

PHOTOVOLTAIC ROOF MOUNT SYSTEM

09 MODULES-ROOF MOUNTED - 3.600 kWDC, 2.610 kWAC
1318 N NEVADA AVE, COLORADO SPRINGS, CO 80903 USA



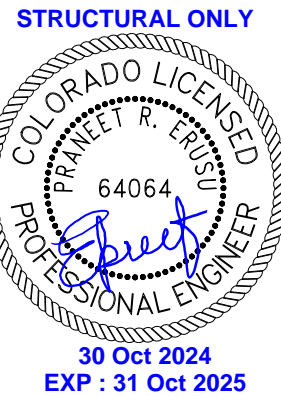
SYSTEM SUMMARY:

- (N) 09 - QCELLS Q.PEAK DUO BLK ML-G10+ (400W) MODULES
- (N) 09 - ENPHASE ENERGY IQ8PLUS-72-M-US MICRO-INVERTERS
- (N) JUNCTION BOX
- (E) 225A MAIN SERVICE PANEL WITH (E) 200A MAIN BREAKER
- (N) ENPHASE IQ COMBINER BOX 5
- (N) 30A UTILITY NON-FUSED VISIBLE LOCKABLE LABELED AC DISCONNECT [240V] (SQUARE D DU221RB)
- (N) 200A RINGLESS LEVER BYPASS PRODUCTION METER SOCKET [240V] (MILBANK U4801-XL-5T9)
- (N) 200A ENPHASE IQ CONTROLLER 3
- (N) RAPID SHUTDOWN SWITCH
- (N) 225A BACKUP LOAD PANEL WITH (N) 200A MAIN BREAKER
- (N) 02 - ENPHASE IQ BATTERY 5P (IQBATTERY-5P-1P-NA) [240V]
- (N) 60A NON-FUSED BATTERY DISCONNECT

INTERCONNECTION : SYSTEM CONTROLLER BREAKER

DESIGN CRITERIA:

ROOF TYPE: - ASPHALT SHINGLE
NUMBER OF LAYERS: - 01
ROOF FRAME: - 2"x4" TRUSSES @12" O.C.
STORY: - ONE STORY
SNOW LOAD : - 45 PSF
WIND SPEED :-130 MPH (ASCE 7-16)
WIND EXPOSURE:- C
EXPOSURE CATEGORY-II
COORDINATES:- 38.852750, -104.821489
CODE ASCE :- 7-16

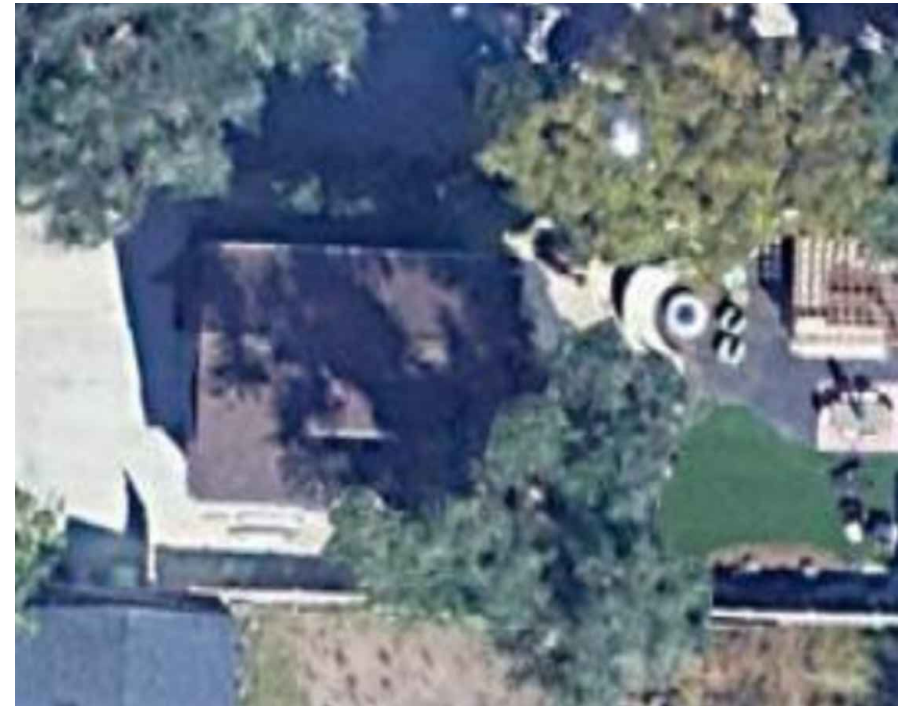


GOVERNING CODES:

- 2023 PIKES PEAK REGIONAL BUILDING CODE (PPRBC)
- 2021 INTERNATIONAL BUILDING CODE (IBC)
- 2021 INTERNATIONAL EXISTING BUILDING CODE (IEBC)
- 2021 INTERNATIONAL ENERGY CONSERVATION CODE (IECC)
- 2021 INTERNATIONAL MECHANICAL CODE (IMC)
- 2021 INTERNATIONAL FUEL GAS CODE (IFGC)
- 2023 NATIONAL ELECTRICAL CODE (NEC)

GENERAL NOTES

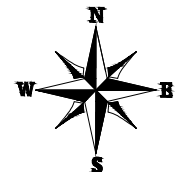
- THE CONTRACTOR/INSTALLER OF THE SOLAR PV SYSTEM OVER EXISTING ROOF SHALL CONFORM TO OSHA REQUIREMENTS DURING THE CONSTRUCTION PHASE. JOB SAFETY AND CONSTRUCTION PROCEDURES ARE THE SOLE RESPONSIBILITY OF THE CONTRACTOR/INSTALLER.
- REFER TO ELECTRICAL DRAWING PV-4 FOR PANEL DETAILED INFORMATION.
- IN CASE OF CONFLICT BETWEEN STRUCTURAL DRAWINGS AND ELECTRICAL DRAWINGS, THE MOST RIGID REQUIREMENTS SHALL GOVERN.
- THE CONTRACTOR/INSTALLER SHALL VERIFY ALL EXISTING BUILDING INFORMATION SHOWN (DIMENSIONS, ROOF TOP PROJECTIONS, ETC.) AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES PRIOR TO INSTALLATIONS OF PV SYSTEM.
- THE CONTRACTOR/INSTALLER SHALL VERIFY AND COORDINATE EXISTING OPENINGS, ROOF TOP UNITS, VENT PIPES, ETC. SHOWN ON DRAWINGS. IF THERE IS A DISCREPANCY BETWEEN DRAWINGS, IT IS THE CONTRACTORS/INSTALLER'S RESPONSIBILITY TO NOTIFY ENGINEER PRIOR TO PERFORMING THE WORK.
- ALL CONSTRUCTION IS TO BE PERFORMED IN STRICT CONFORMANCE WITH ALL APPLICABLE TOWN, COUNTY & STATE REGULATIONS AND/OR ANY OTHER GOVERNING BODIES.
- DO NOT SCALE THESE DRAWINGS, USE DIMENSIONS. CONTRACTOR MUST CONDUCT ROOF SURVEY TO VERIFY DIMENSIONS SHOWN ON PLAN PRIOR TO INSTALLATION. IF THERE IS A DISCREPANCY IT IS CONTRACTOR/INSTALLER'S RESPONSIBILITY TO NOTIFY THE ENGINEER IMMEDIATELY.



1 AERIAL PHOTO
PV-0 SCALE: NTS



2 VICINITY MAP
PV-0 SCALE: NTS



SHEET INDEX

PV-0	COVER SHEET
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PV-3.1	BATTERY MOUNTING DETAILS
PV-4	ELECTRICAL LINE DIAGRAM WITH WIRE CALCULATIONS
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VERSION

DESCRIPTION	DATE	REV
INITIAL RELEASE	10/23/2024	UR

PROJECT NAME

MURPHY ADU 1318 N NEVADA
1318 N NEVADA AVE,
COLORADO SPRINGS, CO 80903 USA
UTILITY: COLORADO SPRINGS UTILITIES
APN : N/A
AHJ: CITY OF COLORADO SPRINGS

SHEET NAME

COVER SHEET

SHEET SIZE

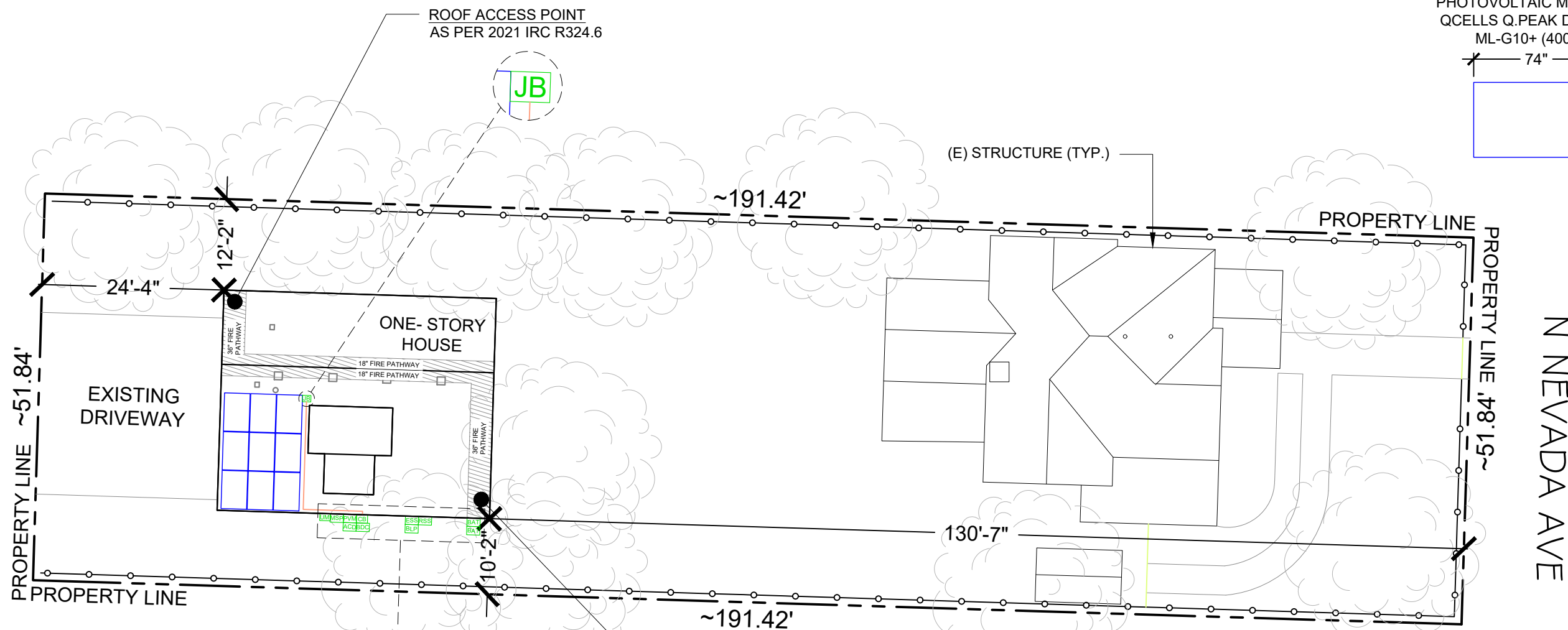
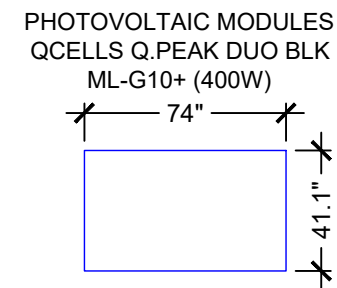
ANSI B
11" X 17"

SHEET NUMBER

PV-0



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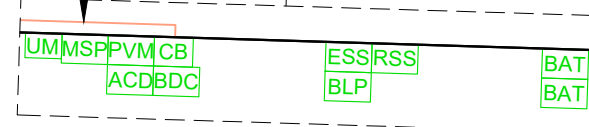
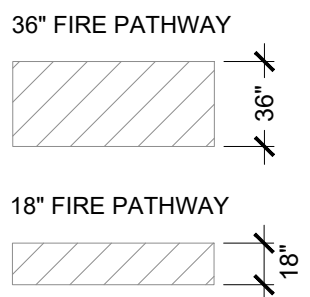


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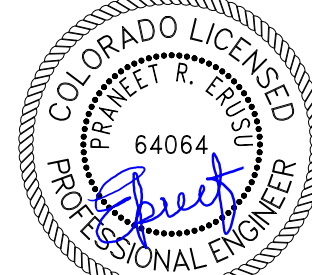
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(N) 3/4" OR GREATER EMT CONDUIT
 RUN (7/8 INCHES ABOVE ROOF)

ROOF ACCESS POINT
 AS PER 2021 IRC R324.6



STRUCTURAL ONLY



LEGEND	
UM	UTILITY METER
MSP	MAIN SERVICE PANEL
CB	ENPHASE IQ COMBINER BOX
JB	JUNCTION BOX
ACD	VISIBLE LOCKABLE LABELED AC DISCONNECT
PVM	RINGLESS LEVER BYPASS PRODUCTION METER SOCKET
ESS	ENPHASE IQ CONTROLLER 3
BLP	BACKUP LOAD PANEL
BAT	ENPHASE BATTERIES
RSS	RAPID SHUTDOWN SWITCH
BDC	BATTERY DISCONNECT

---	FENCE
-x-x-	GATE
- - -	PROPERTY LINE
---	CONDUIT
(Tree symbol)	TREES
(Circle symbol)	VENT, ATTIC FAN (ROOF OBSTRUCTION)

● **ROOF ACCESS POINT** SHALL BE LOCATED IN AREAS THAT DO NOT REQUIRE THE PLACEMENT OF GROUND LADDERS OVER OPENINGS SUCH AS WINDOWS OR DOORS, AND LOCATED AT STRONG POINTS OF BUILDING CONSTRUCTION IN LOCATIONS WHERE THE ACCESS POINT DOES NOT CONFLICT WITH OVERHEAD OBSTRUCTIONS SUCH AS TREE LIMBS, WIRES OR SIGNS.

SYSTEM SIZE:- 09 x 400W = 3.600 kWDC
 SYSTEM SIZE:- 09 x 290W = 2.610 kWAC

NOTE:
 A. ALL ELECTRICAL EQUIPMENT, INVERTERS/COMBINER, DISCONNECTS, MAIN SERVICE PANELS, ETC. SHALL NOT BE INSTALLED WITHIN 3' OF THE GAS METERS' SUPPLY OR DEMAND PIPING.

NOTE: • 3/4" OR GREATER IMC, RMC, FMC, LFMC, PVC, HDPE, NUCC, RTRC, LFNC, FMT, ENT OR EMT CONDUIT RUN EXPOSED CONDUIT RUN SHALL BE MIN. 7/8" ABOVE ROOF. * ROMEX RUN INSIDE ATTIC

NOTE: AC DISCONNECT AND PRODUCTION METER MUST BE WITHIN 10' OF THE UTILITY METER

1 SITE PLAN WITH ROOF PLAN
 SCALE: 1/16" = 1'-0"



SHEET NAME	SITE PLAN WITH ROOF PLAN
SHEET SIZE	ANSI B 11" X 17"
SHEET NUMBER	PV-1

MODULE TYPE, DIMENSIONS & WEIGHT

NUMBER OF MODULES = 09 MODULES
 MODULE TYPE = QCELLS Q.PEAK DUO BLK ML-G10+ (400W) MODULES
 MODULE WEIGHT = 48.5 LBS / 22.0 KG.
 MODULE DIMENSIONS = 74"X 41.1" = 21.12 SF
 UNIT WEIGHT OF ARRAY = 2.30 PSF

SYSTEM SIZE:- 09 x 400W = 3.600 kWDC
 SYSTEM SIZE:- 09 x 290W = 2.610 kWAC

NOTE: FIRE ACCESS POINT
 AS PER 2021 IRC R324.6

ARRAY AREA & ROOF AREA CALC'S		
AREA OF NEW ARRAY (Sq. Ft.)	AREA OF ROOF (PLAN VIEW) (Sq. Ft.)	TOTAL ROOF AREA COVERED BY ARRAY %
190.09	1076.94	18%
18%	ROOF AREA (ARRAY <33% OF ROOF AREA)	

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ROOF DESCRIPTION					
ROOF TYPE				ASPHALT SHINGLE ROOF	
ROOF #	# OF MODULES	ROOF TILT	AZIMUTH	TRUSSES SIZE	TRUSSES SPACING
#1	09	34°	182°	2"x4"	12" O.C.

