PV MATERIAL SUMMARY: DISTRIBUTOR

Q.PEAK DUO BLK ML-G10+400	30
P401	30
SE10000H-US000BNI4	1
SE-WFGW-B-S1-NA	1
SECT-SPL-225A-T-20	2
XR-10-168B	10
XR-10-204B	5
XR10-BOSS-01-M1	8
UFO-CL-01-B1	72
UFO-STP-32MM-B1	24
XR-LUG-03-A1	7
4 IN QB1	92
GC66803 Geocel Sealant	6
SOLADECK 0799-5B	2

NC SOLAR NOW

NORTH CAROLINA PROFESSIONAL SEAL 035699 ENGINEER ANDREW W. KING 12/28/21

CLIENT INFO

GARY DOUGLAS DANTZER
561 WOOD POINT DRIVE
LILLINGTON, NC 27546

PROJECT INFO

DC INPUT:	12.000 kW
AC EXPORT:	10.000 kW
DOI INSPT. METHOD:	OPTION 2

CODE REFERENCES

NATION ELECTRICAL CODE v. 2017
NC FIRE PROTECTION CODE v. 2018
NC BUILDING CODE v. 2018
NC RESIDENTIAL CODE v. 2018
ACSE v. 7-10

SITE CONDITIONS

WIND SPEED:	117 MPH
RISK CATEGORY:	II
EXPOSURE:	B
SNOW:	10 PSF

SHEET INDEX

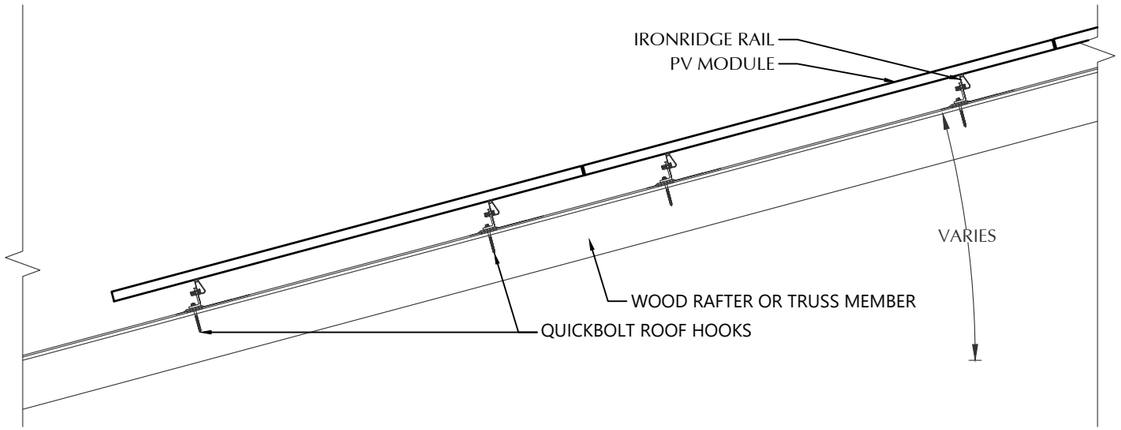
NOTICE TO CONTRACTOR:
All construction must comply with current NC Building Codes and is subject to field inspection and verification.
APPROVED
Limited building only review
Permit holder responsible for full compliance with the code
01/13/2022
Harnett COUNTY NORTH CAROLINA

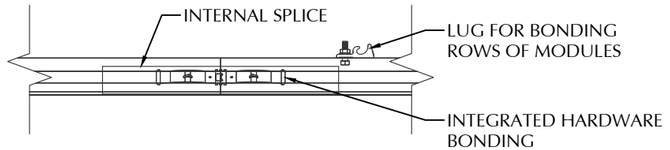
DESIGNER INFO

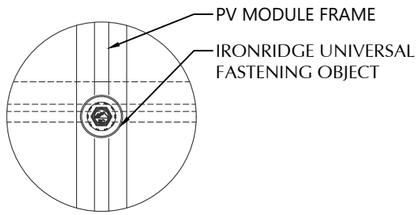
DESIGNER	CRM
ENGINEER	AWK
DATE	12/28/2021
VERSION	P1

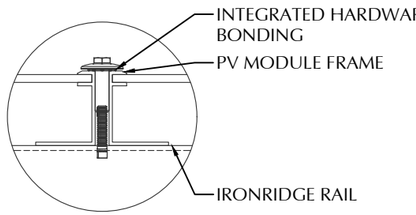
PV SYSTEM COVER PAGE

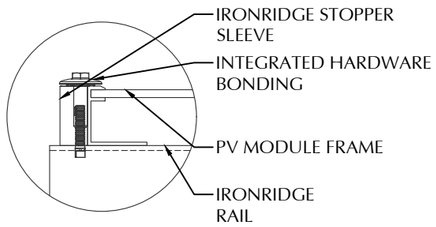
PV-1.1

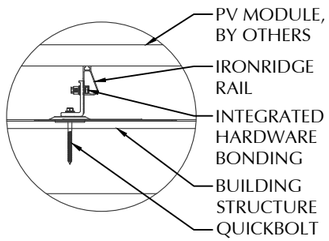




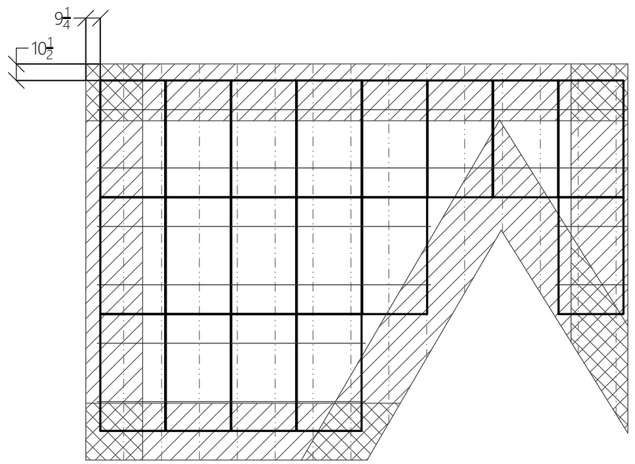








1 ROOF FASTENER DETAIL
NOT TO SCALE



2 ROOF A ARRAY LAYOUT
1/8" = 1'-0"

STATEMENT OF STRUCTURAL COMPLIANCE

THE EXISTING ROOF STRUCTURE HAS BEEN DESIGNED TO SUPPORT THE ADDITIONAL LOADS OF THE PROPOSED PV SYSTEM. IN ADDITION, THE RACKING AND FASTENING SYSTEM SHALL BE CAPABLE OF SECURING THE SYSTEM TO THE STRUCTURE UNDER DESIGN CONDITIONS WHEN INSTALLED PROPERLY AND IN ACCORDANCE WITH THE RACKING AND FASTENING ARRANGEMENT DETAILED WITHIN THESE DRAWINGS.

NAME: ANDREW W. KING, PE

SIGNED:

PV MODULES

MAKE	HANWHA
MODEL	Q.PEAK DUO BLK ML-G10+400
WIDTH	41.10 IN
LENGTH	74.00 IN
THICKNESS	32 MM
WEIGHT	48.50 LBS.
ARRAY AREA	380 SQFT.
ARRAY WEIGHT	950 LBS.

ROOF SUMMARY

STRUCTURE:	
TYPE	TRUSSES
MATERIAL	SOUTHERN PINE #2
SIZE	2 X 4
SPACING	24 IN O.C.
ALLOWABLE SPAN	88 IN
PITCH	4/12
DENSITY	30 LBS./CU.FT.
DECKING:	
TYPE	OSB
MATERIAL	COMPOSITE
THICKNESS	7/16 IN
WEIGHT	1.60 LBS/SQFT
ROOFING:	
TYPE	ASPHALT SHINGLE
MATERIAL	ASPHALT
WEIGHT	2.30 LBS./SQFT.

ROOF MOUNT SUMMARY

MAXIMUM (IN)	MOUNT SPACING	RAIL OVERHANG
WIND ZONE 1	72 IN	10 IN
WIND ZONE 2	24 IN	10 IN
WIND ZONE 3	24 IN	10 IN

ROOF LOADING

GROUND SNOW LOAD:	15 LBS./SQFT.
LIVE LOAD	20 LBS./SQFT.
DEAD LOAD	
ROOFING	3.9 LBS/SQFT.
PV ARRAY	2.5 LBS./SQFT.
TOTAL	6.4 LBS./SQFT.
WIND LOAD:	
UPLIFT ZONE 1	-23.0 LBS./SQFT.
UPLIFT ZONE 2	-38.0 LBS./SQFT.
UPLIFT ZONE 3	-57.1 LBS./SQFT.
DOWNWARD	13.6 LBS./SQFT.
FASTENER LOAD:	
UPLIFT ZONE 1	-423 LBS.
UPLIFT ZONE 2	-233 LBS.
UPLIFT ZONE 3	-350 LBS.
DOWNWARD	250 LBS.

ROOF MOUNT & FASTENER

ROOF MOUNT:	
MAKE	QUICKBOLT
MODEL	4 IN QB1
MATERIAL	STAINLESS / EPDM
FASTENER:	
MAKE	QUICK SCREWS
MODEL	HANGER BOLT
MATERIAL	304 SS
SIZE	5/16-18 X 5-1/4"
GENERAL:	
WEIGHT	0.56 LBS.
FASTENERS PER MOUNT	1
MAX. PULL-OUT FORCE	960.0 LBS.
SAFETY FACTOR	2
DESIGN PULL-OUT FORCE	480.0 LBS.

MOUNTING RAILS

MAKE	IRONRIDGE
MODEL	XR10
MATERIAL	ALUMINUM
WEIGHT	0.425 LBS/IN
SPACING	37 IN

NC SOLAR NOW

NORTH CAROLINA PROFESSIONAL SEAL 035699 ENGINEER ANDREW W. KING 12/28/21

CLIENT INFO

GARY DOUGLAS DANTZER
561 WOOD POINT DRIVE
LILLINGTON, NC 27546

PROJECT INFO

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CODE REFERENCES

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ACSE v. 7-10

SITE CONDITIONS

WIND SPEED:	117 MPH
RISK CATEGORY:	II
EXPOSURE:	B
SNOW:	10 PSF

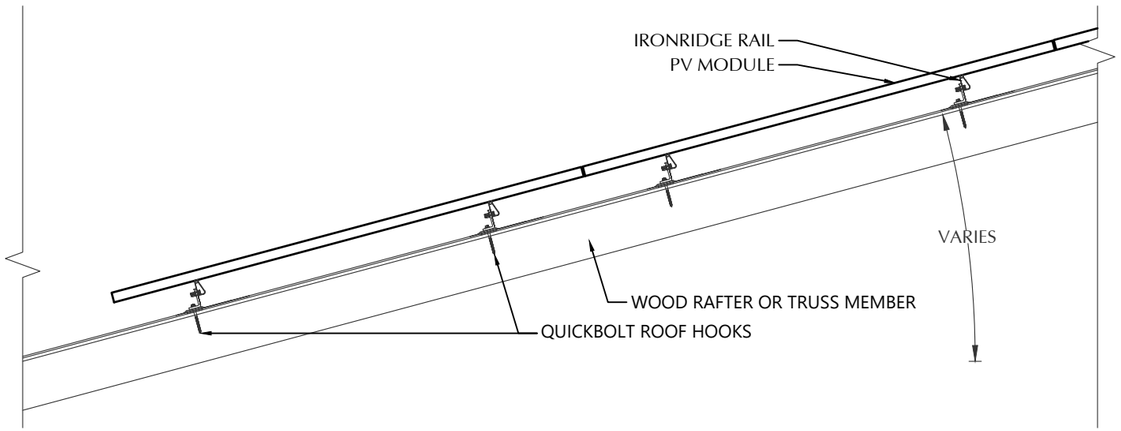
SHEET INDEX

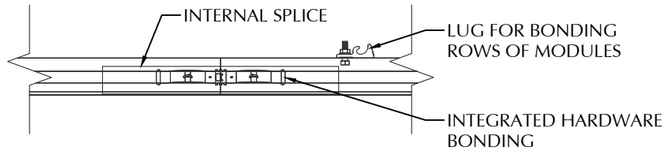
DESIGNER INFO

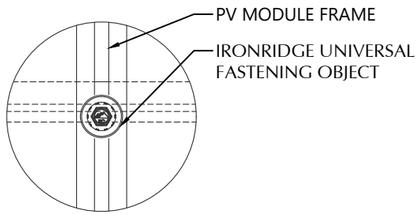
DESIGNER	CRM
ENGINEER	AWK
DATE	12/28/2021
VERSION	P1

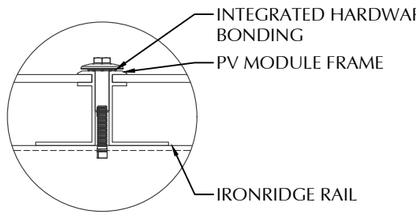
PV SYSTEM STRUCTURAL

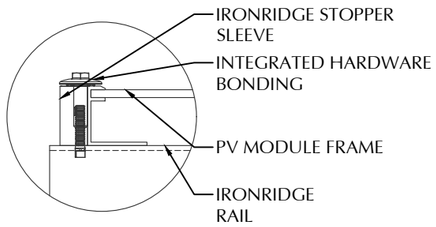
PV-2.1

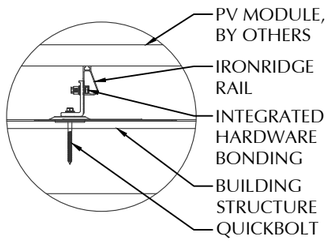




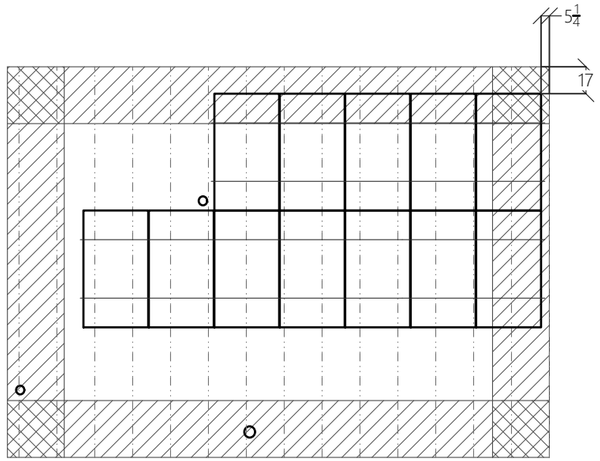








1 ROOF FASTENER DETAIL
NOT TO SCALE



2 ROOF B ARRAY LAYOUT
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NAME: ANDREW W. KING, PE

SIGNED:

PV MODULES

MAKE	HANWHA
MODEL	Q.PEAK DUO BLK ML-G10+400
WIDTH	41.10 IN
LENGTH	74.00 IN
THICKNESS	32 MM
WEIGHT	48.50 LBS.
ARRAY AREA	253 SQFT.
ARRAY WEIGHT	634 LBS.

ROOF SUMMARY

STRUCTURE:	
TYPE	TRUSSES
MATERIAL	SOUTHERN PINE #2
SIZE	2 X 4
SPACING	24 IN O.C.
ALLOWABLE SPAN	88 IN
PITCH	4/12
DENSITY	30 LBS./CU.FT.
DECKING:	
TYPE	OSB
MATERIAL	COMPOSITE
THICKNESS	7/16 IN
WEIGHT	1.60 LBS/SQFT
ROOFING:	
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MATERIAL	ASPHALT
WEIGHT	2.30 LBS./SQFT.

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UPLIFT ZONE 3	-349 LBS
DOWNWARD	250 LBS

ROOF MOUNT & FASTENER

ROOF MOUNT:	
MAKE	QUICKBOLT
MODEL	4 IN QB1
MATERIAL	STAINLESS / EPDM
FASTENER:	
MAKE	QUICK SCREWS
MODEL	HANGER BOLT
MATERIAL	304 SS
SIZE	5/16-18 X 5-1/4"
GENERAL:	
WEIGHT	0.56 LBS.
FASTENERS PER MOUNT	1
MAX. PULL-OUT FORCE	960.0 LBS.
SAFETY FACTOR	2
DESIGN PULL-OUT FORCE	480.0 LBS.

MOUNTING RAILS

MAKE	IRONRIDGE
MODEL	XR10
MATERIAL	ALUMINUM
WEIGHT	0.425 LBS/IN
SPACING	37 IN

NC SOLAR NOW

NORTH CAROLINA PROFESSIONAL SEAL 035699 ENGINEER ANDREW W. KING 12/28/21

CLIENT INFO

GARY DOUGLAS DANTZER
561 WOOD POINT DRIVE
LILLINGTON, NC 27546

PROJECT INFO

DC INPUT:	12.000 kW
AC EXPORT:	10.000 kW
DOI INSPT. METHOD:	OPTION 2

CODE REFERENCES

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NC FIRE PROTECTION CODE v. 2018
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ACSE v. 7-10

SITE CONDITIONS

WIND SPEED:	117 MPH
RISK CATEGORY:	II
EXPOSURE:	B
SNOW:	10 PSF

SHEET INDEX

DESIGNER INFO

DESIGNER	CRM
ENGINEER	AWK
DATE	12/28/2021
VERSION	P1

PV SYSTEM STRUCTURAL

PV-2.2

CONDUCTOR SCHEDULE

TAG	CURRENT CARRYING CONDUCTORS			GROUNDING CONDUCTORS			CONDUIT/RACEWAY			NOTES
	QTY.	SIZE	INSULATION	QTY.	SIZE	INSULATION	QTY.	SIZE	LOCATION	
C1	4	10 AWG	PV WIRE	1	6 AWG	BARE	-	-	FREE AIR	1
C2	4	10 AWG	THWN	1	10 AWG	THWN	1	3/4"	EXT/INT	2,4
C3	3	6 AWG	THWN	1	10 AWG	THWN	1	3/4"	EXTERIOR	2,4
XC	-	-	-	-	-	-	-	-	-	3

NOTES:

1. MANUFACTURER PROVIDED, UL LISTED WIRING HARNESS FOR USE ON EXPOSED ROOFS
2. CONDUIT SIZE SHOWN IS CODE MINIMUM. LARGER SIZES ARE ALLOWED.
3. EXISTING CONDUCTORS, FIELD VERIFY
4. EQUIPMENT TERMINAL RATING SHALL BE A MINIMUM OF 75°C AT BOTH END OF CONDUCTOR

PV MODULE

MAKE	HANWHA
MODEL	Q.PEAK DUO BLK ML-G10+400
NOM. POWER (PNOM)	400 WATTS
NOM. VOLT. (VMPP)	37.1 VOLTS
O.C. VOLT (VOC)	45.3 VOLTS
MAX. SYS. VOLT.	1000 VOLTS
NOM. CURR. (IMPP)	10.8 AMPS
S.C. CURR. (ISC)	11.1 AMPS
TEMP. COEF. (PMPP)	-0.34 %/C
TEMP. COEF. (Voc)	-0.27 %/C
MAX SERIES FUSE	20 AMPS
UL LIST. (Y/N)	YES

MODULE OPTIMIZER

MAKE	SOLAREDGE
MODEL	P401
DC INPUT:	
NOM. POWER	400 WATTS
VOLT. RANGE	8 to 60
MAX. CURR.	11.8 AMPS
DC OUTPUT:	
NOM. POWER	400 WATTS
MAX. VOLT.	60 VOLTS
MAX. CURR.	15 AMPS
MIN-MAX STRING	8-25 OPTIMIZERS
UL LIST. (Y/N)	YES

