

HISTORIC AND DESIGN REVIEW COMMISSION

February 03, 2021

HDRC CASE NO: 2020-567
ADDRESS: 241 DONALDSON AVE
LEGAL DESCRIPTION: NCB 6693 BLK 2 LOT 11
ZONING: R-6,H
CITY COUNCIL DIST.: 7
DISTRICT: Monticello Park Historic District
APPLICANT: Michael Pensabene/Freedom Solar Power
OWNER: Karl Hagenbuch/HAGENBUCH GWYN W & KARL W
TYPE OF WORK: Installation of solar panels
APPLICATION RECEIVED: December 18, 2020
60-DAY REVIEW: Not applicable due to City Council Emergency Orders
CASE MANAGER: Stephanie Phillips

REQUEST:

The applicant is requesting a Certificate of Appropriateness to install a 12-panel solar array on the primary structure at 241 Donaldson. Six panels will be located on rear rooflines and six panels will be located on a front roofline.

APPLICABLE CITATIONS:

Historic Design Guidelines, Chapter 3, Guidelines for Additions

6. Designing for Energy Efficiency

C. SOLAR COLLECTORS

- i. *Location*—Locate solar collectors on side or rear roof pitch of the primary historic structure to the maximum extent feasible to minimize visibility from the public right-of-way while maximizing solar access. Alternatively, locate solar collectors on a garage or outbuilding or consider a ground-mount system where solar access to the primary structure is limited.
- ii. *Mounting (sloped roof surfaces)*—Mount solar collectors flush with the surface of a sloped roof. Select collectors that are similar in color to the roof surface to reduce visibility.
- iii. *Mounting (flat roof surfaces)*—Mount solar collectors flush with the surface of a flat roof to the maximum extent feasible. Where solar access limitations preclude a flush mount, locate panels towards the rear of the roof where visibility from the public right-of-way will be minimized.

FINDINGS:

- a. The primary structure located at 214 Donaldson is a 1-story single family structure constructed circa 1925 in the Tudor Revival style. The structure features a brick façade, a steeply pitched cross gable roof configuration, a front gable with a curved roofline, and half timbering. The structure is contributing to the Monticello Park Historic District.
- b. LOCATION – The applicant is requesting approval to install 12 solar panels the primary structure. Six panels will be located on rear rooflines and six panels will be located on a front roofline. According to the Historic Design Guidelines for Additions 6.C.i, solar collectors should be located on a side or rear roof pitch to the maximum extent possible to minimize visibility from the street. The applicant has not provided information that outlines site limitations or features that necessitate the installation of the six panels on the front roofline, or alternatively preclude the relocation of panels to rear or side rooflines. Staff finds that the applicant should relocate these six panels to a rear roofline to be more consistent with the Guidelines.
- c. PITCH – The panels will be installed flush with the roof pitch. According to the Historic Design Guidelines, solar collectors should be mounted flush with the surface of a sloped roof and maintain distance from the roof

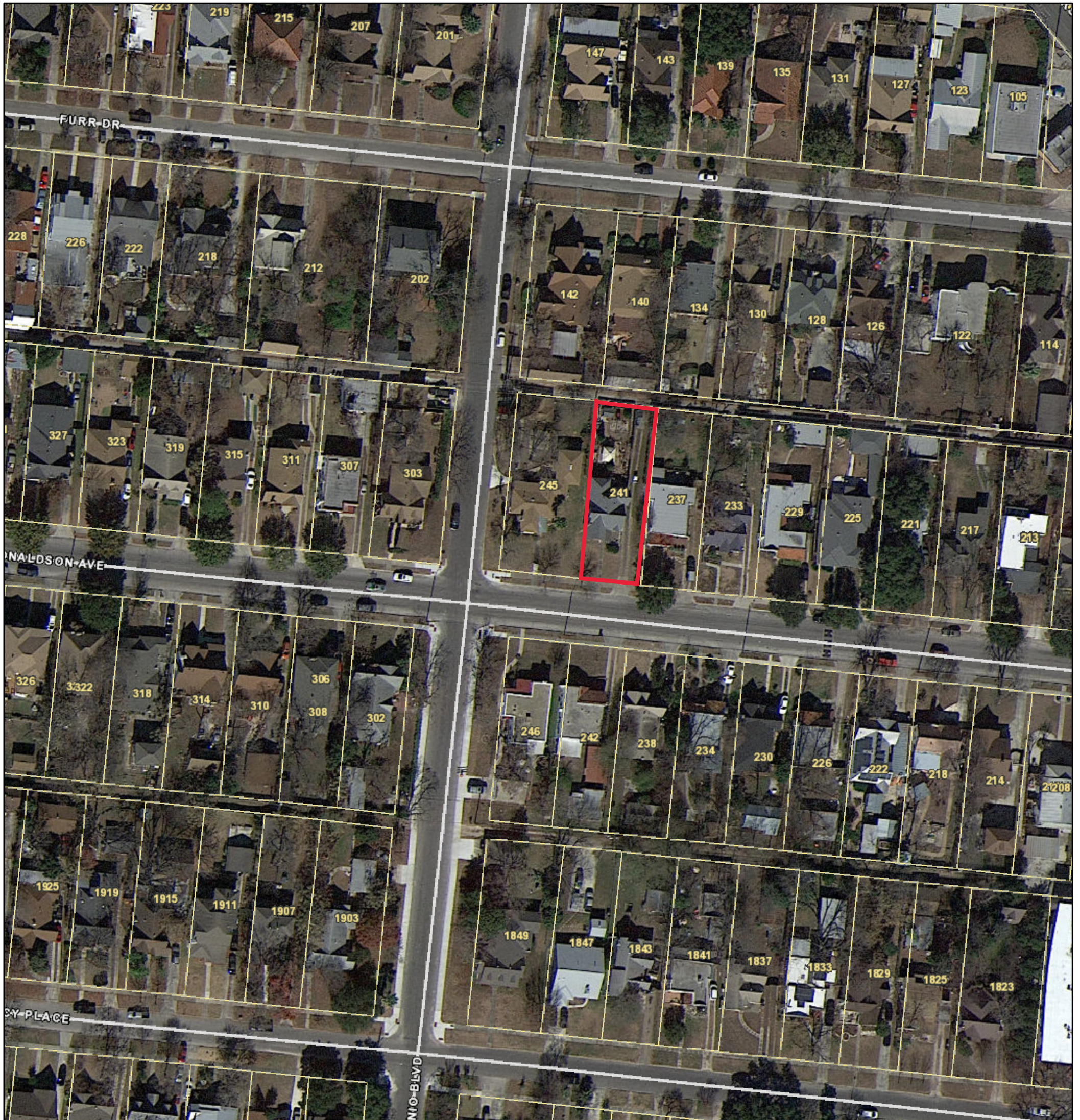
eaves. Staff generally finds the pitch appropriate but finds that the panels on the rear roofline may be installed closer to the eaves than the stipulations listed in the recommendation.

RECOMMENDATION:

Staff recommends approval based on findings a through c with the following stipulations:

- i. That the applicant relocates the six panels on the front roofline to the rear of the primary structure as noted in finding b. The applicant is required to submit updated documents to staff that reflect this change prior to receiving a Certificate of Appropriateness.
- ii. That the solar panels maintain at least 18" of separation from the roof eaves and ridges.

City of San Antonio One Stop



January 14, 2021









SCOPE OF WORK

TO INSTALL A SOLAR PHOTOVOLTAIC (PV) SYSTEM AT THE HAGENBUCH RESIDENCE, LOCATED AT 241 DONALDSON AVENUE, SAN ANTONIO, TEXAS. THE POWER GENERATED BY THE PV SYSTEM WILL BE INTERCONNECTED WITH THE UTILITY GRID THROUGH THE EXISTING ELECTRICAL SERVICE EQUIPMENT. THE PV SYSTEM DOES NOT INCLUDE STORAGE BATTERIES.

SYSTEM RATING

3.92 kW DC STC
3.78 kW AC

EQUIPMENT SUMMARY

- (12) SUNPOWER SPR-E20-327-E-AC PV MODULES
- (12) SUNPOWER SPR-E20-327-E-AC [240V] PV INVERTERS
- (97) (9 X 10.75') LINEAR FEET SUNPOWER INVISIMOUNT

SHEET INDEX

- PV-0 COVER
- PV-1 SITE MAP AND PV LAYOUT
- PV-2 STRING MAP AND MONITORING LAYOUT
- PV-3 ELECTRICAL DIAGRAM
- PV-4 EQ WALL & MOUNTING DETAIL
- PV-5 SYSTEM LABELING DETAIL
- PV-6 SAFETY PLAN

