

AGENDA

TOLLAND GREEN HISTORIC DISTRICT COMMISSION

Wednesday, May 20, 2020 at 7:00 p.m.

REMOTE MEETING

Public Hearings

1. Call to Order
2. Roll Call
3. Reading of Public Notice as appearing in Journal Inquirer
4. Consideration of Application for a COA at 100 Tolland Green for replacement windows, entry doors and shutters.
5. Neighbor comments, both for and against
6. Close of Public Hearing
7. Consideration of Application for a COA at 95 Tolland Green for roof-mounted solar panels
8. Neighbor comments, both for and against
9. Close of Public Hearing

Regular Meeting

10. Call to Order
11. Consideration of COA for 100 Tolland Green by Commission, and vote thereon
12. Consideration of COA for 95 Tolland Green by Commission, and vote thereon
13. New Business
 - 14.1 Discussion of sidewalks in the Tolland Green Historic District
14. Miscellaneous
15. Approval of Minutes from April 15, 2020 Regular Meeting
16. Adjournment

To View Meeting Materials:

See <https://www.tolland.org/historic-district-commission/pages/remote-meeting-packets-audio-recordings>

To Join Zoom Meeting:

If using a computer, tablet or smartphone, download Zoom app prior to the meeting.

Go to: <https://us02web.zoom.us/j/98377753473> and enter meeting ID 983 7775 3473

Password: 9ttiy4

Or call: 929-205-6099 and enter meeting ID 983 7775 3473

Meeting password is 706061

If you receive an error message after entering the password:

Enter the password again.

If it does not work, click on the meeting link.

If you still cannot get into the meeting, call in.

PUBLIC NOTICE LEGAL NOTICE TOLLAND GREEN HISTORIC DISTRICT

PUBLIC NOTICE Legal Notice Tolland Green Historic District Commission The Commission will hold two Public Hearings on May 20, 2020 at 7:00PM. 1.100 Tolland Green: to consider an application for a Certificate of Appropriateness by Scott Zahner to install vinyl replacement windows, new front door, new side entry door new shutters. 2.95 Tolland Green: to consider an application for a Certificate of Appropriateness by Jeff Schwartz to install roof-mounted solar panels. These applications are online at: <https://www.tolland.org/historic-district-commission/pages/applications-pending> Only remote participation will be allowed. Instructions to participate will be on the agenda, which will be posted by May 19, 2020 at www.tolland.org. Journal Inquirer on May 13, 2020.

Appeared in: ***Journal Inquirer*** on 05/13/2020 and 05/14/2020

[Back](#)



TOLLAND GREEN HISTORIC DISTRICT COMMISSION
Application for a Certification of Appropriateness

Property Information

Property Address: 100 Tolland Green

Property Owner: Scott Zahner

Phone Number: [REDACTED]

Applicant Information

Applicant Name: Zahner Construction

Applicant Address: P.O. Box 583

Phone Number: [REDACTED]

Email Address: [REDACTED]

Project Information

Type of Building: Residential Home - Colonial style

Nature and description of work to be done as it affects exterior appearance. Attach appropriate drawing or plans giving the position of the house or structure on the site, ground plan of house with proposed addition, and all pertinent elevations showing size and style of windows, dormers, doors, exterior wall finishes, roofing material, chimneys, vents and ornamentation. (If more space needed, attach sheet to application.)

Install vinyl replacement windows. Install new front door & entry doors. Install new shutters.

* Please see attached Specs and listed improvements.

Estimated Start and Completion Dates:

Start: April

Complete: May

1. Attach a photograph of the existing structure or place to be changed as viewed from the street showing that portion of the structure to be altered, together with a drawing of the proposed alteration or change.
2. Application fee of \$75.00 must accompany application (make checks payable to Town of Tolland).
3. Application form, fee, plans, photograph and drawing must be submitted to Planning & Building Department. Public Hearings will be scheduled within not more than sixty-five days after the filing of an application.

This application form and all accompanying plans and materials are accurate and complete:

Applicant Signature: [Signature]

Date: 4.8.20

Property Owner Signature: [Signature]

Date: 4-8-2020

OFFICE USE ONLY

\$75.00

Received & Fee Paid:

4/13/2020

Hearing Scheduled:

5/20/2020

Hearing Advertised:

Action:

Notice of Action to Applicant:

Dear Board Members,

Listed below are the visually appropriate improvements we would like to make. This Colonial style home was built in 1965 and is located at 100 Tolland Green.

Existing Front Door

- 6068 Double Wooden Door
- Has considerable visual cracks in wood panels which leaks air

New Front Door

- 6068 Double Smooth Star Fiberglass Door
- Insulated – Energy Star
- Black hardware
- Residential Lifetime Warranty

Existing Front Side Door Entry

- 2868 Single Wooden Door
- Has Diamond Grid pattern

New Front Side Door Entry

- 2868 Single Smooth Star Fiberglass Door
- Colonial Style grids between the glass to make consistent with the Colonial aesthetics of the entire home
- Black hardware
- Residential Lifetime warranty

Existing Windows

- Front of the house are wooden windows with diamond grid pattern
- Remaining windows have colonial style grid pattern
- Windows are old and need replacing – seals are broken and leaking air and some have visual rot

New Windows

- Silver Line White Vinyl Double Hung replacement windows – Energy Star
- Colonial style grid pattern in all the windows to make consistent with the Colonial aesthetics of the entire home

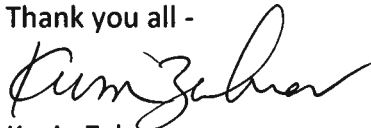
Existing Shutters

- Aluminum painted
- Paint has faded and need painting

New Shutters

- Girardin shutters – louver style
- Polymer construction
- Fade and chip resistant
- Color - Black

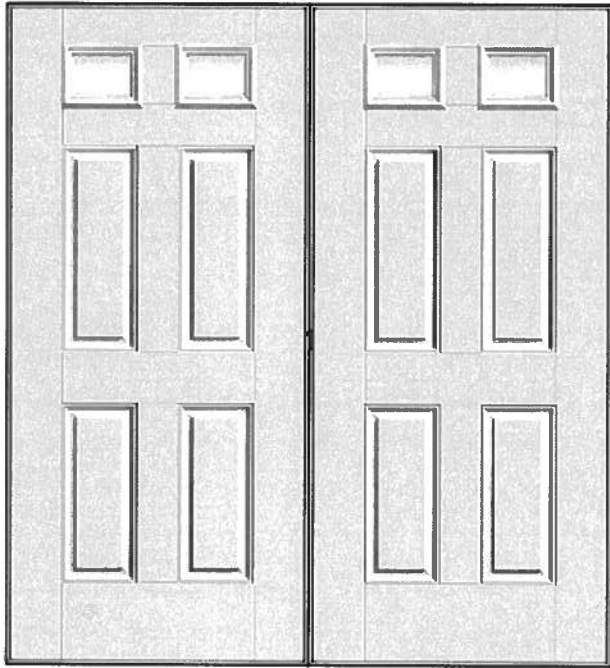
Thank you all -



Kevin Zahner



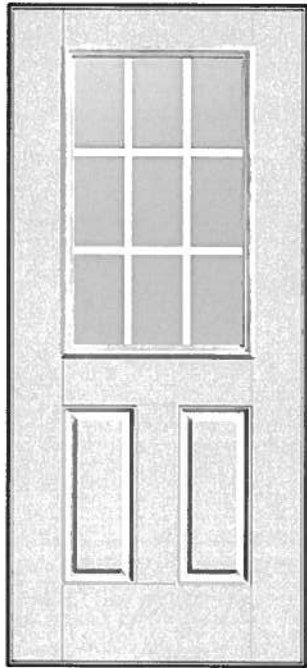
Existing Front Door



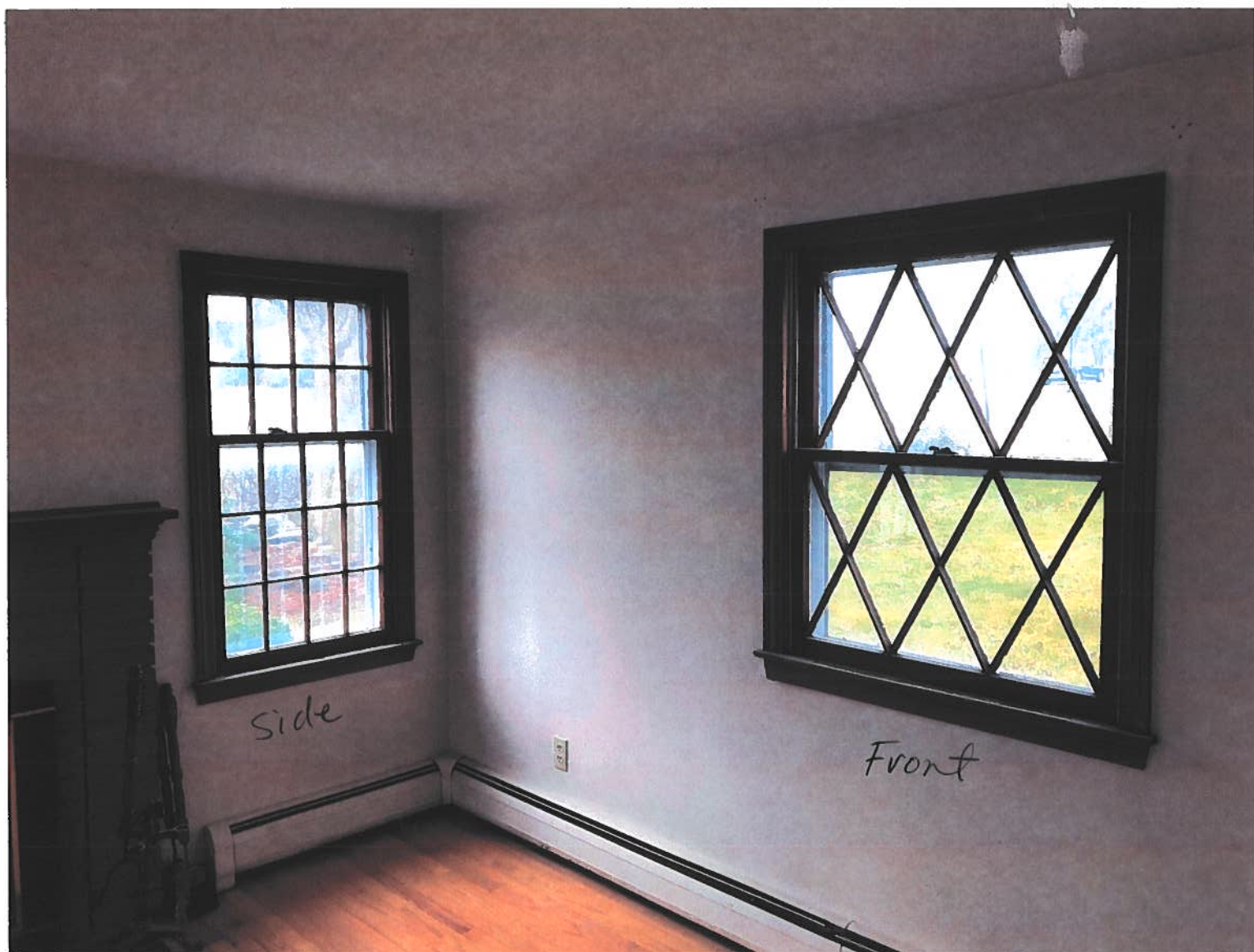
New Front Door



Existing Front Side Entry Door



New Front Side Entry Door





existing windows
& shutters

DOUBLE-HUNG WINDOWS



V3 Series double-hung windows

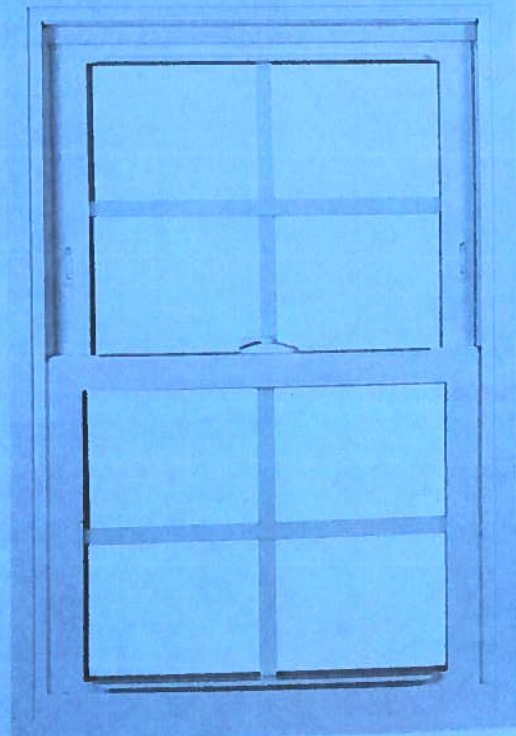
V3 SERIES

Double-Hung Windows

Features and Benefits

- Designed for new construction or easy window replacement
- Colonial brick mould design for classic styling
- Tilt-in top and bottom sash for easy cleaning
- Fusion-welded, heavy-duty vinyl for strength and durability
- Integral J-channel is optional for attractive trimming of exterior siding
- Available with glass options that are ENERGY STAR® certified for greater energy efficiency

• Grid pattern 6 over 6



LOUVER STYLE

The elegance of the classic closed Louver Style is timeless. Designed to provide deep, well-defined shadows, the surface of the shutter is sculpted with a convincing realistic weathered wood grain finish.

The solid one piece construction adds durability and the 6 widths, 22 lengths and choice of 12 colors provide flexibility for any design situation.

New shutters - Black



CA

If the design demands on the shutter just The shutter ad

22



TOLLAND GREEN HISTORIC DISTRICT COMMISSION
Application for a Certification of Appropriateness

Property Information

Property Address: 95 Tolland Green

Property Owner: John Hughes

Phone Number: [REDACTED]

Applicant Information

Applicant Name: Jeff Schwartz, SunPower Corp, Systems

Applicant Address: 50 Rockwell Road, Newington CT 06111

Phone Number: 860-978-6046

Email Address: Jeff.Schwartz@sunpowercorp.com

Project Information

Type of Building: Residential dwelling

Nature and description of work to be done as it affects exterior appearance. Attach appropriate drawing or plans giving the position of the house or structure on the site, ground plan of house with proposed addition, and all pertinent elevations showing size and style of windows, dormers, doors, exterior wall finishes, roofing material, chimneys, vents and ornamentation. (If more space needed, attach sheet to application.)

Roof mounted solar installation. 32 modules on single mounting plane, SE facing roof.

Estimated Start and Completion Dates:

Start: ASAP

Complete: within 1 month of receiving required permits

1. Attach a photograph of the existing structure or place to be changed as viewed from the street showing that portion of the structure to be altered, together with a drawing of the proposed alteration or change.
2. Application fee of \$75.00 must accompany application (*make checks payable to Town of Tolland*).
3. Application form, fee, plans, photograph and drawing must be submitted to **Planning & Building Department**. Public Hearings will be scheduled within not more than sixty-five days after the filing of an application.

This application form and all accompanying plans and materials are accurate and complete:

Applicant Signature:

Jeff Schwartz
Jeff Schwartz (Apr 30, 2020)

Date: Apr 30, 2020

Property Owner Signature:

John Hughes
John Hughes (Apr 30, 2020)

Date: Apr 30, 2020

OFFICE USE ONLY

Received & Fee Paid:	4/30/2020 \$75.00	Hearing Scheduled:	5/20/2020
Hearing Advertised:		Action:	
Notice of Action to Applicant:			



SOLAR INDIVIDUAL PERMIT PACKAGE

JOHN HUGHES

10.46 kW GRID-TIED PHOTOVOLTAIC SYSTEM

AC MAX. CONTINUOUS POWER RATING OF (32) SPR-E20-327-E-AC = 32 x 315W = 10.08 kW
GENERATOR NAMEPLATE KVAR RATING = 3.20 KVAR

[REDACTED]

95 TOLLAND GREEN
TOLLAND, CONNECTICUT 6084

AHJ: TOLLAND
UTILITY: EVERSOURCE ENERGY (FORMERLY CONNECTICUT LIGHT & POWER CO)

JOB NOTES

CODE INFORMATION

APPLICABLE CODES, LAWS AND REGULATIONS

2018 CSBC ADOPT THE FOLLOWING CODES:
2015 IBC (INTERNATIONAL BUILDING CODE)
2015 IEBC (INTERNATIONAL EXISTING BUILDING CODE)
2015 IMC (INTERNATIONAL MECHANICAL CODE)
2015 IPC (INTERNATIONAL PLUMBING CODE)
2015 IRC (INTERNATIONAL RESIDENTIAL CODE)
2015 IECC (INTERNATIONAL ENERGY CONSERVATION CODE)
2017 NEC (NATIONAL ELECTRIC CODE NFPA70)
2009 ICC A117.1 ACCESSIBLE & USABLE BUILDING & FACILITIES

SATELLITE IMAGE



SHEET INDEX

PV SOLAR ARCHITECTURAL DRAWINGS

- PVA-0COVER SHEET
- PVA-1ARRAY LAYOUT
- PVA-1.1ELEVATION VIEW

PV SOLAR STRUCTURAL DRAWINGS

- PVS-1MOUNTING DETAILS

PV SOLAR ELECTRICAL DRAWINGS

- PVE-1ELECTRICAL SINGLE-LINE DIAGRAM & SPECIFICATIONS
- PVE-2ELECTRICAL CALCULATION
- PVE-3ELECTRICAL DATA & SPECIFICATIONS
- PVE-4SHEET_4
- PVE-5BRANCH DIAGRAM

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(510) 540-0550
CA LICENSE #890895

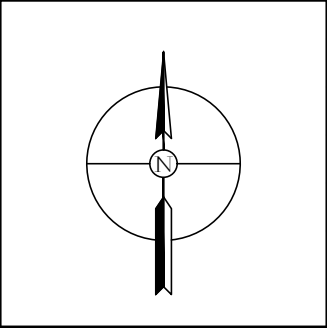
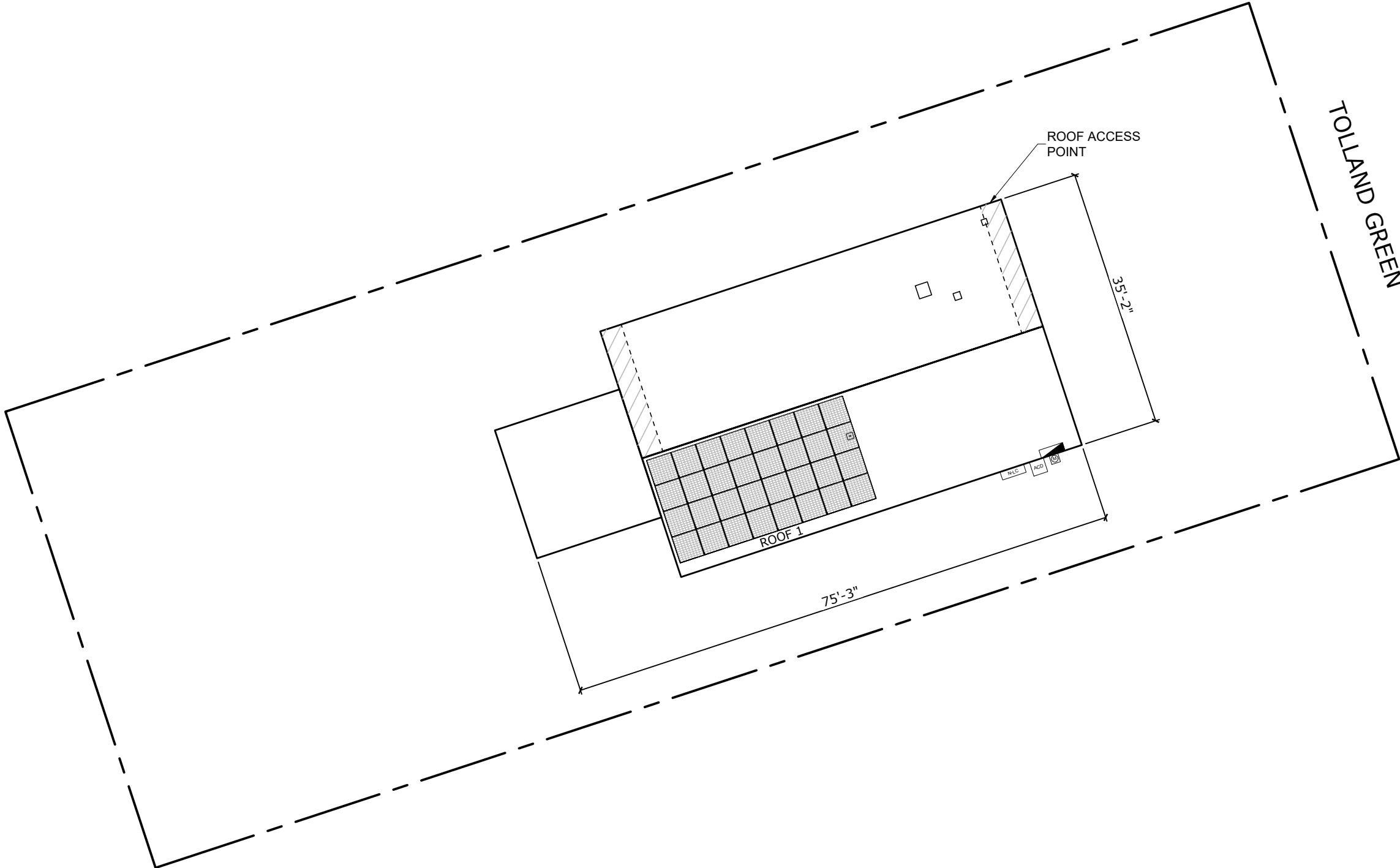
JOHN HUGHES
10.46 kW GRID-TIED PHOTOVOLTAIC SYSTEM
10.08 kW MAX. OUTPUT POWER RATING

95 TOLLAND GREEN
TOLLAND, CONNECTICUT 6084

SOLAR INDIVIDUAL PERMIT PACKAGE
COVER SHEET

REVISIONS					
REV	DESCRIPTION	DATE	DB	CB	
1	ADDED ELEVATION VIEW	4.17.20	JB	TB	
OPPORTUNITY		SPRI - CONNECTICUT			
PROJECT		RP-109070			
DATE DRAWN		03-30-2020			
DRAWN BY		JBERNALES			
DATE CHECKED		03-30-2020			
CHECKED BY		TYLER BOSHARD			
SCALE		NTS			

SHEET
PVA-0



LEGEND	
	JUNCTION BOX
	CONDUIT
	EXISTING SERVICE POINT
	EXISTING UTILITY METER
	PROPERTY LINE
	NEW LOAD CENTER
	AC DISCONNECT
	3' WIDE ACCESS PATH
NOTE: 1. FIELD ADJUSTMENTS OF FEWER THAN 6" MAY BE ALLOWED BASED ON SITE CONDITIONS AND MEASUREMENTS.	
UTILITY ACCOUNT NUMBER	5140 936 6077
CONTRACT MODULE & QUANTITY	SPR-E20-327-E-AC (240) (32)
MICROINVERTER TYPE & QUANTITY	IQ7XS-96-ACM-US (240) (32)
ROOF TYPE	COMPOSITION
ROOF ATTACHMENT QUANTITY	64
STORY HOME TYPE	1 - STORY
SYSTEM ORIENTATION	161°
ROOF PITCH	12:12
TOTAL ARRAY AREA	573 SQ.FT.

