

SCOPE OF WORK

TO INSTALL A RESIDENTIAL ROOFTOP SOLAR PHOTOVOLTAIC (PV) SYSTEM WITH BATTERY BACKUP. THE POWER GENERATED BY THE PV SYSTEM WILL BE INTERCONNECTED WITH THE UTILITY GRID THROUGH THE EXISTING ELECTRICAL SERVICE EQUIPMENT. THE PV SYSTEM INCLUDES BATTERIES.

ELECTRICAL NOTES

- 1) ALL EQUIPMENT TO BE LISTED BY THE UL OR OTHER NRTL AND LABELED FOR ITS APPLICATION.
- 2) ALL CONDUCTORS SHALL BE COPPER, RATED FOR 600V AND 90°C WET ENVIRONMENT.
- 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 ACCESSORIES 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) MODULE GROUNDING CLIPS TO BE INSTALLED BETWEEN MODULE FRAME AND MODULE SUPPORT RAIL, PER THE GROUNDING CLIP MANUFACTURER'S INSTRUCTION.
- 9) MODULE SUPPORT RAIL TO BE BONDED TO CONTINUOUS COPPER G.E.C. VIA WEEB LUG OR THE ILSCO GBL-4DBT LAY-IN LUG.
- 10) THE POLARITY OF THE GROUNDED CONDUCTORS IS (positive/negative) OR THE DC SIDE OF THE PV SYSTEM IS UNGROUNDED AND SHALL COMPLY WITH NEC 690.35

NCDOT REQUIREMENTS

OPTION 2

WEIGHT OF PV SYSTEM ON ROOF:

2.8311 PSF

EXISTING ROOF MATERIAL TYPE:

R-PANEL METAL ROOF

PROJECT LOCATION WIND ZONE:

115 MPH



VICINITY MAP

CONTRACTOR



SUN DOLLAR ENERGY, LLC
 4904 ELAINE AVENUE
 RALEIGH, NC 27616
 (919) 508-6907
 NC ELE LICENSE #: 30043U
 NC GC LICENSE #: 73462

PROJECT & CLIENT INFORMATION

**NUGENT RESIDENCE
 NEW SOLAR PV SYSTEM**
 SYSTEM SIZE: 12.8 KW DC
 SYSTEM SIZE: 12.0 KW AC

PATRICK NUGENT
 225 OUTLAW LANE
 CAMERON, NC 28326
 (910) 639-5455

ENGINEER OF RECORD

DRAWING BY

GBR

REVISIONS

DESCRIPTION	DATE	#	BY
RELEASED FOR PERMITTING	8/26/2020	1	GBR

SHEET SIZE

**ANSI B
 11" X 17"**

DATE

8/26/2020

SHEET NAME

**GENERAL
 INFORMATION**

SHEET NUMBER

COVER

SHEET INDEX	
COVER	GENERAL INFORMATION
PV-1	SITE PLAN
PV-2	ROOF LAYOUT AND MOUNTING DETAIL
PV-3	ELECTRICAL SCHEMATIC
PV-4	AMPACITY CALCULATIONS AND WIRE SIZING
PV-5	LABELING SCHEDULE
CUTSHEETS	MANUFACTURER SPECIFICATION SHEETS

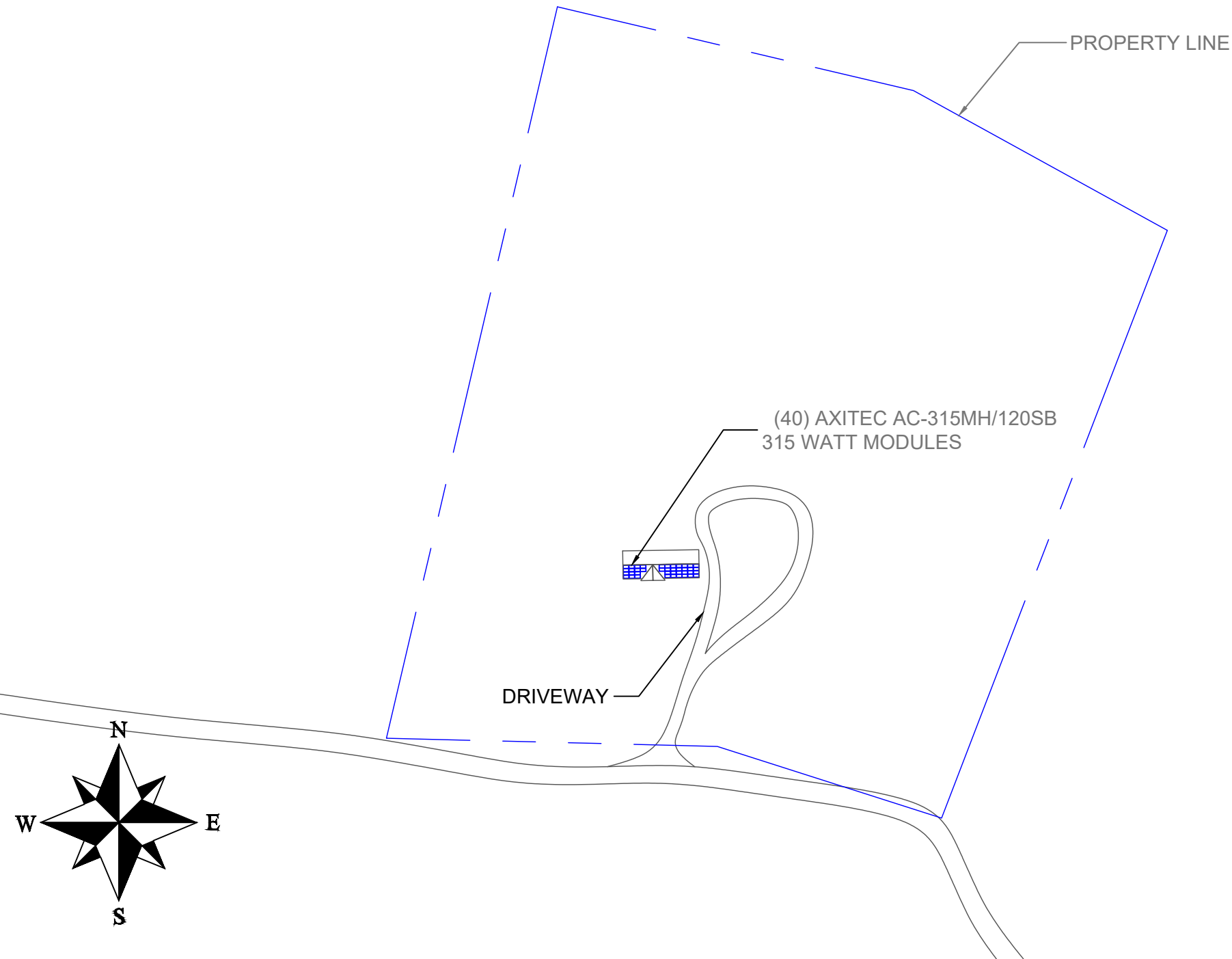
GOVERNING CODES
NFPA 70 NATIONAL ELECTRICAL CODE 2017
2018 INTERNATIONAL BUILDING CODE
2018 NORTH CAROLINA BUILDING CODE
2018 NORTH CAROLINA RESIDENTIAL CODE
UNDERWRITERS LABORATORIES (UL) STANDARDS
OSHA 29 CFR 1910.269
NORTH CAROLINA DEPARTMENT OF INSURANCE

DESIGN SPECIFICATIONS	
CONSTRUCTION TYPE	SINGLE-FAMILY
ZONING	RESIDENTIAL
GROUND SNOW LOAD	20 PSF
WIND EXPOSURE CATEGORY	CATEGORY B
WIND SPEED	115 MPH
UTILITY PROVIDER	DUKE ENERGY
AHJ	HARNETT COUNTY

SYSTEM SPECIFICATIONS	
SOLAR MODULES	(40) AXITEC AC-315MH/120SB 315 WATT MODULES
POWER OPTIMIZERS	(40) SMA TS4-R-F
INVERTER(S)	(2) SMA SB6.0-1SP-US-41
SOLAR MOUNTS	S-5! PROTEA BRACKETS
SOLAR RACKING SYSTEM	EVEREST CROSSRAIL X48
MONITORING	YES
POINT OF INTERCONNECT	60A/2P BREAKER IN MSP

PROPERTY PLAN

SCALE: 1/128"=1'-0"



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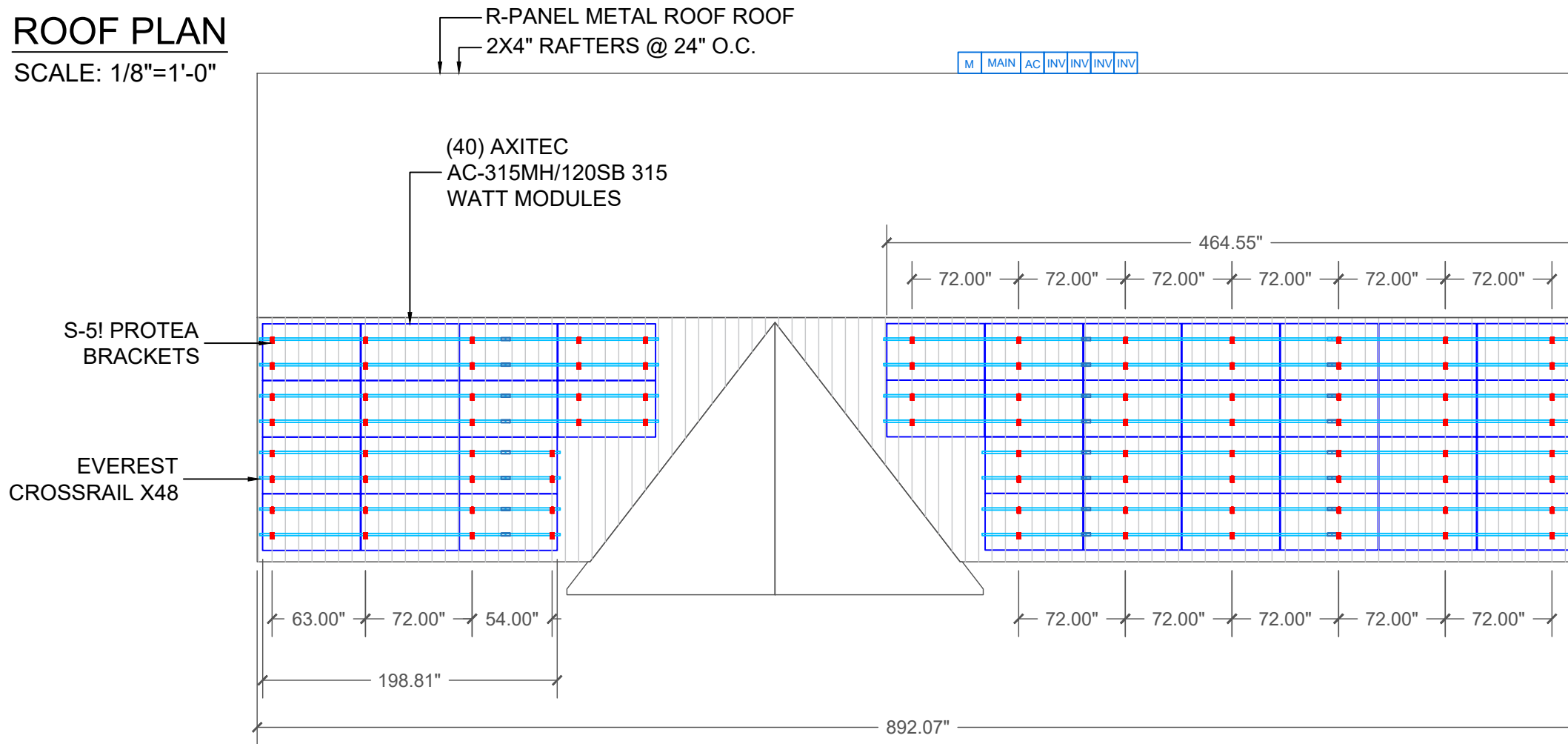
SITE PLAN

