

**PERMIT APPLICATION PACKAGE
TO INSTALL
NEW SOLAR PANELS
FOR
MICHAEL MYERS
700 MIDDLE STREET
PORTSMOUTH, NEW HAMPSHIRE**

Thomas M. Callery



Callery Consulting, LLC
PO Box 607
Pelham, New Hampshire 03076

*Callery Consulting, LLC
P.O. Box 607
Pelham, NH 03076
603-508-0037
mcal0904@comcast.net*

August 30, 2023

City of Portsmouth, New Hampshire
Inspection Department
Mr. Shanti Wolph, Chief Building Inspector
1 Junkins Avenue
Portsmouth, New Hampshire 03801

*Subject: Michael Myers Solar Installation
700 Middle Street, Portsmouth, New Hampshire*

Dear Mr. Wolph:

Attached please find all supporting calculations, sketches, details, photographs and supporting data for the installation of solar panels on the roof of the subject property. All calculations were performed in accordance with the “*International Residential Code*” (IRC) 2018. The roof snow load was determined by utilizing the data found in “*Ground Snow Loads for New Hampshire*” by the US Army Corps of Engineers, 2002.


A total of (26) solar panels (3 Arrays) are proposed to be installed on the roof of the house.

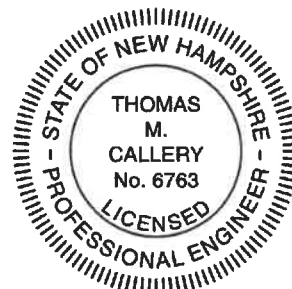
The existing roof structures consists of 2”x6” (True) wood rafters spaced @ 24” on center. The roof pitch varies-see calculations. The maximum horizontal unsupported span length is 11’-6”.

Structural calculations for the roof structures indicate that **STRUCTURAL MODIFICATIONS ARE NOT NEEDED** to carry the additional weight of the solar array (3 PSF) plus all specified snow, live and dead loads.

If you have any questions or require more information, please do not hesitate to contact me.

Sincerely,


Thomas M. Callery, P.E.
Professional Civil Engineer
NH #6763



PHOTOGRAPHS
SKETCHES/MEASUREMENTS
OF
EXISTING STRUCTURE

Callery Consulting, LLC
PO Box 607
Pelham, New Hampshire 03076

SCOPE OF WORK

SYSTEM SIZE: 10.53kW DC, 7.54kW AC
MODULES: (26) HANWHA Q. CELLS Q.PEAK DUO BLK ML-G10+ 405W
INVERTERS: (26) ENPHASE IQ8PLUS-72-2-US MICROINVERTERS
RACKING: IRONRIDGE AIRE RAIL A1
ATTACHMENT: IRONRIDGE AIRE DOCK, WITH L-FOOT

ARRAY TILT: **ARRAY AZIMUTH:**
 #1 - 44° #1 - 195°
 #2 - 9° #2 - 195°
 #3 - 28° #3 - 195°

ELECTRICAL INFORMATION
 UTILITY COMPANY: EVERSOURCE
 MAIN SERVICE AMPERAGE: 200A

BUILDING INFORMATION: TWO STORY HOUSE
 APN #: PRSMM0148B0029L
 ROOF TYPE: COMP. SHINGLE
 NUMBER OF LAYERS: 01
 ROOF RAFTERS: 2"X6" @ 24" O.C.

CODE SUMMARY

THIS PROJECT SHALL COMPLY WITH THE FOLLOWING CODE
 2018 FIRE CODE AS AMENDED BY SAF-FMO 300
 2018 INTERNATIONAL BUILDING CODE (IBC)
 2018 INTERNATIONAL RESIDENTIAL CODE (IRC)
 2018 INTERNATIONAL ENERGY CONSERVATION CODE (IECC)
 2018 INTERNATIONAL EXISTING BUILDING CODE (IEBC)
 2018 INTERNATIONAL MECHANICAL CODE (IMC)
 2018 INTERNATIONAL PLUMBING CODE (IPC)
 2020 NATIONAL ELECTRICAL CODE (NEC)
 STATE FIRE CODE SAF-C 6000


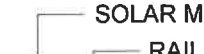





















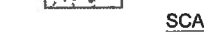


SHEET INDEX

PV-0	COVER SHEET
PV-1	SITE PLAN
PV-2	ARRAY DETAIL
PV-2A	STRING LAYOUT
PV-3	ATTACHMENT DETAILS
PV-4	ELECTRICAL LINE DIAGRAM
PV-5	ELECTRICAL CALCULATION
PV-6	PLACARDS
PV-7+	MANUFACTURER SPEC SHEET

GENERAL NOTES:

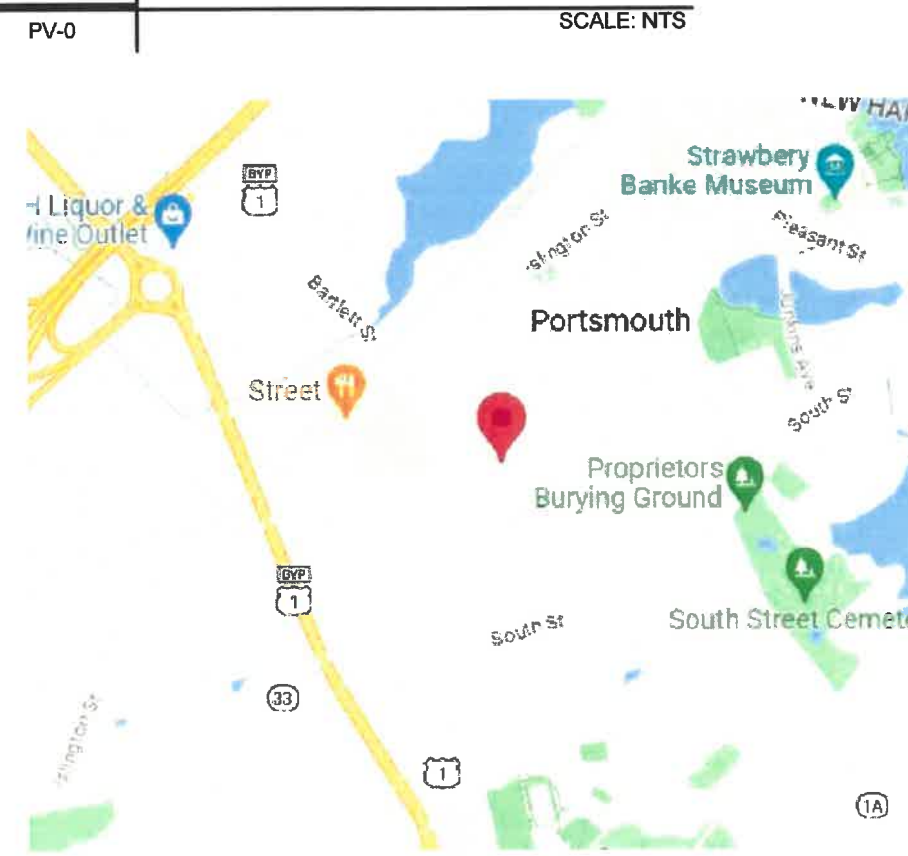
- PV INSTALLATION COMPLIES WITH THE NEC 2020 ARTICLE 690.12(B)(2).
- PHOTOVOLTAIC SYSTEM IS UNGROUNDED. NO CONDUCTORS ARE SOLIDLY GROUNDED IN THE INVERTER. SYSTEM COMPLIES WITH 690.35.
- MODULES CONFORM TO AND ARE LISTED UNDER UL 1703.
- INVERTER CONFORMS TO AND IS LISTED UNDER UL 1741.
- RACKING CONFORMS TO AND IS LISTED UNDER UL 2703.
- RAPID SHUTDOWN REQUIREMENTS MET WHEN INVERTERS AND ALL CONDUCTORS ARE WITHIN ARRAY BOUNDARIES PER NEC 690.12(1).
- CONSTRUCTION FOREMAN TO PLACE CONDUIT RUN PER 690.31(G).
- ARRAY DC CONDUCTORS ARE SIZED FOR DERATED CURRENT.
- 11.17 AMPS MODULE SHORT CIRCUIT CURRENT.
- 17.43 AMPS DERATED SHORT CIRCUIT CURRENT [690.8 (a) & 690.8 (b)].

