107.1-01 - General Use Power Supplies  
UL Std No. 1741 - Second Edition - Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources (Rev. Mar 23, 2016)

Referenced UL CRD for PV Rapid Shutdown Systems and CSA LTR No. AE-004-2015 (revised March 23, 2016) for PV Rapid Shutdown Systems

DQD 507 Rev. 2016-02-18

Page 1



## Supplement to Certificate of Compliance

Certificate: 70043748 Master Contract: 203213

*The products listed, including the latest revision described below, are eligible to be marked in accordance with the referenced Certificate.*

## Product Certification History

Project	Date	Description
70143515	2017-08-03	Update report 70043748 to increase thermal rating up to 65C on Model RSB Duo, and RSB Quattro.
70121897	2017-05-10	Update report 70043748 to add two new models Rapid Shut Down Box Duo, and Quattro.
70099516	2016-10-04	Update report 70043748 to include alternate label material and alternate mounting bracket.
70065402	2016-05-18	Update report 70043748 to include Rapid Shutdown Box Multi and accept test data under the CSA SMTC program in conjunction with CSA remote video testing.
70043748	2015-11-27	Evaluation of Fronius Rapid Shutdown Box (PVRSE). Costs shared (15 days of witness testing in Wels Austria, Sept 14 to Oct 2, 2015) with 5 other projects.

DQD 507 Rev. 2016-02-18

Page 1

## HOME OWNER BUILDER

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## XR Rail Family

Tech Brief

### Solar Is Not Always Sunny

Over their lifetime, solar panels experience countless extreme weather events. Not just the worst storms in years, but the worst storms in 40 years. High winds capable of ripping panels from a roof, and snowfalls weighing enough to buckle a panel frame.

XR Rails are the structural backbone preventing these results. They resist uplift, protect against buckling and safely and efficiently transfer loads into the building structure. Their superior spanning capability requires fewer roof attachments, reducing the number of roof penetrations and the amount of installation time.

#### Force-Stabilizing Curve

Sloped roofs generate both vertical and lateral forces on mounting rails which can cause them to bend and twist. The curved shape of XR Rails is specially designed to increase strength in both directions while resisting the twisting. This unique feature ensures greater security during extreme weather and a longer system lifetime.

#### Compatible with Flat & Pitched Roofs



XR Rails are compatible with FlashFoot and other pitched roof attachments.



IronRidge offers a range of tilt leg options for flat roof mounting applications.

#### Corrosion-Resistant Materials

All XR Rails are made of marine-grade aluminum alloy, then protected with an anodized finish. Anodizing prevents surface and structural corrosion, while also providing a more attractive appearance.



### XR Rail Family

The XR Rail Family offers the strength of a curved rail in three targeted sizes. Each size supports specific design loads, while minimizing material costs. Depending on your location, there is an XR Rail to match.



#### XR10

XR10 is a sleek, low-profile mounting rail, designed for regions with light or no snow. It achieves 6 foot spans, while remaining light and economical.

- 6' spanning capability
- Moderate load capability
- Clear anodized finish
- Internal splices available



#### XR100

XR100 is the ultimate residential mounting rail. It supports a range of wind and snow conditions, while also maximizing spans up to 8 feet.

- 8' spanning capability
- Heavy load capability
- Clear & black anodized finish
- Internal splices available



#### XR1000

XR1000 is a heavyweight among solar mounting rails. It's built to handle extreme climates and spans 12 feet or more for commercial applications.

- 12' spanning capability
- Extreme load capability
- Clear anodized finish
- Internal splices available

### Rail Selection

The following table was prepared in compliance with applicable engineering codes and standards. Values are based on the following criteria: ASCE 7-10, Roof Zone I, Exposure B, Roof Slope of 7 to 27 degrees and Mean Building Height of 30 ft. Visit [IronRidge.com](http://IronRidge.com) for detailed span tables and certifications.

Load		Rail Span					
Snow (PSF)	Wind (MPH)	4'	5' 4"	6'	8'	10'	12'
None	100						
	120						
	140	XR10		XR100		XR1000	
	160						
10-20	100						
	120						
	140						
	160						
30	100						
	160						
40	100						
	160						
50-70	160						
80-90	160						

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### HOME OWNER BUILDER

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### OWNER / ADDRESS

J  
1  
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PHONE:

OCCUPANCY R3 /  
TYPE 5 STRU.  
APN#:

### SYSTEM SIZE

22.401 KW-AC  
24.600 KW-DC

MODULES :  
(60) TRINA SOLAR,  
TSM-410DE15M (II) 410W

INVERTER(S) :  
(2) FRONIUS PRIMO, 12.5-1 [240V]

DATE: 03/30/21

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Tech Brief

## Class A Fire Rating

### Background

All roofing products are tested and classified for their ability to resist fire.