DC / AC INVERTER

MAKE	SOLAREDGE
MODEL	SE10000H-US000BNI4
DC INPUT:	
MAX POWER	15500 WATTS
VOLT. RANGE	400-480
NOM. VOLT.	400 VOLTS
MAX. CURRENT	27 AMPS
STRING INPUTS	3 STRINGS
AC OUTPUT:	
MAX. POWER	10000 WATTS
NOM. POWER	10000 WATTS
NOM. VOLT.	211-240-264
MAX. CURR.	42.00 AMPS
DC DISC. (Y/N)	YES
RAPID SHUTDOWN (Y/N)	YES
PROTECT. RATING	NEMA TYPE 4X
UL LIST. (Y/N)	YES
CONSUMPTION MONITOR	YES

JUNCTION BOX

MAKE	SOLADECK
PROTECT. RATING	NEMA TYPE 3R
UL LIST. (Y/N)	YES

MD PANEL (EXISTING)

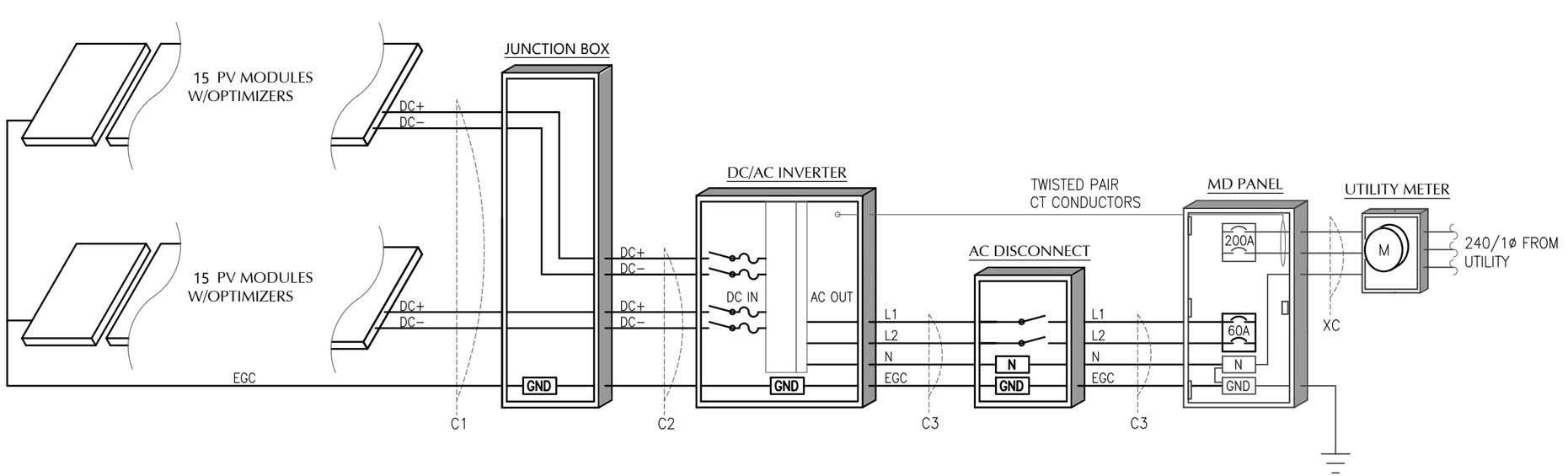
MAKE	SQUARE D
MODEL	QOC42UF
ENCL. RATING	NEMA TYPE 1
VOLT. RATING	240
BUS RATING	225 AMPS
UL LIST. (Y/N)	YES
MAIN BREAKER (Y/N)	YES
MAIN BREAKER RATING	200 AMPS

AC DISCONNECT

MAKE	GENERIC
MODEL	NA
ENCL. RATING	NEMA 3R
VOLT. RATING	240 VOLTS
AMP RATING	60 AMPS
UL LIST. (Y/N)	YES
FUSED (Y/N)	NO
FUSE RATING	N/A

- BACK-FEED SOLAR OUTPUT VIA 60A BREAKER AT THE OPPOSITE END OF THE BUS BAR FROM EXISTING POWER SOURCE
- MAIN BREAKER SERVES AS SERVICE DISCONNECT SWITCH

- LOAD-BREAK RATED
- VISIBLE OPEN
- LOCKABLE IN OPEN POSITION
- INSTALL ADJACENT TO METER
- DISCONNECT TO BE READILY ACCESSIBLE TO UTILITY COMPANY PERSONNEL AT ALL TIMES



1 ELECTRICAL SCHEMATIC
NTS

NC SOLAR NOW

NORTH CAROLINA PROFESSIONAL SEAL 035699 ENGINEER ANDREW W. KING 12/28/21

CLIENT INFO

GARY DOUGLAS DANTZER
561 WOOD POINT DRIVE
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SITE CONDITIONS

WIND SPEED:	117 MPH
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SNOW:	10 PSF

SHEET INDEX

DESIGNER INFO

DESIGNER	CRM
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DATE	12/28/2021
VERSION	P1

PV SYSTEM ELECTRICAL

PV-3.1

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

NEC 690.13 (B)
PLACE ON PV SYSTEM DISCONNECTING MEANS.

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

NEC 705.12 (B)(2)(3)(b)
PLACE ADJACENT TO BACK-FED BREAKER

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

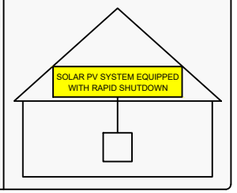
NEC 705.12 (B)(3)
PLACE ON ALL EQUIPMENT THAT IS SUPPLIED BY BOTH POWER SOURCES

WARNING: PHOTOVOLTAIC POWER SOURCE

NEC 690.31 (G)(3)&(4)
PLACE ON ALL JUNCTION BOXES, EXPOSED RACEWAYS, AND OTHER WIRING METHODS EVERY 10' AND ON EVERY SECTION SEPARATED BY ENCLOSURES, WALLS, PARTITIONS, CEILINGS, OR FLOORS.

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)
PLACE WITHIN 3FT OF SERVICE DISCONNECTING MEANS TO WHICH THE PV SYSTEMS ARE CONNECTED AND SHALL INDICATE THE LOCATIONS OF RAPID SHUTDOWN SWITCHES

RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

NEC 690.56 (C)(3)
PLACE ON RAPID SHUTDOWN SWITCH OR EQUIPMENT WITH INTEGRATED RAPID SHUTDOWN *REFLECTIVE*

PV SYSTEM DISCONNECT

NEC 690.13 (B)
PLACE ON PV SYSTEM DISCONNECTING MEANS.

PHOTOVOLTAIC POWER SOURCE
OPERATING AC VOLTAGE 240 V
MAXIMUM OPERATING AC OUTPUT CURRENT 42.0 A

NEC 690.54
PLACE ON INTERCONNECTION DISCONNECTING MEANS

DIRECT CURRENT
PHOTOVOLTAIC POWER SOURCE
MAXIMUM VOLTAGE 600 VDC
MAX CIRCUIT CURRENT 30.0 AMPS

NEC 690.53
PLACE ON ALL DC DISCONNECTING MEANS

SERVICE DISCONNECT LOCATED:
INTERIOR EAST WALL OF RESIDENCE

PV DISCONNECT LOCATED:
EXTERIOR EAST WALL OF RESIDENCE

NEC 705.10
PLACE AT SERVICE EQUIPMENT AND PV SYSTEM DISCONNECTING MEANS. FIELD VERIFY EQUIPMENT LOCATIONS AND LABEL ACCORDINGLY.

LABEL NOTES

1. LABELS SHOWN ARE HALF THEIR ACTUAL REQUIRED SIZE.
2. LABEL MATERIAL SHALL BE SUITABLE FOR THE EQUIPMENT ENVIRONMENT.
3. DC CONDUIT SHALL BE MARKED WITH REQUIRED LABEL EVERY 10 FEET.
4. LABELS WILL BE APPLIED IN ACCORDANCE WITH THE NEC. SOME LABELS MAY NOT BE NECESSARY.

DC WIRING NOTES

1. CONDUCTORS SHALL BE COPPER, RATED AT NOT LESS THAN 600 VOLTS FOR RESIDENTIAL CONSTRUCTION AND NOT LESS THAN 1000 VOLTS FOR COMMERCIAL CONSTRUCTION.
2. MINIMUM SIZE SHALL BE #10 AWG UNLESS OTHERWISE NOTED ON THE DRAWINGS.
3. EXPOSED WIRING CONDUCTOR INSULATION SHALL BE TYPE PV WIRE, USE-2, OR RHW-2 WHERE THE OUTER LAYER OF THE INSULATION IS UV, SUNLIGHT, AND MOISTURE RESISTANT.
6. EXTERIOR WIRING CONDUCTOR INSULATION SHALL BE TYPE THWN-2 AND INSTALLED IN ELECTRICAL METALLIC TUBING(EMT) OR RIGID POLYVINYL CHLORIDE CONDUIT(PVC). ALTERNATIVELY, METAL CLAD CABLE(MC) CAN BE USED AS WELL WHEN RATED FOR USE IN WET LOCATIONS.
7. INTERIOR WIRING CONDUCTOR INSULATION SHALL BE TYPE THHN-2 AND INSTALLED IN ELECTRICAL METALLIC TUBING(EMT), FLEXIBLE METAL CONDUIT(FMC), OR METAL CLAD CABLE(MC).
6. USE SCHEDULE 40 PVC OUTDOORS WHERE NOT SUBJECT TO PHYSICAL DAMAGE OR BELOW FLOOR SLAB. USE SCHEDULE 80 PVC OUTDOORS WHERE SUBJECT TO PHYSICAL DAMMAGE
7. MINIMUM CONDUIT SIZE TO BE 1/2".
8. WIRING METHODS TO CONFORM TO ARTICLES 330, 334, 348, 350, 352, 356, AND 358 OF THE 2017 NEC.

AC WIRING NOTES

1. CONDUCTORS SHALL BE COPPER RATED AT NOT LESS THAN 600 VOLTS.
2. MINIMUM SIZE SHALL BE #14 AWG UNLESS OTHERWISE NOTED ON THE DRAWINGS.
3. EXTERIOR WIRING CONDUCTOR INSULATION SHALL BE TYPE THWN AND INSTALLED IN ELECTRICAL METALLIC TUBING(EMT), RIGID POLYVINYL CHLORIDE CONDUIT(PVC), LIQUID-TIGHT FLEXIBLE METAL CONDUIT(LFMC), OR LIQUID-TIGHT FLEXIBLE NON-METALLIC CONDUIT(LFNC) . ALTERNATIVELY, METAL CLAD CABLE(MC) CAN BE USED AS WELL WHEN RATED FOR USE IN WET LOCATIONS.
4. INTERIOR WIRING CONDUCTOR INSULATION SHALL BE TYPE THHN AND INSTALLED IN ELECTRICAL METALLIC TUBING(EMT), FLEXIBLE METAL CONDUIT(FMC), METAL CLAD CABLE(MC), OR ROMEX.
5. USE SCHEDULE 40 PVC OUTDOORS WHERE NOT SUBJECT TO PHYSICAL DAMAGE OR BELOW FLOOR SLAB. USE SCHEDULE 80 PVC OUTDOORS WHERE SUBJECT TO PHYSICAL DAMMAGE
6. MINIMUM CONDUIT SIZE TO BE 1/2".
7. WIRING METHODS TO CONFORM TO ARTICLES 330, 334, 348, 350, 352, 356, AND 358 OF THE 2017 NEC.

CONSTRUCTION NOTES

1. ALL WORK IS TO BE PERFORMED IN ACCORDANCE WITH THE NEC, STATE, AND LOCAL APPLICABLE CODES.
2. FOLLOW MANUFACTURER'S INSTALLATION INSTRUCTIONS, BEST PRACTICES, AND SPECIFICATIONS.
3. ENSURE REQUIRED MAINTENANCE ACCESS AND CLEARANCES ARE MAINTAINED.
4. WIRES SHALL BE RATED AND LABELED "SUNLIGHT RESISTANT" WHERE EXPOSED TO AMBIENT CONDITIONS.
5. FUSES 0 - 600 AMPS SHALL BE UL CLASS "RK-1" LOW PEAK DUAL ELEMENT TIME DELAY WITH 200,000 AMPERE INTERRUPTING RATING AS MANUFACTURED BY BUSSMANN, UNLESS NOTED OTHERWISE.
6. ALL TERMINALS/LUGS SHALL BE 75° RATED. ALL TERMINALS, SPLICING CONNECTORS, LUGS, ETC SHALL BE IDENTIFIED FOR USE WITH THE MATERIAL (CU/AL) OF THE CONDUCTOR AND SHALL BE PROPERLY INSTALLED.
7. PROVIDE A PULLWIRE IN ALL EMPTY CONDUITS.
8. ALL PENETRATIONS THROUGH EXTERIOR ROOFS SHALL BE FLASHED IN A WATERPROOF MANNER.
9. ALL PENETRATIONS THROUGH ATTIC FIRE BARRIERS SHALL BE SEALED WITH FIRE-BARRIER SEALANT CAULK.
10. SUPPORT ALL CONDUIT AND EQUIPMENT IN ACCORDANCE W/ NEC. ANY SUSPENDED MATERIALS SHALL BE DIRECTLY SUPPORTED BY THE BUILDING STRUCTURE.
11. METAL CONDUIT COUPLINGS CAN BE COMPRESSION TYPE, THREADED, OR BE SET-SCREW TYPE. PLASTIC CONDUIT COUPLINGS TO BE SOCKET GLUED TYPE.
12. A COMPLETE GROUNDING SYSTEM SHALL BE PRESENT OR PROVIDED AND INSTALLED IN ACCORDANCE WITH ARTICLE 250 OF THE NEC, AND AS SHOWN ON THE DRAWINGS.
13. EACH ELECTRICAL APPLIANCE SHALL BE PROVIDED WITH A NAMEPLATE GIVING THE IDENTIFYING NAME AND THE RATING IN VOLTS AND AMPERES, OR VOLTS AND WATTS. IF THE APPLIANCE IS TO BE USED ON A SPECIFIC FREQUENCY OR FREQUENCIES, IT SHALL BE SO MARKED. WHERE MOTOR OVERLOAD PROTECTION EXTERNAL TO THE APPLIANCES IS REQUIRED, THE APPLIANCE SHALL BE SO MARKED.
14. WHERE APPLICABLE, GROUNDING ELECTRODE CONDUCTOR TO BE CONTINUOUS. GROUNDING CRIMPS TO BE IRREVERSIBLE.
15. PHOTOVOLTAIC SYSTEMS SHALL BE PERMANENTLY MARKED AT VARIOUS EQUIPMENT LOCATIONS TO IDENTIFY THAT A PHOTOVOLTAIC SYSTEM IS INSTALLED AND THAT VARIOUS DANGERS ARE PRESENT.
16. EACH PHOTOVOLTAIC SYSTEM DISCONNECTING MEANS SHALL BE PERMANENTLY MARKED TO IDENTIFY IT AS A PHOTOVOLTAIC SYSTEM DISCONNECT.
17. WHERE ALL TERMINALS OF A DISCONNECTING MEANS MAY BE ENERGIZED IN THE OPEN POSITION, A WARNING SIGN SHALL BE MOUNTED ON OR ADJACENT TO THE DISCONNECT.
18. A PERMANENT LABEL FOR THE DIRECT-CURRENT PHOTOVOLTAIC POWER SOURCE SHALL BE PROVIDED AT THE DC DISCONNECT MEANS.
19. A PERMANENT PLAQUE OR DIRECTORY, DENOTING ALL ELECTRIC POWER SOURCES SERVING THE PREMISES, SHALL BE INSTALLED AT EACH SERVICE EQUIPMENT LOCATION AND AT LOCATIONS OF ALL POWER PRODUCTION SOURCES.
20. ALL MODULE GROUND CONNECTIONS SHALL BE MADE IN ACCORDANCE WITH NEC SECTION 690.4 (C)
21. A NORTH CAROLINA REGISTERED DESIGN PROFESSIONAL WILL BE REQUIRED TO SEAL THE STRUCTURAL DESIGN AT THE TIME OF PERMIT APPLICATION IF ANY OF THE FOLLOWING EXIST AND ARE ATTESTED TO BY THE APPLICANT:
    I. THE WEIGHT OF THE PV SYSTEM EXCEEDS THREE (3) POUNDS PER SQUARE FOOT(PSF)
    II. THE ROOF POSSESSES MORE THAN ONE (1) LAYER OF ASPHALT SHINGLES
    III. THE ROOFING MATERIAL CONSISTS OF A TYPE OTHER THAN ASPHALT SHINGLES OR METAL
    IV. THE ROOF IS LOCATED IN A 140 MPH OR GREATER WIND ZONE

NC SOLAR NOW

NORTH CAROLINA PROFESSIONAL SEAL 035699 ENGINEER ANDREW W. KING 12/28/21

CLIENT INFO

GARY DOUGLAS DANTZER
561 WOOD POINT DRIVE
LILLINGTON, NC 27546

PROJECT INFO

DC INPUT:	12.000 kW
AC EXPORT:	10.000 kW
DOI INSPT. METHOD:	OPTION 2

CODE REFERENCES

NATION ELECTRICAL CODE v. 2017
NC FIRE PROTECTION CODE v. 2018
NC BUILDING CODE v. 2018
NC RESIDENTIAL CODE v. 2018
ACSE v. 7-10

SITE CONDITIONS

WIND SPEED:	117 MPH
RISK CATEGORY:	II
EXPOSURE:	B
SNOW:	10 PSF

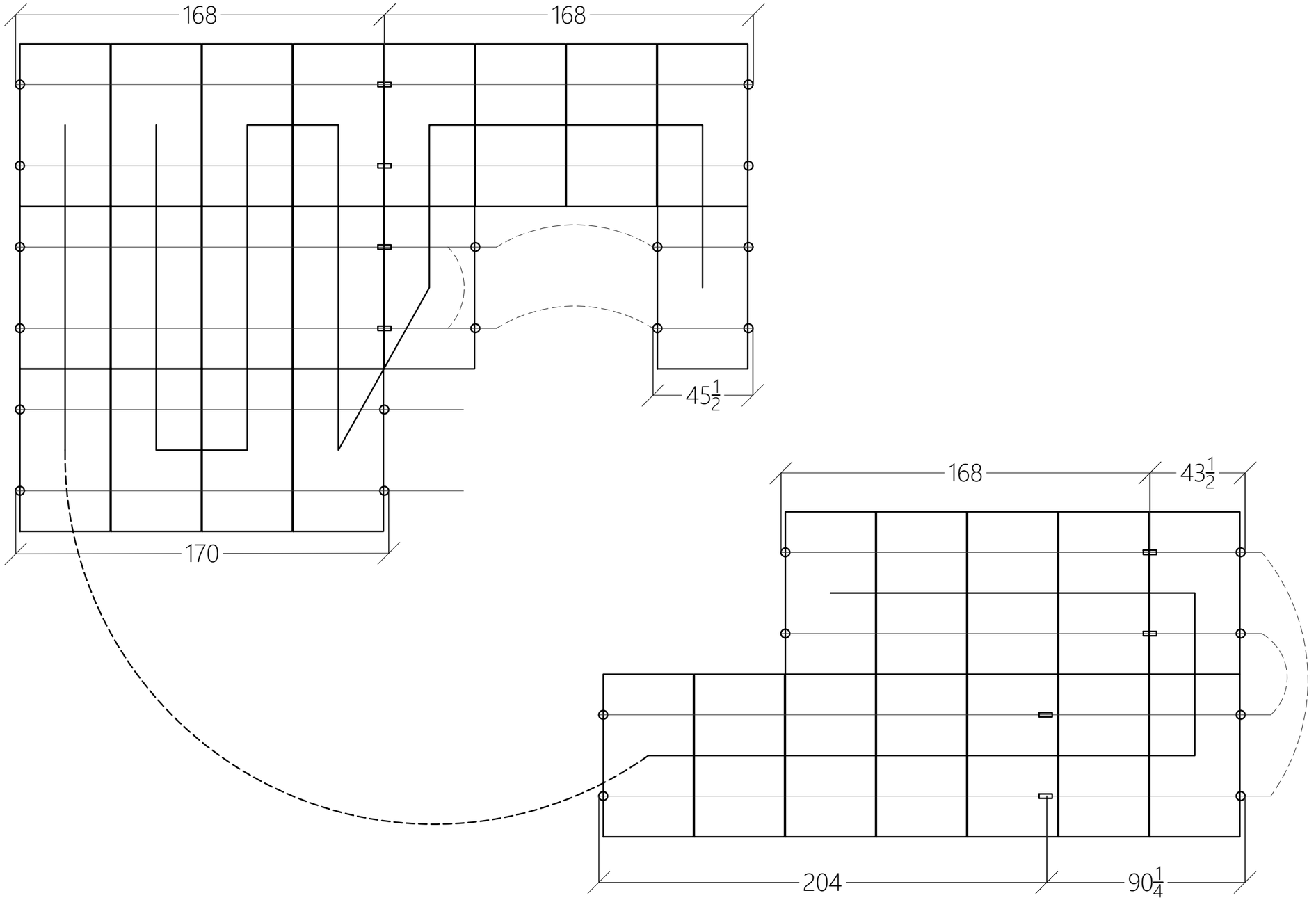
SHEET INDEX

DESIGNER INFO

DESIGNER	CRM
ENGINEER	AWK
DATE	12/28/2021
VERSION	P1

PV SYSTEM EQUIPMENT LABELS

PV-4.1



1 ARRAY LAYOUT DETAIL
NOT TO SCALE

NC SOLAR NOW

NORTH CAROLINA PROFESSIONAL SEAL 035699 ENGINEER ANDREW W. KING
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ENGINEER	AWK
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VERSION	P1

PV SYSTEM INSTALL GUIDE

PV-5.1

powered by Q.ANTUM DUO Z

Q.PEAK DUO BLK ML-G10+

385-405

ENDURING HIGH PERFORMANCE

25 YR Warranty
Product & Performance

EUPD RESEARCH TOP BRAND PV MODULES EUROPE 2021

Q CELLS Yield Security

BREAKING THE 20% EFFICIENCY BARRIER

Q.ANTUM DUO Z Technology with zero gap cell layout boosts module efficiency up to 20.9%.