SHEET NUMBER

PV-1

ROOF PLAN


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



LOAD CALCULATIONS

NUMBER OF MODULES	40	
MODULE WEIGHT	40.79	LBS
MODULE SQ FT	17.875	SQ FT
TOTAL MODULE WEIGHT	1631.6	LBS
TOTAL MODULE SQ FT	715	SQ FT
NUMBER OF PORTRAIT	0	
NUMBER OF LANDSCAPE	40	
NUMBER OF OPTIMIZERS	40	
WEIGHT PER OPTIMIZER	1.5	LBS
TOTAL OPTIMIZER WEIGHT	60	LBS
TOTAL LENGTH OF RAIL	434	LF
RAIL WEIGHT PER FOOT	0.56	LBS
TOTAL RAIL WEIGHT	243.04	LBS
NUMBER OF FLANGES	84	
WEIGHT PER FLANGE	0.7565	LBS
WEIGHT PER SYSTEM	63.546	LBS
NUMBER OF MID CLAMPS	64	
MID CLAMP WEIGHT	0.21	LBS
WEIGHT PER SYSTEM	13.44	LBS
NUMBER OF END CLAMPS	32	
END CLAMP WEIGHT	0.32	LBS
WEIGHT PER SYSTEM	10.24	LBS
NUMBER OF SPLICES	24	
WEIGHT PER SPLICE	0.1	LBS
WEIGHT PER SYSTEM	2.4	LBS
TOTAL ARRAY WEIGHT	2024.266	LBS
POINT LOAD	24.0984	LBS/FT
TOTAL ARRAY AREA	715	SQ FT
ARRAY DEAD LOAD	2.8311	PSF

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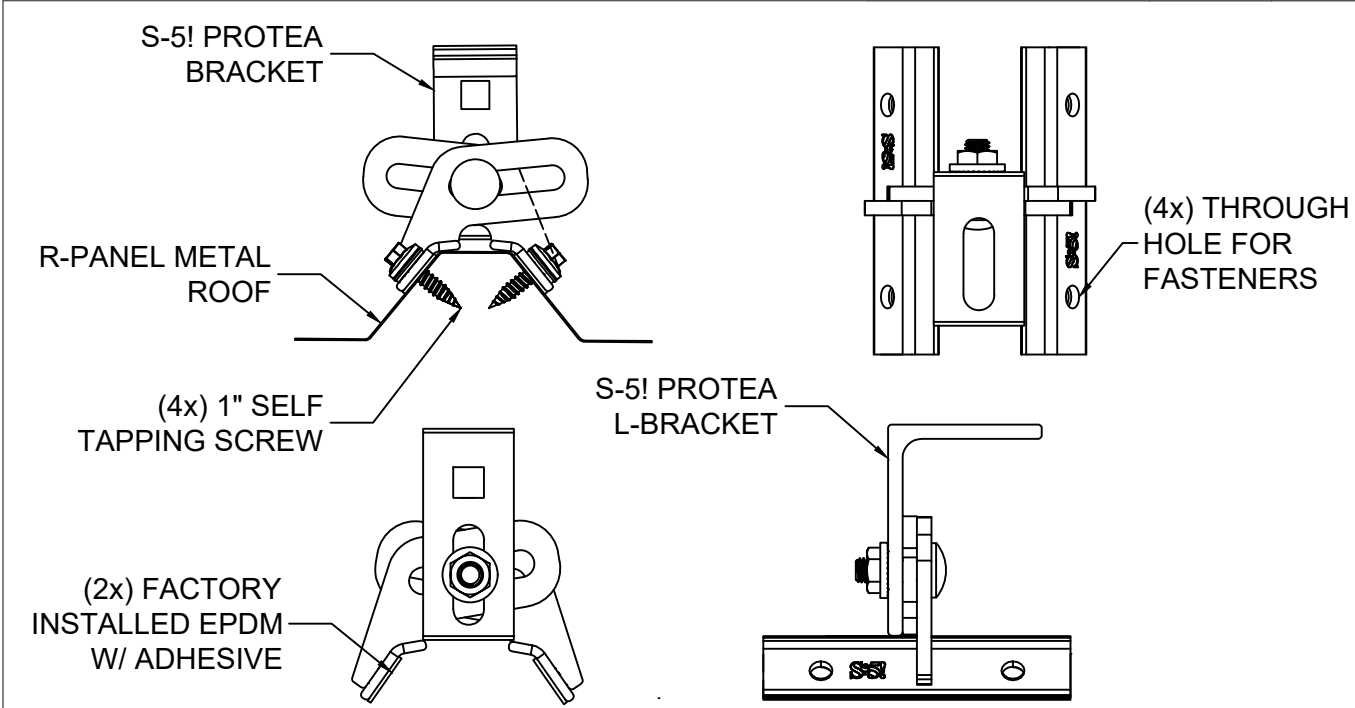
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ROOF 1 PITCH: 11°

LEGEND			
UTILITY METER	DC DISCONNECT	PV METER	RAILS
MAIN SERVICE PANEL	JUNCTION BOX	EXTERIOR CONDUIT	GROUNDING
INVERTER	SUBPANEL	GAS METER	RAIL SPLICE
AC DISCONNECT	LOAD CENTER	FLASHINGS	



SOLAR MOUNTING DETAIL S-5! PROTEA BRACKETS

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**ROOF LAYOUT &
 DETAIL DRAWINGS**

SHEET NUMBER

PV-2

Solar PV Module Data	
Manufacturer	Axitec
Model Number	AC-315MH/120SB
Max Power (Pmax)	315
Max Power Voltage (Vmp)	32.97
Max Power Current (Imp)	9.56
Open Circuit Voltage (Voc)	40.13
Short Circuit Current (Isc)	10.03
Max Series Fuse (OCPD)	20
Max System Voltage	1000
UL Listing	UL1703
Protection Rating	IP67

Inverter Data	
Manufacturer	SMA
Model Number	SB6.0-1SP-US-41
Max DC Input Voltage	600
Nominal DC Input Voltage	480
Max DC Input Current	30
Max DC Short Circuit Current	54
Max DC Input Power	8520
Max AC Output Power	6000
Nominal AC Output Voltage	240
Max AC Output Current	25
Strings Per Inverter	1 - 3
UL Listing	UL1741
Enclosure Rating	NEMA 3R

Battery Inverter Data	
Manufacturer	SMA
Model Number	SI6048-US-10
Rated Grid Voltage / AC Voltage Range	120V / 105-132V
Rated AC Output Power	5750 Watts
Rated Current / Max Output Current	48A / 180A for 60ms
Rated Input Voltage / AC Input Voltage Range	120V / 80V-150V
Max AC Input Current / Rated AC Input Current	56A / 0A-56A
Max AC Input Power	6700 Watts
Rated Battery Input Voltage / Voltage Range	48V / 41V-63V
Max Charge Current / DC Rated Charge Current	130A / 110A
Number of Inverters	2
UL Listing	UL1741
Enclosure Rating	NEMA 1

AC Disconnect Data "A"	
Manufacturer	Eaton
Model Number	DH223NRV
Voltage Rating	240
Amperage Rating	100
Phase	Single
Switch Style	Fusible
Fuse Rating	70
UL Listing	UL 98
Enclosure Rating	NEMA 3R

Main Service Panel Data	
Manufacturer	Siemens
Model Type	Load Center
Model Number	N/A
Voltage Rating	120/240
Busbar Amp Rating	200A
Main Breaker/Main Lug	Main Breaker
Breaker Amp Rating	200A
Phase	Single
UL Listing	UL 67
Enclosure Rating	NEMA 3R

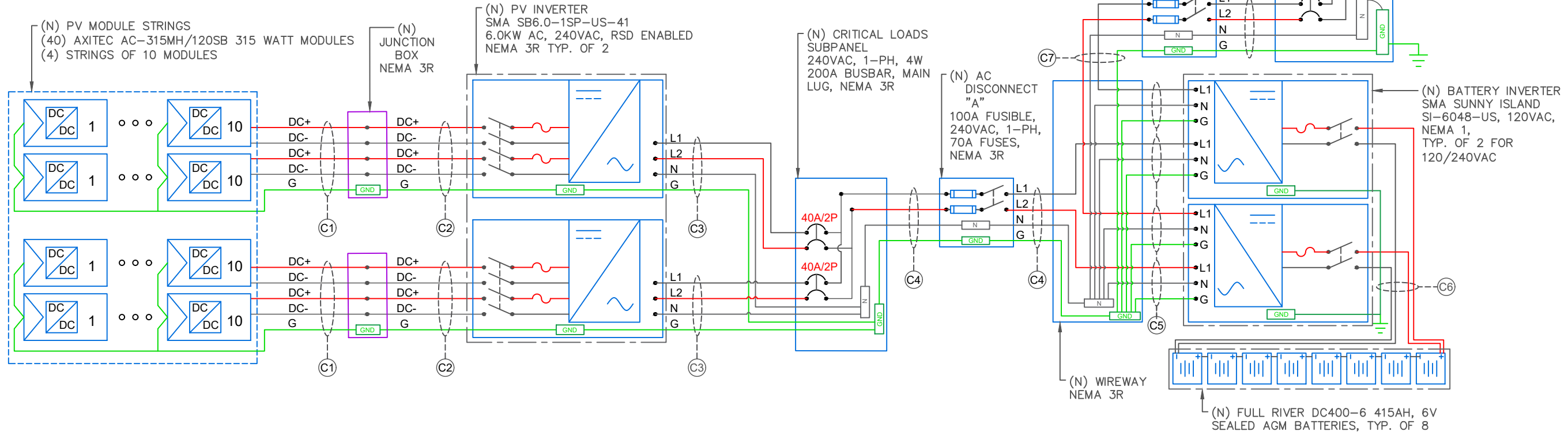
Temperature Data	
Average High Temp	93.2° F
Record Low Temp	10.4° F