GOVERNING CODES

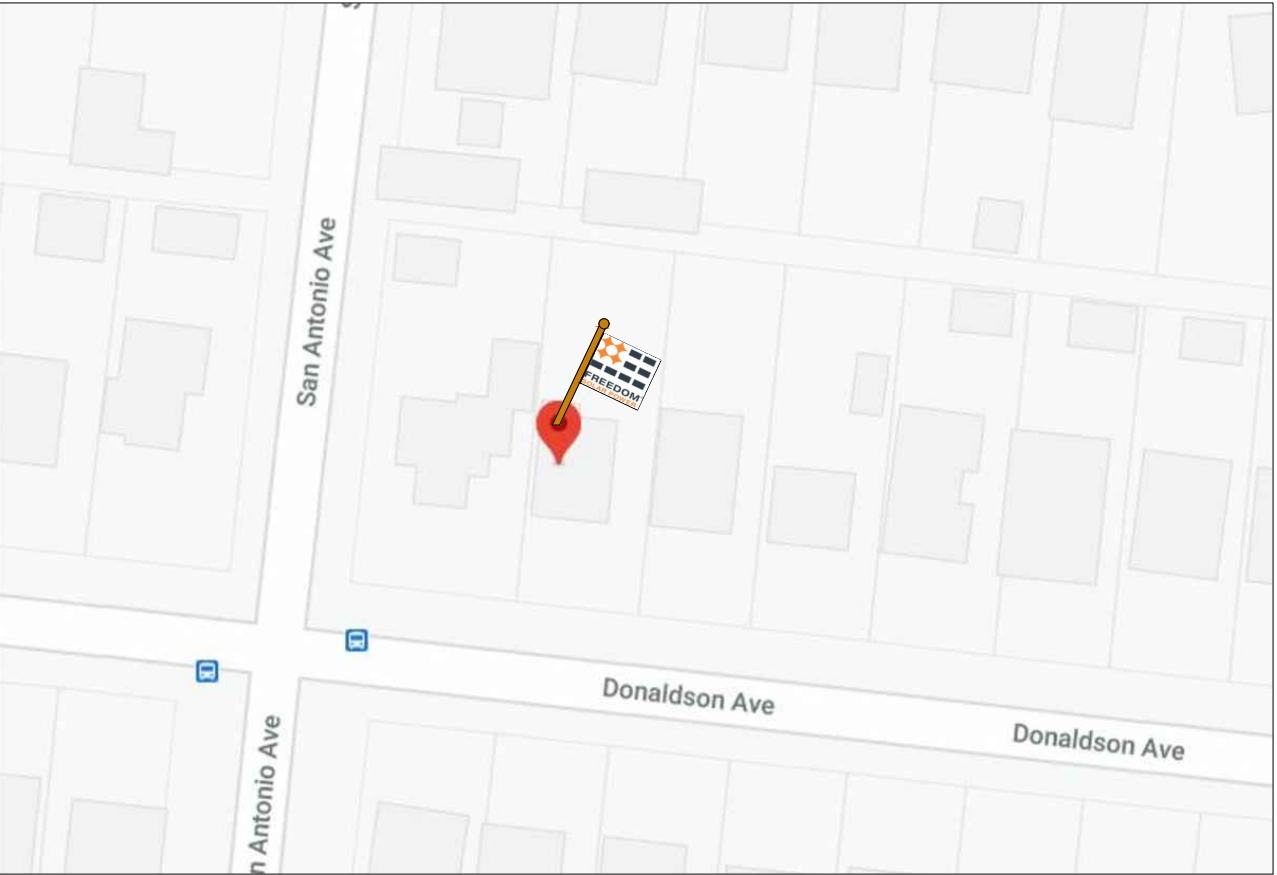
- 2017 NATIONAL ELECTRICAL CODE
- 2018 INTERNATIONAL RESIDENTIAL CODE
- 2018 INTERNATIONAL FIRE CODE
- UNDERWRITERS LABORATORIES (UL) STANDARDS
- OSHA 29 CFR 1910.269



PV Installation
Professional
Mark McManus
Cert #PV-042118-020534



PROJECT LOCATION



VICINITY MAP

DESIGN BY:
FREEDOM SOLAR, LLC

REVISIONS		
DESCRIPTION	DATE	REV
DESIGN PACKET	11/23/2020	A

CONTRACTOR



FREEDOMTM
SOLAR POWER

FREEDOM SOLAR LLC
4801 FREIDRICH LN, STE 100
AUSTIN, TX 78744
TECL # 28621
TBPE FIRM # F-17690

PROJECT NAME

HAGENBUCH, KARL

241 DONALDSON AVENUE

SAN ANTONIO, TEXAS, 78201

(210) 836-6729

SHEET NAME

COVER

SHEET SIZE

ANSI B
11" x 17"

SHEET NUMBER

PV-0

LEAD ID: 35403

CONSTRUCTION SUMMARY

- (12) (SUNPOWER SPR-E20-327-E-AC) SOLAR MODULES, 3.92 kW DC STC
MODULE DIMENSIONS = 41.2" X 61.3" X 1.80"
- (12) SUNPOWER SPR-E20-327-E-AC [240V] PV INVERTERS
COMBINED INVERTER OUTPUT = 1.26 kW AC.
- (97) (4 X 10.75') LINEAR FEET SUNPOWER INVISIMOUNT
- (12) SUNMODO EZ MOUNT ROOF ATTACHMENTS
- (48) SPCR-CH ROOF ATTACHMENTS
- (1) SUNPOWER MONITORING

SITE DETAILS

ROOF TYPE: ASPHALT SHINGLE
ARRAY #1 - TILT = 37°, AZIMUTH = 187°
ARRAY #2 - TILT = 30°, AZIMUTH = 277°

INSTALLATION DIFFICULTY = 9 => NORMAL

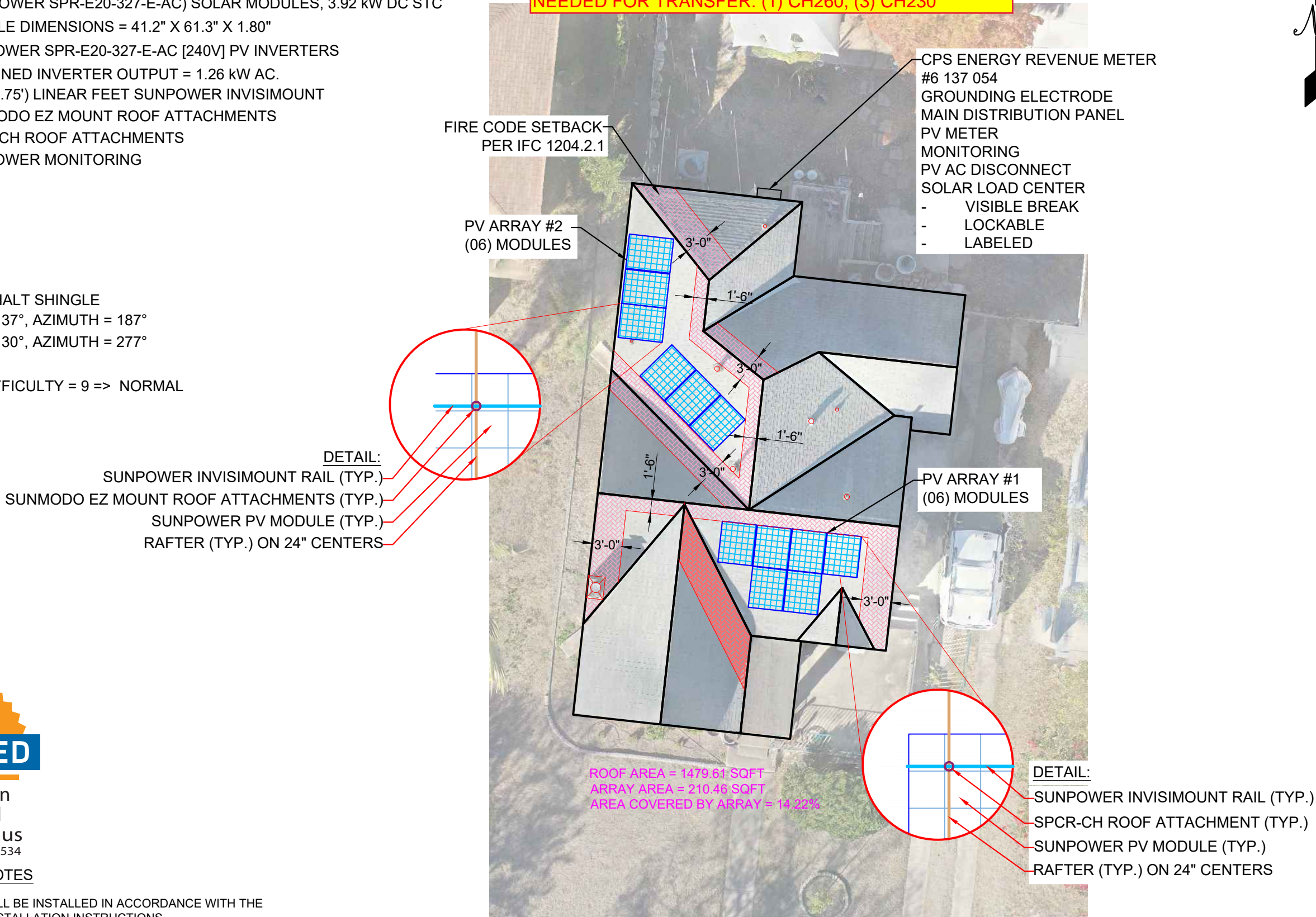


PV Installation
Professional
Mark McManus
Cert #PV-042118-020534

CONSTRUCTION NOTES

- 1.) ALL EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION INSTRUCTIONS.
- 2.) ALL OUTDOOR EQUIPMENT SHALL BE RAIN-TIGHT WITH MINIMUM NEMA 3R RATING.
- 3.) ALL LOCATIONS ARE APPROXIMATE AND REQUIRE FIELD VERIFICATION.
- 4.) TYP. ROOF ATTACHMENT SPACING SHALL BE 6'-0" MAX FOR LAG BOLT TYPE ROOF ATTACHMENTS ANCHORED TO RAFTERS
- 5.) TYP. ROOF ATTACHMENT SPACING SHALL BE 4'-6" MAX FOR S-5! CLAMPS ANCHORED TO STANDING SEAM ROOF PANELS