NOTE: CONTRACTOR TO VERIFY EXISTING FRAMING, STRUCTURAL LETTER AND NOTIFY EOR IN CASE OF ANY DISCRIPENCIES

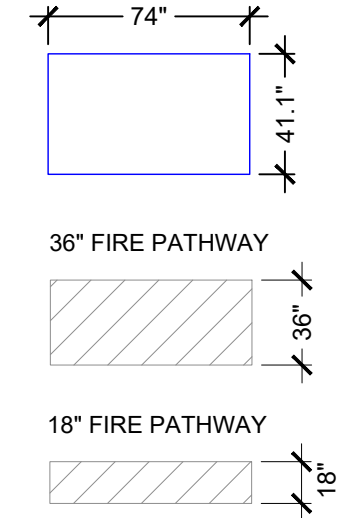
STRUCTURAL ONLY



ROOF #1
 TILT - 34°
 AZIMUTH - 182°

(N) 3/4" OR GREATER EMT CONDUIT RUN (7/8 INCHES ABOVE ROOF)

PHOTOVOLTAIC MODULES
 CELLS Q.PEAK DUO BLK
 ML-G10+ (400W)



FRONT YARD
 REAR YARD
 N NEVADA AVE

LEGEND	
UM	UTILITY METER
MSP	MAIN SERVICE PANEL
CB	ENPHASE IQ COMBINER BOX
JB	JUNCTION BOX
ACD	VISIBLE LOCKABLE LABELED AC DISCONNECT
PVM	RINGLESS LEVER BYPASS PRODUCTION METER SOCKET
ESS	ENPHASE IQ CONTROLLER 3
BLP	BACKUP LOAD PANEL
BAT	ENPHASE BATTERIES
RSS	RAPID SHUTDOWN SWITCH
BDC	BATTERY DISCONNECT
■	MICRO-INVERTERS
—	CONDUIT
●	SFM ATTACHMENT @ 36" O.C.
○ □	VENT, ATTIC FAN (ROOF OBSTRUCTION)
- - -	TRUSSES
■	COUPLING

VERSION		
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SHEET NAME
ROOF PLAN WITH MODULES

SHEET SIZE
**ANSI B
 11" X 17"**

SHEET NUMBER
PV-2

NOTE: AC DISCONNECT AND PRODUCTION METER MUST BE WITHIN 10' OF THE UTILITY METER

NOTE: • 3/4" OR GREATER IMC, RMC, FMC, LFMC, PVC, HDPE, NUCC, RTRC, LFNC, FMT, ENT OR EMT CONDUIT RUN EXPOSED CONDUIT RUN SHALL BE MIN. 7/8" ABOVE ROOF. * ROMEX RUN INSIDE ATTIC

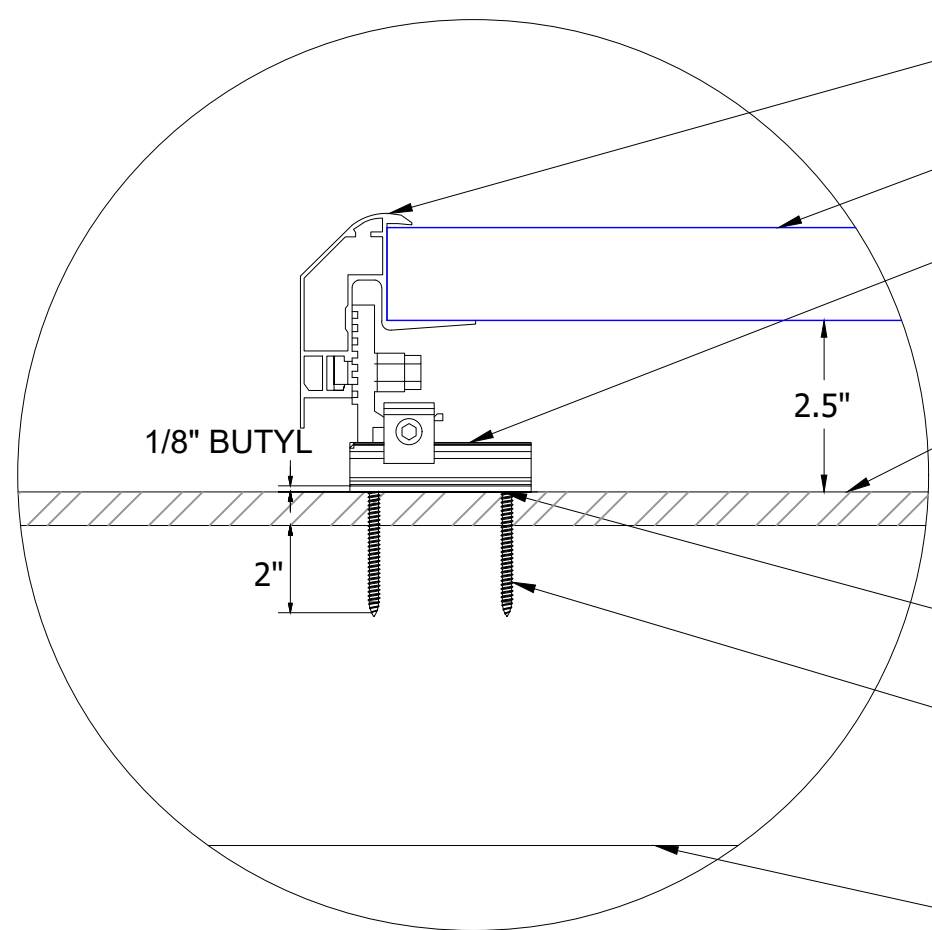
1 ROOF PLAN WITH MODULES
 SCALE: 3/16" = 1'-0"



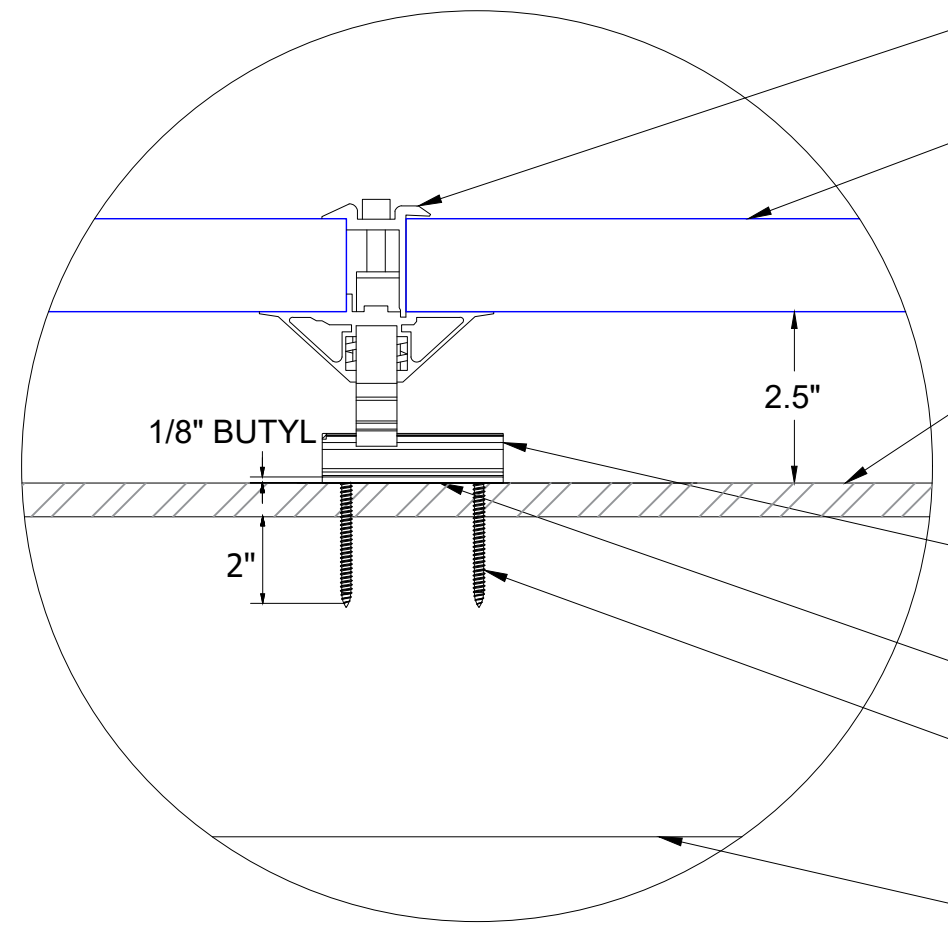
NOTE TO INSTALLER: VERIFY THE ROOF FRAMING INFO BEFORE INSTALLATION AND NOTIFY EOR IF THERE IS ANY INCONSISTENCY BETWEEN SITE VERIFICATION AND THE FOLLOWING: **2X4 TRUSSES @ 12" O.C.** WITH TOP CHORD PANEL POINT DISTANCE EQUAL OR LESS THAN 7.5 FT.



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- SFM TRIM RAIL
- (N) PV MODULE
- SFM DTD ATTACHMENT
- (E) ASPHALT SHINGLE ROOF
- BUTYL
- 2X #14-14 SCREW, HWH, SS, SELF-DR W/ #14 EPDM WASHER
- BUILDING STRUCTURE



- SFM MICRORAIL
- (N) PV MODULE
- (E) ASPHALT SHINGLE ROOF
- SFM DTD ATTACHMENT
- BUTYL
- 2X #14-14 SCREW, HWH, SS, SELF-DR W/ #14 EPDM WASHER
- BUILDING STRUCTURE

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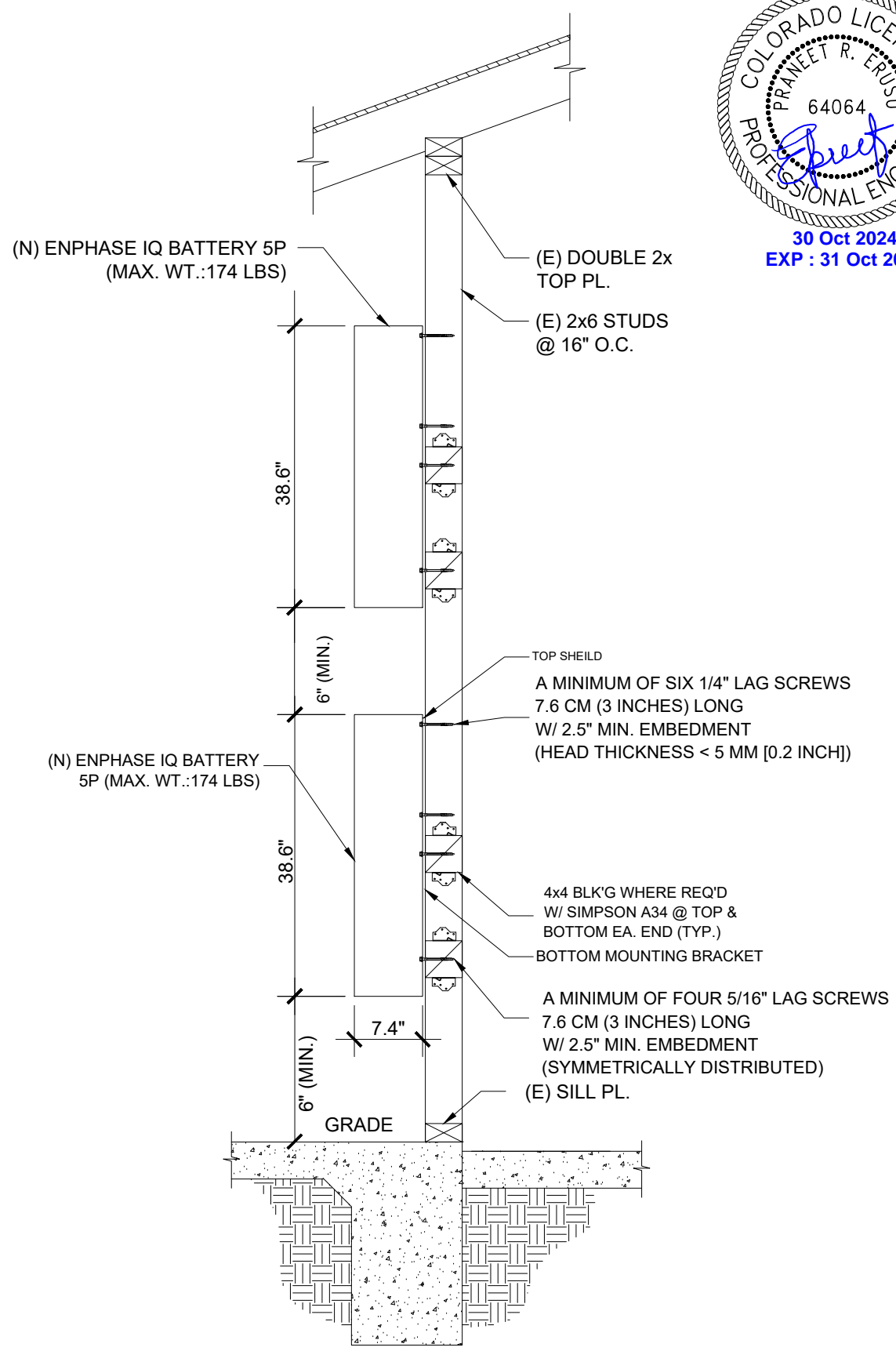
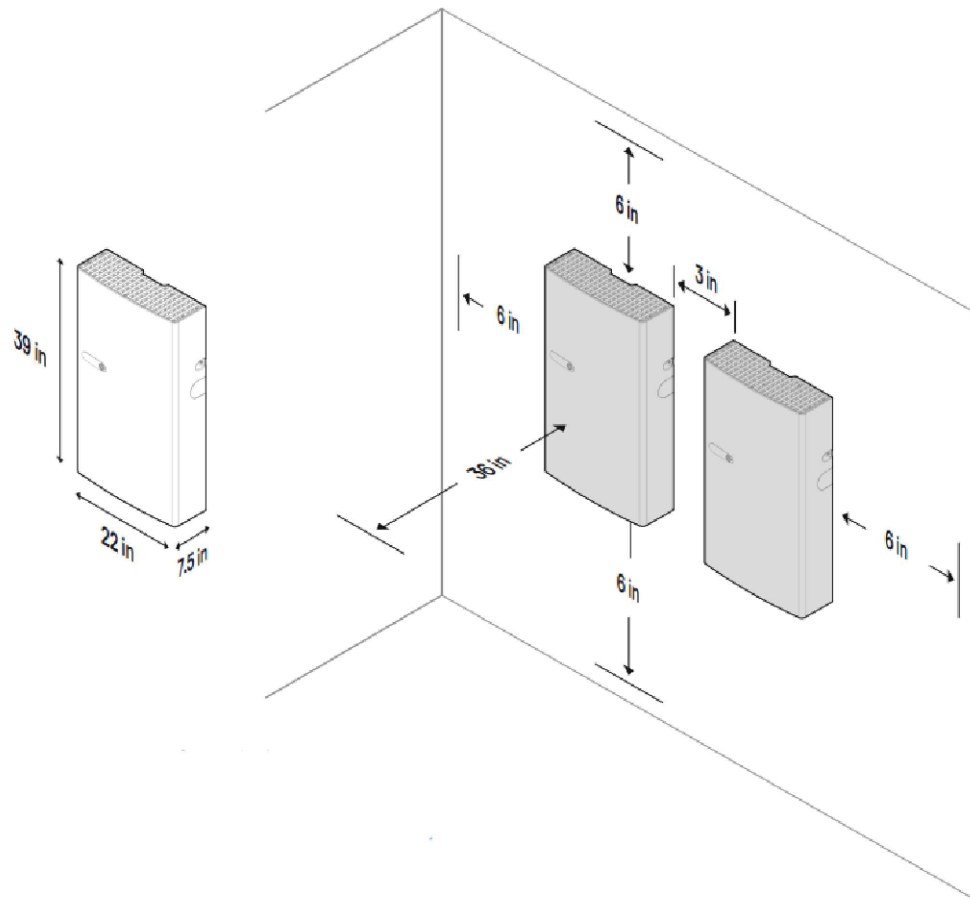
ATTACHMENT
 DETAIL

