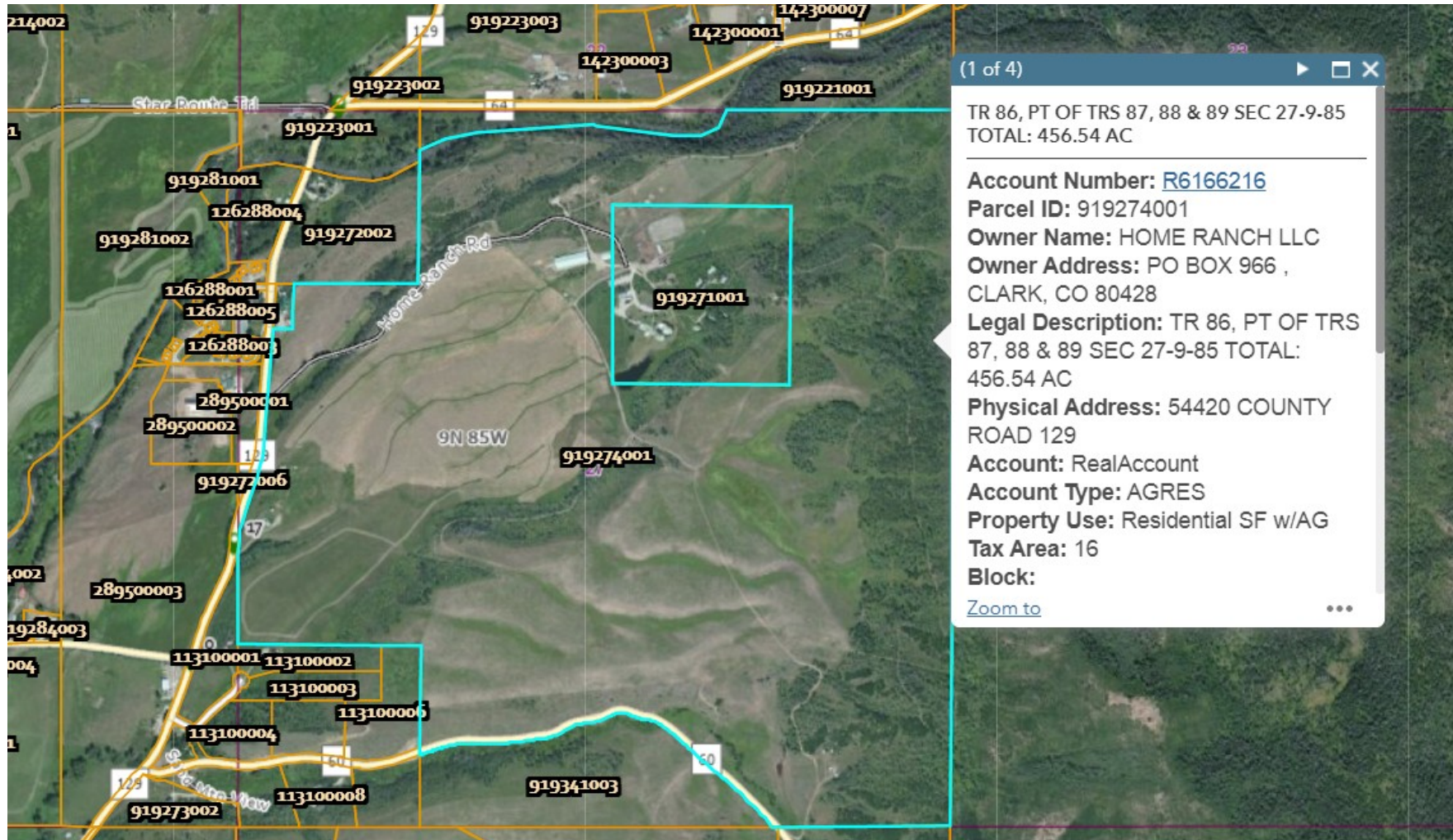


Routt County Assessor Location of McFarlane Property for Solar Array



McFarlane Residence
27315 Home Ranch Road, Clark, CO 80428

Proposed solar array equipment locations

Proposed location for 185 kW solar array. Steel arena being extended in length. New build will be sufficient to accommodate (546) panels w/ appropriate egresses.

Future meter locations targeted for interconnection
Meters to be established as new buildings are erected

Future meters and solar interconnections will have AC disconnects located in close proximity to meters.

Proposed locations for (4) future 12.5 kW Inverters:
(2) at future new residence, (2) at future new shop

Existing Meter location targeted for interconnection
Meters # **47321 56545**

Proposed locations for AC disconnects. All to be located in close proximity to respective inverters.

Proposed locations for (9) Total 12.5 kW Inverters:
(6) at Meter **54475**
(2) at Meter **55307**
(1) at Meter **54473**

HomeRanch Property
27315 HomeRanch Rd, Clark, CO 80428

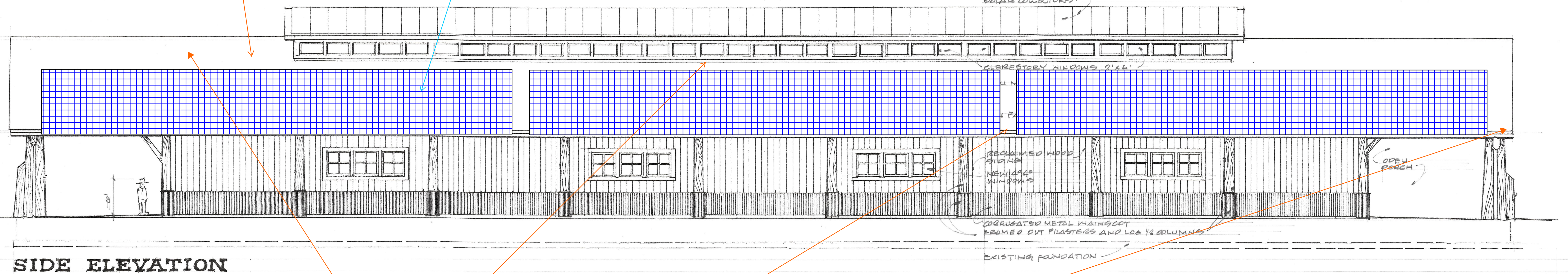


Roof Access

Arena Barn Expansion:
Open porches are being added to both East and West ends. Total roof length will be **285'** East to West

3 Sub Array; Each 89' in length

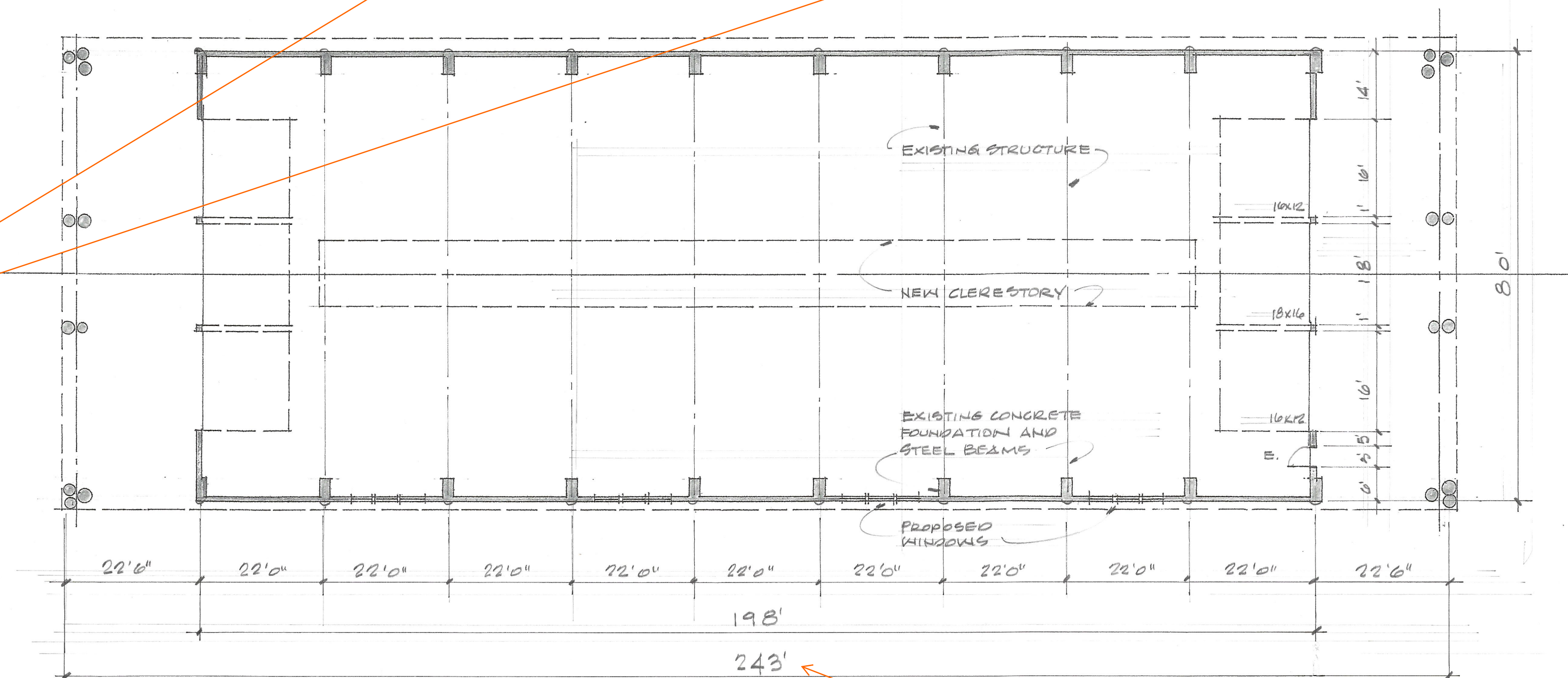
END ELEVATION



SIDE ELEVATION

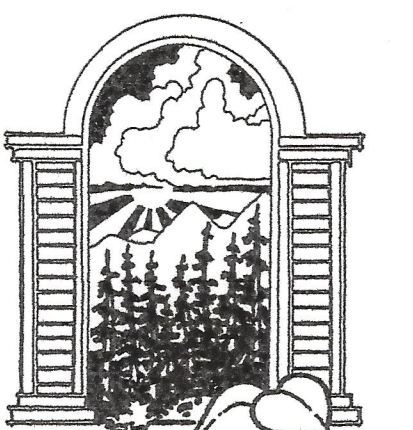
Proposed provided Egress:
2' open roof between top of sub arrays and new clerestory windows.
5' open roof above sub arrays beyond clerestory.

Proposed provided Egresses:
3' open roof between sub arrays.
>5' open roof on East and West ends.



FLOOR PLAN

Incorrect dimensions listed. Original building 240' in length.
New build will result in 285' in length.



JOE PATRICK
ROBBINS
ARCHITECT
BOX 1448 STEAMBOAT COLORADO 80477

A NEW PLAN FOR THE
**HOME RANCH
ARENA**
27315
HOME RANCH ROAD
ROUTT COUNTY
COLORADO

MARCH 28, 2020

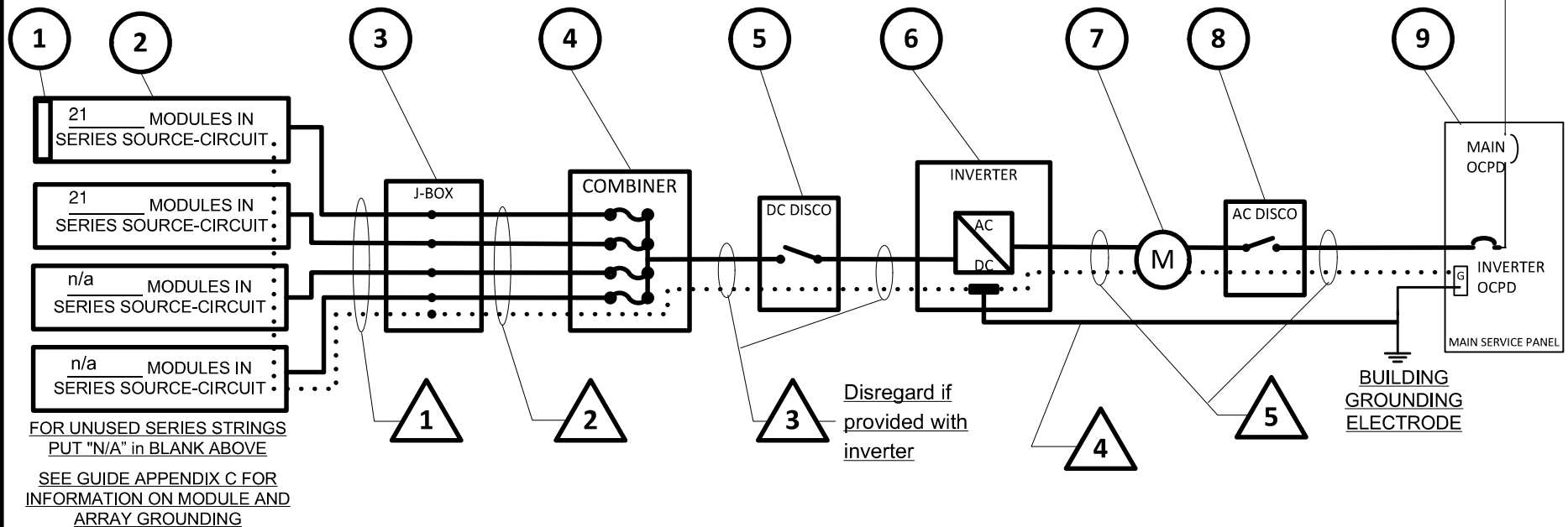
SCALE: 1/8" = 1'-0"