UTILITY CONTROLLED OUTAGE REQUIRED TO
INSTALL NEW EATON CH24B200R MDP WITH 200A MBK
& 60A FEEDER TO SUB-PANEL -THE FOLLOWING ARE
NEEDED FOR TRANSFER: (1) CH260, (3) CH230



DESIGN BY:
FREEDOM SOLAR, LLC

REVISIONS		
DESCRIPTION	DATE	REV
DESIGN PACKET	11/23/2020	A

CONTRACTOR

**FREEDOM[™]
SOLAR POWER**

FREEDOM SOLAR LLC
4801 FREIDRICH LN, STE 100
AUSTIN, TX 78744
TECL # 28621
TBPE FIRM # F-17690

PROJECT NAME

HAGENBUCH, KARL & GWYN
241 DONALDSON AVENUE
SAN ANTONIO, TEXAS, 78201
(210) 836-6729

SHEET NAME

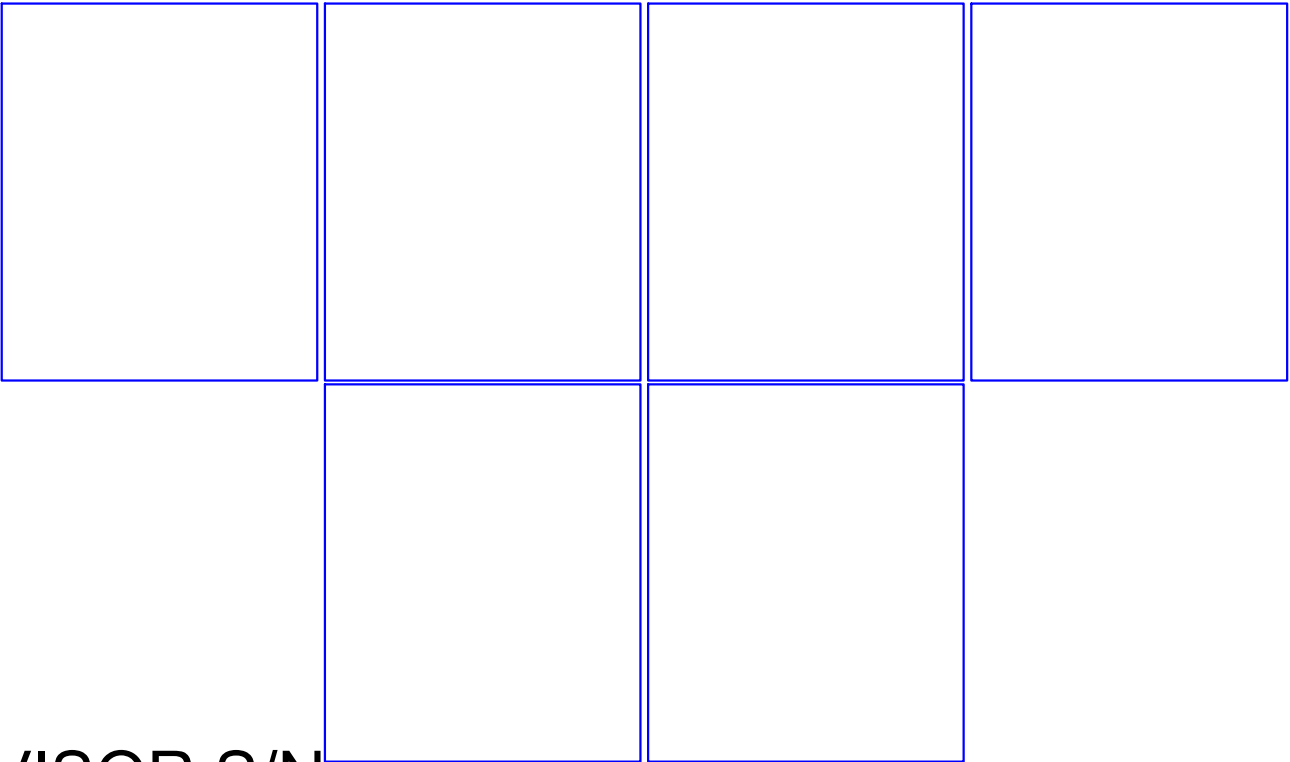
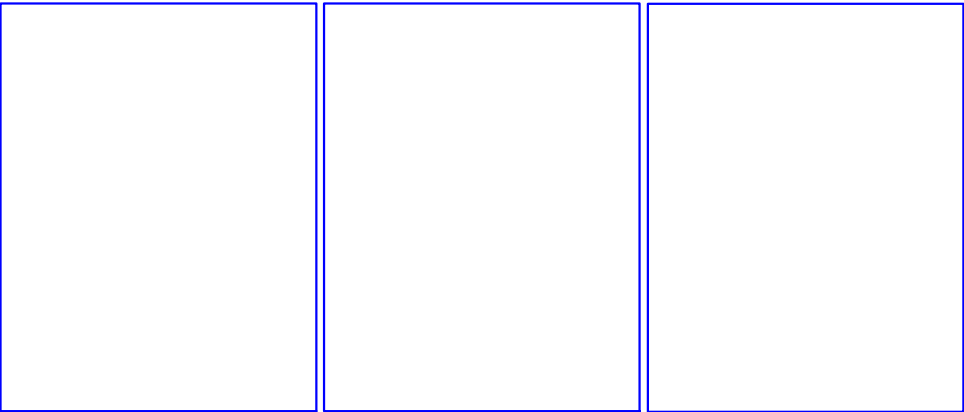
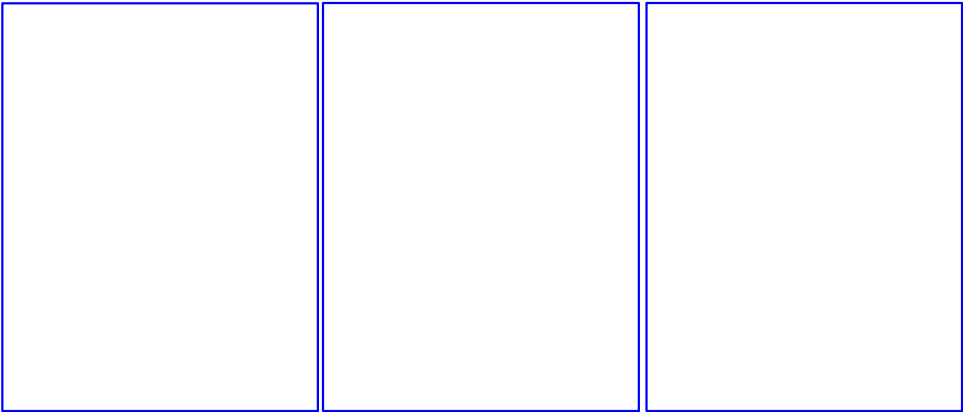
SITE MAP &
PV LAYOUT

SHEET SIZE

ANSI B
11" x 17"

SHEET NUMBER

PV-1



SUNPOWER SUPERVISOR S/N _____



PV Installation
Professional
Mark McManus
Cert #PV-042118-020534

DESIGN BY:
FREEDOM SOLAR, LLC

REVISIONS		
DESCRIPTION	DATE	REV
DESIGN PACKET	11/23/2020	A

CONTRACTOR



FREEDOMTM

SOLAR POWER

FREEDOM SOLAR LLC

4801 FREIDRICH LN, STE 100

AUSTIN, TX 78744

TECL # 28621

TBPE FIRM # F-17690

PROJECT NAME

HAGENBUCH, KARL & GWYN
241 DONALDSON AVENUE
SAN ANTONIO, TEXAS, 78201
(210) 836-6729

SHEET NAME
STRING MAP
&
MONITORING
LAYOUT

SHEET SIZE
ANSI B
11" x 17"

SHEET NUMBER
PV-2

UTILITY CONTROLLED OUTAGE REQUIRED TO
INSTALL NEW EATON CH24B200R MDP WITH 200A MBK
& 60A FEEDER TO SUB-PANEL -THE FOLLOWING ARE
NEEDED FOR TRANSFER: (1) CH260, (3) CH230

SOLAR ARRAY - 3.92kW DC STC
(12) (SUNPOWER SPR-E20-327-E-AC) MODULES

JUNCTION BOX:
TRANSITION FROM DG CABLE
TO AWG #10 THWN-2
NEMA 3R, UL LISTED

BRANCH #1
12 MODULES

(12) (SUNPOWER SPR-E20-327-E-AC [240V])
INVERTERS 240VAC, 1.31A MAX
CEC WEIGHTED EFFICIENCY 97.5%
NEMA 4R, UL LISTED, INTERNAL GFDI

SOLAR LOAD CENTER
240 VAC, 125A
NEMA 3R, UL LISTED
(2) 2P-20 A BREAKERS

PV AC DISCONNECT
240 VAC, 60 A
NON-FUSIBLE,
NEMA 3R, UL LISTED

PV METER
240 VAC, 125A
NEMA 3R, UL LISTED

CPS ENERGY REVENUE METER
#6 137 054
1-PHASE, 240 V

MAIN SERVICE DISCONNECT
240 V, 200A
(UPGRADE)

NEW MAIN DISTRIBUTION PANEL
EATON CH CH24B200R 1P3W
240 V, 225A BUS
(UPGRADE)