LEGEND AND ABBREVIATIONS

	UTILITY METER		SOLAR MODULES RAIL	A	AMPERE
	MAIN PANEL		STANDOFFS & FOOTINGS	AC	ALTERNATING CURRENT
	SUB-PANEL		CHIMNEY	AFCI	ARC FAULT CIRCUIT INTERRUPTER
	PV LOAD CENTER		ATTIC VENT	AZIM	AZIMUTH
	DEDICATED PV METER		FLUSH ATTIC VENT	COMP	COMPOSITION
	INVERTER(S) WITH INTEGRATED DC DISCONNECT AND AFCI		PVC PIPE VENT	DC	DIRECT CURRENT
	AC DISCONNECT(S)		METAL PIPE VENT	(E)	EXISTING
	DC DISCONNECT(S)		T-VENT	EXT	EXTERIOR
	FUSED AC DISCONNECT		SATELLITE DISH	FRM	FRAMING
	COMBINER BOX		PROPERTY LINE	INT	INTERIOR
	ENPHASE MICROINVERTER		INTERIOR EQUIPMENT SHOWN AS DASHED	LBW	LOAD BEARING WALL
	FIRE SETBACKS		HARDSCAPE	MAG	MAGNETIC
	ACCESS PATHWAY		SCALE: NTS	MSP	MAIN SERVICE PANEL
				(N)	NEW
				NTS	NOT TO SCALE
				OC	ON CENTER
				PRE-FAB	PRE-FABRICATED
				PSF	POUNDS PER SQUARE FOOT
				PV	PHOTOVOLTAIC
				TL	TRANSFORMERLESS
				TYP	TYPICAL
				V	VOLTS
				W	WATTS



1 | AERIAL VIEW



2 | VICINITY MAP



603 SOLAR
 24 CHARTER ST.
 EXETER, NH 03833
 (603) 570-2607

REVISIONS		
DESCRIPTION	DATE	REV

PROJECT NAME & ADDRESS

MIKE MYERS
 700 MIDDLE STREET,
 PORTSMOUTH, NH 03801
 PHONE #: (603) 682-8321
 EMAIL: mike@jewettfarms.com
 10.53kW DC PHOTOVOLTAIC SYSTEM

SALES PERSON
 JOEY

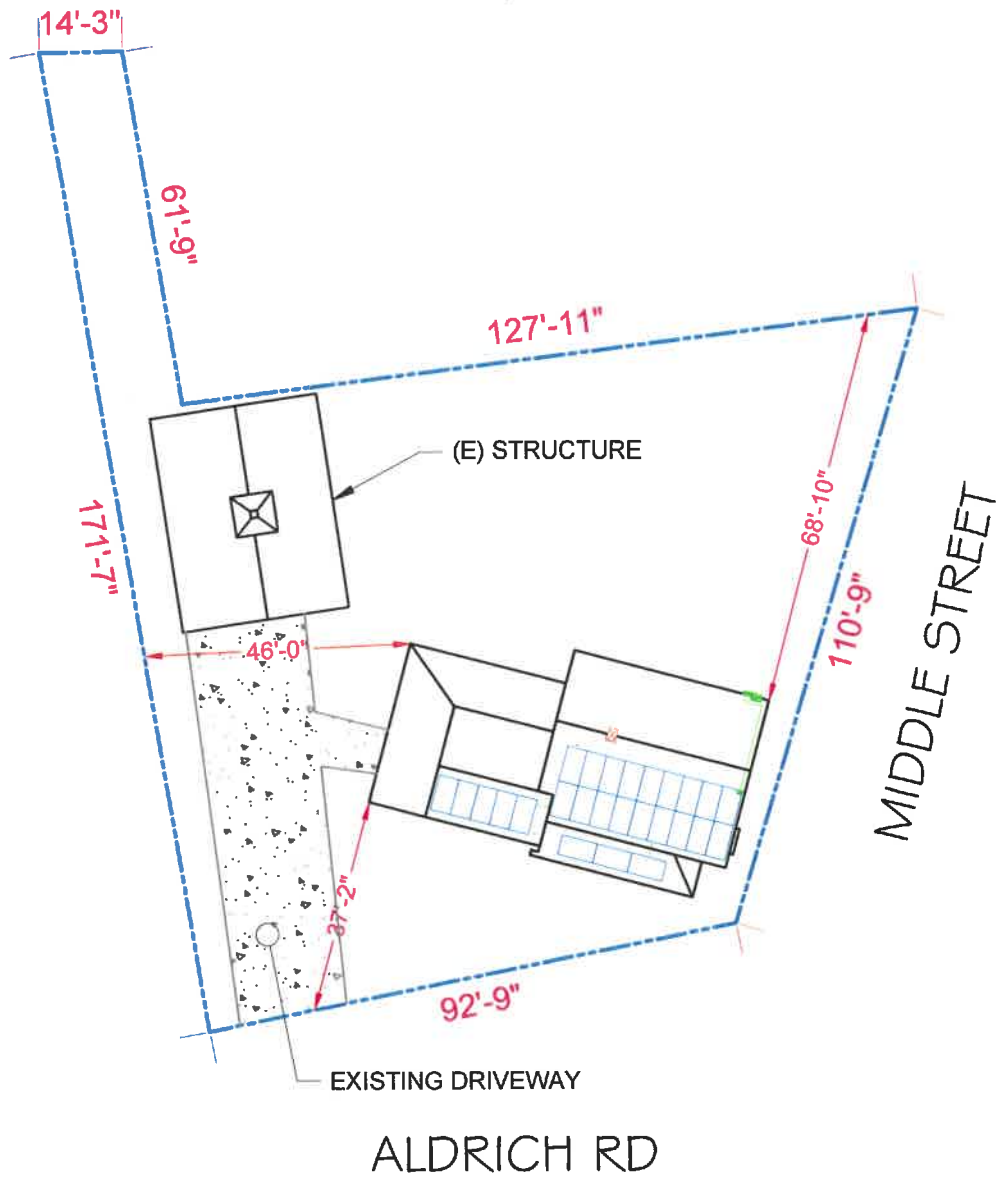
SHEET NAME
COVER SHEET

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

SHEET NUMBER
PV-0

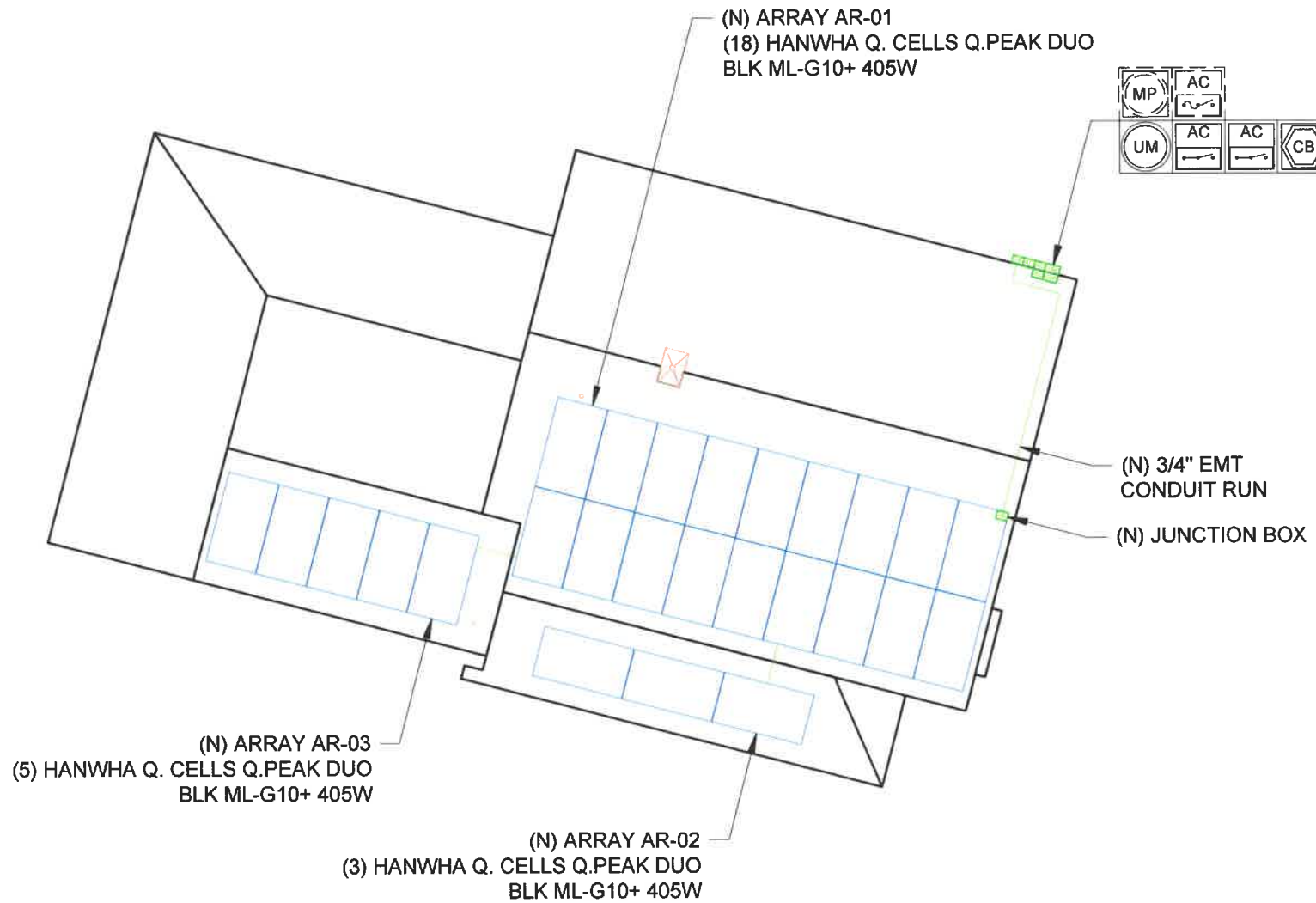
ADDITIONAL NOTE:

- THIS HOME IS IN THE HISTORIC DISTRICT.



1 SITE PLAN

PV-1 SCALE: 1/32" = 1'-0"



2 DETAIL VIEW

PV-1 SCALE: 3/32" = 1'-0"



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SHEET NAME
SITE PLAN

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

SHEET NUMBER
PV-1

MODULE TYPE, DIMENSIONS & WEIGHT

NUMBER OF MODULES = 26 MODULES
 MODULE TYPE = HANWHA Q. CELLS Q.PEAK DUO BLK ML-G10+ 405W
 MODULE WEIGHT = 48.5 LBS / 22.0 KG.
 MODULE DIMENSIONS = 74.0" x 41.1" = 21.12 SF
 UNIT WEIGHT OF ARRAY = 2.30 PSF



ARRAY AREA				
ROOF	# OF MODULES	ARRAY AREA (Sq. Ft.)	ROOF AREA (Sq. Ft.)	ROOF AREA COVERED BY ARRAY (%)
#1	18	549.12	2101	26.14
#2	3			
#3	5			
ROOF DESCRIPTION				
ROOF TYPE		COMP. SHINGLE		
ROOF	ARRAY TILT	AZIMUTH	RAFTERS SIZE	RAFTERS SPACING
#1	44°	195°	2"X6"	24" O.C.
#2	9°	195°	2"X6"	24" O.C.
#3	28°	195°	2"X6"	24" O.C.



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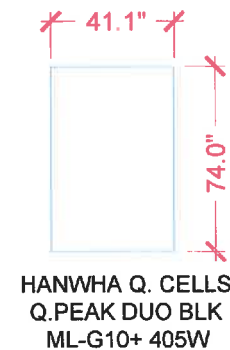
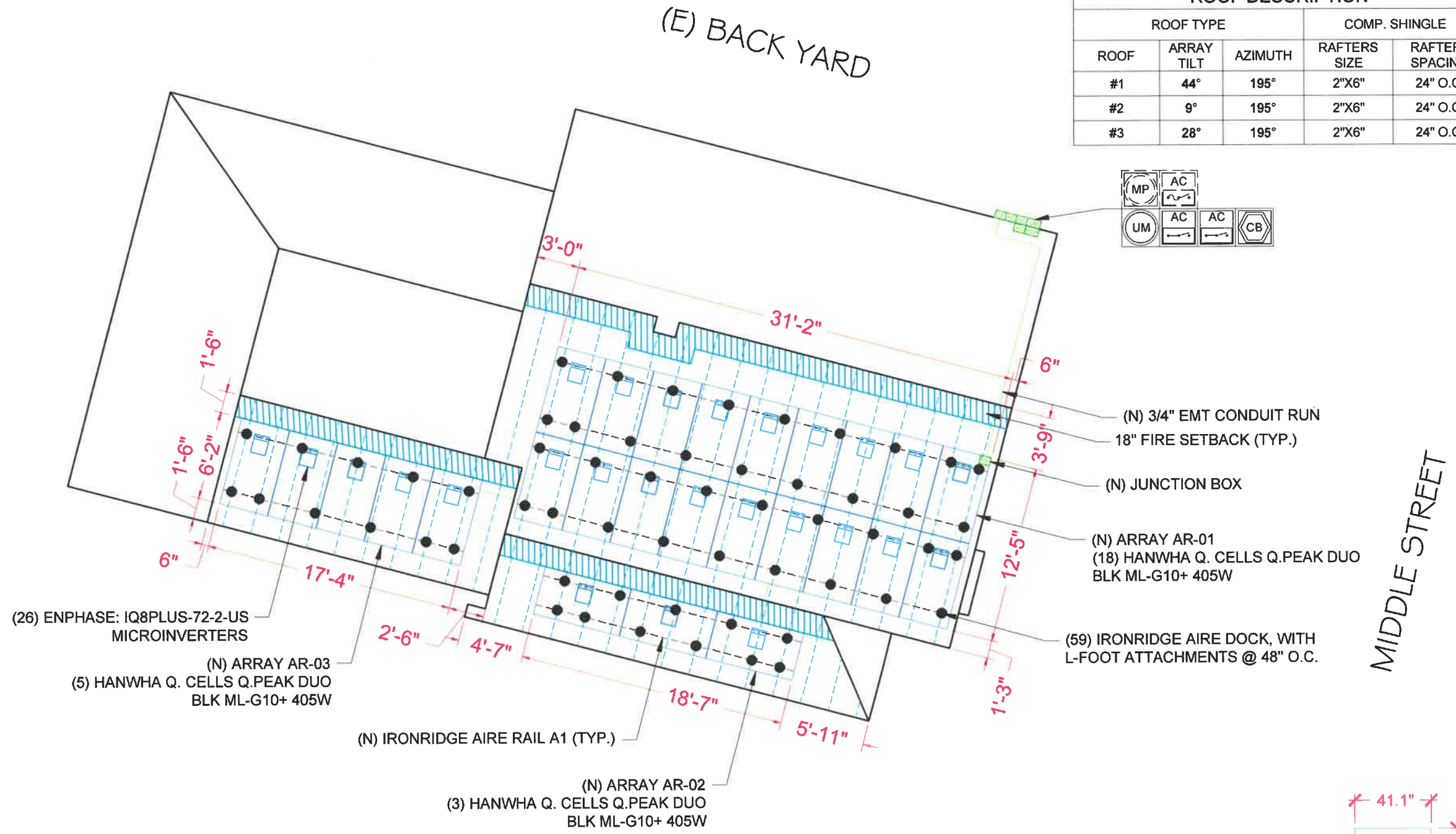
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 10.53KW DC PHOTOVOLTAIC SYSTEM