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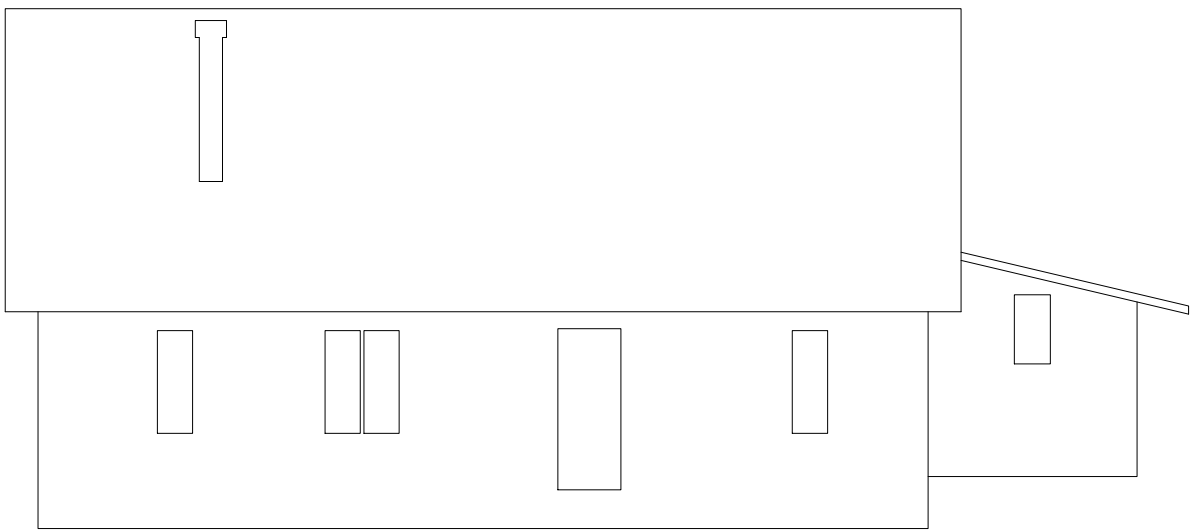
95 TOLLAND GREEN
TOLLAND, CONNECTICUT 6084

SOLAR INDIVIDUAL PERMIT PACKAGE
ARRAY LAYOUT

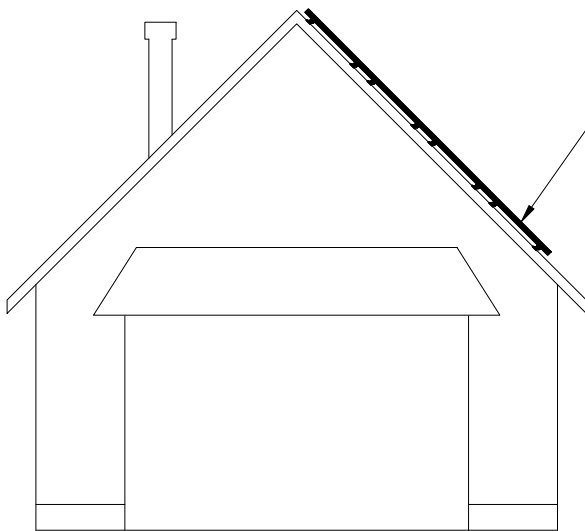
REVISIONS				
REV	DESCRIPTION	DATE	DB	CB
1	ADDED ELEVATION VIEW	4.17.20	JB	TB
OPPORTUNITY		SPRI - CONNECTICUT		
PROJECT		RP-109070		
DATE DRAWN		03-30-2020		
DRAWN BY		JBERNALES		
DATE CHECKED		03-30-2020		
CHECKED BY		TYLER BOSHARD		
SCALE		1/16" = 1'-0"		
SHEET		PVA-1		



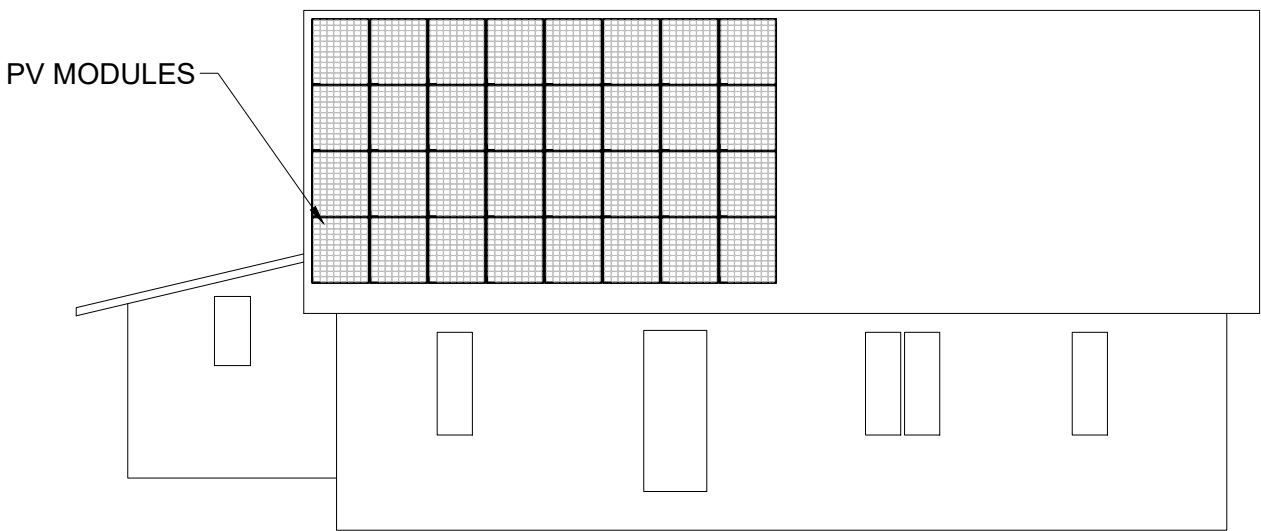
FRONT ELEVATION



RIGHT SIDE ELEVATION

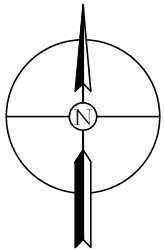


REAR ELEVATION



LEFT SIDE ELEVATION

SIGNED AND SEALED
FOR STRUCTURAL ONLY



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TOLLAND, CONNECTICUT 6084

SOLAR INDIVIDUAL PERMIT PACKAGE
ELEVATION VIEW

REVISIONS					
REV	DESCRIPTION	DATE	DB	CB	
1	ADDED ELEVATION VIEW	4.17.20	JB	TB	
OPPORTUNITY		SPRI - CONNECTICUT			
PROJECT		RP-109070			
DATE DRAWN		03-30-2020			
DRAWN BY		JBERNALES			
DATE CHECKED		03-30-2020			
CHECKED BY		TYLER BOSHARD			
SCALE		NTS			
SHEET		PVA-1.1			

TABLE 1 – ARRAYS INFORMATION									
	ROOF PITCH	ROOFING TYPE	ATTACHMENT TYPE	NO. OF STORIES	FRAMING TYPE	MAX. RAFTER SPAN	PENETRATION PATTERN	MAX. ATTACHMENT SPACING	MAX. RAIL OVERHANG
ROOF 1	45°	Comp Shingle	Pegasus L-foot	1	2x6 Rafter @ 24" OC	8.9'	Staggered	4'	1.33'
ROOF 2	--	--	--	--	--	--	--	--	--
ROOF 3	--	--	--	--	--	--	--	--	--
ROOF 4	--	--	--	--	--	--	--	--	--
ROOF 5	--	--	--	--	--	--	--	--	--
ROOF 6	--	--	--	--	--	--	--	--	--
CHECK TABLE 2 FOR PENETRATION PATTERN GUIDE									

FIG 1: ROOF 1 STRUCTURAL FRAMING DETAIL

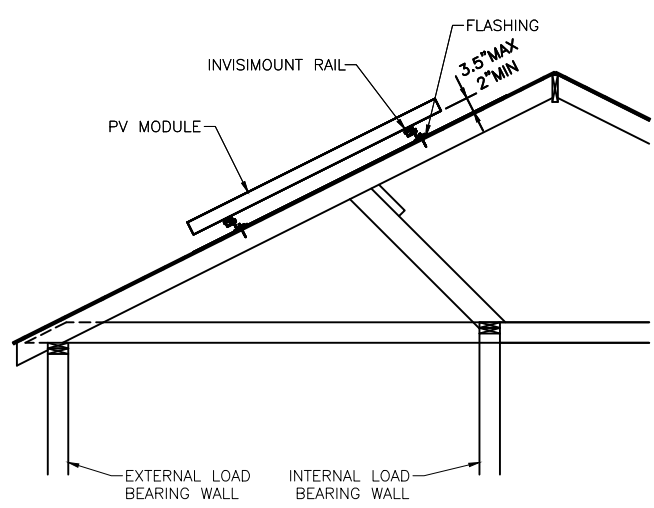


FIGURE 2: INVISIMOUNT ROOF ATTACHMENT DETAILS @ TRUSS / RAFTERS

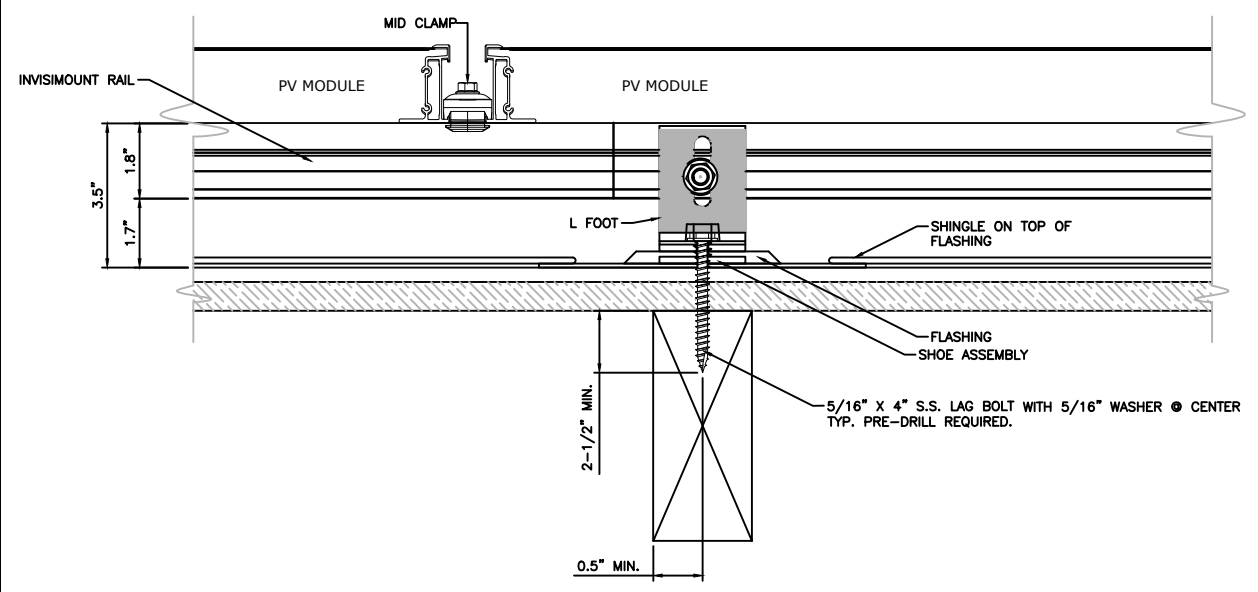


TABLE 2: PENETRATION GUIDE FOR INSTALL

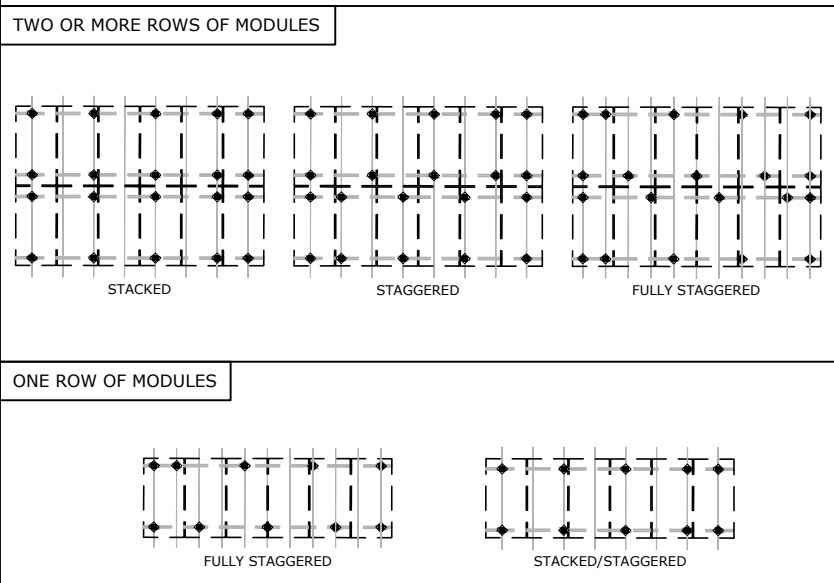
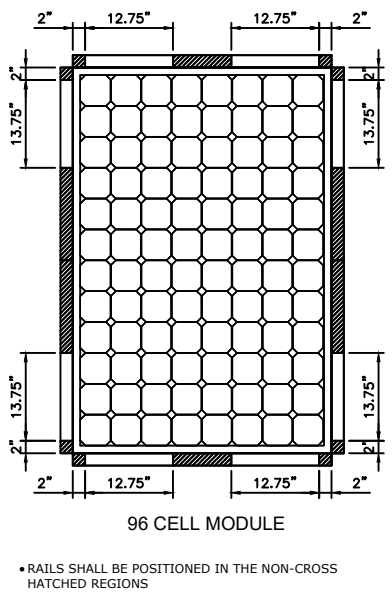


FIGURE 3: MOUNTING CLAMP POSITIONING DETAILS



*CHECK TABLE 1 FOR MAX.. PENETRATION SPACING AND PENETRATION PATTERN FOR EACH ARRAY.

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STATE OF CONNECTICUT
HEINRICH A. VILLANUEVA
No. 0031238
LICENSED PROFESSIONAL ENGINEER
exp 1/31/2021

JOHN HUGHES
10.46 kW GRID-TIED PHOTOVOLTAIC SYSTEM
10.08 kW MAX. OUTPUT POWER RATING

95 TOLLAND GREEN
TOLLAND, CONNECTICUT 6084

SOLAR INDIVIDUAL PERMIT PACKAGE
STRUCTURAL INFORMATION
AND MOUNTING DETAILS

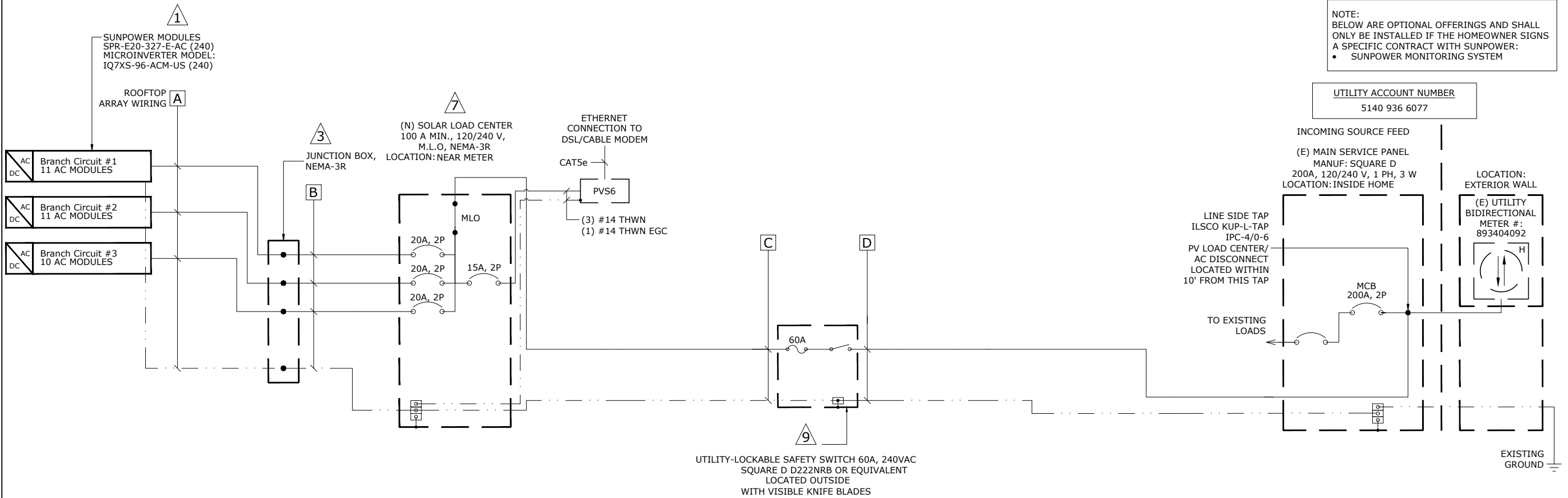
REVISIONS				
REV	DESCRIPTION	DATE	DB	CB
1	ADDED ELEVATION VIEW	4.17.20	JB	TB

OPPORTUNITY	SPRI - CONNECTICUT
PROJECT	RP-109070
DATE DRAWN	03-30-2020
DRAWN BY	JBERNALES
DATE CHECKED	03-30-2020
CHECKED BY	TYLER BOSHARD
SCALE	NTS

SHEET

PVS-1

FIGURE A: SINGLE LINE DIAGRAM - 10.46 kW



TAG	DESCRIPTION			CONDUCTOR / CONDUIT SCHEDULE					ELECTRICAL NOTES	
1	SOLAR AC MODULE / BRANCH	ACM	TAG	DESCRIPTION & CONDUCTOR TYPE	CONDUCTOR SIZE (AWG)	NUMBER OF CONDUCTORS	CONDUIT/CABLE TYPE	CONDUIT SIZE	<div>1. PROPER LISTING EXPECTED FOR CONDITIONS OF USE ON ALL LUGS, FITTINGS, CRIMPS, ETC.</div> <div>2. ALL CONDUIT BEND RADII TO CONFORM TO THE NEC MINIMUM BEND RADII REQUIREMENTS.</div> <div>3. MINIMUM CLEARANCE SHALL BE MAINTAINED PER NEC FOR ALL NEW EQUIPMENT TO BE INSTALLED.</div> <div>4. EXISTING GROUNDING ELECTRODE SYSTEM MUST MEET NEC AND LOCAL UTILITY REQUIREMENTS.</div> <div>5. COPPER CONDUCTORS SHALL BE USED UNLESS SPECIFIED.</div> <div>6. TYPE NM (ROMEX) CONDUCTORS ARE ALLOWED FOR INTERNAL AND ATTIC RUNS AND SHALL BE INSTALLED MEETING NEC REQUIREMENTS.</div> <div>7. IF MAIN SERVICE PANEL IS TO BE UPGRADED, IT WILL BE PERMITTED AND INSTALLED BY 3RD PARTY.</div> <div>8. AC WIRING SHALL UPSIZE IF VOLTAGE DROP EXCEEDS 2%.</div> <div>9. RUN CONDUCTORS IN EXISTING CONDUIT WHEN AVAILABLE PROVIDED IT HAS NO OTHER CONDUCTORS RUNNING THROUGH IT.</div> <div>10. EQUIVALENT SPECIFICATION ON CABLES AND ELECTRICAL EQUIPMENT SPECIFIED ARE ACCEPTABLE.</div> <div>11. AS DC POWER IS INTERNAL TO THE MODULE, GROUNDING ELECTRODE CONDUCTOR (GEC) FOR THE MODULE OR ARRAY IS NOT REQUIRED.</div>	
2	DC / DC CONVERTERS	NO								
3	SOURCE CIRCUIT JUNCTION BOX	YES	A	SUNPOWER PROVIDED AC MODULES EXTENSION CABLE, LISTED AS AN ASSEMBLY	#12	2	BRANCH CIRCUIT FROM PV ARRAY TO JUNCTION BOX	--		
4	SEPARATE DC DISCONNECT	NO	B	EGC: BARE Cu	#6	1	EMT	3/4"		
5	INTERNAL INVERTER DC DISCONNECT	NO		THWN-2	#10	6				
6	STRING INVERTER	NO	C	EGC: THWN-2	#10	1	EMT	3/4"		
7	SOLAR LOAD CENTER	YES		THWN-2	#8	3				
8	PV PRODUCTION METER	NO	D	EGC: THWN-2	#10	1	EMT	3/4"		
9	SEPARATE AC DISCONNECT	YES		THWN-2	#6	3				
<div>CHECK BOX FOR WHETHER SYSTEM IS GROUNDED OR UNGROUNDED:</div> <div><input type="checkbox"/> GROUNDED (INCLUDE GEC)</div> <div><input checked="" type="checkbox"/> UNGROUNDED</div> <div>FOR UNGROUNDED SYSTEMS:</div> <div><ul style="list-style-type: none">DC OCPD DISCONNECT BOTH CONDUCTORS OF EACH SOURCE CIRCUIT.UNGROUNDED CONDUCTORS MUST BE IDENTIFIED PER 210.5(C). WHITE FINISHED CONDUCTORS ARE NOT PERMITTED.</div>				EGC: THWN-2	#8	1	EMT	3/4"		
AC MODULES NOTES										
<div>1. DC CIRCUIT IS ISOLATED AND INSULATED FROM GROUND AND MEETS THE REQUIREMENT OF NEC 690.35.</div> <div>2. SUNPOWER PROVIDED CABLES COMES WITH TWO (2) #12 AWG WIRE AND THIS IS BY DESIGN. NEUTRAL AND ADDITIONAL GROUND WIRE IS NOT REQUIRED FOR PROVIDED TRUNK AND EXTENSION CABLES.</div> <div>3. SUNPOWER AC MODULES HAVE BEEN TESTED AND CERTIFIED TO UL 2703 FOR INTEGRATED GROUNDING AND HENCE A SEPARATE GROUND WIRE IS NOT REQUIRED WITHIN THE ARRAY.</div> <div>4. USE ROW-TO-ROW GROUNDING CLIP PROVIDED TO GROUND ROWS OF MODULE. BOND SUB-ARRAYS BY RUNNING #6 AWG BARE CU WIRE AND GROUND LUGS AT A SINGLE POINT ON EACH SUB-ARRAY AND THEN TO THE JUNCTION BOX. REFER TO PVE-4 FOR ADDITIONAL DETAILS.</div>										

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JOHN HUGHES

10.46 kW GRID-TIED PHOTOVOLTAIC SYSTEM
10.08 kW MAX. OUTPUT POWER RATING

95 TOLLAND GREEN
TOLLAND, CONNECTICUT 6084

SOLAR INDIVIDUAL PERMIT PACKAGE
ELECTRICAL SINGLE-LINE DIAGRAM
& SPECIFICATIONS

REVISIONS				
REV	DESCRIPTION	DATE	DB	CB
1	ADDED ELEVATION VIEW	4.17.20	JB	TB
OPPORTUNITY		SPRI - CONNECTICUT		
PROJECT		RP-109070		
DATE DRAWN		03-30-2020		
DRAWN BY		JBERNALES		
DATE CHECKED		03-30-2020		
CHECKED BY		TYLER BOSHARD		
SCALE		NTS		
SHEET		PVE-1		

SUBPANEL TO GRID-TIE WIRING	#8
VOLTAGE	240 V
SUM OF BRANCHES: I _{OUT_TOTAL} =	41.92 A
MINIMUM WIRE AMPACITY: I _{MAX} = IOUT x 1.25	52.40 A
CONDUCTOR DE-RATING	
MAXIMUM AMBIENT TEMPERATURE	33°C
TEMPERATURE USED FOR AMPACITY DE-RATING	33°C
TEMPERATURE DE-RATING COEFFICIENT	0.96
FILL DE-RATING COEFFICIENT	1
I _{WIREMIN} = I _{MAX} / TEMP_COEFF / FILL_COEFF	54.58 A
WIRE SIZE AMPACITY	55A
CONDUCTOR SIZE	#8
CONDUCTOR SIZE ADJUSTED FOR VOLTAGE DROP	#8
ONE WAY CIRCUIT LENGTH	10 FT.
VOLTAGE DROP	1.27%
OVERCURRENT PROTECTION	60A, 2P
MINIMUM OCPD = I _{OUT} x 1.25	52.40 A