THE MOST THOROUGH TESTING PROGRAMME IN THE INDUSTRY

Q CELLS is the first solar module manufacturer to pass the most comprehensive quality programme in the industry: The new "Quality Controlled PV" of the independent certification institute TÜV Rheinland.

INNOVATIVE ALL-WEATHER TECHNOLOGY

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

ENDURING HIGH PERFORMANCE

Long-term yield security with Anti LID Technology, Anti PID Technology[1], Hot-Spot Protect and Traceable Quality Tra.Q™.

EXTREME WEATHER RATING

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

A RELIABLE INVESTMENT

Inclusive 25-year product warranty and 25-year linear performance warranty[2].

[1] APT test conditions according to IEC / TS 62804-1:2015, method A (–1500 V, 96 h)
[2] See data sheet on rear for further information.

THE IDEAL SOLUTION FOR:

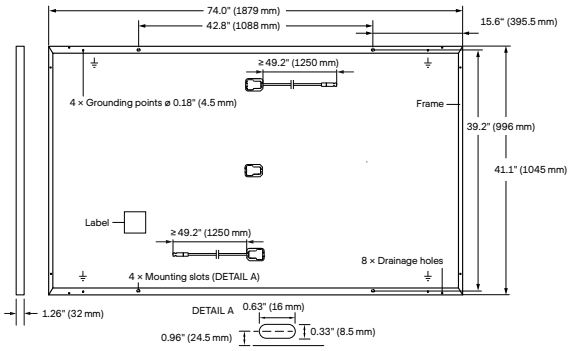
Rooftop arrays on residential buildings

Engineered in Germany

Q CELLS

MECHANICAL SPECIFICATION

Format	74.0 in × 41.1 in × 1.26 in (including frame) (1879 mm × 1045 mm × 32 mm)
Weight	48.5 lbs (22.0 kg)
Front Cover	0.13 in (3.2 mm) thermally pre-stressed glass with anti-reflection technology
Back Cover	Composite film
Frame	Black anodized aluminum
Cell	6 × 22 monocrystalline Q.ANTUM solar half cells
Junction Box	2.09-3.98 in × 1.26-2.36 in × 0.59-0.71 in (53-101 mm × 32-60 mm × 15-18 mm), IP67, with bypass diodes
Cable	4 mm² Solar cable; (+) ≥49.2 in (1250 mm), (–) ≥49.2 in (1250 mm)
Connector	Stäubli MC4; IP68

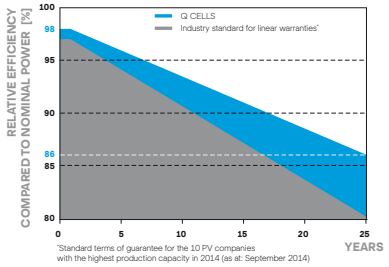


ELECTRICAL CHARACTERISTICS

POWER CLASS				385	390	395	400	405
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC[1] (POWER TOLERANCE +5 W / –0 W)								
Minimum	Power at MPP[1]	P_{MPP}	[W]	385	390	395	400	405
	Short Circuit Current[1]	I_{SC}	[A]	11.04	11.07	11.10	11.14	11.17
	Open Circuit Voltage[1]	V_{OC}	[V]	45.19	45.23	45.27	45.30	45.34
	Current at MPP	I_{MPP}	[A]	10.59	10.65	10.71	10.77	10.83
	Voltage at MPP	V_{MPP}	[V]	36.36	36.62	36.88	37.13	37.39
	Efficiency[1]	η	[%]	≥19.6	≥19.9	≥20.1	≥20.4	≥20.6
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT[2]								
Minimum	Power at MPP	P_{MPP}	[W]	288.8	292.6	296.3	300.1	303.8
	Short Circuit Current	I_{SC}	[A]	8.90	8.92	8.95	8.97	9.00
	Open Circuit Voltage	V_{OC}	[V]	42.62	42.65	42.69	42.72	42.76
	Current at MPP	I_{MPP}	[A]	8.35	8.41	8.46	8.51	8.57
	Voltage at MPP	V_{MPP}	[V]	34.59	34.81	35.03	35.25	35.46

[1]Measurement tolerances P_{MPP} ±3%; I_{SC}; V_{OC} ±5% at STC: 1000 W/m², 25±2 °C, AM 1.5 according to IEC 60904-3 • [2]800 W/m², NMOT, spectrum AM 1.5

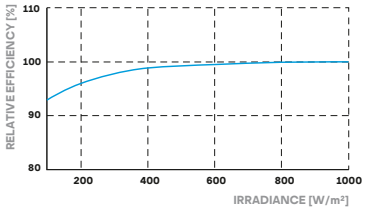
Q CELLS PERFORMANCE WARRANTY



At least 98 % of nominal power during first year. Thereafter max. 0.5 % degradation per year. At least 93.5 % of nominal power up to 10 years. At least 86 % of nominal power up to 25 years.

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

PERFORMANCE AT LOW IRRADIANCE



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

TEMPERATURE COEFFICIENTS							
Temperature Coefficient of I_{SC}	α	[%/K]	+0.04	Temperature Coefficient of V_{OC}	β	[%/K]	–0.27
Temperature Coefficient of P_{MPP}	γ	[%/K]	–0.34	Nominal Module Operating Temperature	NMOT	[°F]	109±5.4 (43±3 °C)

PROPERTIES FOR SYSTEM DESIGN

Maximum System Voltage V_{SYS}	[V]	1000 (IEC) / 1000 (UL)	PV module classification	Class II
Maximum Series Fuse Rating	[A DC]	20	Fire Rating based on ANSI / UL 61730	TYPE 2
Max. Design Load, Push / Pull[3]	[lbs/ft²]	75 (3600 Pa) / 55 (2660 Pa)	Permitted Module Temperature on Continuous Duty	–40 °F up to +185 °F (–40 °C up to +85 °C)
Max. Test Load, Push / Pull[3]	[lbs/ft²]	113 (5400 Pa) / 84 (4000 Pa)		

[3] See Installation Manual

QUALIFICATIONS AND CERTIFICATES

UL 61730, CE-compliant,
Quality Controlled PV - TÜV Rheinland,
IEC 61215:2016, IEC 61730:2016,
U.S. Patent No. 9,893,215 (solar cells),
QCPV Certification ongoing.

C Certified US
UL 61730

TÜVRheinland CERTIFIED
www.tuv.com
ID 1111220277

PACKAGING INFORMATION

Horizontal packaging	76.4 in 1940 mm	43.3 in 1100 mm	48.0 in 1220 mm	1656 lbs 751 kg	24 pallets	24 pallets	32 modules

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

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

INVERTERS

Single Phase Inverter with HD-Wave Technology

for North America

SE3000H-US / SE3800H-US / SE5000H-US / SE6000H-US /
SE7600H-US / SE10000H-US / SE11400H-US

12-25 YEAR WARRANTY

Optimized installation with HD-Wave technology

- Specifically designed to work with power optimizers
- Record-breaking efficiency
- Quick and easy inverter commissioning directly from a smartphone using the SolarEdge SetApp
- Fixed voltage inverter for longer strings
- Integrated arc fault protection and rapid shutdown for NEC 2014 and 2017, per article 690.11 and 690.12
- UL1741 SA certified, for CPUC Rule 21 grid compliance
- Extremely small
- Built-in module-level monitoring
- Outdoor and indoor installation
- Optional: Revenue grade data, ANSI C12.20 Class 0.5 (0.5% accuracy)

solaredge

Single Phase Inverter with HD-Wave Technology for North America

SE3000H-US / SE3800H-US / SE5000H-US / SE6000H-US/ SE7600H-US / SE10000H-US / SE11400H-US

Model Number	SE3000H-US	SE3800H-US	SE5000H-US	SE6000H-US	SE7600H-US	SE10000H-US	SE11400H-US	
APPLICABLE TO INVERTERS WITH PART NUMBER	SEXXXXH-XXXXXBXX4							
OUTPUT								
Rated AC Power Output	3000	3800 @ 240V 3300 @ 208V	5000	6000 @ 240V 5000 @ 208V	7600	10000	11400 @ 240V 10000 @ 208V	VA
Maximum AC Power Output	3000	3800 @ 240V 3300 @ 208V	5000	6000 @ 240V 5000 @ 208V	7600	10000	11400 @ 240V 10000 @ 208V	VA
AC Output Voltage Min.-Nom.-Max. (211 - 240 - 264)	✓	✓	✓	✓	✓	✓	✓	Vac
AC Output Voltage Min.-Nom.-Max. (183 - 208 - 229)	-	✓	-	✓	-	-	✓	Vac
AC Frequency (Nominal)	59.3 - 60 - 60.5[1]							Hz
Maximum Continuous Output Current @240V	12.5	16	21	25	32	42	47.5	A
Maximum Continuous Output Current @208V	-	16	-	24	-	-	48.5	A
Power Factor	1, adjustable -0.85 to 0.85							
GFDI Threshold	1							A
Utility Monitoring, Islanding Protection, Country Configurable Thresholds	Yes							
INPUT								
Maximum DC Power @240V	4650	5900	7750	9300	11800	15500	17650	W
Maximum DC Power @208V	-	5100	-	7750	-	-	15500	W
Transformer-less, Ungrounded	Yes							
Maximum Input Voltage	480							Vdc
Nominal DC Input Voltage	380				400			Vdc
Maximum Input Current @240V[2]	8.5	10.5	13.5	16.5	20	27	30.5	Adc
Maximum Input Current @208V[2]	-	9	-	13.5	-	-	27	Adc
Max. Input Short Circuit Current	45							Adc
Reverse-Polarity Protection	Yes							
Ground-Fault Isolation Detection	600kΩ Sensitivity							
Maximum Inverter Efficiency	99	99.2						%
CEC Weighted Efficiency	99						99 @ 240V 98.5 @ 208V	%
Nighttime Power Consumption	< 2.5							W

[1] For other regional settings please contact SolarEdge support
[2] A higher current source may be used; the inverter will limit its input current to the values stated

Single Phase Inverter with HD-Wave Technology for North America

SE3000H-US / SE3800H-US / SE5000H-US / SE6000H-US/ SE7600H-US / SE10000H-US / SE11400H-US

Model Number	SE3000H-US	SE3800H-US	SE5000H-US	SE6000H-US	SE7600H-US	SE10000H-US	SE11400H-US	
ADDITIONAL FEATURES								
Supported Communication Interfaces	RS485, Ethernet, ZigBee (optional), Cellular (optional)							
Revenue Grade Data, ANSI C12.20	Optional[3]							
Inverter Commissioning	with the SetApp mobile application using built-in Wi-Fi Access Point for local connection							
Rapid Shutdown - NEC 2014 and 2017 690.12	Automatic Rapid Shutdown upon AC Grid Disconnect							
STANDARD COMPLIANCE								
Safety	UL1741, UL1741 SA, UL1699B, CSA C22.2, Canadian AFCI according to T.I.L. M-07							
Grid Connection Standards	IEEE1547, Rule 21, Rule 14 (HI)							
Emissions	FCC Part 15 Class B							
INSTALLATION SPECIFICATIONS								
AC Output Conduit Size / AWG Range	1'' Maximum / 14-6 AWG					1'' Maximum /14-4 AWG		
DC Input Conduit Size / # of Strings / AWG Range	1'' Maximum / 1-2 strings / 14-6 AWG					1'' Maximum / 1-3 strings / 14-6 AWG		
Dimensions with Safety Switch (HxWxD)	17.7 x 14.6 x 6.8 / 450 x 370 x 174					21.3 x 14.6 x 7.3 / 540 x 370 x 185		in / mm
Weight with Safety Switch	22 / 10		25.1 / 11.4		26.2 / 11.9	38.8 / 17.6		lb / kg
Noise	< 25				<50			dBA
Cooling	Natural Convection							
Operating Temperature Range	-40 to +140 / -40 to +60[4]							°F / °C
Protection Rating	NEMA 4X (Inverter with Safety Switch)							

[3] Revenue grade inverter P/N: SExxxxH-US000BNC4
[4] Full power up to at least 50°C / 122°F; for power de-rating information refer to: https://www.solaredge.com/sites/default/files/se-temperature-derating-note-na.pdf

RoHS

Power Optimizer
Frame-Mounted

P370 / P401 / P404 / P500

POWER OPTIMIZER

Fast mount power optimizers with module-level optimization

- Specifcally designed to work with SolarEdge inverters
- Quicker installation - Power optimizers can be mounted in advance saving installation time
- Up to 25% more energy
- Superior efficiency (99.5%)
- Mitigates all types of modules mismatch-loss, from manufacturing tolerance to partial shading
- Flexible system design for maximum space utilization
- Next generation maintenance with module level monitoring
- Module-level voltage shutdown for installer and firefighter safety

solaredge

/ Power Optimizer

Frame-Mounted

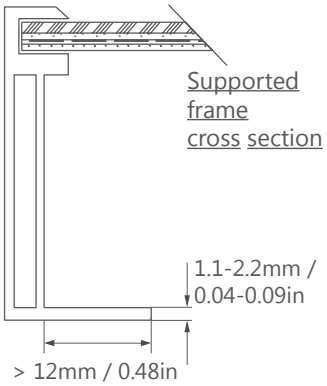
P370 / P401 / P404 / P500

OPTIMIZER MODEL (TYPICAL MODULE COMPATIBILTY)	P370 (FOR HIGH-POWER 60-CELL AND FOR 72-CELL MODULES)	P401 (FOR HIGH POWER 60/72-CELL MODULES)	P404 (FOR 60-CELL AND 72-CELL, SHORT STRINGS)	P500 (FOR 96-CELL MODULES)	
INPUT					
Rated Input DC Power(1)	370	400	405	500	W
Absolute Maximum Input Voltage (Voc at lowest temperature)	60		80		Vdc
MPPT Operating Range	8 - 60		12.5 - 80	8 - 80	Vdc
Maximum Short Circuit Current (Isc)	11	11.75	11	10.1	Adc
Maximum Efficiency	99.5				%
Weighted Efficiency	98.8				%
Overvoltage Category	II				
OUTPUT DURING OPERATION (POWER OPTIMIZER CONNECTED TO OPERATING SOLAREDGE INVERTER)					
Maximum Output Current	15				Adc
Maximum Output Voltage	60		85	60	Vdc
OUTPUT DURING STANDBY (POWER OPTIMIZER DISCONNECTED FROM SOLAREDGE INVERTER OR SOLAREDGE INVERTER OFF)					
Safety Output Voltage per Power Optimizer	1 ± 0.1				Vdc
STANDARD COMPLIANCE					
EMC	FCC Part15 Class B, IEC61000-6-2, IEC61000-6-3				
Safety	IEC62109-1 (class II safety), UL1741				
RoHS	Yes				
Fire Safety	VDE-AR-E 2100-712:2013-05				
INSTALLATION SPECIFICATIONS					
Maximum Allowed System Voltage	1000				Vdc
Dimensions (W x L x H)	139 x 165 x 40 / 5.5 x 6.5 x 1.6	129 x 153 x 29.5 / 5.08 x 6.02 x 1.16	139 x 165 x 48 / 5.5 x 6.5 x 1.9		mm / in
Weight (including cables)	775 / 1.7	655 / 1.5	895 / 2.0	870 / 1.9	gr / lb
Input Connector	MC4(2)				
Input Wire Length	0.16 / 0.52				m / ft
Output Connector	MC4				
Output Wire Length	1.2 / 3.9				m / ft
Operating Temperature Range(3)	-40 to +85 / -40 to +185				˚C / ˚F
Protection Rating	IP68 / NEMA6P				
Relative Humidity	0 - 100				%

(1) Rated power of the module at STC will not exceed the optimizer "Rated Input DC Power". Modules with up to +5% Power tolerance are allowed
(2) For other connector types please contact SolarEdge
(3) For ambient temperature above +85°C / +185°F power de-rating is applied. Refer to Power Optimizers Temperature De-Rating Technical Note for more details