POINT OF INTERCONNECTION
(1) 2P-40A CIRCUIT BREAKER
INSTALLED AT OPPOSITE END OF
BUS FROM MAIN DISCONNECT

EXISTING GROUNDING
ELECTRODE SYSTEM

(2) AWG #10 THWN-2
(1) AWG #8 THWN-2 GND
IN 3/4" CONDUIT

(3) AWG #6 THWN-2
(1) AWG #8 THWN-2 GND
IN 1" CONDUIT



PV Installation
Professional
Mark McManus
Cert #PV-042118-020534

ELECTRICAL NOTES

- 1.) ALL EQUIPMENT TO BE LISTED BY UL OR OTHER NRTL, AND LABELED FOR ITS APPLICATION.
- 2.) ALL CONDUCTORS SHALL BE COPPER, RATED FOR 600 V AND 90°C WET ENVIRONMENT UNLESS OTHERWISE NOTED.
- 3.) WIRING, CONDUIT, AND RACEWAYS MOUNTED ON ROOFTOPS SHALL BE ROUTED DIRECTLY TO, AND LOCATED AS CLOSE AS POSSIBLE TO THE NEAREST RIDGE, HIP, OR VALLEY.
- 4.) WORKING CLEARANCES AROUND ALL NEW AND EXISTING ELECTRICAL EQUIPMENT SHALL COMPLY WITH NEC 110.26.
- 5.) DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS. CONTRACTOR SHALL FURNISH ALL NECESSARY OUTLETS, SUPPORTS, FITTINGS AND ACESSORIES TO FULFILL APPLICABLE CODES AND STANDARDS.
- 6.) WHERE SIZES OF JUNCTION BOXES, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, THE CONTRACTOR SHALL SIZE THEM ACCORDINGLY.
- 7.) ALL WIRE TERMINATIONS SHALL BE APPROPRIATELY LABELED AND READILY VISIBLE.
- 8.) MAXIMUM MOUNTING HEIGHT FROM GRADE TO CENTER OF METER SOCKET SHALL BE 72" FOR RESIDENTIAL SINGLE PHASE METER SOCKETS 0-320 AMPS. MINIMUM MOUNTING HEIGHT IS 30" FROM FOR AUSTIN ENERGY, AND 48" FOR ALL OTHER JURISDICTIONS
- 9.) MINIMUM HORIZONTAL CLEARANCE FROM GAS REGULATOR TO ANY ELECTRICAL ENCLOSURE IS 36", EXCEPT AUSTIN ENERGY WHICH REQUIRES 48" CLEARANCE FROM GAS TO METER SOCKET
- 10.) PV DISCONNECT SHALL BE VISIBLE, LOCKABLE AND LABELED AND THE DOOR CANNOT BE OPENED WHEN HANDLE IS IN ON POSITION
- 11.) BY DEFAULT THE MONITORING DEVICE IS SHOWN CONNECTED TO A 20-AMP BREAKER IN THE SOLAR LOAD CENTER. ALTERNATIVELY, THE MONITORING DEVICE MAY BE CONNECTED TO A 20-AMP BREAKER AT THE MAIN DISTRIBUTION PANEL.

CALCULATIONS FOR CURRENT CARRYING CONDUCTORS	CALCULATIONS FOR OVERCURRENT DEVICES
<p>INVERTER OUTPUT WIRE AMPACITY CALCULATION [NEC 690.8(A)(3)]: 1.31A PER INVERTER (SUNPOWER SPR-E20-327-E-AC [240V]) MAXIMUM INVERTER BRANCH CURRENT = (12)(1.31A) = 15.7A CONTINUOUS USE: #10 WIRE 75°C DERATED AMPACITY = (0.80)(35.0A) = 28.0A 28.0A > 15.7A CONDITIONS OF USE: #10 WIRE 90°C DERATED AMPACITY = (0.91)(1)(40.0A) = 36.4A 36.4A > 15.7A</p> <p>SOLAR LOAD CENTER OUTPUT WIRE AMPACITY CALCULATION [NEC 690.8(A)(3)]: 1.31A PER INVERTER (SUNPOWER SPR-E20-327-E-AC [240V]) COMBINED CURRENT = (12)(1.31A) = 15.7A CONTINUOUS USE: #6 WIRE 75°C DERATED AMPACITY = (0.80)(65A) = 52.0A 52.0A > 15.7A CONDITIONS OF USE: #6 WIRE 90°C DERATED AMPACITY = (0.91)(75A) = 68.3A 68.3A > 15.7A</p>	<p>INVERTER BRANCH AC CURRENT CALCULATION [NEC 690.8(A)(3)]: 1.31A PER INVERTER (SUNPOWER SPR-E20-327-E-AC [240V]) MAXIMUM BRANCH INVERTER CURRENT = (12)(1.31A) = 15.7A MINIMUM OCPD = (15.7A)(1.25) = 19.6A USE 2P-20A BREAKERS IN SOLAR LOAD CENTER FOR INVERTER BRANCH OCPD</p> <p>SYSTEM AC CURRENT CALCULATION [NEC 690.8(A)(3)]: 1.31A PER INVERTER (SUNPOWER SPR-E20-327-E-AC [240V]) COMBINED CURRENT = (12)(1.31A) = 15.7A MINIMUM OCPD = (15.7A)(1.25) = 19.6A USE 2P-40A BREAKER IN MDP FOR SYSTEM OCPD</p>

DESIGN BY:
FREEDOM SOLAR, LLC

REVISIONS		
DESCRIPTION	DATE	REV
DESIGN PACKET	11/23/2020	A

CONTRACTOR

FREEDOM SOLAR POWER
FREEDOM SOLAR, LLC
4801 FREDRICH LN, STE 100
AUSTIN, TX 78744
TECL # 28621
TBPE FIRM # F-17690

PROJECT NAME

HAGENBUCH, KARL
241 DONALDSON AVENUE
SAN ANTONIO, TEXAS, 78201
(210) 836-6729

SHEET NAME

ELECTRICAL
DIAGRAM

SHEET SIZE

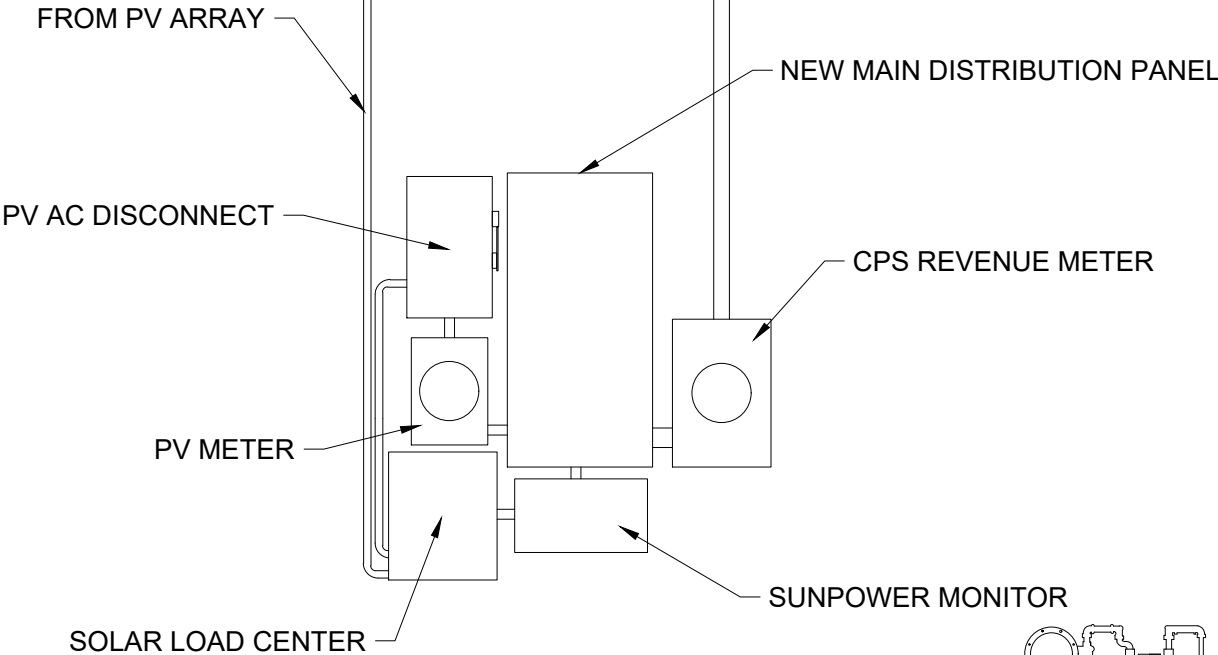
ANSI B
11" x 17"