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

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

STANDARD STRING SYSTEM ELECTRICAL DIAGRAM

EQUIPMENT SCHEDULE			
TAG	DESCRIPTION	PART NUMBER	NOTES
1	SOLAR PV MODULE	Q Peak Duo L - G6+	Q Cell Q Peak Duo L - G6+ ,340W
2	PV ARRAY	Q Peak Duo L - G6+	Q Cell Q Peak Duo L - G6+ , 340W, (42) Panel , 14,280W
3	J-BOX (IF USED)	MNPV 8	Midnite Solar MNPV 8
4	COMBINER (IF USED)	N/A	
5	DC DISCONNECT	Primo 12.5-1	(1) Fronius Primo 12.5-1
6	DC/AC INVERTER	Primo 12.5-1	(1) Fronius Primo 12.5-1
7	GEN METER (IF USED)	n/a	
8	AC DISCONNECT (IF USED)	H223NRB	AC Disconnect 70A 2 Pole / Square D H223NRB
9	SERVICE PANEL		240 VAC, 200 A MAIN, 200 A BUS, 70 A INVERTER OCPD
(SEE NOTE 5 FOR INVERTER OCPDs, ALSO SEE GUIDE SECTION 9)			



CONDUIT AND CONDUCTOR SCHEDULE					
TAG	DESCRIPTION OR CONDUCTOR TYPE	COND. GAUGE	NUMBER OF CONDUCTORS	CONDUIT TYPE	CONDUIT SIZE
1	USE-2 <input type="checkbox"/> or PV WIRE <input checked="" type="checkbox"/>	10	4	N/A	N/A
	BARE COPPER EQ. GRD. COND. (EGC)	6	1	N/A	N/A
2	THWN-2 <input type="checkbox"/> or XHHW-2 <input type="checkbox"/> or RHW-2 <input type="checkbox"/>	n/a			
3	THWN-2 <input checked="" type="checkbox"/> or XHHW-2 <input type="checkbox"/> or RHW-2 <input type="checkbox"/>	10	4	emt	1"
	INSULATED EGC	10	1	emt	1"
4	DC GROUNDING ELECTRODE COND.	6	1	emt	1"
5	THWN-2 <input checked="" type="checkbox"/> or XHHW-2 <input type="checkbox"/> or RHW-2 <input type="checkbox"/>	6	3	emt	1"
	INSULATED EGC	6	1	emt	1"

Contractor Name, Address and Phone: Brightside Solar P.O. Box 773115 Steamboat Springs, CO 80477 970-879-1707		One-Line Standard Electrical Diagram for Small-Scale, Single-Phase PV Systems	
Site Name: HR - ARENA Site Address: 27315 HomeRanch Road, Clark, CO 80428 System AC Size: 12.5 kW			
Drawn By: M. Piva	SIZE: _____ FSCM NO: _____ DWG NO: _____ REV: _____		
Checked By: _____	SCALE: NTS	Date: _____	SHEET: _____

NOTES FOR STANDARD STRING SYSTEM ELECTRICAL DIAGRAM

PV MODULE RATINGS @ STC (Guide Section 5)

MODULE MAKE	Hanwha Q Cell	
MODULE MODEL	Q Cell 400 Duo L -G6+ 340W	
MAX POWER-POINT CURRENT (I _{MP})	10.02	A
MAX POWER-POINT VOLTAGE (V _{MP})	33.94	V
OPEN-CIRCUIT VOLTAGE (V _{OC})	40.66	V
SHORT-CIRCUIT CURRENT (I _{SC})	10.52	A
MAX SERIES FUSE (OCPD)	20	A
MAXIMUM POWER (P _{MAX})	340	W
MAX VOLTAGE (TYP 600V _{DC})	1000	V
VOC TEMP COEFF (mV/°C □ or %/°C ■)	-0.27%/°C	■
IF COEFF SUPPLIED, CIRCLE UNITS		

NOTES FOR ALL DRAWINGS:

OCPD = OVERCURRENT PROTECTION DEVICE
NATIONAL ELECTRICAL CODE® REFERENCES
SHOWN AS (NEC XXX.XX)

INVERTER RATINGS (Guide Section 4)

INVERTER MAKE	Fronius	
INVERTER MODEL	(1) Primo 12.5-1	
MAX DC VOLT RATING	1000V	V
MAX POWER @ 40°C	12,500	W
NOMINAL AC VOLTAGE	240	V
MAX AC CURRENT	52.1	A
MAX OCPD RATING	70	A

SIGNS—SEE GUIDE SECTION 7

SIGN FOR DC DISCONNECT

PHOTOVOLTAIC POWER SOURCE		
RATED MPP CURRENT	10.02	A
RATED MPP VOLTAGE	713	V
MAX SYSTEM VOLTAGE	969	V
MAX CIRCUIT CURRENT	13.5	A

WARNING: ELECTRICAL SHOCK
HAZARD—LINE AND LOAD MAY BE
ENERGIZED IN OPEN POSITION

SIGN FOR INVERTER OCPD AND AC DISCONNECT (IF USED)

SOLAR PV SYSTEM AC POINT OF CONNECTION		
AC OUTPUT CURRENT	52.1	A
NOMINAL AC VOLTAGE	240	V
THIS PANEL FED BY MULTIPLE SOURCES (UTILITY AND SOLAR)		

NOTES FOR ARRAY CIRCUIT WIRING (Guide Section 6 and 8 and Appendix D):

1.) LOWEST EXPECT AMBIENT TEMPERATURE BASED ON ASHRAE MINIMUM MEAN EXTREME DRY BULB TEMPERATURE FOR ASHRAE LOCATION MOST SIMILAR TO INSTALLATION LOCATION. LOWEST EXPECTED AMBIENT TEMP -25 °C

2.) HIGHEST CONTINUOUS AMBIENT TEMPERATURE BASED ON ASHRAE HIGHEST MONTH 2% DRY BULB TEMPERATURE FOR ASHRAE LOCATION MOST SIMILAR TO INSTALLATION LOCATION. HIGHEST CONTINUOUS TEMPERATURE 30 °C

2.) 2005 ASHRAE FUNDAMENTALS 2% DESIGN TEMPERATURES DO NOT EXCEED 47°C IN THE UNITED STATES (PALM SPRINGS, CA IS 44.1°C). FOR LESS THAN 9 CURRENT-CARRYING CONDUCTORS IN ROOF-MOUNTED SUNLIT CONDUIT AT LEAST 0.5" ABOVE ROOF AND USING THE OUTDOOR DESIGN TEMPERATURE OF 47°C OR LESS (ALL OF UNITED STATES),

a) 12 AWG, 90°C CONDUCTORS ARE GENERALLY ACCEPTABLE FOR MODULES WITH I_{sc} OF 7.68 AMPS OR LESS WHEN PROTECTED BY A 12-AMP OR SMALLER FUSE.

b) 10 AWG, 90°C CONDUCTORS ARE GENERALLY ACCEPTABLE FOR MODULES WITH I_{sc} OF 9.6 AMPS OR LESS WHEN PROTECTED BY A 15-AMP OR SMALLER FUSE.

NOTES FOR INVERTER CIRCUITS (Guide Section 8 and 9):

1) IF UTILITY REQUIRES A VISIBLE-BREAK SWITCH, DOES THIS SWITCH MEET THE REQUIREMENT? YES ☒ NO ☐ N/A ☐

2) IF GENERATION METER REQUIRED, DOES THIS METER SOCKET MEET THE REQUIREMENT? YES ☐ NO ☐ N/A ☐

3) SIZE PHOTOVOLTAIC POWER SOURCE (DC) CONDUCTORS BASED ON MAX CURRENT ON NEC 690.53 SIGN OR OCPD RATING AT DISCONNECT

4) SIZE INVERTER OUTPUT CIRCUIT (AC) CONDUCTORS ACCORDING TO INVERTER OCPD AMPERE RATING. (See Guide Section 9)

5) TOTAL OF 1 INVERTER OCPD(s), ONE FOR EACH INVERTER. DOES TOTAL SUPPLY BREAKERS COMPLY WITH 120% BUSBAR EXCEPTION IN 690.64(B)(2)(a)? YES ☒ NO ☐

Contractor Name,
Address and Phone:

Brightside Solar
P.O. Box 773115
Steamboat Springs, CO 80477
970-879-1707

Notes for One-Line Standard Electrical Diagram for Single-Phase PV Systems

Site Name: **HR - ARENA**

Site Address: 27315 HomeRanch Road, Clark, CO 80428

System AC Size: 12.5 kW

Drawn By:

SIZE

FSCM NO

DWG NO

REV

Checked By:

SCALE

NTS

Date:

SHEET

STANDARD STRING SYSTEM ELECTRICAL DIAGRAM



EQUIPMENT SCHEDULE

TAG	DESCRIPTION	PART NUMBER	NOTES
1	SOLAR PV MODULE	Q Peak Duo L -G6+	Q Cell Q Peak Duo L -G6+ 340
2	PV ARRAY	Q Peak Duo L -G5.2	Q Cell Q Peak Duo L -G6+ 340, (252) Panel, 85,680W
3	J-BOX (IF USED)	RHC242408	RHC242408 NEMA 3R Enclosure
4	COMBINER (IF USED)	N/A	
5	DC DISCONNECT	Primo 12.5-1	(6) Fronius Primo 12.5-1
6	DC/AC INVERTER	Primo 12.5-1	(6) Fronius Primo 12.5-1
7	AC SubPanel	Square D	Square D
8	AC DISCONNECT (IF USED)	H223NRB	(1) AC Disconnect 150A 2 Pole / Square D H223NRB
9	SERVICE PANEL	(2) 200 A FeedThru Panels	<u>240</u> VAC, <u>200</u> A MAIN, <u>(2)200</u> A BUS, <u>(6) 70</u> A INVERTER OCPD