Recently, these fire resistance standards were expanded to include solar equipment as part of the roof system. Specifically, this requires the modules, mounting hardware and roof covering to be tested together as a system to ensure they achieve the same fire rating as the original roof covering.

These new requirements are being adopted throughout the country in 2016.

### IronRidge Certification

IronRidge was the first company to receive a Class A Fire Rating—the highest possible rating—from Intertek Group plc., a Nationally Recognized Testing Laboratory.

IronRidge Flush Mount and Tilt Mount Systems were tested on sloped and flat roofs in accordance with the new UL 1703 & UL 2703 test standards. The testing evaluated the system's ability to resist flame spread, burning material and structural damage to the roof.

Refer to the table below to determine the requirements for achieving a Class A Fire Rating on your next project.

### Fire Testing Process

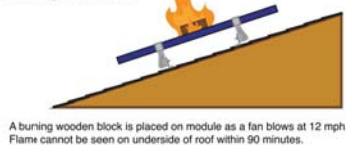
#### Test Setup

**Solar Modules**  
Solar modules are given a Type classification based on their materials and construction.

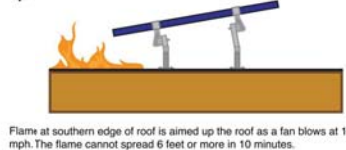
**Mounting System**  
Mounting is tested as part of a system that includes type-tested modules and fire-rated roof covering.

**Roof Covering**  
Roof covering products are given a Fire Class Rating of A, B or C based on their tested fire resistance.

#### Burning Brand Test



#### Spread of Flame Test



\*Class A rated PV systems can be installed on Class A, B, and C roofs.

System	Roof Slope	Module	Fire Rating*
Flush Mount 	Any Slope	Type 1, 2, & 3	Class A
Tilt Mount 	≤ 6 Degrees	Type 1, 2, & 3	Class A

### Frequently Asked Questions

#### What is a "module type"?

The new UL1703 standard introduces the concept of a PV module type, based on 4 construction parameters and 2 fire performance parameters. The purpose of this classification is to certify mounting systems without needing to test it with every module.

#### What roofing materials are covered?

All fire rated roofing materials are covered within this certification including composition shingle, clay and cement tile, metal, and membrane roofs.

#### What if I have a Class C roof, but the jurisdiction now requires Class A or B?

Generally, older roofs will typically be "grandfathered in", and will not require re-roofing. However, if 50% or more of the roofing material is replaced for the solar installation the code requirement will be enforced.

#### Where is the new fire rating requirement code listed?

2012 IBC: 1509.7.2 Fire classification. Rooftop mounted photovoltaic systems shall have the same fire classification as the roof assembly required by Section 1505.

#### Where is a Class A Fire Rating required?

The general requirement for roofing systems in the IBC refers to a Class C fire rating. Class A or B is required for areas such as Wildland Urban Interface areas (WUI) and for very high fire severity areas. Many of these areas are found throughout the western United States. California has the most Class A and B roof fire rating requirements, due to wild fire concerns.

#### Are standard mid clamps covered?

Mid clamps and end clamps are considered part of the PV "system", and are covered in the certification.

#### What attachments and flashings are deemed compatible with Class A?

Attachments and their respective flashings are not constituents of the rating at this time. All code-compliant flashing methods are acceptable from a fire rating standpoint.

#### What mounting height is acceptable?

UL fire testing was performed with a gap of 5", which is considered worst case in the standard. Therefore, the rating is applicable to any module to roof gap.

#### Am I required to install skirting to meet the fire code?

No, IronRidge achieved a Class A fire rating without any additional racking components.

#### What determines Fire Classification?

Fire Classification refers to a fire-resistance rating system for roof covering materials based on their ability to withstand fire exposure.

Class A - effective against severe fire exposure  
Class B - effective against moderate fire exposure  
Class C - effective against light fire exposure

#### What if the roof covering is not Class A rated?

The IronRidge Class A rating will not diminish the fire rating of the roof, whether Class A, B, or C.

#### What tilts is the tilt mount system fire rated for?

The tilt mount system is rated for 1 degree and up and any roof to module gap, or mounting height.