	BRANCH 1	BRANCH 2	BRANCH 3
ROOF JCT BOX TO SUBPANEL WIRING	#10	#10	#10
NUMBER OF MODULES	11	11	10
VOLTAGE	240 V	240 V	240 V
RATED AC OUTPUT CURRENT: I _{OUT} =	14.41 A	14.41 A	13.10 A
MINIMUM WIRE AMPACITY: I _{MAX} = I _{OUT} x 1.25	18.01 A	18.01 A	16.38 A
CONDUCTOR DE-RATING			
MAXIMUM AMBIENT TEMPERATURE	33°C	33°C	33°C
TEMPERATURE ADDER	22°C	22°C	22°C
TEMPERATURE USED FOR AMPACITY DE-RATING	55°C	55°C	55°C
TEMPERATURE DE-RATING COEFFICIENT	0.76	0.76	0.76
FILL DE-RATING COEFFICIENT	0.80	0.80	0.80
I _{WIREMIN} = I _{MAX} / TEMP_COEFF / FILL_COEFF	29.63 A	29.63 A	26.93 A
WIRE SIZE AMPACITY	40 A	40 A	40 A
CONDUCTOR SIZE	#10	#10	#10
CONDUCTOR SIZE ADJUSTED FOR VOLTAGE DROP	#10	#10	#10
ONE WAY CIRCUIT LENGTH	85 FT.	85 FT.	85 FT.
CALCULATED VOLTAGE DROP	1.27%	1.27%	1.15%
OVERCURRENT PROTECTION	20A, 2P	20A, 2P	20A, 2P
MINIMUM OCPD = I _{OUT} x 1.25	18.01 A	18.01 A	16.38 A

SUNPOWER[®]

CORPORATION, SYSTEMS
1414 HARBOUR WAY SOUTH
RICHMOND, CA 94804
(510) 540-0550
CA LICENSE #890895

JOHN HUGHES
10.46 kW GRID-TIED PHOTOVOLTAIC SYSTEM
10.08 kW MAX. OUTPUT POWER RATING

95 TOLLAND GREEN
TOLLAND, CONNECTICUT 6084

SOLAR INDIVIDUAL PERMIT PACKAGE
ELECTRICAL CALCULATION

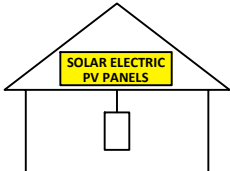
REVISIONS

REV	DESCRIPTION	DATE	DB	CB
1	ADDED ELEVATION VIEW	4.17.20	JB	TB

OPPORTUNITY	SPRI - CONNECTICUT
PROJECT	RP-109070
DATE DRAWN	03-30-2020
DRAWN BY	JBERNALES
DATE CHECKED	03-30-2020
CHECKED BY	TYLER BOSHARD
SCALE	NTS

SHEET

PVE-2

ELECTRICAL DATA & SPECIFICATIONS									
<div><div>PHOTOVOLTAIC POINT OF INTERCONNECTION</div><div>WARNING: DUAL POWER SOURCE. SECOND SOURCE IS PHOTOVOLTAIC SYSTEM</div><table><tr><td>MAXIMUM RATED AC OUTPUT CURRENT:</td><td>41.92 A</td><td>AMPS</td></tr><tr><td>MAXIMUM OPERATING AC VOLTAGE:</td><td>240 V</td><td>VOLTS</td></tr></table><div>SIGNAGE LOCATIONS:</div><div><div><div></div></div><div><div>MAIN SERVICE PANEL</div><div>INDOOR / OUTDOOR SUBPANEL</div></div></div></div>	MAXIMUM RATED AC OUTPUT CURRENT:	41.92 A	AMPS	MAXIMUM OPERATING AC VOLTAGE:	240 V	VOLTS	<div><div>PHOTOVOLTAIC SYSTEM EQUIPPED WITH RAPID SHUTDOWN</div><div>SIGNAGE LOCATIONS:</div><div><div><div></div></div><div><div>MAIN SERVICE PANEL</div></div></div></div> <div><div>PV SOLAR BREAKER</div><div>DO NOT RELOCATE THIS OVERCURRENT DEVICE</div><div>SIGNAGE LOCATIONS:</div><div><div><div></div></div><div><div>MAIN SERVICE PANEL</div><div>NEW INDOOR / OUTDOOR LOAD CENTER</div><div>INDOOR / OUTDOOR SUBPANEL</div></div></div></div>	<div><div>RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM</div><div>SIGNAGE LOCATIONS:</div><div><div><div></div></div><div><div>LABEL SHALL BE LOCATED ON OR NO MORE THAN 1M (3FT) FROM THE SWITCH</div></div></div></div>	
MAXIMUM RATED AC OUTPUT CURRENT:	41.92 A	AMPS							
MAXIMUM OPERATING AC VOLTAGE:	240 V	VOLTS							
<div><div>SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN</div><div><div>TURN RAPID SHUTDOWN SWITCH TO THE "OFF" POSITION TO SHUT DOWN AND REDUCE SHOCK HAZARD IN THE ARRAY</div><div></div></div><div>SIGNAGE LOCATIONS:</div><div><div><div></div></div><div><div>SHALL BE LOCATED ON OR NO MORE THAN 1 M (3 FT) FROM THE SERVICE DISCONNECTING MEANS TO WHICH THE PV SYSTEMS ARE CONNECTED.</div></div></div></div>	<div><div>PHOTOVOLTAIC SYSTEM AC DISCONNECT</div><table><tr><td>RATED AC OUTPUT CURRENT:</td><td>41.92 A</td><td>AMPS</td></tr><tr><td>NOMINAL OPERATING AC VOLTAGE:</td><td>240 V</td><td>VOLTS</td></tr></table><div>SIGNAGE LOCATIONS:</div><div><div><div></div></div><div><div>INDOOR / OUTDOOR AC DISCONNECT</div></div></div></div>	RATED AC OUTPUT CURRENT:	41.92 A	AMPS	NOMINAL OPERATING AC VOLTAGE:	240 V	VOLTS		
RATED AC OUTPUT CURRENT:	41.92 A	AMPS							
NOMINAL OPERATING AC VOLTAGE:	240 V	VOLTS							
			<div>SIGNAGE NOTES</div> <div><div>1. MATERIAL USED FOR THE SIGNAGE SHALL BE REFLECTIVE, WEATHER RESISTANT AND SUITABLE FOR THE ENVIRONMENT.</div><div>2. ALL SIGNAGE SHALL HAVE ALL CAPITAL LETTERS WITH MINIMUM 3⁄8" LETTER HEIGHT.</div><div>3. MAIN SERVICE DISCONNECT MARKING SHALL BE PLACED ADJACENT TO MAIN SERVICE DISCONNECT IN A LOCATION CLEARLY VISIBLE FROM THE LOCATION WHERE THE LEVER IS OPERATED.</div><div>4. MARKING IS REQUIRED ON ALL INTERIOR AND EXTERIOR DC CONDUIT, RACEWAYS, ENCLOSURES, CABLE ASSEMBLIES, AND JUNCTION BOXES TO ALERT THE FIRE SERVICE TO AVOID CUTTING THEM. MARKINGS SHALL BE PLACED EVERY 10', AT TURNS AND ABOVE AND/OR BELOW PENETRATIONS, AND AT ALL DC COMBINER AND JUNCTION BOXES.</div><div>5. DO NOT USE SCREWS FOR SIGNAGE ATTACHMENT. USE ONLY APPROVED ADHESIVE.</div></div>						

SUNPOWER®

CORPORATION, SYSTEMS
1414 HARBOUR WAY SOUTH
RICHMOND, CA 94804
(510) 540-0550
CA LICENSE #890895

JOHN HUGHES

10.46 kW GRID-TIED PHOTOVOLTAIC SYSTEM
10.08 kW MAX. OUTPUT POWER RATING

95 TOLLAND GREEN
TOLLAND, CONNECTICUT 6084

SOLAR INDIVIDUAL PERMIT PACKAGE
ELECTRICAL DATA & SPECIFICATIONS

REVISIONS				
REV	DESCRIPTION	DATE	DB	CB
1	ADDED ELEVATION VIEW	4.17.20	JB	TB

OPPORTUNITY	SPRI - CONNECTICUT
PROJECT	RP-109070
DATE DRAWN	03-30-2020
DRAWN BY	JBERNALES
DATE CHECKED	03-30-2020
CHECKED BY	TYLER BOSCHARD
SCALE	NTS

SHEET

PVE-3



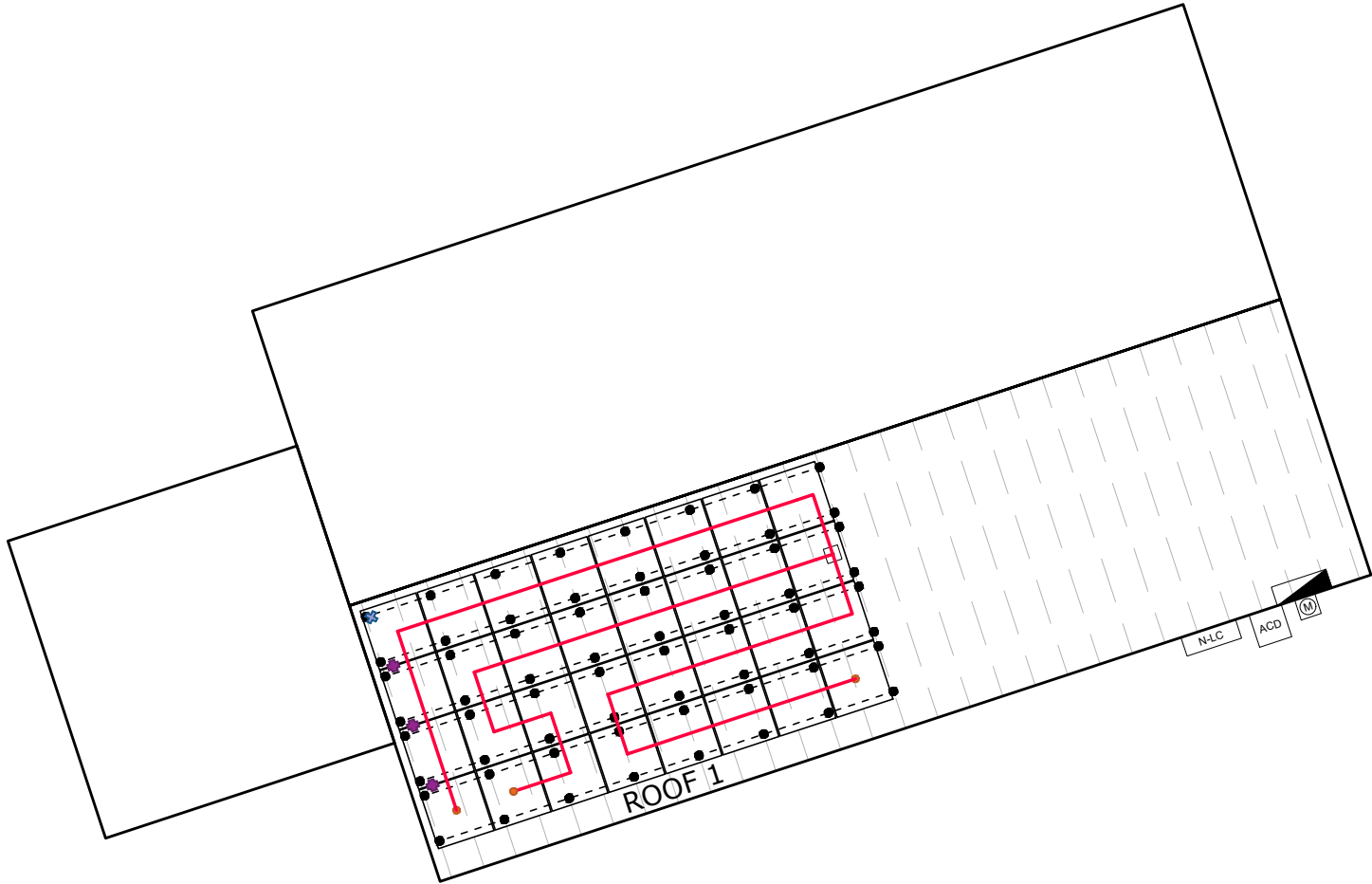
95 TOLLAND GREEN

FIGURE 2: PLACARD IDENTIFYING LOCATION OF DISCONNECTS AND POWER SOURCES

JOHN HUGHES	10.08 kW MAX. OUTPUT POWER RATING
95 TOLLAND GREEN	
TOLLAND, CONNECTICUT 06084	
SOLAR INDIVIDUAL PERMIT PACKAGE PLACARD / SUNPOWER EQUIP/NOX GROUNDING DETAILS	

REVISIONS				
REV	DESCRIPTION	DATE	DB	CB
1	ADDED ELEVATION VIEW	4.17.20	JB	TB

OPPORTUNITY	SPRI - CONNECTICUT
PROJECT	RP-109070
DATE DRAWN	03-30-2020
DRAWN BY	JBERNALES
DATE CHECKED	03-30-2020
CHECKED BY	TYLER BOSHARD
SCALE	NTS



INSTALLER NAME:

BRANCH VOLTAGES:

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

LEGEND & SYMBOLS:

JUNCTION BOX

GROUND LUG ASSEMBLY

R2R GROUNDING CLIP

TERMINATOR

SEALING CAP

FEMALE CONNECTOR

MALE CONNECTOR

RAW TRUNK CABLE

2.0 m. TRUNK CABLE

1.3 m. TRUNK CABLE

2.3 m. TRUNK CABLE

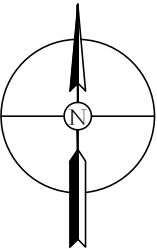
ONE CONNECTOR PER MODULE

EXISTING RAFTER

ROOF ATTACHMENT

RAIL

ROOF	1
MODULE QTY.	32
SYSTEM ORIENTATION	161
ROOF PITCH	12:12



SUNPOWER®

CORPORATION, SYSTEMS
1414 HARBOUR WAY SOUTH
RICHMOND, CA 94804
(510) 540-0550
CA LICENSE #890895

JOHN HUGHES

10.46 kW GRID-TIED PHOTOVOLTATIC SYSTEM
10.08 kW MAX. OUTPUT POWER RATING

95 TOLLAND GREEN
TOLLAND, CONNECTICUT 6084

SOLAR INDIVIDUAL PERMIT PACKAGE
BRANCH DIAGRAM

REVISIONS					
REV	DESCRIPTION	DATE	DB	CB	
1	ADDED ELEVATION VIEW	4.17.20	JB	TB	
OPPORTUNITY		SPRI - CONNECTICUT			
PROJECT		RP-109070			
DATE DRAWN		03-30-2020			
DRAWN BY		JBERNALES			
DATE CHECKED		03-30-2020			
CHECKED BY		TYLER BOSHARD			
SCALE		3/32" = 1'-0"			
SHEET		PVE-5			



State of Connecticut

Town of Tolland

21 Tolland Green, Tolland, CT 06084 Phone: (860) 871-3601



RECEIPT

Application for Building Permit

Application No: **TB-20-108**

Date Received:

4/3/2020

Job **95** **TOLLAND GREEN**
Location:

Contractor's Name: **SUNPOWER CORPORATION SYSTEMS**

Phone:

Contractor's Address: **1414 HARBOUR WAY S STE 1901**

City: **RICHMOND**

State: **CA** Zip Code: **948043606** State Lic. No: **HIC.0645870** E-Mail:

(Home)Owner's Name: **HUGHES JOHN P**

Phone: [REDACTED]

(Home)Owner's Address: **777 TOLLAND STAGE RD**

E-Mail:

Work Description: **Roof mounted solar. No structural upgrades. 10.46 kW, 32 modules**

Total Value Of Work To Be Performed: **8000.00**

Structure Size:	0.00	0.00	0.00
	Width	Depth	Area

I hereby swear and attest that I will require proof of workers' compensation insurance for every contractor, subcontractor, or other worker before he/she engages in work on the above property in accordance with the Workers' Compensation Act (Chapter 568).

I understand that pursuant to 31-275 C.G.S., officers of a corporation and partners in a partnership may elect to be excluded from coverage by filing a waiver with the appropriate District Office; and that a sole proprietor of a business is not required to have coverage unless he files his intent to accept coverage.

I hereby certify that I am the owner of the property which is the subject of this application or the authorized agent of the property owner and have been authorized to make this application. I understand that when a permit is issued, it is a permit to proceed and grants no right to violate the Connecticut State Building Code or any other code, ordinance or statute, regardless of what might be shown or omitted on the submitted plans and specifications. All information contained within is true and accurate to the best of my knowledge and belief.

All permits approved are subject to inspections performed by a representative of this office. Requests for inspections must be made at least 24 hours in advance.

Signed: **Jeff Schwartz**

4/3/2020

(860) 978-6046

Applicant

Date

Telephone No.

Estimated Construction Costs / Permit Fees

Total Project Cost :	8000.00	Payment Date	Amount Paid	Check No
Total Permit Fee:	135.00	4/3/2020	135.00	XXXX-XXXX-XXXX-4674
Total Permit Fee Paid:	135.00			

THIS IS NOT A PERMIT



State of Connecticut

Town of Tolland

21 Tolland Green, Tolland, CT 06084 Phone: (860) 871-3601



RECEIPT

Application for Electrical Permit

Permit No: **TE-20-68**

Date Received:

4/3/2020

Job Location: **95 TOLLAND GREEN**

Contractor's Name: **DARREN HANDLER**

Phone:

Contractor's Address: **18 WASHINGTON PL**

City: **NORTHPORT**

State: **NY** Zip Code: **117682936**

State Lic. No: **ELC.0203485-E1**

E-Mail:

(Home)Owner's Name: **HUGHES JOHN P**

Phone: [REDACTED]

(Home)Owner's Address: **777 TOLLAND STAGE RD**

E-Mail:

Work Description: **Roof mounted solar. 10.46 kW 32 modules**

FOR A SERVICE CHANGE, A HOMEOWNER CANNOT CUT & TAP. A CUT & TAP MUST BE DONE BY AN E-1 ELECTRICIAN WITH A PERMIT OR THE POWER COMPANY.

Total Value Of Work To Be Performed:

24000.00

Affidavit: I hereby certify that I am the owner of the property which is the subject of this application or the authorized agent of the property owner and have been authorized to make this application. I understand that when a permit is issued, it is a permit to proceed and grants no right to violate the Connecticut State Building Code or any other code, ordinance or statute, regardless of what might be shown or omitted on the submitted plans and specifications. All information contained within is true and accurate to the best of my knowledge and belief.

All permits approved are subject to inspections performed by a representative of this office. Requests for inspections must be made at least 24 hours in advance.

Signed:	Jeff Schwartz	4/3/2020	(860) 978-6046
	Applicant	Date	Telephone No.

Estimated Construction Costs / Permit Fees			
Total Project Cost :	\$24,000.00	Payment Date	Amount Paid
Total Permit Fee:	375.00	1/1/1900	375.00
Total Permit Fee Paid:	\$375.00		XXXX-XXXX-XXXX-4674

THIS IS NOT A PERMIT



CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)
11/01/2019

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an **ADDITIONAL INSURED**, the policy(ies) must have **ADDITIONAL INSURED** provisions or be endorsed. If **SUBROGATION IS WAIVED**, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER Marsh Risk & Insurance Services 1735 Technology Drive, Suite 790 San Jose, CA 95110	CONTACT NAME: PHONE (A/C, No, Ext): E-MAIL ADDRESS:	FAX (A/C, No):
CN102680983-STND-NH-19-20	INSURER(S) AFFORDING COVERAGE	
INSURED SunPower Corporation SunPower Corporation, Systems 1414 Harbour Way South, Suite 1901 Richmond, CA 94804	INSURER A: AXIS Specialty Europe SE- London Branch	NAIC #
	INSURER B: Hartford Fire Insurance Company	19682
	INSURER C: Steadfast Insurance Company	26387
	INSURER D:	
	INSURER E:	
	INSURER F:	

COVERAGES**CERTIFICATE NUMBER:**

SEA-00342222-61

REVISION NUMBER: 37

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL SUBR INSD WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
A	COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS-MADE <input checked="" type="checkbox"/> OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: <input checked="" type="checkbox"/> POLICY <input type="checkbox"/> PRO-JECT <input type="checkbox"/> LOC OTHER:		3788080119ES	11/01/2019	11/01/2020	EACH OCCURRENCE \$ 2,000,000 DAMAGE TO RENTED PREMISES (Ea occurrence) \$ 1,000,000 MED EXP (Any one person) \$ 10,000 PERSONAL & ADV INJURY \$ 2,000,000 GENERAL AGGREGATE \$ 4,000,000 PRODUCTS - COMP/OP AGG \$ 2,000,000 \$
B	AUTOMOBILE LIABILITY <input checked="" type="checkbox"/> ANY AUTO <input type="checkbox"/> OWNED AUTOS ONLY <input checked="" type="checkbox"/> SCHEDULED AUTOS <input checked="" type="checkbox"/> HIRED AUTOS ONLY <input checked="" type="checkbox"/> NON-OWNED AUTOS ONLY		57 UEL WQ0014 (AOS) 57 AB WQ0017 (HI)	11/01/2019 11/01/2019	11/01/2020 11/01/2020	COMBINED SINGLE LIMIT (Ea accident) \$ 1,000,000 BODILY INJURY (Per person) \$ BODILY INJURY (Per accident) \$ PROPERTY DAMAGE (Per accident) \$ \$
A	UMBRELLA LIAB <input checked="" type="checkbox"/> OCCUR EXCESS LIAB <input type="checkbox"/> CLAIMS-MADE DED <input type="checkbox"/> RETENTION \$		3788080219ES	11/01/2019	11/01/2020	EACH OCCURRENCE \$ 5,000,000 AGGREGATE \$ 5,000,000 \$
B	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	Y/N <input checked="" type="checkbox"/> N	57 WV WQ0015	11/01/2019	11/01/2020	<input checked="" type="checkbox"/> PER STATUTE <input type="checkbox"/> OTH-ER E.L. EACH ACCIDENT \$ 1,000,000 E.L. DISEASE - EA EMPLOYEE \$ 1,000,000 E.L. DISEASE - POLICY LIMIT \$ 1,000,000
C	E&O/Pollution Liability SIR Value: \$500,000		EOC 9819934 - 04	11/01/2018	01/01/2020	PER CLAIM: 1,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)
Evidence of Insurance

CERTIFICATE HOLDER**CANCELLATION**

SunPower Corporation
SunPower Corporation Systems
1414 Harbour Way South, Suite 1901
Richmond, CA 94804

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE
of Marsh Risk & Insurance Services

Lisa De Costa

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**STATE OF CONNECTICUT
DEPARTMENT OF CONSUMER PROTECTION**

450 Columbus Boulevard ♦ Hartford Connecticut 06103

Attached is your Home Improvement Contractor registration. This registration is not transferable. The Department of Consumer Protection must be notified of any changes to your registration within thirty (30) days of such change. Questions regarding this registration can be directed to the License Services Division at (860) 713-6000 or email dcp.licenseservices@ct.gov.

In an effort to be more efficient and Go Green, the department asks that you keep your email information with our office current to receive correspondence. You can access your account at www.elicense.ct.gov to verify, add or change your email address.

Visit our web site at www.ct.gov/dcp to verify registrations, download applications and the booklet for The Connecticut Contractor for Home Improvement and New Home Construction.