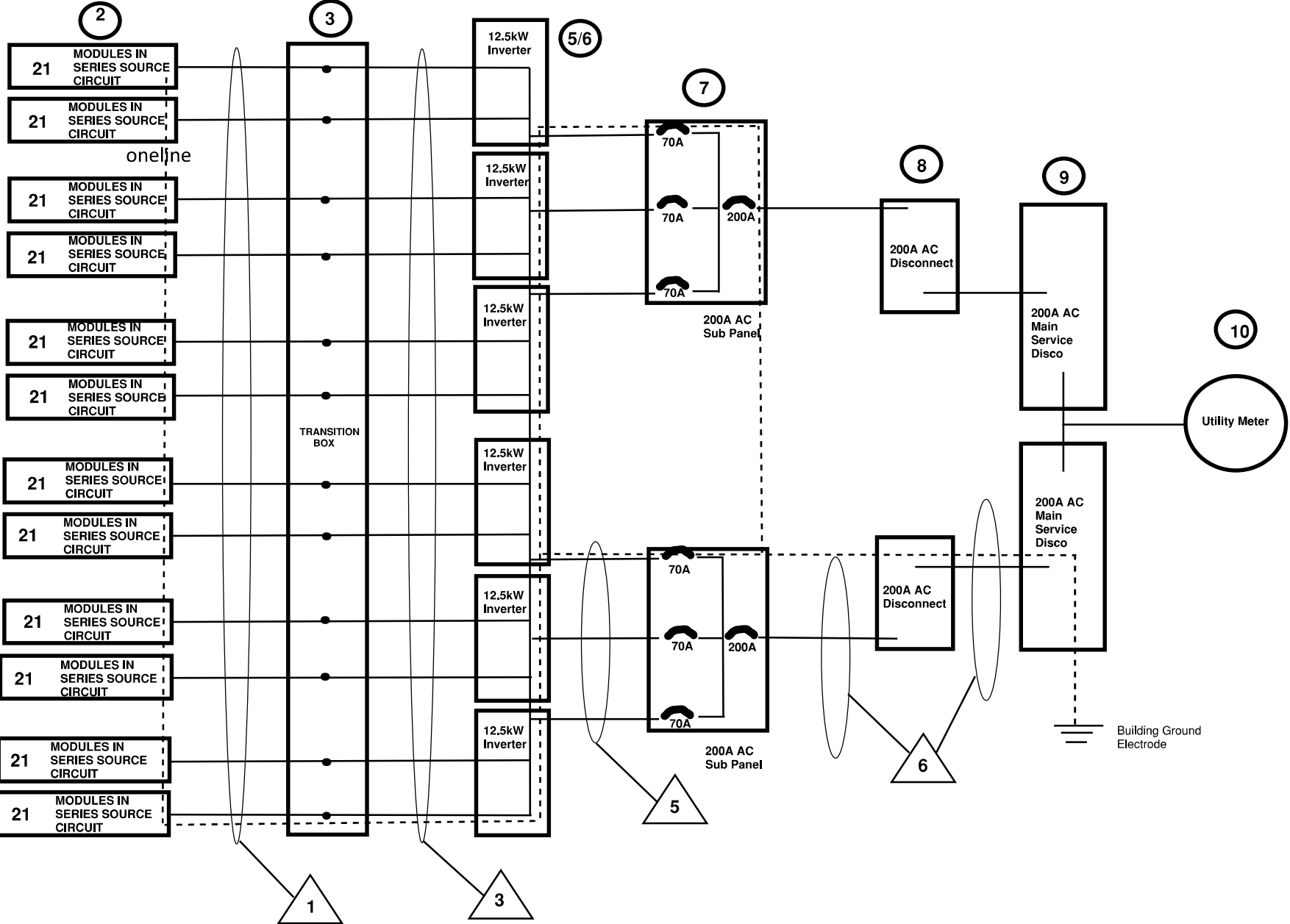
One Line Diagram on Next Page



CONDUIT AND CONDUCTOR SCHEDULE

TAG	DESCRIPTION OR CONDUCTOR TYPE	COND. GAUGE	NUMBER OF CONDUCTORS	CONDUIT TYPE	CONDUIT SIZE
1	USE-2 <input type="checkbox"/> or PV WIRE <input checked="" type="checkbox"/>	10	24	N/A	N/A
	BARE COPPER EQ. GRD. COND. (EGC)	6	1	N/A	N/A
2	THWN-2 <input type="checkbox"/> or XHHW-2 <input type="checkbox"/> or RHW-2 <input type="checkbox"/>	N/A			
3	THWN-2 <input checked="" type="checkbox"/> or XHHW-2 <input type="checkbox"/> or RHW-2 <input type="checkbox"/>	8	24	PVC	3"
	INSULATED EGC	10	1	PVC	3"
4	DC GROUNDING ELECTRODE COND.	6	1	EMT	(2)1/-1/2"
5	THWN-2 <input checked="" type="checkbox"/> or XHHW-2 <input type="checkbox"/> or RHW-2 <input type="checkbox"/>	2/0	6	EMT	(2)1/-1/2"
6	URD Cable Aluminum	N/A			

Contractor Name, Address and Phone: Brightside Solar P.O. Box 773115 Steamboat Springs, CO 80477 97-879-1707	One-Line Standard Electrical Diagram for Small-Scale, Single-Phase PV Systems			
	Site Name: HR - MAIN LODGE Site Address: <u>27315 HomeRanch Road, Clark, CO 80428</u> System AC Size: <u>75kW</u>			
Drawn By: m piva	SIZE	FSCM NO	DWG NO	REV
Checked By:	SCALE	NTS	Date:	SHEET



HomeRanch - Main Lodge
27315 Homeranch Road, Clark, CO 80428

NOTES FOR STANDARD STRING SYSTEM ELECTRICAL DIAGRAM

PV MODULE RATINGS @ STC (Guide Section 5)

MODULE MAKE	Q Cell
MODULE MODEL	Q Peak Duo L -G6+ 340W
MAX POWER-POINT CURRENT (I _{MP})	10.02 A
MAX POWER-POINT VOLTAGE (V _{MP})	33.94 V
OPEN-CIRCUIT VOLTAGE (V _{OC})	40.66 V
SHORT-CIRCUIT CURRENT (I _{SC})	10.52 A
MAX SERIES FUSE (OCPD)	20 A
MAXIMUM POWER (P _{MAX})	340 W
MAX VOLTAGE (TYP 600V _{DC})	1000 V
VOC TEMP COEFF (mV/°C <input type="checkbox"/> or %/°C <input checked="" type="checkbox"/>	-0.27%/ C
IF COEFF SUPPLIED, CIRCLE UNITS	

NOTES FOR ALL DRAWINGS:

OCPD = OVERCURRENT PROTECTION DEVICE

NATIONAL ELECTRICAL CODE® REFERENCES SHOWN AS (NEC XXX.XX)

INVERTER RATINGS (Guide Section 4)

INVERTER MAKE	(6) Fronius
INVERTER MODEL	(6) Primo 12.5 - 1
MAX DC VOLT RATING	1000 V
MAX POWER @ 40°C	12,500 W
NOMINAL AC VOLTAGE	240 V
MAX AC CURRENT	52.1 A
MAX OCPD RATING	70 A

SIGNS—SEE GUIDE SECTION 7

SIGN FOR DC DISCONNECT

PHOTOVOLTAIC POWER SOURCE		
RATED MPP CURRENT	10.02	A
RATED MPP VOLTAGE	713	V
MAX SYSTEM VOLTAGE	969	V
MAX CIRCUIT CURRENT	13.15	A

WARNING: ELECTRICAL SHOCK HAZARD—LINE AND LOAD MAY BE ENERGIZED IN OPEN POSITION

SIGN FOR INVERTER OCPD AND AC DISCONNECT (IF USED)

SOLAR PV SYSTEM AC POINT OF CONNECTION		
AC OUTPUT CURRENT	52.1	A
NOMINAL AC VOLTAGE	240	V
THIS PANEL FED BY MULTIPLE SOURCES (UTILITY AND SOLAR)		

NOTES FOR ARRAY CIRCUIT WIRING (Guide Section 6 and 8 and Appendix D):

1.) LOWEST EXPECT AMBIENT TEMPERATURE BASED ON ASHRAE MINIMUM MEAN EXTREME DRY BULB TEMPERATURE FOR ASHRAE LOCATION MOST SIMILAR TO INSTALLATION LOCATION. LOWEST EXPECTED AMBIENT TEMP -25 °C

2.) HIGHEST CONTINUOUS AMBIENT TEMPERATURE BASED ON ASHRAE HIGHEST MONTH 2% DRY BULB TEMPERATURE FOR ASHRAE LOCATION MOST SIMILAR TO INSTALLATION LOCATION. HIGHEST CONTINUOUS TEMPERATURE 30 °C

2.) 2005 ASHRAE FUNDAMENTALS 2% DESIGN TEMPERATURES DO NOT EXCEED 47°C IN THE UNITED STATES (PALM SPRINGS, CA IS 44.1°C). FOR LESS THAN 9 CURRENT-CARRYING CONDUCTORS IN ROOF-MOUNTED SUNLIT CONDUIT AT LEAST 0.5" ABOVE ROOF AND USING THE OUTDOOR DESIGN TEMPERATURE OF 47°C OR LESS (ALL OF UNITED STATES),

a) 12 AWG, 90°C CONDUCTORS ARE GENERALLY ACCEPTABLE FOR MODULES WITH I_{sc} OF 7.68 AMPS OR LESS WHEN PROTECTED BY A 12-AMP OR SMALLER FUSE.

b) 10 AWG, 90°C CONDUCTORS ARE GENERALLY ACCEPTABLE FOR MODULES WITH I_{sc} OF 9.6 AMPS OR LESS WHEN PROTECTED BY A 15-AMP OR SMALLER FUSE.

NOTES FOR INVERTER CIRCUITS (Guide Section 8 and 9):

1) IF UTILITY REQUIRES A VISIBLE-BREAK SWITCH, DOES THIS SWITCH MEET THE REQUIREMENT? YES ☒ NO ☐ N/A ☐

2) IF GENERATION METER REQUIRED, DOES THIS METER SOCKET MEET THE REQUIREMENT? YES ☐ NO ☐ N/A ☒

3) SIZE PHOTOVOLTAIC POWER SOURCE (DC) CONDUCTORS BASED ON MAX CURRENT ON NEC 690.53 SIGN OR OCPD RATING AT DISCONNECT

4) SIZE INVERTER OUTPUT CIRCUIT (AC) CONDUCTORS ACCORDING TO INVERTER OCPD AMPERE RATING. (See Guide Section 9)

5) TOTAL OF 6 INVERTER OCPD(s), ONE FOR EACH INVERTER. DOES TOTAL SUPPLY BREAKERS COMPLY WITH 120% BUSBAR EXCEPTION IN 690.64(B)(2)(a)? YES ☒ NO ☐

Contractor Name,
Address and Phone:

Brightside Solar
P.O. Box 773115
Steamboat Springs, CO 80477
97-879-1707

Notes for One-Line Standard Electrical Diagram for Single-Phase PV Systems

Site Name **HR - MAIN LODGE**

Site Address: 27315 HomeRanch Road, Clark, CO 80428

System AC Size: 75kW

Drawn By: **m.piva**

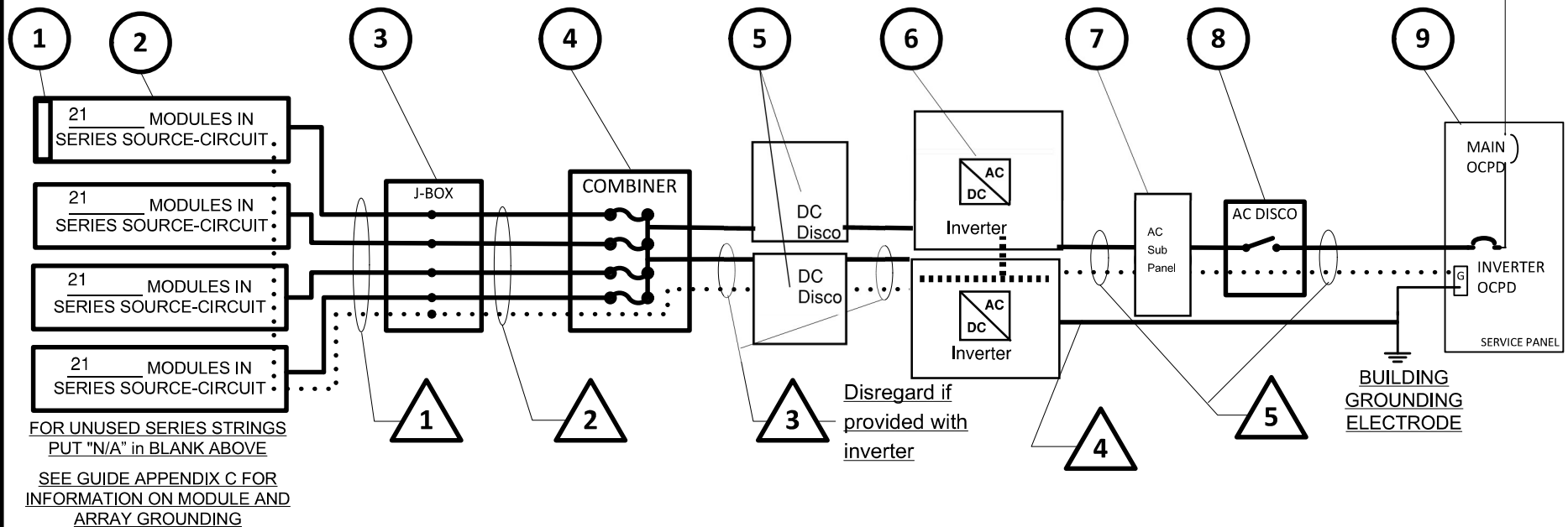
SIZE	FSCM NO	DWG NO	REV
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Checked By:

SCALE	NTS	Date:	SHEET
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STANDARD STRING SYSTEM ELECTRICAL DIAGRAM

EQUIPMENT SCHEDULE			
TAG	DESCRIPTION	PART NUMBER	NOTES
1	SOLAR PV MODULE	Q Peak Duo L -G6+	Q Cell Q Peak Duo L -G6+ 340
2	PV ARRAY	Q Peak Duo L -G5.2	Q Cell Q Peak Duo L -G6+ 340, (84) Panel, 28,560W
3	J-BOX (IF USED)	RHC242408	RHC242408 NEMA 3R Enclosure
4	COMBINER (IF USED)	N/A	
5	DC DISCONNECT	Primo 12.5-1	(2) Fronius Primo 12.5-1
6	DC/AC INVERTER	Primo 12.5-1	(2) Fronius Primo 12.5-1
7	AC SubPanel	Square D	Square D
8	AC DISCONNECT (IF USED)	H223NRB	(1) AC Disconnect 150A 2 Pole / Square D H223NRB
9	SERVICE PANEL		240 VAC, 200 A MAIN, 200 A BUS, (2) 70 A INVERTER OCPD (SEE NOTE 5 FOR INVERTER OCPDs, ALSO SEE GUIDE SECTION 9)



CONDUIT AND CONDUCTOR SCHEDULE					
TAG	DESCRIPTION OR CONDUCTOR TYPE	COND. GAUGE	NUMBER OF CONDUCTORS	CONDUIT TYPE	CONDUIT SIZE
1	USE-2 <input type="checkbox"/> or PV WIRE <input checked="" type="checkbox"/>	10	8	N/A	N/A
	BARE COPPER EQ. GRD. COND. (EGC)	6	1	N/A	N/A
2	THWN-2 <input type="checkbox"/> or XHHW-2 <input type="checkbox"/> or RHW-2 <input type="checkbox"/>	N/A			
3	THWN-2 <input checked="" type="checkbox"/> or XHHW-2 <input type="checkbox"/> or RHW-2 <input type="checkbox"/>	6	8	PVC	2"
	INSULATED EGC	10	1	PVC	2"
4	DC GROUNDING ELECTRODE COND.	6	1	EMT	(2)3/4"
5	THWN-2 <input checked="" type="checkbox"/> or XHHW-2 <input type="checkbox"/> or RHW-2 <input type="checkbox"/>	1	6	EMT	(2)3/4"
6	URD Cable Aluminum	N/A			

Contractor Name, Address and Phone: Brightside Solar P.O. Box 773115 Steamboat Springs, CO 80477 97-879-1707		One-Line Standard Electrical Diagram for Small-Scale, Single-Phase PV Systems Site Name: HR - COLUMBINE Site Address: 27315 HomeRanch Road, Clark, CO 80428 System AC Size: 25kW	
Drawn By: m piva	SIZE	FSCM NO	DWG NO
Checked By:	SCALE	NTS	Date:
			SHEET

NOTES FOR STANDARD STRING SYSTEM ELECTRICAL DIAGRAM

PV MODULE RATINGS @ STC (Guide Section 5)

MODULE MAKE	Q Cell
MODULE MODEL	Q Peak Duo L -G6+ 340W
MAX POWER-POINT CURRENT (I _{MP})	10.02 A
MAX POWER-POINT VOLTAGE (V _{MP})	33.94 V
OPEN-CIRCUIT VOLTAGE (V _{OC})	40.66 V
SHORT-CIRCUIT CURRENT (I _{SC})	10.52 A
MAX SERIES FUSE (OCPD)	20 A
MAXIMUM POWER (P _{MAX})	340 W
MAX VOLTAGE (TYP 600V _{DC})	1000 V
VOC TEMP COEFF (mV/°C □ or %/°C ■)	-0.27%/ C
IF COEFF SUPPLIED, CIRCLE UNITS	

NOTES FOR ALL DRAWINGS:

OCPD = OVERCURRENT PROTECTION DEVICE

NATIONAL ELECTRICAL CODE® REFERENCES SHOWN AS (NEC XXX.XX)

INVERTER RATINGS (Guide Section 4)

INVERTER MAKE	(2) Fronius
INVERTER MODEL	(2) Primo 12.5 -1
MAX DC VOLT RATING	1000 V
MAX POWER @ 40°C	12,500 W
NOMINAL AC VOLTAGE	240 V
MAX AC CURRENT	52.1 A
MAX OCPD RATING	70 A

SIGNS—SEE GUIDE SECTION 7

SIGN FOR DC DISCONNECT

PHOTOVOLTAIC POWER SOURCE		
RATED MPP CURRENT	10.02	A
RATED MPP VOLTAGE	713	V
MAX SYSTEM VOLTAGE	969	V
MAX CIRCUIT CURRENT	13.15	A

WARNING: ELECTRICAL SHOCK HAZARD—LINE AND LOAD MAY BE ENERGIZED IN OPEN POSITION

SIGN FOR INVERTER OCPD AND AC DISCONNECT (IF USED)

SOLAR PV SYSTEM AC POINT OF CONNECTION		
AC OUTPUT CURRENT	52.1	A
NOMINAL AC VOLTAGE	240	V
THIS PANEL FED BY MULTIPLE SOURCES (UTILITY AND SOLAR)		

NOTES FOR ARRAY CIRCUIT WIRING (Guide Section 6 and 8 and Appendix D):

1.) LOWEST EXPECT AMBIENT TEMPERATURE BASED ON ASHRAE MINIMUM MEAN EXTREME DRY BULB TEMPERATURE FOR ASHRAE LOCATION MOST SIMILAR TO INSTALLATION LOCATION. LOWEST EXPECTED AMBIENT TEMP -25 °C

2.) HIGHEST CONTINUOUS AMBIENT TEMPERATURE BASED ON ASHRAE HIGHEST MONTH 2% DRY BULB TEMPERATURE FOR ASHRAE LOCATION MOST SIMILAR TO INSTALLATION LOCATION. HIGHEST CONTINUOUS TEMPERATURE 30 °C

2.) 2005 ASHRAE FUNDAMENTALS 2% DESIGN TEMPERATURES DO NOT EXCEED 47°C IN THE UNITED STATES (PALM SPRINGS, CA IS 44.1°C). FOR LESS THAN 9 CURRENT-CARRYING CONDUCTORS IN ROOF-MOUNTED SUNLIT CONDUIT AT LEAST 0.5" ABOVE ROOF AND USING THE OUTDOOR DESIGN TEMPERATURE OF 47°C OR LESS (ALL OF UNITED STATES),

a) 12 AWG, 90°C CONDUCTORS ARE GENERALLY ACCEPTABLE FOR MODULES WITH I_{sc} OF 7.68 AMPS OR LESS WHEN PROTECTED BY A 12-AMP OR SMALLER FUSE.

b) 10 AWG, 90°C CONDUCTORS ARE GENERALLY ACCEPTABLE FOR MODULES WITH I_{sc} OF 9.6 AMPS OR LESS WHEN PROTECTED BY A 15-AMP OR SMALLER FUSE.

NOTES FOR INVERTER CIRCUITS (Guide Section 8 and 9):

1) IF UTILITY REQUIRES A VISIBLE-BREAK SWITCH, DOES THIS SWITCH MEET THE REQUIREMENT? YES ☒ NO ☐ N/A ☐

2) IF GENERATION METER REQUIRED, DOES THIS METER SOCKET MEET THE REQUIREMENT? YES ☐ NO ☐ N/A ☒

3) SIZE PHOTOVOLTAIC POWER SOURCE (DC) CONDUCTORS BASED ON MAX CURRENT ON NEC 690.53 SIGN OR OCPD RATING AT DISCONNECT

4) SIZE INVERTER OUTPUT CIRCUIT (AC) CONDUCTORS ACCORDING TO INVERTER OCPD AMPERE RATING. (See Guide Section 9)

5) TOTAL OF 2 INVERTER OCPD(s), ONE FOR EACH INVERTER. DOES TOTAL SUPPLY BREAKERS COMPLY WITH 120% BUSBAR EXCEPTION IN 690.64(B)(2)(a)? YES ☒ NO ☐

Contractor Name,
Address and Phone:

Brightside Solar
P.O. Box 773115
Steamboat Springs, CO 80477
97-879-1707

Notes for One-Line Standard Electrical Diagram for Single-Phase PV Systems

Site Name: **HR - COLUMBINE**

Site Address: 27315 HomeRanch Road, Clark, CO 80428

System AC Size: 25kW

Drawn By: **m.piva**

SIZE	FSCM NO	DWG NO	REV
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Checked By:

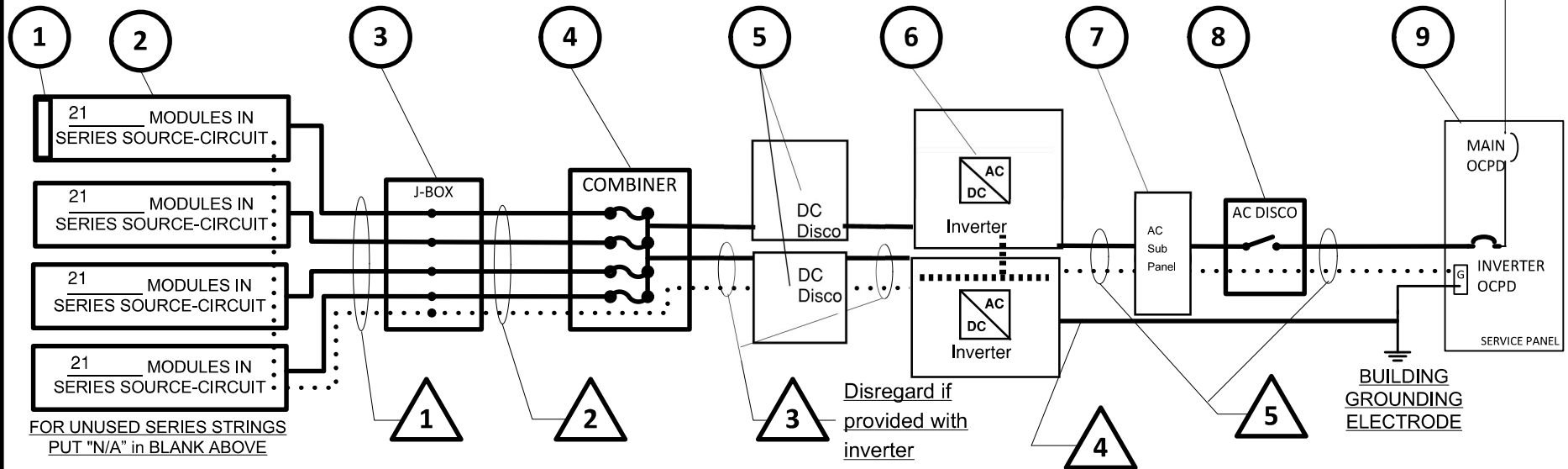
SCALE	NTS	Date:	SHEET
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STANDARD STRING SYSTEM ELECTRICAL DIAGRAM



EQUIPMENT SCHEDULE

TAG	DESCRIPTION	PART NUMBER	NOTES
1	SOLAR PV MODULE	Q Peak Duo L -G6+	Q Cell Q Peak Duo L -G6+ 340
2	PV ARRAY	Q Peak Duo L -G5.2	Q Cell Q Peak Duo L -G6+ 340, (84) Panel, 28,560W
3	J-BOX (IF USED)	RHC242408	RHC242408 NEMA 3R Enclosure
4	COMBINER (IF USED)	N/A	
5	DC DISCONNECT	Primo 12.5-1	(2) Fronius Primo 12.5-1
6	DC/AC INVERTER	Primo 12.5-1	(2) Fronius Primo 12.5-1
7	AC SubPanel	Square D	Square D
8	AC DISCONNECT (IF USED)	H223NRB	(1) AC Disconnect 150A 2 Pole / Square D H223NRB
9	SERVICE PANEL		240 VAC, 200 A MAIN, 200 A BUS, (2) 70 A INVERTER OCPD (SEE NOTE 5 FOR INVERTER OCPDs, ALSO SEE GUIDE SECTION 9)



CONDUIT AND CONDUCTOR SCHEDULE

TAG	DESCRIPTION OR CONDUCTOR TYPE	COND. GAUGE	NUMBER OF CONDUCTORS	CONDUIT TYPE	CONDUIT SIZE
1	USE-2 <input type="checkbox"/> or PV WIRE <input checked="" type="checkbox"/>	10	8	N/A	N/A
	BARE COPPER EQ. GRD. COND. (EGC)	6	1	N/A	N/A
2	THWN-2 <input type="checkbox"/> or XHHW-2 <input type="checkbox"/> or RHW-2 <input type="checkbox"/>	N/A			
3	THWN-2 <input checked="" type="checkbox"/> or XHHW-2 <input type="checkbox"/> or RHW-2 <input type="checkbox"/>	10	8	PVC	2"
	INSULATED EGC	10	1	PVC	2"
4	DC GROUNDING ELECTRODE COND.	6	1	EMT	(2)3/4"
5	THWN-2 <input checked="" type="checkbox"/> or XHHW-2 <input type="checkbox"/> or RHW-2 <input type="checkbox"/>	1	6	EMT	(2)3/4"
6	URD Cable Aluminum	N/A			