SHEET NUMBER

PV-3

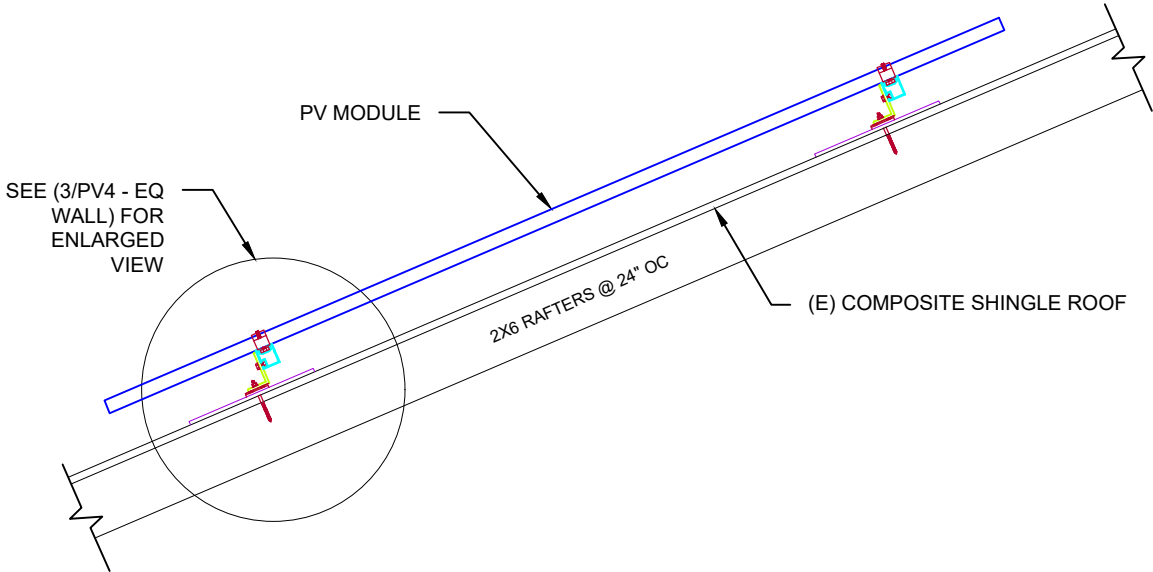


PV Installation
Professional
Mark McManus
Cert #PV-042118-020534



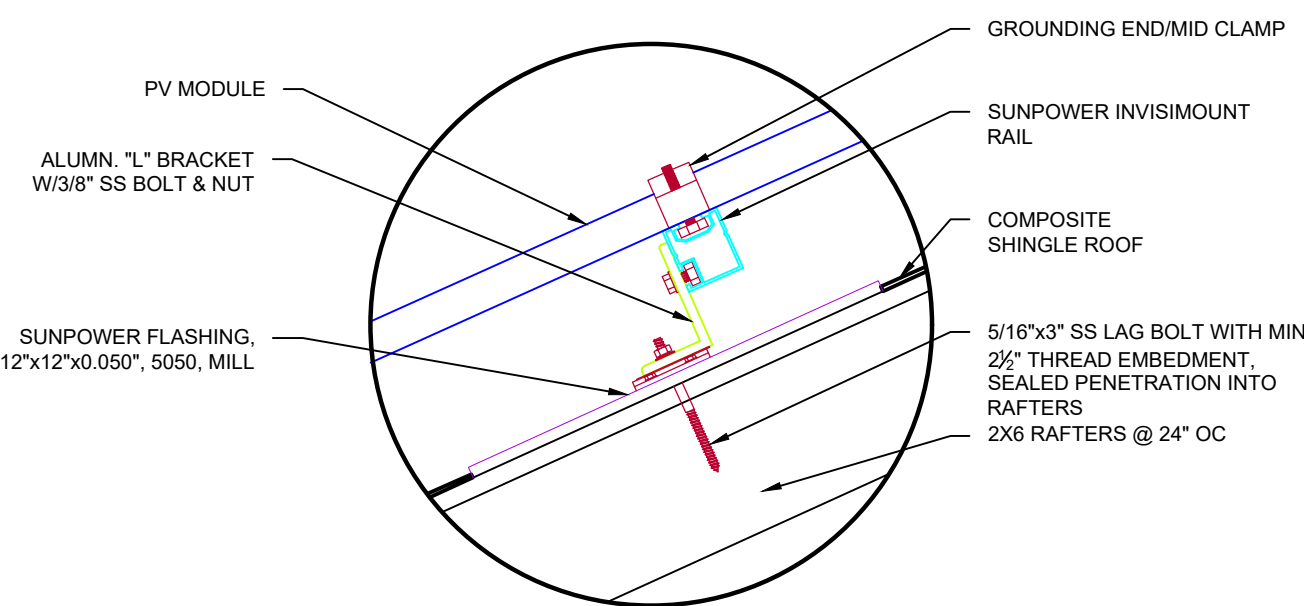
EQUIPMENT ELEVATION
NTS

1



MOUNTING METHOD
NTS

2



MOUNTING DETAIL
NTS

3

DESIGN BY:
FREEDOM SOLAR, LLC

REVISIONS		
DESCRIPTION	DATE	REV
DESIGN PACKET	11/23/2020	A

CONTRACTOR



FREEDOM[™]
SOLAR POWER

FREEDOM SOLAR LLC
4801 FREIDRICH LN, STE 100
AUSTIN, TX 78744
TECL # 28621
TBPE FIRM # F-17690

PROJECT NAME

HAGENBUCH, KARL
241 DONALDSON AVENUE
SAN ANTONIO, TEXAS, 78201
(210) 836-6729

SHEET NAME

EQ.WALL &
MOUNTING DETAIL

SHEET SIZE

ANSI B
11" x 17"

SHEET NUMBER

PV-4

NOTE: NOT ALL LABELS MAY BE APPLICABLE

SIGNAGE REQUIREMENTS

- > RED BACKGROUND
- > WHITE LETTERING
- > MIN. 3/8" LETTER HEIGHT
- > ALL CAPITAL LETTERS
- > ARIAL OR SIMILAR FONT
- > REFLECTIVE, WEATHER RESISTANT MATERIAL, UL 969

PV SYSTEM DISCONNECT

REQ'D BY: NEC 690.13(B)

A

APPLY TO:
PV DISCONNECT

WARNING
ELECTRIC SHOCK HAZARD.
DO NOT TOUCH TERMINALS.
TERMINALS ON THE LINE AND
LOAD SIDES MAY BE
ENERGIZED IN THE OPEN
POSITION.

REQ'D BY: NEC 690.13(B)

B

APPLY TO:
PV DISCONNECT

WARNING: PHOTOVOLTAIC
POWER SOURCE

REQ'D BY: NEC 690.31(G)(3)

C

APPLY TO:
RACEWAYS, CABLE TRAYS,
OTHER WIRING METHODS, AND
ENCLOSURES THAN CONTAIN
PV SYSTEM DC CONDUCTORS

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

REQ'D BY: NEC 705.12(B)(2)(3)(b)

D

APPLY TO:
DISTRIBUTION EQUIPMENT
ADJACENT TO BACK-FED BREAKER

2" ADDRESS NUMBERS

REQ' BY: AHJ

E

APPLY TO:
REVENUE METER SOCKET
(IF APPLICABLE)

PV METER

REQ'D BY: AHJ

F

APPLY TO:
PV METER SOCKET
(IF APPLICABLE)

REVENUE METER

REQ'D BY: AHJ

G

APPLY TO:
REVENUE METER SOCKET
(IF APPLICABLE)

MONITORING

REQ'D BY: FREEDOM SOLAR

H

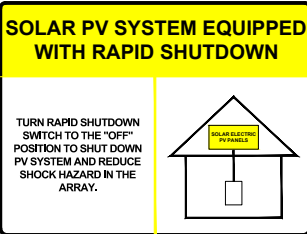
APPLY TO:
MONITORING DEVICE ENCLOSURE

PHOTOVOLTAIC SYSTEM
AC DISCONNECT
OPERATING CURRENT: 15.7A
OPERATING VOLTAGE: 240 VAC

REQ'D BY: 690.56(1)(a)