SUNPOWER CORPORATION SYSTEMS
1414 HARBOUR WAY S STE 1901
RICHMOND, CA 94804-3606

**STATE OF CONNECTICUT
DEPARTMENT OF CONSUMER PROTECTION****HOME IMPROVEMENT CONTRACTOR**

SUNPOWER CORPORATION SYSTEMS
1414 HARBOUR WAY S STE 1901
RICHMOND, CA 94804-3606

Registration #	Effective	Expiration
HIC.0645870	12/01/2019	11/30/2020
SIGNED	<i>Michelle Seagull</i>	

STATE OF CONNECTICUT ♦ DEPARTMENT OF CONSUMER PROTECTION

Be it known that

SUNPOWER CORPORATION SYSTEMS**1414 HARBOUR WAY S STE 1901****RICHMOND, CA 94804-3606**

has satisfied the qualifications required by law and is hereby registered as a

HOME IMPROVEMENT CONTRACTOR**Registration # HIC.0645870****Effective: 12/01/2019****Expiration: 11/30/2020***Michelle Seagull*

Michelle Seagull, Commissioner

STATE OF CONNECTICUT
DEPARTMENT OF CONSUMER PROTECTION

ELECTRICAL UNLIMITED CONTRACTOR

DARREN HANDLER
18 WASHINGTON PL
NORTHPORT, NY 11768-2936

License #	Effective	Expiration
ELC.0203485-E1	10/01/2019	09/30/2020

SIGNED

Darren Handler

STATE OF CONNECTICUT ♦ DEPARTMENT OF CONSUMER PROTECTION

Be it known that

DARREN HANDLER
18 WASHINGTON PL
NORTHPORT, NY 11768-2936

has been certified by the Department of Consumer Protection as a licensed

ELECTRICAL UNLIMITED CONTRACTOR

License # ELC.0203485-E1

Effective: 10/01/2019

Expiration: 09/30/2020

Michelle Sengul
Michelle Sengul, Commissioner

SUNPOWER®

50 Rockwell Rd.

Newington, CT 06111

Darren Handler

18 Washington Place

Northport, NY 11768

631-793-0889

darren.handler@sunpowercorp.com

April 3, 2020

Building Department:

Please be advised that I, Darren Handler, Electrical Contractor for SunPower Corporation, Systems, am designating Jeff Schwartz, Tylon George, and Marilu Medina, SunPower Corporation representatives, as the authorized persons to file for and or obtain an electrical permit on my behalf. The specifications are as follows:

95 Tolland Green
Tolland, CT 06084

Description:

Grid tied PV solar panel installation with meter can replacement

The starting date of this job is to be determined by the approval date of the permit.



Darren Handler

ELC.0203485-E1

SUNPOWER™

3/31/2020

Subject: Structural Certification for Installation of Residential Solar

Client: JOHN HUGHES

Address: 95 TOLLAND GREEN, TOLLAND, CONNECTICUT 6084

Attn.: To Whom It May Concern

A field observation was performed to document the existing framing of the above mentioned address. From the field observation, the existing roof structure was observed as:

ROOF 1: Comp Shingle roofing over roof plywood supported by 2x6 Rafter @ 24" OC. The roof is sloped at approximately 45 degrees and has a max beam span of 8.9 ft between supports.

Design Criteria:

Code:	2018 Connecticut State Building Code (ASCE 7-10)
Ult Wind Speed:	125 mph
Exposure Cat:	B
Ground Snow:	30 psf

After review of the field observation report and based on our structural capacity calculations in accordance with applicable building codes, the existing roof framing supporting the proposed solar panel layout has been determined to be:

ROOF 1: adequate to support the imposed loads. Therefore, no structural upgrades are required.

If you have any questions on the above, please do not hesitate to call.

Sincerely,
Heinrich A. Villanueva, PE



Heinrich A
Villanueva

Digitally signed by Heinrich
A Villanueva
Date: 2020.03.31 21:18:14
-07'00'

SOLAR INDIVIDUAL PERMIT PACKAGE

JOHN HUGHES

10.46 kW GRID-TIED PHOTOVOLTAIC SYSTEM

AC MAX. CONTINUOUS POWER RATING OF (32) SPR-E20-327-E-AC = 32 x 315W = 10.08 kW
GENERATOR NAMEPLATE KVAR RATING = 3.20 KVAR

[REDACTED]

95 TOLLAND GREEN
TOLLAND, CONNECTICUT 6084

AHJ: TOLLAND
UTILITY: EVERSOURCE ENERGY (FORMERLY CONNECTICUT LIGHT & POWER CO)

JOB NOTES

CODE INFORMATION

APPLICABLE CODES, LAWS AND REGULATIONS

2018 CSBC ADOPT THE FOLLOWING CODES:
2015 IBC (INTERNATIONAL BUILDING CODE)
2015 IEBC (INTERNATIONAL EXISTING BUILDING CODE)
2015 IMC (INTERNATIONAL MECHANICAL CODE)
2015 IPC (INTERNATIONAL PLUMBING CODE)
2015 IRC (INTERNATIONAL RESIDENTIAL CODE)
2015 IECC (INTERNATIONAL ENERGY CONSERVATION CODE)
2017 NEC (NATIONAL ELECTRIC CODE NFPA70)
2009 ICC A117.1 ACCESSIBLE & USABLE BUILDING & FACILITIES

SATELLITE IMAGE



SHEET INDEX

PV SOLAR ARCHITECTURAL DRAWINGS

- PVA-0COVER SHEET
- PVA-1ARRAY LAYOUT

PV SOLAR STRUCTURAL DRAWINGS

- PVS-1MOUNTING DETAILS

PV SOLAR ELECTRICAL DRAWINGS

- PVE-1ELECTRICAL SINGLE-LINE DIAGRAM & SPECIFICATIONS
- PVE-2ELECTRICAL CALCULATION
- PVE-3ELECTRICAL DATA & SPECIFICATIONS
- PVE-4PLACARD / EQUINOX GROUNDING DETAILS
- PVE-5BRANCH DIAGRAM

SUNPOWER®

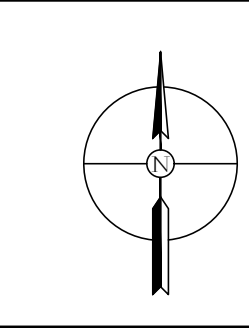
CORPORATION, SYSTEMS
1414 HARBOUR WAY SOUTH
RICHMOND, CA 94804
(510) 540-0550
CA LICENSE #890895









JOHN HUGHES
10.46 kW GRID-TIED PHOTOVOLTAIC SYSTEM
10.08 kW MAX. OUTPUT POWER RATING

95 TOLLAND GREEN
TOLLAND, CONNECTICUT 6084

SOLAR INDIVIDUAL PERMIT PACKAGE
COVER SHEET

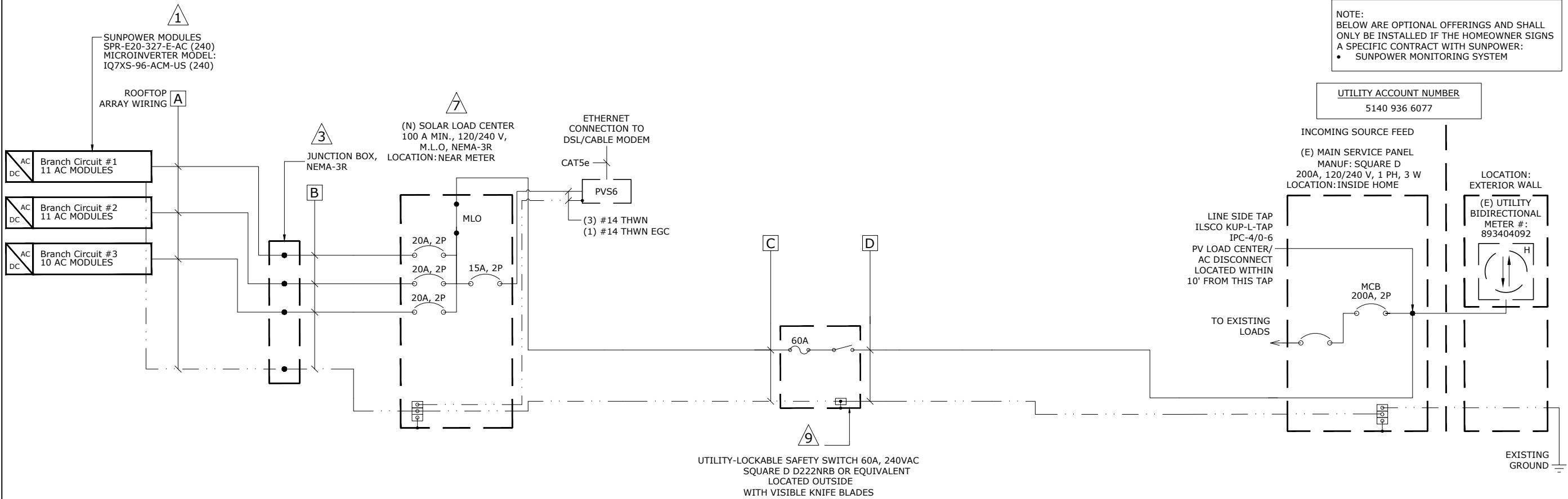
REVISIONS				
REV	DESCRIPTION	DATE	DB	CB
OPPORTUNITY		SPRI - CONNECTICUT		
PROJECT		RP-109070		
DATE DRAWN		03-30-2020		
DRAWN BY		JBERNALES		
DATE CHECKED		03-30-2020		
CHECKED BY		TYLER BOSHARD		
SCALE		NTS		
SHEET		PVA-0		



LEGEND	
	JUNCTION BOX
	CONDUIT
	EXISTING SERVICE POINT
	EXISTING UTILITY METER
	PROPERTY LINE
	NEW LOAD CENTER
	AC DISCONNECT
	3' WIDE ACCESS PATH
<p>NOTE:</p> <p>1. FIELD ADJUSTMENTS OF FEWER THAN 6" MAY BE ALLOWED BASED ON SITE CONDITIONS AND MEASUREMENTS.</p>	

UTILITY ACCOUNT NUMBER	5140 936 6077
CONTRACT MODULE & QUANTITY	SPR-E20-327-E-AC (240) (32)
MICROINVERTER TYPE & QUANTITY	IQ7XS-96-ACM-US (240)(32)
ROOF TYPE	COMPOSITION
ROOF ATTACHMENT QUANTITY	64
STORY HOME TYPE	1 - STORY
SYSTEM ORIENTATION	161°
ROOF PITCH	12:12
TOTAL ARRAY AREA	573 SQ.FT.

FIGURE A: SINGLE LINE DIAGRAM - 10.46 kW



TAG	DESCRIPTION		CONDUCTOR / CONDUIT SCHEDULE						ELECTRICAL NOTES	
1	SOLAR AC MODULE / BRANCH	ACM	TAG	DESCRIPTION & CONDUCTOR TYPE	CONDUCTOR SIZE (AWG)	NUMBER OF CONDUCTORS	CONDUIT/CABLE TYPE	CONDUIT SIZE	<div>1. PROPER LISTING EXPECTED FOR CONDITIONS OF USE ON ALL LUGS, FITTINGS, CRIMPS, ETC.</div> <div>2. ALL CONDUIT BEND RADII TO CONFORM TO THE NEC MINIMUM BEND RADII REQUIREMENTS.</div> <div>3. MINIMUM CLEARANCE SHALL BE MAINTAINED PER NEC FOR ALL NEW EQUIPMENT TO BE INSTALLED.</div> <div>4. EXISTING GROUNDING ELECTRODE SYSTEM MUST MEET NEC AND LOCAL UTILITY REQUIREMENTS.</div> <div>5. COPPER CONDUCTORS SHALL BE USED UNLESS SPECIFIED.</div> <div>6. TYPE NM (ROMEX) CONDUCTORS ARE ALLOWED FOR INTERNAL AND ATTIC RUNS AND SHALL BE INSTALLED MEETING NEC REQUIREMENTS.</div> <div>7. IF MAIN SERVICE PANEL IS TO BE UPGRADED, IT WILL BE PERMITTED AND INSTALLED BY 3RD PARTY.</div> <div>8. AC WIRING SHALL UPSIZE IF VOLTAGE DROP EXCEEDS 2%.</div> <div>9. RUN CONDUCTORS IN EXISTING CONDUIT WHEN AVAILABLE PROVIDED IT HAS NO OTHER CONDUCTORS RUNNING THROUGH IT.</div> <div>10. EQUIVALENT SPECIFICATION ON CABLES AND ELECTRICAL EQUIPMENT SPECIFIED ARE ACCEPTABLE.</div> <div>11. AS DC POWER IS INTERNAL TO THE MODULE, GROUNDING ELECTRODE CONDUCTOR (GEC) FOR THE MODULE OR ARRAY IS NOT REQUIRED.</div>	
2	DC / DC CONVERTERS	NO								
3	SOURCE CIRCUIT JUNCTION BOX	YES	A	SUNPOWER PROVIDED AC MODULES EXTENSION CABLE, LISTED AS AN ASSEMBLY	#12	2	BRANCH CIRCUIT FROM PV ARRAY TO JUNCTION BOX	--		
4	SEPARATE DC DISCONNECT	NO		EGC: BARE Cu	#6	1				
5	INTERNAL INVERTER DC DISCONNECT	NO	B	THWN-2	#10	6	EMT	3/4"		
6	STRING INVERTER	NO		EGC: THWN-2	#10	1				
7	SOLAR LOAD CENTER	YES	C	THWN-2	#8	3	EMT	3/4"		
8	PV PRODUCTION METER	NO		EGC: THWN-2	#10	1				
9	SEPARATE AC DISCONNECT	YES	D	THWN-2	#6	3	EMT	3/4"		
<div>CHECK BOX FOR WHETHER SYSTEM IS GROUNDED OR UNGROUNDED: <input type="checkbox"/> GROUNDED (INCLUDE GEC) <input checked="" type="checkbox"/> UNGROUNDED</div> <div>FOR UNGROUNDED SYSTEMS:</div> <div><div>• DC OCPD DISCONNECT BOTH CONDUCTORS OF EACH SOURCE CIRCUIT.</div><div>• UNGROUNDED CONDUCTORS MUST BE IDENTIFIED PER 210.5(C). WHITE FINISHED CONDUCTORS ARE NOT PERMITTED.</div></div>				EGC: THWN-2	#8	1				
AC MODULES NOTES										
<div>1. DC CIRCUIT IS ISOLATED AND INSULATED FROM GROUND AND MEETS THE REQUIREMENT OF NEC 690.35.</div> <div>2. SUNPOWER PROVIDED CABLES COMES WITH TWO (2) #12 AWG WIRE AND THIS IS BY DESIGN. NEUTRAL AND ADDITIONAL GROUND WIRE IS NOT REQUIRED FOR PROVIDED TRUNK AND EXTENSION CABLES.</div> <div>3. SUNPOWER AC MODULES HAVE BEEN TESTED AND CERTIFIED TO UL 2703 FOR INTEGRATED GROUNDING AND HENCE A SEPARATE GROUND WIRE IS NOT REQUIRED WITHIN THE ARRAY.</div> <div>4. USE ROW-TO-ROW GROUNDING CLIP PROVIDED TO GROUND ROWS OF MODULE. BOND SUB-ARRAYS BY RUNNING #6 AWG BARE CU WIRE AND GROUND LUGS AT A SINGLE POINT ON EACH SUB-ARRAY AND THEN TO THE JUNCTION BOX. REFER TO PVE-4 FOR ADDITIONAL DETAILS.</div>										

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JOHN HUGHES

10.46 kW GRID-TIED PHOTOVOLTATIC SYSTEM
10.08 kW MAX. OUTPUT POWER RATING

95 TOLLAND GREEN
TOLLAND, CONNECTICUT 6084

SOLAR INDIVIDUAL PERMIT PACKAGE
ELECTRICAL SINGLE-LINE DIAGRAM
& SPECIFICATIONS

REVISIONS

REV	DESCRIPTION	DATE	DB	CB

OPPORTUNITY	SPRI - CONNECTICUT
PROJECT	RP-109070
DATE DRAWN	03-30-2020
DRAWN BY	JBERNALES
DATE CHECKED	03-30-2020
CHECKED BY	TYLER BOSHARD
SCALE	NTS

SHEET

PVE-1

SUBPANEL TO GRID-TIE WIRING	#8
VOLTAGE	240 V
SUM OF BRANCHES: I _{OUT_TOTAL} =	41.92 A
MINIMUM WIRE AMPACITY: I _{MAX} = IOUT x 1.25	52.40 A
CONDUCTOR DE-RATING	
MAXIMUM AMBIENT TEMPERATURE	33°C
TEMPERATURE USED FOR AMPACITY DE-RATING	33°C
TEMPERATURE DE-RATING COEFFICIENT	0.96
FILL DE-RATING COEFFICIENT	1
I _{WIREMIN} = I _{MAX} / TEMP_COEFF / FILL_COEFF	54.58 A
WIRE SIZE AMPACITY	55A
CONDUCTOR SIZE	#8
CONDUCTOR SIZE ADJUSTED FOR VOLTAGE DROP	#8
ONE WAY CIRCUIT LENGTH	10 FT.
VOLTAGE DROP	1.27%
OVERCURRENT PROTECTION	60A, 2P
MINIMUM OCPD = I _{OUT} x 1.25	52.40 A

	BRANCH 1	BRANCH 2	BRANCH 3
ROOF JCT BOX TO SUBPANEL WIRING	#10	#10	#10
NUMBER OF MODULES	11	11	10
VOLTAGE	240 V	240 V	240 V
RATED AC OUTPUT CURRENT: I _{OUT} =	14.41 A	14.41 A	13.10 A
MINIMUM WIRE AMPACITY: I _{MAX} = I _{OUT} x 1.25	18.01 A	18.01 A	16.38 A
CONDUCTOR DE-RATING			
MAXIMUM AMBIENT TEMPERATURE	33°C	33°C	33°C
TEMPERATURE ADDER	22°C	22°C	22°C
TEMPERATURE USED FOR AMPACITY DE-RATING	55°C	55°C	55°C
TEMPERATURE DE-RATING COEFFICIENT	0.76	0.76	0.76
FILL DE-RATING COEFFICIENT	0.80	0.80	0.80
I _{WIREMIN} = I _{MAX} / TEMP_COEFF / FILL_COEFF	29.63 A	29.63 A	26.93 A
WIRE SIZE AMPACITY	40 A	40 A	40 A
CONDUCTOR SIZE	#10	#10	#10
CONDUCTOR SIZE ADJUSTED FOR VOLTAGE DROP	#10	#10	#10
ONE WAY CIRCUIT LENGTH	85 FT.	85 FT.	85 FT.
CALCULATED VOLTAGE DROP	1.27%	1.27%	1.15%
OVERCURRENT PROTECTION	20A, 2P	20A, 2P	20A, 2P
MINIMUM OCPD = I _{OUT} x 1.25	18.01 A	18.01 A	16.38 A

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ELECTRICAL CALCULATION

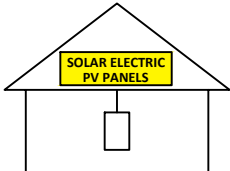
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SCALE	NTS

SHEET

PVE-2

ELECTRICAL DATA & SPECIFICATIONS									
<div><div>PHOTOVOLTAIC POINT OF INTERCONNECTION</div><div>WARNING: DUAL POWER SOURCE. SECOND SOURCE IS PHOTOVOLTAIC SYSTEM</div><table><tr><td>MAXIMUM RATED AC OUTPUT CURRENT:</td><td>41.92 A</td><td>AMPS</td></tr><tr><td>MAXIMUM OPERATING AC VOLTAGE:</td><td>240 V</td><td>VOLTS</td></tr></table><div>SIGNAGE LOCATIONS:</div><ul style="list-style-type: none">MAIN SERVICE PANELINDOOR / OUTDOOR SUBPANEL</div>	MAXIMUM RATED AC OUTPUT CURRENT:	41.92 A	AMPS	MAXIMUM OPERATING AC VOLTAGE:	240 V	VOLTS	<div><div>PHOTOVOLTAIC SYSTEM EQUIPPED WITH RAPID SHUTDOWN</div><div>SIGNAGE LOCATIONS:</div><ul style="list-style-type: none">MAIN SERVICE PANEL<div><div>PV SOLAR BREAKER</div><div>DO NOT RELOCATE THIS OVERCURRENT DEVICE</div><div>SIGNAGE LOCATIONS:</div><ul style="list-style-type: none">MAIN SERVICE PANELNEW INDOOR / OUTDOOR LOAD CENTERINDOOR / OUTDOOR SUBPANEL</div></div>	<div><div>RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM</div><div>SIGNAGE LOCATIONS:</div><ul style="list-style-type: none">LABEL SHALL BE LOCATED ON OR NO MORE THAN 1M (3FT) FROM THE SWITCH</div>	
MAXIMUM RATED AC OUTPUT CURRENT:	41.92 A	AMPS							
MAXIMUM OPERATING AC VOLTAGE:	240 V	VOLTS							
<div><div>SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN</div><div><div>TURN RAPID SHUTDOWN SWITCH TO THE "OFF" POSITION TO SHUT DOWN AND REDUCE SHOCK HAZARD IN THE ARRAY</div><div></div></div><div>SIGNAGE LOCATIONS:</div><ul style="list-style-type: none">SHALL BE LOCATED ON OR NO MORE THAN 1 M (3 FT) FROM THE SERVICE DISCONNECTING MEANS TO WHICH THE PV SYSTEMS ARE CONNECTED.</div>	<div><div>PHOTOVOLTAIC SYSTEM AC DISCONNECT</div><table><tr><td>RATED AC OUTPUT CURRENT:</td><td>41.92 A</td><td>AMPS</td></tr><tr><td>NOMINAL OPERATING AC VOLTAGE:</td><td>240 V</td><td>VOLTS</td></tr></table><div>SIGNAGE LOCATIONS:</div><ul style="list-style-type: none">INDOOR / OUTDOOR AC DISCONNECT</div>	RATED AC OUTPUT CURRENT:	41.92 A	AMPS	NOMINAL OPERATING AC VOLTAGE:	240 V	VOLTS		
RATED AC OUTPUT CURRENT:	41.92 A	AMPS							
NOMINAL OPERATING AC VOLTAGE:	240 V	VOLTS							
			<div>SIGNAGE NOTES</div> <div>1. MATERIAL USED FOR THE SIGNAGE SHALL BE REFLECTIVE, WEATHER RESISTANT AND SUITABLE FOR THE ENVIRONMENT.</div> <div>2. ALL SIGNAGE SHALL HAVE ALL CAPITAL LETTERS WITH MINIMUM 3⁄8" LETTER HEIGHT.</div> <div>3. MAIN SERVICE DISCONNECT MARKING SHALL BE PLACED ADJACENT TO MAIN SERVICE DISCONNECT IN A LOCATION CLEARLY VISIBLE FROM THE LOCATION WHERE THE LEVER IS OPERATED.</div> <div>4. MARKING IS REQUIRED ON ALL INTERIOR AND EXTERIOR DC CONDUIT, RACEWAYS, ENCLOSURES, CABLE ASSEMBLIES, AND JUNCTION BOXES TO ALERT THE FIRE SERVICE TO AVOID CUTTING THEM. MARKINGS SHALL BE PLACED EVERY 10', AT TURNS AND ABOVE AND/OR BELOW PENETRATIONS, AND AT ALL DC COMBINER AND JUNCTION BOXES.</div> <div>5. DO NOT USE SCREWS FOR SIGNAGE ATTACHMENT. USE ONLY APPROVED ADHESIVE.</div>						