SHEET SIZE

ANSI B
 11" X 17"

SHEET NUMBER

PV-3



SIDE VIEW
SCALE: NTS

STRUCTURAL ONLY

30 Oct 2024
EXP : 31 Oct 2025

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AHJ: CITY OF COLORADO SPRINGS

SHEET NAME

BATTERY MOUNTING DETAILS

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-3.1

1 BATTERY MOUNTING DETAILS
SCALE: NTS

SOLAR MODULE SPECIFICATIONS						
MANUFACTURER / MODEL #	MODULE QUANTITY	VMP (V)	IMP (A)	VOC (V)	ISC (A)	TEMPERATURE COEFFICIENT OF Voc
QCELLS Q.PEAK DUO BLK ML-G10+ (400W)	09	37.13	10.77	45.30	11.14	-0.27%/K
MODULE DIMENSION	74" L x 41.1" W x 1.26" D					

AMBIENT TEMPERATURE SPECIFICATIONS				
RECORD LOW TEMP	AMBIENT TEMP (HIGH TEMP 2%)	CONDUIT HEIGHT	CONDUCTOR TEMPERATURE RATE (ON ROOF)	CONDUCTOR TEMPERATURE RATE (OFF ROOF)
-23°	32°	7/8"	90°	75°

INVERTER SPECIFICATIONS			
MANUFACTURER / MODEL #	QUANTITY	NOMINAL OUTPUT VOLTAGE	NOMINAL OUTPUT CURRENT
ENPHASE ENERGY IQ8PLUS-72-M-US	09	240 VAC	1.21A

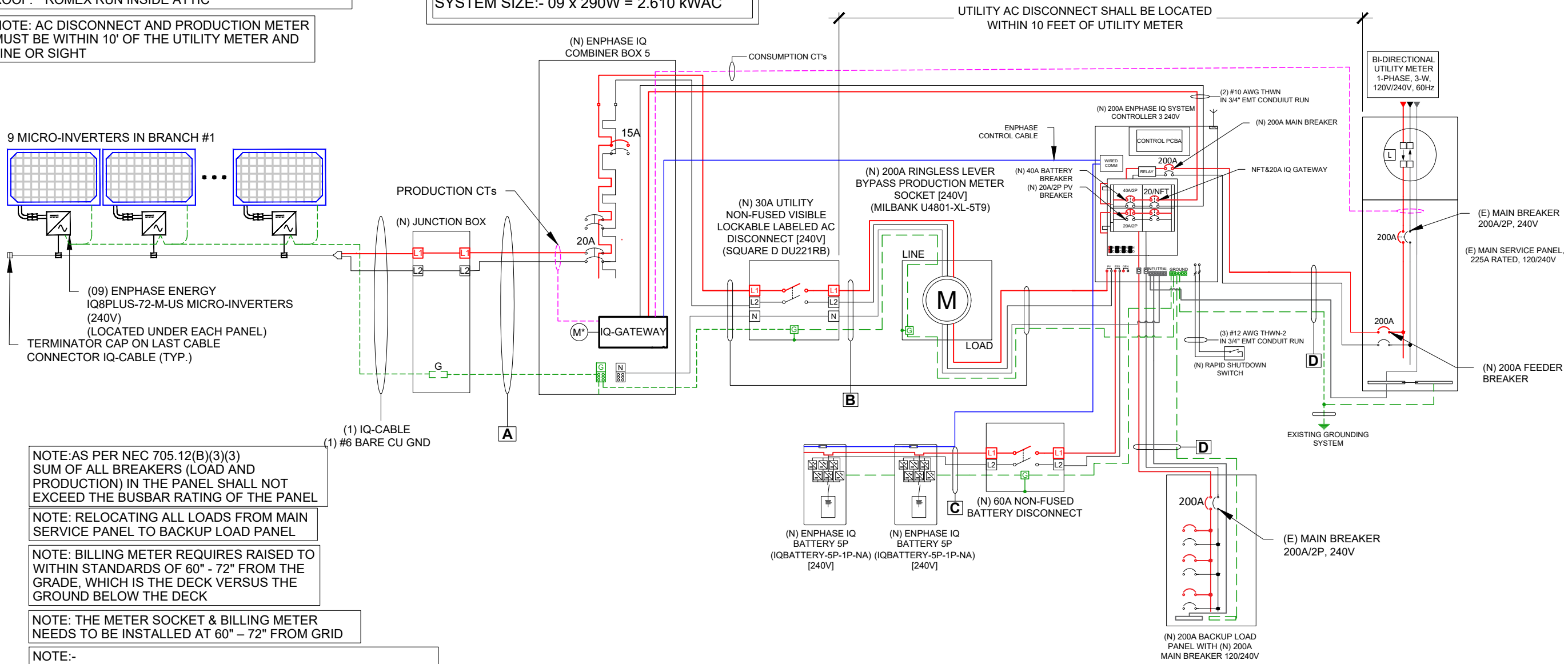


NOTE: • 3/4" OR GREATER IMC, RMC, FMC, LFMC, PVC, HDPE, NUCC, RTRC, LFNC, FMT, ENT OR EMT CONDUIT RUN EXPOSED CONDUIT RUN SHALL BE MIN. 7/8" ABOVE ROOF. * ROMEX RUN INSIDE ATTIC

NOTE: AC DISCONNECT AND PRODUCTION METER MUST BE WITHIN 10' OF THE UTILITY METER AND LINE OR SIGHT

SYSTEM SIZE:- 09 x 400W = 3.600 kWDC
 SYSTEM SIZE:- 09 x 290W = 2.610 kWAC

INTERCONNECTION : SYSTEM CONTROLLER BREAKER



NOTE: AS PER NEC 705.12(B)(3)(3) SUM OF ALL BREAKERS (LOAD AND PRODUCTION) IN THE PANEL SHALL NOT EXCEED THE BUSBAR RATING OF THE PANEL

NOTE: RELOCATING ALL LOADS FROM MAIN SERVICE PANEL TO BACKUP LOAD PANEL

NOTE: BILLING METER REQUIRES RAISED TO WITHIN STANDARDS OF 60" - 72" FROM THE GRADE, WHICH IS THE DECK VERSUS THE GROUND BELOW THE DECK

NOTE: THE METER SOCKET & BILLING METER NEEDS TO BE INSTALLED AT 60" - 72" FROM GRID

NOTE:- "LINE" ON THE TOP OF THE METER IS FOR THE PV GENERATION "LOAD" ON THE BOTTOM OF THE METER IS FOR THE UTILITY.

Wire Tag	Conduit	Wire Qty	Wire Gauge	Wire Type	Temp. Rating	Wire Ampacity (A)	Temp. Derate	Conduit Fill Derate	Derated Ampacity (A)	Inverter Qty	NOC (A)	No of Batteries	Battery Current (A)	CEC Correction	Design Current (A)	Ground Size	Ground Wire Type
A	3/4" EMT	2	10 AWG	THWN-2	90°C	40	0.96	1.0	38.40	09	1.21	-	-	1.25	13.61	10 AWG	THWN-2
B	3/4" EMT	3 + G	10 AWG	THWN	75°C	35	0.94	1.0	32.90	09	1.21	-	-	1.25	13.61	10 AWG	THWN
C	3/4" EMT	2 + G	8 AWG	THWN	75°C	50	0.94	1.0	47.00	-	-	2	16	1.25	40.00	10 AWG	THWN
D	2" EMT	3 + G	4/0 AWG	THWN	75°C	230	0.94	1.0	216.20	-	-	-	-	-	200.00	6 AWG	THWN

1 ELECTRICAL LINE DIAGRAM WITH WIRE CALCULATIONS
 SCALE: NTS

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 APN : N/A
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SHEET NAME
ELECTRICAL LINE DIAGRAM WITH WIRE CALCULATIONS

SHEET SIZE
ANSI B 11" X 17"

SHEET NUMBER
PV-4

⚠ WARNING

ELECTRICAL SHOCK HAZARD

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

LABEL LOCATION:
INVERTER(S), AC DISCONNECT(S), AC COMBINER PANEL (IF APPLICABLE).
PER CODE(S): NEC 2020: NEC 706.15 (C)(4) & NEC 690.13(B)

PHOTOVOLTAIC

AC DISCONNECT

LABEL LOCATION:
AC DISCONNECT
NEC 690.13(B)

CAUTION

TRI POWER SOURCE

FIRST SOURCE IS UTILITY ELECTRICAL GRID
SECOND SOURCE IS AC BATTERY
THIRD SOURCE IS PV INVERTER

LABEL LOCATION:
POINT OF INTERCONNECTION
MAIN SERVICE PANEL
(NEC 2017)

⚠ WARNING

POWER SOURCE OUTPUT CONNECTION
DO NOT RELOCATE THIS OVERCURRENT DEVICE

LABEL LOCATION:
SERVICE PANEL IF SUM OF BREAKERS EXCEEDS PANEL RATING
NEC 705.12 (B)(3)(2)

- NOTES AND SPECIFICATIONS:
- SIGNS AND LABELS SHALL MEET THE REQUIREMENTS OF THE 2020 ARTICLE 110.21(B), UNLESS SPECIFIC INSTRUCTIONS ARE REQUIRED BY SECTION 690, OR IF REQUESTED BY THE LOCAL AHJ.
 - SIGNS AND LABELS SHALL ADEQUATELY WARN OF HAZARDS USING EFFECTIVE WORDS, COLORS AND SYMBOLS.
 - LABELS SHALL BE PERMANENTLY AFFIXED TO THE EQUIPMENT OR WIRING METHOD AND SHALL NOT BE HAND WRITTEN.
 - LABEL SHALL BE OF SUFFICIENT DURABILITY TO WITHSTAND THE ENVIRONMENT INVOLVED.
 - SIGNS AND LABELS SHALL COMPLY WITH ANSI Z535.4-2011, PRODUCT SAFETY SIGNS AND LABELS, UNLESS OTHERWISE SPECIFIED.
 - DO NOT COVER EXISTING MANUFACTURER LABELS.

PHOTOVOLTAIC AC DISCONNECT

MAXIMUM AC OPERATING CURRENT: 10.89 AMPS
NOMINAL OPERATING AC VOLTAGE: 240 VAC

LABEL LOCATION:
AC DISCONNECT(S), PHOTOVOLTAIC SYSTEM POINT OF INTERCONNECTION.
PER CODE(S): NEC 2020: 690.54

PHOTOVOLTAIC POWER SOURCE

LABEL LOCATION:
EMT/CONDUIT RACEWAYS
(PER CODE: NEC690.31(D)(2))

MAIN PHOTOVOLTAIC SYSTEM DISCONNECT

LABEL LOCATION:
MAIN SERVICE DISCONNECT / UTILITY METER
(PER CODE: NEC 690.13(B))

⚠ WARNING

THIS EQUIPMENT FED BY MULTIPLE SOURCES TOTAL RATING OF ALL OVERCURRENT DEVICES EXCLUDING MAIN POWER SUPPLY SHALL NOT EXCEED AMPACITY OF BUSBAR

LABEL LOCATION:
POINTS OF CONNECTION/BREAKER
CODE: NEC 705.12(B)(3)(3)

ENERGY STORAGE SYSTEM DISCONNECT

NOMINAL VOLTAGE: 240 VAC
MAX AVAILABLE ISC: ___ AAC
ISC CLEAR TIME: ___ MS
DATE: _____

REQ'D BY NEC 706.7(D)
APPLY TO: BATTERY

⚠ WARNING:

EQUIPMENT FED BY MULTIPLE SOURCES. TOTAL RATING OF ALL OVER CURRENT DEVICES, EXCLUDING MAIN SUPPLY OVERCURRENT DEVICE, SHALL NOT EXCEED AMPACITY OF BUSBAR

LABEL LOCATION:
GENERATION PANEL

CAUTION:
PHOTOVOLTAIC SYSTEM COMBINER PANEL. DO NOT ADD LOADS.

LABEL LOCATION:
COMBINER PANEL

CAUTION

THIS PANEL HAS SPLICED FEED THROUGH CONDUCTORS
LOCATION OF DISCONNECT AT BATTERY BACKUP LOAD PANEL

LABEL LOCATION:
SYSTEM CONTROLLER

⚠ WARNING

THE DISCONNECTION OF THE GROUNDED CONDUCTOR(S) MAY RESULT IN OVERVOLTAGE ON THE EQUIPMENT

LABEL LOCATION:
INVERTER
PER CODE: NEC 690.31(E)

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.

LABEL LOCATION:
ON OR NO MORE THAT 1 M (3 FT) FROM THE SERVICE DISCONNECTING MEANS TO WHICH THE PV SYSTEMS ARE CONNECTED.
PER CODE(S): NEC 2020: IFC 605.11.3.1(1) & 690.56(C)

CAUTION !

POWER TO THIS BUILDING IS ALSO SUPPLIED FROM THE FOLLOWING SOURCES WITH DISCONNECTS LOCATED AS SHOWN

1318 N NEVADA AVE

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SHEET NAME

WARNING LABELS & PLACARD

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-5

1. EACH MODULE TO BE GROUNDED USING THE SUPPLIED CONNECTION POINT PER MANUFACTURER'S REQUIREMENTS. ALL SOLAR MODULES, EQUIPMENT, AND METALLIC COMPONENTS ARE TO BE BONDED. IF THE EXISTING GROUNDING ELECTRODE SYSTEM CAN NOT BE VERIFIED OR IS ONLY METALLIC WATER PIPING, IT IS THE CONTRACTOR'S RESPONSIBILITY TO INSTALL A SUPPLEMENTAL GROUNDING ELECTRODE.
2. ALL PLAQUES AND SIGNAGE REQUIRED BY THE LATEST EDITION OF NATIONAL ELECTRICAL CODE. LABEL SHALL BE METALLIC OR PLASTIC, ENGRAVED OR MACHINE PRINTED IN A CONTRASTING COLOR TO THE PLAQUE. PLAQUE SHALL BE UV RESISTANT IF EXPOSED TO SUNLIGHT.
3. AC CONDUCTORS SHALL BE RUN IN EMT AND SHALL BE LABELED, "CAUTION AC CIRCUIT" OR EQUIV. EVERY 5 FT.
4. AC CONDUCTORS SHALL BE RUN IN EMT AND SHALL BE LABELED, "CAUTION AC CIRCUIT" OR EQUIV. EVERY 5 FT.
5. EXPOSED NON-CURRENT CARRYING METAL PARTS OF ELECTRICAL EQUIPMENT SHALL BE GROUNDED IN ACCORDANCE WITH 250.134 OR 250.138(A).
6. CONFIRM LINE SIDE VOLTAGE AT ELECTRIC UTILITY SERVICE PRIOR TO CONNECTING INVERTER. VERIFY SERVICE VOLTAGE IS WITHIN INVERTER VOLTAGE OPERATIONAL RANGE.
7. OUTDOOR EQUIPMENT SHALL BE NEMA-3R RATED OR BETTER.
8. ELECTRICAL CONTRACTOR TO PROVIDE CONDUIT EXPANSION JOINTS AND ANCHOR CONDUIT RUNS AS REQUIRED PER NEC.
9. ALL WIRING MUST BE PROPERLY SUPPORTED BY DEVICES OR MECHANICAL MEANS DESIGNED AND LISTED FOR SUCH USE, AND FOR ROOF-MOUNTED SYSTEMS, WIRING MUST BE PERMANENTLY AND COMPLETELY HELD OFF OF THE ROOF SURFACE. NEC 110.2 - 110.4 / 300.4



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ELECTRICAL & SOLAR**
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VERSION		
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1318 N NEVADA AVE,
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UTILITY: COLORADO SPRINGS UTILITIES
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AHJ: CITY OF COLORADO SPRINGS

SHEET NAME

ADDITIONAL
NOTES

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-6

Q.PEAK DUO BLK ML-G10+ SERIES



385-410 Wp | 132 Cells
20.9% Maximum Module Efficiency

MODEL Q.PEAK DUO BLK ML-G10+



6 busbar cell technology

12 busbar cell technology



Breaking the 20% efficiency barrier

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



A reliable investment

Inclusive 25-year product warranty and 25-year linear performance warranty¹.