Contractor Name,
Address and Phone:

Brightside Solar
P.O. Box 773115
Steamboat Springs, CO 80477
97-879-1707

One-Line Standard Electrical Diagram for Small-Scale, Single-Phase PV Systems

Site Name: **HR - NEW SHOP**

Site Address: 27315 HomeRanch Road, Clark, CO 80428

System AC Size: 25kW

Drawn By: **m piva**

Checked By:

SIZE	FSCM NO	DWG NO	REV
SCALE	NTS	Date:	SHEET

NOTES FOR STANDARD STRING SYSTEM ELECTRICAL DIAGRAM

PV MODULE RATINGS @ STC (Guide Section 5)

MODULE MAKE	Q Cell
MODULE MODEL	Q Peak Duo L -G6+ 340W
MAX POWER-POINT CURRENT (I _{MP})	10.02 A
MAX POWER-POINT VOLTAGE (V _{MP})	33.94 V
OPEN-CIRCUIT VOLTAGE (V _{OC})	40.66 V
SHORT-CIRCUIT CURRENT (I _{SC})	10.52 A
MAX SERIES FUSE (OCPD)	20 A
MAXIMUM POWER (P _{MAX})	340 W
MAX VOLTAGE (TYP 600V _{DC})	1000 V
VOC TEMP COEFF (mV/°C <input type="checkbox"/> or %/°C <input checked="" type="checkbox"/>	-0.27%/ C
IF COEFF SUPPLIED, CIRCLE UNITS	

NOTES FOR ALL DRAWINGS:

OCPD = OVERCURRENT PROTECTION DEVICE
NATIONAL ELECTRICAL CODE® REFERENCES
SHOWN AS (NEC XXX.XX)

INVERTER RATINGS (Guide Section 4)

INVERTER MAKE	(2) Fronius
INVERTER MODEL	(2) Primo 12.5 - 1
MAX DC VOLT RATING	1000 V
MAX POWER @ 40°C	12,500 W
NOMINAL AC VOLTAGE	240 V
MAX AC CURRENT	52.1 A
MAX OCPD RATING	70 A

SIGNS—SEE GUIDE SECTION 7

SIGN FOR DC DISCONNECT

PHOTOVOLTAIC POWER SOURCE		
RATED MPP CURRENT	10.02	A
RATED MPP VOLTAGE	713	V
MAX SYSTEM VOLTAGE	969	V
MAX CIRCUIT CURRENT	13.15	A
WARNING: ELECTRICAL SHOCK HAZARD—LINE AND LOAD MAY BE ENERGIZED IN OPEN POSITION		

SIGN FOR INVERTER OCPD AND AC DISCONNECT (IF USED)

SOLAR PV SYSTEM AC POINT OF CONNECTION		
AC OUTPUT CURRENT	52.1	A
NOMINAL AC VOLTAGE	240	V
THIS PANEL FED BY MULTIPLE SOURCES (UTILITY AND SOLAR)		

NOTES FOR ARRAY CIRCUIT WIRING (Guide Section 6 and 8 and Appendix D):

- 1.) LOWEST EXPECT AMBIENT TEMPERATURE BASED ON ASHRAE MINIMUM MEAN EXTREME DRY BULB TEMPERATURE FOR ASHRAE LOCATION MOST SIMILAR TO INSTALLATION LOCATION. LOWEST EXPECTED AMBIENT TEMP -25 °C
- 2.) HIGHEST CONTINUOUS AMBIENT TEMPERATURE BASED ON ASHRAE HIGHEST MONTH 2% DRY BULB TEMPERATURE FOR ASHRAE LOCATION MOST SIMILAR TO INSTALLATION LOCATION. HIGHEST CONTINUOUS TEMPERATURE 30 °C
- 2.) 2005 ASHRAE FUNDAMENTALS 2% DESIGN TEMPERATURES DO NOT EXCEED 47°C IN THE UNITED STATES (PALM SPRINGS, CA IS 44.1°C). FOR LESS THAN 9 CURRENT-CARRYING CONDUCTORS IN ROOF-MOUNTED SUNLIT CONDUIT AT LEAST 0.5" ABOVE ROOF AND USING THE OUTDOOR DESIGN TEMPERATURE OF 47°C OR LESS (ALL OF UNITED STATES),
 - a) 12 AWG, 90°C CONDUCTORS ARE GENERALLY ACCEPTABLE FOR MODULES WITH I_{sc} OF 7.68 AMPS OR LESS WHEN PROTECTED BY A 12-AMP OR SMALLER FUSE.
 - b) 10 AWG, 90°C CONDUCTORS ARE GENERALLY ACCEPTABLE FOR MODULES WITH I_{sc} OF 9.6 AMPS OR LESS WHEN PROTECTED BY A 15-AMP OR SMALLER FUSE.

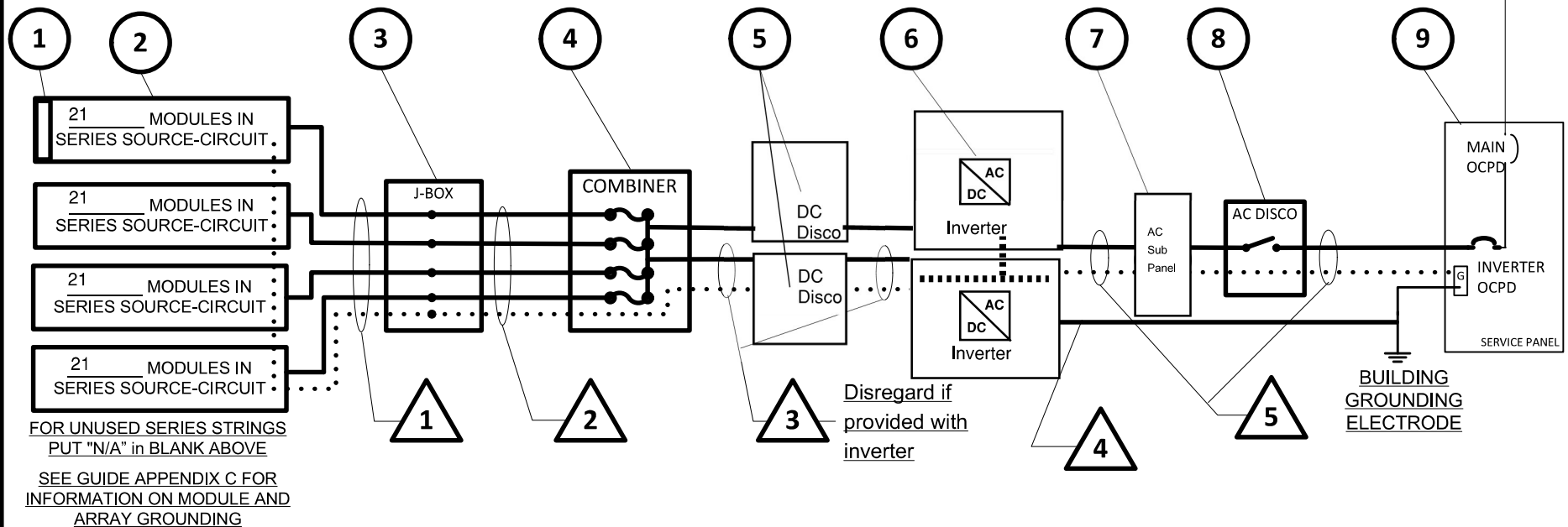
NOTES FOR INVERTER CIRCUITS (Guide Section 8 and 9):

- 1) IF UTILITY REQUIRES A VISIBLE-BREAK SWITCH, DOES THIS SWITCH MEET THE REQUIREMENT? YES ☒ NO ☐ N/A ☐
- 2) IF GENERATION METER REQUIRED, DOES THIS METER SOCKET MEET THE REQUIREMENT? YES ☐ NO ☐ N/A ☒
- 3) SIZE PHOTOVOLTAIC POWER SOURCE (DC) CONDUCTORS BASED ON MAX CURRENT ON NEC 690.53 SIGN OR OCPD RATING AT DISCONNECT
- 4) SIZE INVERTER OUTPUT CIRCUIT (AC) CONDUCTORS ACCORDING TO INVERTER OCPD AMPERE RATING. (See Guide Section 9)
- 5) TOTAL OF 2 INVERTER OCPD(s), ONE FOR EACH INVERTER. DOES TOTAL SUPPLY BREAKERS COMPLY WITH 120% BUSBAR EXCEPTION IN 690.64(B)(2)(a)? YES ☒ NO ☐

Contractor Name, Address and Phone: Brightside Solar P.O. Box 773115 Steamboat Springs, CO 80477 97-879-1707		Notes for One-Line Standard Electrical Diagram for Single-Phase PV Systems		
		Site Name: HR - NEW SHOP		
		Site Address: <u>27315 HomeRanch Road, Clark, CO 80428</u>		
		System AC Size: <u>25kW</u>		
Drawn By: m.piva	SIZE	FSCM NO	DWG NO	REV
Checked By:	SCALE	NTS	Date:	SHEET

STANDARD STRING SYSTEM ELECTRICAL DIAGRAM

EQUIPMENT SCHEDULE			
TAG	DESCRIPTION	PART NUMBER	NOTES
1	SOLAR PV MODULE	Q Peak Duo L -G6+	Q Cell Q Peak Duo L -G6+ 340
2	PV ARRAY	Q Peak Duo L -G5.2	Q Cell Q Peak Duo L -G6+ 340, (84) Panel, 28,560W
3	J-BOX (IF USED)	RHC242408	RHC242408 NEMA 3R Enclosure
4	COMBINER (IF USED)	N/A	
5	DC DISCONNECT	Primo 12.5-1	(2) Fronius Primo 12.5-1
6	DC/AC INVERTER	Primo 12.5-1	(2) Fronius Primo 12.5-1
7	AC SubPanel	Square D	Square D
8	AC DISCONNECT (IF USED)	H223NRB	(1) AC Disconnect 150A 2 Pole / Square D H223NRB
9	SERVICE PANEL		240 VAC, 200 A MAIN, 200 A BUS, (2) 70 A INVERTER OCPD (SEE NOTE 5 FOR INVERTER OCPDs, ALSO SEE GUIDE SECTION 9)



CONDUIT AND CONDUCTOR SCHEDULE					
TAG	DESCRIPTION OR CONDUCTOR TYPE	COND. GAUGE	NUMBER OF CONDUCTORS	CONDUIT TYPE	CONDUIT SIZE
1	USE-2 <input type="checkbox"/> or PV WIRE <input checked="" type="checkbox"/>	10	8	N/A	N/A
	BARE COPPER EQ. GRD. COND. (EGC)	6	1	N/A	N/A
2	THWN-2 <input type="checkbox"/> or XHHW-2 <input type="checkbox"/> or RHW-2 <input type="checkbox"/>	N/A			
3	THWN-2 <input checked="" type="checkbox"/> or XHHW-2 <input type="checkbox"/> or RHW-2 <input type="checkbox"/>	6	8	PVC	2"
	INSULATED EGC	10	1	PVC	2"
4	DC GROUNDING ELECTRODE COND.	6	1	EMT	(2)3/4"
5	THWN-2 <input checked="" type="checkbox"/> or XHHW-2 <input type="checkbox"/> or RHW-2 <input type="checkbox"/>	1	6	EMT	(2)3/4"
6	URD Cable Aluminum	N/A			

Contractor Name, Address and Phone: Brightside Solar P.O. Box 773115 Steamboat Springs, CO 80477 97-879-1707		One-Line Standard Electrical Diagram for Small-Scale, Single-Phase PV Systems Site Name: HR - NEW RESIDENCE Site Address: 27315 HomeRanch Road, Clark, CO 80428 System AC Size: 25kW	
Drawn By: m piva	SIZE	FSCM NO	DWG NO
Checked By:	SCALE	NTS	Date:
			REV
			SHEET

NOTES FOR STANDARD STRING SYSTEM ELECTRICAL DIAGRAM

PV MODULE RATINGS @ STC (Guide Section 5)

MODULE MAKE	Q Cell	
MODULE MODEL	Q Peak Duo L -G6+ 340W	
MAX POWER-POINT CURRENT (I _{MP})	10.02	A
MAX POWER-POINT VOLTAGE (V _{MP})	33.94	V
OPEN-CIRCUIT VOLTAGE (V _{OC})	40.66	V
SHORT-CIRCUIT CURRENT (I _{SC})	10.52	A
MAX SERIES FUSE (OCPD)	20	A
MAXIMUM POWER (P _{MAX})	340	W
MAX VOLTAGE (TYP 600V _{DC})	1000	V
VOC TEMP COEFF (mV/°C <input type="checkbox"/> or %/°C <input checked="" type="checkbox"/>)	-0.27%/ C	
IF COEFF SUPPLIED, CIRCLE UNITS		