Power Optimizer Data	
Manufacturer	SMA
Model Number	TS4-R-F
Rated DC Input Power	475
Max Input Voltage	90
Max Input Current	10.32
Max Short Circuit Current	12
Max Output Voltage	40.1
Max Output Current	9.74
UL Listing	UL1741
Protection Rating	IP68/NEMA4X

Junction Box Data	
Manufacturer	Soladeck
Model Number	0799-5B
Voltage Rating	600
Amperage Rating	120
UL Listing	UL 50
Enclosure Rating	NEMA 3R

Battery Data	
Manufacturer	Full River
Model Number	DC400-6
Battery Type	Sealed AGM
Nominal Voltage	6 Volts
Rated Capacity	400 Amp Hours
Cycling Capacity (20Hr Rate)	415 Amp Hours
Battery Dimensions	16.69" (H) x 11.61" (L) x 7.05" (W)
Weight	6700 Watts
UL Listing	48V / 41V-63V
Number of Batteries	130A / 110A

AC Disconnect Data "B"	
Manufacturer	GE
Model Number	TG3222R
Voltage Rating	240
Amperage Rating	60
Phase	Single
Switch Style	Fusible
Fuse Rating	60
UL Listing	UL 98
Enclosure Rating	NEMA 3R



WIRE SCHEDULE													
TAG	CURRENT CARRYING CONDUCTORS				GROUNDING CONDUCTORS				CONDUIT/RACEWAY				NOTES
	QTY.	SIZE	MATERIAL	INSULATION TYP.	QTY.	SIZE	MATERIAL	INSULATION TYP.	QTY.	SIZE	MATERIAL	LOCATION	
C1	4	10 AWG	COPPER	PV WIRE	1	8 AWG	BARE COPPER	N/A	-	-	-	FREE AIR	PANELS TO JUNCTION BOX
C2	4	10 AWG	COPPER	THHN/THWN-2	1	10 AWG	COPPER	THHN/THWN-2	1	3/4"	LFMC/EMT	EXTERIOR/INTERIOR	JUNCTION BOX TO INVERTERS
C3	3	8 AWG	COPPER	THHN/THWN-2	1	10 AWG	COPPER	THHN/THWN-2	1	3/4"	LFNC/EMT	EXTERIOR	INVERTER TO SUBPANEL
C4	3	8 AWG	COPPER	THHN/THWN-2	1	10 AWG	COPPER	THHN/THWN-2	1	3/4"	LFNC/EMT	EXTERIOR	SUBPANEL TO DISCONNECT
C5	2	6 AWG	COPPER	THHN/THWN-2	1	6 AWG	COPPER	THHN/THWN-2	1	3/4"	LFNC	EXTERIOR	WIREWAY TO SUNNY ISLAND
C6	2	2/0 AWG	COPPER	MTW/AWM	1	6 AWG	COPPER	BARE	1	1-1/2"	PVC	INTERIOR	EGC TO GROUND ROD
C7	3	6 AWG	COPPER	THHN/THWN-2	1	10 AWG	COPPER	THHN/THWN-2	1	1"	LFNC	EXTERIOR	INTERCONNECTION TO MSP

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SHEET NAME
ELECTRICAL SCHEMATIC

SHEET NUMBER
PV-3

Ampacity Calculations

Wiring Location: Module to Power Optimizer (Direct Current)
 Wiring Location: Inverter to Service Entrance (Alternating Current)
 All calculations show minimum sizing for ampacity
 Actual wire sizing may be larger for voltage drop or other factors
 All calculations are according to the 2017 National Electric Code

Modules: Axitec AC-315MH/120SB
Inverter: SMA SB6.0-1SP-US-41

Initial Input Values

Isc (Short Circuit Current)	10.03				
Number of circuits	10.03	x	1	=	10.03
Maximum Circuit Current (NEC 690.8 (A)(1+2))	10.03	x	156%	=	15.6468
Minimum Overcurrent Device	20	A	Series Fuse Rating by Manufacturer		
	Size AWG #				
Chosen Conductor Type (THHN, RHW-2, or USE-2)	10				

Conductor Derating

NEC 690.31 © ref (NEC 310.16)

Conductor 90°C Ampacity		40			
Conduit Fill Derating	4-6	40	x	0.8	= 32
Temperature Derating (°F)	132-140	32	x	0.71	= 22.72

Ampacity vs Overcurrent

Device					
Conductor Ampacity Check		22.72	15.6468		OK
Conductor to Overcurrent Check		22.72	20		OK

Input Data Into Yellow Fields

Green Field must say OK

Use this calculation for over current protection and wire sizing for stringers coming from Solar Panels.
 Isc comes from manufacturer

Ampacity Calculations

Wiring Location: Inverter to Service Entrance (Alternating Current)
 All calculations show minimum sizing for ampacity
 Actual wire sizing may be larger for voltage drop or other factors
 All calculations are according to the 2017 National Electric Code

Modules: Axitec AC-315MH/120SB
Inverter: SMA SB6.0-1SP-US-41

Initial Input Values

Inverter Continuous AC Output Combined (Watts)	6000				
Minimum Operating Voltage	240				

	Watts		Volts	=	Amps
	6000	/	240	=	25
Inverter Continuous AC Amps	25				
Number of Inverters	25	x	1	=	25

Overcurrent Device Rating

NEC 690.8 (B)(3)

Minimum Overcurrent Device	25	x	125%	=	31.25
Circuit Breaker Size per NEC 240.6(A)	40	Amps			
	40	Amps			
	Size AWG #				

Chosen Conductor Type	8				
THHN, THWN, RHW-2 or USE-2					

Conductor Derating

NEC 690.31© ref (NEC 310.16)

Conductor 90°C Ampacity		55			
Conduit Fill Derating	1-3	55	x	1	= 55
Temperature Derating (°F)	96-104	55	x	0.91	= 50.05

Ampacity vs Overcurrent

Device					
Conductor Ampacity Check		50.05	31.25		OK
Conductor to Overcurrent Check		50.05	40		OK

Input Data into Yellow Fields

Green Fields must say OK

Use this calculation for over current protection and wire sizing for inverter

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AMPACITY
CALCULATIONS

SHEET NUMBER

PV-4

SIGNAGE REQUIREMENTS

- > WARNING SIGNS OR LABELS SHALL COMPLY WITH NEC 110.21(B)
- > MIN. 3/8" LETTER HEIGHT
- > ALL CAPITAL LETTERS
- > ARIAL OR SIMILAR FONT
- > REFLECTIVE, WEATHER RESISTANT MATERIAL, UL 969

PV LABELS

**PHOTOVOLTAIC SYSTEM
DC DISCONNECT**

OPERATING VOLTAGE: VDC
 OPERATING CURRENT: AMPS
 MAX SYSTEM VOLTAGE: VDC
 SHORT CIRCUIT CURRENT: AMPS
 CHARGE CONTROLLER MAX: AMPS