SALES PERSON
 JOEY

SHEET NAME
ARRAY DETAIL

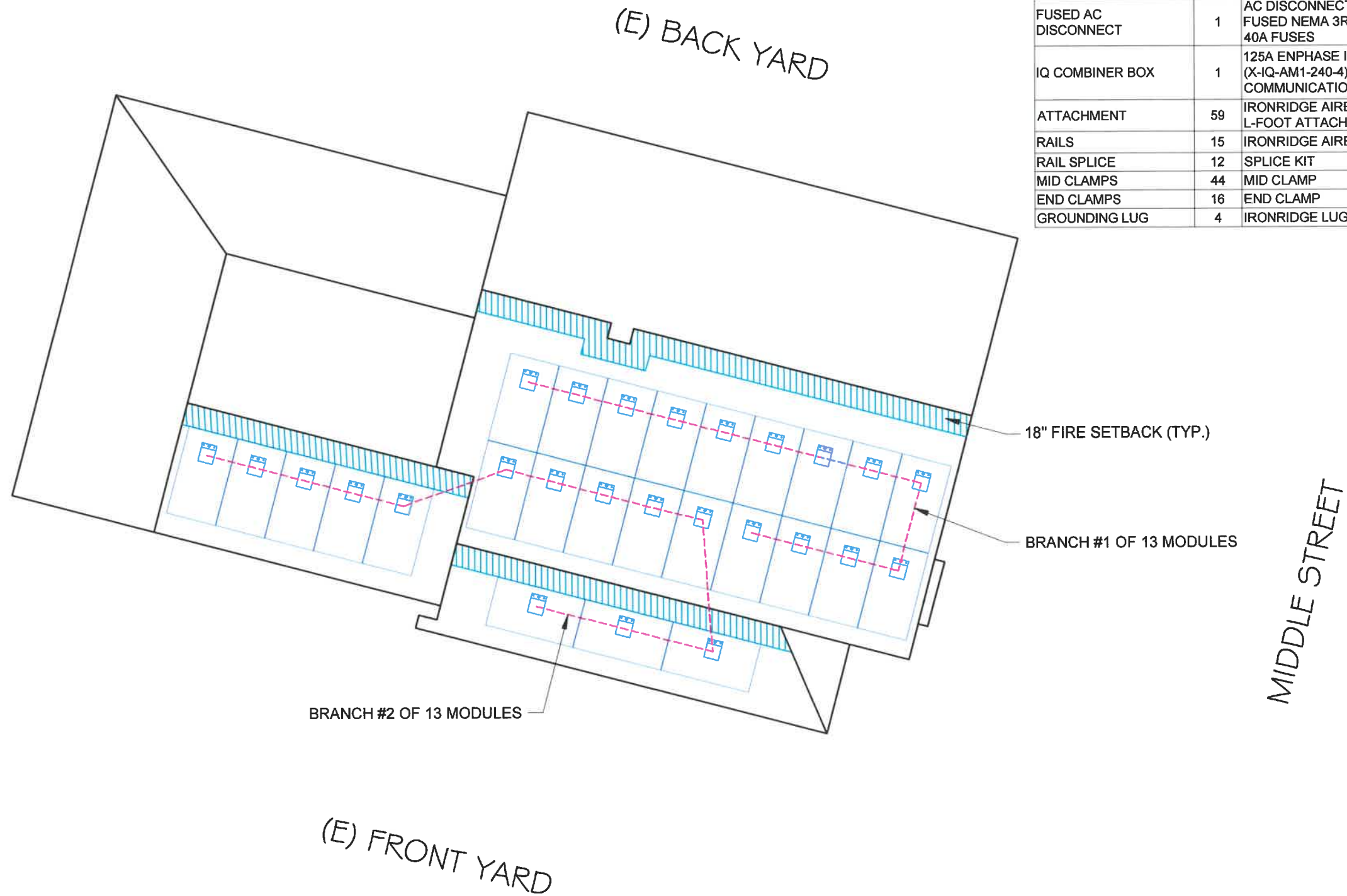
SHEET SIZE
**ANSI B
 11" X 17"**

SHEET NUMBER
PV-2



(26) HANWHA Q. CELLS Q.PEAK DUO BLK ML-G10+ 405W MODULE

(2) BRANCH OF 13 MODULES CONNECTED IN PARALLEL



BILL OF MATERIALS

EQUIPMENT	QTY	DESCRIPTION
SOLAR PV MODULE	26	HANWHA Q. CELLS Q.PEAK DUO BLK ML-G10+ 405W MODULES
INVERTER	26	ENPHASE: IQ8PLUS-72-2-US MICROINVERTERS
AC DISCONNECT	1	AC DISCONNECT: 240V, 60AMP, NEMA 3R, UL LISTED LOCKABLE AND NON-FUSIBLE
AC DISCONNECT	1	AC DISCONNECT: 240V, 60AMP, LOCKABLE KNIFE HANDLE DISCONNECT
FUSED AC DISCONNECT	1	AC DISCONNECT: 240V, 60AMP, FUSED NEMA 3R, UL LISTED WITH 40A FUSES
IQ COMBINER BOX	1	125A ENPHASE IQ COMBINER 4 BOX (X-IQ-AM1-240-4) WITH ENVOY COMMUNICATION GATEWAY
ATTACHMENT	59	IRONRIDGE AIRE DOCK, WITH L-FOOT ATTACHMENTS
RAILS	15	IRONRIDGE AIRE RAIL A1 170"
RAIL SPLICE	12	SPLICE KIT
MID CLAMPS	44	MID CLAMP
END CLAMPS	16	END CLAMP
GROUNDING LUG	4	IRONRIDGE LUG



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 10.53kW DC PHOTOVOLTAIC SYSTEM

SALES PERSON

JOEY

SHEET NAME

STRING LAYOUT

SHEET SIZE

**ANSI B
 11" X 17"**

SHEET NUMBER

PV-2A

1 | STRING LAYOUT

PV-2A | SCALE: 1/8" = 1'-0"

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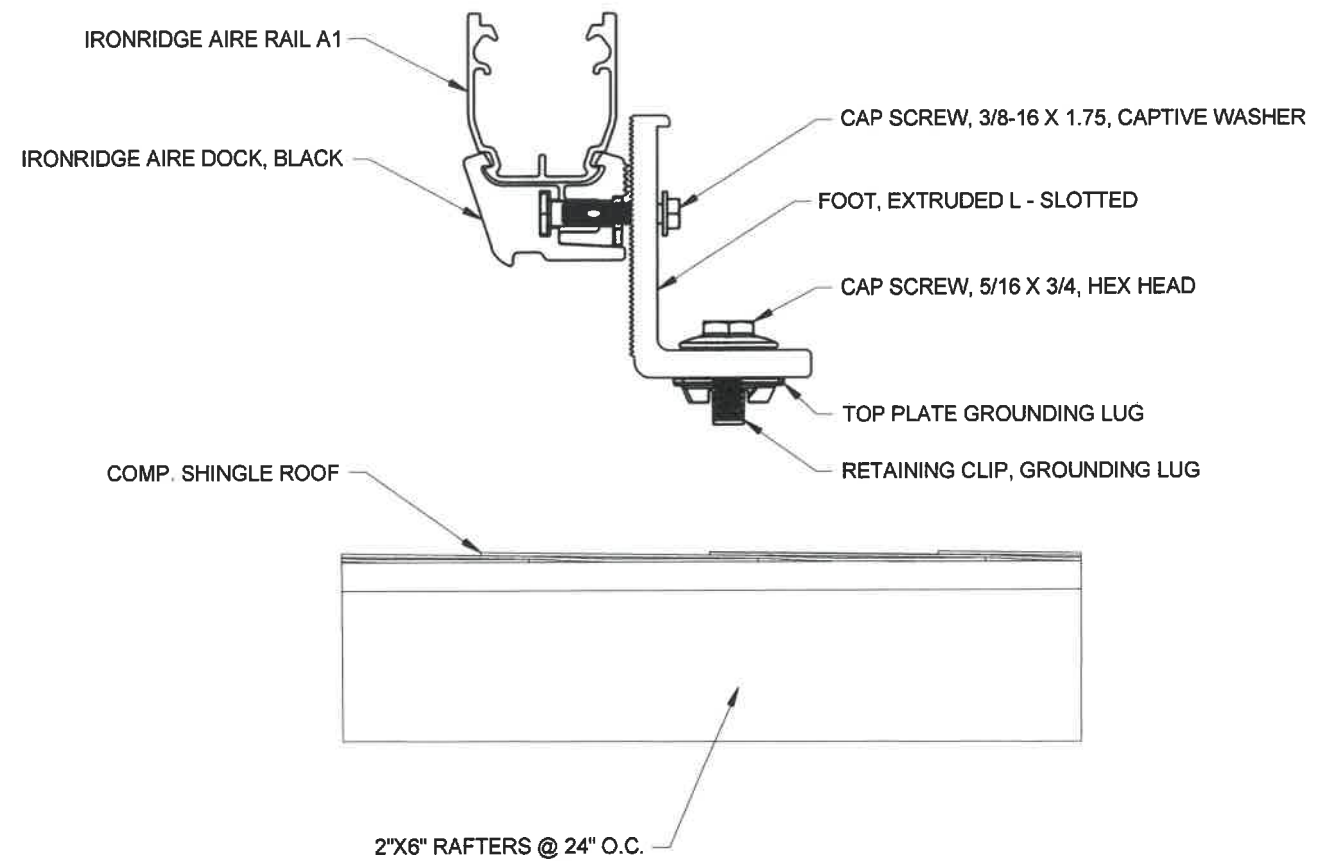
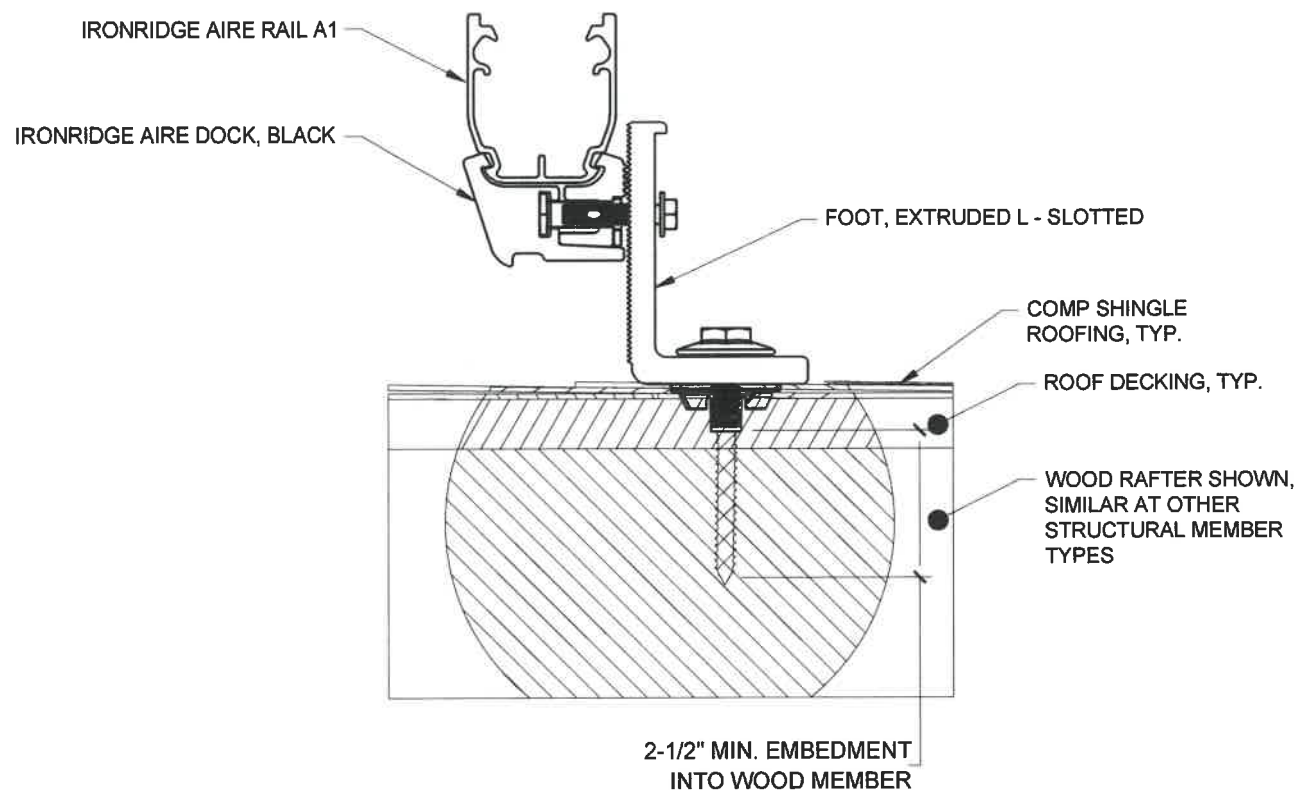
**ATTACHMENT
DETAILS**