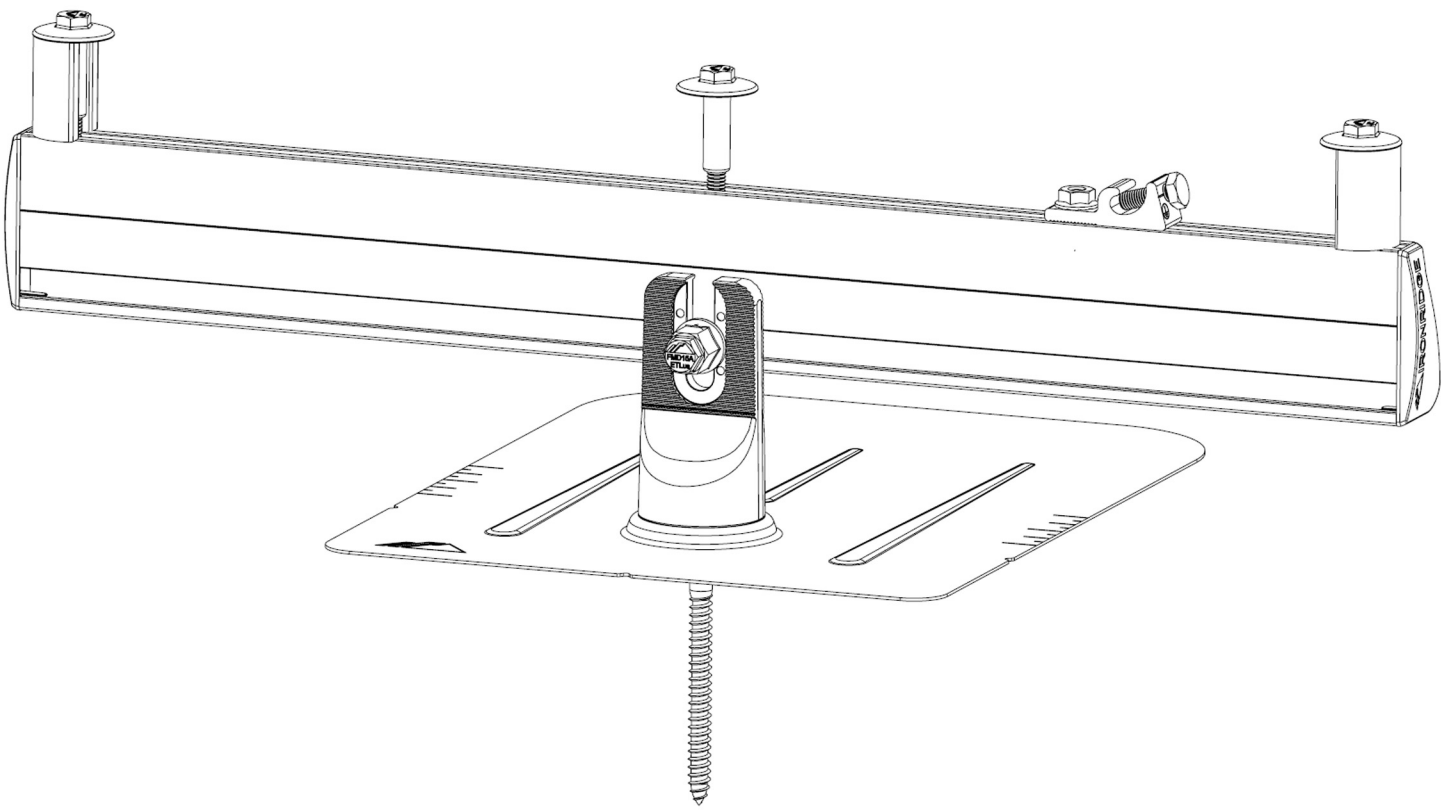
PV SYSTEM DESIGN USING A SOLAREDGE INVERTER(4)		SINGLE PHASE HD-WAVE	SINGLE PHASE	THREE PHASE	THREE PHASE FOR 277/480V GRID	
Minimum String Length (Power Optimizers)	P370/ P401/ P500(5)	8		16	18	
	P404	6		14 (13 with SE3K)(6)	14	
Maximum String Length (Power Optimizers)		25		50	50	
Maximum Nominal Power per String		5700(7)	5250(7)	11250(8)	12750	W
Parallel Strings of Different Lengths or Orientations		Yes				

(4) It is not allowed to mix P404 with P370/P401/P500 in one string
(5) The P370/P401/P500 cannot be used with the SE3K three phase inverter (available in some countries; refer to Three Phase Inverter SE3K-SE10K datasheet)
(6) Exactly 10 when using SE3K-RW010BNN4
(7) If the inverters rated AC power ≤ maximum nominal power per string, then the maximum power per string will be able to reach up to the inverters maximum input DC power Refer to: https://www.solaredge.com/sites/default/files/se-power-optimizer-single-string-design-application-note.pdf
(8) For SE27.6K, SE55K, SE82.8K: It is allowed to install up to 13,500W per string when 3 strings are connected to the inverter and when the maximum power difference between the strings is up to 2,000W; inverter max DC power: 37,250W



CE

FLUSH MOUNT



INSTALLATION MANUAL

IRONRIDGE

CONTENTS

DISCLAIMER

This manual describes proper installation procedures and provides necessary standards required for product reliability. Warranty details are available on website. All installers must thoroughly read this manual and have a clear understanding of the installation procedures prior to installation. Failure to follow these guidelines may result in property damage, bodily injury or even death.

IT IS THE INSTALLER'S RESPONSIBILITY TO:

- Ensure safe installation of all electrical aspects of the array. All electrical installation and procedures should be conducted by a licensed and bonded electrician or solar contractor. Routine maintenance of a module or panel shall not involve breaking or disturbing the bonding path of the system. All work must comply with national, state and local installation procedures, product and safety standards.
- Comply with all applicable local or national building and fire codes, including any that may supersede this manual.
- Ensure all products are appropriate for the installation, environment, and array under the site's loading conditions.
- Use only IronRidge parts or parts recommended by IronRidge; substituting parts may void any applicable warranty.
- Review the Design Assistant and Certification Letters to confirm design specifications.
- Ensure provided information is accurate. Issues resulting from inaccurate information are the installer's responsibility.
- Ensure bare copper grounding wire does not contact aluminum and zinc-plated steel components, to prevent risk of galvanic corrosion.
- If loose components or loose fasteners are found during periodic inspection, re-tighten immediately. If corrosion is found, replace affected components immediately.
- Provide an appropriate method of direct-to-earth grounding according to the latest edition of the National Electrical Code, including NEC 250: Grounding and Bonding, and NEC 690: Solar Photovoltaic Systems.
- Disconnect AC power before servicing or removing modules, AC modules, microinverters and power optimizers.
- Review module manufacturer's documentation for compatibility and compliance with warranty terms and conditions.

RATINGS

UL 2703 LISTED

#5003807

- Conforms to STD UL 2703 (2015) Standard for Safety First Edition: Mounting Systems, Mounting Devices, Clamping/ Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels.
- Max Overcurrent Protective Device (OCPD) Rating: 25A
- Max Module Size: 24ft²
- Module Orientation: Portrait or Landscape
- CAMO Specific Allowable Design Load Rating: 50 PSF downward, 50 PSF upward, 15 PSF lateral
- System Level Allowable Design Load Rating: meets minimum requirements of the standard (10 PSF downward, 5 PSF upward, 5 PSF lateral). Actual system structural capacity is defined by PE stamped certification letters.

CLASS A SYSTEM FIRE RATING PER UL 1703

- Any Roof Slope with Module Types 1, 2, and 3
- Any module-to-roof gap is permitted, with no perimeter guarding required. This rating is applicable with any third-party attachment.
- Class A rated PV systems can be installed on Class A, B, and C roofs without affecting the roof fire rating.

WATER SEAL RATINGS: UL 441 & TAS 100(A)-95 (FLASHFOOT2, ALL TILE HOOK, KNOCKOUT TILE)

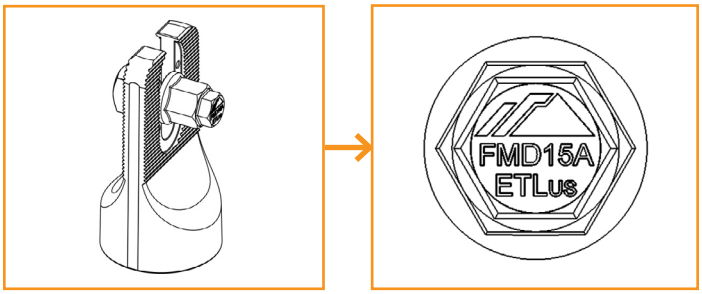
- Tested and evaluated without sealant.
- Any roofing manufacturer approved sealant is allowed. Ratings applicable for roof slopes between 2:12 and 12:12

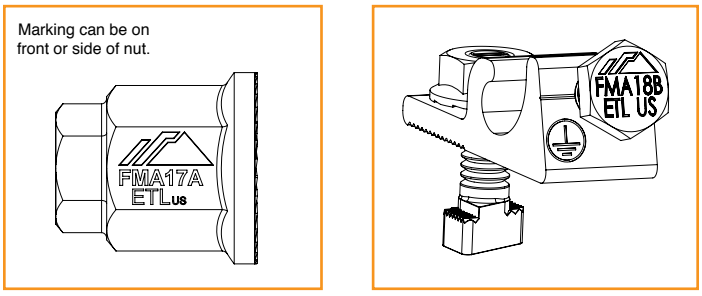
STRUCTURAL CERTIFICATION

- Designed and Certified for Compliance with the International Building Code & ASCE/SEI-7

MARKINGS

Product markings are located on the 3/8" flange hex nut or Grounding Lug bolt head.





CHECKLIST

PRE-INSTALLATION

☐ Verify module compatibility. See Page 10 for info.

TOOLS REQUIRED

☐ Cordless Drill (non-impact)

☐ Impact Driver (for lag bolts)

☐ Torque Wrench (0-250 in-lbs)

☐ 5/16” Socket

☐ 7/16” Socket

☐ 1/2" Socket

☐ String Line

TORQUE VALUES

☐ FlashFoot2 Lag Bolts (7/16" Socket): Fully Seat

☐ Bonded Splice Screws (5/16" Socket): 20 in-lbs

☐ Grounding Lug Nuts (7/16" Socket): 80 in-lbs

☐ Grounding Lug Terminal Screws (7/16" Socket): 20 in-lbs

☐ Universal Fastening Object (7/16" Socket): 80 in-lbs

☐ Expansion Joint Nuts (7/16" Socket): 80 in-lbs

☐ Flush Standoffs (1/2" Socket): 132 in-lbs

☐ Microinverter Kit Nuts (7/16" Socket): 80 in-lbs

☐ Frameless Module Kit Nuts (7/16" Socket): 80 in-lbs

☐ 3/8" Bonding Hardware Nuts (7/16" Socket): 250 in-lbs

☐ All Tile Hook Lags (7/16" Socket): Fully Seat

☐ All Tile Hook Carriage Bolts (7/16" Socket): 132 in-lbs

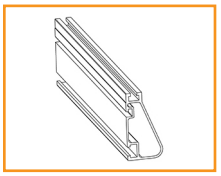
☐ Knockout Tile Lags (1/2" Socket): Fully Seat

☐ Knockout Tile Nuts (1/2" Socket): 132 in-lbs

☐ Flat Roof Attachment Nuts (9/16” Socket): 250 in-lbs

If using previous version of: FlashFoot, Integrated Grounding Mid Clamps, Grounding Lug, End Clamps, and Expansion Joints please refer to Alternate Components Addendum (Version 1.20).

IRONRIDGE COMPONENTS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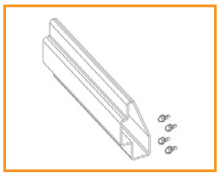
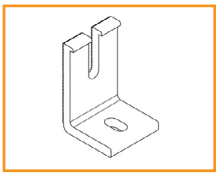
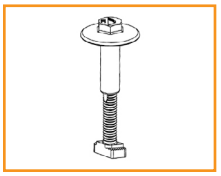
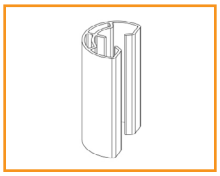
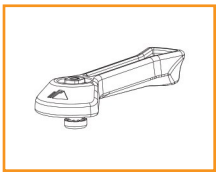
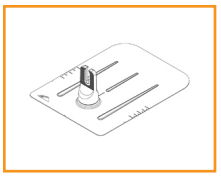

Bonded Splice

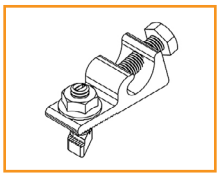

L-Foot

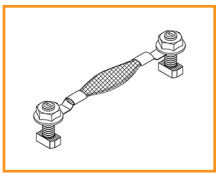

UFO


Stopper Sleeve


CAMO

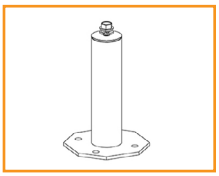

FlashFoot2

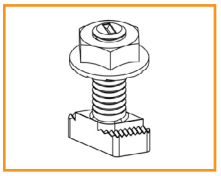

Grounding Lug

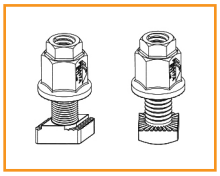

Expansion Joint

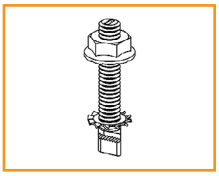
End Cap

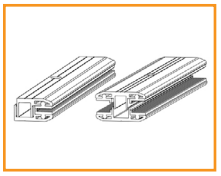

Wire Clip

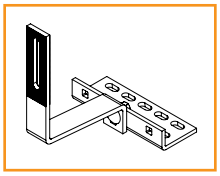

Flush Standoff

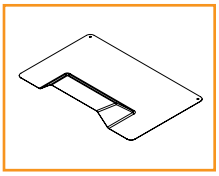

Microinverter Kit

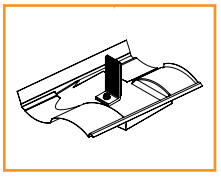

3/8" Bonding Hardware

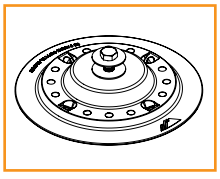

Frameless Module Kit

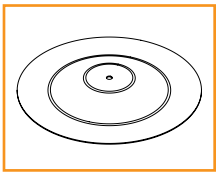

Frameless End/Mid Clamp


All Tile Hook


All Tile Hook Flashing

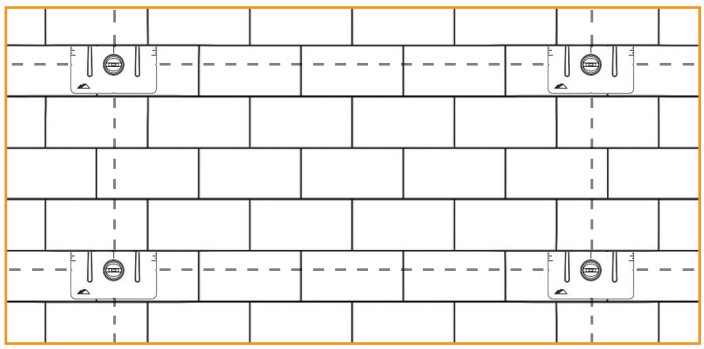

Knockout Tile


Flat Roof Attachment


Membrane Flashing

1. ATTACH BASES

For composition roofs, refer to FlashFoot2 install instructions on page 8. For tile roofs, refer to All Tile Hook and Knockout Tile install instructions on page 8 and 9. For flat roofs, refer to Flat Roof Attachment install instructions on page 9. When using approved third party attachments, refer to manufacturer's install instructions.



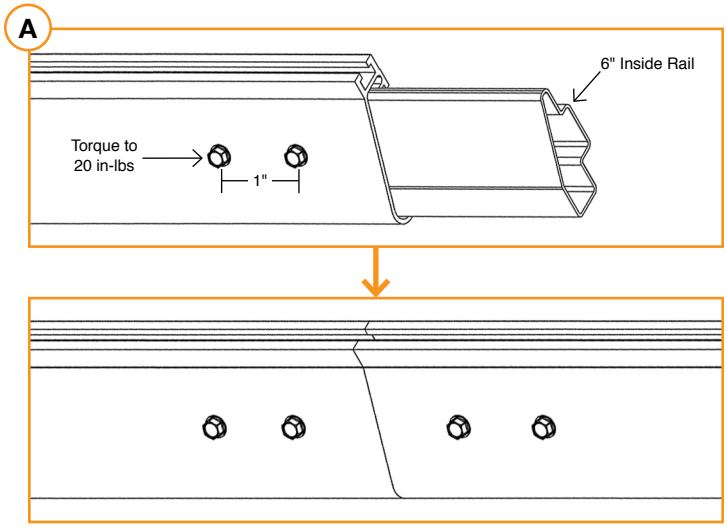
- **Tested or evaluated third-party roof attachments:**
  - **Anchor Products - U-Anchor**
  - **S-5! Standing Seam Metal Roof Clamps - Certification of metal roof clamps includes bonding to both painted and galvalume metal roofs. Tighten S-5! and S-5! Mini set screws to 130-150 in-lbs (≥ 24 gauge) or 160-180 in-lbs (22 gauge) roofs. Tighten S-5! M10 bolt to 240 in-lbs or S-5! Mini M8 bolt to 160 in-lbs. Use the following fastening guidelines for other S-5! roof clamps: ProteaBracket™ - firmly seat roof screws and tighten hinge bolt to 225 in-lbs; RibBracket™ - firmly seat roof screws and tighten M8 bolt (M8-1.25 x 22mm sold separately) to 160 in-lbs; and SolarFoot™ - firmly seat roof screws and tighten M8 flange nut to 160 in-lbs.**
  - **EcoFasten Green Fasten GF-1 Anchors**
  - **Rooftech RT-Mini - Attach to L-foot using 5/16-18 x 1.25" stainless steel bolt and nut torqued to 132 in-lbs.**
  - **QuickMount PV Roof Mounts QMLM/QMLM - ST and Tile Hooks - Tile Hook attaches to XR Rail using 3/8" Bonding Hardware Kit torqued to 250 in-lbs.**
  - **Quickscrews Solar Roof Hooks, Ejot Aluminum Roof Hooks, Unirac Creotecc Tile Hooks, or Solarhooks - Attach to XR Rails with L-Foot or 3/8" Bonding Hardware Kit torqued to 250 in-lbs.**
  - **Pegasus Comp Mount - Attach to XR Rail using 3/8" Bonding Hardware kit torqued to 250 in-lbs.**

2. PLACE RAILS

A. CONNECT SPLICES

Use Bonded Splices, when needed, to join multiple sections of rail. Insert Bonded Splice 6" into first rail and secure with two self-drilling screws, spacing them approximately 1" apart and tightening to **20 in-lbs**. Slide second rail over Bonded Splice and secure with two more self-drilling screws.

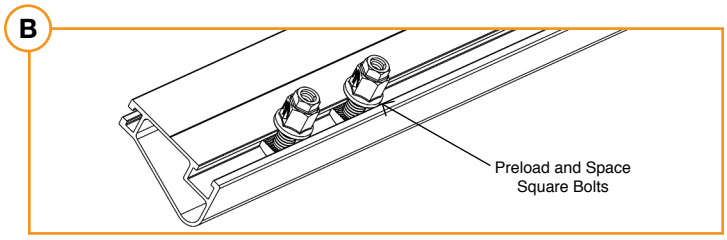
- **Rows exceeding 100 feet of rail must use Expansion Joints.**
- **For XR10 and XR100 rails, insert screws along the provided lines.**
- **Refer to Structural Certification letters for rail splice location requirements.**
- **Screws can be inserted on front or back of rails.**



B. PREPARE HARDWARE

Slide square-headed bolts into side-facing rail slot. Space out bolts to match attachment spacing.

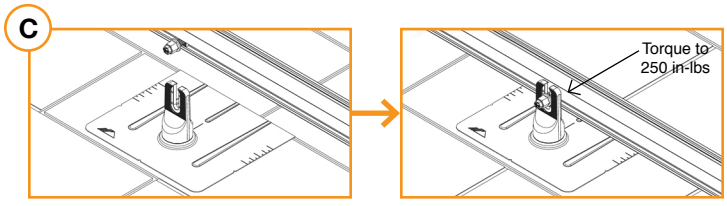
- **Tape ends of rail, to keep bolts from sliding out while moving.**
- **If using T-bolts, carry hardware onto roof and proceed.**



C. ATTACH RAILS

Drop rail with hardware into roof attachment. Level rail at desired height, then torque to **250 in-lbs**.

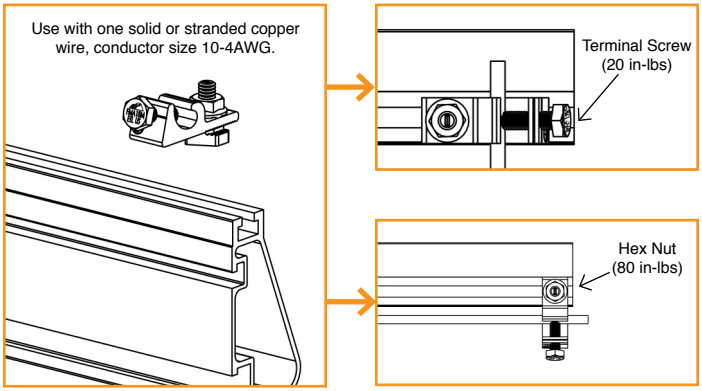
- **Rail can face either upslope or downslope on roof.**



3. SECURE LUGS

Insert T-bolt in top rail slot and torque hex nut to **80 in-lbs**. Install a minimum 10 AWG solid copper or stranded grounding wire. Torque terminal screw to **20 in-lbs**.