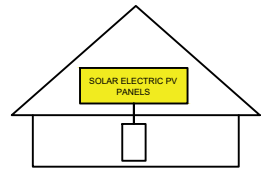
NEC 690.53 1
 APPLY TO:
 INVERTER

WARNING: PHOTOVOLTAIC POWER SOURCE

NEC 690.31(G)(3)(4) 2
 APPLY TO:
 SOLAR DC CONDUIT

**SOLAR PV SYSTEM EQUIPPED
WITH RAPID SHUTDOWN**

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



NEC 690.56(C)(1)(a) 3
 APPLY TO:
 SOLAREGE INVERTERS

! WARNING

ELECTRIC SHOCK HAZARD
 TERMINALS ON THE LINE AND
 LOAD SIDES MAY BE ENERGIZED
 IN THE OPEN POSITION

NEC 690.13(B) 4
 APPLY TO:
 DISCONNECTS
 SOLAR LOAD CENTERS
 COMBINER BOXES

**RAPID SHUTDOWN
SWITCH FOR
SOLAR PV SYSTEM**

NEC 690.5(C)(3) 5
 APPLY TO:
 SMA AND SOLAREGE INVERTERS

**PHOTOVOLTAIC SYSTEM
AC DISCONNECT**

OPERATING VOLTAGE: VDC
 OPERATING CURRENT: AMPS

NEC 690.54 6
 APPLY TO:
 AC DISCONNECT

! WARNING

TURN OFF PHOTOVOLTAIC
 AC DISCONNECT PRIOR TO
 WORKING INSIDE PANEL

NEC 110.27(C) & OSHA 1910.145(f)(7) 7
 APPLY TO:
 COMBINER BOXES
 ENCLOSURES
 BREAKER PANEL
 MAIN SERVICE DISCONNECT

SOLAR PV BREAKER

BREAKER IS BACKFED
 DO NOT RELOCATE

NEC 690.64(B)(7) & NEC 705.12(B)(2) 8
 APPLY TO:
 PV SYSTEM BREAKER

! WARNING

DUAL POWER SUPPLY
 SOURCES: UTILITY GRID AND
 PV SOLAR ELECTRIC SYSTEM

NEC 705.12(D)(3) & NEC 690.64 9
 APPLY TO:
 MAIN SERVICE PANEL
 METER

DC JUNCTION BOX

! WARNING

ELECTRIC SHOCK HAZARD
 THE DC CONDUCTORS OF
 THIS PHOTOVOLTAIC SYSTEM ARE
 UNGROUNDED AND MAY BE ENERGIZED

PHOTOVOLTAIC
 POWER SOURCE

NEC 690.31(G)(2) 10
 APPLY TO:
 DC JUNCTION BOXES

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**LABELING
SCHEDULE**

SHEET NUMBER
PV-5



310 - 320 Wp

www.axitecsolar.us

AXITEC[®]
high quality german solar brand

AXIblackpremium HC

120 cell monocrystalline
High performance solar module

German engineered – made for America

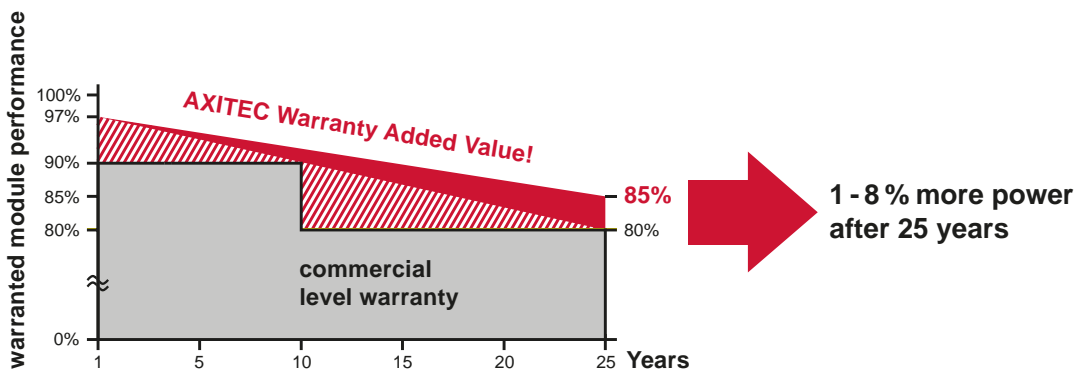
- 15**
Years 15 years manufacturer's warranty
Five more years than industry standard
- HC** Highest module performance through
Half-Cut-technology and tested materials
- +**
Wp Positive power tolerance from 0-5 Wp
Higher guaranteed yield
- ↓**
113 PSF Snow load of up to 113 psf
Stable module for a long life in extreme conditions
- 100%** 100 % electroluminescence inspection
Micro crack and hotspot free modules
- Soft Grip** Axitec-Soft-Grip-Seam aluminum frame
Higher stability and easier handling
- IP 67** High quality junction box and connector
system for a longer life time



Fig. similar 120MHUSA190704A

Exclusive linear AXITEC high performance guarantee!

- 15 years manufacturer's guarantee on 90% of the nominal performance
- 25 years manufacturer's guarantee on 85% of the nominal performance



(PHOTOVOLTAIC MODULE
OVER 600 VOLTS) 5JK4
E487509

AXIblackpremium HC 310 - 320 W

Electrical data (at standard conditions (STC) irradiance 1000 watt/m², spectrum AM 1.5 at a cell temperature of 25°C)

Type	Nominal output P _{mpp}	Nominal voltage U _{mpp}	Nominal current I _{mpp}	Short circuit current I _{sc}	Open circuit voltage U _{oc}	Module conversion efficiency
AC-310MH/120S	310 Wp	32.74 V	9.47 A	9.96 A	40.01 V	18.66 %
AC-315MH/120S	315 Wp	32.97 V	9.56 A	10.03 A	40.13 V	18.96 %
AC-320MH/120S	320 Wp	33.21 V	9.64 A	10.11 A	40.25 V	19.26 %

Design

Frontside	0.13 inch (3.2 mm) hardened, low-reflection white glass
Cells	120 monocrystalline high efficiency cells
Backside	Composite film
Frame	1.38 inch (35 mm) black aluminium frame

Mechanical data

L x W x H	65,94 x 39.06 x 1.38 inch (1675 x 992 x 35 mm)
Weight	40.79 lbs (18.5 kg) with frame

Power connection

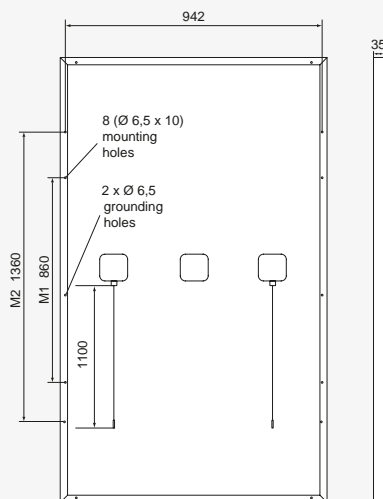
Socket	Protection Class IP67
Wire	43.3 inch, AWG 11
Plug-in system	Plug/socket IP67, MC4

Limit values

System voltage	1000 VDC (UL) 1000 VDC (IEC)
Module Fire Performance	TYPE 1 (UL 1703) or CLASS C (IEC 61730)
NOCT (nominal operating cell temperature)*	45°C +/-2K
Max. load-carrying capacity	113 PSF
Reverse current feed IR	20.0 A
Permissible operating temperature	-40°C to 85°C / -40F to 185F

(No external voltages greater than V_o may be applied to the module)

* NOCT, irradiance 800 W/m²; AM 1.5; wind speed 1 m/s; Temperature 20°C



All dimensions in inch

Temperature coefficients

Voltage U _{oc}	-0.29 %/K
Current I _{sc}	0.04 %/K
Output P _{mpp}	-0.39 %/K

Low-light performance (Example for AC-310M/120S)

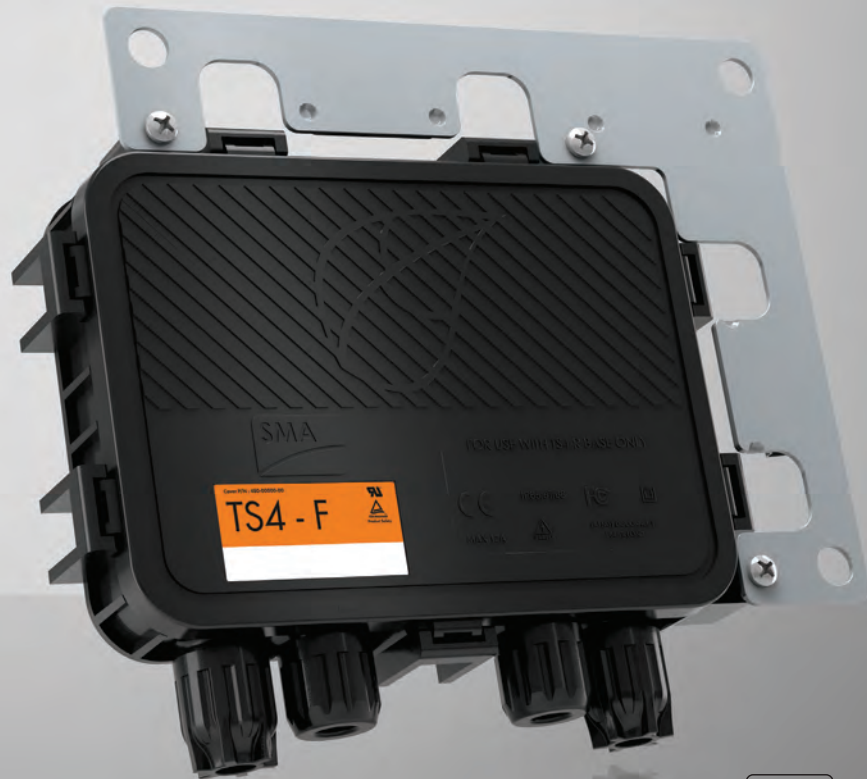
I-U characteristic curve	Current I _{pp}	Voltage U _{pp}
200 W/m ²	1.90 A	32.15 V
400 W/m ²	3.81 A	32.39 V
600 W/m ²	5.68 A	32.50 V
800 W/m ²	7.57 A	32.68 V
1000 W/m ²	9.47 A	32.74 V

Packaging

Module pieces per pallet	30
Module pieces per HC-container	780

TS4-R-F SUNSPEC RAPID SHUTDOWN

TS4-R-F



Cost-effective

- Simple to install via existing DC wires
- No additional components necessary, reducing balance of system costs

Simple and robust

- Power line based communication compatible with SunSpec signal for rapid shutdown
- Shuts down PV module whenever SunSpec signal is interrupted

Safe and reliable

- SunSpec compliant rapid shutdown that fulfills:
 - › UL 1741
 - › NEC 2014
 - › NEC 2017

Reduced risk

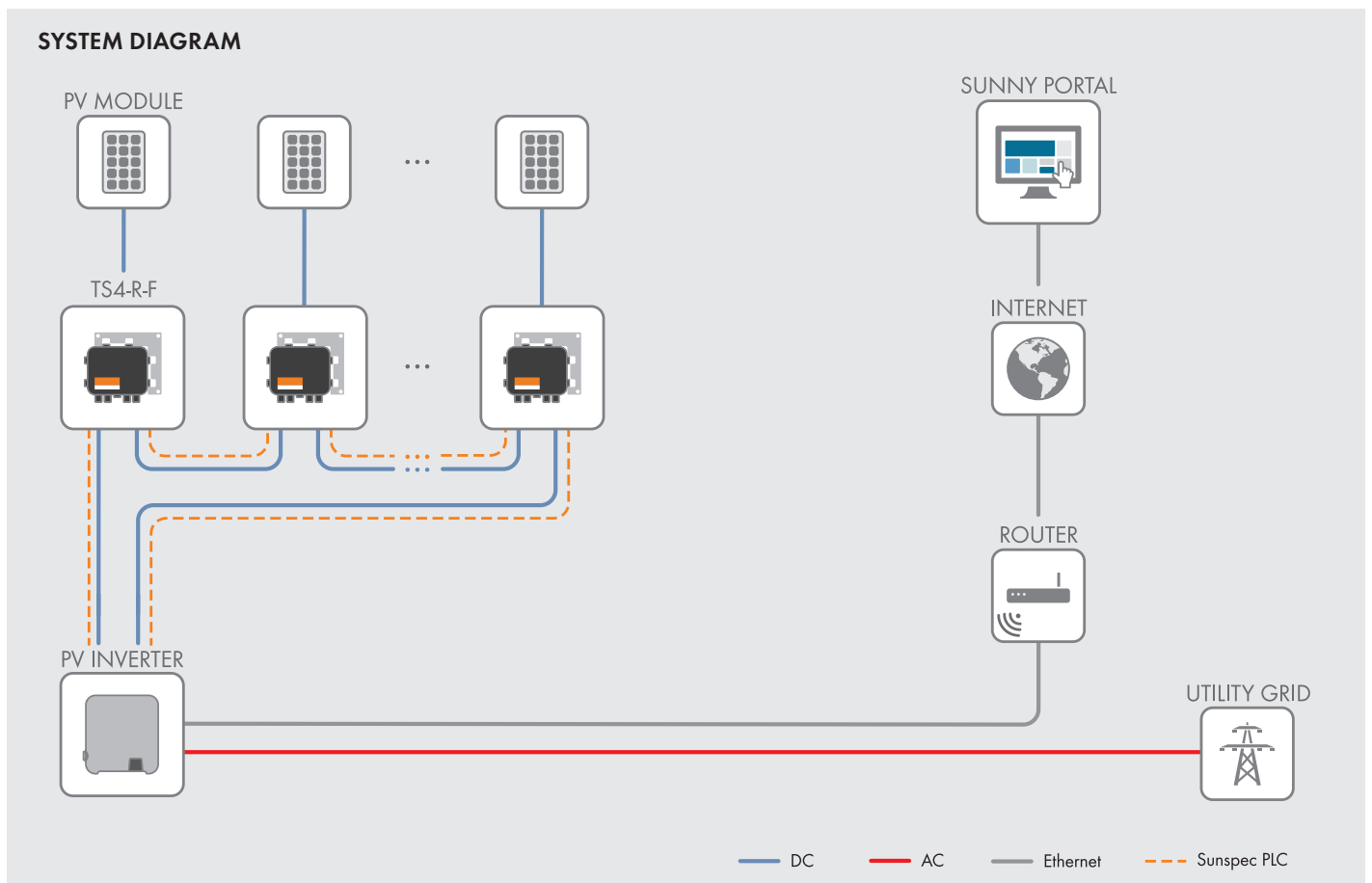
- Technical support from SMA's #1 ranked service organization
- Simple, safe repair or replacement of proprietary snap-in cover—no cabling work