Enduring high performance

Long-term yield security with Anti LeTid Technology, Anti PID Technology² and Hot-Spot Protect.



Extreme weather rating

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



Innovative all-weather technology

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



The most thorough testing programme in the industry

Qcells 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.

¹ See data sheet on rear for further information.

² APT test conditions according to IEC/TS 62804-1:2015, method A (-1500 V, 96 h)

The ideal solution for:

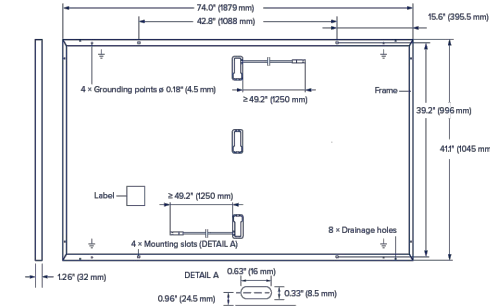
Rooftop arrays on residential buildings



Q.PEAK DUO BLK ML-G10+ SERIES

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 anodised aluminium
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 mm ² Solar cable; (+) ≥ 49.2 in (1250 mm), (-) ≥ 49.2 in (1250 mm)
Connector	Stäubli MC4; IP68



Electrical Characteristics

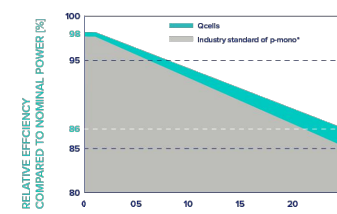
POWER CLASS	385	390	395	400	405	410	
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC ¹ (POWER TOLERANCE +5 W/-0 W)							
Power at MPP ¹	P _{MPP} [W]	385	390	395	400	405	410
Short Circuit Current ¹	I _{SC} [A]	11.04	11.07	11.10	11.14	11.17	11.20
Open Circuit Voltage ¹	V _{OC} [V]	45.19	45.23	45.27	45.30	45.34	45.37
Current at MPP	I _{MPP} [A]	10.59	10.65	10.71	10.77	10.83	10.89
Voltage at MPP	V _{MPP} [V]	36.36	36.62	36.88	37.13	37.39	37.64
Efficiency ¹	η [%]	≥ 19.6	≥ 19.9	≥ 20.1	≥ 20.4	≥ 20.6	≥ 20.9

MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT²

Power at MPP	P _{MPP} [W]	288.8	292.6	296.3	300.1	303.8	307.6
Short Circuit Current	I _{SC} [A]	8.90	8.92	8.95	8.97	9.00	9.03
Open Circuit Voltage	V _{OC} [V]	42.62	42.65	42.69	42.72	42.76	42.79
Current at MPP	I _{MPP} [A]	8.35	8.41	8.46	8.51	8.57	8.62
Voltage at MPP	V _{MPP} [V]	34.59	34.81	35.03	35.25	35.46	35.68

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

Qcells PERFORMANCE WARRANTY

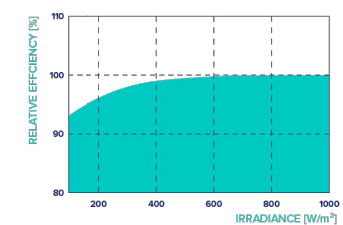


At least 98% of nominal power during first year. Thereafter max. 0.5% degradation per year. At least 93.5% of nominal power up to 10 years. At least 86% of nominal power up to 25 years.

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

^{*}Standard terms of guarantee for the 5 PV companies with the highest production capacity in 2021 (February 2021)

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 / ft ²]	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 / ft ²]	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),



Qcells pursues minimizing paper output in consideration of the global environment.

Note: Installation instructions must be followed. Contact our technical service for further information on approved installation 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: hqc-inquiry@qcells.com | WEB: www.qcells.com



Specifications subject to technical changes © Qcells Q.PEAK_DUO_BLK_ML-G10+_series_385-410_2023-01_Rev03_NA



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SHEET NAME

SPEC SHEETS

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SHEET NUMBER

PV-7



DATA SHEET

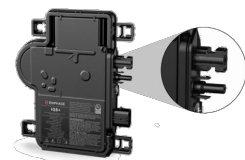


IQ8 and IQ8+ Microinverters

Our newest IQ8 Microinverters are the industry's first microgrid-forming, software-defined microinverters with split-phase power conversion capability to convert DC power to AC power efficiently. The brain of the semiconductor-based microinverter is our proprietary application-specific integrated circuit (ASIC), which enables the microinverter to operate in grid-tied or off-grid modes. This chip is built using advanced 55-nm technology with high-speed digital logic and has superfast response times to changing loads and grid events, alleviating constraints on battery sizing for home energy systems.



Part of the Enphase Energy System, IQ8 Series Microinverters integrate with the Enphase IQ Battery, Enphase IQ Gateway, and the Enphase App monitoring and analysis software.



Connect PV modules quickly and easily to the IQ8 Series Microinverters that have integrated MC4 connectors.



IQ8 Series Microinverters redefine reliability standards with more than one million cumulative hours of power-on testing, enabling an industry-leading limited warranty of up to 25 years.



IQ8 Series Microinverters are UL Listed as PV rapid shutdown equipment and conform with various regulations when installed according to manufacturer's instructions.

* Meets UL 1741 only when installed with IQ System Controller 2 or 3.
** IQ8 and IQ8+ support split-phase, 240 V installations only.

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Easy to install

- Lightweight and compact with plug-and-play connectors
- Power line communication (PLC) between components
- Faster installation with simple two-wire cabling

High productivity and reliability

- Produce power even when the grid is down*
- More than one million cumulative hours of testing
- Class II double-insulated enclosure
- Optimized for the latest high-powered PV modules

Microgrid-forming

- Complies with the latest advanced grid support**
- Remote automatic updates for the latest grid requirements
- Configurable to support a wide range of grid profiles
- Meets CA Rule 21 (UL 1741-SA) and IEEE 1547:2018 (UL 1741-SB)

NOTE:

- IQ8 Microinverters cannot be mixed together with previous generations of Enphase microinverters (IQ7 Series, IQ6 Series, and so on) in the same system.
- IQ Microinverters ship with default settings that meet North America's IEEE 1547 interconnection standard requirements. Region-specific adjustments may be requested by an Authority Having Jurisdiction (AHJ) or utility representative according to the IEEE 1547 interconnection standard. An IQ Gateway is required to make these changes during installation.

IQ8 and IQ8+ Microinverters

INPUT DATA [DC]	UNITS	IQ8-60-M-US	IQ8PLUS-72-M-US
Commonly used module pairings ¹	W	235-350	235-440
Module compatibility	–	To meet compatibility, PV modules must be within the following maximum input DC voltage and maximum module I_{sc} . Module compatibility can be checked at https://enphase.com/installers/microinverters/calculator .	
MPPT voltage range	V	27-37	27-45
Operating range	V	16-48	16-58
Minimum/Maximum start voltage	V	22/48	22/58
Maximum input DC voltage	V	50	60
Maximum continuous input DC current	A	10	12
Maximum input DC short-circuit current	A	25	
Maximum module (I_{sc})	A	20	
Overvoltage class DC port	–	II	
DC port backfeed current	mA	0	
PV array configuration	–	Ungrounded array; no additional DC side protection required; AC side protection requires max. 20 A per branch circuit	
OUTPUT DATA [AC]	UNITS	IQ8-60-M-US	IQ8PLUS-72-M-US
Peak output power	VA	245	300
Maximum continuous output power	VA	240	290
Nominal grid voltage (L-L)	V	240, split-phase (L-L), 180°	
Minimum and Maximum grid voltage ²	V	211-264	
Maximum continuous output current	A	1.0	1.21
Nominal frequency	Hz	60	
Extended frequency range	Hz	47-68	
AC short circuit fault current over three cycles	Arms	2	
Max units per 20 A (L-L) branch circuit ³	–	16	13
Total harmonic distortion	%	<5	
Overvoltage class AC port	–	III	
AC port backfeed current	mA	30	
Power factor setting	–	1.0	
Grid-tied power factor (adjustable)	–	0.85 leading ... 0.85 lagging	
Peak efficiency	%	97.7	
CEC weighted efficiency	%	97	
Nighttime power consumption	mW	23	25
MECHANICAL DATA			
Ambient temperature range		-40°C to 60°C (-40°F to 140°F)	
Relative humidity range		4% to 100% (condensing)	
DC connector type		Stäubli MC4	
Dimensions (H × W × D)		212 mm (8.3") × 175 mm (6.9") × 30.2 mm (1.2")	
Weight		1.1 kg (2.43 lbs)	
Cooling		Natural convection-no fans	
Approved for wet locations		Yes	
Pollution degree		PD3	
Enclosure		Class II double-insulated, corrosion-resistant polymeric enclosure	
Environmental category/UV exposure rating		NEMA Type 6/outdoor	

(1) No enforced DC/AC ratio.

(2) Nominal voltage range can be extended beyond nominal if required by the utility.

(3) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

IQ8SP-MC4-DSH-00206-3.0-EN-US-2024-02-09

IQ8SP-MC4-DSH-00206-3.0-EN-US-2024-02-09



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SHEET NAME

SPEC SHEETS

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ANSI B
 11" X 17"

SHEET NUMBER

PV-8



X-IQ-AM1-240-5
X-IQ-AM1-240-5C

IQ Combiner 5/5C

The IQ Combiner 5/5C consolidates interconnection equipment into a single enclosure and streamlines IQ Series Microinverters and IQ Gateway installation by providing a consistent, pre-wired solution for residential applications. IQ Combiner 5/5C uses wired control communication and is compatible with IQ System Controller 3/3G and IQ Battery 5P.

The IQ Combiner 5/5C, IQ Series Microinverters, IQ System Controller 3/3G, and IQ Battery 5P provide a complete grid-agnostic Enphase Energy System.



IQ Series Microinverters
The high-powered smart grid-ready IQ Series Microinverters (IQ6, IQ7, and IQ8 Series) simplify the installation process.



IQ System Controller 3/3G
Provides microgrid interconnection device (MID) functionality by automatically detecting grid failures and seamlessly transitioning the home energy system from grid power to backup power.



IQ Battery 5P
Fully integrated AC battery system. Includes six field-replaceable IQ8D-BAT Microinverters.



IQ Load Controller
Helps prioritize essential appliances during a grid outage to optimize energy consumption and prolong battery life.



5-year limited warranty



*For country-specific warranty information, see the <https://enphase.com/installers/resources/warranty> page.

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Smart

- Includes IQ Gateway for communication and control
- Includes Enphase Mobile Connect (CELLMODEM-M1-06-SP-05), only with IQ Combiner 5C
- Supports flexible networking: Wi-Fi, Ethernet, or cellular
- Provides production metering (revenue grade) and consumption monitoring

Easy to install

- Mounts to one stud with centered brackets
- Supports bottom, back, and side conduit entries
- Supports up to four 2-pole branch circuits for 240 VAC plug-in breakers (not included)
- 80 A total PV branch circuits
- Bluetooth-based Wi-Fi provisioning for easy Wi-Fi setup

Reliable

- Durable NRTL-certified NEMA type 3R enclosure
- 5-year limited warranty
- 2-year labor reimbursement program coverage included for both the IQ Combiner SKUs*
- UL1741 Listed

IQ Combiner 5/5C

MODEL NUMBER	
IQ Combiner 5 (X-IQ-AM1-240-5)	IQ Combiner 5 with IQ Gateway printed circuit board for integrated revenue-grade PV production metering (ANSI C12.20 ±0.5%), consumption monitoring (± 2.5%), and IQ Battery monitoring (±2.5%). Includes a silver solar shield to deflect heat.
IQ Combiner 5C (X-IQ-AM1-240-5C)	IQ Combiner 5C with IQ Gateway printed circuit board for integrated revenue-grade PV production metering (ANSI C12.20 ±0.5%), consumption monitoring (±2.5%) and IQ Battery monitoring (±2.5%). Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05)¹. Includes a silver solar shield to deflect heat.
WHAT'S IN THE BOX	
IQ Gateway printed circuit board	IQ Gateway is the platform for total energy management for comprehensive, remote maintenance, and management of the Enphase Energy System
Busbar	80 A busbar with support for 1 × IQ Gateway breaker and 4 × 20 A breaker for installing IQ Series Microinverters and IQ Battery 5P
IQ Gateway breaker	Circuit breaker, 2-pole, 10 A/15 A
Production CT	Pre-wired revenue-grade solid-core CT, accurate up to ±0.5%
Consumption CT	Two consumption metering clamp CTs, shipped with the box, accurate up to ±2.5%
IQ Battery CT	One battery metering clamp CT, shipped with the box, accurate up to ±2.5%
CTRL board	Control board for wired communication with IQ System Controller 3/3G and the IQ Battery 5P
Enphase Mobile Connect (only with IQ Combiner 5C)	4G-based LTE-M1 cellular modem (CELLMODEM-M1-06-SP-05) with a 5-year T-Mobile data plan
Accessories kit	Spare control headers for the COMMS-KIT-02 board
ACCESSORIES AND REPLACEMENT PARTS (NOT INCLUDED, ORDER SEPARATELY)	
CELLMODEM-M1-06-SP-05	4G-based LTE-M1 cellular modem with a 5-year T-Mobile data plan
CELLMODEM-M1-06-AT-05	4G-based LTE-M1 cellular modem with a 5-year AT&T data plan
Circuit breakers (off-the-shelf)	Supports Eaton BR2XX, Siemens Q2XX and GE/ABB THQL21XX Series circuit breakers (XX represents 10, 15, 20, 30, 40, 50, or 60). Also supports Eaton BR220B, BR230B, and BR240B circuit breakers compatible with the hold-down kit.
Circuit breakers (provided by Enphase)	BRK-10A-2-240V, BRK-15A-2-240V, BRK-20A-2P-240V, BRK-15A-2P-240V-B, and BRK-20A-2P-240V-B (more details in the "Accessories" section)
XA-SOLARSHIELD-ES	Replacement solar shield for IQ Combiner 5/5C
XA-ENV2-PCBA-5	IQ Gateway replacement printed circuit board (PCB) for IQ Combiner 5/5C
X-IQ-NA-HD-125A	Hold-down kit compatible with Eaton BR-B Series circuit breakers (with screws)
XA-COMMS2-PCBA-5	Replacement COMMS-KIT-02 printed circuit board (PCB) for IQ Combiner 5/5C
ELECTRICAL SPECIFICATIONS	
Rating	80 A
System voltage and frequency	120/240 VAC, 60 Hz
Busbar rating	125 A
Fault current rating	10 kAIC
Maximum continuous current rating (input from PV/storage)	64 A
Branch circuits (solar and/or storage)	Up to four 2-pole Eaton BR, Siemens Q, or GE/ABB THQL Series distributed generation (DG) breakers only (not included)
Maximum total branch circuit breaker rating (input)	80 A of distributed generation/95 A with IQ Gateway breaker included
IQ Gateway breaker	10 A or 15 A rating GE/Siemens/Eaton included
Production metering CT	200 A solid core pre-installed and wired to IQ Gateway
Consumption monitoring CT (CT-200-CLAMP)	A pair of 200 A clamp-style current transformers is included with the box
IQ Battery metering CT	200 A clamp-style current transformer for IQ Battery metering, included with the box

1. A plug-and-play industrial-grade cell modem for systems of up to 60 microinverters. Available in the United States, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.