- **Ground Lugs are only needed on one rail per continuous row of modules, regardless of row length (unless frameless modules are being used, see Page 9).**
- **If using Enphase microinverters or Sunpower AC modules, Grounding Lugs may not be needed. See Page 9 for more info.**
- **Grounding Lugs can be installed anywhere along the rail and in either orientation shown. If installing lug underneath modules in areas with ground snow loads greater than 40 psf, place lug within 4 inches module frame edge.**



4. SECURE MODULES

A. SECURE FIRST END

Place first module in position on rails, a minimum of 1" from rail ends. Snap Stopper Sleeves onto UFO. Fasten module to rail using the UFO, ensuring that the UFO is hooked over the top of the module. Torque to **80 in-lbs**.

- **Ensure rails are square before placing modules.**
- **Hold Stopper Sleeves on end while torquing to prevent rotation.**
- **If using CAMO instead of UFO + Stopper Sleeve, refer to Page 6 for CAMO installation procedure.**

B. SECURE NEXT MODULES

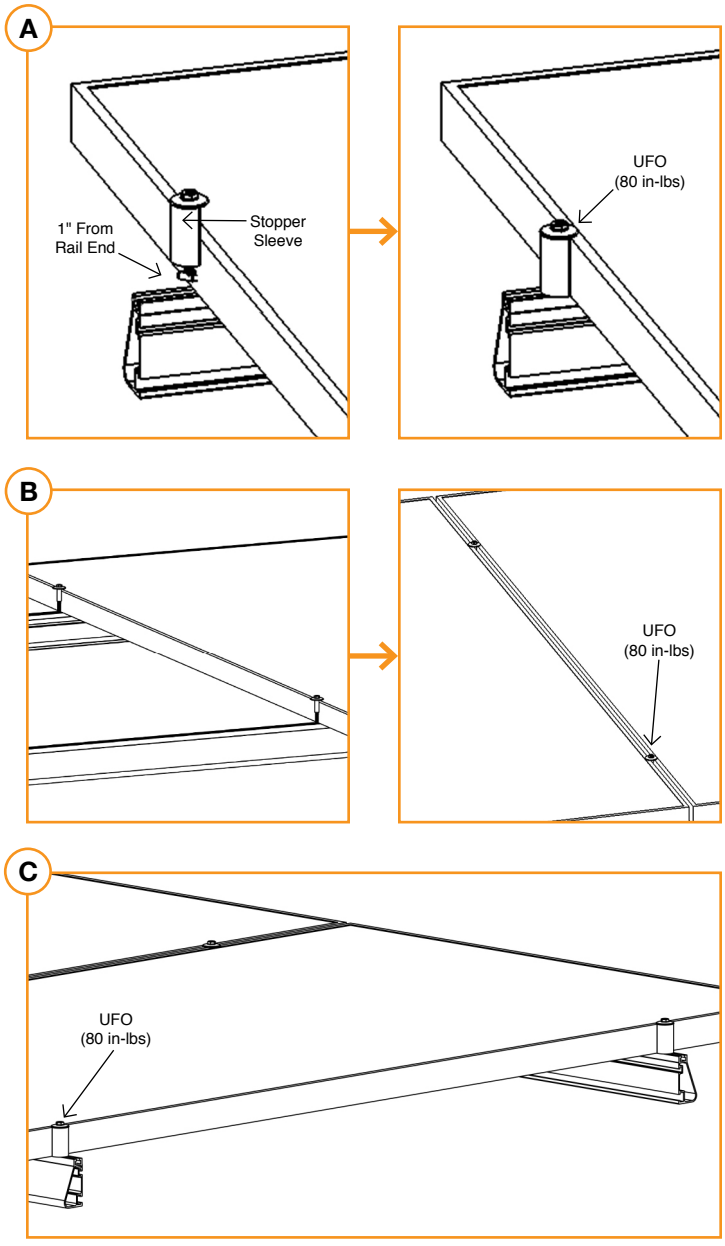
Place UFO into each rail, placing them flush against first module. Slide second module against UFO. Torque to **80 in-lbs**. Repeat for each following module.

- **When reinstalling UFO, move modules a minimum of 1/16" so UFOs are in contact with a new section of module frame.**
- **When UFOs are loosened and re-tightened, ensure UFO T-bolt bottoms out in rail channel before re-torquing UFO to achieve full engagement between T-bolt and rail.**
- **If using Wire Clips, refer to Page 9.**

C. SECURE LAST END

Place last module in position on rails, a minimum of 1" from rail ends. Snap Stopper Sleeves onto UFO. Secure UFO Clamps on rails, ensuring they are hooked over top of module. Torque to **80 in-lbs**.

- **Hold Stopper Sleeves on end while torquing to prevent rotation.**
- **Repeat all steps for each following row of modules, leaving a minimum 3/8" gap between rows.**
- **If using CAMO instead of UFO + Stopper Sleeve, refer to Page 6 for CAMO installation procedure.**

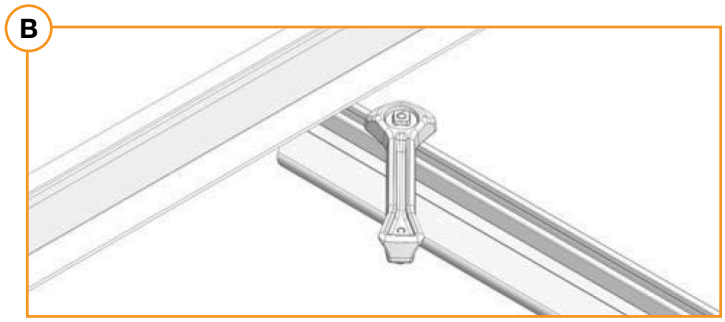


A. SLIDE INTO RAIL

Slide CAMO into rail channel far enough to clear the module frame. CAMO requires 6" of clearance from end of rail.

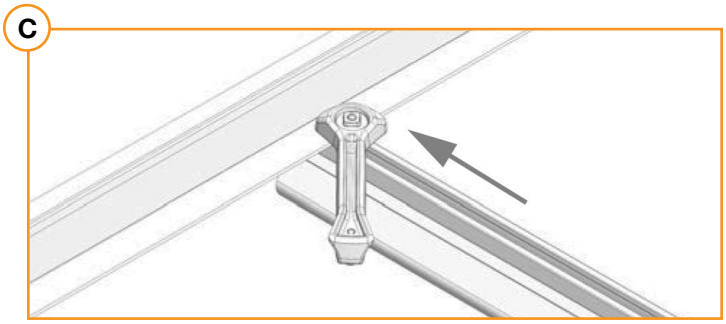
B. PLACE MODULE

Place module on rails (module cells not shown for clarity). When installing CAMO the module can overhang the rail no more than 1/4".



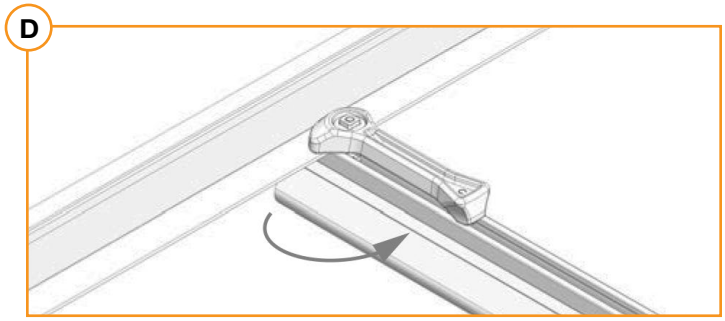
C. PULL TOWARDS END

Pull CAMO towards rail ends, at 45 degree angle, so the bonding bolt contacts the module flange edge.



D. SECURE TO FRAME

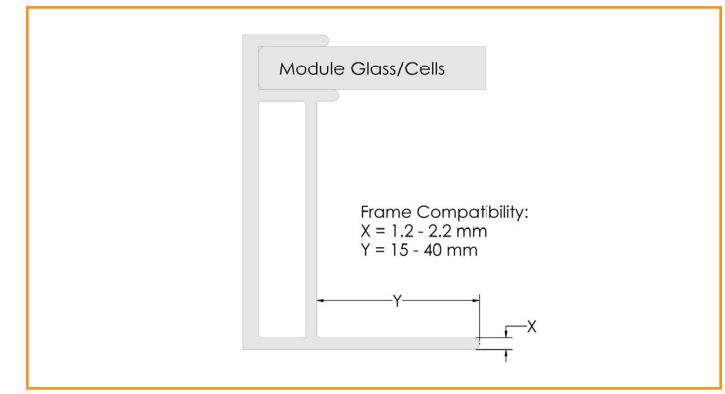
Rotate handle with an upwards motion until CAMO snaps into rail channel. Ensure CAMO bonding pins are fully seated on top of module frame.



FRAME COMPATIBILITY

CAMO has been tested or evaluated with all modules listed in the Module Compatibility section having frames within the referenced dimensions. Be sure the specific module being used meets the dimension requirements.

For installations with Hanwha Q CELLS modules with 32 mm frame heights, the maximum ground snow is 45 PSF (33 PSF module pressure).



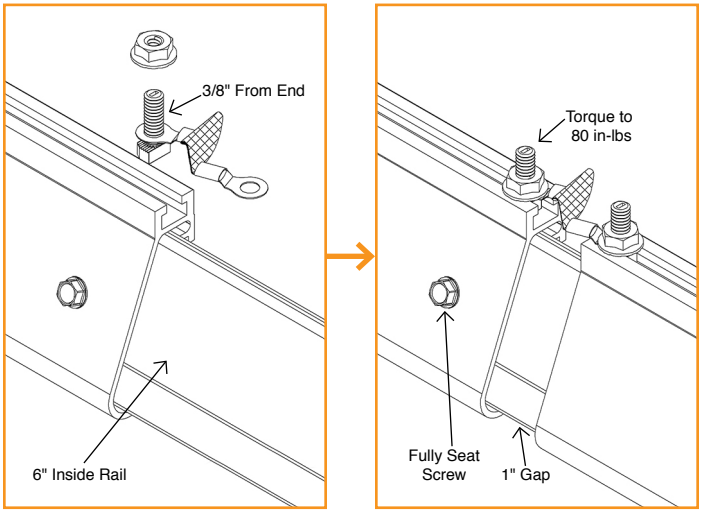
EXPANSION JOINTS

GROUNDING STRAP EXPANSION JOINT

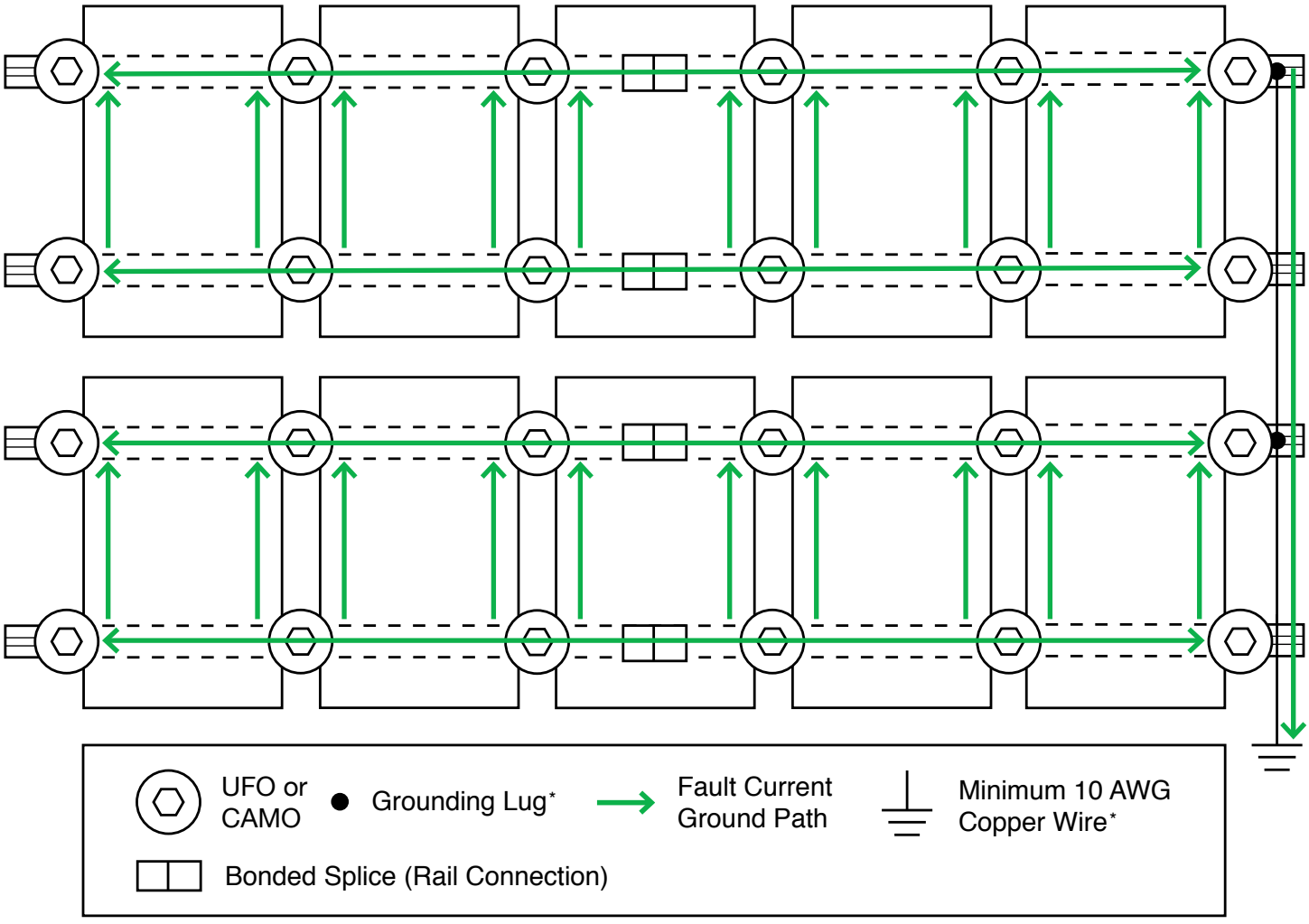
Grounding Strap Expansion Joints are required for thermal expansion of rows exceeding 100 feet of rail.

Insert Internal Splice into first rail and secure with screw. Assemble and secure Grounding Strap 3/8" from rail end. Slide second rail over Internal Splice leaving 1" gap between rails. Attach other end of Grounding Strap with hardware, and torque hex nuts to **80 in-lbs**.

- **Second Bonded Splice screw is <u>not</u> used with Expansion Joints.**
- **Do <u>not</u> install module over top of expansion joint location.**



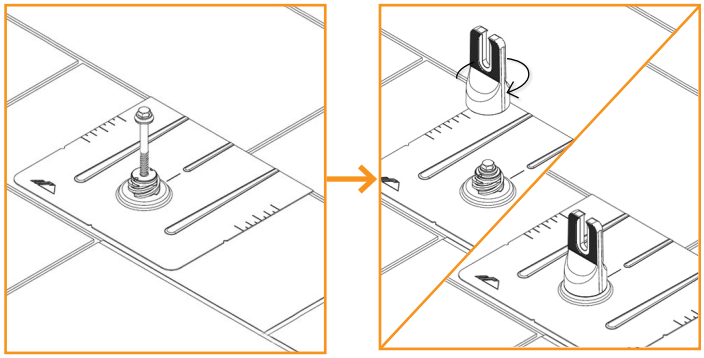
ELECTRICAL DIAGRAM



*Grounding Lugs and wire are not required in systems using certain Enphase microinverters or certain Sunpower modules. Equipment grounding is achieved with the Engage cable for Enphase or the AC module cable system for Sunpower via their integrated EGC.

FLASHFOOT2

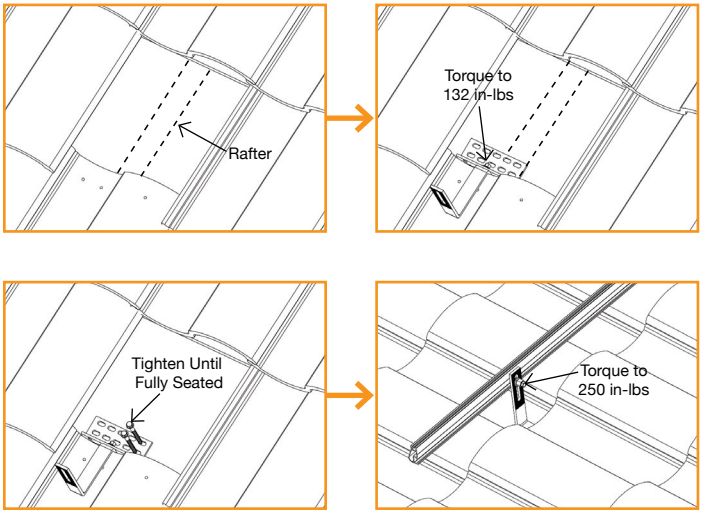
Locate roof rafters and mark locations on roof. Drill 1/4" pilot holes and backfill with approved sealant. Slide flashing between 1st and 2nd course of shingles, ensuring flashing doesn't overhang the downhill shingle. Line up with pilot hole and insert supplied lag bolt with washer through flashing. Fully seat lag bolt. Place Cap onto flashing in desired orientation for E/W or N/S rails and rotate 180 degrees until it locks into place.



- **Rail can be installed on either side of FlashFoot2 Cap.**
- **Standalone FlashFoot2 manual available on website.**

ALL TILE HOOK

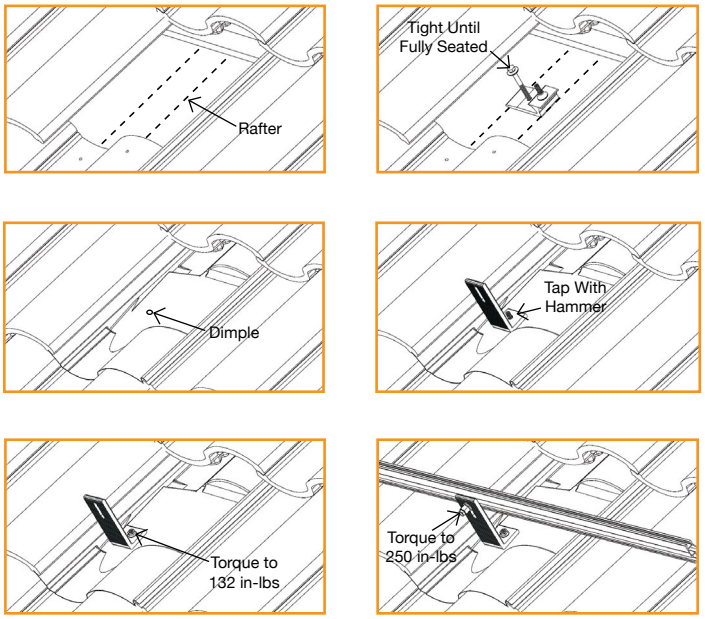
Remove tile and mark rafter. Position base over rafter, adjust arm if necessary and torque hardware to **132 in-lbs (11 ft-lbs)**. Use base as guide to drill 1/4" pilot holes, back fill with roofing manufacturer's approved sealant, then insert lag bolts and tighten until fully seated. Replace tiles and notch as necessary to ensure proper fit. Attach rails to either side of slot using bonding hardware and torque to **250 in-lbs (21-ft-lbs)**.