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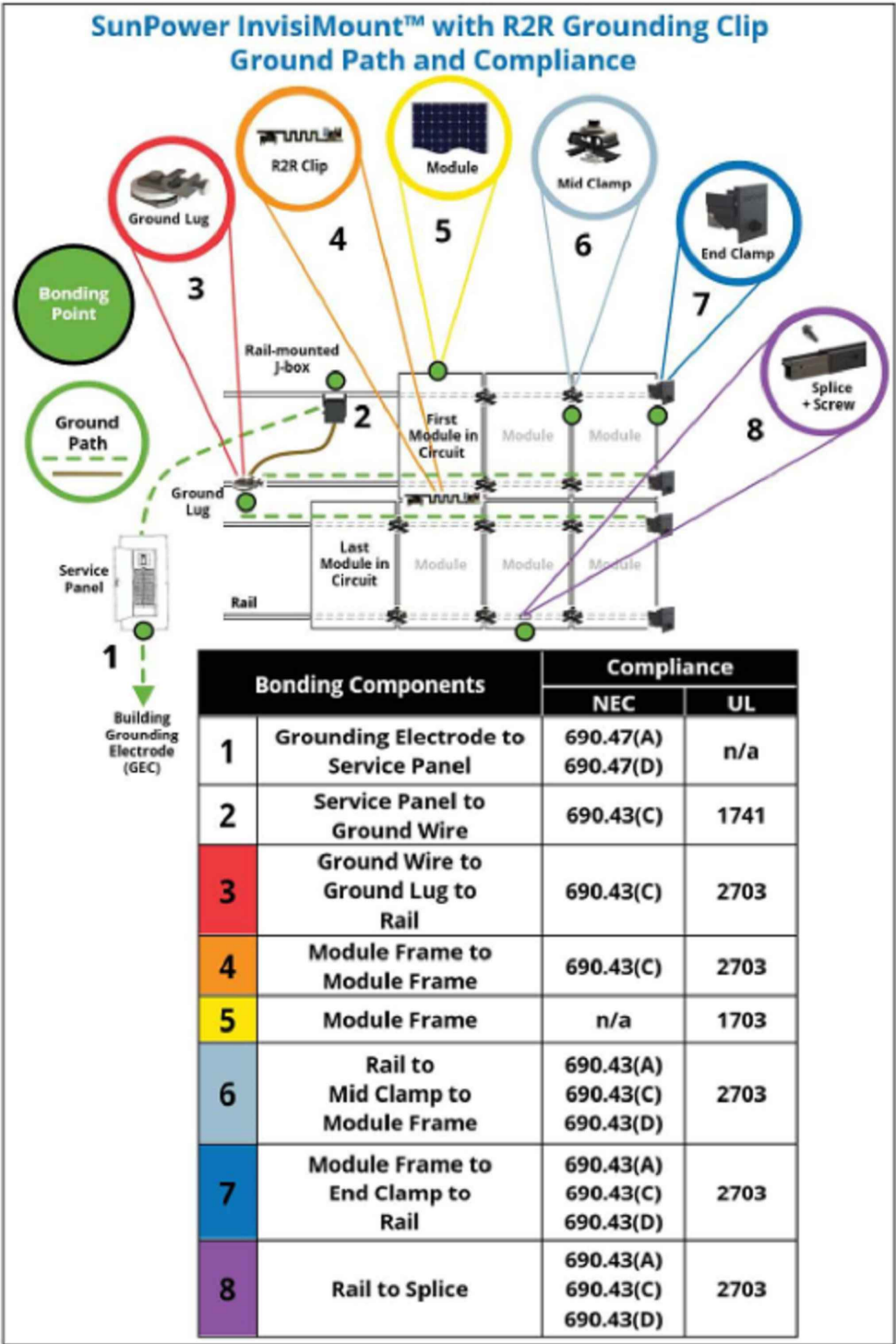
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ELECTRICAL DATA & SPECIFICATIONS

REVISIONS				
REV	DESCRIPTION	DATE	DB	CB

OPPORTUNITY	SPRI - CONNECTICUT
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DRAWN BY	JBERNALES
DATE CHECKED	03-30-2020
CHECKED BY	TYLER BOSCHARD
SCALE	NTS

SHEET

PVE-3



Document #508988 Rev1

15

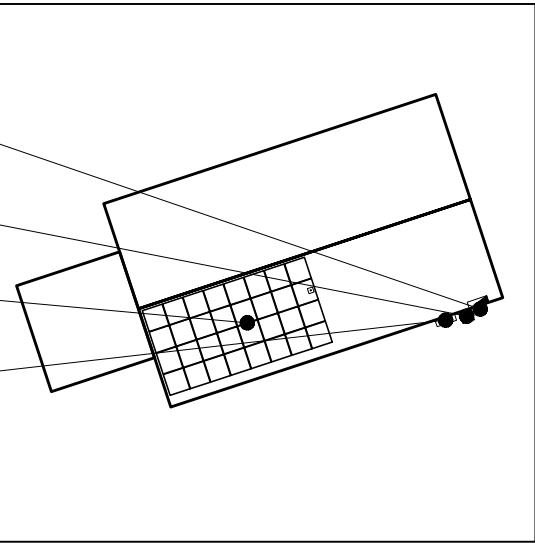
SunPower Proprietary

FIGURE 1: SUNPOWER EQUINOX GROUNDING DETAILS

CAUTION:

POWER TO THIS BUILDING IS ALSO SUPPLIED FROM THE FOLLOWING SOURCES WITH DISCONNECT(S) LOCATED AS SHOWN:

SERVICE POINT & UTILITY METERING
AC DISCONNECT
PHOTOVOLTAIC ARRAY ON ROOF
SOLAR LOAD CENTER



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FIGURE 2: PLACARD IDENTIFYING LOCATION OF DISCONNECTS AND POWER SOURCES

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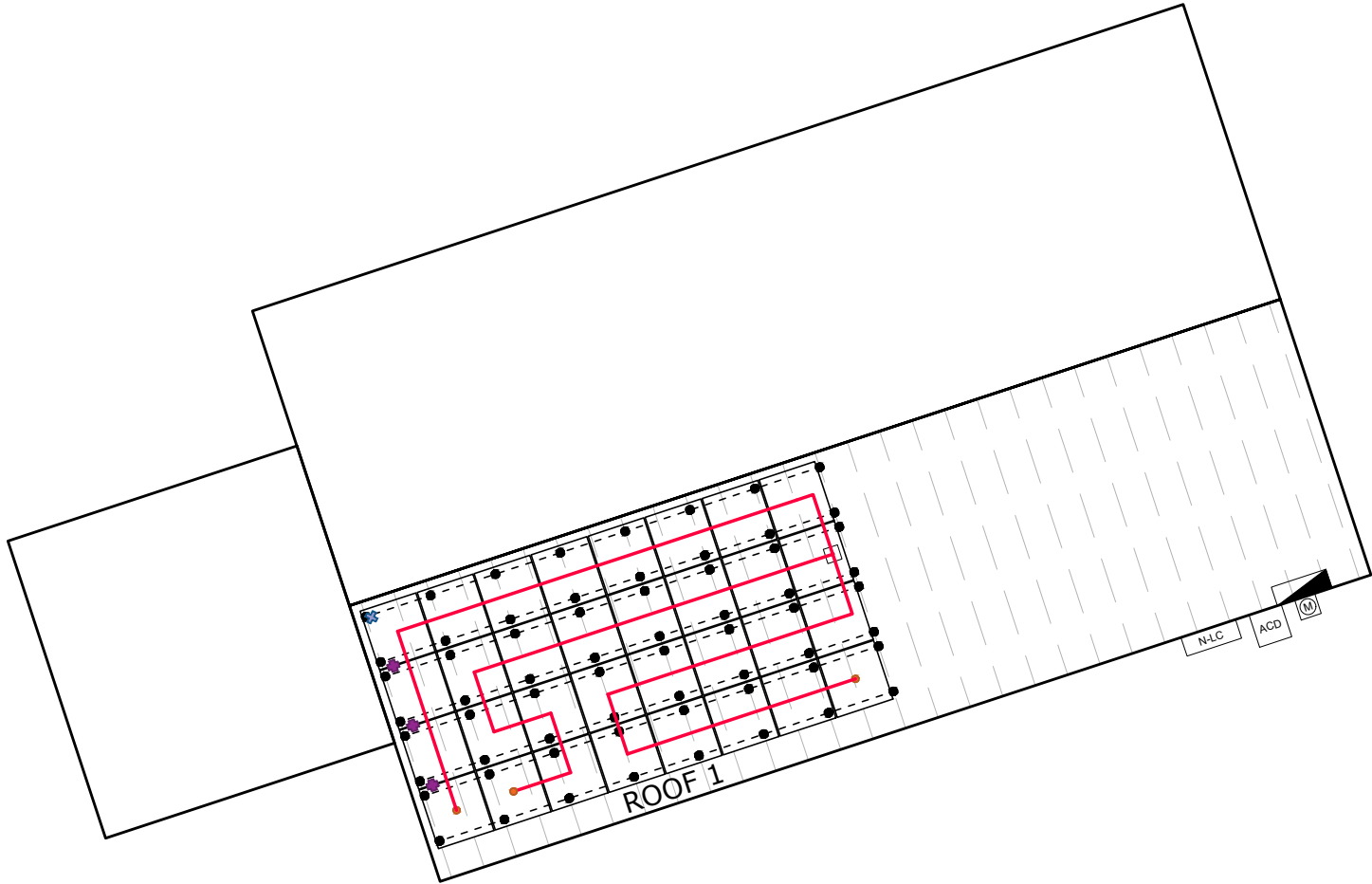
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PLACARD / SUNPOWER EQUINOX
GROUNDING DETAILS

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SCALE	NTS
SHEET	

PVE-4



INSTALLER NAME:

BRANCH VOLTAGES:

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

LEGEND & SYMBOLS:

JUNCTION BOX

GROUND LUG ASSEMBLY

R2R GROUNDING CLIP

TERMINATOR

SEALING CAP

FEMALE CONNECTOR

MALE CONNECTOR

RAW TRUNK CABLE

2.0 m. TRUNK CABLE

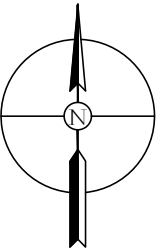
1.3 m. TRUNK CABLE

2.3 m. TRUNK CABLE

ONE CONNECTOR
PER MODULE

EXISTING RAFTERROOF ATTACHMENTRAIL

ROOF	1
MODULE QTY.	32
SYSTEM ORIENTATION	161
ROOF PITCH	12:12



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SOLAR INDIVIDUAL PERMIT PACKAGE
BRANCH DIAGRAM

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DATE CHECKED		03-30-2020		
CHECKED BY		TYLER BOSHARD		
SCALE		3/32" = 1'-0"		
SHEET		PVE-5		

X-Series: E20-327 | E19-320 SunPower® Residential AC Module

AC Electrical Data		
Inverter Model: Enphase IQ 7XS (IQ7XS-96-ACM-US)	@240 VAC	@208 VAC
Peak Output Power	320 VA	320 VA
Max. Continuous Output Power	315 VA	315 VA
Nom. (L-L) Voltage/Range² (V)	240 / 211–264	208 / 183–229
Max. Continuous Output Current (A)	1.31	1.51
Max. Units per 20 A (LL) Branch Circuit³	12 (single phase)	10 (two pole) wye
CEC Weighted Efficiency	97.5%	97.0%
Nom. Frequency	60 Hz	
Extended Frequency Range	47–68 Hz	
AC Short Circuit Fault Current Over 3 Cycles	5.8 A rms	
Overvoltage Class AC Port	III	
AC Port Backfeed Current	18 mA	
Power Factor Setting	1.0	
Power Factor (adjustable)	0.7 lead. / 0.7 lag.	
No active phase balancing for three-phase installations		

DC Power Data		
	SPR-E20-327-E-AC	SPR-E19-320-E-AC
Nom. Power ⁵ (P _{nom})	327 W	320 W
Power Tol.	+5/–0%	+5/–0%
Module Efficiency	20.4%	19.9%
Temp. Coef. (Power)	–0.35%/°C	–0.35%/°C
Shade Tol.	• Three bypass diodes • Integrated module-level maximum power point tracking	

Tested Operating Conditions	
Operating Temp.	–40°F to +185°F (–40°C to +85°C)
Max. Ambient Temp.	122°F (50°C)
Max. Load	Wind: 62 psf, 3000 Pa, 305 kg/m² front & back Snow: 125 psf, 6000 Pa, 611 kg/m² front
Impact Resistance	1 inch (25 mm) diameter hail at 52 mph (23 m/s)

Mechanical Data	
Solar Cells	96 Monocrystalline Maxeon Gen III
Front Glass	High-transmission tempered glass with anti-reflective coating
Environmental Rating	Outdoor rated
Frame	Class 1 black anodized (highest AAMA rating)
Weight	42.9 lbs (19.5 kg)
Recommended Max. Module Spacing	1.3 in. (33 mm)

1 SunPower 360 W compared to a conventional module on same-sized arrays (260 W, 16% efficient, approx. 1.6 m²), 4% more energy per watt (based on third-party module characterization and PVSIM), 0.75%/yr slower degradation (Campeau, Z. et al. "SunPower Module Degradation Rate," SunPower white paper, 2013).

2 Based on search of datasheet values from websites of top 10 manufacturers per IHS, as of January 2017.

3 #1 rank in "Fraunhofer PV Durability Initiative for Solar Modules: Part 3." PVTech Power Magazine, 2015. Campeau, Z. et al. "SunPower Module Degradation Rate," SunPower white paper, 2013.

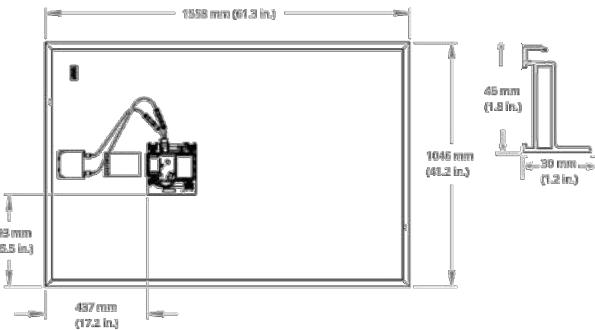
4 Factory set to 1547a-2014 default settings. CA Rule 21 default settings profile set during commissioning. See the Equinox Installation Guide #518101 for more information.

5 Standard Test Conditions (1000 W/m² irradiance, AM 1.5, 25°C), NREL calibration standard: SOMS current, LACCS FF and voltage. All DC voltage is fully contained within the module.

6 This product is UL Listed as PVRE and conforms with NEC 2014 and NEC 2017 690.12; and C22.1-2015 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors; when installed according to manufacturer's instructions.

See www.sunpower.com/facts for more reference information. For more details, see extended datasheet www.sunpower.com/datasheets. Specifications included in this datasheet are subject to change without notice. ©2018 SunPower Corporation. All Rights Reserved. SUNPOWER, the SUNPOWER logo and MAXEON are registered trademarks of SunPower Corporation in the U.S. and other countries as well. 1-800-SUNPOWER.

Warranties, Certifications, and Compliance	
Warranties	• 25-year limited power warranty • 25-year limited product warranty
Certifications and Compliance	• UL 1703 • UL 1741 / IEEE-1547 • UL 1741 AC Module (Type 2 fire rated) • UL 62109-1 / IEC 62109-2 • FCC Part 15 Class B • ICES-0003 Class B • CAN/CSA-C22.2 NO. 107.1-01 • CA Rule 21 (UL 1741 SA) ⁴ (includes Volt/Var and Reactive Power Priority) • UL Listed PV Rapid Shutdown Equipment ⁶
Enables installation in accordance with:	
• NEC 690.6 (AC module) • NEC 690.12 Rapid Shutdown (inside and outside the array) • NEC 690.15 AC Connectors, 690.33(A)–(E)(1)	
When used with InvisiMount racking and InvisiMount accessories (UL 2703):	
• Module grounding and bonding through InvisiMount • Class A fire rated	
When used with AC module Q Cables and accessories (UL 6703 and UL 2238) ⁴ :	
• Rated for load break disconnect	
PID Test	Potential-induced degradation free





AC MODULE
CUL600P/SPR1703
ULTRACON
PV RAPID SHUTDOWN
EQUIPMENT
E478330

Module Fire Performance: Type 2



531948 RevA

Please read the Safety and Installation Instructions for details.

sunpower.com

CERTIFICATE OF COMPLIANCE

Certificate Number 20180922-E478330
Report Reference E478330-20180919
Issue Date 2018-SEPTEMBER-22

Issued to: SUNPOWER CORP
77 RIO ROBLES
SAN JOSE CA 95134-1859

**This is to certify that
representative samples of**

AC MODULES AND PHOTOVOLTAIC MODULES WITH
INTEGRATED ELECTRONICS

AC modules, Models: SPR-E19-xxx-BLK-E-AC, SPR-E20-xxx-BLK-E-AC, SPR-E19-xxx-E-AC, SPR-E20-xxx-E-AC, SPR-X20-xxx-BLK-E-AC, SPR-X21-xxx-BLK-E-AC, SPR-X22-xxx-BLK-E-AC, SPR-X20-xxx-E-AC, SPR-X21-xxx-E-AC, SPR-X22-xxx-E-AC.

Where "xxx" – can be 320 to 370.

These AC modules include Enphase inverter IQ7XS-96-ACM-US (QIKH.E341165) evaluated for CPCU rule 21 compliance, tested with Volt Var reactive power priority and Rapid shutdown functionality.

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

Standard(s) for Safety: UL 1741, Inverters, Converters, Controllers, and Interconnection System Equipment for Use with Distributed Energy Resources.
UL 1703, Flat-Plate Photovoltaic Modules and Panels.

Additional Information: See the UL Online Certifications Directory at www.ul.com/database for additional information

Only those products bearing the UL Certification Mark should be considered as being covered by UL's
Certification and Follow-Up Service.

Look for the UL Certification Mark on the product.


Bruce Mahrenholz, Director North American Certification Program
UL LLC

Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL. For questions, please contact a local UL Customer Service Representative at <http://ul.com/aboutul/locations/>



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SCALE	
SHEET	



Safety and Installation Instructions for SunPower Type E and Type G AC Modules

Contents are subject to change without notice.

SunPower Corporation
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531725 RevC

FIGURE 1: MODULE INSTALLATION MANUAL PAGE 1



Safety and Installation Instructions for AC Modules IMPORTANT SAFETY INSTRUCTIONS SAVE THESE INSTRUCTIONS

1.0 Introduction

This document provides safety and installation instructions for the UL Listed SunPower AC photovoltaic (PV) modules described herein, all of which bear the UL logo on the product label:



Important! Please read these instructions in their entirety before installing, wiring, or using this product in any way. Failure to comply with these instructions will invalidate the SunPower Limited Warranty for PV Modules.

1.1 Disclaimer of Liability

The installation techniques, handling and use of this product are beyond company control. Therefore, SunPower does not assume responsibility for loss, damage, or expense resulting from improper installation, handling, or use.

1.2 Nationally Recognized Testing Laboratory (NRTL) Listing Information

This product meets or exceeds the requirements set forth by UL 1703, UL 1741, and UL 1741 SA for AC PV Modules. The UL 1703 Standard covers flat-plate PV modules intended for installation on buildings; or those intended to be freestanding. The UL 1741 SA Standard covers inverters, converters, controllers, and interconnection system equipment for use with distributed energy resources, including AC modules. The NRTL listing does not include integration into a building surface because additional requirements may apply. This product is not intended for use where artificially concentrated sunlight is applied to the module. The Type E and the Type G AC module models comply with HECO Rule 14H, CA CPUC Rule 21, 1547-2003 and 1547a-2014.

1.3 Limited Warranty

Module limited warranties are described in full in the SunPower warranty certificates obtainable at www.sunpower.com. In summary, the Limited Warranties do not apply to any of the following:

PV modules which in SunPower's absolute judgment have been subjected to: misuse, abuse, neglect, or accident; alteration, improper installation, application, or removal. Including, but not limited to installation, application, or removal by any party other than a SunPower authorized Dealer; non-observance of SunPower's installation, user's and/or maintenance instructions; repair or modifications by someone other than an approved service technician of SunPower; power failure surges, lightning, flood, fire, accidental breakage or other events outside SunPower's control.

2.0 Safety Precautions

Before installing this device, read all safety instructions in this document.

Danger! AC modules generate internal direct current (DC) and output alternating current (AC); and are a source of voltage when under load and when exposed to light. *Electrical currents can arc across gaps and may cause injury or death if improper connection or disconnection is made; or if contact is made with module leads that are frayed or torn.*

- Disconnect the utility AC source from all modules in the array before making or breaking electrical connections.
- Use only the AC locking connectors in order to defend against untrained personnel disconnecting the modules after they have been installed.

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FIGURE 2: MODULE INSTALLATION MANUAL PAGE 2

- All installations must be performed in compliance with the National Electrical Code (NEC) and any applicable local codes.
- Installation should be performed only by qualified personnel.
- Remove all metallic jewelry prior to installing this product to reduce the chance of accidental exposure to live circuits.
- Use only insulated tools to reduce your risk of electric shock.
- Do not stand on, drop, scratch, or allow objects to fall on modules.
- Broken glass, J-boxes, broken connectors, and/or damaged backsheets are electrical hazards as well as laceration hazards. If a module is cracked after installation, a qualified person should remove the module from the array and contact the supplier for disposal instructions.
- Do not install or handle modules when they are wet or during periods of high wind.
- Unconnected connectors must always be protected from pollution (e.g. dust, humidity, foreign particles, etc), prior to installation. Do not leave unconnected (unprotected) connectors exposed to the environment. A clean installation environment is essential in order to avoid performance degradation.
- Do not block drain holes or allow water to pool in or near module frames
- Contact your module supplier if maintenance is necessary.
- Save these instructions!

3.0 Electrical Characteristics

All electrical characteristics and grid interaction data are shown in Section 7. It is the installer's responsibility to set the grid profile—this can only be done with internet access and the SunPower monitoring system.

If an installation involves a SunPower AC module which does not appear on this list please consult the product label on the back of the module or visit www.sunpower.com for the product datasheet.

3.1 Fire Rating

The AC module maintains the same Type 2 fire rating associated with DC modules.

4.0 Electrical Connections

Modules must only be connected using the supplied AC cabling and integrated connectors. Do not alter any connectors. The AC module cable system features locking connectors which, after connected, require the use of a tool to disconnect. This defends against untrained personnel disconnecting the modules when under load. AC cable connectors are rated and tested to interrupt load current; however, SunPower recommends that you always open the utility dedicated branch circuit protector to remove power before plugging or unplugging any connectors; but a local AC disconnect is not required by SunPower.

When installing AC modules the National Electric Code, ANSI/NFPA 70 wiring methods shall be used.

4.1 Equipment Grounding

To reduce the possibility of electrical shock, ground the module frame or array per NEC before wiring the circuit. In order to install in accordance with their UL Listing, SunPower AC modules must be grounded using Listed grounding hardware that meets requirements for grounding systems in UL 467, UL 1703, UL 1741, or UL 2703; on anodized aluminum frames. SunPower recommends using one of the following methods of grounding the module frame. In addition, to avoid corrosion due to the use of dissimilar metals SunPower recommends stainless steel between copper and aluminum.

- Modules may be grounded through the use of an InvisiMount™ mid clamp that bonds the module frame to the InvisiMount rail. This method is UL 2703 Listed. InvisiMount rail sections must be bonded and connected to a grounding conductor using methods and materials specified in the *InvisiMount Residential Mounting System Installation Guide 508988*.
- Modules may be grounded by attaching a lay-in lug (Ilco GBL-4DBT, Burndy CL50-DB-T or Tyco Solklip 1954381-2) to one of the grounding holes on the module frame, and attach the ground conductor to the lug. Use stainless

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steel hardware (bolt, washers, and nut). Use an external-tooth star washer between the lug and the module frame in order to pierce the anodizing and establish electrical contact with the aluminum frame. The assembly must end with a nut that's torqued to 20–25 in-lb (for a #10-32 bolt). A lock washer or other locking mechanism is required to maintain tension between the bolt and the assembly. The conductor must be attached to the ground lug using the lug's set screw. Refer to NEC 690.

Note: Method 3 is evaluated to UL 1703 by ETL. As such, the use of these devices is not considered part of the UL Listing of these modules.