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PV-9



Enphase IQ Cable accessories

The Enphase IQ Cable and accessories are part of the latest generation Enphase Energy System. These accessories provide simplicity, reliability, and faster installation times.



Enphase IQ Cable

- Two-wire, double-insulated Enphase IQ Cable is 50% lighter than the previous generation Enphase cable
- New cable numbering and plug-and-play connectors speed up installation and simplify wire management
- Link connectors eliminate cable waste

IQ Field Wireable Connectors

- Easily connect IQ Cables on the roof without complex wiring
- Make connections from any open connector and center-feed any section of cable within branch limits
- Available in male and female connector types

Enphase IQ Cable accessories



CONDUCTOR SPECIFICATIONS	
Certification	UL 3003 (raw cable), UL 9703 (cable assemblies), DG cable
Flame test rating	FT4
Compliance	RoHS, OIL RES I, CE, UV Resistant, combined UL for Canada and United States
Conductor type	THHN/THWN-2 dry/wet
Disconnecting means	The AC and DC bulkhead connectors have been evaluated and approved by UL for use as the load-break disconnect required by NEC 690.

IQ CABLE TYPES/ORDERING OPTIONS			
Connectorized models	Size/Maximum nominal voltage	Connector spacing	Connector count per box
Q-12-10-240	12 AWG/277 VAC	1.3 m (4.2 ft)	240
Q-12-12-240	12 AWG/277 VAC	1.5 m (4.9 ft)	240
Q-12-17-240	12 AWG/277 VAC	2.0 m (6.5 ft)	240
Q-12-18-240	12 AWG/277 VAC	2.1 m (6.9 ft)	240
Q-12-20-200	12 AWG/277 VAC	2.3 m (7.5 ft)	200
Q-12-22-200	12 AWG/277 VAC	2.5 m (8.2 ft)	200
Q-12-25-200	12 AWG/277 VAC	2.8 m (9.1 ft)	200

ENPHASE IQ CABLE ACCESSORIES		
Name	Model number	Description
IQ Raw Cable	Q-12-RAW-300	300 meters of 12 AWG cable with no connectors
IQ Field Wireable Connector (male)	Q-CONN-10M	Make connections from any open connector
IQ Field Wireable Connector (female)	Q-CONN-10F	Make connections from any IQ Cable open connector
IQ Cable Clip	Q-CLIP-100	Used to fasten cabling to the racking or to secure looped cabling
IQ Disconnect Tool	Q-DISC-10	IQ Disconnect tool for IQ Cable connectors, DC connectors, and AC module mount
IQ Sealing Caps (female)	Q-SEAL-10	One needed to cover each unused connector on the cabling
IQ Terminator	Q-TERM-10	IQ Terminator for unused cable ends
Enphase EN4 to MC4 adapter (150 mm) ¹	ECA-EN4-S22	Connect PV module using MC4 connectors to IQ Microinverters with EN4 (TE PV4-S SOLARLOK) 150 mm/5.9" to MC4
Enphase EN4 to MC4 adapter (1000 mm) ²	ECA-EN4-S22-10-12	Connect PV module using MC4 connectors to IQ Microinverters with EN4 (TE PV4-S SOLARLOK) 1000 mm/39.4" to MC4
Enphase EN4 to MC4 adapter (1800 mm) ²	ECA-EN4-S22-18-12	Connect PV module using MC4 connectors to IQ Microinverters with EN4 (TE PV4-S SOLARLOK) 1800 mm/70.9" to MC4
Enphase EN4 to non-terminated extension cable ³	ECA-EN4-FW-12	For field wiring of UL-certified DC connectors. EN4 to non-terminated cable, 150 mm/5.9"
Enphase EN4 non-terminated adapter ¹	ECA-EN4-FW	For field wiring of UL-certified DC connectors. EN4 (TE PV4-S SOLARLOK) to non-terminated cable 150 mm/5.9"
Enphase EN4 to MC4 adapter (600 mm) ³	ECA-EN4-S22-L	Longer adapter cable for EN4 (TE PV4-S SOLARLOK) to MC4. Use with split cell modules or PV modules with short DC cable 600 mm/23.6"
Enphase EN4 to MC4 adapter (57 mm) ²	ECA-EN4-S22-12	Connect PV module using MC4 connectors to IQ Microinverters with EN4 (TE PV4-SSOLARLOK) 57mm/2.24" to MC4
Enphase EN4 to non-terminated extension cable (1000 mm) ³	ECA-EN4-FW-10-12	For field wiring of UL-certified DC connectors. EN4 to non-terminated cable, 1000 mm/39.4"
Replacement DC adapter (MC4) ²	Q-DCC-2	DC adapter to MC4 (max voltage 100 VDC)
Replacement DC adapter (UTX) ¹	Q-DCC-5	DC adapter to UTX (max voltage 100 VDC)
Replacement DC adapter (MC4) IQ8P Microinverters ²	Q-DCC-2-P	DC Adapter to MC4 (max voltage 100 VDC) for IQ8P Microinverter
Enphase MC4 to non-terminated extension cable (1000 mm) ³	ECA-S22-FW-12	For field wiring of UL-certified DC connectors. MC4 to non-terminated cable, 1000 mm/39.4"
Enphase MC4 to MC4 extension cable (1000 mm) ²	ECA-S22-S22-10-12	MC4 to MC4 extension cable to connect PV module to DC adapter (MC4) or IQ Microinverters with MC4, 1000 mm/39.4"



PROUD AMERICAN ELECTRICAL INC
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 CO 80909, USA
 TEL: (719) 360-4986
 LICENSE NUMBER: EC.0102307
 Email : jesse.berkshire@proudamericansolar.com

VERSION

DESCRIPTION	DATE	REV
INITIAL RELEASE	10/23/2024	UR

PROJECT NAME

MURPHY ADU 1318 N NEVADA
 1318 N NEVADA AVE,
 COLORADO SPRINGS, CO 80903 USA
 UTILITY: COLORADO SPRINGS UTILITIES
 APN : N/A
 AHJ: CITY OF COLORADO SPRINGS

SHEET NAME

SPEC SHEETS

SHEET SIZE

ANSI B
 11" X 17"

SHEET NUMBER

PV-10



DATA SHEET



IQ System Controller 3/3G

The Enphase IQ System Controller 3/3G connects the home to grid power, the IQ Battery system, and solar PV. It provides microgrid interconnect device (MID) functionality by automatically detecting and seamlessly transitioning the home energy system from grid power to backup power in the event of a grid failure. It consolidates interconnection equipment into a single enclosure and streamlines grid-independent capabilities of PV and storage installations by providing a consistent, pre-wired solution for residential applications.



IQ Series Microinverters
The high-powered smart grid-ready IQ Series Microinverters (M Series, IQ6, IQ7, and IQ8 Series) dramatically simplify the installation process.



IQ Battery 5P
Fully integrated AC battery system. Includes six field-replaceable IQ8D-BAT microinverters.



IQ Combiner 5/5C
Consolidates PV interconnection equipment into a single enclosure and streamlines IQ Series Microinverters and IQ Gateway installation by providing a consistent, pre-wired solution for residential applications.



IQ Load Controller
Helps prioritize essential appliances during a grid outage to optimize energy consumption and prolong battery life.



IQ System Controller 3



IQ System Controller 3G

Easy to install

- Connects to service entrance¹ or main load center
- Includes neutral-forming transformer
- Mounts on single stud with centered brackets
- Provides conduit entry from the bottom, left, or right
- Includes color-coded wires for ease of wiring the System Shutdown Switch
- Integrates hold-down functionality to eliminate the need for hold-down kits and special breakers

Flexible

- Can be used for Sunlight Backup, Home Essentials Backup, or Full Energy Independence
- IQ System Controller 3 integrates with IQ Battery 5P
- IQ System Controller 3G integrates with select AC standby generators. See the [Generator integration tech brief](#) for a list of generators
- Provides a seamless transition to backup

Safe and reliable

- System Shutdown Switch can be used to disconnect PV, battery, and generator systems
- The System Shutdown Switch acts as a rapid shutdown initiator of grid-forming IQ8 PV Microinverters for the safety of maintenance technicians/first responders
- 10-year limited warranty

¹IQ System Controller 3 is not suitable for use as service equipment in Canada.

IQ System Controller 3/3G

MODEL NUMBER	DESCRIPTION
SC200D111C240US01	IQ System Controller 3 streamlines the grid-independent capabilities of PV and storage installations. Integrates hold-down capability. Supports IQ Battery 5P units up to 40 kWh (without PCS*) and 80 kWh (with PCS*). Does not support generator integration
SC200G111C240US01	IQ System Controller 3G streamlines the grid-independent capabilities of PV and storage installations. Integrates hold-down capability. Supports IQ Battery 5P units up to 20 kWh (without PCS*) and 40 kWh (with PCS*). Supports generator integration
WHAT IS IN THE BOX	
IQ System Controller 3/3G	Includes neutral-forming transformer (NFT) and microgrid interconnect device (MID)
System Shutdown Switch	Includes pre-wired red, black, orange, and purple 12 AWG wire (EP200G-NA-02-RSD)
Wall-mounting bracket	Screws provided in the accessories kit for mounting
4-pole circuit breaker	Pre-installed quad breaker (BRK-20A40A-4P-240V), 20 A-40 A, 10 kAIC, Eaton BQC220240 ²
Accessories kit	IQ System Controller 3/3G literature kit, including labels, CTRL headers, screws, filler plates, and quick install guide (QIG) (EP200G-LITKIT)
OPTIONAL ACCESSORIES AND REPLACEMENT PARTS	
CT-200-SPLIT	200 A split-core current transformers for metering (accuracy: ±2.5%) ³
CT-200-CLAMP	200 A clamp-type current transformers for metering (accuracy: ±2.5%) ³
Main or load circuit breakers (order separately, as needed) ⁴	<ul style="list-style-type: none"> • BRK-100A-2P-240V: 2-pole, 100A, 25kAIC, CSR2100N or CSR2100 • BRK-125A-2P-240V: 2-pole, 125A, 25kAIC, CSR2125N • BRK-150A-2P-240V: 2-pole, 150A, 25kAIC, CSR2150N • BRK-175A-2P-240V: 2-pole, 175A, 25kAIC, CSR2175N • BRK-200A-2P-240V: 2-pole, 200A, 25kAIC, CSR2200N
Distributed energy resource (DER) circuit breakers (order separately, as needed) ⁵	<ul style="list-style-type: none"> • BRK-20A-2P-240V-B: 2-pole, 20 A, 10 kAIC, BR220B/BR220 • BRK-30A-2P-240V-B: 2-pole, 30 A, 10 kAIC, BR230 • BRK-40A-2P-240V-B: 2-pole, 40 A, 10 kAIC, BR240B/BR240 • BRK-60A-2P-240V: 2-pole, 60 A, 10 kAIC, BR260 • BRK-80A-2P-240V: 2-pole, 80 A, 10 kAIC, BR280
EP200G-HNDL-R1	IQ System Controller 3/3G installation handle kit (order separately)
CTRL-SC3-NA-01	Control cable, 500 ft. spool (order separately)
BRK-20A40A-4P-240V	2-pole 20 A, 2-pole 40 A, 10 kAIC, Quad Breaker BQC220240 ⁶
ALTERNATE DER CIRCUIT BREAKERS	
GE/ABB	THQL21xx (20/40/60/80 A)
Siemens	Q2xx (20/40/60/80 A)
Siemens (quad breaker)	Q24020CT2 (20/40 A)
ELECTRICAL SPECIFICATIONS	
Nominal voltage/Range (L-L)	240 V ~ ⁷ /±20%
Voltage measurement accuracy	±1% V nominal (±1.2 V L-N and ±2.4 V L-L)
Auxiliary (dry) contact for load control, excess PV control, and generator two-wire control	24 V, 1 A
Nominal frequency/Range	60 Hz/56–63 Hz
Frequency measurement accuracy	±0.1 Hz
Maximum continuous current rating	160 A
Maximum input overcurrent protection device	200 A
Maximum output overcurrent protection device	200 A
Maximum overcurrent protection device rating for generator circuit	80 A (IQ System Controller 3G only - SC200G111C240US01)
Maximum overcurrent protection device rating for storage circuit	2 × 80 A (IQ System Controller 3 - SC200D111C240US01) 1 × 80 A (IQ System Controller 3G - SC200G111C240US01)

² Factory-installed quad breaker (Siemens or Eaton). NFT pre-wired to 40 A terminal of the quad breaker.

³ Two units of CT-200-SPLIT or CT-200-CLAMP must be bought separately for generator integration.

⁴ The IQ System Controller 3 is rated at 22 kAIC.

⁵ Integrated hold-down kit support breakers (BR230/BR230/BR240) without predrilled hole. The integrated hold-down kit also supports GE/ABB and Siemens as mentioned in the *Alternate DER circuit breakers* section.

⁶ Figures 1a and 1b show Siemens or Eaton factory-installed quad breakers with NFT pre-wired to 40 A.

⁷ ~ indicates alternating current (AC) supply.

* Power control system.



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VERSION

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SHEET NAME

SPEC SHEETS

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-11

IQ Battery 5P

The IQ Battery 5P all-in-one AC-coupled system is powerful, reliable, simple, and safe. It has a total usable energy capacity of 5.0 kWh and includes six embedded grid-forming microinverters with a 3.84 kVA continuous power rating. It provides backup capability, and installers can quickly design the right system size to meet the customer needs.



IQ BATTERY 5P SPECIFICATIONS	
Rated (continuous) output power	3.84 kVA
Rated output current (@240 VAC)	16 A
Interconnection	Single-phase
Nominal voltage	240 VAC
Nominal frequency	60 Hz
Usable capacity	5.0 kWh
Ambient operating temperature range (charging)	-20°C to 50°C (-4°F to 122°F) non-condensing
Ambient operating temperature range (discharging)	-20°C to 55°C (-4°F to 131°F) non-condensing
Chemistry	Lithium iron phosphate (LFP)
Mounting	Wall-mount or pedestal-mount (sold separately)

Powerful

- Provides 3.84 kVA continuous and 7.68 kVA peak power
- Doubles the available power per kWh of prior generations of IQ Battery
- Includes six embedded microinverters

Reliable

- 15-year limited warranty
- Cools passively with no moving parts or fans
- Uses wired communication for fast and consistent connection
- Updates software and firmware remotely

Simple

- Fully integrated AC battery system
- Installs and commissions easily
- Supports Backup, Self-Consumption, and time-of-use (TOU) modes
- Offers homeowners remote monitoring and control from the Enphase App
- Field replaceable components

Safe

- Evaluated to UL 9540A for thermal runaway fire propagation and reduced separation distance as required in 2021 IRC R328.3.1, 2021 IFC 1207.1.5, and 2023 NFPA 855 15.3.1 and 9.1.5.¹
- Uses lithium iron phosphate (LFP) chemistry for maximum safety and longevity

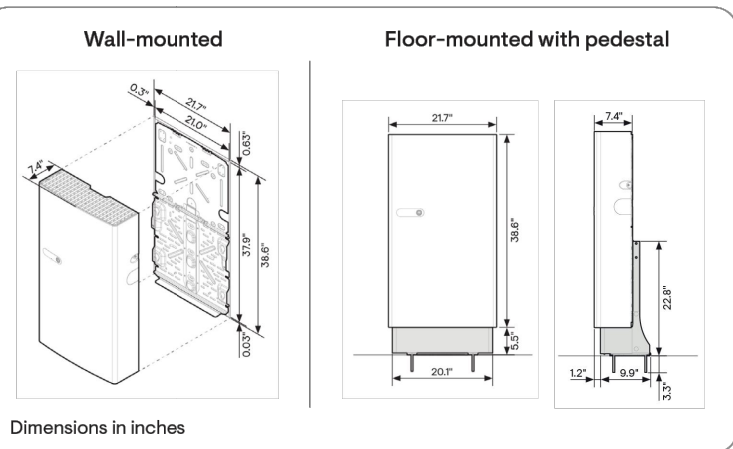
MODEL NUMBER	
IQBATTERY-5P-1P-NA	The IQ Battery 5P system with integrated IQ Microinverters (SKU: IQ8D-BAT) and battery management system (BMS) with battery controller
LIMITED WARRANTY	
IQ Battery 5P unit	>60% capacity, up to 15-year or 6,000 cycles ²
OUTPUT (AC)	
@240 VAC ³	
Rated (continuous) output power	3.84 kVA
Peak output power	7.68 kVA (three seconds), 6.14 kVA (ten seconds)
Nominal voltage/range	240/211–264 VAC
Nominal frequency/range	60/57–63 Hz
Rated output current (@240 VAC)	16 A
Peak output current (@240 VAC)	32 A (three seconds), 25.6 A (ten seconds)
Power Start capability	Up to 48 A LRA ⁴
Power factor (adjustable)	0.85 leading ... 0.85 lagging
Maximum units per 20 A branch circuit	One unit (single-phase)
Maximum conductor size supported	3 AWG
Overcurrent protection device (OCPD) for 3 AWG cable	80 A
Interconnection	Single-phase
AC round-trip efficiency ⁵	90%
BATTERY	
Total capacity	5.0 kWh
Usable capacity	5.0 kWh
DC round-trip efficiency	96%
Nominal DC voltage	76.8 V
Maximum DC voltage	86.4 V
Ambient operating temperature range (charging)	-20°C to 50°C (-4°F to 122°F) non-condensing
Ambient operating temperature range (discharging)	-20°C to 55°C (-4°F to 131°F) non-condensing
Optimum operating temperature range	0°C to 30°C (32°F to 86°F)
Chemistry	Lithium iron phosphate (LFP)
MECHANICAL DATA	
Dimensions (H x W x D)	980 mm x 550 mm x 188 mm (38.6 in x 21.7 in x 7.4 in)
Lifting weight	66.3 kg (146.1 lb)
Total installed weight	78.9 kg (174 lb)
Enclosure	Outdoor-NEMA 3R
IQ8D-BAT Microinverter enclosure	NEMA type 6
Cooling	Natural convection
Altitude	Up to 2,500 meters (8,202 feet)
Mounting	Wall-mount or pedestal-mount (sold separately)

² Whichever occurs first. Restrictions apply.