NOTES FOR ALL DRAWINGS:

OCPD = OVERCURRENT PROTECTION DEVICE

NATIONAL ELECTRICAL CODE® REFERENCES SHOWN AS (NEC XXX.XX)

INVERTER RATINGS (Guide Section 4)

INVERTER MAKE	(2) Fronius	
INVERTER MODEL	(2) Primo	
MAX DC VOLT RATING	1000	V
MAX POWER @ 40°C	12,500	W
NOMINAL AC VOLTAGE	240	V
MAX AC CURRENT	52.1	A
MAX OCPD RATING	70	A

SIGNS—SEE GUIDE SECTION 7

SIGN FOR DC DISCONNECT

PHOTOVOLTAIC POWER SOURCE		
RATED MPP CURRENT	10.02	A
RATED MPP VOLTAGE	713	V
MAX SYSTEM VOLTAGE	969	V
MAX CIRCUIT CURRENT	13.15	A

WARNING: ELECTRICAL SHOCK HAZARD—LINE AND LOAD MAY BE ENERGIZED IN OPEN POSITION

SIGN FOR INVERTER OCPD AND AC DISCONNECT (IF USED)

SOLAR PV SYSTEM AC POINT OF CONNECTION		
AC OUTPUT CURRENT	52.1	A
NOMINAL AC VOLTAGE	240	V
THIS PANEL FED BY MULTIPLE SOURCES (UTILITY AND SOLAR)		

NOTES FOR ARRAY CIRCUIT WIRING (Guide Section 6 and 8 and Appendix D):

1.) LOWEST EXPECT AMBIENT TEMPERATURE BASED ON ASHRAE MINIMUM MEAN EXTREME DRY BULB TEMPERATURE FOR ASHRAE LOCATION MOST SIMILAR TO INSTALLATION LOCATION. LOWEST EXPECTED AMBIENT TEMP -25 °C

2.) HIGHEST CONTINUOUS AMBIENT TEMPERATURE BASED ON ASHRAE HIGHEST MONTH 2% DRY BULB TEMPERATURE FOR ASHRAE LOCATION MOST SIMILAR TO INSTALLATION LOCATION. HIGHEST CONTINUOUS TEMPERATURE 30 °C

2.) 2005 ASHRAE FUNDAMENTALS 2% DESIGN TEMPERATURES DO NOT EXCEED 47°C IN THE UNITED STATES (PALM SPRINGS, CA IS 44.1°C). FOR LESS THAN 9 CURRENT-CARRYING CONDUCTORS IN ROOF-MOUNTED SUNLIT CONDUIT AT LEAST 0.5" ABOVE ROOF AND USING THE OUTDOOR DESIGN TEMPERATURE OF 47°C OR LESS (ALL OF UNITED STATES),

a) 12 AWG, 90°C CONDUCTORS ARE GENERALLY ACCEPTABLE FOR MODULES WITH I_{sc} OF 7.68 AMPS OR LESS WHEN PROTECTED BY A 12-AMP OR SMALLER FUSE.

b) 10 AWG, 90°C CONDUCTORS ARE GENERALLY ACCEPTABLE FOR MODULES WITH I_{sc} OF 9.6 AMPS OR LESS WHEN PROTECTED BY A 15-AMP OR SMALLER FUSE.

NOTES FOR INVERTER CIRCUITS (Guide Section 8 and 9):

1) IF UTILITY REQUIRES A VISIBLE-BREAK SWITCH, DOES THIS SWITCH MEET THE REQUIREMENT? YES ☒ NO ☐ N/A ☐

2) IF GENERATION METER REQUIRED, DOES THIS METER SOCKET MEET THE REQUIREMENT? YES ☐ NO ☐ N/A ☒

3) SIZE PHOTOVOLTAIC POWER SOURCE (DC) CONDUCTORS BASED ON MAX CURRENT ON NEC 690.53 SIGN OR OCPD RATING AT DISCONNECT

4) SIZE INVERTER OUTPUT CIRCUIT (AC) CONDUCTORS ACCORDING TO INVERTER OCPD AMPERE RATING. (See Guide Section 9)

5) TOTAL OF 2 INVERTER OCPD(s), ONE FOR EACH INVERTER. DOES TOTAL SUPPLY BREAKERS COMPLY WITH 120% BUSBAR EXCEPTION IN 690.64(B)(2)(a)? YES ☒ NO ☐

Contractor Name,
Address and Phone:

Brightside Solar
P.O. Box 773115
Steamboat Springs, CO 80477
97-879-1707

Notes for One-Line Standard Electrical Diagram for Single-Phase PV Systems

Site Name: **HR - NEW RESIDENCE**

Site Address: 27315 HomeRanch Road, Clark, CO 80428

System AC Size: 25kW

Drawn By: **m.piva**

SIZE	FSCM NO	DWG NO	REV
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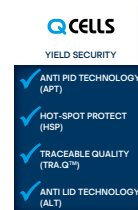
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Q.PEAK DUO BLK-G6+

330-345

ENDURING HIGH
PERFORMANCE



Q.ANTUM TECHNOLOGY: LOW LEVELIZED COST OF ELECTRICITY

Higher yield per surface area, lower BOS costs, higher power classes, and an efficiency rate of up to 19.5%.



INNOVATIVE ALL-WEATHER TECHNOLOGY

Optimal yields, whatever the weather with excellent low-light and temperature behavior.



ENDURING HIGH PERFORMANCE

Long-term yield security with Anti LID and Anti PID Technology¹, Hot-Spot Protect and Traceable Quality Tra.Q™.



EXTREME WEATHER RATING

High-tech aluminum alloy frame, certified for high snow (5400 Pa) and wind loads (4000 Pa).



A RELIABLE INVESTMENT

Inclusive 25-year product warranty and 25-year linear performance warranty².



STATE OF THE ART MODULE TECHNOLOGY

Q.ANTUM DUO combines cutting edge cell separation and innovative wiring with Q.ANTUM Technology.

¹ APT test conditions according to IEC/TS 62804-1:2015, method B (-1500 V, 168h)

² See data sheet on rear for further information



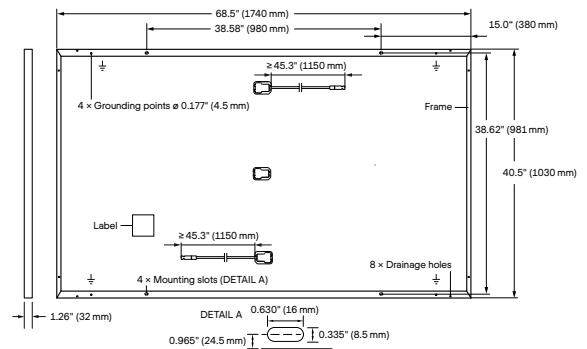
THE IDEAL SOLUTION FOR:



Rooftop arrays on
residential buildings

MECHANICAL SPECIFICATION

Format	68.5 × 40.6 × 1.26 in (including frame) (1740 × 1030 × 32 mm)
Weight	43.9 lbs (19.9 kg)
Front Cover	0.13 in (3.2 mm) thermally pre-stressed glass with anti-reflection technology
Back Cover	Composite film
Frame	Black anodized aluminum
Cell	6 × 20 monocrystalline Q-ANTUM solar half cells
Junction Box	2.09-3.98 × 1.26-2.36 × 0.59-0.71 in (53-101 × 32-60 × 15-18 mm), Protection class IP67, with bypass diodes
Cable	4 mm ² Solar cable; (+) ≥ 45.3 in (1150 mm), (-) ≥ 45.3 in (1150 mm)
Connector	Stäubli MC4, Hanwha Q CELLS HQC4, Amphenol UTX, Renhe 05-6, Tongling TL-Cable01S, JMTHY JM601; IP68 or Friends PV2e; IP67

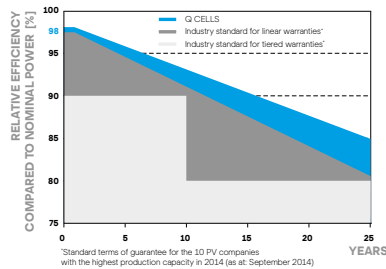


ELECTRICAL CHARACTERISTICS

POWER CLASS		330	335	340	345
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC ¹ (POWER TOLERANCE +5 W / -0 W)					
Minimum	Power at MPP ¹	P _{MPP} [W]	330	335	340
	Short Circuit Current ¹	I _{SC} [A]	10.41	10.47	10.52
	Open Circuit Voltage ¹	V _{OC} [V]	40.15	40.41	40.66
	Current at MPP	I _{MPP} [A]	9.91	9.97	10.02
	Voltage at MPP	V _{MPP} [V]	33.29	33.62	33.94
	Efficiency ¹	η [%]	≥ 18.4	≥ 18.7	≥ 19.0
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT ²					
Minimum	Power at MPP	P _{MPP} [W]	247.0	250.7	254.5
	Short Circuit Current	I _{SC} [A]	8.39	8.43	8.48
	Open Circuit Voltage	V _{OC} [V]	37.86	38.10	38.34
	Current at MPP	I _{MPP} [A]	7.80	7.84	7.89
	Voltage at MPP	V _{MPP} [V]	31.66	31.97	32.27

¹Measurement tolerances P_{MPP} ± 3%; I_{SC}; V_{OC} ± 5% at STC: 1000 W/m², 25 ± 2 °C, AM 1.5 according to IEC 60904-3 • ²800 W/m², NMOT, spectrum AM 1.5

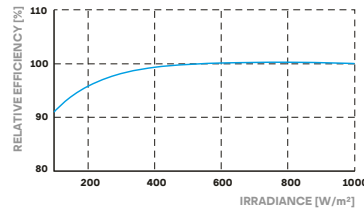
Q CELLS PERFORMANCE WARRANTY



At least 98% of nominal power during first year. Thereafter max. 0.54% degradation per year. At least 93.1% of nominal power up to 10 years. At least 85% of nominal power up to 25 years.

All data within measurement tolerances. Full warranties in accordance with the warranty terms of the Q CELLS sales organization of your respective country.

PERFORMANCE AT LOW IRRADIANCE



Typical module performance under low irradiance conditions in comparison to STC conditions (25 °C, 1000 W/m²)

TEMPERATURE COEFFICIENTS

Temperature Coefficient of I _{SC}	α [%/K]	+0.04	Temperature Coefficient of V _{OC}	β [%/K]	-0.27
Temperature Coefficient of P _{MPP}	γ [%/K]	-0.36	Normal Module Operating Temperature	NMOT [°F]	109 ± 5.4 (43 ± 3 °C)

PROPERTIES FOR SYSTEM DESIGN

Maximum System Voltage V _{sys}	[V]	1000 (IEC)/1000 (UL)	Safety Class	II
Maximum Series Fuse Rating	[A DC]	20	Fire Rating based on ANSI / UL 1703	C (IEC)/TYPE 2 (UL)
Max. Design Load, Push / Pull ³	[lbs / ft ²]	75 (3600 Pa) / 55 (2667 Pa)	Permitted Module Temperature on Continuous Duty	-40 °F up to +185 °F (-40 °C up to +85 °C)
Max. Test Load, Push / Pull ³	[lbs / ft ²]	113 (5400 Pa) / 84 (4000 Pa)		

³ See Installation Manual

QUALIFICATIONS AND CERTIFICATES

UL 1703, VDE Quality Tested, CE-compliant, IEC 61215:2016, IEC 61730:2016, Application Class II, U.S. Patent No. 9,893,215 (solar cells)



PACKAGING INFORMATION

Number of Modules per Pallet	32
Number of Pallets per 53' Trailer	28
Number of Pallets per 40' HC-Container	24
Pallet Dimensions (L × W × H)	71.5 × 45.3 × 48.0 in (1815 × 1150 × 1220 mm)
Pallet Weight	1505 lbs (683 kg)

Note: Installation instructions must be followed. See the installation and operating manual or contact our technical service department for further information on approved installation and use of this product.

Hanwha Q CELLS America Inc.