I

APPLY TO:
PV DISCONNECT



REQ'D BY: FREEDOM SOLAR

J

APPLY TO:
MAIN DISTRIBUTION PANEL

DESIGN BY:
FREEDOM SOLAR, LLC

REVISIONS

DESCRIPTION	DATE	REV
DESIGN PACKET	11/23/2020	A

CONTRACTOR



PROJECT NAME

HAGENBUCH, KARL
241 DONALDSON AVENUE
SAN ANTONIO, TEXAS, 78201
(210) 836-6729

SHEET NAME

SYSTEM
LABELING
DETAIL

SHEET SIZE

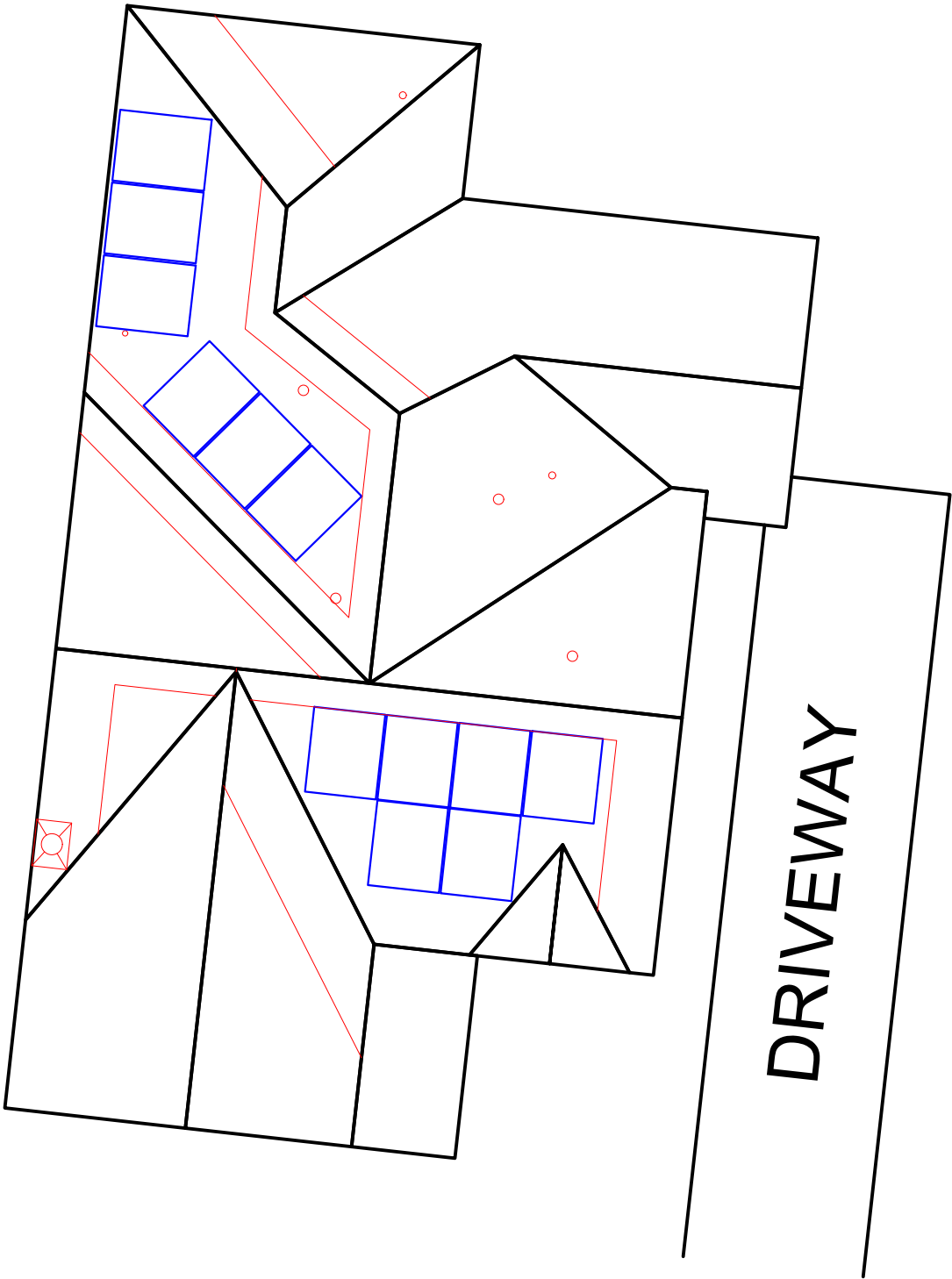
ANSI B
11" x 17"

SHEET NUMBER

PV-5

DRAW IN CONTROLLED ACCESS ZONE (CAZ) BOUNDARY AND LADDER
PLACEMENT ON SITE PLAN BELOW.

HARD HAT IS REQUIRED AT ALL TIMES IN CAZ



COMPETENT PERSON: _____ JOB START DATE: _____

CONDUCT SAFETY MEETING WITH ALL CREW
MEMBERS ON SITE AT THE BEGINNING OF EACH JOB.
USE SIGN IN SHEET BELOW.

- 1. _____
- 2. _____
- 3. _____
- 4. _____
- 5. _____

GUEST SIGN IN

- 1. _____
- 2. _____
- 3. _____

DESIGN BY:
FREEDOM SOLAR, LLC

REVISIONS		
DESCRIPTION	DATE	REV
DESIGN PACKET	11/23/2020	A

CONTRACTOR



**FREEDOMTM
SOLAR POWER**

FREEDOM SOLAR LLC
4801 FREIDRICH LN, STE 100
AUSTIN, TX 78744
TECL # 28621
TBPE FIRM # F-17690

PROJECT NAME

HAGENBUCH, KARL & GWYN
241 DONALDSON AVENUE
SAN ANTONIO, TEXAS, 78201
(210) 836-6729

SHEET NAME

SAFETY
PLAN

SHEET SIZE

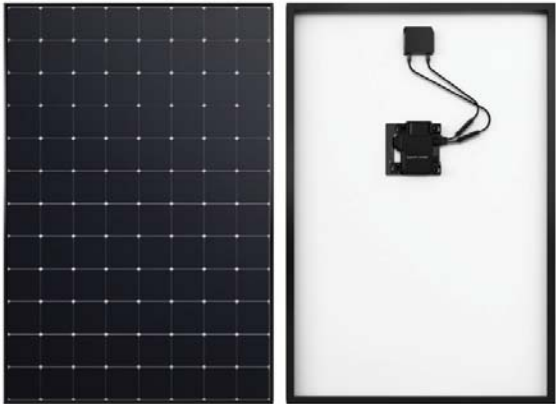
ANSI B
11" x 17"

SHEET NUMBER

PV-6



SUNPOWER®



SunPower® E-Series: E20-327 | E19-320

SunPower® Residential AC Module

Built specifically for use with the SunPower Equinox™ system, the only fully integrated solution designed, engineered, and warranted by one manufacturer.



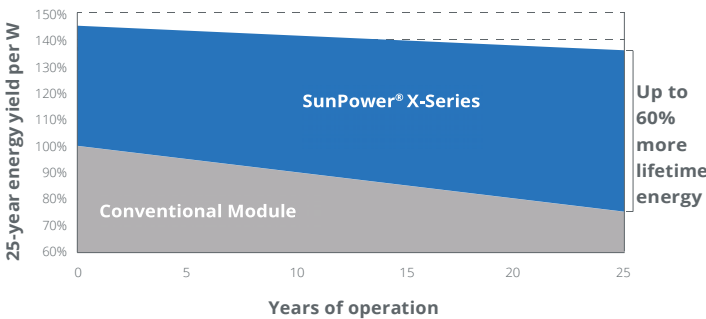
Maximum Power. Minimalist Design.

Industry-leading efficiency means more power and savings per available space. With fewer modules required and hidden microinverters, less is truly more.



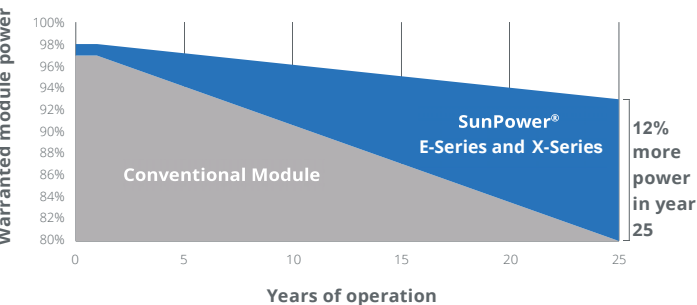
Highest Lifetime Energy and Savings.

Designed to deliver 60% more energy over 25 years in real-world conditions like partial shade and high temperatures.¹



Best Reliability. Best Warranty.

With more than 25 million modules deployed around the world, SunPower technology is proven to last. That's why we stand behind our module and microinverter with the industry's best 25-year Combined Power and Product Warranty, including the highest Power Warranty in solar.



Fundamentally Different. And Better.



The SunPower® Maxis® Solar Cell

- Enables highest-efficiency modules available.²
- Unmatched reliability³
- Patented solid metal foundation prevents breakage and corrosion



Factory-integrated Microinverter

- Simpler, faster installation
- Integrated wire management, rapid shutdown
- Engineered and calibrated by SunPower for SunPower modules

E-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/Range ² (V)	240 / 211–264	208 / 183–229
Max. Continuous Output Current (A)	1.31	1.51
Max. Units per 20 A (LL) Branch Circuit ³	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 Maxis 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.

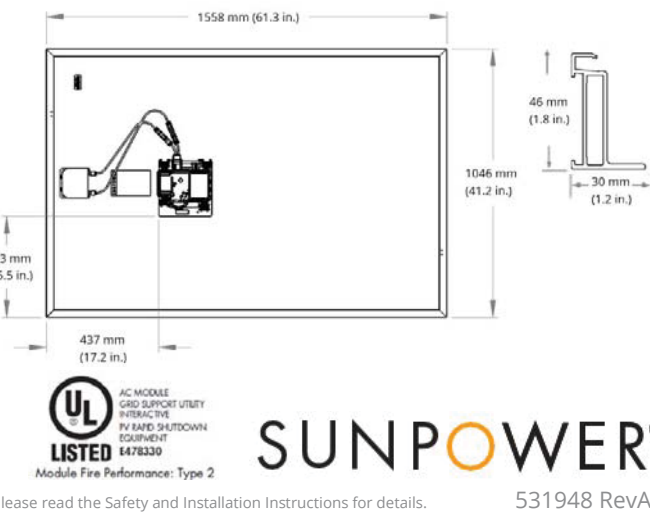
4 Factory set to 1547a-2014 default settings. CA Rule 21 default settings profile set during commissioning. See the Equinox Installation Guide #518101 for more information.

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 PVRSE 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) ⁶ : • Rated for load break disconnect
PID Test	Potential-induced degradation free



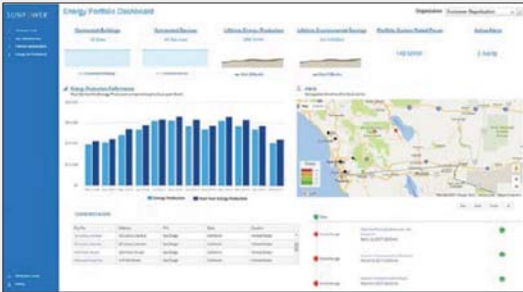


SunPower® EnergyLink™ | Residential and Commercial PVS6

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 PVS6 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



SunPower® EnergyLink™ | Residential and Commercial PVS6

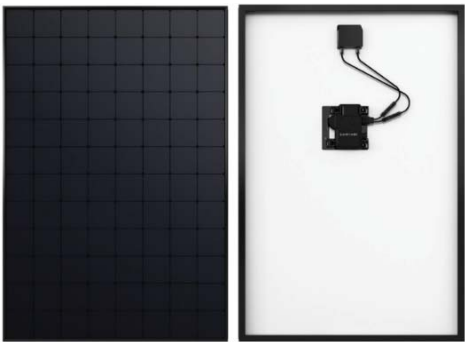
SunPower Monitoring Websites



PVS6



SunPower AC Modules



Multiple communication options include Ethernet, Wi-Fi, and cellular.