³ Supported in both grid-connected and backup/off-grid operations.

⁴ Power Start capability may vary.

⁵ AC to the battery to AC at 50% power rating.



¹ Follow all installation instructions and local codes and requirements of the Authority Having Jurisdiction (AHJ) when installing the Enphase Energy System.

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 AHJ: CITY OF COLORADO SPRINGS

SHEET NAME

SPEC SHEETS

SHEET SIZE

ANSI B
 11" X 17"

SHEET NUMBER

PV-12

FEATURES AND COMPLIANCE

Compatibility	Compatible with IQ and M Series Microinverters, IQ System Controller 3/3G, IQ Combiner 5/5C, and IQ Gateway for grid-tied and backup operation
Communication	Wired control communication
Services	Backup, Self-Consumption, TOU, and NEM integrity
Monitoring	Enphase Installer Platform and Enphase App monitoring options; API integration
Compliance	CA Rule 21 (UL 1741-SA), IEEE 1547:2018 (UL 1741-SB, 3rd Ed.) CAN/CSA C22.2 No. 107.1-16 UL 9540 ⁶ , UL 9540A, UN 38.3, UL 1998, UL 991, NEMA Type 3R, AC156 EM: 47 CFR, Part 15, Class B, ICES 003 Cell module: UL 1973, UN 38.3 Inverters: UL 62109-1, IEC 62109-2

WHAT'S IN THE BOX


IQ Battery 5P unit	IQ Battery 5P unit (B05-T02-US00-1-3)
ID cover and conduit cover	IQ Battery 5P cover with two conduit covers for the left and right sides of the unit
Bottom mounting bracket and top shield	Bottom mounting bracket for mounting the battery on the wall. One top shield is required for UL 9540A
M5 seismic screws	Two M5 seismic screws for securing the battery unit on the bottom mounting bracket
M4 grounding screws	Two M4 grounding screws for securing the top shield on the bottom mounting bracket
M5 ID cover grounding screws	Two M5 ID cover grounding screws for the EMI/EMC requirement
Cable ties	Six cable ties for securing field cables to the unit
Control (CTRL) connector	Spare CTRL connector without resistor for CTRL wiring
Control (CTRL) connector with resistor	Spare CTRL connector with resistor for CTRL wiring
Quick install guide (QIG)	QIG for IQ Battery unit installation instructions

OPTIONAL ACCESSORIES AND REPLACEMENT PARTS

IQ8D-BAT-RMA	IQ8D-BAT Microinverter for field replacement
B05-T02-US00-1-3-RMA	IQ Battery 5P Battery unit for field replacement
B05-CX-0550-O	IQ Battery 5P cover for field replacement
B05-PI-0550-O	IQ Battery 5P pedestal mount
B05-CP-096-O	IQ Battery 5P conduit plates for field replacement. Includes one left-side and one right-side conduit plate
B05-WB-0543-O	IQ Battery 5P wall bracket for field replacement. Includes one bottom mounting bracket and one top shield
IQBATTERY-HNDL-5	IQ Battery 5P lifting handles. Includes one left-side and one right-side lifting handle
B05-ACFB-080-O	IQ Battery 5P AC filter board for field replacement
B05-BMSNA-0490-O	IQ Battery 5P BMS board for field replacement
B05-CANB-063-O	IQ Battery 5P control communication board for field replacement
B05-NICS-0524-O, B05-NUCS-0524-O	IQ Battery 5P control switch is preinstalled on the wiring cover for field replacement


⁶ Following local standards, choose a well-ventilated, non-habitable indoor location (like a 2-car garage) or an outdoor location where the ambient temperature and humidity are within -4°F to 131°F (-20°C to 55°C) and 5% to 95% RH, non-condensing. Avoid direct sunlight to ensure the temperature stays in the optimal operating range. This ensures charging and discharging currents are not de-rated due to temperature. The full performance will occur within 59°F to 113°F (15°C to 45°C) while charging and within 41°F to 122°F (5°C to 50°C) while discharging.

Components of the Enphase Energy System




IQ Microinverters

IQ Series Microinverters pack more power into less space than other rooftop solar systems and make rooftop solar more productive, reliable, smart, and safe.



IQ Gateway

The IQ Gateway with Current Transformers provides complete control and insight into the Enphase Energy System.



Communications Kit 2 INT

The Communications Kit 2 INT enables wired communication between the battery and gateway for grid-tied operation.



IQ Battery 5P accessories

The IQ Battery 5P lifting handles are reusable and ease the installation process. The IQ Battery 5P pedestal enables floor mounting of the IQ Battery 5P.



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VERSION		
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MURPHY ADU 1318 N NEVADA
 1318 N NEVADA AVE,
 COLORADO SPRINGS, CO 80903 USA
 UTILITY: COLORADO SPRINGS UTILITIES
 APN : N/A
 AHJ: CITY OF COLORADO SPRINGS

SHEET NAME
 SPEC SHEETS

SHEET SIZE
 ANSI B
 11" X 17"

SHEET NUMBER
 PV-13



U4801-XL-5T9

Catalog Number	U4801-XL-5T9
Marketing Product Description	5 Terminal Ringless Small Closing Plate Lever Bypass 5th Terminal 9 O'clock Position
UPC	784572288218
Length (IN)	4.844
Width (IN)	13
Height (IN)	19
Brand Name	Milbank
Type	Ringless Meter Socket
Application	Meter Socket
Standard	UL Listed;Type 3R
Voltage Rating	600 Volts Alternating Current
Amperage Rating	200 Continuous Ampere
Phase	1 Phase
Frequency Rating	60 Hertz
Size	4.844L x 13W x 19H
Number Of Cutouts	0
Cutout Size	No Main Breaker
Cable Entry	Overhead or Underground
Terminal	Lay in
Insulation	Glass Polyester
Mounting	Surface Mount

Enclosure	G90 Galvanized Steel with Powder Coat Finish
Jaw Quantity	5 Terminal
Bypass Type	Lever Bypass
Number of Meter Positions	1 Position
Equipment Ground	Bonded Ground Strap
Hub Opening	Small Closing Plate
Line Side Wire Range	6 AWG - 350 kcmil
Load Side Wire Range	6 AWG - 350 kcmil
Number Of Receptacles	0

Please consult serving utility for their requirements prior to ordering or installing, as specifications and approvals vary by utility and may require local electrical inspector approval. All installations must be installed by a licensed electrician and must comply with all national and local codes, laws and regulations. Milbank reserves the right to make changes in specifications and features shown without notice or obligation.



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SHEET NAME

SPEC SHEETS

SHEET SIZE

ANSI B
 11" X 17"

SHEET NUMBER

PV-14

VERSION		
DESCRIPTION	DATE	REV
INITIAL RELEASE	10/23/2024	UR

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 1318 N NEVADA AVE,
 COLORADO SPRINGS, CO 80903 USA
 UTILITY: COLORADO SPRINGS UTILITIES
 APN : N/A
 AHJ: CITY OF COLORADO SPRINGS

SHEET NAME

SPEC SHEETS

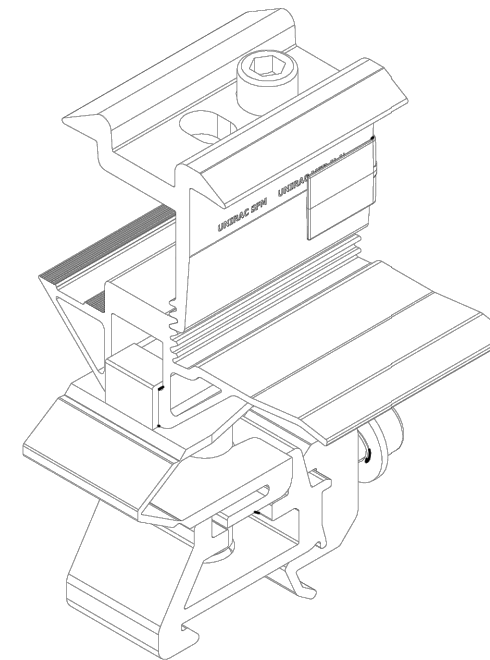
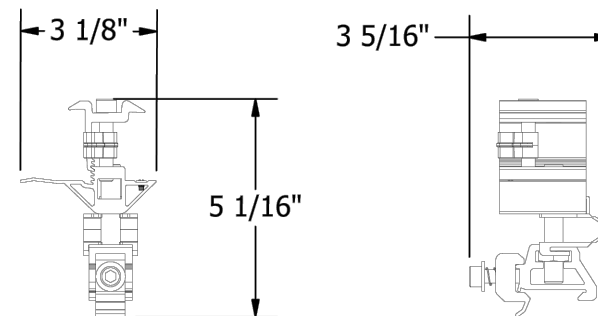
SHEET SIZE

ANSI B
 11" X 17"

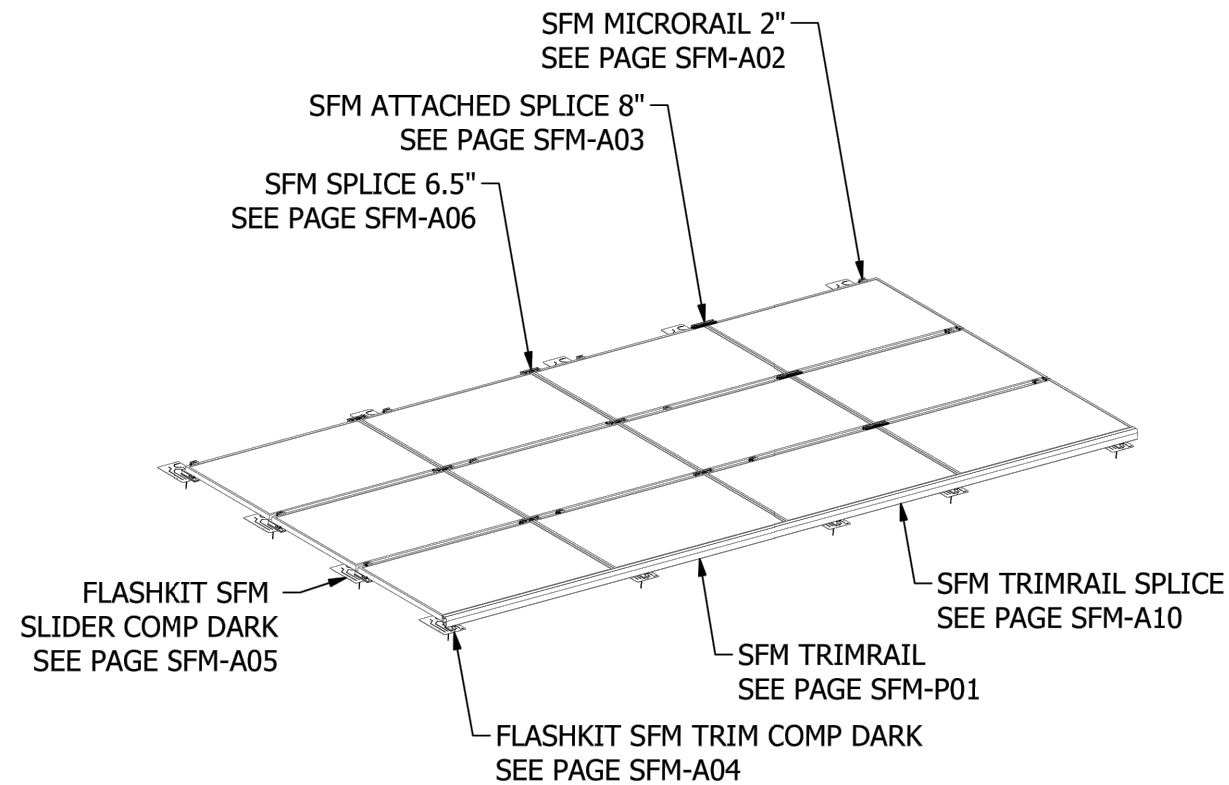
SHEET NUMBER

PV-15

PART # TABLE	
P/N	DESCRIPTION
250020U	SFM MICRORAIL 2"



SFM MICRORAIL 2"