SHEET SIZE

**ANSI B
11" X 17"**

SHEET NUMBER

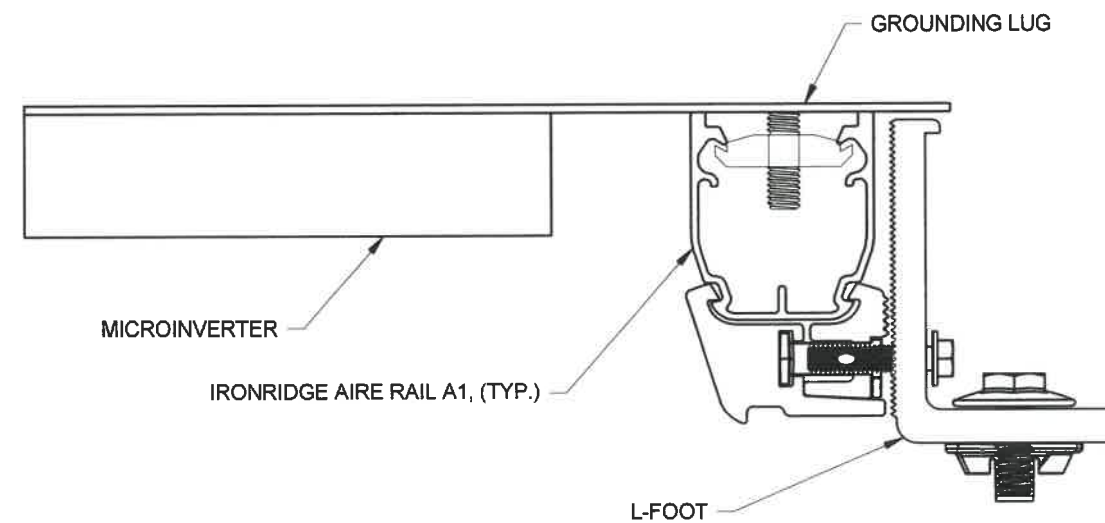
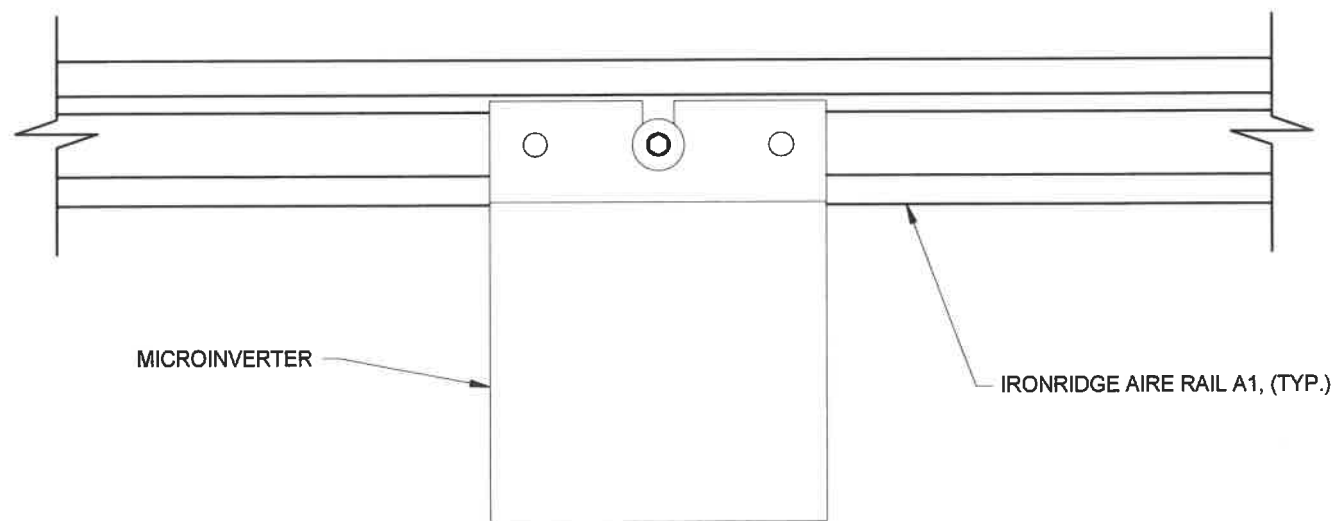
PV-3