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

Mechanical	
Weight	5.5 lbs (2.5 kg)
Dimensions	11.8 × 8.0 × 4.2 in. (30.5 × 20.5 × 10.8 cm)
Enclosure rating	UL50E Type 3R

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

Web and Mobile Device Support	
Customer site	monitor.us.sunpower.com
Partner site	pvsmtgmt.us.sunpower.com
Browsers	Firefox, Safari, and Chrome
Mobile devices	iPhone®, iPad®, and Android™
Customer app	<ol style="list-style-type: none">1. Create account online at: monitor.us.sunpower.com.2. On a mobile device, download the SunPower Monitoring app from Apple App Store® or Google Play™ store.3. Sign in using account email and password.

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



© 2019 SunPower Corporation. All rights reserved. SUNPOWER, SUNPOWER logo, and ENERGYLINK are trademarks or registered trademarks of SunPower Corporation. iPhone and iPad are registered trademarks of Apple Inc. Android and Google Play are trademarks of Google Inc. All other trademarks are the property of their respective owners. Specifications included in this datasheet are subject to change without notice.



530536 RevC



SunPower® InvisiMount™ | Residential Mounting System

Simple and Fast Installation

- Integrated module-to-rail grounding
- Pre-assembled mid and end clamps
- Levitating mid clamp for easy placement
- Mid clamp width facilitates consistent, even module spacing
- UL 2703 Listed integrated grounding

Flexible Design

- Addresses nearly all sloped residential roofs
- Design in landscape and portrait with up to 8' rail span
- Pre-drilled rails and rail splice
- Rails enable easy obstacle management

Customer-Preferred Aesthetics

- #1 module and #1 mounting aesthetics
- Best-in-class system aesthetics
- Premium, low-profile design
- Black anodized components
- Hidden mid clamps and capped, flush end clamps

Part of Superior System

- Built for use with SunPower DC and AC modules
- Best-in-class system reliability and aesthetics
- Optional rooftop transition flashing, rail-mounted J-box, and wire management rail clips
- Combine with SunPower modules and SunPower EnergyLink® monitoring app



Elegant Simplicity

SunPower® InvisiMount™ is a SunPower-designed rail-based mounting system. The InvisiMount system addresses residential sloped roofs and combines faster installation time, design flexibility, and superior aesthetics. The InvisiMount product was specifically envisioned and engineered to pair with SunPower modules. The resulting system-level approach amplifies the aesthetic and installation benefits—for homeowners and for installers.



SunPower® InvisiMount™ | Residential Mounting System

InvisiMount Components

Module¹ / Mid Clamp and Rail



Ground Lug Assembly



Mid Clamp



Row-to-Row Spacer



Row-to-Row Grounding Clip

Module¹ / End Clamp and Rail



End Clamp



Rail and Rail Splice

InvisiMount Component Details		
Mid clamp	Black oxide stainless steel 300 series	63 g (2.2 oz)
End clamp	Black anodized aluminum 6000 series	110 g (3.88 oz)
Rail	Black anodized aluminum 6000 series	830 g/m (9 oz/ft)
Rail splice	Aluminum alloy 6000 series	830 g/m (9 oz/ft)
Rail bolt	M10-1.5 × 25 mm; custom T-head SS304	18 g (0.63 oz)
Rail nut	M10-1.5; DIN 6923 SS304	nominal
Ground lug assembly	SS304; A2-70 bolt; tin-plated copper lug	106.5 g (3.75 oz)
Row-to-row grounding clip	SS 301 with SS 304 M6 bolts	75 g (2.6 oz)
Row-to-row spacer	Black POM-grade plastic	5 g (0.18 oz)

InvisiMount Operating Conditions	
Temperature	−40° C to 90° C (−40° F to 194° F)
Max. Load (LRFD)	<ul style="list-style-type: none">• 3000 Pa uplift• 6000 Pa downforce

Roof Attachment Hardware Supported by Design Tool	
Application	<ul style="list-style-type: none">• Composition Shingle Rafter Attachment• Composition Shingle Roof Decking Attachment• Curved and Flat Tile Roof Attachment• Universal interface for other roof attachments

InvisiMount Warranties And Certifications	
Warranties	<ul style="list-style-type: none">• 25-year product warranty• 5-year finish warranty
Certifications	<ul style="list-style-type: none">• UL 2703 Listed• Class A Fire Rated

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

InvisiMount Component LRFD Capacities ²		
Mid clamp	Uplift	664 lbf
	Shear	540 lbf
End clamp	Uplift	899 lbf
	Shear	220 lbf
Rail	Moment: upward	548 lbf-ft
	Moment: downward	580 lbf-ft
Rail splice	Moment: upward	548 lbf-ft
	Moment: downward	580 lbf-ft
L-foot	Uplift	1000 lbf
	Shear	390 lbf

¹ Module frame that is compatible with the InvisiMount system required for hardware interoperability.
² SunPower recommends that all Equinox™, InvisiMount™, and AC module systems always be designed using the InvisiMount Span Tables #524734. If a designer decides to instead use the component capacities listed in this document to design a system, note that the capacities shown are Load and Resistance Factor Design (LRFD) design loads, and are NOT to be used for Allowable Stress Design (ASD) calculations; and that a licensed Professional Engineer (PE) must then stamp all calculations. If you have any questions please contact SunPower Technical Support at 1-855-977-7867.
© 2018 SunPower Corporation. All Rights Reserved. SUNPOWER, the SUNPOWER logo, EQUINOX, and INVISIMOUNT are trademarks or registered trademarks of SunPower Corporation. All other trademarks are the property of their respective owners. Specifications included in this datasheet are subject to change without notice.

sunpower.com
509506 RevF

Datasheet

SUNPOWER®

Datasheet

SUNPOWER®

COMP MOUNT – BLACK



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 coating 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 – BLACK

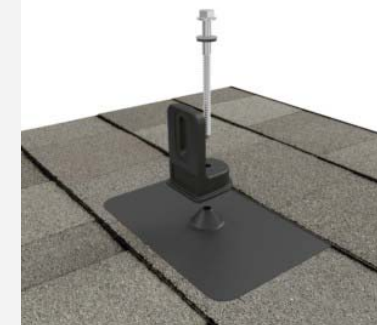
1. Drill pilot hole in center of rafter.



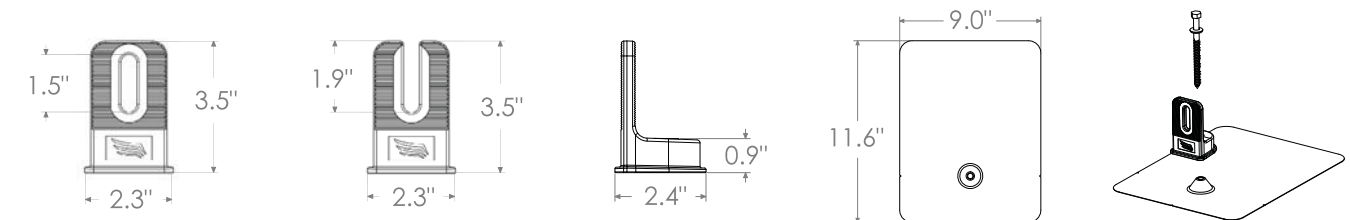
2. Optional: Apply a "U-shape" of sealant to underside of flashing and position under 2nd shingle course, cone over pilot hole.



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



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



Specifications	Black Comp Mount Install Kits		
SKU	PSCR-C0	PSCR-UBB0	SPCR-CH
L-Foot Type	Closed Slot	Open Slot	Closed Slot
Kit Contents	L-Foot, Flashing, 5/16" x 4-1/2" SS Lag w/ EPDM washer	L-Foot, Flashing, 5/16" x 4-1/2" SS Lag w/ EPDM washer	L-Foot, Flashing, 5/16" x 4-1/2" SS Lag w/ EPDM washer, M10 Hex Bolt
Finish	Black L-Foot and Black Flashing		
Roof Type	Composition Shingle		
Certifications	IBC, ASCE/SEI 7-10, AC286		
Install Application	Railed Systems		
Compatible Rail	Most		
Flashing Material	Painted Galvalume Plus		
L-Foot Material	Aluminum		
Kit Quantity	24		
Boxes per Pallet	72		

Patents Pending. All rights reserved. © 2019 Pegasus Solar Inc

Eaton general duty cartridge fuse safety switch

DG222NRB

UPC:782113144221

Dimensions:

- **Height:** 14.37 IN
- **Length:** 7.35 IN
- **Width:** 8.4 IN

Weight:10 LB

Notes:Maximum hp ratings apply only when dual element fuses are used. 3-Phase hp rating shown is a grounded B phase rating, UL listed.

Warranties:

- Eaton Selling Policy 25-000, one (1) year from the date of installation of the Product or eighteen (18) months from the date of shipment of the Product, whichever occurs first.