TS4-R-F SUNSPEC RAPID SHUTDOWN

Compliance made simple and economical

The new TS4-R-F rapid shutdown solution is a cost-effective way to fulfill UL 1741, NEC 2014 and NEC 2017 requirements. It is compatible with the power line based SunSpec communication signal for rapid shutdown, making it simple to implement with robust functionality. Using the existing DC wires between the inverter and module-level electronics as a communication channel significantly reduces installation time and labor costs, since no additional communication equipment is needed. The TS4-R-F's compliance with the SunSpec open standard makes it the most flexible solution on the market, as it can be combined with multiple types of inverters.

Technical data	TS4-R-F 478-00252-42
Input	
Rated DC input power	475 W
Maximum PV module open circuit voltage @ STC	75 V
Maximum input voltage	90 V
Maximum current I _{sc}	12 A
Output	
Output power range	0 - 475 W
Output voltage range	0 - V _{oc}
Communication type	SunSpec Rapid Shutdown
Rapid shutdown compliant (NEC 2017 690.12)	Yes
Maximum system voltage	1000 V
Maximum series fuse rating	15 A
Mechanical	
Operating temperature range	-40°C to +85°C (-40°F to +185°F)
Non-operating temperature range	-40°C to +85°C (-40°F to +185°F)
Cooling method	Natural convection
Dimensions with cover	152.5 mm x 108 mm x 25.3 mm
Weight with cover	610 g
Environmental rating	IP68, NEMA 4X
Cabling	
Cabling type / Output cable length	H1Z2Z2-K / 1.2 m (solar cable, certified to EN 50618)
Cabling	MC4
UV resistance	500 hr with UVB light between 300 and 400 nm at 65° C
Type designation	TS4-R-F 478-00252-42



SUNNY BOY 3.0-US / 3.8-US / 5.0-US / 6.0-US / 7.0-US / 7.7-US



SB3.0-1SP-US-41 / SB3.8-1SP-US-41 / SB5.0-1SP-US-41 / SB6.0-1SP-US-41 / SB7.0-1SP-US-41 / SB7.7-1SP-US-41 / SB3.0-1TP-US-41 / SB3.8-1TP-US-41 / SB5.0-1TP-US-41 / SB6.0-1TP-US-41 / SB7.0-1TP-US-41 / SB7.7-1TP-US-41



Value-Added Improvements

- SunSpec certified technology for cost-effective module-level shutdown
- Advanced AFCI compliant to UL 1699B for arc fault protection

Reduced Labor

- New Installation Assistant with direct access via smartphone minimizes time in the field
- Advanced communication interface with fewer components creates 50% faster setup and commissioning

Optimized Power Production

- ShadeFix, SMA's proprietary shade management solution, produces more power than alternatives
- Reduced component count provides maximum system reliability

Trouble-Free Service

- SMA Service Mobile App provides simplified, expedited field service
- Equipped with SMA Smart Connected, a proactive service solution that is integrated into Sunny Portal

SUNNY BOY 3.0-US / 3.8-US / 5.0-US / 6.0-US / 7.0-US / 7.7-US

Power with a purpose

The residential PV market is changing rapidly. Your bottom line matters more than ever—so we've designed a superior residential solution to help you decrease costs at every stage of your business operations. The Sunny Boy 3.0-US/3.8-US/5.0-US/6.0-US/7.0-US/7.7-US join the SMA lineup of field-proven solar technology backed by the world's #1 service team. This improved residential solution features ShadeFix, SMA's proprietary technology that optimizes system performance. ShadeFix also provides superior power production with a reduced component count versus competitors, which provides maximum reliability. No other optimized solution generates more power or is as easy as systems featuring SMA ShadeFix and SunSpec certified devices. Finally, SMA Smart Connected will automatically detect errors and initiate the repair and replacement process so that installers can reduce service calls and save time and money.

www.SMA-America.com

Technical data	Sunny Boy 6.0-US		Sunny Boy 7.0-US		Sunny Boy 7.7-US	
	208 V	240 V	208 V	240 V	208 V	240 V
Input (DC)						
Max. PV power	9600 W _p		11200 W _p		12320 W _p	
Max. DC Voltage			600 V			
Rated MPP Voltage range	220 - 480 V		245 - 480 V		270 - 480 V	
MPPT operating voltage range			100 - 550 V			
Min. DC voltage / start voltage			100 V / 125 V			
Max. operating input current per MPPT			10 A			
Max. short circuit current per MPPT			18 A			
Number of MPPT tracker / string per MPPT tracker			3 / 1			
Output (AC)						
AC nominal power	5200 W	6000 W	6660 W	7000 W	6660 W	7680 W
Max. AC apparent power	5200 VA	6000 VA	6660 VA	7000 VA	6660 VA	7680 VA
Nominal voltage / adjustable	208 V / ●	240 V / ●	208 V / ●	240 V / ●	208 V / ●	240 V / ●
AC voltage range	183 - 229 V	211 - 264 V	183 - 229 V	211 - 264 V	183 - 229 V	211 - 264 V
AC grid frequency	60 Hz / 50 Hz					
Max. output current	25.0 A	25.0 A	32.0 A	29.2 A	32.0 A	32.0 A
Power factor (cos φ) / harmonics	1 / < 4 %					
Output phases / line connections	1 / 2					
Efficiency						
Max. efficiency	97.3 %	97.7 %	97.3 %	97.9 %	97.3 %	97.5 %
CEC efficiency	96.5 %	97.0 %	96.5 %	97.0 %	96.5 %	97.0 %
Protection devices						
DC disconnect device / DC reverse polarity protection			● / ●			
Ground fault monitoring / Grid monitoring			●			
AC short circuit protection			●			
All-pole sensitive residual current monitoring unit (RCMU)			●			
Arc fault circuit interrupter (AFCI)			●			
Protection class / overvoltage category			I / IV			
General data						
Dimensions (W / H / D) in mm (in)			535 x 730 x 198 (21.1 x 28.5 x 7.8)			
Packaging Dimensions (W / H / D) in mm (in)			600 x 800 x 300 (23.6 x 31.5 x 11.8)			
Weight / packaging weight			26 kg (57 lb) / 30 kg (66 lb)			
Temperature range: operating / non-operating			-25 °C ...+60 °C / -40 °C ...+60 °C			
Environmental protection rating			NEMA 3R			
Noise emission (typical)	39 dB(A)				45 dB(A)	
Internal power consumption at night			< 5 W			
Topology / cooling concept	transformerless / convection				transformerless / fan	
Features						
Ethernet ports			2			
Secure Power Supply			●*			
Display (2 x 16 characters)			●			
2.4 GHz WLAN / External WLAN antenna			●/○			
ShadeFix technology for string level optimization			●			
Cellular (4G / 3G) / Revenue Grade Meter			○/○**			
Warranty: 10 / 15 / 20 years ***			●/○/○			
Certificates and approvals	UL 1741, UL 1741 SA incl. CA Rule 21 RSD, UL 1998, UL 1699B Ed. 1, IEEE1547, FCC Part 15 (Class A & B), CAN/CSA V22.2 107.1-1, HECO Rule 14H, PV Rapid Shutdown System Equipment					
● Standard features ○ Optional features – Not available						
NOTE: US inverters ship with gray lids. Data at nominal conditions * Not compatible with SunSpec shutdown devices **Standard in SBX.X-1TP-US-41						
Type designation	SB6.0-1SP-US-41 / SB6.0-1TP-US-41		SB7.0-1SP-US-41 / SB7.0-1TP-US-41		SB7.7-1SP-US-41 / SB7.7-1TP-US-41	

POWER+ SOLUTION

The SMA Power+ Solution combines legendary SMA inverter performance and SunSpec certified shutdown devices in one cost-effective, comprehensive package. In addition, SMA ShadeFix technology optimizes power production and provides greater reliability than alternatives.

This rapid shutdown solution fulfills UL 1741, NEC 2014, and NEC 2017 requirements and is certified to the power line-based SunSpec Rapid Shutdown communication signal over DC wires, making it the most simple and cost-effective rapid shutdown solution on the market.

Visit www.SMA-America.com for more information.