1 ATTACHMENT DETAIL

PV-3

SCALE: NTS



2 MICROINVERTER DETAIL

PV-3

SCALE: NTS

(26) HANWHA Q. CELLS Q.PEAK DUO BLK ML-G10+ 405W MODULE

(2) BRANCH OF 13 MODULES CONNECTED IN PARALLEL



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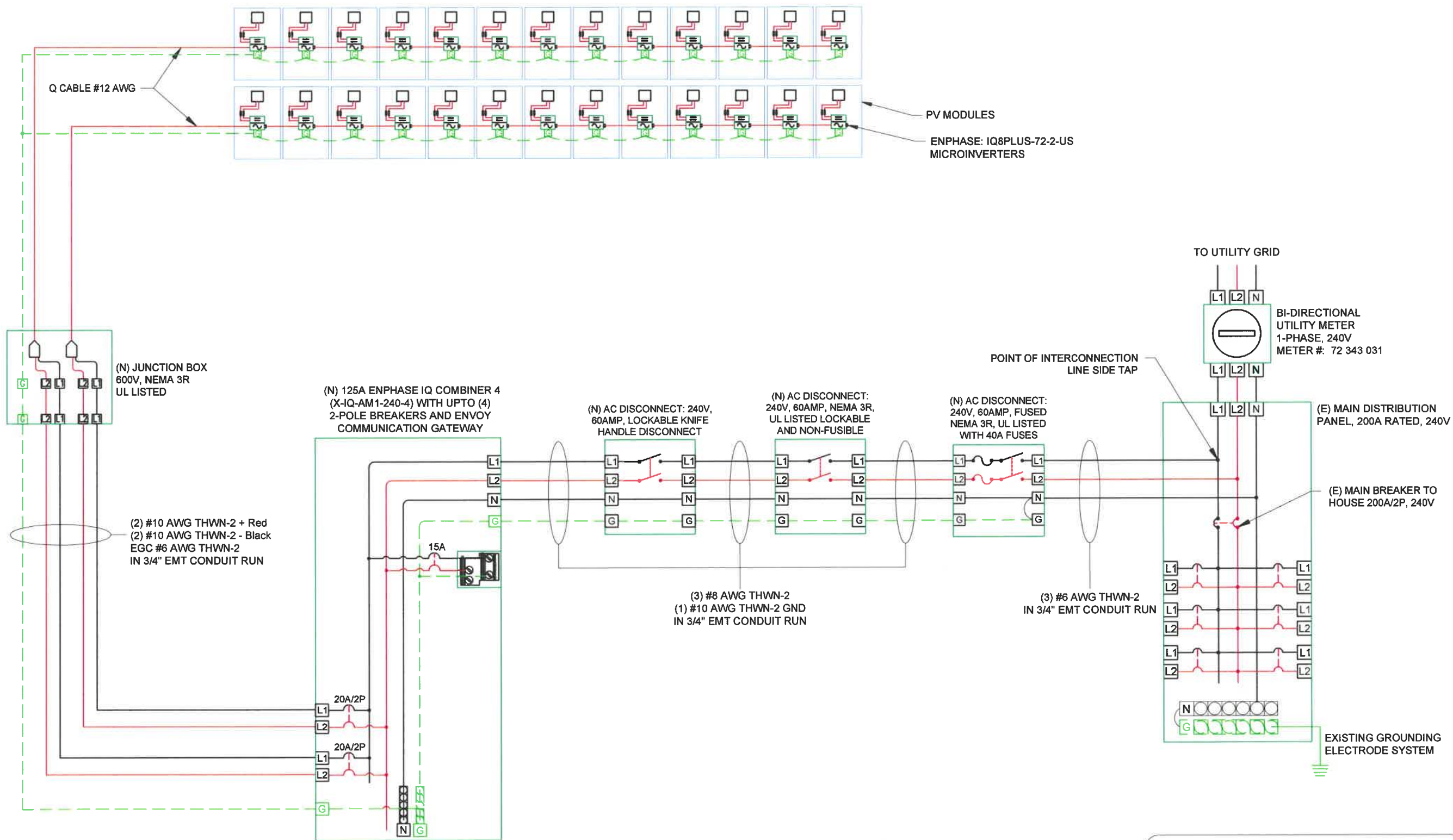
SHEET NAME
**ELECTRICAL
 LINE DIAGRAM**

SHEET SIZE

**ANSI B
 11" X 17"**

SHEET NUMBER

PV-4



SERVICE INFO	
UTILITY PROVIDER:	EVERSOURCE
MAIN SERVICE VOLTAGE:	240V
MAIN PANEL BRAND:	N/A
MAIN SERVICE PANEL:	200A
MAIN CIRCUIT BREAKER RATING:	200A
MAIN SERVICE LOCATION:	NORTH EAST WALL
SERVICE FEED SOURCE:	OVERHEAD

AC CONDUCTOR AMPACITY CALCULATIONS: FROM ROOF TOP JUNCTION BOX TO IQ COMBINER BOX

AMBIENT TEMPERATURE ADJUSTMENT FOR EXPOSED CONDUIT
PER NEC 310.15(B)(2)(c): + 22°
EXPECTED WIRE TEMP (°C): 31° + 22°
TEMP CORRECTION PER TABLE 310.15: 0.76
#OF CURRENT CARRYING CONDUCTORS: 4
CONDUIT FILL CORRECTION PER NEC 310.15(B)(2)(a): 0.80
CIRCUIT CONDUCTOR SIZE: 10 AWG
CIRCUIT CONDUCTOR AMPACITY: 40A

REQUIRED CIRCUIT CONDUCTOR AMPACITY PER NEC 690.8(A&B):
1.25 X MAX AC OUTPUT CURRENT X # OF INVERTERS PER STRING
BRANCH #1 & #2 : 1.25 X 1.21 X 13 = 19.66A

DERATED AMPACITY OF CIRCUIT CONDUCTOR PER NEC TABLE 310.15
TEMP CORR. PER NEC TABLE 310.15 X
CONDUIT FILL CORR. PER NEC 310.15(B)(2)(a) X
CIRCUIT CONDUCTOR AMPACITY = 0.76 X 0.80 X 40 = 24.32A

AC CONDUCTOR AMPACITY CALCULATIONS: FROM IQ COMBINER BOX TO FUSED AC DISCONNECT

EXPECTED WIRE TEMP (°C): 31°
TEMP CORRECTION PER NEC TABLE 310.15: 0.96
CIRCUIT CONDUCTOR SIZE: 8 AWG
CIRCUIT CONDUCTOR AMPACITY: 55A
#OF CURRENT CARRYING CONDUCTORS: 3
CONDUIT FILL PER NEC 310.15(B)(2)(a): 1
REQUIRED CIRCUIT CONDUCTOR AMPACITY PER NEC 690.8(B):
1.25 X OUTPUT CURRENT OF LOAD CENTER
1.25 X 1.21 X 26 = 39.33A

DERATED AMPACITY OF CIRCUIT CONDUCTORS PER NEC TABLE 310.15:
TEMP CORR. PER NEC 310.15 X
CONDUIT FILL CORR. PER NEC 310.15(B)(2)(a) X
CIRCUIT CONDUCTOR AMPACITY =
0.96 X 1.00 X 55 = 52.8A

ELECTRICAL NOTES

- NO DC CONDUCTORS PRESENT.
- ALL EQUIPMENT TO BE LISTED BY UL OR OTHER NRTL, AND LABELED FOR ITS APPLICATION.
- ALL CONDUCTORS SHALL BE COPPER, RATED FOR 600 V AND 90 DEGREE C WET ENVIRONMENT.
- WORKING CLEARANCES AROUND ALL NEW AND EXISTING ELECTRICAL EQUIPMENT SHALL COMPLY WITH NEC 110.26.
- DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS. CONTRACTOR SHALL FURNISH ALL NECESSARY OUTLETS, SUPPORTS, FITTINGS AND ACCESSORIES TO FULFILL APPLICABLE CODES AND STANDARDS.
- WHERE SIZES OF JUNCTION BOXES, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, THE CONTRACTOR SHALL SIZE THEM ACCORDINGLY.
- ALL WIRE TERMINATIONS SHALL BE APPROPRIATELY LABELED AND READILY VISIBLE.
- MODULE GROUNDING CLIPS TO BE INSTALLED BETWEEN MODULE FRAME AND MODULE SUPPORT RAIL, PER THE GROUNDING CLIP MANUFACTURER'S INSTRUCTION AND WHERE REQUIRED.
- MODULE SUPPORT RAIL TO BE BONDED TO COPPER G.E.C. VIA WEEB LUG OR ILSCO GBL-4DBT LAY-IN LUG.
- THE POLARITY OF THE GROUNDED CONDUCTORS IS NEGATIVE.