- 3) If the Unirac SOLARMOUNT system is used, modules may be grounded by using either a BURNDY Wiley WEEB-UMC or WEEB-UGC-1 grounding clip in combination with Unirac Mid or End clamps and 1/4-20 bolt and flanged nut, torqued to 120 in-lbs. If the Solarmount-I system is used grounding is achieved with the Unirac UGC-2 grounding clips in combination with Unirac Mid or End clamps and Sliders with a 1/4-20 bolt and flanged nut torqued to 120 in-lbs.

Note: Method 4 was evaluated to UL 2703 by TUV. As such, the use of these devices is not considered part of the UL Listing of these modules.

- 4) Modules may be grounded using a WEEB-9.5NL ground clip between the module and supporting structure. This combination is secured with a 1/4" stainless steel rivet or a 1/4-20 x 3/4" zinc-plated bolt with zinc-plated K-nut torqued to min. 6 ft-lbs to secure the module to minimum 12 ga. G90 coated steel or Z-purlin, either painted or unpainted. The WEEB-9.5NL is for single use only.
- 5) Other grounding methods may be used in conjunction with a module mounting system compliant with UL 2703. For these installations, the SunPower module and frame style must be tested and part of the instructions for the Listed mounting product. The SunPower module must be installed in accordance with these instructions as well as the mounting system's Listed instructions.

4.2 Connection to AC Circuits

It is the installer's responsibility to verify grid compatibility (120/240 or 120/208 wye 3-phase 4-wire 2-pole). SunPower AC modules must be connected to a utility source at the correct voltage and frequency in order to operate and produce power. They are not standalone generators and do not create AC voltage thus are not capable of operation independent of a utility-generated AC signal. The AC modules must be connected only to a dedicated branch circuit. The AC cables and connectors are certified and rated for the maximum number of AC units in parallel only. When connecting modules, DO NOT exceed the following single branch circuit maximum number of modules:

- 240 VAC: 12 (single phase)
- 208 VAC: 10 (two pole wye)

This circuit must be protected by overcurrent protection.

CAUTION! To reduce the risk of fire, connect only to a circuit provided with 20 A maximum branch circuit overcurrent protection in accordance with the National Electrical Code, ANSI/NFPA 70.

5.0 Module Mounting

This section contains information for SunPower Type E AC modules; and SunPower Type G AC modules. Ensure that you use the correct information for your module type. The SunPower Limited Warranty for PV Modules is contingent upon modules being mounted in accordance with the requirements described in this section.

5.1 Site Considerations

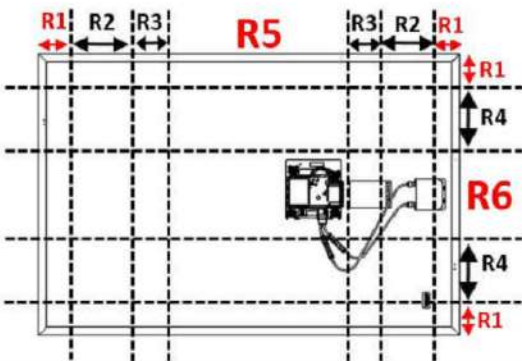
SunPower modules should only be mounted in locations that meet the following requirements:

Operating Temperature: All SunPower AC modules must be mounted in environments that ensure that the modules will operate within the following maximum and minimum temperatures:

Max. Operating Cell Temp.	+85°C (+185°F)
Max. Ambient Temp.	+50°C (+122°F)
Min. Operating Temp.	-40°C (-40°F)

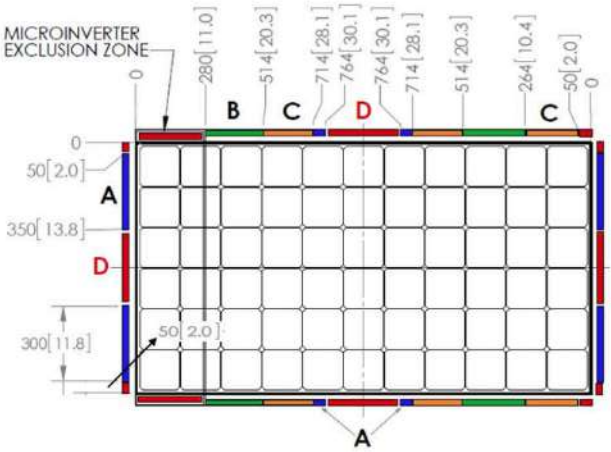
Design Strength: SunPower Type E and Type G AC modules are designed to meet a maximum positive (or upward, e.g. wind) and negative (or downward, e.g. static load) design pressure when mounted in the mounting configurations specified in Section 5.2. (Design strength of 2400 Pa corresponds approximately to a wind speed of 130 km/h (81 mph). SunPower AC modules have also been evaluated to UL 1703 for a positive or negative design load of 30 psf.)

Type E. The following image and table show where to mount to the Type E module frame; and defines mounting ranges and the resulting load ratings achieved for each range:



Mounting Range <small>Tolerances are identical at each module corner in / mm from corner</small>	Load rating (Pa)	
	Wind (up and down)	Snow (down)
R1 0-2 / 0-50	DO NOT MOUNT!	
R2 2-11.8 / 50-300	3000	3000
R3 11.8-15.75 / 300-400	3000	6000
R4 2-14.75 / 50-375	3000	3000
R5	DO NOT MOUNT!	
R6	DO NOT MOUNT!	

Type G.
Important! The following image and tables show where to mount to the Type G module frame and the allowable load ratings corresponding to the mounting zones chosen. To use the tables, identify the two mounting zones in which you wish to mount. You may choose to mount at any location in zones A, B, and C, as long as the mounting points are symmetric about one axis of the module. Identify the combination of mounting zones you have chosen in the table and then refer to the corresponding load rating. Note also that load ratings are different for modules supported by rails; versus systems that attach modules without rails.



		InvisiMount™ or Bolt			
		Load Rating (Pa)			
		Rail Supported		Railless	
Mounting Zone 1	Mounting Zone 2	Wind (up and down)	Snow (down)	Wind (up and down)	Snow (down)
B	B	3600	6000	3600	3600
C	C	2800	2800	2800	2400
A	A	2000	3000	2000	200
A	B	1700	2800	1600	1600
A	C	2000	3000	2000	2000
D	D	DO NOT MOUNT!			

		Top Clamp			
		Load Rating (Pa)			
		Rail Supported		Railless	
Mounting Zone 1	Mounting Zone 2	Wind (up and down)	Snow (down)	Wind (up and down)	Snow (down)
B	B	3600	6000	3600	3600
C	C	2800	2800	2800	2400
A	A	2000	3000	2000	200
A	B	1700	2800	1600	1600
A	C	2000	3000	2000	2000
D	D	DO NOT MOUNT!			

When mounting modules in snow-prone or high-wind environments, special care should be taken to mount the modules in a manner that provides sufficient design strength while meeting local code requirements.

Excluded Operating Environments and Reconfigurations
Certain operating environments are not recommended for SunPower AC modules, and are excluded from the SunPower Limited Warranty for these modules. Contact

SunPower if there are any unanswered questions concerning the operating environment.

5.2 Mounting Configurations

Modules may be mounted at any angle, from horizontal to vertical. Select the appropriate orientation to maximize sunlight exposure.

In order to prevent water from entering the junction box (which could present a safety hazard), modules should be oriented such that the junction box is in the uppermost position and should *not* be mounted such that the top surface faces downward.

Clearance between the module frame and mounting structure or grade is required to prevent wiring damage and to enable air to circulate behind the module. A minimum of 2" (5 cm) is required between the module frame and structure or ground.

SunPower AC modules are only NRTL Listed for use when their factory frames are fully intact. Do not remove or alter any module frame. Creating additional mounting holes may damage the module and reduce the strength of the frame.

Modules may be mounted using the following methods only:

- Pressure Clamps or Clips:** Mount the module with the clips attached to the longer sides of the module. Refer to the allowable ranges in Section 5.0. Installers must ensure the clamps are of sufficient strength to allow for the maximum design pressure of the module.
- End Mount:** End mounting is the capture mounting of the module's shorter sides to a supporting rail. The end-mounting rail and clips or clamps must be of sufficient strength to allow for the maximum design pressure of the module. Verify this capacity with the mounting system vendor before installation.
- SunPower, SunPower-specified, or SunPower-supplied mounting systems:** Modules mounted with strict adherence to SunPower documentation, using hardware systems supplied by or specified by SunPower.

5.3 Handling of Modules during Installation

Never lift or move the modules using cables or the junction box under any circumstances. Do not place modules face forward in direct contact with abrasive surfaces such as roofs, driveways, wooden pallets, railings, or walls. The front surface of a module is sensitive to oils and abrasive surfaces, which may lead to scratches and irregular soiling.

SunPower recommends handling modules with gloves and not touching the front surface. Any fingerprints resulting from installation can be reduced by following the washing guidelines in Section 6.0. A given module's product datasheet specifies the glass type it uses.

6.0 Maintenance

Visually inspect all modules annually to verify the integrity of both the electrical and the mechanical connections; and to verify the absence of corrosion. This visual inspection should be performed by an authorized SunPower Dealer or trained SunPower support personnel.

Periodic cleaning of modules is recommended, but is not required. Periodic cleaning has resulted in improved module performance, especially in regions with low levels of annual precipitation (fewer than 18.25 inches annually). Consult your Dealer or supplier about recommended cleaning schedules for your area. To clean a module, spray it with potable, non-heated water. Normal water pressure is more than adequate, but pressurized water (up to 1500 psi) may be used. Fingerprints, stains, or accumulations of dirt on the front surface of the module may be removed as follows: rinse the area and wait 5 minutes. Re-wet the area and then use a soft sponge or seamless cloth to wipe the glass surface in a circular motion. NEVER use harsh cleaning materials such as scouring powder, steel wool, scrapers, blades, or other sharp instruments to clean module glass. Use of such materials on the modules will void the product warranty.

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7.0 Electrical Characteristics and Grid Interaction

Type E.

Model	DC Ratings												AC Ratings								
	DC values @ STC							Temperature					Efficiency		AC values @ STC					Operating Limits	
	Nom. Power (W)	Power Tol. (%)	Voltage at Rated Power (Vmpp)	Curr. at Rated Power, Imp (A)	Open Circuit Voltage (Voc)	Short Circuit Curr., Iso (A)	Max. Series Fuse (A)	Curr. (Isc) Temp. Coeff. (mA/°C)	Voltage (Voc) Temp. Coeff. (mV/°C)	Power Temp. Coeff. (%/°C)	NOCT @ 20°C (value ± 2°C)	Module Efficiency (%)	Nom. Peak power (W) per unit area: m² / ft²	AC Voltage Output (nom., V)	AC Max. Cont. Output Curr. (A)	AC Max. Cont. Output Power, W or VA	AC Peak Output Curr. (A)	AC Peak Output Power (W)	Freq. (nom., Hz)	Max. Units per Branch	
SPR-X22-370-E-AC	370	+5/-0	59.1	6.26	69.5	6.66	15	2.9	-167.4	-0.29	41.5	22.7	227/21.1	240	1.31	315	1.33	320	60	12	
SPR-X22-360-E-AC	360	+5/-0	59.1	6.09	69.5	6.48	15	2.9	-167.4	-0.29	41.5	22.1	221/20.5	208 2 pole	1.51	315	1.54	320	60	10	
														240	1.31	315	1.33	320	60	12	
SPR-X21-345-E-AC	345	+5/-0	57.3	6.02	68.2	6.39	15	2.9	-167.4	-0.29	41.5	21.2	212/19.7	240	1.31	315	1.33	320	60	12	
														208 2 pole	1.51	315	1.54	320	60	10	
SPR-X21-335-E-AC	335	+5/-0	57.3	5.85	67.9	6.23	15	2.9	-167.4	-0.29	41.5	20.6	206/19.1	240	1.31	315	1.33	320	60	12	
														208 2 pole	1.51	315	1.54	320	60	10	
SPR-X20-327-E-AC	327	+5/-0	57.3	5.71	67.6	6.07	15	2.9	-167.4	-0.29	41.5	20.1	201/18.6	240	1.31	315	1.33	320	60	12	
														208 2 pole	1.51	315	1.54	320	60	10	
SPR-X21-350-BLK-E-AC	350	+5/-0	57.3	6.11	68.2	6.50	15	2.9	-167.4	-0.29	43.0	21.5	215/19.9	240	1.31	315	1.33	320	60	12	
														208 2 pole	1.51	315	1.54	320	60	10	
SPR-X21-335-BLK-E-AC	335	+5/-0	57.3	5.85	67.9	6.23	15	2.9	-167.4	-0.29	43.0	20.6	206/19.1	240	1.31	315	1.33	320	60	12	
														208 2 pole	1.51	315	1.54	320	60	10	
SPR-X20-327-BLK-E-AC	327	+5/-0	57.3	5.71	67.6	6.07	15	2.9	-167.4	-0.29	43.0	20.1	201/18.6	240	1.31	315	1.33	320	60	12	
														208 2 pole	1.51	315	1.54	320	60	10	
SPR-E20-327-E-AC	327	+5/-0	54.7	5.98	64.9	6.46	15	2.6	-176.6	-0.35	45.0	20.1	201/18.7	240	1.31	315	1.33	320	60	12	
SPR-E19-320-E-AC	320	+5/-0	54.7	5.86	64.8	6.24	15	2.6	-176.6	-0.35	46.0	19.6	196/18.2	240	1.31	315	1.33	320	60	12	
														208 2 pole	1.51	315	1.54	320	60	10	

Type G.

Model	DC Ratings											AC Ratings								
	DC values @ STC						Temperature			Efficiency		AC values @ STC						Operating Limits		
	Nom. Power (W)	Power Tol. (%)	Voltage at Rated Power (Vmpp)	Current at Rated Power (Imp) (A)	Open Circuit Voltage (Voc)	Short Circuit Current (Isc) (A)	Max. Series Fuse (A)	Current (Isc) Temp. Coeff. (mA/°C)	Voltage (Voc) Temp. Coeff. (mV/°C)	Power Temp. Coeff. (W/°C)	NOCT @ 20°C (value ± 2°C)	Module Efficiency (%)	Nom. Peak power (W) per unit area: m² / ft²	AC Voltage Output (nom., V)	AC Max. Cont. Output Curr. (A)	AC Max. Cont. Output Power, W or VA	AC Peak Output Curr. (A)	AC Peak Output Power (W)	Freq. (nom., Hz)	Max. Units per Branch
SPR-A425-G-AC	425	+5/-0	41.2	10.2	48.4	11.0	20	4.1	-114.7	-0.31	41.5	22.8	227/21.2	240	1.45	349	1.53	366	60	11
SPR-A415-G-AC	415	+5/-0	40.4	10.2	48.0	10.9	20	4.1	-113.8	-0.31	41.5	22.2	222/20.7	240	1.45	349	1.53	366	60	11
SPR-A400-G-AC	400	+5/-0	39.6	10.1	47.6	10.9	20	4.1	-112.8	-0.31	41.5	21.5	214/19.9	240	1.45	349	1.53	366	60	11

Type E.

Voltage and Frequency Limits for Utility Interaction ^c			
Condition	Simulated Source		Maximum Time (sec) at 60 Hz ^a before cessation of current to the simulated utility
	Voltage (V)	Frequency (Hz)	
A	< 0.50 V _{nor} ^b	Rated	0.16
B	0.50 V _{nor} ^b ≤ V < 1.20 V _{nor}	Rated	2
C	1.10 V _{nor} ^b ≤ V < 1.20 V _{nor}	Rated	1
D	1.20 V _{nor} ≤ V	Rated	0.16
E	Rated	f > rated +0.5	0.16
F	Rated	f < rated -0.7	0.16
G	Volt-Var	Accuracy	x

- a – Non-adjustable maximum clearing times
b – Nominal voltage equals 240 V line to line
c – Trip Limit accuracy: Voltage ± 1.0% based on 240 V nominal, frequency - ± 0.1 Hz

I rms	Total duration	Synchronization in rush current	Trip Time Accuracy
5.8 A	100 ms	0.2 A	20 ms

Type G.

Voltage and Frequency Limits for Utility Interaction ^c			
Condition	Simulated Source		Maximum Time (sec) at 60 Hz ^a before cessation of current to the simulated utility
	Voltage (V)	Frequency (Hz)	
A	< 0.50 V _{nor} ^b	Rated	0.16
B	0.50 V _{nor} ^b ≤ V < 1.20 V _{nor}	Rated	2
C	1.10 V _{nor} ^b ≤ V < 1.20 V _{nor}	Rated	1
D	1.20 V _{nor} ≤ V	Rated	0.16
E	Rated	f > rated +0.5	0.16
F	Rated	f < rated -0.7	0.16
G	Volt-Var	Accuracy	6%

- a – Non-adjustable maximum clearing times
b – Nominal voltage equals 240 V line to line
c – Trip Limit accuracy: Voltage ± 1.0% based on 240 V nominal, frequency - ± 0.1 Hz

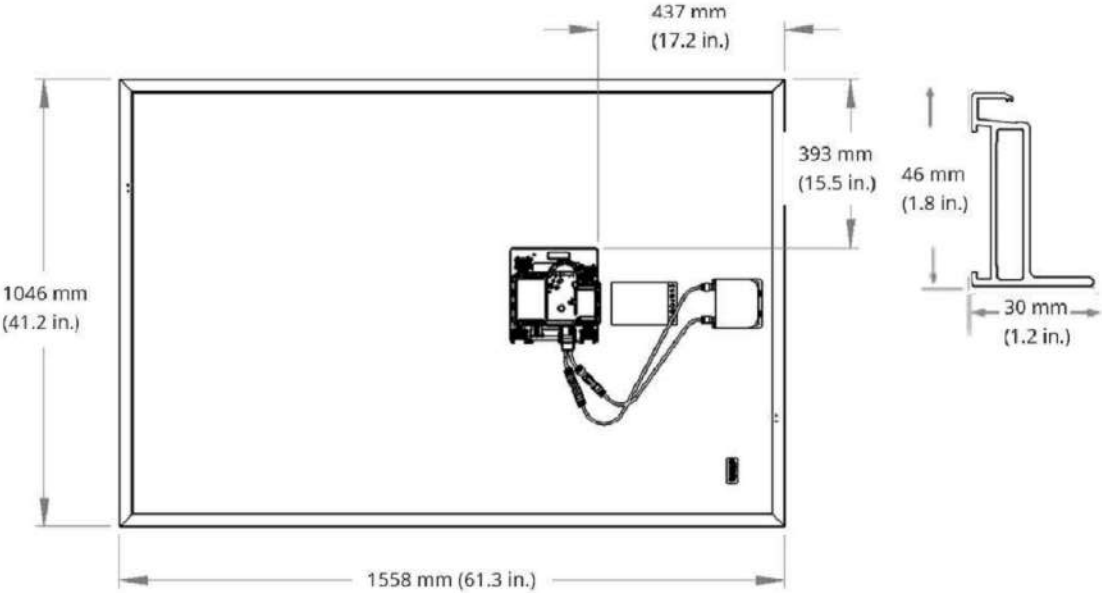
I rms	Total duration	Synchronization in rush current	Trip Time Accuracy
5.8 A	100 ms	0.2 A	2 line cycles

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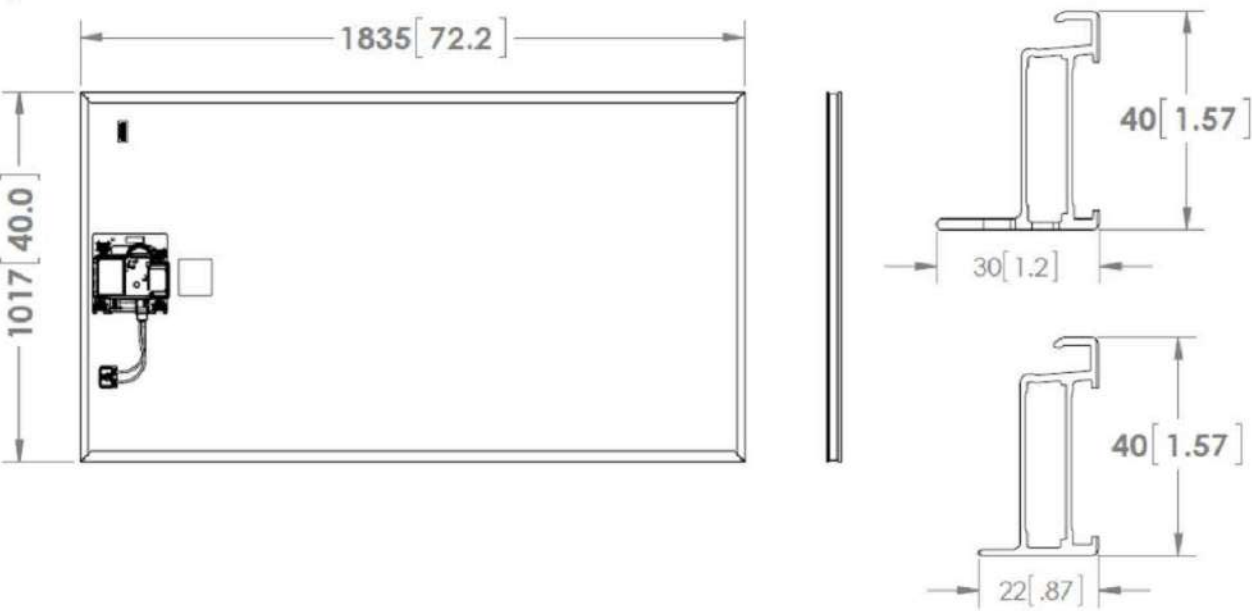
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Type E.



Type G.



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FIGURE 1: MODULE INSTALLATION MANUAL PAGE 7

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Photovoltaic Rapid Shutdown System Equipment - Component

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Photovoltaic Rapid Shutdown System Equipment - Component

[See General Information for Photovoltaic Rapid Shutdown System Equipment - Component](#)


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SAN JOSE, CA 95134 USA

E479127

Cat. No.	Function	Ratings
Power supply		
MI-C-320-US208/240-XX, MI-C-320-US208/240-10	Inverter	120/240v, 120/208V AC 20-80V DC 320W

Marking: Company name, catalog designation and the Recognized Component Mark  on the product or on the smallest unit container in which the product is packaged.

Last Updated on 2016-11-16

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FIGURE 1: UL CERTIFICATION: PV RAPID SHUTDOWN SYSTEM EQUIPMENT - COMPONENT

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CERTIFICATE OF COMPLIANCE

Certificate Number 20161116-E478711
Report Reference E478711-20160324
Issue Date 2016-NOVEMBER-16

Issued to: PHOENIX CONTACT GMBH & CO KG
FLACHSMARKTSTRASSE 8
32825 BLOMBERG GERMANY

This is to certify that
representative samples of

COMPONENT - DISTRIBUTED GENERATION WIRING
SYSTEMS AND HARNESSSES
Photovoltaic Wiring Harness, Series PV-MI-YC-T-3-12-X,X
S05 and PV-MI-YC-T-3-12-X,X G3.1 S05

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

Standard(s) for Safety: UL 9703 – Standard of DISTRIBUTED GENERATION WIRING HARNESSSES

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AC MODULE CABLE CERTIFICATE OF COMPLIANCE

File E478711
Project 4787157281

March 24, 2016

REPORT

on

Distributed Generation Wiring Systems and Harnesses

PHOENIX CONTACT GMBH & CO KG
BLOMBERG, GERMANY

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AC MODULE CABLE CERTIFICATE OF COMPLIANCE

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File E478711 Vol. 1 Sec. 2 Page 1 Issued: 2016-03-24
and Report

DESCRIPTION

PRODUCT COVERED:

USR - Photovoltaic Wiring Harness, Series PV-MI-YC-T-3-12-43,6 S05

GENERAL:

USR indicates investigation to Subject 9703, the Outline of Investigation for Distributed Generation Wiring Harnesses, Issue No. 1, dated August 2nd, 2011.