### More Resources



#### Installation Manuals

Visit our website for manuals that include UL 2703 Listing and Fire Rating Classification.  
[Go to IronRidge.com](http://Go to IronRidge.com)



#### Engineering Certification Letters

We offer complete engineering resources and pre-stamped certification letters.  
[Go to IronRidge.com](http://Go to IronRidge.com)

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## Ground Mount System

[Datasheet](#)


### Mount on all terrains, in no time.

The IronRidge Ground Mount System combines our XF1000 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.



#### UL 2703 Listed System

Meets newest effective UL 2703 standard.



#### Flexible Architecture

Multiple foundation and array configuration options.



#### PE Certified

Pre-stamped engineering letters available in most states.



#### Design Software

Online tool generates engineering values and bill of materials.



#### 25-Year Warranty

Products guaranteed to be free of impairing defects.



360° Product Tour  
Visit [ironridge.com](http://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](http://ironridge.com/design)



##### NABCEP Certified Training

Earn free continuing education credits, while learning more about our systems.  
Go to [ironridge.com/training](http://ironridge.com/training)

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## UFO Family of Components

Tech Brief

### Simplified Grounding for Every Application

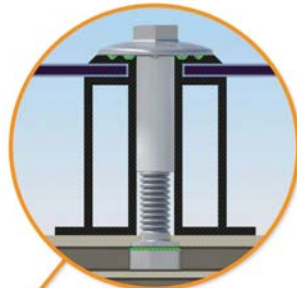
The UFO family of components eliminates the need for separate grounding hardware by bonding solar modules directly to IronRidge XR Rails. All system types that feature the UFO family—Flush Mount, Tilt Mount and Ground Mount—are fully listed to the UL 2703 standard.

UFO hardware forms secure electrical bonds with both the module and the rail, resulting in many parallel grounding paths throughout the system. This leads to safer and more reliable installations.



#### Stopper Sleeve

The Stopper Sleeve snaps onto the UFO, converting it into a bonded end clamp.



#### Universal Fastening Object (UFO)

The UFO securely bonds solar modules to XR Rails. It comes assembled and lubricated, and can fit a wide range of module heights.



#### Bonded Splice

Each Bonded Splice uses self-drilling screws to form a secure connection. No bonding strap needed.



#### Grounding Lug

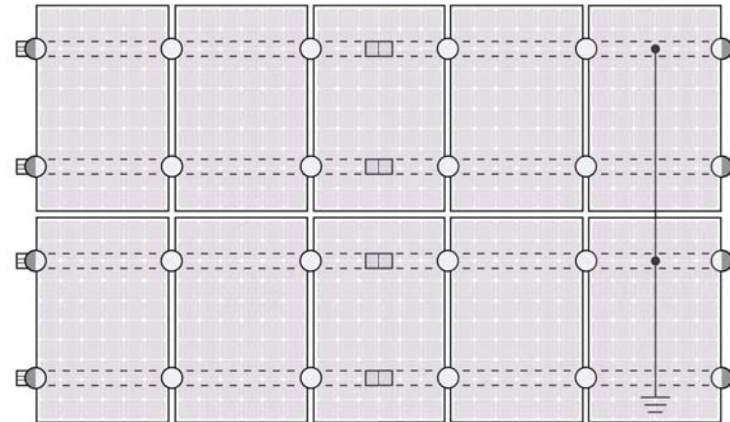
A single Grounding Lug connects an entire row of PV modules to the grounding conductor.



#### Bonded Attachments

The bonding bot attaches and bonds the L-foot to the rail. It is installed with the same socket as the rest of the system.

### System Diagram



○ UFO    ◐ Stopper Sleeve    ● Grounding Lug    □ Bonded Splice    ≡ Ground Wire

Approved Enphase microinverters can provide equipment grounding of IronRidge systems, eliminating the need for grounding lugs and field installed equipment ground conductors (EGC). A minimum of two microinverters mounted to the same rail and connected to the same Engage cable is required. Refer to installation manuals for additional details.

### UL Certification

The IronRidge Flush Mount, Tilt Mount, and Ground Mount Systems have been listed to UL 2703 by Intertek Group plc.

Feature	Cross-System Compatibility		
	Flush Mount	Tilt Mount	Ground Mount
XR Rails	✓	✓	XR1000 Only
UFO/Stopper	✓	✓	✓
Bonded Splice	✓	✓	N/A

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