SUNNY ISLAND 4548-US / 6048-US

SI4548-US-10 / SI6048-US-10



NOW COMPATIBLE WITH LITHIUM ION BATTERY SYSTEMS



Efficient

- CEC efficiency of 94.5% and 94%
- State of charge calculation
- Intelligent battery management for maximum battery life
- Now supports external BMS and lithium-ion technology

Simple

- Easy commissioning with the "Quick Configuration Guide"
- Complete off-grid management
- Excellent for grid-tied battery back up

Flexible

- For Sunny Island systems from 4.5 to 100 kW
- Single, split-phase and three-phase operation, connectable in parallel and modularly expandable
- AC and DC coupling

Durable

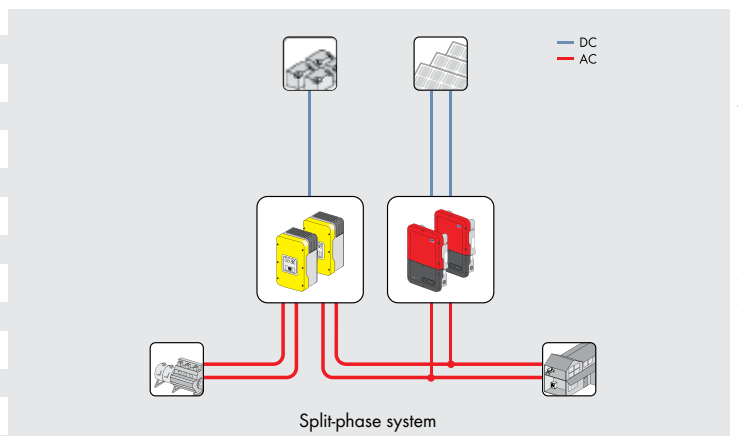
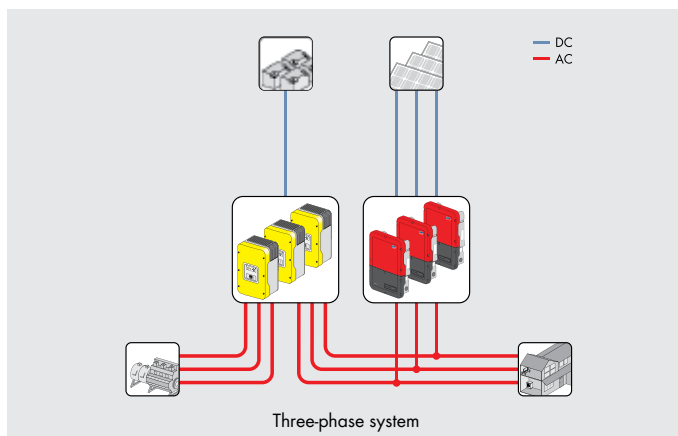
- Extreme overload capability
- OptiCool™ active temperature management system
- 5-year standard warranty

SUNNY ISLAND 4548-US / 6048-US

The efficient off-grid manager

The SMA Sunny Island 4548-US and 6048-US inverters are based on proven off-grid technology and feature industry leading power output. A maximum efficiency of 96 percent ensures peak production, which results in reduced diesel usage in rural communities. More flexible sizing allows for simplified system planning. And, with multicluster technology, up to 12 Sunny Islands can be integrated into off-grid power systems up 110 kW in size.

Technical data	Sunny Island 4548-US	Sunny Island 6048-US
AC output (loads)		
Rated grid voltage / AC voltage range	120 V/105 V - 132 V	120 V/105 V - 132 V
Rated frequency / frequency range (adjustable)	60 Hz/55 Hz ... 65 Hz	60 Hz/55 Hz ... 65 Hz
AC power (at 25 °C / at 40 °C) for 3 hours	5000 W/4000 W	6000 W/5000 W
Rated power (@ U_{nom} , f_{nom} / 25 °C / @ $\cos \varphi = 1$)	4500 W	5750 W
AC power at 25 °C for 30 min / 1 min / 3 s	5300 W / 8400 W / 11000 W	7000 W / 8400 W / 11000 W
Rated current / max. output current (peak)	37.5 A/180 A for approx. 60 ms	48 A/180 A for approx. 60 ms
Total harmonic factor output voltage / power factor with rated power	3 % / -1 ... +1	3 % / -1 ... +1
AC input (PV array or grid)		
Rated input voltage / AC input voltage range	120 V/80 V - 150 V	120 V/80 V - 150 V
Rated input frequency / allowable input frequency range	60 Hz/54 Hz ... 66 Hz	60 Hz/54 Hz ... 66 Hz
Max. AC input current / adjustable	56 A/0 A ... 56 A	56 A/0 A ... 56 A
Max. AC input power	6.7 kW	6.7 kW
Battery DC input		
Rated input voltage / DC voltage range	48 V/41 V - 63 V	48 V/41 V - 63 V
Max. battery charging current / DC rated charging current	100 A / 85 A	130 A / 110 A
Battery type / battery capacity range	Lead, NiCd, Li-ion / 100 Ah ... 10000 Ah	Lead, NiCd, Li-ion / 100 Ah ... 10000 Ah
External BMS compatible	●	●
Charge control	IUoU charge procedure with automatic full charge and equalization charge	IUoU charge procedure with automatic full charge and equalization charge
Efficiency / self-consumption		
Max. efficiency / CEC efficiency	96 % / 94.5 %	96 % / 94 %
Self-consumption without load / standby	25 W/4 W	25 W/4 W
Protective devices		
DC reverse polarity protection / DC fuse	● / ●	● / ●
AC short-circuit / AC overload	● / ●	● / ●
Overtemperature / battery deep discharge	● / ●	● / ●
General data		
Dimensions (W / H / D)	467 / 612 / 235 mm (18.4 / 24.1 / 9.3 inch)	467 / 612 / 235 mm (18.4 / 24.1 / 9.3 inch)
Weight	63 kg / 139 lb	63 kg / 139 lb
Operating temperature range	-25 °C ... +60 °C / -13 °F ... +122 °F	-25 °C ... +60 °C / -13 °F ... +122 °F
Features / function		
Operation and display / multi-function relay	Internal / 2	Internal / 2
Degree of protection (according to IEC 60529)	indoors (NEMA 1)	indoors (NEMA 1)
Three-phase systems / parallel connection	● / ●	● / ●
Integrated bypass / multicluster operation	- / ●	- / ●
State of charge calculation / full charge / equalization charge	● / ● / ●	● / ● / ●
Integrated soft start / generator support	● / ●	● / ●
Battery temperature sensor / data cable	● / ●	● / ●
Warranty	5 years	5 years
Certificates and approvals	www.SMA-Solar.com	www.SMA-Solar.com
Accessories		
Battery cable / battery fuse	○ / ○	○ / ○
Interface (RS 485 / Multicluster PB)	○ / ○	○ / ○
Extended generator start "GenMan"	○	○
Load-shedding protection / battery current measurement	○ / ○	○ / ○
● Standard feature ○ Optional feature - Not available		
Type designation	SI4548-US-10	SI6048-US-10





DC400-6 DEEP CYCLE

400AH @ 20Hr
6-Volt

Group Size: L16 / 903

Maintenance-Free
Sealed AGM Battery

CYCLING CAPACITY

20 Hour Rate **415 Amp Hours**

RESERVE CAPACITY

Reserve @25 AMPS **885 Minutes**

Reserve @75 AMPS **229 Minutes**

ELECTRICAL SPECIFICATIONS

Nominal Voltage	6 Volt
C100	460AH
C20	415AH
C10	374AH
C5	340AH
CCA	1500
CA or MCA	1800
HPCA	2000 Amps
Internal Resistance	1.6m Ω

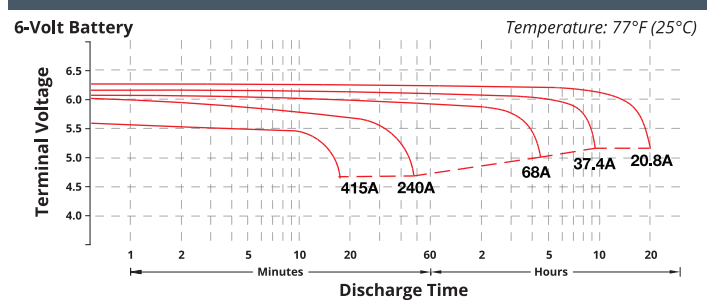
MECHANICAL SPECIFICATIONS

Group Size	L16 / 903	
Terminal Type	DTW	
Terminal Torque	See reverse side	
Height (w/ terminal)	16.69"	424mm
Height (case only)	15.90"	404mm
Width	7.05"	179mm
Length	11.61"	295mm
Weight	123.2 lbs.	56 kg
Case Type	ABS Plastic - Flame Res. Rating UL94-HB	

DISCHARGE TABLE (Constant Current)

Time	Amps	Rate
20hr	20.8	0.05CA
10hr	37.4	0.10CA
8hr	45.1	0.13CA
5hr	68.0	0.25CA
3hr	93.9	0.33CA
2hr	123	0.50CA
1hr	232	1.00CA

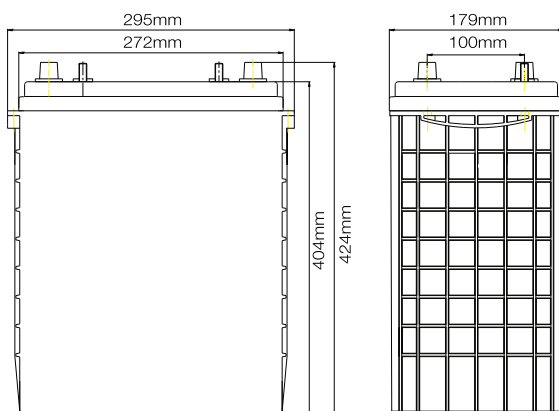
DISCHARGE PROFILE (Constant Current)



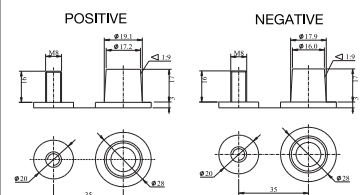
- All listed ratings are @ 100% SoC, T=77°F (25°C), 1.75VPC unless otherwise specified.

- Specifications listed are for estimation purposes only. Battery performance can vary depending on application. Battery design subject to change.