ENPHASE: IQ8PLUS-72-2-US MICROINVERTERS		
Input Data (DC)		
Recommended Input Power (STC)		235-440W +
Maximum Input DC Voltage		60V
Peak Power Tracking Voltage		27V-45V
Operating Range		16V-58V
Min. / Max. Start Voltage		22V / 58V
Max DC Short Circuit Current		25A
Output Data (AC)		
Maximum Output Power		290W
Nominal Output Current		1.21A
Nominal Voltage / Range		240V/211-264V
Nominal Frequency / Range		60 Hz
Extended Frequency / Range		47-68 Hz
Power Factor at rated power		1.0
Maximum unit per 20A Branch Circuit		13 (240 VAC)

PERCENT OF VALUES	NUMBER OF CURRENT CARRYING CONDUCTORS IN EMT
.80	4-6
.70	7-9
.50	10-20

AMBIENT TEMPERATURE SPECS	
RECORD LOW TEMP	-19°
AMBIENT TEMP (HIGH TEMP 2%)	31°
CONDUIT HEIGHT	0.5"
ROOF TOP TEMP	53°
CONDUCTOR TEMPERATURE RATE	90°



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10.53kW DC PHOTOVOLTAIC SYSTEM

SALES PERSON

JOEY

SHEET NAME

**ELECTRICAL
CALCULATION**

SHEET SIZE

**ANSI B
11" X 17"**

SHEET NUMBER

PV-5

! 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).

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

LABEL LOCATION:
 UTILITY SERVICE METER AND MAIN SERVICE PANEL.

! WARNING
INVERTER OUTPUT CONNECTION
DO NOT RELOCATE THIS OVERCURRENT DEVICE

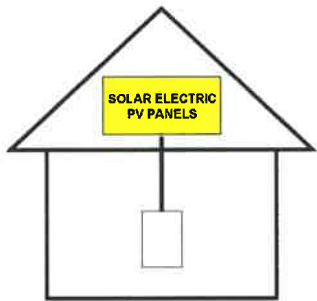
LABEL LOCATION:
 ADJACENT TO PV BREAKER (IF APPLICABLE).

! WARNING
PHOTOVOLTAIC SYSTEM COMBINER PANEL
DO NOT ADD LOADS

LABEL LOCATION:
 PHOTOVOLTAIC AC COMBINER (IF APPLICABLE).

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 THAN 1 M (3 FT) FROM THE SERVICE DISCONNECTING MEANS TO WHICH THE PV SYSTEMS ARE CONNECTED.

PHOTOVOLTAIC AC DISCONNECT
 MAXIMUM AC OPERATING CURRENT: 39.33 AMPS
 NOMINAL OPERATING AC VOLTAGE: 240 VAC

LABEL LOCATION:
 AC DISCONNECT(S), PHOTOVOLTAIC SYSTEM POINT OF INTERCONNECTION.

DATA PER PANEL

NOMINAL OPERATING AC VOLTAGE -	240	V
NOMINAL OPERATING AC FREQUENCY-	60	Hz
MAXIMUM AC POWER-	290	VA
MAXIMUM AC CURRENT-	1.21	A
MAXIMUM OVERCURRENT DEVICE RATING FOR AC MODULE PROTECTION PER CIRCUIT-	20	A

LABEL LOCATION:
 COMBINER BOX

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.



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SALES PERSON
 JOEY

SHEET NAME
PLACARDS

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

SHEET NUMBER
PV-6

powered by
Q.ANTUM DUO Z



Q.PEAK DUO BLK ML-G10+

385-405

ENDURING HIGH PERFORMANCE



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 Technology¹, 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 warranty².

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

THE IDEAL SOLUTION FOR:

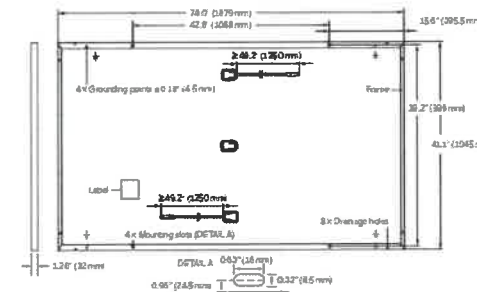


Engineered in Germany



MECHANICAL SPECIFICATION

Format	74.0in x 41.1in x 1.26in (Including frame) (1879mm x 1045mm x 32mm)
Weight	48.5 lbs (22.0 kg)
Front Cover	0.13in (3.2mm) thermally pre-stressed glass with anti-reflection technology
Back Cover	Composite film
Frame	Black anodized aluminum
Cell	6 x 22 monocrystalline Q.ANTUM solar half cells
Junction Box	2.09-3.98in x 1.26-2.36in x 0.59-0.71in (53-101mm x 32-60mm x 15-18mm), IP67, with bypass diodes
Cable	4mm ² Solar cable (+) ≥49.2in (1250mm), (-) ≥49.2in (1250mm)
Connector	Stäubli MC4; IP68

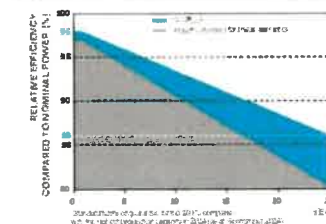


ELECTRICAL CHARACTERISTICS

POWER CLASS		385	390	395	400	405	
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC ¹ (POWER TOLERANCE +5W / -0W)							
Minimum	Power at MPP	P _{MPP} [W]	385	390	395	400	405
	Short Circuit Current	I _{sc} [A]	11.04	11.07	11.10	11.14	11.17
	Open Circuit Voltage	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 ²	η [%]	≥19.6	≥19.9	≥20.1	≥20.4	≥20.6
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT ¹							
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: 1000W/m², 25±2°C, AM 1.5 according to IEC 60904-3 + 800W/m², NMOT, spectrum AM 1.5

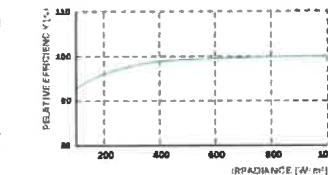
Q CELLS PERFORMANCE WARRANTY



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, 1000W/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 ¹	[lbs/ft ²]	75 (3600Pa) / 55 (2660Pa)	Permitted Module Temperature on Continuous Duty	-40°F up to +185°F (-40°C up to +85°C)
Max. Test Load, Push / Pull ¹	[lbs/ft ²]	113 (5400Pa) / 84 (4000Pa)		

¹ 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



PACKAGING INFORMATION

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

Hersteller: 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



603 SOLAR
24 CHARTER ST.
EXETER, NH 03833
(603) 570-2607

REVISIONS

DESCRIPTION	DATE	REV

PROJECT NAME & ADDRESS

MIKE MYERS
700 MIDDLE STREET,
PORTSMOUTH, NH 03801
PHONE #: (603) 682-8321
EMAIL: mike@jewettfarms.com
10.53kW DC PHOTOVOLTAIC SYSTEM

SALES PERSON

JOEY

SHEET NAME

DATA SHEET

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-7

Specifications subject to without charge © Q CELLS Q.PEAK DUO BLK ML-G10+ 385-405, 2021-01, Rev 01, NA



DATA SHEET

IQ8 and IQ8+ Microinverters

INPUT DATA (DC)		IQ8-60-2-US	IQ8PLUS-72-2-US
Commonly used module pairings ¹	W	235 - 350	235 - 440
Module compatibility		60-cell / 120 half-cell	54-cell / 108 half-cell, 60-cell / 120 half-cell, 66-cell / 132 half-cell and 72-cell / 144 half-cell
MPPT voltage range	V	27 - 37	27 - 45
Operating range	V	16 - 48	16 - 58
Min. / Max. start voltage	V	22 / 48	22 / 58
Max. input DC voltage	V	50	60
Max. continuous input DC current	A	10	12
Max. input DC short-circuit current	A		25
Max. module I _{sc}	A		20
Overvoltage class DC port			II
DC port backfeed current	mA		0
PV array configuration		1 x 1 Ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit	

OUTPUT DATA (AC)		IQ8-60-2-US	IQ8PLUS-72-2-US
Peak output power	VA	245	300
Max. continuous output power	VA	240	290
Nominal (L-L) voltage / range ²	V		240 / 211 - 264
Max. continuous output current	A	1.0	1.21
Nominal frequency	Hz		60
Extended frequency range	Hz		47 - 68
AC short circuit fault current over 3 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
Night-time power consumption	mW		60

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	MC4
Dimensions (H x W x D)	212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")
Weight	1.08 kg (2.38 lbs)
Cooling	Natural convection - no fans
Approved for wet locations	Yes
Pollution degree	PD3
Enclosure	Class II double-insulated, corrosion resistant polymeric enclosure
Environ. category / UV exposure rating	NEMA Type 6 / outdoor

COMPLIANCE	
Certifications	CA Rule 21 (UL 1741-SA), UL 62109-1, IEEE 1547:2018 (UL 1741-SB 3 rd Ed.), FCC Part 15 Class B, ICES-0003 Class B, CAN / CSA-C22.2 NO. 1071-01 This product is UL Listed as PV Rapid Shutdown Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020 section 690.12 and C22.1-2018 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to manufacturer's instructions.