Specifications:

- **Type:** General duty, cartridge fused
- **Amperage Rating:** 60A
- **Enclosure:** NEMA 3R
- **Enclosure Material:** Painted galvanized steel
- **Fuse Class Provision:** Class H fuses
- **Fuse Configuration:** Fusible with neutral
- **Number Of Poles:** Two-pole
- **Number Of Wires:** Three-wire
- **Product Category:** General duty safety switch
- **Voltage Rating:** 240V

Supporting documents:

- [Eatons Volume 2-Commercial Distribution](#)
- [Eaton Specification Sheet - DG222NRB](#)

Certifications:

- UL Listed

Product compliance: No Data



Eaton general duty non-fusible safety switch

DG222URB

UPC:782113144238

Dimensions:

- **Height:** 14.38 IN
- **Length:** 7.38 IN
- **Width:** 8.69 IN

Weight:9 LB

Notes:WARNING! Switch is not approved for service entrance unless a neutral kit is installed.

Warranties:

- Eaton Selling Policy 25-000, one (1) year from the date of installation of the Product or eighteen (18) months from the date of shipment of the Product, whichever occurs first.

Specifications:

- **Type:** Non-fusible, single-throw
- **Amperage Rating:** 60A
- **Enclosure:** NEMA 3R, Rainproof
- **Enclosure Material:** Painted galvanized steel
- **Fuse Configuration:** Non-fusible
- **Number Of Poles:** Two-pole
- **Number Of Wires:** Two-wire
- **Product Category:** General duty safety switch
- **Voltage Rating:** 240V

Supporting documents:

- [Eatons Volume 2-Commercial Distribution](#)
- [Eaton Specification Sheet - DG222URB](#)

Certifications:

- UL Listed

Product compliance: No Data



Eaton CH main lug loadcenter

CH8L125RP

UPC:782114190548

Dimensions:

- **Height:** 3.69 IN
- **Length:** 13 IN
- **Width:** 11 IN

Weight:12 LB

Notes:Ground bar kits priced separately. Suitable for use as service equipment when not more than two service disconnecting mains are provided or when not used as a lighting and appliance panelboard.

Warranties:

- Limited lifetime

Specifications:

- **Special Features:** Cover included
- **Type:** Main lug only
- **Amperage Rating:** 125A
- **Box Size:** 7r
- **Bus Material:** Copper
- **Enclosure:** NEMA 3R
- **Enclosure Material:** Metallic
- **Feed Type:** Overhead
- **Main Circuit Breaker:** CH
- **Number Of Circuits:** 8
- **Number Of Wires:** Three-wire
- **Phase:** Single-phase
- **Voltage Rating:** 120/240V, 208Y/120, 240V
- **Wire Size:** #6-1/0 AWG

Supporting documents:

- [Type CH Circuit Breakers and Loadcenters](#)
- [Loadcenters and Circuit Breakers](#)
- [Eatons Volume 1-Residential and Light Commercial](#)



Eaton CH main lug loadcenter

CH12L125R

UPC:782113097381

Dimensions:

- **Height:** 5.19 IN
- **Length:** 16.75 IN
- **Width:** 14.31 IN

Weight:15.8 LB

Notes:Suitable for use as service equipment when not more than six service disconnecting mains are provided or when not used as a lighting and appliance panelboard. Rainproof panels are furnished with hub closure plates. For rainproof hubs.

Warranties:

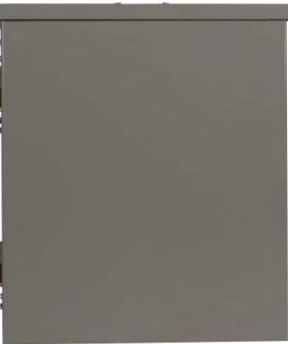
- Limited lifetime

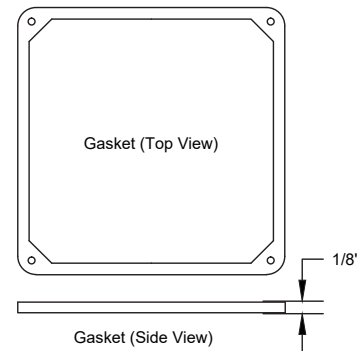
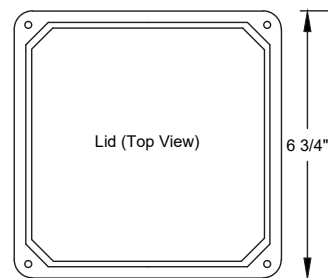
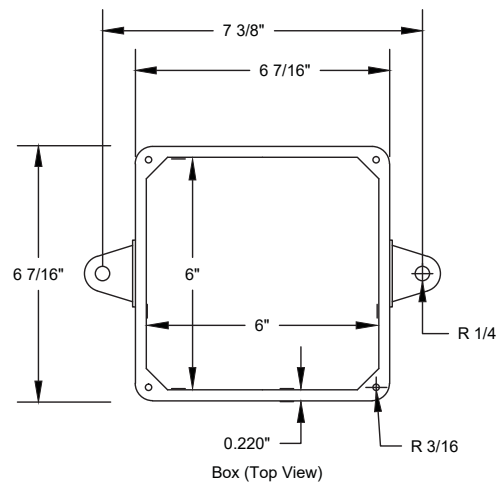
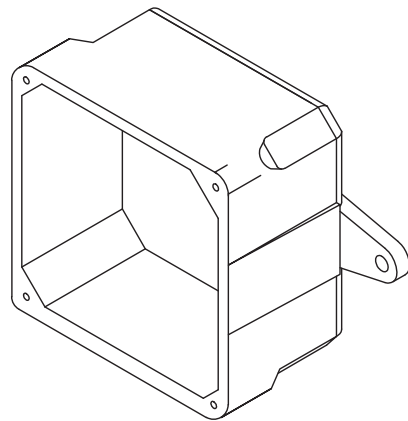
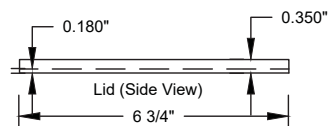
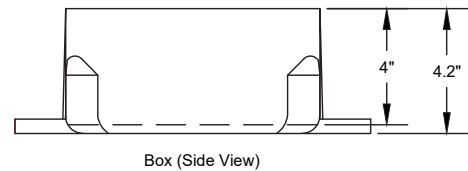
Specifications:

- **Special Features:** Cover included
- **Type:** Main lug only
- **Amperage Rating:** 125A
- **Box Size:** B
- **Bus Material:** Copper
- **Enclosure:** NEMA 3R
- **Enclosure Material:** Metallic
- **Feed Type:** Overhead
- **Main Circuit Breaker:** CH
- **Number Of Circuits:** 12
- **Number Of Wires:** Three-wire
- **Phase:** Single-phase
- **Voltage Rating:** 120/240V
- **Wire Size:** #6-2/0 AWG

Supporting documents:

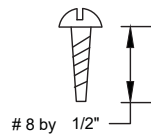
- [Dimensional Drawing - CH 3/4 LOADCENTER, MAIN LUG ONLY, OUTDOOR NEMA 3R, 120/240 VAC, 1 PH](#)





Gasket (Side View)

UL Listed
Marine Listed
UL File # E205935 (QCUP)
UL Control # 92CM
Material is Rigid PVC
132 cu in Volume (2163 cu cm)
Screws are Zinc Plated Steel
Gasket is neoprene



CANTEX
INC.
Fort Worth, TEXAS

Junction Box 6 x 6 x 4

Drawn By: O.M. Date: 6/19/17 5133710



INSTALLATION MADE EZ & EZR!

EZ



EZR



SunModo's best-selling EZ Roof Mount is the industry standard for PV system mounting on any composite shingle roof.

Now, SunModo introduces a smaller footprint, EZR Roof Mount flashing, where truss anchoring can be assured, embossed design minimizes bending, and only one tool is needed.

The EZ & EZR Advantage

- ✓ Leak-proof design protects sealing points from elements.
- ✓ ICC Certified for both rafter and decking solution.
- ✓ Exceptional resistance to corrosion and wear.
- ✓ A wide variety of L-feet and standoffs available.
- ✓ **Surprisingly easy to install!**

Key Features of EZ and EZR

MODEL

Raised teardrop design diverts water from the roof penetration.

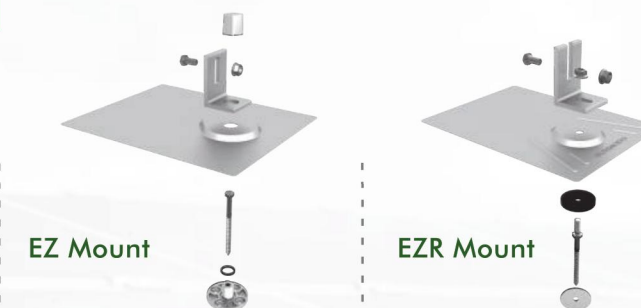
360-degree L foot positioning, serrated L foot on both sides for rail mounting.

A wide variety of L-feet and standoffs available.

Versatile mounting option includes direct-to-decking for easy installation.

Stamped emboss features stiffen the flashing to minimize bending.

Only one tool is needed.



EZ Mount

EZR Mount



Technical Data

Application	Composite shingle
Material	High grade aluminum, 304 stainless steel hardware
Finish	Clear anodized, silver or black powder coated
Flashing Size	EZ Roof Mount: 10.00 x 12.48 x 0.04 inches EZR Roof Mount: 8.00 x 11.38 x 0.03 inches
Roof Attachment	EZ Roof Mount: Rafter and decking EZR Roof Mount: Rafter only
Structural Integrity	IBC and IRC compliant
Warranty	20 years