- **Position arm near the center of valley for curved tiles.**
- **Position arm away from seam of joining flat tiles.**
- **Ensure top of hook does not extend above rail.**
- **IronRidge offers an optional aluminum deck flashing. Refer to All Tile Hook Flashing Installation Manual. Other approved flashing methods include user supplied adhesive backed flexible flashing.**
- **Standalone All Tile Hook manual available on website.**

KNOCKOUT TILE

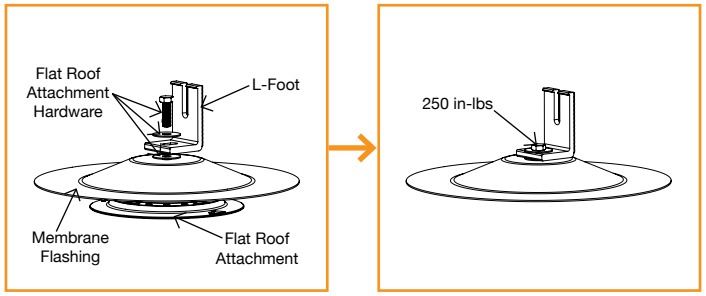
Remove tile and mark rafter. Use base as guide to drill 1/4" pilot hole and fill with roofing manufacturer's approved sealant. Insert lag bolt with bonded washer through base and drive until fully seated. Insert Tile Replacement Flashing, lower onto base and apply pressure over the threaded post until it dimples the flashing. Place L-Foot over dimple and tap with hammer to punch threaded post through the flashing. Ensure punched pieces of flashing are cleared away. Form flashing as needed to sit flush with surrounding tiles, position L-Foot in desired orientation and torque hardware to **132 in-lbs (11 ft-lbs)**. Attach rail to either side of L-Foot with bonding hardware and torque to **250 in-lbs (21 ft-lbs)**.



- **Base can be installed parallel or perpendicular to rafter.**
- **L-foot can be installed facing any direction.**
- **Ensure L-Foot does not extend above rail.**
- **If deck level flashing is required, approved flashing methods include user supplied adhesive backed flexible flashing.**
- **Standalone Knockout Tile manual available on website.**

FLAT ROOF ATTACHMENT

Flat Roof Attachment can be used with an L-foot for flush mounting modules on low sloped roofs. Mark locations for Flat Roof Attachment. Screws should be installed symmetrically to each other. If using a membrane flashing, remove the silicone washer's protective liner prior to attaching the membrane. Attach L-foot with washers and 3/8" hardware torqued to **250 in-lbs (21 ft-lbs)**. Seal attachment and/or membrane per roofing manufacturer's requirements.

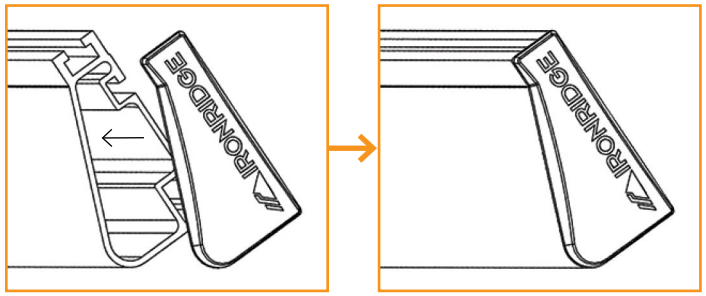


- **Type, size, and quantity of roof screws to be specified by Structural Engineer. Fastener size not to exceed #15.**
- **Membrane flashing available for TPO, PVC, and KEE roofs. Ensure membrane flashing is compatible with existing roofing material.**
- **If membrane flashing is not used, only washer on top of L-Foot is required.**
- **Standalone Flat Roof Attachment manual available on website.**

END CAPS

End Caps add a completed look and keep debris and pests from collecting inside rail.

Firmly press End Cap onto rail end.

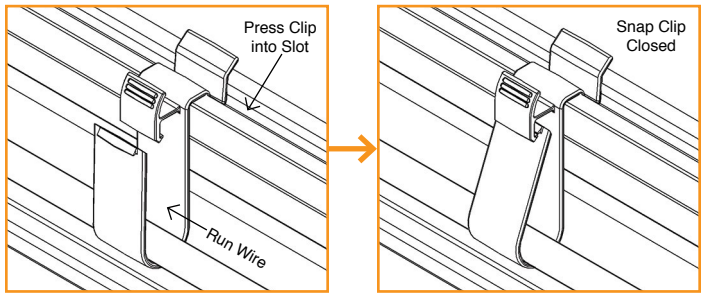


- **End Caps come in sets of left and right. Check that the proper amount of each has been provided.**

WIRE CLIPS

Wire Clips offer a simple wire management solution.

Firmly press Wire Clip into top rail slot. Run electrical wire through open clip. Snap closed once all wires have been placed.



FLUSH STANDOFFS

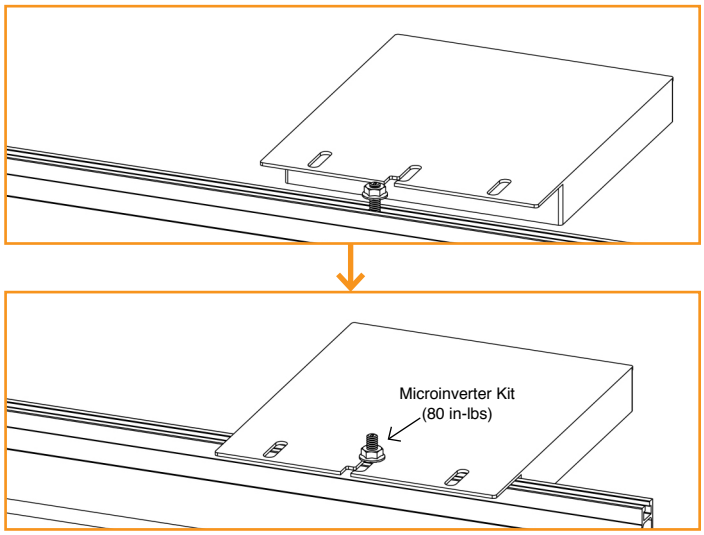
Attach Standoffs to roof locations with lag bolts (not included). Place flashing over Standoff. Attach L-Foot on Standoff washer with hardware. Torque to **132 in-lbs (11 ft-lbs)**.

MICROINVERTER KITS

Use IronRidge's Microinverter Kit to bond compatible microinverters and power optimizers to the racking system.

Insert Microinverter Kit T-bolt into top rail slot. Place compatible microinverter or power optimizer into position and tighten hex nut to **80 in-lbs**.

If installing in areas with ground snow loads greater than 40 psf, install MLPE devices directly next to module frame edge.



COMPATIBLE PRODUCTS

Enphase
M250-72, 250-60, M215-60, C250-72, S230, S280, IQ 6, IQ 6+, IQ 7, IQ 7+, IQ 7X, Q Aggregator

Darfon
MIG240, MIG300, G320, G640

Solar Edge
P300, P320, P340, P370, P400, P405, P505, P600, P700, P730, P800p, P800s, P850, P860

SYSTEMS USING ENPHASE MICROINVERTERS OR SUNPOWER AC MODULES

IronRidge systems using approved Enphase products or SunPower modules eliminate the need for lay-in lugs and field installed equipment grounding conductors (EGC). This solution meets the requirements of UL 2703 for bonding and grounding and is included in this listing.

The following Sunpower modules are included in this listing: Modules with model identifier Ab-xxx-YY and InvisiMount (G5) 46mm frame; where "A" is either E, or X; “b” can be 17, 18, 19, 20, 21, or 22; and “YY” can be C-AC, D-AC, BLK-C-AC, or BLK-D-AC.

The following Enphase products are included in this listing: Microinverters M250-72, M250-60, M215-60, C250-72, and Engage cables ETXX-240, ETXX-208, ETXX-277.

A minimum of two inverters mounted to the same rail and connected to the same Engage cable are required.

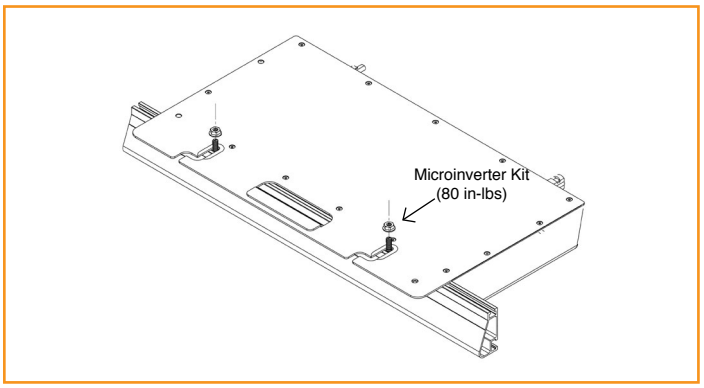
The microinverters or Sunpower AC modules must be used with a maximum 20 A branch rated overcurrent protection device (OCPD).

If an AC module is removed from a circuit for maintenance, you must first disconnect AC power and then install a temporary EGC to bridge the gap by inserting an AC extension cable (or via other NEC-compliant means), in order to maintain effective ground continuity to subsequent modules.

SYSTEMS USING PHAZR MICROSTORAGE PRODUCTS

Bonding and grounding is achieved via the IronRidge system when using the Microinverter Kit. Running a separate equipment grounding conductor to the PHAZRs is not required.

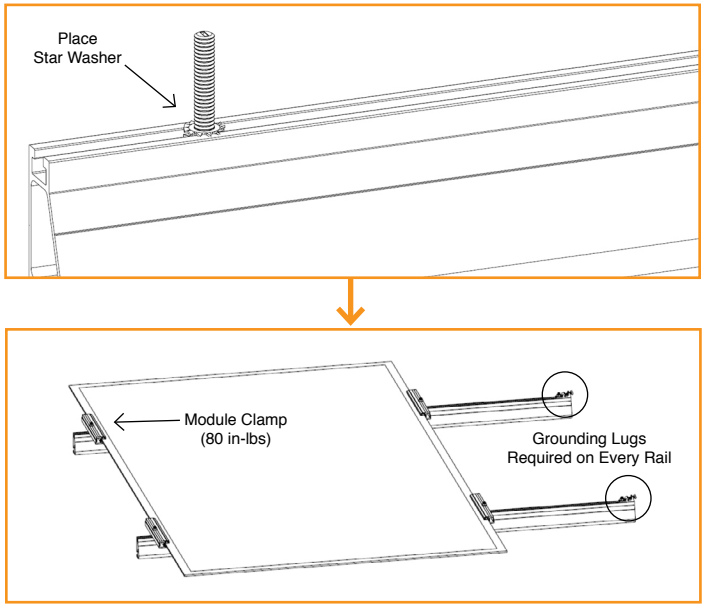
If installing in areas with ground snow loads greater than 40 psf and underneath a module, install PHAZR devices as close as possible to module frame edge.



FRAMELESS MODULE KITS

Insert Frameless Kit T-bolt in top rail slot. Place star washer over T-bolt, allowing it to rest on top of rail. Secure module clamps with a hex nut and torque to **80 in-lbs**.

- **Tested or evaluated module clamps:**
  - **Sunforson silver or black SFS-UTMC-200(B) mid and SFS-UTEC-200(B) end clamps.**
  - **Sunpreme silver or black mid and end clamps with part numbers 7500105X where "X" is 1, 5, 6 or 7.**
  - **IronRidge silver or black mid and end clamps with part numbers FMLS-XC-001-Y where "X" is E or M and "Y" is B or blank.**
- **Follow module manufacturer's installation instructions to install the module clamps.**
- **Frameless modules require using a Grounding Lug on every rail.**
- **For Sunpreme Modules Only: If required to use slide prevention hardware, see Module Slide Prevention Addendum (Version 1.10).**



MODULE COMPATIBILITY

The Flush Mount System may be used to ground and/or mount a PV module complying with UL 1703 only when the specific module has been evaluated for grounding and/or mounting in compliance with the included instructions. Unless otherwise noted, “xxx” refers to the module power rating and both black and silver frames are included in the certification.

MAKE	MODELS
Amerisolar	Modules with 35, 40 and 50mm frames and model identifier ASbYxxxZ; where "b" can be 5 or 6; "Y" can be M, P, M27, P27, M30, or P30; and "Z" can be blank, W or WB.
Astronergy Solar	Modules with 35, 40, and 45mm frames and model identifier aaSM66yyPzz-xxx; where “aa” can be CH or A; “yy” can be either 10 or 12; and “zz” can be blank, HV, (BF) or (BL). Frameless modules with model identifier CHSM6610P(DG)-xxx.
Auxin	Modules with 40mm frames and model identifier AXN6y6zAxxx; where "y" can be M or P; "z" can be 08, 09, 10, 11, or 12; and "A" can be F or T.
Axitec	Modules with 35 and 40mm frames and model identifier AC-xxxY/aa-ZZ; where "Y" can be M or P; "aa" can be 125 or 156; and "ZZ" can be 54S, 60S or 72S.
Boviet	Modules with 40mm frames and model identifier BVM66aaYY-xxx; where "aa" can be 9, 10 or 12; and "YY" is M or P.
BYD	Modules with 35mm frames and model identifier BYDxxxAY-ZZ; where "A" can be M6, P6, or PH; "Y" can be C or K; and "ZZ" can be 30 or 36.
Canadian Solar	Modules with 30, 35 and 40mm frames and model identifier CSbY-xxxZ; where “b” can be 1, 3 or 6; “Y” can be H, K, P, U, V, or X; and “Z” can be M, P, MS, PX, M-SD, P-AG, P-SD, MB-AG, PB-AG, MS-AG, or MS-SD. Frameless modules with model identifier CSbY-xxx-Z; where “b” can be 3 or 6; “Y” is K, P, U, or X; and “Z” can be M-FG, MS-FG, P-FG, MB-FG, or PB-FG.
CertainTeed	Modules with 35 and 40mm frames and model identifier CTxxxYZZ-AA; where "Y" can be M or P; "ZZ" can be 00,01, 10, or 11; and "AA" can be 01, 02 or 03.
CSUN	Modules with 35 and 40mm frames and model identifier YYxxx-zzAbb; where "YY" is CSUN or SST; "zz" is blank, 60, or 72; "A" is blank, P or M; and "bb" is blank, BB, BW, or ROOF.
Ecosolargy	Modules with 35, 40, and 50mm frames and model identifier ECOxxxYzzA-bbD; where "Y" can be A, H, S, or T; "zz" can be 125 or 156; "A" can be M or P; "bb" can be 60 or 72; and "D" can be blank or B.
ET Solar	Modules with 35, 40, or 50mm frames and model identifier ET-Y6ZZxxxAA; where "Y" is P, L, or M; "ZZ" is 60 or 72; and "AA" is WB, WW, BB, WBG, WWG, WBAC, WBCO, WWCO, WWBCO or BBAC.

MODULE COMPATIBILITY

Flex	Modules with 35, 40, or 50mm frames and model identifier FXS-xxxYY-ZZ; where "xxx" is the module power rating; "YY" is BB or BC; and "ZZ" is MAA1B, MAA1W, MAB1W, SAA1B, SAA1W, SAC1B, SAC1W, SAD1W, SBA1B, SBA1W, SBC1B, or SBC1W.
GCL	Modules with 35 and 40mm frames and and model identifier GCL-a6/YY xxx; where "a" can be M or P; and "YY" can be 60, 72, or 72H.
GigaWatt Solar	Modules with 40mm frames and model identifier GWxxxYY; where “YY” is either PB or MB.
Hansol	Modules with 35 and 40mm frames and model identifier HSxxxYY-zz; where "YY" can be TB, TD, UB or UD; and "zz" can be AN1, AN3, AN4.
Hanwha Solar	Modules with 40, 45, or 50mm frames and model identifier HSLaaP6-YY-1-xxxZ; where "aa" is either 60 or 72; "YY" is PA or PB; and "Z" is blank or B.
Hanwha Q CELLS	Modules with 32, 35, 40, and 42mm frames and model identifier aaYY-ZZ-xxx; where “aa” can be Q. or B.; “YY” can be PLUS, PRO, PEAK, LINE PRO, LINE PLUS, or PEAK DUO; and “ZZ” can be G3, G3.1, G4, G4.1, L-G2, L-G2.3, L-G3, L-G3.1, L-G3y, L-G4, L-G4.2, L-G4y, LG4.2/TAA, BFR-G3, BLK-G3, BFR-G3.1, BLK-G3.1, BFR-G4, BFR-G4.1, BFR G4.3, BLK-G4.1, G4/SC, G4.1/SC, G4.1/TAA, G4.1/MAX, BFR G4.1/TAA, BFR G4.1/MAX, BLK G4.1/TAA, BLK G4.1/SC, EC-G4.4, G5, BLK-G5, L-G5, L-G5.1, L-G5.2, L-G5.2/H, L-G5.3, G6, BLK-G6, L-G6, LG6.1, LG6.2, or LG6.3.
Heliene	Modules with 40mm frames and model identifier YYZZxxx; where "YY" is 36, 60, 72, or 96; and "ZZ" is M, P, or MBLK.
Hyundai	Modules with 35, 40 and 50mm frames and model identifier HiS-YxxxZZ; where "Y" can be M or S; and "ZZ" can be KI, MI, MF, MG, SG, RI, RG(BF), RG(BK), TI, or TG.
Itek	Modules with 40 or 50mm frames and model identifier IT-xxx-YY; where "YY" is blank, HE, or SE, or SE72.
JA Solar	Modules with 35, 40 and 45mm frames and model identifier JAyyzz-bb-xxx/aa; where “yy” can be M, P, M6 or P6; “zz” can be blank, (K), (L), (R), (V), (BK), (FA), (TG), (FA)(R), (L)(BK), (L)(TG), (R)(BK), (R)(TG), (V)(BK), (BK)(TG), or (L)(BK)(TG); “bb” can be 48, 60, 72, 60S01, 60S02, 60S03, 72S01, 72S02, 72S03; and “aa” can be MP, SI, SC, PR, PR/1500V, 3BB, 4BB, 4BB/RE, 4BB/1500V, 5BB.
Jinko	Modules with 35 and 40mm frames and model identifier JKMYxxxZZ-aa; where “Y” can either be blank or S; “ZZ” can be P, PP, M; and “aa” can be blank, 60, 60B, 60H, 60L, 60BL, 60HL, 60HBL, 60-J4, 60B-J4, 60B-EP, 60(Plus), 60-V, 60-MX, 72, 72-V, 72H-V, 72L-V, 72HL-V or 72-MX. Frameless modules with model identifier JKMxxxPP-DV.
Kyocera	Modules with 46mm frames and model identifier KYxxxZZ-AA; where “Y” is D or U; “ZZ” is blank, GX, or SX; and “AA” is LPU, LFU, UPU, LPS, LPB, LFB, LFBS, LFB2, LPB2, 3AC, 3BC, 3FC, 4AC, 4BC, 4FC, 4UC, 5AC, 5BC, 5FC, 5UC, 6BC, 6FC, 8BC, 6MCA, or 6MPA.
LG	Modules with 35, 40, and 46mm frames LGxxxYaZ-bb; where “Y” can be A, E, N, Q, S; “a” can be 1 or 2; “Z” can be C, K, T, or W; and “bb” can be A3, A5, B3, G3, G4, K4, or V5.
Longi	Modules with 40 and 45mm frames and model identifier LR6-YYZZ-xxxM; where "YY" can be 60 or 72; and "ZZ" can be BK, BP, HV, PB, PE, or PH.
Mission Solar	Modules with 40mm frames and model identifier MSExxxZZaa; where “ZZ” can be MM, SE, SO or SQ; and “aa” can be 1J, 4J, 4S, 5K, 5T, 6J, 6S, 6W, 8K, 8T, or 9S.
Mitsubishi	Modules with 46mm frames and model identifier PV-MYYxxxZZ; where "YY" is LE or JE; and "ZZ" is either HD, HD2, or FB.
Motech	IM and XS series modules with 40, 45, or 50mm frames.
Neo Solar Power	Modules with 35mm frames and model identifier D6YxxxZZaa; where "Y" can be M or P; "ZZ" can be B3A, B4A, E3A, E4A, H3A, H4A; and "aa" can be blank, (TF), ME or ME (TF).
Panasonic	Modules with 35 and 40mm frames and model identifier VBHNxxxYYzzA; where “YY” can be either SA or KA; “zz” can be either 01, 02, 03, 04, 06, 06B, 11, 11B, 15, 15B, 16, 16B, 17, or 18; and “A” can be blank, E or G.
Peimar	Modules with 40mm frames and model identifier SGxxxYzz; where "Y" can be M or P; and "zz" can be blank, (BF), or (FB).
Phono Solar	Modules with 35, 40, or 45mm frames and model identifier PSxxxY-ZZ/A; where "Y" is M or P; "ZZ" is 20 or 24; and "A" is F, T or U.