The PV-MI-YC-T-3-12-43,6 S05 consists of two recognized component multi-pole connectors and a T-junction box assembled to a multi-conductor harness assembly. The center T-junction box is provided with threading to secure to another enclosure.

These products may only be installed in inaccessible locations or must be installed in a NEC compliant raceway.

These products are not intended to replace required overcurrent protection for photovoltaic modules or for wiring unless evaluated and Listed for that purpose.

AC MODULE CABLE CERTIFICATE OF COMPLIANCE

File E478711 Vol. 1 Sec. 2 Page 2 Issued: 2016-03-24
and Report

ELECTRICAL RATINGS:

Model	Max system Voltage (V ac)	Max Current (Output) (A ac)	Max Current (From MicroInverter) (A ac)	Maximum Overcurrent protection (A ac)	Maximum ambient temp (Deg. C)
PV-MI-YC-T-3-12-4,36 S05	600	20	2	20	65

Wiring Method - Factory wiring only.

Nomenclature:

	PV-	MI-	YC-	T-	3-	12	XX,X-	XXXX	
	A	B	C	D	E	F	G	H	
A: Connector Family				PV-			Photovoltaic		
B: End Product				MI-			MicroInverter		
C: Group of Connector Harness				YC-			Y-Connector		
D: Subgroup of Connector Harness				T-			T-Box harness		
E: Number of Conductors				3-			3 conductors		
F: Conductor Size				12-			AWG 12		
G: Cable Length				XXX,X-			Cable length in inches		
H: Customer Designation				XXXX			Customer specific code		

AC MODULE CABLE CERTIFICATE OF COMPLIANCE

SUNPOWER

CORPORATION, SYSTEMS
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RICHMOND, CA 94804
(510) 540-0550
CA LICENSE #890895

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ENGINEERING CONSIDERATIONS (NOT FOR FIELD REPRESENTATIVE’S USE):

1.
- After installation in the end product, these wiring harnesses are intended to be mated with R/C (QIFA2) male and female PV connectors. The relationship between the cable and the mating connector is listed as below:

Maximum Voltage (V ac)	Conductor (AWG, Cu, Stranding)	# of Strands / Dia. of conductor , mm	Outside Wire Insulati on Diameter , mm	Cable File No.	Mating Connector Type
600	12AWG, Stranded Copper	TCER Wire: 19-65	11 +/-1 mm	E318358	R/C (QIFA2.E346710) - Type 0189102 and 0189103, Manufactured by Phoenix Contact GMBH & CO KG.

2.
- A. An OVERLOAD TEST and an RESISTANCE TO ARCING TEST was performed on the R/C (QIFA2.E346710) Multi-Pole PV Connectors Type 0189102 and 0189103, Manufactured by Phoenix Contact GMBH & CO KG to assess suitability for disconnection under load. For reference see E346710, Vol. 1, Sec. 1, issued 2015-09-15.

B. These devices are intended to be suitable for disconnection under load. Any alternate types of connector ends added to this report must be suitable for disconnection under load. (For reference see E346710 Vol. 1 Sec. 1 issued 2015-09-15, data sheet package 1 and additionally the Test Reference 1, Illustration 5 of this Report)
3.
- The required ampacity of overcurrent protection devices has been assessed on the basis of the requirements in the National Electrical Code, Article 690, clause 8, and on the basis of the results of the current overload tests.
4.
- The non UL Recognized material type VMQ 70 714865, (Methyl-Vinyl-Silikon) manufactured by Eriks used as O-ring, was subjected to the Accelerated Aging Test to establish suitability as gasket for a maximum operating temperature of 75°C.
5.
- The traceability of the non UL recognized material type VMQ 70 714865, (Methyl-Vinyl-Silikon) manufactured by Eriks used as o-ring is proven by an ID-Scan: INFRARED SPECTROSCOPY - IR - UL746A 6th Ed.(2015-02-27), Part 43, THERMOGRAVIMETRIC ANALYSIS - TGA - UL746A 6th Ed.(2015-02-27), Part 46, DIFFERENTIAL SCANNING CALORIMETRY - DSC - UL746A 6th Ed.(2015-02-27), Part 47.
6.
- The R/C (QMFZ2) polymeric material, designated "XYRON", type "644Z(f1)(c)", by ASAHI KASEI CHEMICALS CORP XYRON POLYMER (E82268), used to construct the T-junction box enclosure, is acceptable with a minimum flame rating of V-0 because the total surface area of the T-junction box is less than 200 cm².

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NOTICE OF COMPLETION
AND
AUTHORIZATION TO APPLY THE UL MARK

June 16, 2017

Sunpower, Inc.
Attn: Mr. Mark McMurtrey
77 Rio Robles
San Jose, CA 95134-1859

Our Reference: Project 4787705999.1

Subject: Phase 4 - UL 1741 SA - Continuation of 4787455560 and 4787555554

Dear Mr. McMurtrey:

Congratulations! UL's investigation of your product(s) has been completed under the above Reference Number and the product was determined to comply with the applicable requirements. This letter temporarily supplements the UL Follow-Up Services Procedure and serves as authorization to apply the UL Mark at authorized factories under UL's Follow-Up Service Program. To provide your manufacturer(s) with the intended authorization to use the UL Mark, you must send a copy of this notice to each manufacturing location currently authorized under File E479127 Vol. 1 and including any special instructions as indicated in the addendum to this letter.

Records in the Follow-Up Services Procedure covering the product are now being prepared and will be sent in the near future. Until then, this letter authorizes application of the UL Mark for 90 days from the date indicated above.

Any information and documentation provided to you involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL.

We have completed testing on the subject products, described as "Model MI-C-320-US208/240-1X". Where "X" is an option described in the product nomenclature as "Code for marketing purposes" . Only revision "E" of the product is covered by this evaluation.

This letter also serves as authorization to apply the UL Mark to the following end products, constructed using "Model MI-C-320-US208/240-1X" which are covered in File E478330 Vol. 1, Sec. 2:

Grid Support Utility Interactive AC Modules with Rapid Shutdown Functionality,

Models SPR-X22-360-D-AC, SPR-X21-335-BLK-D-AC, SPR-X20-327-BLK-D-AC, SPR-X21-345-D-AC, SPR-X21-335-D-AC, SPR-X20-327-D-AC, SPR-E20-327-D-AC, SPR-E19-320-D-AC.

File E479127

Project 4787705999.1

The subject products are determined to be in compliance with UL 1741 2nd Edition requirements Including the following sections of Supplement A (SA).

Anti-islanding Protection - Unintentional Islanding with Grid Support Functions Enabled	UL 1741 SA8
L/HVRT Low and High Voltage Ride-Through	UL 1741 SA9
L/HFRT Low and High Frequency Ride-Through	UL 1741 SA10
RR – Normal Ramp Rate and SS – Soft-Start Ramp Rate	UL 1741 SA11
SPF – Specified Power Factor	UL 1741 SA12
Volt/VAr Mode (Q(V))	UL 1741 SA13

This completes our work under Project 4787705999.1. Should you have any additional questions or if you feel that we can be of further assistance, please feel free to contact us.

Best regards,	Reviewed by,
<i>John W Carr</i>	<i>Scott Picco</i>
John W Carr	Scott Picco
Staff Engineer	Engineer Program Manager
Department: 3018DNBK	
Tel: 847-664-1760	
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Safety and Installation Instructions for AC Modules

United States and Canada

Contents of this manual are subject to change without notice.
For the latest guide please refer to www.sunpower.com/PVInstallGuideACModule

SunPower Corporation
www.sunpower.com



Document 514744 Rev C



Safety and Installation Instructions (United States and Canada)

IMPORTANT SAFETY INSTRUCTIONS SAVE THESE INSTRUCTIONS

1.0 Introduction

This manual provides safety and installation instructions for UL Listed SunPower AC photovoltaic (PV) modules carrying the UL logo on the product label (Fig. 1).



Fig. 1

Important! Please read this instruction manual in its entirety before installing, wiring, or using this product in any way. Failure to comply with these instructions will invalidate the SunPower Limited Warranty for PV Modules.

1.1 Disclaimer of Liability

The installation techniques, handling and use of this product are beyond company control. Therefore, SunPower does not assume responsibility for loss, damage, or expense resulting from improper installation, handling, or use.

1.2 Nationally Recognized Testing Laboratory (NRTL) Listing Information
This product meets or exceeds the requirements set forth by UL1703 and UL 1741 for AC PV Modules. The UL 1703 Standard covers flat-plate PV modules and panels intended for installation on buildings or those intended to be freestanding. The UL 1741 Standard covers inverters, converters, controllers, and interconnection system equipment for use with distributed energy resources, including AC Modules. The NRTL listing does not include integration into a building surface because additional requirements may apply. This product is not intended for use where artificially concentrated sunlight is applied to the module.

1.3 Limited Warranty

Module limited warranties are described in full in the SunPower warranty certificates obtainable at www.sunpower.com. In summary, the Limited Warranties do not apply to any of the following:

PV modules which in SunPower's absolute judgment have been subjected to: misuse, abuse, neglect, or accident; alteration, improper installation, application, or removal. Including, but not limited to installation, application, or removal by any party other than a SunPower authorized Dealer; non-observance of SunPower's installation, user's and/or maintenance instructions; repair or modifications by someone other than an approved service technician of SunPower; power failure surges, lightning, flood, fire, accidental breakage or other events outside SunPower's control.

2.0 Safety Precautions

Before installing this device, read all safety instructions in this document.

Danger! AC Modules generate internal direct current (DC) and output alternating current (AC) and are sources of voltage when the module is under load and when it is exposed to light. **Electrical currents can arc across gaps and may cause injury or death if improper connection or disconnection is made, or if contact is made with module leads that are frayed or torn.**

- Disconnect the utility AC source from all modules in the PV array before making or breaking electrical connections.

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Safety and Installation Instructions - Document 514744 Rev C

- It is imperative to use the supplied AC locking connectors in order to defend against untrained personnel disconnecting the modules after they have been installed.
- All installations must be performed in compliance with the National Electrical Code (NEC) and any applicable local codes.
- Installation should be performed only by authorized personnel.
- Remove all metallic jewelry prior to installing this product to reduce the chance of accidental exposure to live circuits.
- Use insulated tools to reduce your risk of electric shock.
- Do not stand on, drop, scratch, or allow objects to fall on modules.
- Broken glass, J-boxes, broken connectors, and/or damaged backsheets are electrical hazards as well as laceration hazards. An authorized person should remove the module from the array and contact the supplier for disposal instructions.
- Do not install or handle modules when they are wet or during periods of high wind.
- Contact your module supplier if maintenance is necessary.
- Save these instructions!

3.0 Electrical Characteristics

AC Output Characteristics:
All AC module electrical output characteristics are listed in the Table 2 of the appendix.

DC Internal Characteristics:
All internal DC electrical characteristics of SunPower modules are listed in Table 2 of the appendix.

If an installation involves a SunPower AC module which does not appear on this list please consult the product label on the back of the module or visit www.sunpower.com for the product datasheet.

3.1 Fire Rating

The AC module maintains the same Type 2 fire rating associated with DC modules.

4.0 Electrical Connections

This unit or system is provided with fixed trip limits and shall not be aggregated above 30 kW on a single point of common connection.

Modules must only be connected using supplied AC cabling and AC cable accessories. Do not cut or alter any connectors or cables attached to modules. You must use the proper AC transition cable adaptor supplied by SunPower when transitioning from the AC module cabling system to other wiring methods. The connectors on SunPower AC modules ship with weatherproof and sunlight-rated AC locking connectors which after connected require the use of a tool to disconnect module-to-module connections. This defends against untrained personnel disconnecting the modules when under load (see Section 2.0). AC connectors are rated and tested to interrupt load current; however, SunPower recommends that you always open the utility dedicated branch circuit protector to remove power before plugging or unplugging any connectors; but a local AC disconnect is not required by SunPower.

When installing AC modules the National Electric Code, ANSI/NFPA 70 wiring methods shall be used.

4.1 Equipment Grounding

In accordance with the NRTL Listing of this product and to reduce the possibility of electrical shock, all metallic components of AC modules shall be grounded. SunPower AC modules shall be grounded using the integrated equipment grounding conductor contained within the factory-installed AC module cables and the supplied AC transition cable. This grounding conductor must be connected to the building or structure's equipment grounding system and AC grounding electrode system using NEC compliant methods. All metallic components of the AC module are bonded together in the factory so no additional grounding conductor attachment to the AC module is required. This method meets NEC requirements for grounding.

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The AC output/neutral is not bonded to ground outside of the inverter. The AC input and AC output circuit are isolated from the enclosure. System grounding per NEC is the responsibility of the installer. If auxiliary grounding is desired to bond metallic components in contact with the AC module, such as mounting rails, use grounding hardware that has been certified to meet requirements for grounding systems in UL 2703, UL1703, or UL1741 on anodized aluminum. The SunPower InvisiMount™ mounting system is compliant with UL 2703 requirements and module-to rail grounding is achieved through its mid clamp and end clamp. When selecting any grounding components avoid corrosion due to the use of dissimilar metals. SunPower suggests that stainless steel parts be used between any copper and aluminum connections.

4.2 Connections to AC Circuits

SunPower AC modules must be connected a utility source at the correct voltage and frequency in order to operate and produce power. They are not stand alone generators and do not create AC voltage thus are not capable of operation independent of a utility-generated AC signal. The AC modules must be connected only to a dedicated branch circuit. The cables and connectors supplied with SunPower AC modules are certified and rated for the maximum number of AC units in parallel only. DO NOT connect more AC module units together onto any single branch circuit than are noted in the specific AC module specifications. This circuit must be protected by overcurrent protection not exceeding the values stated in the AC module specifications (see Table 2).

CAUTION: To reduce the risk of fire, connect only to a circuit provided with 20 A maximum branch circuit overcurrent protection in accordance with the National Electrical Code, ANSI/NFPA 70.

5.0 Module Mounting

The SunPower Limited Warranty for PV Modules is contingent upon modules being mounted in accordance with the requirements described in this section.

5.1 Site Considerations

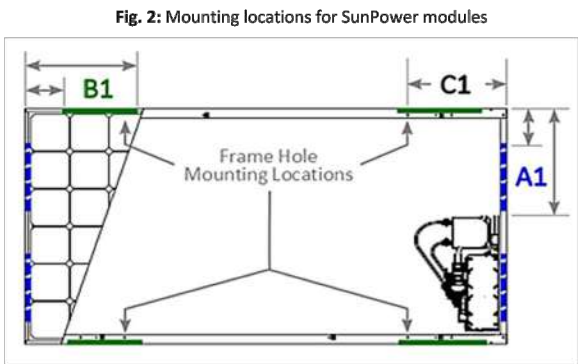
SunPower modules should be mounted in locations that meet the following requirements:

Operating Temperature: All SunPower AC modules must be mounted in environments that ensure SunPower modules will operate within the following maximum and minimum operating temperatures:

Max. Operating Cell Temp.	+85° C, +185° F
Max. Ambient Temp.	+50° C, +122° F
Min. Operating Temp.	−40° C, −40° F

Design Strength: SunPower AC modules are designed to meet a maximum positive (or upward, e.g. wind) and negative (or downward, e.g. static load) design pressure described in Table 1 when mounted in all of the mounting configurations specified in Section 5.2. Design strength of 2400 Pa corresponds approximately to a wind speed of 130 km/h (81 mph), as tested per IEC 61215. SunPower AC modules have also been evaluated to UL1703 for a positive or negative design load of 30 psf.

Fig. 2: Mounting locations for SunPower Modules shows where to mount to the module frame. Table 1 defines mounting options, attachment locations and resulting load rating achieved for each module configuration.



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Table 1: Mounting Configurations and Load Resistance

Module Configuration		Mounting configuration (valid mounting location in mm)			Load rating Wind (up & down) / Snow (down)
		End mount (A1)	Pressure clamp or clip (B1)	Frame holes (C1)	
96 cell	G5 (black)		300-400		3000Pa / 6000Pa
			50-400		3000Pa / 3000Pa

When mounting modules in snow-prone or high-wind environments, special care should be taken to mount the modules in a manner that provides sufficient design strength while meeting local code requirements.

Excluded Operating Environments and Reconfigurations

Certain operating environments are not recommended for SunPower AC modules, and are excluded from the SunPower Limited Warranty of these modules. Request your supplier to contact SunPower if there are any unanswered questions concerning the operating environment.

5.2 Mounting Configurations

Modules may be mounted at any angle, from horizontal to vertical. Select the appropriate orientation to maximize sunlight exposure. Specific information on module dimensions and the location of mounting holes is shown in Fig. 2.

In order to prevent water from entering the junction box (which could present a safety hazard), modules should be oriented with the junction box in the uppermost position and should *not* be mounted such that the top surface faces downward (e.g., on a tracking structure that positions the modules with the junction box facing skyward during sleep mode).

Clearance between the module frame and mounting structure or grade is required to prevent wiring damage and to enable air to circulate behind the module. A minimum of 2" (5 cm) is required between the module frame and structure or ground.

The module is only NRTL Listed for use when its factory frame is fully intact. Do not remove or alter the module frame. Creating additional mounting holes may damage the module and reduce the strength of the frame.

Modules may be mounted using the following methods only:

- Pressure Clamps or Clips:** Mount the module with the clips on the side frame of the module. The side frames are attached to the longer sides of the module. The centerline of the clips should be 6–15" (15.2–38 cm) from the end of the side frame. Installers should ensure the clamps are of sufficient strength to allow for the maximum design pressure of the module.
- End Mount:** End mounting is the capture mounting of the length of the module's end frame to a supporting rail (the end frames are on the shorter dimensions of the module). The end-mounting rail and clips or clamps must be of sufficient strength to allow for the maximum design pressure of the module. Verify this capacity with the mounting system vendor before installation.
- SunPower-specified or SunPower-supplied mounting systems:** Modules mounted with strict adherence to SunPower documentation, using hardware systems supplied by or specified by SunPower.

5.3 Handling of Modules during Installation

Never lift or move the modules using cables or the junction box under any circumstances. Do not place modules face forward in direct contact with abrasive surfaces such as roofs, driveways, wooden pallets, railings, or stucco walls. The front surface is sensitive to oils and abrasive surfaces, which may lead to scratches and irregular soiling.



Modules that feature antireflective glass are susceptible to visible fingerprint marks if touched on the front surface. SunPower recommends handling modules having antireflective glass with gloves or limiting touching of the front surface. Any fingerprints resulting from installation will naturally disappear over time or can be reduced by following the washing guidelines in Section 6.0. Product datasheets specify the glass type used by a particular module.

6.0 Maintenance

Visually inspect all modules annually for safe electrical connections, sound mechanical connection, and freedom from corrosion. This visual inspection should be performed from the ground, unless performed by trained SunPower dealers or trained SunPower support personnel.

Periodic cleaning of modules is recommended, but is not required. Periodic cleaning has resulted in improved performance levels, especially in regions with low levels of annual precipitation (less than 18.25 inches [46.3 cm]). Consult your dealer or supplier about recommended cleaning schedules for your area. To clean

a module, wash with potable, non-heated water. Normal water pressure is more than adequate, but pressurized water (up to1500 psi) may be used. Fingerprints, stains, or accumulations of dirt on the front surface may be removed as follows: first rinse off area and let soak for 5 minutes. Re-wet the area and then use a soft sponge or seamless cloth to wipe glass surface in a circular motion. Fingerprints typically can be removed with a soft cloth or sponge and water after wetting. Do not use harsh cleaning materials such as scouring powder, steel wool, scrapers, blades, or other sharp instruments to clean module glass. Use of such materials or cleaning without consultation will invalidate the product warranty.

Table 2: Electrical Characteristics

Module Model	DC Ratings															AC Ratings				
	DC values at Standard Test Conditions (STC)							Basic Temperature Data			EFFICIENCY NUMBERS					AC values at STC			Operating Limits	
	Nominal Power (W)	Power Tolerance (%)	Voltage at Rated Power (Vmp)	Current at Rated Power, Imp (A)	Open Circuit Voltage (Voc)	Short Circuit Current, Isc (A)	Maximum Series Fuse (A)	Current (Isc) Temp. Coeff. (mV/K) ±1-3%	Voltage (Voc) Temp. Coeff. (mV/K) ±1-3%	Power Temp. Coeff. (1/°K) ±1-3% absolute	NOCT @ 20°C (Value ±1 °C)	Module Efficiency (%)	Cell Efficiency (%)	Nominal Peak Power per Unit Area (W/m2)	Nominal Peak Power per Unit Area (W/m2)	AC Voltage Output (nom, V)	AC Max. cont. Output Current (A)	AC Max. Cont. Output Power, W	Operating Frequency (nom, Hz)	Max Units per Branch
SPR-X22-360-C-AC	360	+5/-0	60.6	5.94	69.5	6.48	15	3.5	-167.4	-0.30%	41.5	22.1%	24.8%	220.8	20.5	240	1.33	320	60	12
SPR-X21-335-BLK-C-AC	335	+5/-0	57.3	5.65	67.9	6.23	15	3.5	-167.4	-0.30%	43.0	20.5%	24.2%	210.3	19.5	240	1.33	320	60	10
																208.2 pole	1.54	320	60	12
SPR-X20-327-BLK-C-AC	327	+5/-0	57.3	5.71	67.6	6.07	15	3.5	-167.4	-0.30%	43.0	20.1%	22.5%	204.2	19.0	240	1.33	320	60	12
SPR-X21-345-C-AC	345	+5/-0	57.3	6.02	68.2	6.39	15	3.5	-167.4	-0.30%	41.5	21.2%	23.6%	214.6	19.9	240	1.33	320	60	12
																208.2 pole	1.54	320	60	10
SPR-X21-335-C-AC	335	+5/-0	57.3	5.65	67.9	6.23	15	3.5	-167.4	-0.30%	41.5	20.5%	24.2%	210.3	19.5	240	1.33	320	60	12
SPR-X20-327-C-AC	327	+5/-0	57.3	5.71	67.6	6.07	15	3.5	-167.4	-0.30%	41.5	20.1%	22.5%	204.2	19.0	240	1.33	320	60	12
																208.2 pole	1.54	320	60	10
SPR-E20-327-C-AC	327	+5/-0	54.7	5.58	64.9	6.46	15	3.5	-178.6	-0.38%	45.0	20.1%	22.5%	204.2	19.0	240	1.33	320	60	12
SPR-E19-320-C-AC	320	+5/-0	54.7	5.66	64.8	6.24	15	3.5	-178.6	-0.38%	45.0	19.6%	22.7%	198.6	18.4	240	1.33	320	60	12
																208.2 pole	1.54	320	60	10

Voltage and Frequency Limits for Utility Interaction ^c			
Condition	Simulated Utility Source		Maximum Time (cycles) (sec) at 60Hz* before cessation of current to the simulated utility
	Voltage (V)	Frequency (Hz)	
A	<0.50 V _{nom} ^b	Rated	0.16
B	0.50 V _{nom} ^b ≤ V < 0.88 V _{nom}	Rated	2
C	1.10 V _{nom} ^b ≤ V < 1.20 V _{nom}	Rated	1
D	1.20 V _{nom} ≤ V	Rated	0.16
E	Rated	f > rated + 0.5	0.16
F	Rated	f < rated − 0.7	0.16

a - Non adjustable maximum clearing times

b - Nominal voltage equals 120V phase to neutral

c - Trip Limit accuracy: Voltage - ± 2.5% based on 120 V nominal, frequency - ± 0.1 Hz

Maximum output fault current (ac)	I rms	Total duration	Synchronization in rush current	Trip Time Accuracy
69.5 Apk	38 A	5.53 mS	0.2A	20mS

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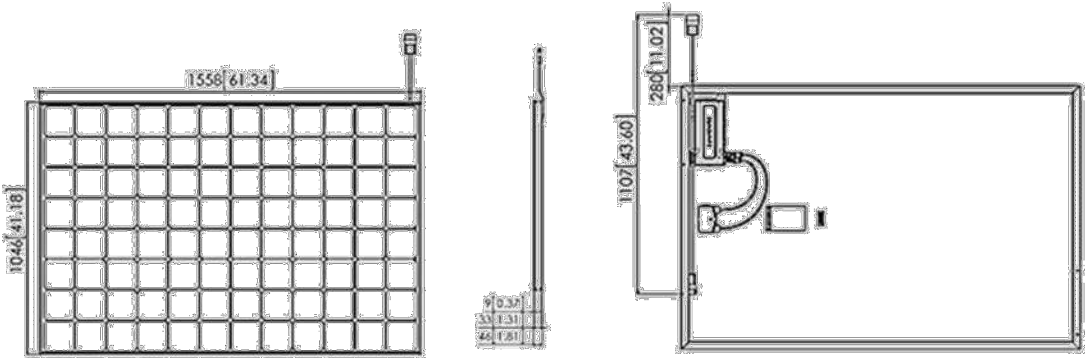
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Fig. 3: 96 Cell AC Modules



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1.7 Grounding Overview

Warning! Ensure that you fully understand the grounding aspects in this section before proceeding.