400 Spectrum Center Drive, Suite 1400, Irvine, CA 92618, USA | **TEL** +1 949 748 59 96 | **EMAIL** inquiry@us.q-cells.com | **WEB** www.q-cells.us



CRAIG FRITHSEN
ENGINEERING

PROFESSIONAL ENGINEERING & DRAFTING SERVICES

PO BOX 772759 | STEAMBOAT SPRINGS, CO 80477

PHONE 970-846-7980 | craigfrithsen@gmail.com

August 18, 2020

Brightside Solar, Inc.
PO Box 773115
Steamboat Springs, CO 80477

Reference: Home Ranch Solar Array, Clark, CO

Subject: Rack Strength, Roof Structure

Dear Mr. Piva,

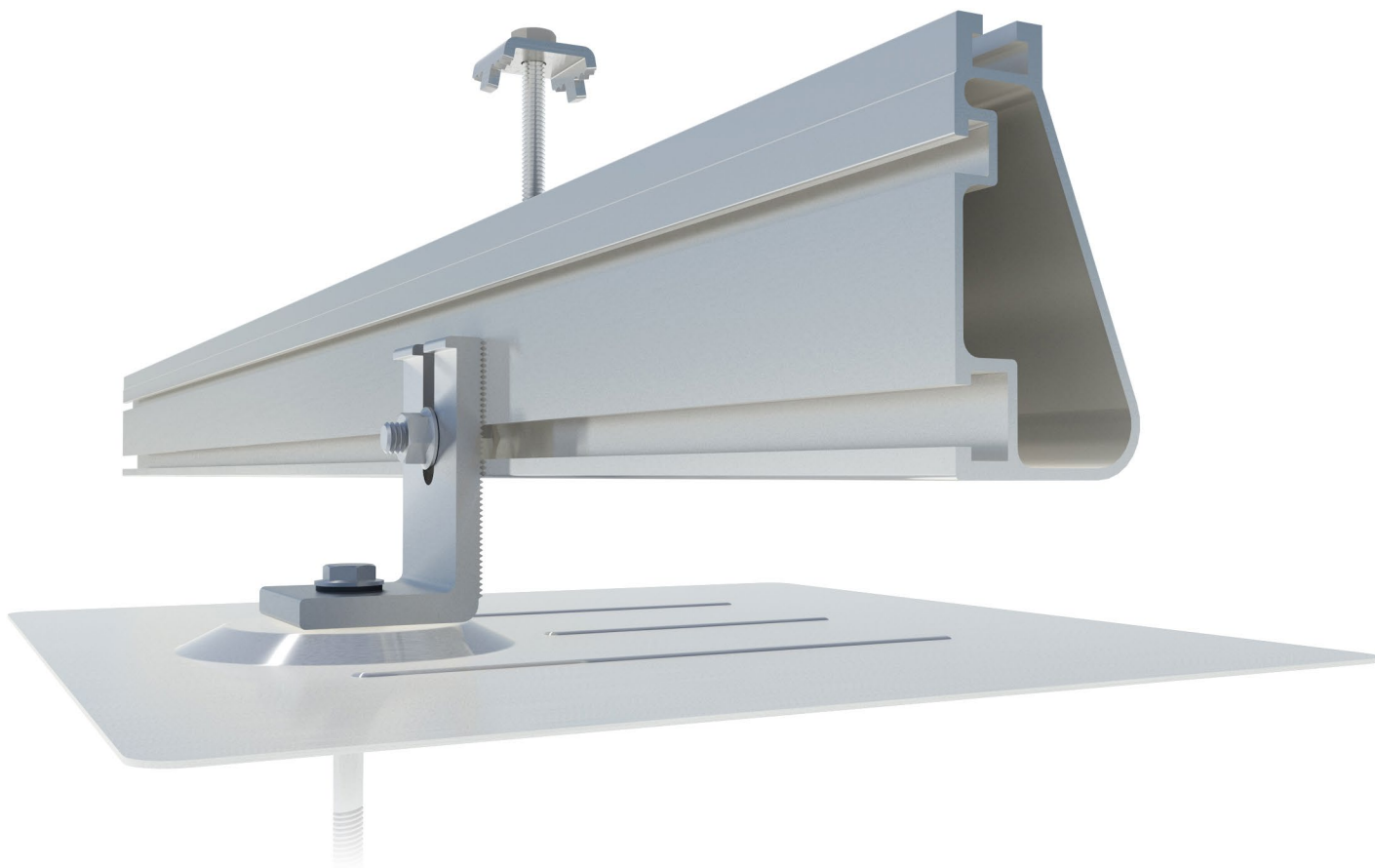
Please note that I have reviewed your proposal to place a 546 panel solar array on the south facing 4:12 roof of the Home Ranch riding arena. The proposed array consists of three sub-arrays of 182 panels each. The sub-arrays each have 7 rows of 26 panels. Each row of panels will be supported by three IronRidge XR1000 rails spaced at 2' on center and located above the Z purlin roof members below. The Routt County Regional Building Department has indicated the appropriate ground snow load for this location is 112 psf. Based on the IronRidge technical documents the rails will be able to support the required 112 psf snow load for a span of 60" between mount locations. The rails will be supported by S-5 SolarFoot connectors which are connected to the steel Z-purlin roof structure with (4)1/4"x1 1/2" metal screws. S-5 load charts indicate these connectors have an allowable shear capacity of 1142 lbs and an allowable withdrawal capacity of 780 lbs. A safety factor of 2 was applied to the actual test results for both the lateral and withdrawal values. The IronRidge documents indicate the maximum load for each connection is 277 lbs shear and 594 lbs withdrawal. The XR1000 rails and the SolarFoot connectors are both sufficient to support the required loads.

The Home Ranch riding arena is a typical steel building with superstructure frame supports at 22 feet on center and 8" Z purlins spaced 2' on center spanning between the frames and supporting the metal roofing. The proposed solar array will add approximately 2.9 psf of additional dead load to the roof system, and the rack mounts will be located at 2' on center over the Z purlins to equally load each purlin in the layout. SEAD performed an analysis of the existing roof structure in the course of preparing plans for a remodel of the riding arena. The SEAD report indicates the Z purlins have the capacity to support a solar array of up to 3.5 psf. This confirms the roof is sufficient to support the additional 2.9 psf required for the proposed array. Thank you for your attention to these items and if you have any additional questions or concerns please do not hesitate to contact me.

Sincerely,

Craig Frithsen, PE





Built for solar's toughest roofs.

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

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



Strength Tested

All components evaluated for superior structural performance.



PE Certified

Pre-stamped engineering letters available in most states.



Class A Fire Rating

Certified to maintain the fire resistance rating of the existing roof.



Design Software

Online tool generates a complete bill of materials in minutes.



Integrated Grounding

UL 2703 system eliminates separate module grounding components.



20 Year Warranty

Twice the protection offered by competitors.

XR Rails

XR10 Rail



A low-profile mounting rail for regions with light snow.

- 6' spanning capability
- Moderate load capability
- Clear anodized finish

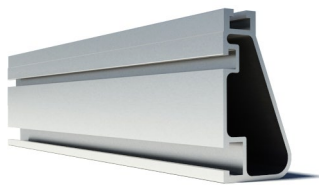
XR100 Rail



The ultimate residential solar mounting rail.

- 8' spanning capability
- Heavy load capability
- Clear & black anod. finish

XR1000 Rail



A heavyweight mounting rail for commercial projects.

- 12' spanning capability
- Extreme load capability
- Clear anodized finish

Internal Splices

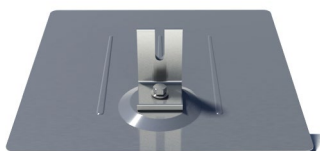


All rails use internal splices for seamless connections.

- Self-tapping screws
- Varying versions for rails
- Grounding Straps offered

Attachments

FlashFoot



Anchor, flash, and mount with all-in-one attachments.

- Ships with all hardware
- IBC & IRC compliant
- Certified with XR Rails

Slotted L-Feet



Drop-in design for rapid rail attachment.

- High-friction serrated face
- Heavy-duty profile shape
- Clear & black anod. finish

Standoffs



Raise flush or tilted systems to various heights.

- Works with vent flashing
- Ships pre-assembled
- 4" and 7" Lengths

Tilt Legs



Tilt assembly to desired angle, up to 45 degrees.

- Attaches directly to rail
- Ships with all hardware
- Fixed and adjustable

Clamps & Grounding

End Clamps



Slide in clamps and secure modules at ends of rails.

- Mill finish & black anod.
- Sizes from 1.22" to 2.3"
- Optional Under Clamps

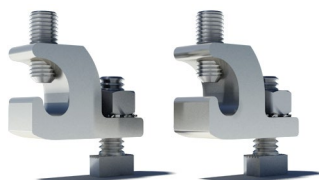
Grounding Mid Clamps



Attach and ground modules in the middle of the rail.

- Parallel bonding T-bolt
- Reusable up to 10 times
- Mill & black stainless

T-Bolt Grounding Lugs



Ground system using the rail's top slot.

- Easy top-slot mounting
- Eliminates pre-drilling
- Swivels in any direction

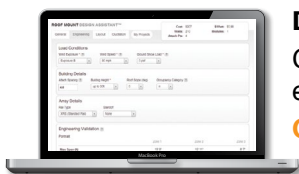
Accessories



Provide a finished and organized look for rails.

- Snap-in Wire Clips
- Perfected End Caps
- UV-protected polymer

Free Resources



Design Assistant

Go from rough layout to fully engineered system. For free.

Go to IronRidge.com/rm



NABCEP Certified Training

Earn free continuing education credits, while learning more about our systems.

Go to IronRidge.com/training

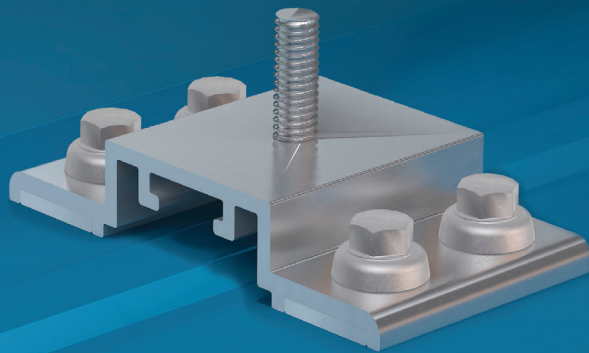
S-5!®

The Right Way!

NEW PRODUCT
SolarFoot™

Introducing the new SolarFoot™ for exposed fastener metal roofing with the strength, testing, quality, and time-proven integrity you expect from S-5!. The SolarFoot provides an ideal mounting platform to attach the L-Foot (not included) of a rail-mounted PV system to the roof. This solution is The Right Way to secure rail-mounted solar systems to exposed fastener metal such as AG-Panel or R-Panel.

The right way to attach almost anything to metal roofs!



SolarFoot Features:

Manufactured in the U.S.A. from certified raw material

Fabricated in our own ISO 9001:2015 certified factory

All aluminum and stainless components
25yr limited warranty

Compatible with all commercial L-Foot products on the market

Factory applied 40-year isobutylene/isoprene crosslink polymer sealant for reliable weathertightness

Sealant reservoir to prevent over-compression of sealant

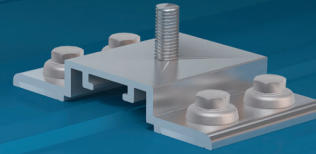
Load-to-failure tested Normal to Seam by a nationally accredited laboratory on numerous metal roof materials and substrates

Four points of attachment into structure or deck with tested holding strength for engineered applications

Integrated M8-1.25x17mm stud and M8-1.25 stainless steel hex flange nut included

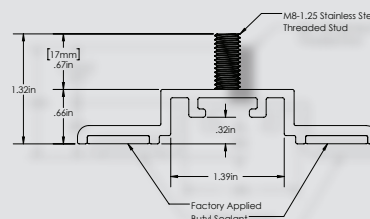
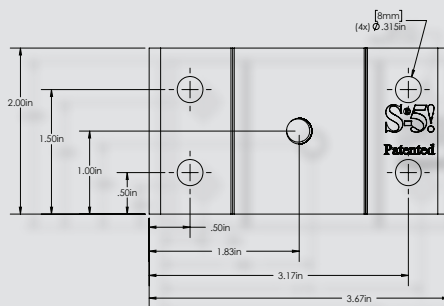


888-825-3432 | www.S-5.com



SolarFoot™ Mounting for Exposed Fastener Roofing

The SolarFoot is a simple, cost-effective pedestal for L-Foot (not included) attachment of rail-mounted solar PV. The unique design is compatible with all rail producer L-Foot components. The new SolarFoot assembly ensures a durable weathertight solution for the life of the roof. Special factory applied butyl co-polymeric sealant contained in a reservoir is The Right Way, allowing a water-tested seal. Stainless integrated stud and hex flange lock-nut secure the L-Foot into position. A low center of gravity reduces the moment arm commonly associated with L-Foot attachments. Direct attachment of the SolarFoot to the structural member or deck provides unparalleled holding strength.