BATTERY & TERMINAL DIMENSIONS (All units shown in mm)



Terminal: DTW (Dual AP & Stud)



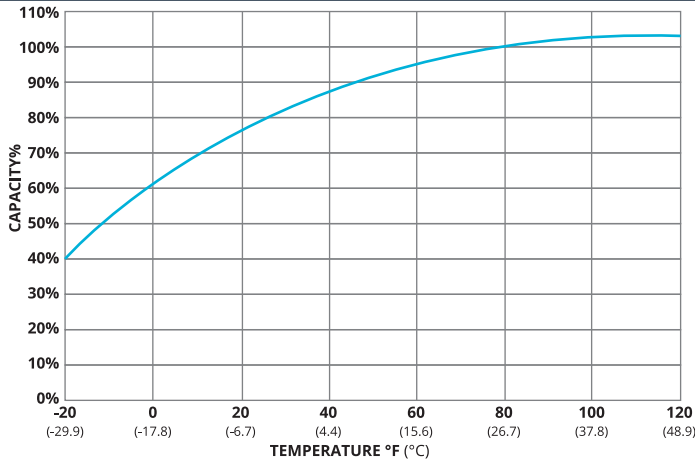
(unit: mm)



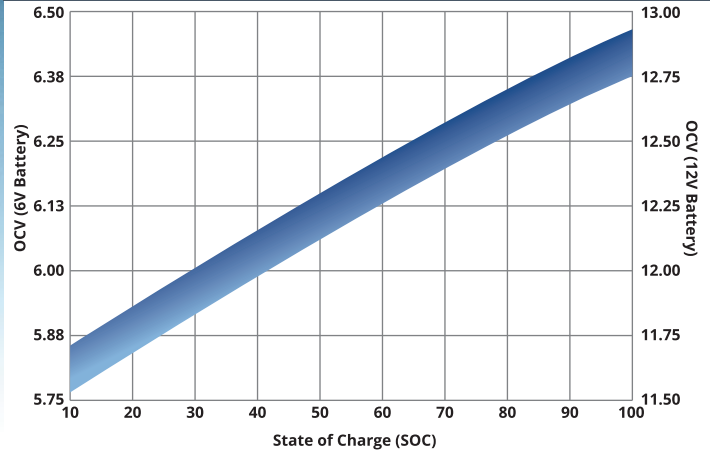
DC1150-2 DATA SHEET

fullriverbattery.com

TEMPERATURE vs CAPACITY

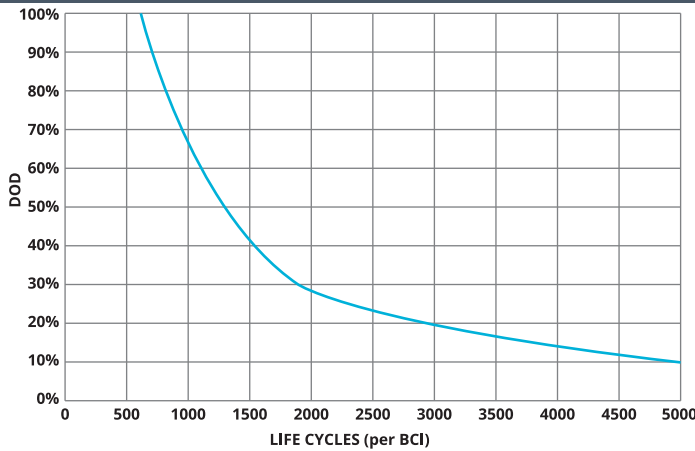


STATE of CHARGE (SOC) vs OPEN CIRCUIT VOLTAGE (OCV)

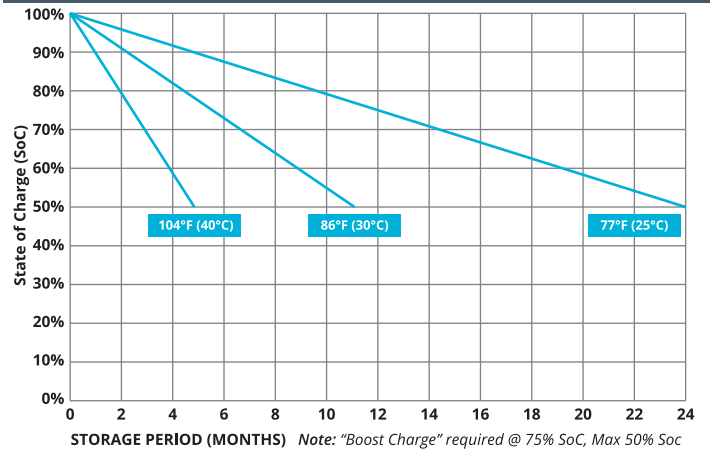


CYCLE LIFE vs DEPTH of DISCHARGE (DOD)

*(Based on BCI Testing @ 2-hr Rate)



SELF DISCHARGE vs TIME/TEMPERATURE



TEMPERATURE RANGE SPECIFICATIONS

Condition	Recommended	Maximum	Recommended	Maximum
Storage	5°F to 122°F	-40°F to 160°F	-15°C to 50°C	-40°C to 71°C
Operation	5°F to 104°F	-40°F to 160°F	-15°C to 40°C	-40°C to 71°C
Charge with TC	5°F to 122°F	-40°F to 160°F	-15°C to 50°C	-40°C to 71°C
Charge w/o TC	32°F to 104°F	5°F to 122°F	0°C to 40°C	-15°C to 50°C

*TC= Temperature Compensation

CHARGE VOLTAGES

Charge Stage	Battery Voltages			
	12V	24V	36V	48V
Bulk	14.7V	29.4V	44.1V	58.8V
Absorption	14.7V	29.4V	44.1V	58.8V
Float	13.6V	27.2V	40.8V	54.6V

TC Factor: (-2mV°F/cell) or (-4mV°C/cell)

TERMINAL TORQUE SPECS

Terminal Type	ft-lbs	in-lbs	Nm
AP, DT (AP), M6, M6M (Stud), TP07 (AP), TP08 (AP)	4.2 - 6.0	50-70	5.6 - 7.9
FR45	6.0 - 7.5	70-90	7.9 - 10.1
M8	7.1 - 8.0	85-95	9.6 - 10.7
DT (Stud), M10M (Stud)	9.2 - 10.4	110-125	12.2 - 14



9001:2008 Quality Management System
 14001:2004 Environmental Management System
 18001:2007 Occupational Health & Safety Management System



DELIVERY APPROVED!
**LAND, SEA
 & AIR**

Fullriver batteries are sealed lead acid batteries made with Absorbed Glass Mat (AGM) technology. The electrolyte is absorbed into the fiberglass separator material rather than in a free-flowing liquid form. Fullriver batteries are non-spillable electric storage batteries. They are excepted from the requirements of DOT's hazardous materials regulations, since they adhere to the requirements of code 49 CFR Section 173.159(D) - (CLASSIFIED APPROVED: DOT, CFR, HMR49, IATA, ICAO67, IMDG27)

S-5![®]

The Right Way![™]



**NOW AVAILABLE
IN ALUMINUM**

ProteaBracket[™]

ProteaBracket[™]

A versatile bracket for mounting solar PV to trapezoidal roof profiles

ProteaBracket[™] is now made in aluminum. Still the most versatile trapezoidal metal roof attachment solution on the market, the S-5! ProteaBracket just got better!

The bracket features an adjustable attachment base and module attachment options to accommodate different roof profile dimensions and mounting options.

Our pre-applied EPDM gasket with peel and stick adhesive makes installation a snap, ensuring accurate and secure placement the first time.

With no messy sealants, faster installation, and a weather-proof fit, ProteaBracket offers you the most versatile solar attachment solution available.

ProteaBracket* can be used for rail mounting or "direct-attach" with S-5! PVKIT[™]



Features and Benefits

- 34% lighter - saves on shipping
- Stronger L-Foot[™]
- Load-tested for engineered application
- Corrosion-resistant materials
- Adjustable - Fits rib profiles up to 3"
- Peel-and-Stick prevents accidental shifting during installation
- Fully pre-assembled
- 25-year warranty*

The right way to attach solar PV to trapezoidal roof profiles!

*When ProteaBracket is used in conjunction with the S-5! PVKIT, an additional nut is required during installation.

*See www.S-5.com for details.



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

S-5!®

The Right Way!™

ProteaBracket™ is the perfect solar attachment solution for most trapezoidal rib, exposed-fastened metal roof profiles!

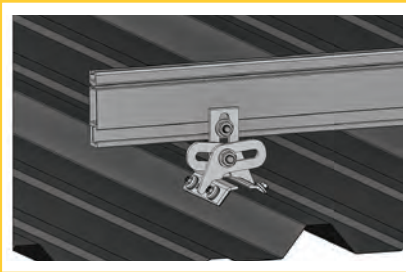
ProteaBracket™ is compatible with common metal roofing materials and comes with a pre-applied EPDM gasket on the base.

Note: All four pre-punched holes must be used to achieve tested strength. Fasteners are provided.

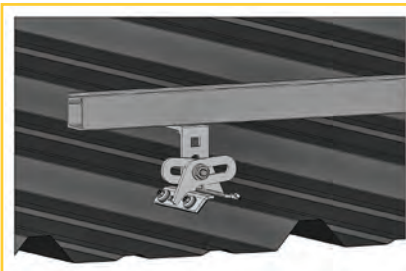
For design assistance, ask your distributor, or visit www.S-5.com for the independent lab test data that can be used for load-critical designs and applications. Also, please visit our website for more information including metallurgical compatibilities and specifications.

S-5!® holding strength is unmatched in the industry.

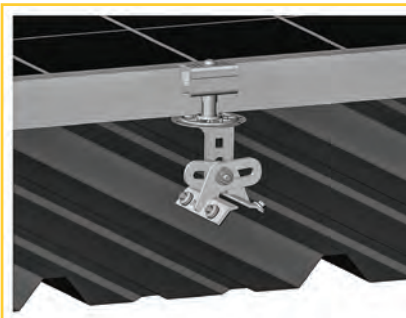
Multiple Attachment Options:



Side
Mount Rail



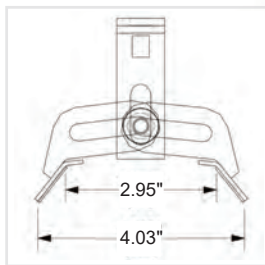
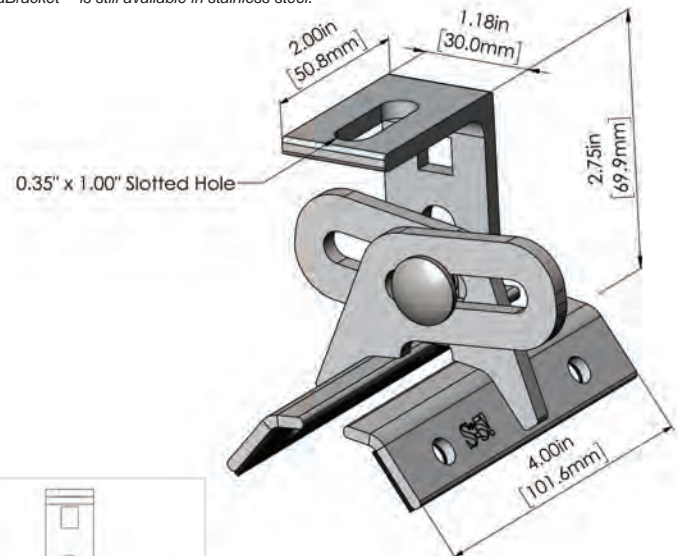
Bottom
Mount Rail



w/ S-5!
PVKIT™
(rail-less)