- The AC dedicated branch circuit wiring from the readily accessible disconnect to the array must include an equipment grounding conductor (EGC) in the same raceway or cable as the AC circuit conductors. This EGC must be connected to the green conductor of the transition cable, which is part of the AC module cable system.
- If a module is removed from a circuit, SunPower strongly recommends that you install a temporary EGC to bridge the gap by inserting an AC extension cable or other means, in order to maintain effective ground continuity to subsequent modules.
- Because the modules are connected in a “daisy chain” fashion, disconnecting one module from the circuit using the AC cable removes voltage and ground from the other downstream modules in the circuit. Extreme care should be taken to ensure that no other energized sources are adjacent to these ungrounded modules; otherwise auxiliary grounding methods must be applied.
- Because the DC power is internal to the module, a grounding electrode conductor (GEC) for the module or array is not required. The existing AC GEC at the utility service serves as the NEC-required GEC for the structure.
- The AC cable grounding path has been tested by a NRTL, and its electrical continuity from the AC cable ground pin to the module frame has been certified.
- The AC module interconnecting cable system provides an internal EGC for grounding the AC modules. It is the installer's responsibility to ground any metallic mounting structure according to local code. *Installers must ensure that whichever mounting system they choose is then grounded according to the instructions of that mounting system.* Some mounting systems can be bonded to the ACPV modules with listed devices. Consult the module's included safety instructions for details.
- The AC modules or array do not require a GEC, and the neutral conductor within the AC module is isolated from ground. The AC module must be connected to a dedicated AC branch circuit with the neutral conductor referenced at the building service entrance.
- The AC interconnecting cable system attached to each module's microinverter is fully insulated and includes an internal EGC. The grounding pin is longer than the others in the plug.

The ground path from the transition cable to the module frame is as follows:

- The transition cable's green conductor is connected to the EGC from the utility dedicated branch circuit.
- All plugs have ground pins that are longer than the circuit pins. This extra length ensures that the ground is the first to make contact when connecting modules and the last to break contact when disconnecting modules.
- The AC ground wire inside the microinverter terminates on the microinverter chassis with a bolted connection, and is environmentally sealed.
- The microinverter chassis is bonded to the module frame with stainless steel hardware to provide ground continuity to the module frame.

Document #505446 Rev B

18

SunPower Proprietary

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Module1 / Mid Clamp and Rai

Module¹ / End Clamp and Rail

End Clamp



Rail & Rail Splice



Ground Lug Assembly



Roof Attachment Hardware Warranties
Refer to roof attachment hardware manufacturer's documentation.

Datasheet



En. m. l.

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FIGURE 1 CERTIFICATE OF COMPLIANCE

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Mounting Systems, Mounting Devices, Clamping Devices and Ground Lugs for Use with Photovoltaic Modules and Panels

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Mounting Systems, Mounting Devices, Clamping Devices and Ground Lugs for Use with Photovoltaic Modules and Panels


[See General Information for Mounting Systems, Mounting Devices, Clamping Devices and Ground Lugs for Use with Photovoltaic Modules and Panels](#)

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SAN JOSE, CA 95134 USA

E 466 981

Cat. No.	Investigated for Bonding	Investigated for Mechanical Loading	System Fire Classification (A, B or C)	Tested in Combination With
Photovoltaic mounting system				
InvisiMount - consisting of the following components: L-Foot, Rail, Rail Splice, Mid Clamp, Ground Lug Assembly, End Clamp, SolarEdge P400 Microinverter Backplate, Row Clip.	See Below	See Below	A	Listed Fire Performance Type 2 Modules in Steep Slope
	Y	Y	See Above	SPR-E or SPR-X followed by 18, 19, 20, 21, 22, followed by - XXX where XXX is 320-370, may be followed by - BLK, followed by C, D, E, followed by - AC.
	Y	Y	See Above	NRTL Listed Sunpower Corp modules: Gen 5 frame models SPR-XXXE/NE-WHT/BLK-U-YYYACPV and SPR-V-WW-XXX-Y-Z-G-AC (where "XXX" is the wattage of the panel and ranges from 250 to 225; and where "YYY"

				indicates the inverter voltage used in the module, and can be blank, 240 or 208/240.)
	Y	Y	See Above	UL Listed Sunpower Corp modules: Gen 5 frame models SPR-XY-###. (where YY represents numbers 18, 19, 20 or 21, and ### represents any number from 370 to 310 and 274 to 233)
	Y	Y	See Above	UL Listed Sunpower Corp modules: Gen 5 frame models SPR-EY-###. (where YY represents numbers 18, 19, 20 or 21, and ### represents any number from 345 to 285 and 250 to 225)
Helix Single Tilt Mounting System and Helix Dual Tilt Mounting System - Chassis - Single Tilt - Part No. 513831, Following Tray - Part No. 513832, Link Tray - Part No. 513833, Leading Tray - Part No. 513834, Riveted Leading Tray - Part No. 517871, Spoiler - Single Tilt - Part No. 513836 & 520302, Deflector - Left - Part No. 513841, 521794, Deflector - Right - Part No. 513842, 521795, Base Chassis - Dual Tilt - Part No. 514056, Chassis Platform - Dual Tilt, Part No. 514057, Front Skirt - Part No. 515928 & 520303, Rear Skirt - Part No. 515929 & 520301, Module Clip and Inverter Rack 512663, 526398, & 527073	See Below	See Below	A	Listed Fire Performance Type 2 Modules in Low Slope
	Y	Y	See Above	UL Listed PV Modules: Sunpower Corp: Models SPR-XY-###, where YY represents numbers 18, 19, 20, 21 or 22, and ### represents any number from 390 to 445, 370 to 310 and 274 to 233; SPR-EY-###, where YY represents numbers 18, 19, 20 or 21, and ### represents any number from 390 to 445, 345 to 285 and 250 to 225. All models identified must have



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				the Gen 3 frame.
	Y	Y	See Above	UL Listed PV Modules: Sunpower Corp: Models SPR-PYY-### and SPV-PYY-###, where YY represents 15 or 17, and ### represents any number from 320 to 370. All models identified must have the Gen 3 frame

Last Updated on 2018-09-24

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COMP MOUNT



WATERTIGHT FOR LIFE

Pegasus Solar's Comp Mount is a cost effective, high-quality option for rail installations on composition shingle roofs. Designed to last decades, the one-piece flashing with elevated cone means there is simply nothing to fail.



25-year Warranty

Manufactured with advanced materials and coatings to outlast the roof itself



Superior Waterproofing

Tested to AC286 without sealant
0.9" elevated water seal



Code Compliant

Fully IBC/CBC Code Compliant
Exceeds ASCE 7-10 Standards



All-In-One Kit Packaging

Flashings, L-feet and SS lags with bonded EPDM washers are included in each 24-pack

COMP MOUNT

1. Drill pilot hole in center of rafter.



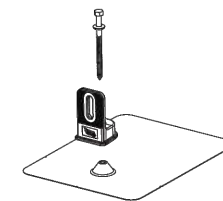
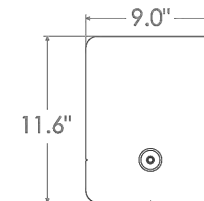
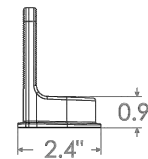
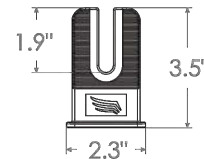
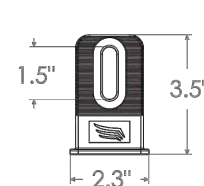
2. Optional: Apply a "U-shape" of sealant to underside of flashing and position under 2nd shingle course, cone over pilot hole.



3. Place L-Foot over cone and install lag with washer through L-Foot.



4. Drive lag to required embedment. Attach rail per rail manufacturer's instructions.



Specifications	Comp Mount Install Kit		
SKU	PSCR-C0	PSCR-U0	SPCR-CH
L-foot Type	Closed Slot	Open Slot	Closed Slot
Kit Contents	L-Foot, Flashing, 5/16" SS Lag w/ EPDM washer	L-Foot, Flashing, 5/16" SS Lag w/ EPDM washer	L-Foot, Flashing, 5/16" SS Lag w/ EPDM washer, M10 Hex Bolt
Finish	Black (L-foot and Flashing)		
Roof Type	Composition Shingle		
Certifications	IBC, ASCE/SEI 7-10, AC286		
Install Application	Railed Systems		
Compatible Rail	All		
Flashing Material	Painted Galvalume Plus		
L-Foot Material	Aluminum		
Kit Quantity	24		
Boxes Per Pallet	72		

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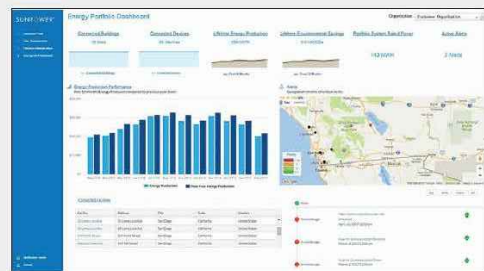


SunPower® EnergyLink™ | Residential and Commercial PVS6

Improve Support,
Reduce Maintenance Costs

An intuitive monitoring website enables you to:

- See a visual map of customer sites
- Remotely manage hundreds of sites
- Receive elective system reports
- Locate system issues and remotely diagnose
- Diagnose issues online
- Drill down for the status of individual devices



Add Value for Customers

With the SunPower Monitoring System customers can:

- See what their solar system produces each day, month, or year
- Optimize their solar investment and save on energy expenses
- See their energy use and estimated bill savings
- See their solar system's performance using the SunPower monitoring website or mobile app



SunPower EnergyLink—Plug-and-Play Installation

This complete solution for residential and commercial monitoring and control includes the SunPower® PV Supervisor 6 (PVS6) which improves the installation process, overall system reliability, and customer experience.

- Compact footprint for improved aesthetics
- Robust cloud connectivity and comprehensive local connectivity
- Flexible configuration of devices during installation
- Consumption metering
- Revenue-grade production metering (pending)
- Web-based commissioning
- Remote diagnostics of PV56 and inverters
- Durable UL Type 3R enclosure reduces maintenance costs
- Easy integration with SunPower eBOS

Robust Cloud Connectivity

Multiple options to maintain optimal connectivity:

- Hardwired Ethernet
- Wi-Fi
- Cellular backup

Datasheet

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FIGURE 1: PVS6 SPECIFICATION SHEET



SunPower® EnergyLink™ | Residential and Commercial PVS6



Site Requirements	
Number of SunPower AC modules supported per PVS6	85
Internet access	High-speed internet access via accessible router or switch
Power	<ul style="list-style-type: none"> 100–240 VAC (L–N), 50 or 60 Hz 208 VAC (L–L in 3-phase), 60 Hz

Operating Conditions	
Temperature	-22°F to +140°F (-30°C to +60°C)
Humidity (maximum)	95%, non-condensing

Communication	
RS-485	Inverters and meters
Integrated Metering	<ul style="list-style-type: none"> One channel of revenue-grade production metering Two channels of consumption metering
Ethernet	1 LAN (or optional WAN) port
PLC	PLC for SunPower AC modules
Wi-Fi	802.11b/g/n 2.4 GHz and 5 GHz
Cellular	LTE Cat-M1/3G UMTS
ZigBee	IEEE 802.15.4 MAC, 2.4GHz ISM band
Data Storage	60 days
Upgrades	Automatic firmware upgrades

Warranty and Certifications	
Warranty	10-year Limited Warranty
Certifications	UL, cUL, CE, UL 61010-1 and -2, FCC Part 15 (Class B)



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530536 RevC

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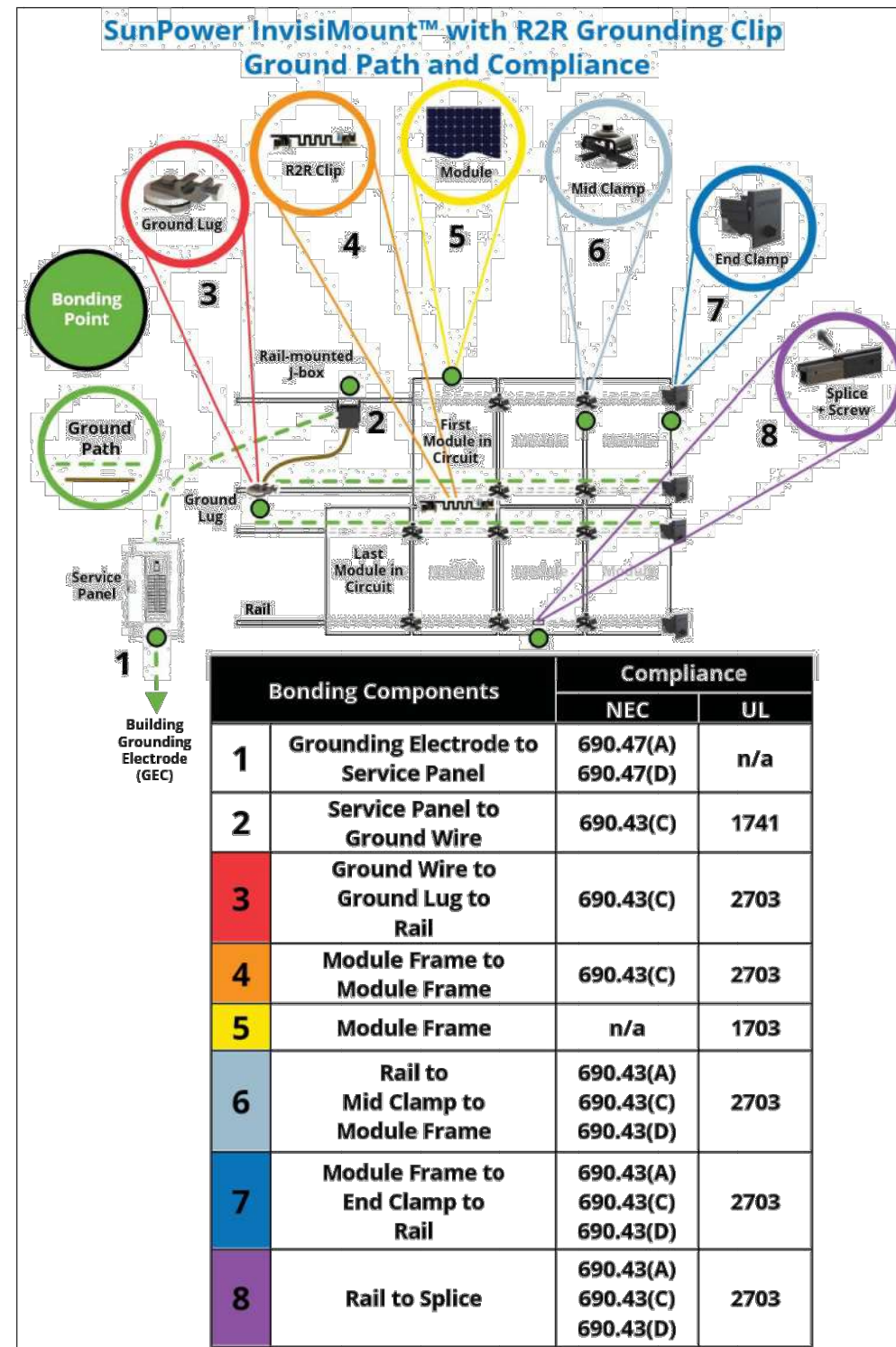
FIGURE 1: PVS6 SPECIFICATION SHEET

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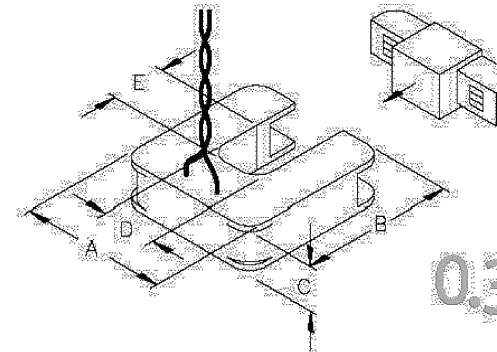
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Continental Control Systems

SPLIT-CORE current transformers make installation easier because they can be installed without disconnecting the circuit being measured. Split-core current transformers are available in a range of stock sizes and rated currents to meet your measurement

Model		Model		Model	
CTS-0750-(xxx) 0.75" I.D.		CTS-1250-(xxx) 1.25" I.D.		CTS-2000-(xxx) 2.00" I.D.	
Rated Amps	Model Suffix (xxx)	Rated Amps	Model Suffix (xxx)	Rated Amps	Model Suffix (xxx)
5	-005	70	-070	400	-400
15	-015	100	-100	600	-600
30	-030	150	-150	800	-800
50	-050	200	-200	1000	-1000
70	-070	250	-250	1200	-1200
100	-100	300	-300	1500	-1500
150	-150	400	-400		
200	-200	600	-600		



Size	CTS-0750	CTS-1250	CTS-2000
A	2.00 in. 5.08 cm	3.25 in. 8.25 cm	4.75 in. 12.1 cm
B	2.10 in. 5.33 cm	3.35 in. 8.51 cm	5.00 in. 12.7 cm
C	0.61 in. 1.55 cm	1.00 in. 2.54 cm	1.20 in. 3.05 cm
D	0.75 in. 1.91 cm	1.25 in. 3.18 cm	2.00 in. 5.08 cm
E	0.75 in. 1.91 cm	1.25 in. 3.18 cm	2.00 in. 5.08 cm



(888) 928-8663



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Boulder, CO 80301 USA
(888) 928-8663 Fax (303) 444-2903
sales@controlsys.com
www.wattnode.com

SPLIT CORE CURRENT TRANSFORMERS



0.333 VAC Output

Split Core

Easy Installation

- No exposed metal parts on assembled transformer.
- Internal precision burden resistor across secondary.
- Epoxy encapsulated housing.
- Leads-8ft. twisted pair, 22 AWG.
- Core interleaved at joints for accuracy.
- Phase angle is measured at 50% of rated current.
- UL & CE recognized for voltages up to 600VAC.
- 0.333 VAC output at rated current.
- Accuracy $\pm 1\%$ from 10% to 130% of rated current.
- Phase angle < 2 degrees for CTS-0750 models > 70 Amps & CTS-1250 models > 150 Amps.
- Snap closing/opening feature.
- RoHS Compliant

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FIGURE 1: SUNPOWER EQUINOX GROUND PATH & COMPLIANCE

FIGURE 2: CURRENT TRANSFORMER SPECIFICATION SHEET

FILE: SQUARE D SPEC SHEETS.dwg, USER: joemoles, DATE/TIME: Jul 05, 2018 - 11:32am

Product data sheet
Characteristics

DU222RB
SWITCH NOT FUSIBLE GD 240V 60A 2P
NEMA3R

Product availability : Stock - Normally stocked in distribution facility

Price* : 353.00 USD



Main

Product or component type	Single Throw Safety Switch
Line Rated Current	60 A
Product certifications	UL listed
NEMA degree of protection	NEMA 3R
Disconnecter device type	Non-fusible disconnect
Device composition	None
Device mounting	Surface
Number of poles	2
Electrical connection	Lugs
Series name	General duty

Ordering and shipping details

Category	00106 - D & DU SW,NEMA3R, 30-200A
Discount Schedule	DE1A
GTIN	00785901491491
Nbr. of units in pkg.	1
Package weight(Lbs)	4.6500000000000004
Returnability	Y
Country of origin	MX

Contractual warranty

Warranty period	18 months
-----------------	-----------

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Jul 3, 2018

Life is On



1

Product Data Sheet

D222NRB
Safety Switch , 60A, Fusible, Cartridge (Class H, K or R), 2-Pole



List Price \$326.00 USD

Availability **Stock Item: This item is normally stocked in our distribution facility.**

Technical Characteristics

Terminal Type	Lugs
Type of Duty	General Duty
Maximum Voltage Rating	240VAC
Wire Size	#10 to #2 AWG(Al) - #14 to #2 AWG(Cu)
Depth	4.83 Inches
Height	14.88 Inches
Width	6.63 Inches
Action	Single Throw
Ampere Rating	60A
Approvals	UL Listed File: E2875
Enclosure Rating	NEMA 3R
Enclosure Type	Rainproof and Sleet/Ice proof (Indoor/Outdoor)
Enclosure Material	Galvannealed Steel
Factory Installed Neutral	Yes
Fuse Type	Cartridge (Class H, K or R)
Disconnect Type	Fusible
Short Circuit Current Rating	100kA (max. depending on fuse type)
Mounting Type	Surface
Number of Poles	2-Pole

Shipping and Ordering

Category	00106 - Safety Switch, General Duty, 30 - 200 Amp, NEMA3R
Discount Schedule	DE1A
GTIN	00785901460640
Package Quantity	1
Weight	8.35 lbs.
Availability Code	Stock Item: This item is normally stocked in our distribution facility.
Returnability	Y
Country of Origin	US

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KUP-L-TAP® (IPC) Insulation Piercing (Dual Rated)

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KUP-L-TAP® (IPC) Insulation Piercing (Dual Rated)

Home > ILSCO Product Catalog > Insulation Piercing > KUP-L-TAP® (IPC) Insulation Piercing (Dual Rated)



- Kup-L-Tap(R) insulation piercing connector.
- Body is molded from tough, resilient glass-filled nylon.
- UL 486A/B 90° C Listed and is CSA Certified.
- For use with stranded conductor Class B or C
- Compact design.
- Tin Plated copper contact teeth and pre-filled with silicone lubricant.
- Removable end tabs.
- Dual Rated for Copper and Aluminum Conductor.
- UL File E6207


Items Per Page 20 Compare Create Cut Sheet

Compare/Cut Sheet	Item ID	Figure Number	Conductor Range Main	Conductor Range Tap	Voltage	Hex Size	Standard Package Quantity	NAED/L Numb
<input type="checkbox"/>	IPC-1/0-2	4	1/0-8 AWG	2-8 AWG	300 (480 GROUNDED Y SYSTEM)	1/2	12	07836695:
<input type="checkbox"/>	IPC-4/0-6	2	4/0-4 AWG	6-14 AWG	600	1/2	12	07836695:
<input type="checkbox"/>	IPC-4/0-2/0	1	4/0-2 AWG	2/0-6 AWG	600	1/2	8	07836695:
<input type="checkbox"/>	IPC-250-4/0	2	250 kcmil-1 AWG	4/0-6 AWG	600	5/8	4	07836695:
<input type="checkbox"/>	IPC-350-4/0	1	350 kcmil-4/0 AWG	4/0-10 AWG	300 (480 GROUNDED Y SYSTEM)	5/8	4	07836695:
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<input type="checkbox"/>	IPC-750-500	1	750 kcmil-500 kcmil	500 kcmil-350 kcmil	600	7/8 - 7/8	1	07836695:

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