MLPE MOUNTING ASSEMBLY
SEE PAGE SFM-A11

N/S BONDING CLAMP
SEE PAGE SFM-A12

TRIM BONDING CLAMP
SEE PAGE SFM-A12

WIRE BONDING CLIP
SEE PAGE SFM-A12

1411 BROADWAY BLVD. NE
 ALBUQUERQUE, NM 87102 USA
 PHONE: 505.242.6411
 WWW.UNIRAC.COM

PRODUCT LINE:	SFM INFINITY
DRAWING TYPE:	ASSEMBLY
DESCRIPTION:	LAYOUT EXAMPLE
REVISION DATE:	4/22/2019

DRAWING NOT TO SCALE
 ALL DIMENSIONS ARE
 NOMINAL

PRODUCT PROTECTED BY
 ONE OR MORE US PATENTS
 LEGAL NOTICE

SFM-A01

SHEET

1411 BROADWAY BLVD. NE
 ALBUQUERQUE, NM 87102 USA
 PHONE: 505.242.6411
 WWW.UNIRAC.COM

PRODUCT LINE:	SFM INFINITY
DRAWING TYPE:	PARTS ASSEMBLY
DESCRIPTION:	MICRORAIL 2"
REVISION DATE:	4/22/2019

DRAWING NOT TO SCALE
 ALL DIMENSIONS ARE
 NOMINAL

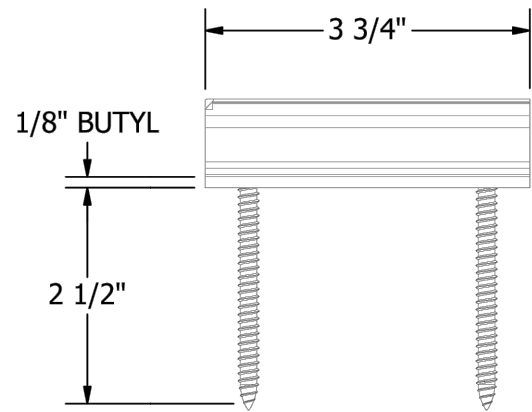
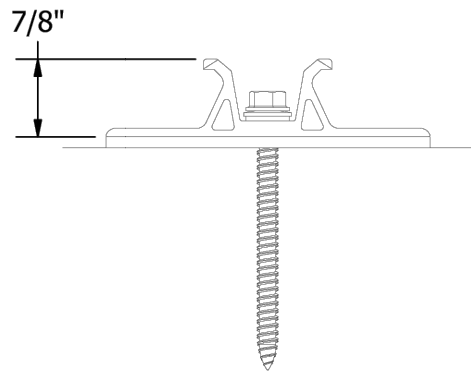
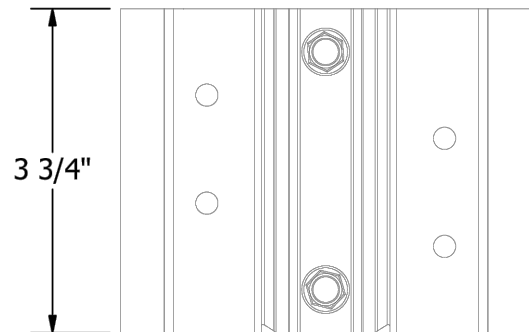
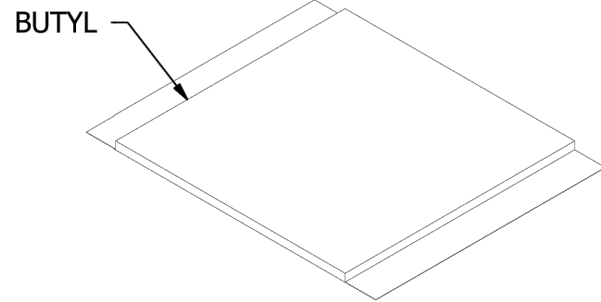
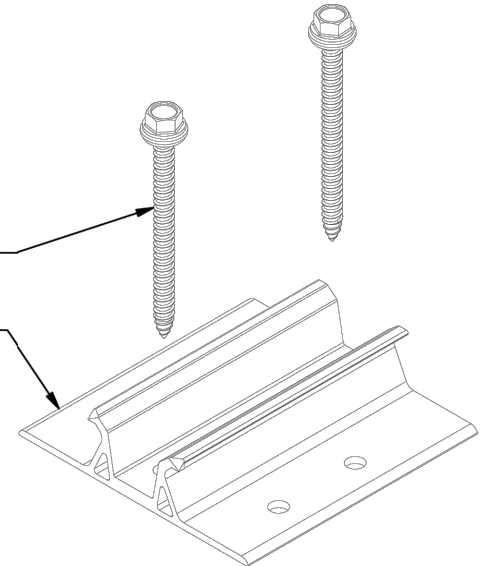
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SFM-A02

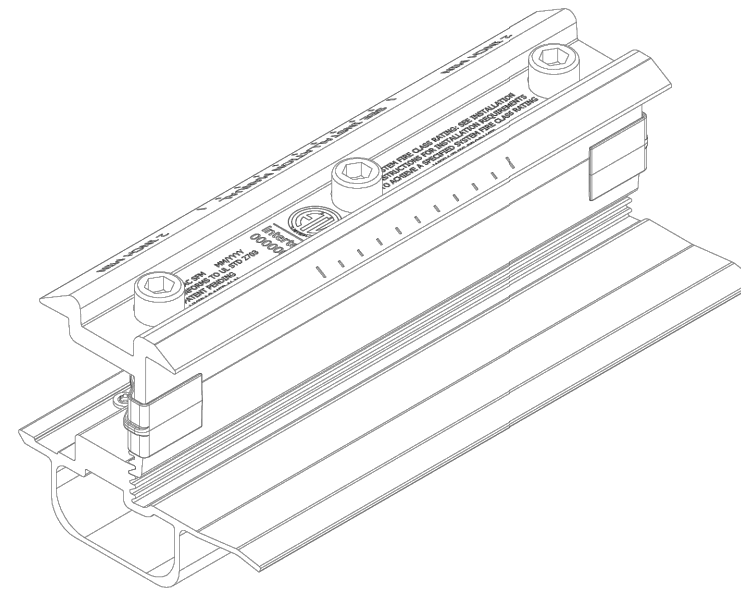
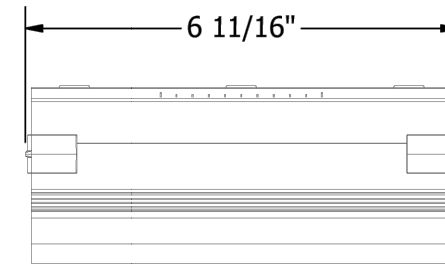
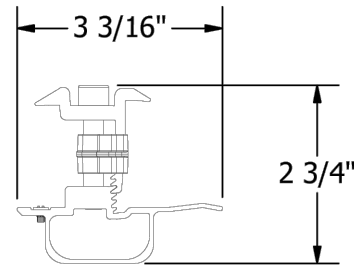
SHEET

PART # TABLE	
P/N	DESCRIPTION
SFMBTLM1	SFM DTD BUTYL ATT, MILL

2X #14-14 SCREW, HWH, SS, SELF-DR
W/ #14 EPDM WASHER
DTD ATTACHMENT



PART # TABLE	
P/N	DESCRIPTION
250010U	SFM SPLICE 6.5"



SFM SPLICE 6.5"

UNIRAC
1411 BROADWAY BLVD. NE
ALBUQUERQUE, NM 87102 USA
PHONE: 505.242.6411
WWW.UNIRAC.COM

PRODUCT LINE:	SFM INFINITY
DRAWING TYPE:	PARTS ASSEMBLY
DESCRIPTION:	SFM DTD BUTYL ATTACHMENT
REVISION DATE:	3/1/2023

DRAWING NOT TO SCALE
ALL DIMENSIONS ARE
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SFM-A23

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1411 BROADWAY BLVD. NE
ALBUQUERQUE, NM 87102 USA
PHONE: 505.242.6411
WWW.UNIRAC.COM

PRODUCT LINE:	SFM INFINITY
DRAWING TYPE:	PARTS ASSEMBLY
DESCRIPTION:	SPLICE 6.5"
REVISION DATE:	4/22/2019

DRAWING NOT TO SCALE
ALL DIMENSIONS ARE
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SFM-A06

SHEET



**PROUD AMERICAN
ELECTRICAL & SOLAR**
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SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-16

SFM INFINITY



EASY INSTALLATION - SUPERIOR PERFORMANCE

- Make two installs per day your new standard. SFM INFINITY has fewer roof attachments, one tool installation and pre-assembled components to get you off the roof 40% faster.

BETTER AESTHETICS

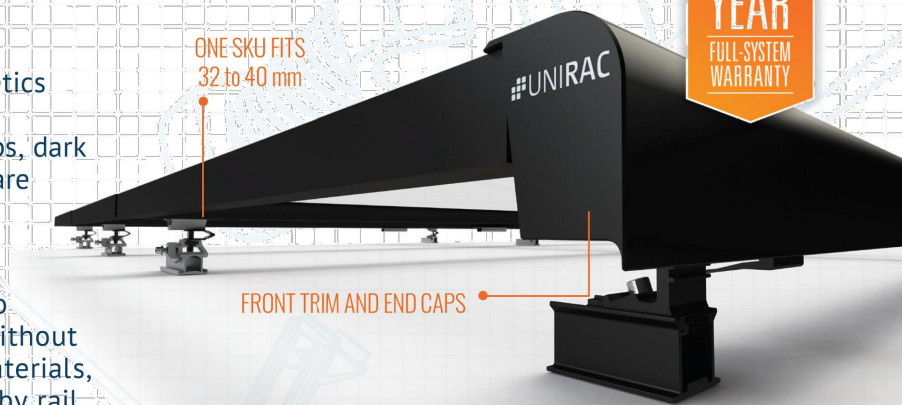
- Install the system with the aesthetics preferred by homeowners, with integrated front trim, trim end caps, dark components, and recessed hardware

MAXIMUM POWER DENSITY

- Easily mix module orientations to achieve optimal power density without incurring the increased bill of materials, labor, and attachments required by rail.

SAVE TIME AND MONEY IN EVERY PROJECT

- SFM INFINITY requires 20% fewer attachments than rail systems.
- SFM INFINITY is easier to stock with fewer SKUs and compact components, is easier to stock, transport and to lift to the roof.



WHY SFM INFINITY?

Take your business to the next level with SFM INFINITY, UNIRAC's rail-less PV mounting system for flush mount installations on comp shingle and tile roofs. An advanced 3rd generation product platform in use by top solar contractors nationwide, SFM INFINITY optimizes your operations on and off the roof, with approximately 40% less labor, 30% logistics savings, and 20% fewer roof attachments than traditional solar racking. Plus, homeowners prefer SFM INFINITY's aesthetics over rail based systems.

FOR QUESTIONS OR CUSTOMER SERVICE CONTACT:
505-242-6411 | SALES@UNIRAC.COM | WWW.UNIRAC.COM
PUB2024JAN01-V1

CONFORMS TO
UL2703



PROUD AMERICAN ELECTRICAL INC
COLORADO SPRINGS,
CO 80909, USA
TEL: (719) 360-4986
LICENSE NUMBER: EC.0102307
Email : jesse.berkshire@proudamericansolar.com

VERSION		
DESCRIPTION	DATE	REV
INITIAL RELEASE	10/23/2024	UR

PROJECT NAME

MURPHY ADU 1318 N NEVADA
1318 N NEVADA AVE,
COLORADO SPRINGS, CO 80903 USA
UTILITY: COLORADO SPRINGS UTILITIES
APN : N/A
AHJ: CITY OF COLORADO SPRINGS

SHEET NAME
SPEC SHEETS

SHEET SIZE
**ANSI B
11" X 17"**

SHEET NUMBER
PV-17



TECHNICAL SPECIFICATIONS:

Material Types
All extruded components:
 6005A-T61 or 6061-T6 Aluminum

Hardware: Stainless Steel

Bonding and Grounding: Integrated in Microrail™ (Trimrail™ and row to row bonding require additional components)

TOOLS REQUIRED OR RECOMMENDED FOR LAYOUT, FLASHINGS & ROOF ATTACHMENTS:

- Hammer
- Marker / crayon
- Measuring tape
- Drill
- Pilot drill bit
- Pry bar
- String line

TOOLS FOR MODULE INSTALL:

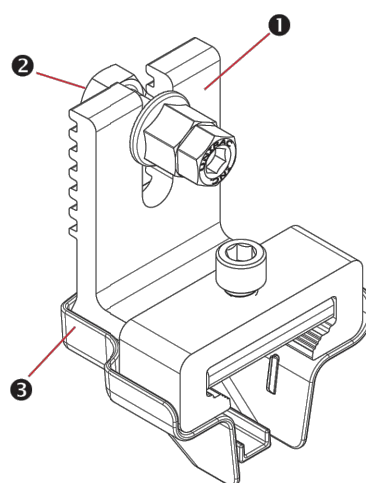
- Drill and socket adapter or socket wrench
- 1/4" hex driver
- Torque wrench
- 1/2" socket (optional)

SAFETY:

All applicable OSHA safety guidelines should be observed when working on a PV installation job site. The installation and handling of PV solar modules, electrical installation and PV racking systems involves handling components with potentially sharp metal edges. Rules regarding the use of gloves and other personal protective equipment should be observed.

TORQUE SPECIFICATIONS:

All SFM Hardware	20 ft-lbs (unless otherwise noted)
Grounding lugs	See page 22



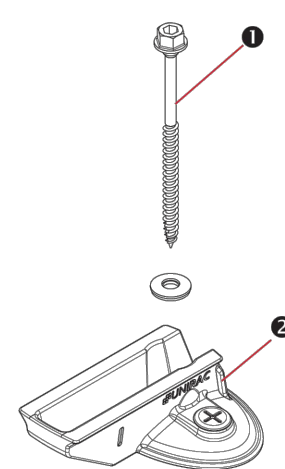
Flashloc Trim Attachments
 (Part Number - 004095D)

Sub-Components:

1. Trim Assembly
2. Hardware (Hex Bolt)
3. Plastic Cap

Functions:

- Attach Trimrail™ to roof attachment



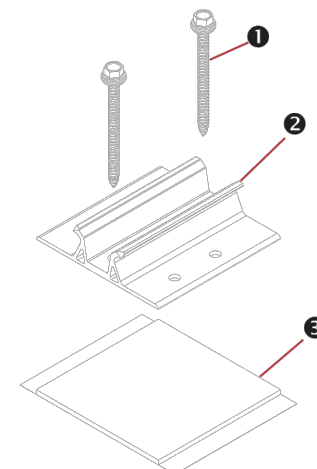
Flashloc SFM Slider
 (Part Number - 004285M)

Sub-Components:

1. Structural Screw & SS EPDM washer
2. Flashloc Slider

Functions:

- Shingle comp roof attachment with Flashloc Technology
- Connect with TrimRail™ & SFM Splice



SFM DTD Butyl Attachment
 (Part Number - SFMBTLM1)

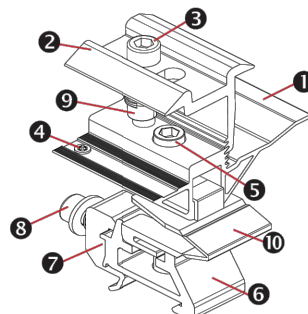
Sub-Components:

1. (2) 3" Screw, HWH, SS, #14-14, TYPE AB, W/#14 EPDM washer
2. SFM DTD Attachment
3. Butyl Pad

Functions:

- Slider provides north/south adjustment along the slope of the roof
- Compatible with 2" Microrail, 8" Attached Splices, and Flashloc Trim attachment.

NOTE: Extra screws (P/N: 003251W) & Extra butyl pads (P/N: XTRABUTL-SFM) for direct-to-deck applications are sold separately.



SUNFRAME Microrail™ - 2"
 (Part Number - 250020U/ 253020U(30 mm))

Sub-Components:

1. Base
2. Cap
3. Clamp Socket Head Cap Screw
4. Bonding Pin
5. Height Adjustment Feature
6. Tower
7. Dovetail Lock
8. Dovetail Socket Head Cap Screw
9. Spring Clip
10. Anti-rotation Clip

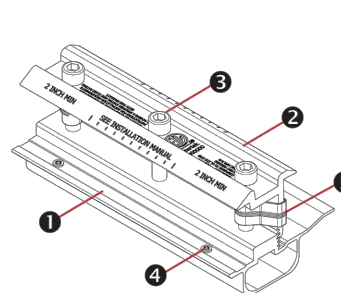
Functions:

- 1 or 2 module support to roof attachment
- Single Use Only

Features:

- Arrives on-site pre-assembled and ready for installation
- Cap indicates module height compatibility
- Supports discrete module thicknesses from 30mm* to 40mm
- Receiving feature that allows simple module placement, tightening of fasteners and eliminates working over modules.

NOTE: 1. For 30mm modules, 30mm Microrails, Splices, and Attached splices must be used.
2. All parts with bonding features are certified for single-use only, unless noted otherwise.