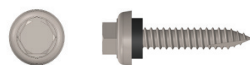


**Fasteners sold separately. Fastener type varies with substrate. Contact S-5! on how to purchase fasteners and obtain our test results. L-Foot also sold separately.*

Fastener Selection



Metal to Metal:
1/4-14 Self Drilling Screw
1-1/2" to 2-1/2"



Metal to Wood:
1/4-14 Type 17 AB Milled Point
1-1/2" to 2-1/2"

To source fasteners for your projects, contact S-5!

When other brands claim to be "just as good as S-5!", tell them to PROVE IT.

SolarFoot Advantages:

Exposed fastener mounting platform for solar arrays attached via L-Foot and Rails

Weatherproof attachment to exposed fastener roofing

Butyl sealant reservoir provides long-term waterproof seal

M8-1.25x17mm stud with M8 hex flange nut for attachment of all popular L-Foot/rail combinations

Tool: 13 mm Hex Socket or 1/2" Hex Socket

Tool Required: Electric screw gun with hex drive socket for self-tapping screws.

Low Center of Gravity reduces moment arm commonly associated with L-Foot/Rail solar mounting scenarios

Attaches directly to structure or deck for optimal holding strength

S-5! Recommended substrate-specific (e.g. steel purlin, wood 2x4, OSB, etc.) fasteners provide excellent waterproofing and pull-out strength

Fastener through-hole locations comply with NDS (National Design Specification) for Wood Construction

S-5!® Warning! Please use this product responsibly!

The independent lab test data found at www.S-5.com can be used for load-critical designs and applications.

Products are protected by multiple U.S. and foreign patents. For published data regarding holding strength, fastener torque, patents, and trademarks, visit the S-5! website at www.S-5.com. Copyright 2017, Metal Roof Innovations, Ltd. S-5! products are patent protected.

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Distributed by:

/ Perfect Welding / Solar Energy / Perfect Charging



FRONIUS PRIMO

/ Solutions for a brighter tomorrow.



/ PC board replacement process



/ SnapINverter mounting system



/ Wi-Fi® interface



/ Design Flexibility



/ Smart Grid Ready



/ Arc Fault Circuit Interruption



/ With power categories ranging from 3.8 kW to 15.0 kW, the transformerless Fronius Primo is the ideal compact single-phase inverter for residential applications. The sleek design is equipped with the SnapINverter hinge mounting system which allows for lightweight, secure and convenient installation. The Fronius Primo has several integrated features that set it apart from competitors including dual powerpoint trackers, high system voltage, a wide input voltage range, Wi-Fi® and SunSpec Modbus interface, and Fronius' online and mobile monitoring platform Fronius Solar.web. The Fronius Primo also works seamlessly with the Fronius Rapid Shutdown Box as a reliable rapid shutdown solution outside the PV Array boundary.

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.	20.1 x 28.5 x 8.9 in.
Weight	47.29 lb.	82.5 lbs.
Protection Class	NEMA 4X	
Night time consumption	< 1 W	
Inverter topology	Transformerless	
Cooling	Variable speed fan	
Installation	Indoor and outdoor installation	
Ambient operating temperature range	-40 - 131°F (-40 - 55°C)	-40 - 140°F (-40 - 60°C)
Permitted humidity	0 - 100 %	
Elevation	4000m (13123 ft)	
DC connection terminals	4x DC+ and 4x DC- screw terminals for copper (solid / stranded / fine stranded) or aluminum (solid / stranded)	4x DC+1, 2x DC+2 and 6x DC- screw terminals for copper (solid / stranded / fine stranded) or aluminum (solid / stranded)
AC connection terminals	Screw terminals 12 - 6 AWG	
Revenue Grade Metering	Optional (ANSI C12.1 accuracy)	
Certificates and compliance with standards	UL 1741-2010 Second Edition (incl. UL1741 Supplement SA 2016-09 for California Rule 21 and Hawaiian Electric Code Rule 14H), UL1998 (for functions: AFCI, RCMU and isolation monitoring), IEEE 1547-2003, IEEE 1547.1-2003, ANSI/IEEE C62.41, FCC Part 15 A & B, NEC 2017 Article 690, C22. 2 No. 107.1-16, UL1699B Issue 2 -2013, CSA TIL M-07 Issue 1 – 2013	UL 1741-2010 Second Edition (incl. UL1741 Supplement SA 2016-09 for California Rule 21 and Hawaiian Electric Code Rule 14H), UL1998 (for functions: AFCI, RCMU and isolation monitoring), IEEE 1547-2003, IEEE 1547.1-2003, ANSI/IEEE C62.41, FCC Part 15 A & B, NEC 2017 Article 690, C22. 2 No. 107.1-16, UL1699B Issue 2 -2013, CSA TIL M-07 Issue 1 -2013

PROTECTIVE DEVICES	STANDARD WITH ALL PRIMO MODELS
DC reverse polarity protection	Yes
Anti Islanding	Internal; in accordance with UL 1741-2016-09, IEEE 1547-2003 and NEC 2017
Over temperature protection	Output power derating/ Active cooling
AFCI	Yes
Rapid shutdown compliant	Per Sect. 690.12 of 2014 (of NEC 2017 prior to Jan 2019)
Ground Fault Protection with Isolation Monitor Interrupter	Yes
DC disconnect	Yes
INTERFACES	STANDARD WITH ALL PRIMO MODELS
USB (A socket)	Datalogging and inverter update possible via USB
2x RS422 (RJ45 socket)	Fronius Solar Net, interface protocol
Wi-Fi®/Ethernet LAN	Wireless standard 802.11 b/g/n/Fronius Solar.web, SunSpec Modbus TCP, JSON
Datalogger and Webserver	Included
Serial RS485	SunSpec Modbus RTU or meter connection
6 inputs or 4 digital inputs/outputs	Load management; signaling, multipurpose I/O

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

TECHNICAL DATA FRONIUS PRIMO

INPUT DATA		PRIMO 3.8-1	PRIMO 5.0-1	PRIMO 6.0-1	PRIMO 7.6-1	PRIMO 8.2-1
Recommended PV power (kWp)		3.0 - 6.0 kW	4.0 - 7.8 kW	4.8 - 9.3 kW	6.1 - 11.7 kW	6.6 - 12.7 kW
Max. usable input current (MPPT 1/MPPT 2)		18 A / 18 A				
Max. usable input current (MPPT 1+MPPT 2)		36 A				
Max. array short circuit current (1.5* I _{max}) (MPPT1/MPPT2)		27 A / 27 A				
Nominal input voltage		410 V	420 V	420 V	420V	420 V
Operating voltage range		80 V - 600 V				
DC startup voltage		80 V				
MPP Voltage Range		200-480 V	200-400 V	240-480 V	250-480 V	270-480 V
Max. input voltage		600 V (1000 V optional ¹)				
Admissible conductor size DC		AWG 14 - AWG 6 copper (solid / stranded / fine stranded)(AWG 10 copper or AWG 8 aluminium for overcurrent protective devices up to 60A, from 61 to 100A minimum AWG 8 for copper or AWG 6 aluminium has to be used) , AWG 6 - AWG 2 copper(solid / stranded) MultiContactWiringable with AWG 12				
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	208 V/240 V	3800 VA/3800 VA	5000 VA/5000 VA	6000 VA/6000 VA	7600 VA/7600 VA	7900 VA/8200 VA
Output configuration		208/240 V				
Frequency range (adjustable)		45.0 - 55.0 Hz / 50 - 66 Hz				
Operating frequency range default for CAL setups		- / 58.5 - 60.5 Hz				
Operating frequency range default for HI setups		- / 57.0 - 63.0 Hz				
Nominal operating frequency		60 Hz				
Admissible conductor size AC		AWG 14 - AWG 6				
Total harmonic distortion		< 5.0 %				
Power factor range		0.85-1 ind./cap				
Max. continuous output current	208 V	18.3 A	24.0 A	28.8 A	36.5 A	38.0 A
	240 V	15.8 A	20.8 A	25.0 A	31.7 A	34.2 A
OCPD/AC breaker size	208V	25 A	30 A	40 A	50 A	50 A
	240 V	20 A	30 A	35 A	40 A	45 A
Max. Efficiency		96.7 %	96.9 %	96.9 %	96.9 %	97.0 %
CEC Efficiency		95.0 %	95.5 %	96.0 %	96.0 %	96.5 %
INPUT DATA		PRIMO 10.0-1	PRIMO 11.4-1	PRIMO 12.5-1	PRIMO 15.0-1	
Recommended PV power (kWp)		8.0 - 12.0 kW	9.1 - 13.7 kW	10.0 - 15.0 kW	12.0 - 18.0 kW	
Max. usable input current (MPPT 1/MPPT 2)		33.0 / 18.0 A				
Max. usable input current (MPPT 1+MPPT 2)		51 A				
Max. array short circuit current (1.5 * I _{max})		49.5 A/ 27.0				
Nominal input voltage		655 V	660 V	665 V	680 V	
Operating voltage range		80 V - 1,000 V				
DC startup voltage		80 V				
MPP Voltage Range		220-800 V	240-800 V	260-800 V	320-800 V	
Max. input voltage		1000 V				
Admissible conductor size DC		AWG 14 - AWG 6 copper direct, AWG 6 aluminum direct (AWG 10 copper or AWG 8 aluminium for overcurrent protective devices up to 60A, from 61 to 100A minimum AWG 8 for copper or AWG 6 aluminium has to be used), AWG 4 - AWG 2 copper or alu- minum with optional input combiner				
Number of MPPT		2				
Integrated DC string fuse holders		4- and 4+ for MPPT 1 / no fusing required on MPPT 2				
OUTPUT DATA		PRIMO 10.0-1	PRIMO 11.4-1	PRIMO 12.5-1	PRIMO 15.0-1	
Max. output power	208 V/240 V	9995 VA/9995 VA	11400 VA/11400 VA	12500 VA/12500 VA	13750 VA/15000 VA	
Output configuration		1-NPE 208/240 V				
Frequency range (adjustable)		45-55 Hz / 50-66 Hz				
Operating frequency range default for CAL setups		- / 58.5 - 60.5 Hz				
Operating frequency range default for HI setups		- / 57.0 - 63.0 Hz				
Nominal operating frequency		60 Hz				
Admissible conductor size AC		AWG 10- AWG 2 copper (solid/stranded/fine stranded)(AWG 10 copper or AWG 8 aluminum for overcurrent protective devices up to 60 A, from 61 to 100A minimum AWG 6 aluminum has to be used), AWG 6-AWG 2 copper (solid/stranded) Multi Contact Wiring able with AWG 12				
Total harmonic distortion		< 2.5 %				
Power factor range		0-1 ind./cap.				
Max. continuous output current	208 V	48.1 A	54.8 A	60.1 A	66.1 A	
	240 V	41.6 A	47.5 A	52.1 A	62.5 A	
OCPD/AC breaker size	208 V	70 A	70 A	80 A	90 A	
	240 V	60 A	60 A	70 A	80 A	
Max. Efficiency		96.7 %				
CEC Efficiency 600 V/ 1000 V	240 V	96.0 % / 96.5 %			96.5 % / 97.0 %	

¹ inverter rated for up to 1000 V open-circuit. Nominal, Operating, and MPP voltages based on 600 V system design. Actual DC system voltage is dependent on PV string-sizing, not inverter input capacity.

/ Perfect Welding / Solar Energy / Perfect Charging

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

v08 Aug 2017 EN

Fronius USA LLC

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pv-support-usa@fronius.com

www.fronius-usa.com





Main

Product or component type	Single Throw Safety Switch
Line Rated Current	60 A
Product certifications	UL listed
NEMA degree of protection	NEMA 3R galvanized steel
Device composition	Neutral (factory installed)
Disconnect device type	Fusible disconnect
Short-circuit current	10 kA H or K 200 kA R, J or L
Device mounting	Surface
Number of poles	3
Electrical connection	Lugs
Series name	Heavy duty
System Voltage	240 V AC 250 V DC
AWG gauge	AWG 14...AWG 3 (copper or aluminium)

Complementary

Environment

Offer Sustainability

Green Premium product	Green Premium product
Compliant - since 1313 - Schneider Electric declaration of conformity	Compliant - since 1313 - Schneider Electric declaration of conformity
Reference not containing SVHC above the threshold	Reference not containing SVHC above the threshold
Available	Available
Need no specific recycling operations	Need no specific recycling operations
WARNING: This product can expose you to chemicals including:	WARNING: This product can expose you to chemicals including:
Lead and lead compounds, which is known to the State of California to cause cancer and birth defects or other reproductive harm.	Lead and lead compounds, which is known to the State of California to cause cancer and birth defects or other reproductive harm.
For more information go to www.p65warnings.ca.gov	For more information go to www.p65warnings.ca.gov

Contractual warranty

Warranty period	18 months
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