MODULE COMPATIBILITY

Prism Solar	Frameless modules with model identifier BiYY-xxxBSTC; where "YY" can be 48, 60, 60S, 72 or 72S.
REC Solar	Modules with 30, 38 and 45mm frames and model identifier RECxxxYYZZ; where “YY” can be M, NP, PE, TP, TP2, TP2M, TP2SM, or TP2S; and “ZZ” can be blank, Black, BLK, BLK2, SLV, or 72.
Renesola	Modules with 35, 40 or 50mm frames and model identifier JCxxxY-ZZ; where "Y" is F, M or S; and "ZZ" is Ab, Ab-b, Abh, Abh-b, Abv, Abv-b, Bb, Bb-b, Bbh, Bbh-b, Bbv, Bbv-b, Db, or Db-b.
Renogy	Modules with 40 or 50mm frames and model identifier RNG-xxxY; where “Y” is D or P.
S-Energy	Modules with 40mm frames and model identifier SNxxxY-ZZ; where "Y" is M or P; and "ZZ" is 10, or 15.
Seraphim Energy Group	Modules with 40mm frames and model identifier SEG-6YY-xxxZZ; where "YY" can be MA, MB, PA, PB; and "ZZ" can be BB, WB, or WW.
Seraphim USA	Modules with 40 and 50mm frames and model identifier SRP-xxx-6YY; where "YY" can be MA, MB, PA, PB, QA-XX-XX, and QB-XX-XX.
Sharp	Modules with 35 or 40mm frames and model identifier NUYYxxx; where “YY” is SA or SC.
Silfab	Modules with 38mm frames and model identifier SYY-Z-xxx; where “YY” is SA or LA; SG or LG; and “Z” is M, P, or X.
Solaria	Modules with 40mm frames and model identifier PowerXT xxxY-ZZ; where "Y" can be R or C; and "ZZ" can be AC, BD, BX, BY, PD, PX, PZ, WX or WZ.
SolarTech	Modules with 42mm frames and model identifier STU-xxxYY; where "YY" can be PERC or HJT.
SolarWorld AG / Industries GmbH	SolarWorld Sunmodule Plus, Protect, Bisun, XL, Bisun XL, may be followed by mono, poly, duo, black, bk, or clear; modules with 31, 33 or 46mm frames and model identifier SW-xxx.
SolarWorld Americas Inc.	SolarWorld Sunmodule Plus, Protect, Bisun, XL, Bisun XL, may be followed by mono, poly, duo, black, bk, or clear; modules with 33mm frames and model identifier SWA-xxx.
Stion	Thin film modules with 35mm frames and model identifier STO-xxx or STO-xxxA. Thin film frameless modules with model identifier STL-xxx or STL-xxxA.
SunEdison	Modules with 35, 40, or 50mm frames and model identifier SE-YxxxZABCDE; where "Y" is B, F, H, P, R, or Z; "Z" is 0 or 4; "A" is B, C, D, E, H, I, J, K, L, M, or N; "B" is B or W; "C" is A or C; "D" is 3, 7, 8, or 9; and "E" is 0, 1 or 2.
Suniva	Modules with 35, 38, 40, 46, or 50mm frames and model identifiers OPTxxx-AA-B-YYY-Z or MVXxxx-AA-B-YYY-Z; where "AA" is either 60 or 72; "B" is either 4 or 5; "YYY" is either 100,101,700,1B0, or 1B1; and "Z" is blank or B.
Sunpower	Modules with standard (G3 or G4) or InvisiMount (G5) 40 and 46mm frames with model identifier SPR-Zb-xxx-YY; where “Z” is either A, E, P or X; “b” can be blank, 17, 18, 19, 20, 21, or 22; and “YY” can be blank, NE, BLK, COM, C-AC, D-AC, E-AC, BLK-C-AC, or BLK-D-AC.
Sunpreme	Sunpreme modules with 35 and 40mm frames and model identifier SNPM-AxB-xxxYzz; where "A" can be G or H; "Y" can be blank or T; and "zz" can be blank, 4BB, SM or 4BB SM. Frameless modules with model identifier SNPM-GxB-xxxZZ; where "ZZ" can be blank, 4BB, SM or 4BB SM.
Sunspark	Modules with 40mm frames and model identifier SYY-xxZ; where "YY" can be MX or ST; and "Z" can be P or W.
Suntech	Vd, Vem, Wdb, Wde, and Wd series modules with 35, 40, or 50mm frames.
Talesun	Modules with 35 and 40mm frames and model identifier TP6yyZxxx-A; where "yy" can be 60, 72, H60 or H72; "Z" can be M, or P; and "A" can be blank, B, or T.
Trina	Modules with 35, 40 or 46mm frames and model identifier TSM-xxxYYZZ; where “YY” is PA05, PC05, PD05, PA14, PC14, PD14, PE14, or DD05; and “ZZ” is blank, A, A.05, A.08, A.10, A.18, .05, .08, .10, .18, .08D, .18D, 0.82, A.082(II), .002, .00S, 05S, 08S, A(II), A.08(II), A.05(II), A.10(II), or A.18(II). Frameless modules with model identifier TSM-xxxYY; and “YY” is either PEG5, PEG5.07, PEG14, DEG5(II), DEG5.07(II), or DEG14(II).
Winaico	Modules with 35 or 40mm frames and model identifier Wsy-xxxz6; where "y" is either P or T; and ""z"" is either M or P.
Yingli	Panda, YGE, and YGE-U series modules with 35, 40, or 50 mm frames.

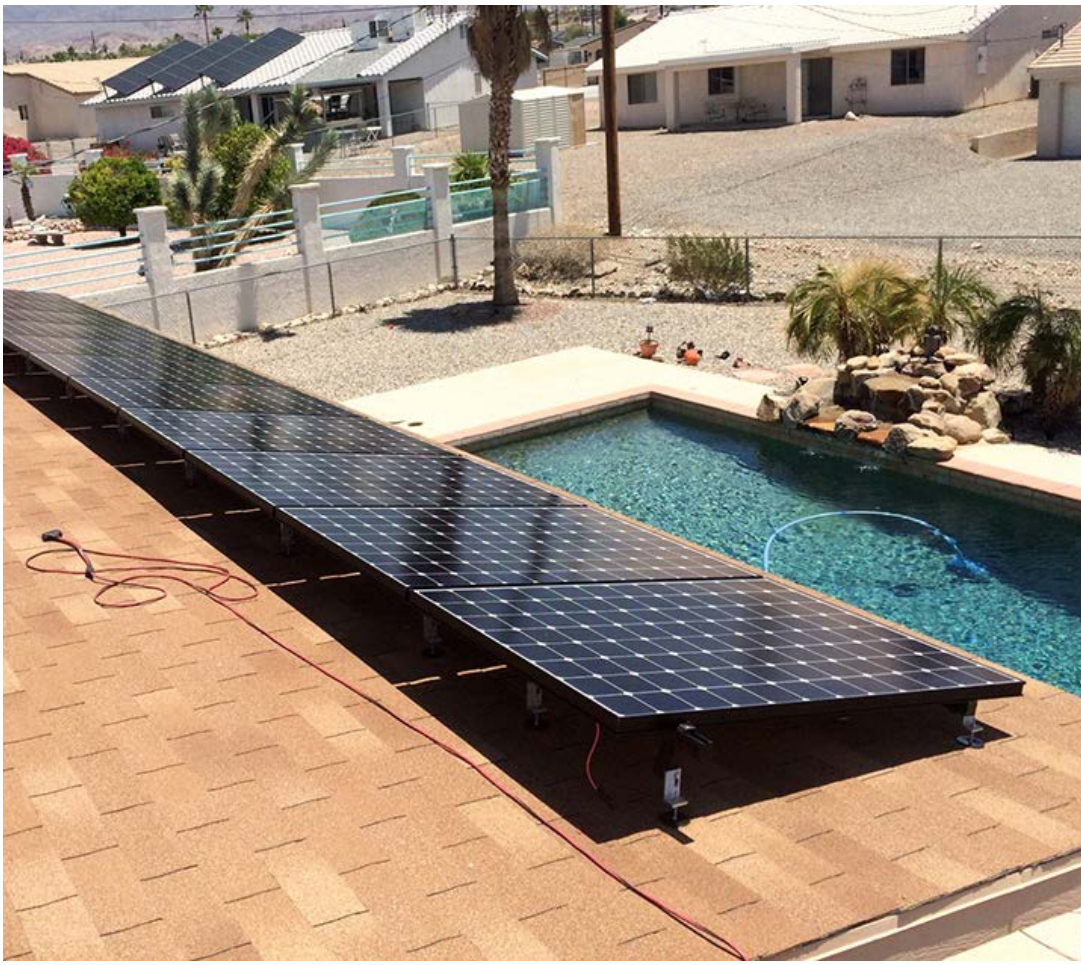
17721 SS

17664, 17720

LOW PROFILE QUICKBOLT WITH 4" MICROFLASHING®

FOR ASPHALT SHINGLE ROOFS

PATENT # 8448407



QuickBOLT

A DIVISION OF QUICKSCREWS INTERNATIONAL CORP

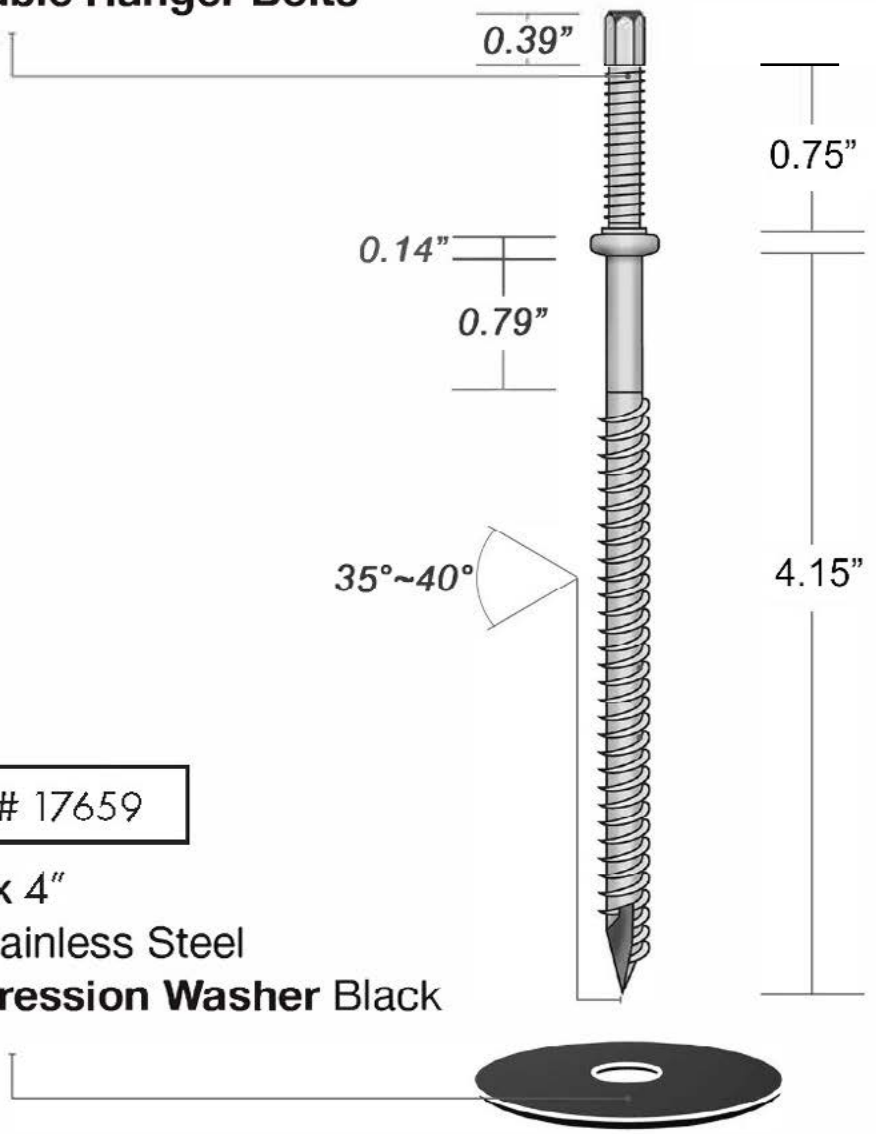
TABLE OF CONTENTS

SPEC SHEET

Part #	Box Quantity
17664	5.25″ Bolts (10)
17720	4″ Microflashing® (10); 5.25″ Bolts (10)
17721SS	4″ Microflashing® (20); 5.25″ Bolts (20); L-Foot (20); 5/16″ Serrated Hex Flange Nuts (20)

Part #17664

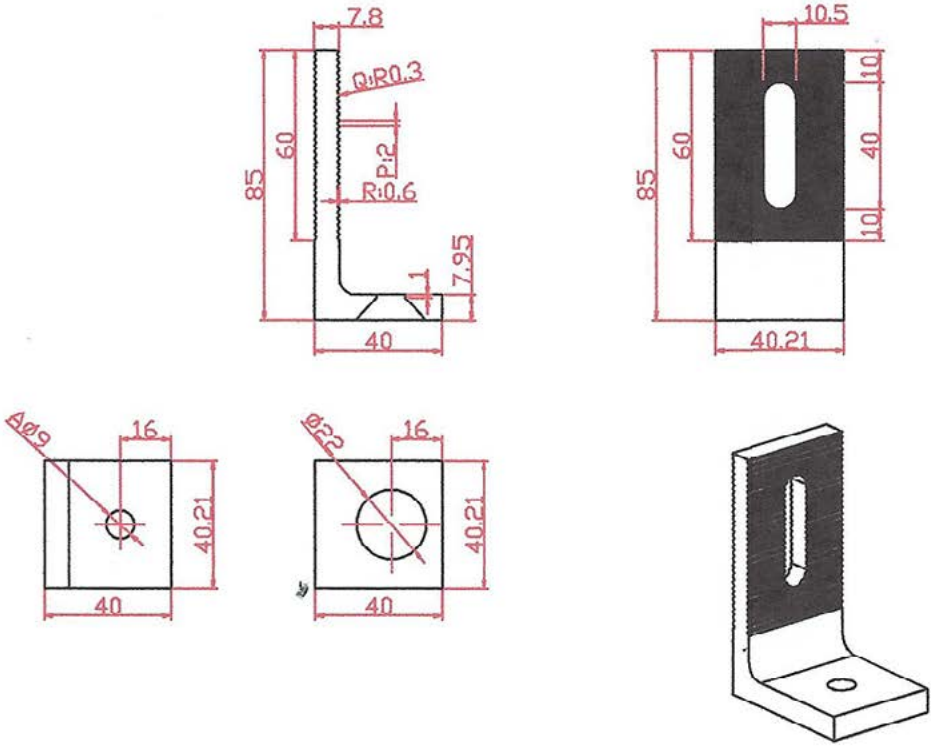
5/16–18 X 5.25”
304 Stainless Steel
Removable Hanger Bolts



Part # 17659

5/16” x 4”
304 Stainless Steel
Compression Washer Black

5830 Las Positas Road, Livermore CA 94551 | 3948 Airway Drive, Rock Hill SC 29732
Phone: (844) 671-6045 | Fax: (800) 689-7975 | www.quickbolt.com
QuickBOLT is a division of Quickscrews International Corp.



Baiting tolerance	± 2 mm
Hole tolerance	± 0.5 mm
Hole distance tolerance	± 0.5 mm
Form tolerance	± 2 mm
Thicknessmess tolerance	± 0.1 mm
Angle tolerance	± 1° mm

INSTALL INSTRUCTIONS

RECOMMENDED MATERIALS

- Rafter locator
- Chalk or a crayon
- Drill with a 3/16" drill bit
- MFG approved sealant
- M6 deep socket hex driver
- 1/2" wrench

INSTALLATION INSTRUCTIONS

1. Locate the rafter and predrill the hole
2. Fill the predrilled hole with MFG approved sealant
3. Place a ring of sealant around the bottom of the Microflashing® washer
4. Place the Microflashing® and drive the bolt until it compresses
5. Insert the L-Foot
6. Insert the nut and tighten until secure

5830 Las Positas Road, Livermore CA 94551 | 3948 Airway Drive, Rock Hill SC 29732
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QuickBOLT is a division of Quickscrews International Corp.

BUILDING CODE LETTER

February 26, 2019

To whom this may concern,

QuickBOLT is committed to excellence. The parts tested are durable goods, meaning the material composition and detailed specifications of the parts do not change. Therefore, all stamps are current. Any part tested will have the same results no matter what year the tests are performed.

SolarRoofHook is the previous name of QuickBOLT. Any test result referencing SolarRoofHook is referring to a QuickBOLT product.

All our parts were tested by a third-party test facility, in possession of a current engineering license for the state where the tests were performed for the following.

1. Uplift test
2. Downward load test
3. Lateral Test – Asphalt Mounts, and Metal Mounts only
4. ASTM E2440 and ASTM E330 Waterproof Tests - QuickBOLT only

The following is an excerpt from:

CALIFORNIA BOARD FOR PROFESSIONAL ENGINEERS AND LAND SURVEYORS
guide to Engineering & Land Surveying for City and County Officials
Page 12, Line 27

27. If the license has expired between the time the engineering documents were prepared and the time when the local agency's review is performed, do the documents need to be re-sealed by a licensee with a current license? (B&P Code §§ 6733, 6735, 6735.3, 6735.4)

As long as the license was current at the time the engineering documents were prepared, the documents do not need to be re-sealed prior to review by the local agency. However, any changes (updates or modifications) to the documents that are made following the review by the local agency would have to be prepared by a licensed engineer with a current license and those changes would have to be signed and sealed.

We trust the information provided will resolve any request for the test reports submitted to have a stamp from the current year.

Regards,

Rick Gentry
Executive Vice President

APPLIED MATERIALS & ENGINEERING, INC.
980 41st Street
Oakland, CA 94608
Tel: (510) 420-8190
FAX: (510) 420-8186
e-mail: info@appmateng.com

February 14, 2018

Mr. Rick Gentry
SolarRoofHook
a division of Quickscrews International Corp.
5830 Las Positas Road
Livermore, CA 94551

Project Number 1180031C

Subject: L-Foot 4mm w/ Low Profile 5-1/4" QuickBOLT
Part #15894SS with Part #17664 Laboratory Load Testing

Dear Mr. Gentry:

As requested, Applied Materials & Engineering, Inc. (AME) has completed load-testing the L-Foot 4mm (Part #15894SS) with the Low Profile 5-1/4" QuickBOLT (Part #17664); see Appendix A, Figure A1 and Figure A2, respectively. The purpose of our testing was to evaluate the lateral and tensile (uplift) load capacity of the L-Foot 4mm connecting member attached to a 2"x4" Douglas Fir rafter using one Low Profile 5/16"Øx5-1/4" QuickBOLT.

SAMPLE DESCRIPTION

Mockup samples were delivered to our laboratory on January 10, 2018. Mockup configuration consisted of three 12" long rafters at 6.5"o.c., screwed to 1/2" OSB. One 5/16"Øx5-1/4" QuickBOLT was screwed through the Microflashing™ (sold as Part #17669) and then through the OSB into a rafter. The L-Foot 4mm is fastened to the QuickBOLT using one 5/16" 18-8 Stainless Steel Flange Nut.