SUNFRAME Microrail™ 6.5" Splice
 (Part Number - 250010U/ 253010U (30 mm))

Sub-Components:

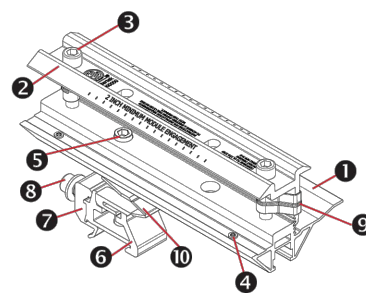
1. Base
2. Cap
3. (3) Clamping Socket Head Cap Screws
4. Bonding Pins
5. (2) Spring Clips

Functions:

- 2,3 or 4 module support & connection
- E-W module to module bonding
- Single Use Only

Features:

- Arrives on-site pre-assembled and ready for installation
- Cap indicates module height compatibility
- Supports discrete module thickness from 30mm* to 40mm
- Receiving feature that allows simple module placement, tightening of fasteners and eliminates working over modules.
- Does not attach to roof



SUNFRAME Microrail™ 8" Attached Splice
 (Part Number - 250030U/ 253030U (30 mm))

Sub-Components:

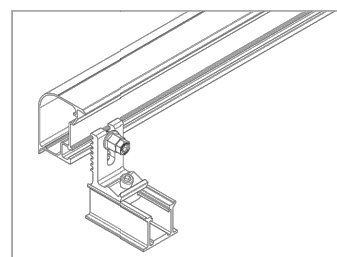
1. Base
2. Cap
3. (2) Clamp Socket Head Cap Screws
4. (2) Bonding Pins
5. Height Adjustment Feature
6. Tower
7. Dovetail Lock
8. Dovetail Socket Head Cap Screw
9. (2) Spring Clip
10. Anti-Rotation Clip

Functions:

- 2, 3, or 4 module support to roof attachment (when attachment is necessary at splice point)
- E-W module to module bonding
- Single Use Only

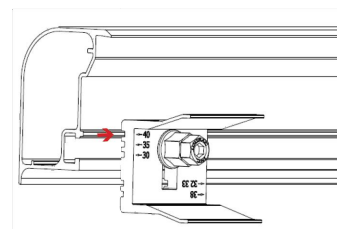
Features:

- Arrives on-site pre-assembled and ready for installation
- Cap indicates module height compatibility
- Supports discrete module thickness from 30mm* to 40mm
- Receiving feature that allows simple module placement, tightening of fasteners and eliminates working over modules.



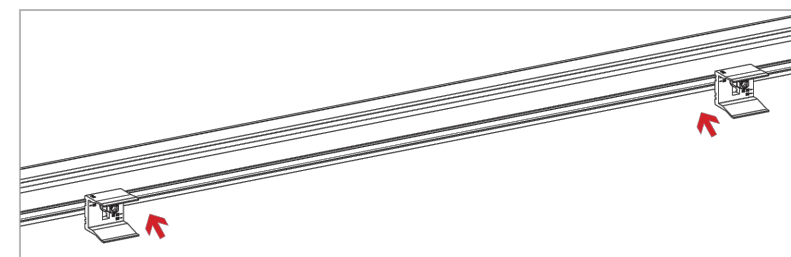
ATTACH TRIMRAIL TO ROOF ATTACHMENT:

Attach rail using 3/8" hex bolt & Tri-drive or serrated flange nuts. Make sure Trimrail™ is level across all Trimrail™ roof attachments. After rail is level, tighten channel clamp bolts to secure Trimrail™ roof attachments to channels.



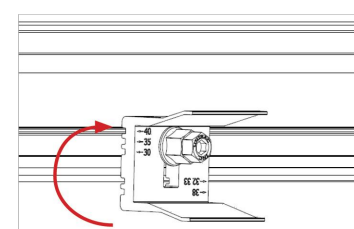
POSITION MODULE CLIPS ACCORDING TO MODULE THICKNESS:

Align notch in module clip with trimrail rib according to module thickness (identified in mm on faces of module clips). Rotate clip to position at required location.



INSTALL MODULE CLIPS ON TRIMRAIL:

Attach module clips to Trimrail using 3/8" T-bolts and Tri-drive or serrated flange nuts. A minimum of two clips are required per module. Refer to SFM D&E guide and U-builder for required position and quantity of module clips.



NOTE: module clips may be pre-installed on trimrail prior to attaching trimrail to roof attachments

NOTE: Bonding pin on Microrails should be positioned downslope.

INSTALL MICRORAILS:

Install Microrail™ into sliders and push Microrail™ to top of slider. Ensure that cap remains in upper most (40mm) position.

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 UTILITY: COLORADO SPRINGS UTILITIES
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SHEET NAME

SPEC SHEETS

SHEET SIZE

ANSI B
 11" X 17"

SHEET NUMBER

PV-18

Electrical Bonding and Grounding Test Modules

The list below is not exhaustive of compliant modules but shows those that have been evaluated and found to be electrically compatible with the SFM system.

Manufacture	Module Model / Series
Panasonic	EVPVxxx (H/K/PK), VBHNxxxSA15 & SA16, VBHNxxxSA17 & SA18, VBHNxxxSA17(E/G) & SA18E, VBHNxxxKA01 & KA03 & KA04, VBHNxxxZA01, VBHNxxxZA02, VBHNxxxZA03, VBHNxxxZA04
Peimar	SGxxxM (FB/BF)
Phono Solar	PS-60, PS-72
Prism Solar	P72 Series
Q.Cells	Plus, Pro, Peak, G3, G4, G5, G6(+), G7, G8(+) Pro, Peak L-G2, L-G4, L-G5, L-G6, L-G7 Q.PEAK DUO BLK-G6+ Q.PEAK DUO BLK-G6+/TS Q.PEAK DUO (BLK)-G8(+) Q.PEAK DUO L-G8.3/BFF Q.PEAK DUO (BLK) ML-G9(+) Q.PEAK DUO XL-G9/G9.2/G9.3 Q.PEAK DUO (BLK) ML-G10(+) Q.PEAK DUO XL-G(10/10.2/10.3/10.c/10.d) Q.PEAK DUO BLK ML-G10+ t Q.TRON BLK M-G2+ SERIES
REC	Alpha (72) (Black) (Pure) RECxxxAA (PURE-R) (Pure-RX) RECxxxNP3 Black N-Peak (Black) N-Peak 2 (Black) PEAK Energy Series PEAK Energy BLK2 Series PEAK Energy 72 Series

Manufacture	Module Model / Series
REC (cont.)	TwinPeak Series TwinPeak 2 Series TwinPeak 2 BLK2 Series TwinPeak 2S(M)72(XV) TwinPeak 3 Series (38mm) TP4 (Black)
Renesola	Vitrus2 Series & 156 Series
Risen	RSM72-6 (MDG) (M), RSM60-6
SEG Solar	SEG-xxx-BMD-HV SEG-xxx-BMD-TB
S-Energy	SN72 & SN60 Series (40mm)
Seraphim	SEG-6 & SRP-6 Series
Sharp	NU-SA & NU-SC Series
Silfab	SLA, SLG, BC Series & SILxxx(BL/NL/NT/HL/ ML/BK/NX/NU/HC/QM)
Solarever USA	SE-166*83-xxxM-120N
Solaria	PowerXT-xxxR-(AC/PD/BD) PowerXT-xxxC-PD PowerXT-xxxR-PM (AC)
SolarWorld	Sunmodule Protect, Sunmodule Plus
Sonali	SS-M-360 to 390 Series, SS-M-390 to 400 Series, SS-M-440 to 460 Series, SS-M-430 to 460 BiFacial Series, SS 230 - 265
SunEdison	F-Series, R-Series & FLEX FXS Series
Suniva	MV Series & Optimus Series

Manufacture	Module Model / Series
SunPower	A-Series A400-BLK, SPR-MAX3-XXX-R, X-Series, E-Series & P-Series, Axxx-BLK-G-AC, SPR-Mxxx-H-AC SPR-Mxxx-BLK-H-AC
Suntech	STP, STPXXXS - B60/Wnhb
Talesun	TP572, TP596, TP654, TP660, TP672, Hipor M, Smart
Tesla	SC, SC B, SC B1, SC B2 TxxxH, TxxxS
Trina	PA05, PD05, DD05, DE06, DD06, PE06, PD14, PE14, DD14, DE09.05, DE14, DE15, PE15H
Universal Solar	UNIxxx-120M-BB, UNIxxx-120MH, UNIxxx-108M-BB,
Upsolar	UP-MxxxP(-B), UP-MxxxM(-B)
United Renewable Energy (URE)	D7MxxxH7A, D7(M/K)xxxH8A FAKxxx(C8G/E8G), FAMxxxE7G-BB FAMxxxE8G(-BB), FBMxxxMFG-BB
URECO	F6MxxxE7G-BB
Vikram	Eldora, Solivo, Somera
VSUN	VSUNxxx-(108/120)M-BB VSUNxxx-108BMH
Waaree	AC & Adiya Series
Winaico	WST & WSP Series
Yingli	YGE & YLM Series
ZN Shine	ZXM6-72, ZXM6-NH144-166_2094

- Unless otherwise noted, all modules listed above include all wattages and specific models within that series. Variable wattages are represented as "xxx"
- Items in parenthesis are those that may or may not be present in a compatible module's model ID
- Slashes "/" between one or more items indicates that either of those items may be the one that is present in a module's model ID
- Please see the SFM UL2703 Construction Data Report at unirac.com to ensure the exact solar module selected is approved for use with SFM
- SFM Infinity is not compatible with module frame height of less than 30mm and more than 40mm. See Module Mounting section, page 15 for further information

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 1318 N NEVADA AVE,
 COLORADO SPRINGS, CO 80903 USA
 UTILITY: COLORADO SPRINGS UTILITIES
 APN : N/A
 AHJ: CITY OF COLORADO SPRINGS

SHEET NAME
SPEC SHEETS
SHEET SIZE
ANSI B 11" X 17"
SHEET NUMBER
PV-19

14-October-2022

Unirac
1411 Broadway Blvd. NE
Albuquerque, NM 87101
Tel: 505 242 6411

Attn.: Engineering Department

Subject: Engineering Certification for the Unirac SunFrame MicroRail (SFM) Infinity to Support Photovoltaic Panels.

The Unirac SunFrame MicroRail (SFM) is a rail-less, fully integrated solar racking system for residential sloped roofs and installed parallel to the roof surface.

We have reviewed the SunFrame MicroRail (SFM) Infinity, a proprietary mounting system for rooftop solar photovoltaic (PV) panels installation, and the U-Builder 2.0 Online tool. This U-Builder 2.0 software includes analysis for SFM Microrail 2", SFM Attached Splice 8", SFM Splice 6.5", and SFM Trimrail. All information, data, and analysis are in compliance with the following codes, city ordinances, and typical specifications:

- Codes:**
1. ASCE/SEI 7-05, 7-10 & 7-16 Minimum Design Loads for Buildings and other Structures.
 2. International Building Code, 2006-2021 Edition w/ Provisions from SEAOC PV-2 2017.
 3. International Residential Code, 2006- 2021 Edition w/ Provisions from SEAOC PV-2 2017.
 4. AC428, Acceptance Criteria for Modular Framing Systems Used to Support Photovoltaic (PV) Panels, November 1, 2012 by ICC-ES.

The following are typical specifications to meet the above code requirements:

- Design Criteria:** Ground Snow Load = 0 - 100 (psf)
Basic Wind Speed = 95 - 190 (mph)
Roof Mean Height = 0 - 60 (ft)
Roof Pitch = 0°-45°
Exposure Category = B, C & D
- Attachment Spacing:** Per U-Builder 2.0 Engineering report.
- Cantilever:** Per U-Builder 2.0 Engineering report.
- Clearance:** 2" to 10" clear from the top of the roof to the top of the PV panel.
- Tolerance(s):** 1.0" tolerance for any specified dimension in this report is allowed for installation.
- Installation Orientation:** See SFM Installation Guide.
Landscape - PV Panel long dimension is parallel to ridge/eave line of the roof and the PV panel is mounted on the long side.
Portrait - PV Panel short dimension is parallel to ridge/eave line of the roof and the PV panel is mounted on the short side.
Attachment shall be staggered where ground snow load exceeds 10 PSF.

Components and Cladding Roof Zones:

The Components and Cladding Roof Zones shall be determined based on ASCE 7-05, 7-10 & 7-16 Component and Cladding design.

- Notes:**
1. U-Builder 2.0 Online tool analysis is only for Unirac SFM Infinity and do not include roof capacity check.
 2. Risk Category II per ASCE 7-16.
 3. Topographic factor, k_{zt} is 1.0.
 4. Array Edge Factor $Y_E = 1.5$
 5. Average parapet height is 0.0 ft.
 6. Wind speeds are LRFD values.
 7. Attachment spacing(s) apply to a seismic design category E or less.

Design Responsibility:

The U-Builder 2.0 design software is intended to be used under the responsible charge of a registered design professional where required by the authority having jurisdiction. In all cases, this U-Builder 2.0 software should be used under the direction of a design professional with sufficient structural engineering knowledge and experience to be able to:

- Evaluate whether the U-Builder 2.0 Software is applicable to the project, and
- Understand and determine the appropriate values for all input parameters of the U-Builder 2.0 software.

This letter certifies that the Unirac SFM Infinity, when installed according to the U-Builder 2.0 engineering report and the manufacture specifications is in compliance with the above codes and loading criteria.

This certification excludes evaluation of the following components:

- 1) The structure to support the loads imposed on the building by the array; including, but not limited to: strength and deflection of structural framing members, fastening and/or strength of roofing materials, and/or the effects of snow accumulation on the structure.
- 2) The attachment of the SFM Microrail 2" or SFM Attached Splice 8" to the existing structure.
- 3) The capacity of the solar module frame to resist the loads.

This requires additional knowledge of the building and is outside the scope of the certification of this racking system.

Please feel free to call for any questions or clarifications.

Prepared By

Engineering Alliance, Inc
Sugar Land, TX



14-OCT-2022

VERSION

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SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-20



AUTHORIZATION TO MARK

This authorizes the application of the Certification Mark(s) shown below to the models described in the Product(s) Covered section when made in accordance with the conditions set forth in the Certification Agreement and Listing Report. This authorization also applies to multiple listee model(s) identified on the correlation page of the Listing Report.

This document is the property of Intertek Testing Services and is not transferable. The certification mark(s) may be applied only at the location of the Party Authorized To Apply Mark.

Applicant: Unirac, Inc **Manufacturer:**
Address: 1411 Broadway Blvd NE **Address:**
Albuquerque, NM 87102
Country: USA **Country:**
Party Authorized To Apply Mark: Same as Manufacturer
Report Issuing Office: Intertek Testing Services NA, Inc., Lake Forest, CA
Control Number: 5003705 **Authorized by:** Kenneth L. Snyder
for L. Matthew Snyder, Certification Manager



This document supersedes all previous Authorizations to Mark for the noted Report Number.

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Intertek Testing Services NA Inc.
545 East Algonquin Road, Arlington Heights, IL 60005
Telephone 800-345-3851 or 847-439-5667 Fax 312-283-1672

Standard(s):	Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels [UL 2703:2015 Ed.1+R:24Mar2021] PV Module and Panel Racking Mounting System and Accessories [CSA T.I.L. A-40:2020]
Product:	Photovoltaic Mounting System, Sun Frame Microrail Installation Guide, PUB2024MAY22
Brand Name:	Unirac
Models:	Unirac SFM



AUTHORIZATION TO MARK

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Applicant: Unirac, Inc **Manufacturer:**
Address: 1411 Broadway Blvd NE **Address:**
Albuquerque, NM 87102
Country: USA **Country:**
Party Authorized To Apply Mark: Same as Manufacturer
Report Issuing Office: Intertek Testing Services NA, Inc., Lake Forest, CA
Control Number: 5014989 **Authorized by:** Kenneth L. Snyder
for L. Matthew Snyder, Certification Manager



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545 East Algonquin Road, Arlington Heights, IL 60005
Telephone 800-345-3851 or 847-439-5667 Fax 312-283-1672

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Product:	Photovoltaic Mounting System, Sun Frame Microrail Installation Guide, PUB2024MAY22
Brand Name:	Unirac
Models:	Unirac SFM



PROUD AMERICAN ELECTRICAL INC
COLORADO SPRINGS,
CO 80909, USA
TEL: (719) 360-4986
LICENSE NUMBER: EC.0102307
Email: jesse.berkshire@proudamericansolar.com

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