ProteaBracket™

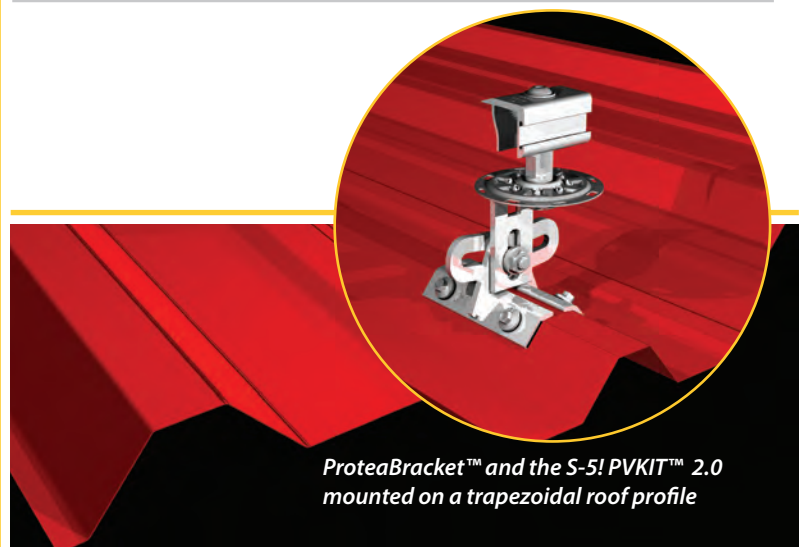
ProteaBracket™ is still available in stainless steel.



ProteaBracket fits profiles
up to 3 inches

INSTALLATION:

- No surface preparation needed.** (1) Wipe away excess oil and debris. (2) Peel off adhesive release paper. (3) Align and mount bracket directly onto crown of panel. (4) Secure ProteaBracket through pre-punched holes, using piercing-point S-5! screws.



ProteaBracket™ and the S-5! PVKIT™ 2.0
mounted on a trapezoidal roof profile

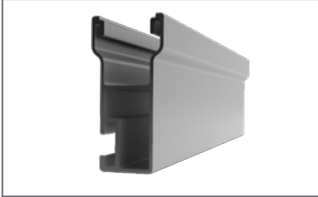
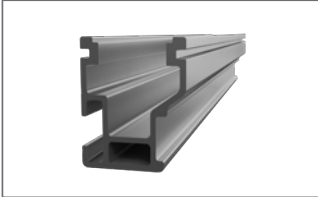
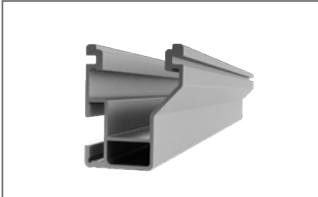
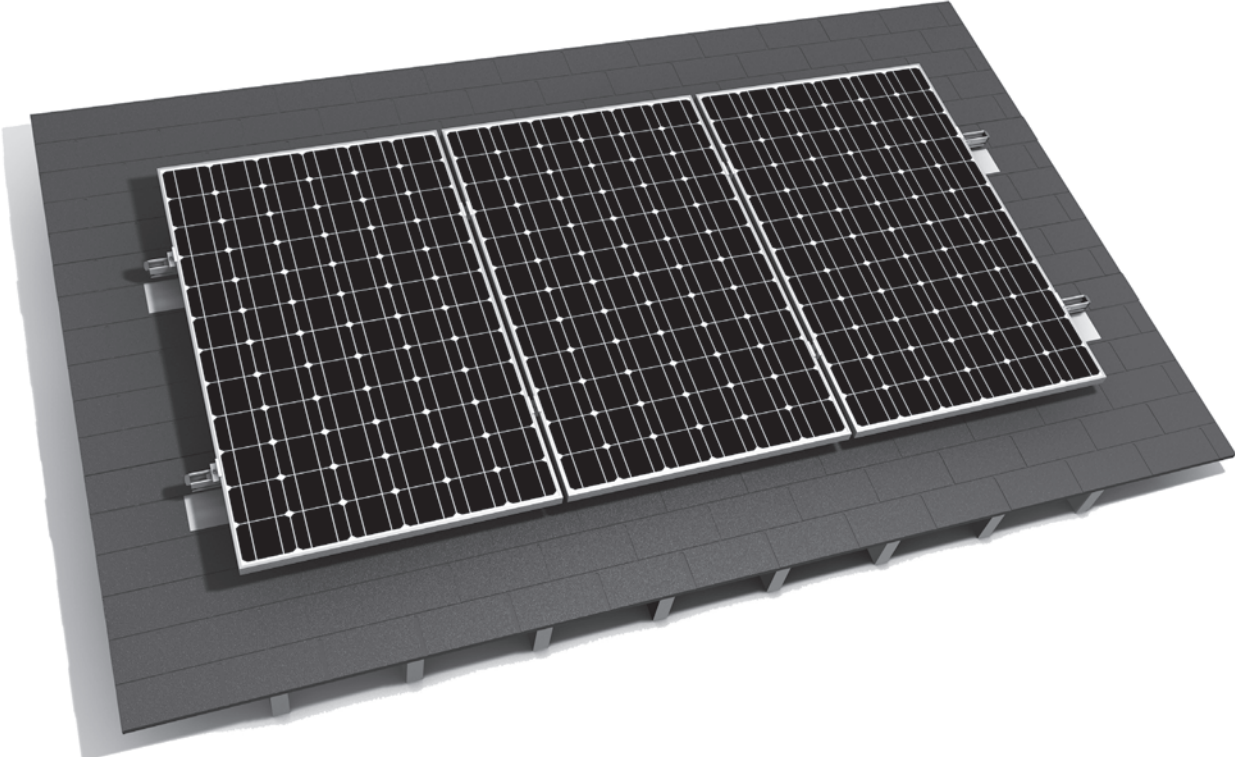
S-5!® Warning! Please use this product responsibly!

Products are protected by multiple U.S. and foreign patents. For published data regarding holding strength, bolt torque, patents, and trademarks, visit the S-5! website at www.S-5.com.

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Distributed by

Mounting systems for solar technology



EVEREST SOLAR SYSTEMS
RESIDENTIAL ROOF SOLUTIONS
CROSSRAIL SYSTEM

Everest Solar Systems, LLC
3809 Ocean Ranch Blvd., Suite 111
Oceanside, CA 92056
Service-Hotline +1.760.301.5300
info@everest-solarsystems.com
www.everest-solarsystems.com

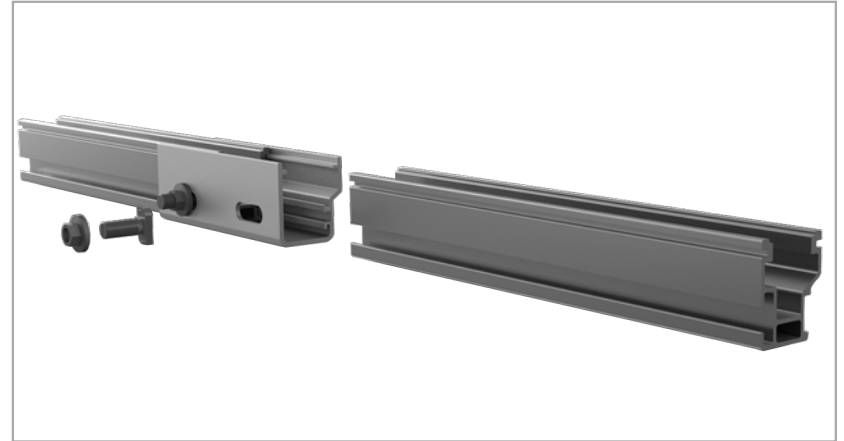
CROSSRAIL SYSTEM



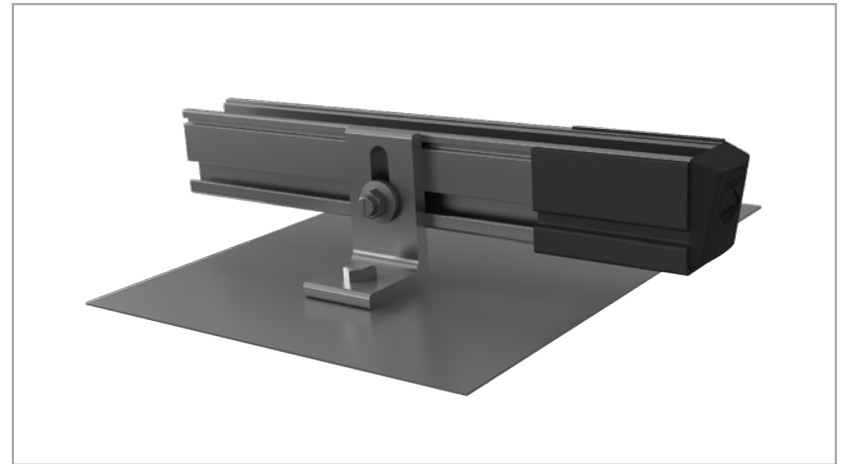
- ▶ High quality, German-engineered system optimized for residential installation
- ▶ MK3 mounting hardware simplifies module installation – fast, easy, and secure
- ▶ Easily integrates with third party roof attachment products
- ▶ L-foot provides adjustability and compatibility with common roof types
- ▶ 100% code-compliant, structural validation for all solar states
- ▶ Three rail sizes available to suit all structural conditions
- ▶ Most components also available in dark
- ▶ Fast installation with minimal component count result in low total installed cost
- ▶ Simple to design using code compliant Everest Online Design Tool
- ▶ Use two innovative components to turn this system into Shared Rail or Tilt Up

TECHNICAL DATA

Applicable roof types	Composition shingle, tile, flat tile
Flexibility	Modular construction, suitable for any system size, height adjustable
PV modules	For all common module types
Module orientation	Portrait and landscape
Material	High corrosion resistance, stainless steel and high grade aluminum
Roof attachment	Screw connection into rafter
Structural validity	IBC compliant, stamped engineering letters available for all solar states
Warranty	20 years
System components	CrossRail 48-X/48-XL/80, L-Foot, Mid and End Clamp Sets



CrossRail Structural Splice



CrossRail with EverFlash, Rail Sleeve and End Cap



Bonding Mid Clamp | End Clamp | Micro, Optimizer & Accs Mounting Kit