TEST PROCEDURES & RESULTS

1. Lateral Load Test

A total of three tests were conducted for lateral load capacity on January 12, 2018 using a United Universal testing machine. Samples were rigidly attached to the testing machine and a lateral load was applied to each L-foot. The samples were loaded in shear at a constant rate of axial deformation of 0.10 in. /min. without shock until failure occurred; displacement at maximum load was recorded. Based on the above testing, the average maximum lateral load of the L-Foot 4mm attached to a 2"x4" Douglas Fir rafter using one Low Profile 5/16"Øx5-1/4" QuickBOLT was determined to be 508 lbf. Detailed results are provided in Table I and Figure 1. Test setup and mode of failure are provided in Appendix B, Figure B1.

The specific gravity and moisture content of each rafter was tested in accordance with ASTM D2395, Method A (oven-dry). The average specific gravity and average moisture content of the three samples were determined to be 0.416 and 10.8%, respectively.

2. Tensile (Uplift) Load Test

A total of three tests were conducted for tensile (uplift) load capacity on January 16, 2018 using a United Universal testing machine. Samples were rigidly attached to the testing machine and an uplift (tensile) load was applied to each L-foot. The samples were loaded in tension at a constant rate of axial deformation of 0.10 in. /min. without shock until failure occurred; displacement at maximum load was recorded. Based on the above testing, the average maximum uplift load of the L-Foot 4mm attached to a 2"x4" Douglas Fir rafter using one Low Profile 5/16"Øx5-1/4" QuickBOLT was determined to be 3277 lbf. Detailed results are provided in Table II and Figure 2. Test setup and mode of failure are provided in Appendix B, Figure B2.

The specific gravity and moisture content of the rafter was tested in accordance with ASTM D2395, Method A (oven-dry). The average specific gravity and average moisture content of the three samples were determined to be 0.402 and 11.1%, respectively.

Respectfully Submitted,

APPLIED MATERIALS & ENGINEERING, INC.

Joseph Gapuz
Joseph Gapuz
Laboratory Manager

Reviewed by:

REGISTERED PROFESSIONAL ENGINEER
ARMEN TAJIRIAN
No 35535
Exp 9/30/19
CIVIL
STATE OF CALIFORNIA

Armen Tajirian, Ph.D., P.E.
Principal

5830 Las Positas Road, Livermore CA 94551 | 3948 Airway Drive, Rock Hill SC 29732
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TABLE I

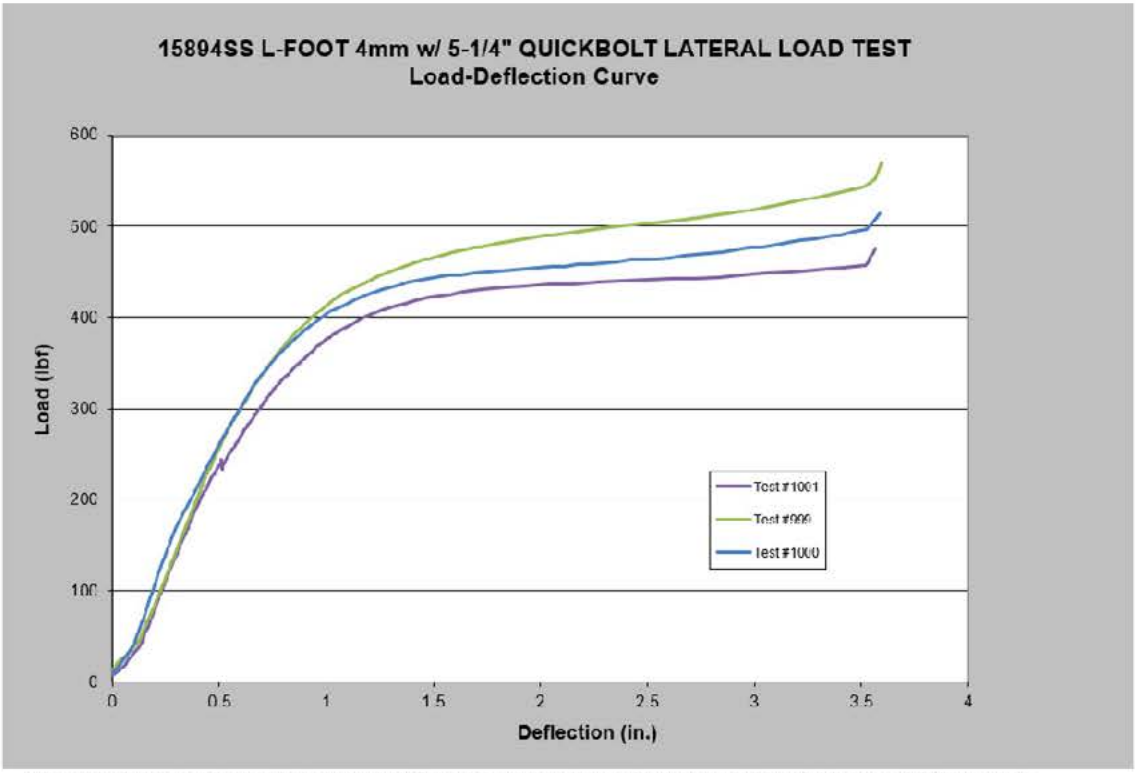
LATERAL LOAD TEST RESULTS

L-FOOT 4MM
PART #15894SS w/ LOW PROFILE 5/16"Øx5-1/4" QUICKBOLT (PART #17664)

PROJECT NUMBER 1180031C

TEST NUMBER	MAXIMUM LATERAL LOAD (lbf)	DISPLACEMENT AT MAXIMUM LOAD (in.)	MODE OF FAILURE	RAFTER SPECIFIC GRAVITY	RAFTER MOISTURE CONTENT (%)
999	552	3.5	Test Fixture Contacted Plywood	0.398	10.9
1000	498	3.5		0.413	11.7
1001	475	3.5		0.438	9.7
AVERAGE	**508**	**3.5**	**..**	**0.416**	**10.8**

FIGURE 1



Note: Maximum load recorded at moment fixture contacts plywood; see Appendix B for image of failure mode.

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TABLE II

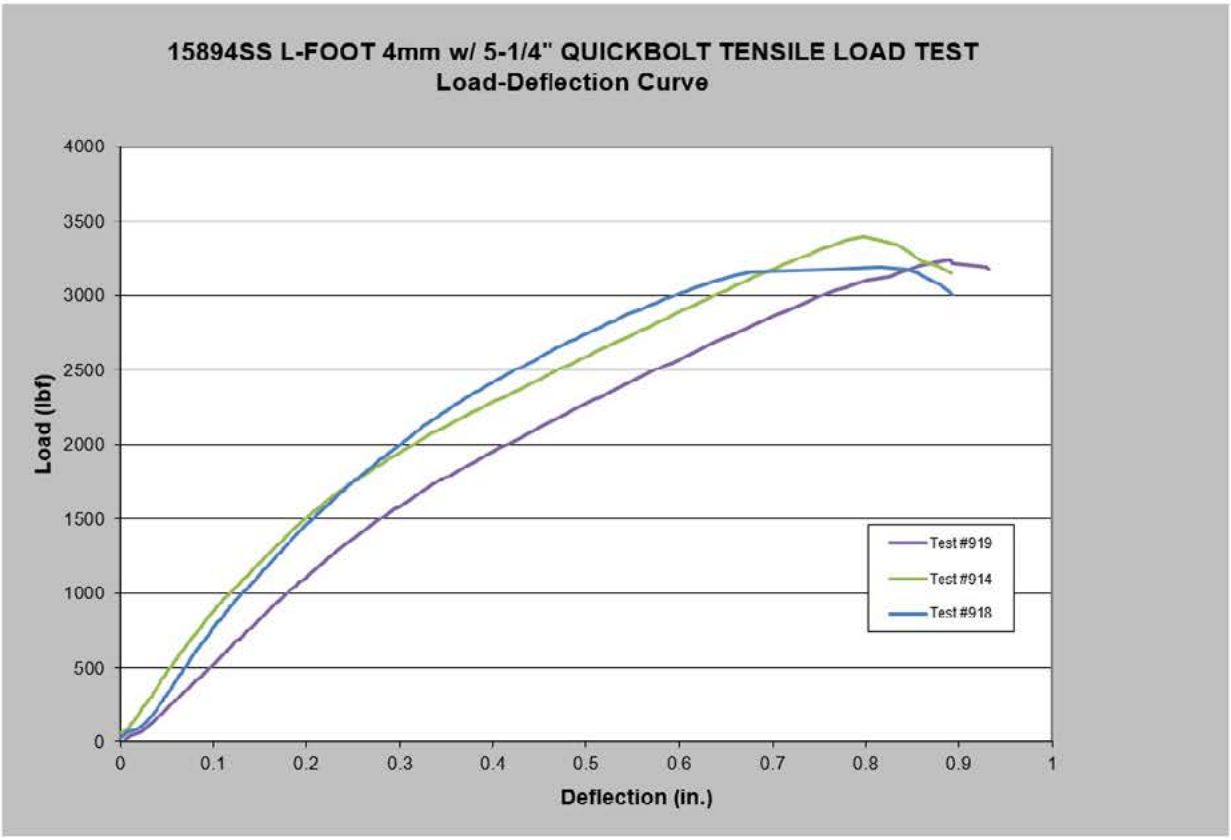
TENSILE (UPLIFT) LOAD TEST RESULTS

L-FOOT 4MM
PART #15894SS w/ LOW PROFILE 5/16"Øx5-1/4" QUICKBOLT (PART #17664)

PROJECT NUMBER 1180031C

TEST NUMBER	MAXIMUM TENSILE LOAD (lbf)	DISPLACEMENT AT MAXIMUM LOAD (in.)	MODE OF FAILURE	RAFTER SPECIFIC GRAVITY	RAFTER MOISTURE CONTENT (%)
914	3397	0.8	QuickBOLT Pull-out	0.395	10.1
918	3191	0.8		0.431	11.5
919	3242	0.8		0.381	11.9
AVERAGE	**3277**	**0.8**	**..**	**0.402**	**11.1**

FIGURE 2



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CERTIFICATE OF COMPLIANCE

Certificate Number	20180725-E493748
Report Reference	E493748-20170817
Issue Date	2018-JULY-25

Issued to: SolarRoofHook, a Division of Quickscrews International Corp
5830 Las Positas Rd, Livermore CA 94551

This is to certify that representative samples of COMPONENT - MOUNTING SYSTEMS, MOUNTING DEVICES, CLAMPING DEVICES AND GROUND LUGS FOR USE WITH PHOTOVOLTAIC MODULES AND PANELS
Refer to Addendum Page for Models/Product.

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

Standard(s) for Safety: UL 2703 Standard for Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with 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.

The UL Recognized Component Mark generally consists of the manufacturer's identification and catalog number, model number or other product designation as specified under "Marking" for the particular Recognition as published in the appropriate UL Directory. As a supplementary means of identifying products that have been produced under UL's Component Recognition Program, UL's Recognized Component Mark: ЯU, may be used in conjunction with the required Recognized Marks. The Recognized Component Mark is required when specified in the UL Directory preceding the recognitions or under "Markings" for the individual recognitions.

Recognized components are incomplete in certain constructional features or restricted in performance capabilities and are intended for use as components of complete equipment submitted for investigation rather than for direct separate installation in the field. The final acceptance of the component is dependent upon its installation and use in complete equipment submitted to UL LLC.

Look for the UL Certification Mark on the product.

Bruce Mahrenholz, Director North American Certification Program

UL LLC

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CERTIFICATE OF COMPLIANCE

Certificate Number	20180725-E493748
Report Reference	E493748-20170817
Issue Date	2018-JULY-25

This is to certify that representative samples of the product as specified on this certificate were tested according to the current UL requirements.

Models/Product

USR – Component, Roof Mounting Hook Units, Models 15891 15893 15987 16000 16988 16990 16991 16993 17508 17509 17510 17511 17512 17513 17514 17515 17516 17517 17518 17519 17520 17521 17522 17523 17524 17525 17526 17527 17536 17537 17538 17539 17540 17541 17542 17543 17544 17545 17546 17547 17548 17549 17550 17551 17552 17553 17554 17555 17556 17558 17559 17560 17568 17569 17570 17571 17572 17573 17574 17575 17576 17577 17578 17579 17580 17585 17586 17587 17588 17589 17592 17596 17600 17601 17606 17607 17608 17609 17610 17611 17612 17613 17614 17615 17616 17617 17618 17620 17621 17622 17623 17624 17625 17626 17627 17628 17629 17630 17631 17632 17633 17636 17637 17638 17639 17642 17643 17646 17647 17648 17649 17650 17651 17659 17664 17667 17669 17670 17671 17672 17673 17678 17679 17680 17681 17686 17687 17688 17689 17700 17701 17702 17703 17704 17705 17706 17707 17708 17709 17710 17711 17712 17717 17718 17759 15891-10 15891BLK-10 15987A 15987B 17667SS 17672SS 17680SS 17688SS 17713SS 17720 17721SS 17723 17724SS 17726 17727SS 17729 17730SS 15894SS 15891SS 15987BSS.

Bruce Mahrenholz, Director North American Certification Program

UL LLC

GE Consumer & Industrial
Electrical Distribution

NEMA 3R
Service Entrance Disconnect
150-200 Amp Main Breaker

- Factory installed main breaker
- Galvanized steel construction with electro deposited paint for superior corrosion protection
- 9 1/2" wide for easy wiring
- Factory installed and bonded ground lugs
- Padlock provision for secure installations

- Single phase, three wire, 120/240 VAC, 22kAIC rated
- UL Listed for US and Canada
- 60°C/75°C conductor rating
- Suitable for reverse feed

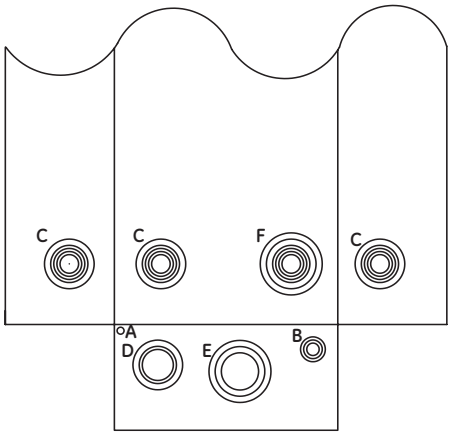
imagination at work

NEMA 3R Service Entrance Disconnect

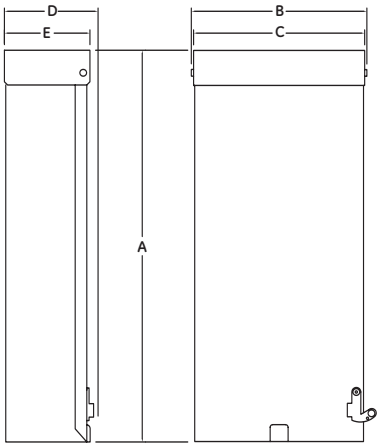
Catalog Number	**THQMV150NRE, THQMV200NRE**
Main Breaker Type	THQMV (Factory Installed)
Main Amp Rating	150A, 200A
Wire Range	1-4/0 Cu, 2/0-4/0 Al
Enclosure	Outdoor (NEMA 3R)
Front Type	Surface
Conduit Hub (Top)	3/4" – 2"
Padlock Hasp (Hole Diameters)	5/32" & 5/16"
Bending Space (Line/Load)	7" / 10 3/4"
Factory Installed Lugs	
Neutral	1-4/0 Cu/Al
Ground	6-2/0 Cu/Al

Suitable ONLY for service entrance equipment (bonded neutral) when installed in accordance with the NEC.

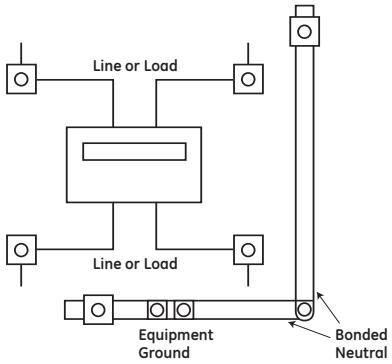
Knockouts



Dimensions



Typical Wiring Diagram



Conduit Size in Inches	Symbol					
	A	B	C	D	E	F
	9/32"	-	-	-	-	-
	-	1/2"	1/2"	-	-	1/2"
	-	3/4"	3/4"	-	-	3/4"
	-	1"	1"	-	-	1"
	-	-	1 1/4"	1 1/4"	-	1 1/4"
	-	-	1 1/2"	1 1/2"	1 1/2"	1 1/2"
	-	-	2"	2"	2"	2"
	-	-	-	-	2 1/2"	2 1/2"

Cat. No.	A	B	C	D	E
THQMV150NRE	21 3/4"	9 3/4"	9 1/2"	5"	4 3/4"
THQMV200NRE					

Conduit Hub Accessory

Size	3/4"	1"	1 1/4"	1 1/2"	2"
Cat. No.	TC75	TC100	TC125	TC150	TC200

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www.geelectrical.com

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RSTC Enterprises Inc
2214 Heimstead Road
Eau Claire, WI 54703
715-830-9997

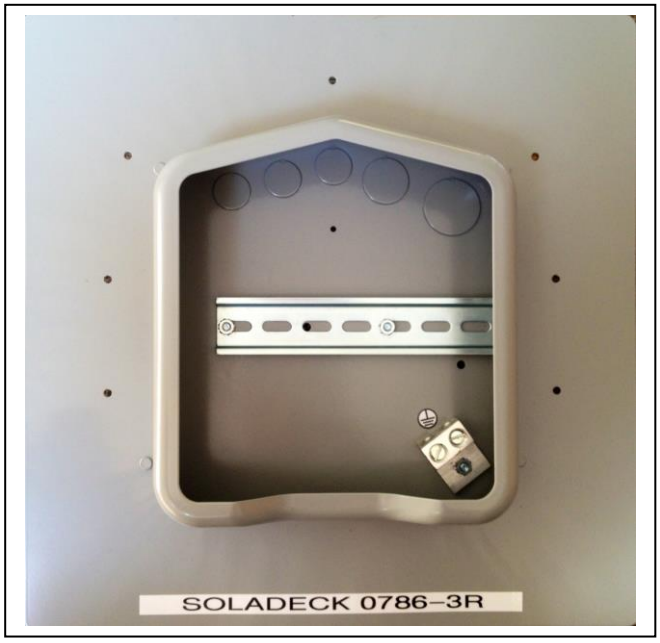
Outdoor Pass Thru enclosure:

Model - 0786-3R

Asphalt/Cedar roof systems

ETL Listed and labeled
Report # 3125796 CRT-001b Revised March 2012

- **UL50 Type 3R, 11 Edition Electrical**
- **equipment enclosures**
- **CSA C22.2 # 94-M91 special purpose**
- **enclosures (2006)**



Basic specifications

Material - 18 Gauge Galvanized 90 Steel Base/Cover
Process - Seamless draw (stamped)
Flashing - 15" x 15"
Height - 2.625"
Cavity - 8" x 9" x 2.5" (162 Cubic inches)
Finish - Powder coat (1100 hours salt spray)

Assembly:

- **Cavity Base and cover hole punched for matched assembly**
- **Base flashing pre-punched for roof deck mounting**
- **Cavity Base - 5 predetermined dimples for fittings or conduit**

Base Plate Attachment:

- **16 gauge galvanized steel**
- **Fastened to base flashing with toggle fastening system**
- **Finish – Powder coat (1100 hours salt spray)**
- **5 roof deck knockouts**
- **Knockout sizes – (3) .5", (1) .75" , and (1) 1"**
- **Rail 7" slotted 35mm**

Ground – Installed with steel stud and star nut
Dual position Wire size - 2/0-14
Located with ground sticker

Strain Relief Clip – Aluminum riveted installation

Hardware Installation Pack:
7 - 1" Truss head screws
4 - .5" 8-32 thread cutting screws
4 - Bonded seal washers #10
2 – 10-32 ½" Steel studs
2 – 10-32 3/8" steel star nuts
1 – Foam gasket seal
1 – Installation instructions

With 2 string DC pass thru kit
Kit Part # 01602
***** Kit sold separately**