(1) Pairing PV modules with wattage above the limit may result in additional clipping losses. See the compatibility calculator at <https://link.enphase.com/module-compatibility>.
(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.

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 in advanced 55nm 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 IQ Battery, IQ Gateway, and the Enphase App monitoring and analysis software.



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.



Connect PV modules quickly and easily to IQ8 Series Microinverters using the included Q-DCC-2 adapter cable with plug-n-play MC4 connectors.



IQ8 Series Microinverters are UL listed as PV Rapid Shutdown Equipment and conform with various regulations, when installed according to manufacturer's instructions.

Easy to Install

- Lightweight and compact with plug-n-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 3rd Ed.)

Note:

IQ8 Microinverters cannot be mixed together with previous generations of Enphase microinverters (IQ7 Series, IQ6 Series, etc.) in the same system.

*Only when installed with IQ System Controller 2, meets UL 1741.
**IQ8 and IQ8Plus support split-phase, 240V installations only.



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REVISIONS

DESCRIPTION	DATE	REV

PROJECT NAME & ADDRESS

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700 MIDDLE STREET,
PORTSMOUTH, NH 03801
PHONE #: (603) 682-8921
EMAIL: mike@jewettfarms.com
10.53kW DC PHOTOVOLTAIC SYSTEM

SALES PERSON

JOEY

SHEET NAME

DATA SHEET

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-8

Enphase IQ Combiner 4/4C

X-IQ-AM1-240-4
X-IQ-AM1-240-4C



X-IQ-AM1-240-4C

X-IQ-AM1-240-4



To learn more about Enphase offerings, visit enphase.com

The **Enphase IQ Combiner 4/4C** with Enphase IQ Gateway and integrated LTE-M1 cell modem (included only with IQ Combiner 4C) consolidates interconnection equipment into a single enclosure and streamlines IQ microinverters and storage installations by providing a consistent, pre-wired solution for residential applications. It offers up to four 2-pole input circuits and Eaton BR series busbar assembly.

Smart

- Includes IQ Gateway for communication and control
- Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), included only with IQ Combiner 4C
- Includes solar shield to match Enphase IQ Battery aesthetics and deflect heat
- Flexible networking supports Wi-Fi, Ethernet, or cellular
- Optional AC receptacle available for PLC bridge
- Provides production metering and consumption monitoring

Simple

- Centered mounting brackets support single stud mounting
- Supports bottom, back and side conduit entry
- Up to four 2-pole branch circuits for 240 VAC plug-in breakers (not included)
- 80A total PV or storage branch circuits

Reliable

- Durable NRTL-certified NEMA type 3R enclosure
- Five-year limited warranty
- Two years labor reimbursement program coverage included for both the IQ Combiner SKU's
- UL listed



Enphase IQ Combiner 4/4C

MODEL NUMBER

IQ Combiner 4 (X-IQ-AM1-240-4)

IQ Combiner 4 with Enphase IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes a silver solar shield to match the IQ Battery system and IQ System Controller 2 and to deflect heat.

IQ Combiner 4C (X-IQ-AM1-240-4C)

IQ Combiner 4C with Enphase IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), a plug-and-play industrial-grade cell modem for systems up to 60 microinverters. (Available in the US, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.) Includes a silver solar shield to match the IQ Battery and IQ System Controller and to deflect heat.

ACCESSORIES AND REPLACEMENT PARTS

(not included, order separately)

Ensemble Communications Kit
COMMS-CELLMODEM-M1-06
CELLMODEM-M1-06-SP-05
CELLMODEM-M1-06-AT-05

- Includes COMMS-KIT-01 and CELLMODEM-M1-06-SP-05 with 5-year Sprint data plan for Ensemble sites
- 4G based LTE-M1 cellular modem with 5-year Sprint data plan
- 4G based LTE-M1 cellular modem with 5-year AT&T data plan

Circuit Breakers
BRK-10A-2-240V
BRK-15A-2-240V
BRK-20A-2P-240V
BRK-15A-2P-240V-B
BRK-20A-2P-240V-B

Supports Eaton BR210, BR215, BR220, BR230, BR240, BR250, and BR260 circuit breakers.
Circuit breaker, 2 pole, 10A, Eaton BR210
Circuit breaker, 2 pole, 15A, Eaton BR215
Circuit breaker, 2 pole, 20A, Eaton BR220
Circuit breaker, 2 pole, 15A, Eaton BR215B with hold down kit support
Circuit breaker, 2 pole, 20A, Eaton BR220B with hold down kit support

EPLC-01

Power line carrier (communication bridge pair), quantity - one pair

XA-SOLARSHIELD-ES

Replacement solar shield for IQ Combiner 4/4C

XA-PLUG-120-3

Accessory receptacle for Power Line Carrier in IQ Combiner 4/4C (required for EPLC-01)

XA-ENV-PCBA-3

Replacement IQ Gateway printed circuit board (PCB) for Combiner 4/4C

X-IQ-NA-HD 125A

Hold down kit for Eaton circuit breaker with screws.

ELECTRICAL SPECIFICATIONS

Rating	Continuous duty
System voltage	120/240 VAC, 60 Hz
Eaton BR series busbar rating	125 A
Max. continuous current rating	65 A
Max. continuous current rating (input from PV/storage)	64 A
Max. fuse/circuit rating (output)	90 A
Branch circuits (solar and/or storage)	Up to four 2-pole Eaton BR series Distributed Generation (DG) breakers only (not included)
Max. total branch circuit breaker rating (input)	80A of distributed generation / 95A with IQ Gateway breaker included
Envoy breaker	10A or 15A rating GE/Siemens/Eaton included
Production metering CT	200 A solid core pre-installed and wired to IQ Gateway
Consumption monitoring CT (CT-200-SPLIT)	A pair of 200 A split core current transformers

MECHANICAL DATA

Dimensions (WxHxD)	37.5 x 49.5 x 16.8 cm (14.75" x 19.5" x 6.63"). Height is 21.06" (53.5 cm) with mounting brackets.
Weight	7.5 kg (16.5 lbs)
Ambient temperature range	-40° C to +46° C (-40° to 115° F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction
Wire sizes	<ul style="list-style-type: none"> • 20 A to 50 A breaker inputs: 14 to 4 AWG copper conductors • 60 A breaker branch input: 4 to 1/0 AWG copper conductors • Main lug combined output: 10 to 2/0 AWG copper conductors • Neutral and ground: 14 to 1/0 copper conductors Always follow local code requirements for conductor sizing.
Altitude	To 2000 meters (6,560 feet)

INTERNET CONNECTION OPTIONS

Integrated Wi-Fi	802.11b/g/n
Cellular	CELLMODEM-M1-06-SP-05, CELLMODEM-M1-06-AT-05 (4G based LTE-M1 cellular modem). Note that an Enphase Mobile Connect cellular modem is required for all Ensemble installations.
Ethernet	Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included)

COMPLIANCE

Compliance, IQ Combiner	UL 1741, CAN/CSA C22.2 No. 107.1, 47 CFR, Part 15, Class B, ICES 003 Production metering: ANSI C12.20 accuracy class 0.5 (PV production) Consumption metering: accuracy class 2.5
Compliance, IQ Gateway	UL 60601-1/CANCSA 22.2 No. 61010-1

To learn more about Enphase offerings, visit enphase.com

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603 SOLAR
24 CHARTER ST.
EXETER, NH 03833
(603) 570-2607

REVISIONS

DESCRIPTION	DATE	REV

PROJECT NAME & ADDRESS

MIKE MYERS
700 MIDDLE STREET,
PORTSMOUTH, NH 03801
PHONE #: (603) 682-6321
EMAIL: mike@jewettfarms.com
10.53kW DC PHOTOVOLTAIC SYSTEM

SALES PERSON

JOEY

SHEET NAME

DATA SHEET

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-9



AIRE RAIL A1

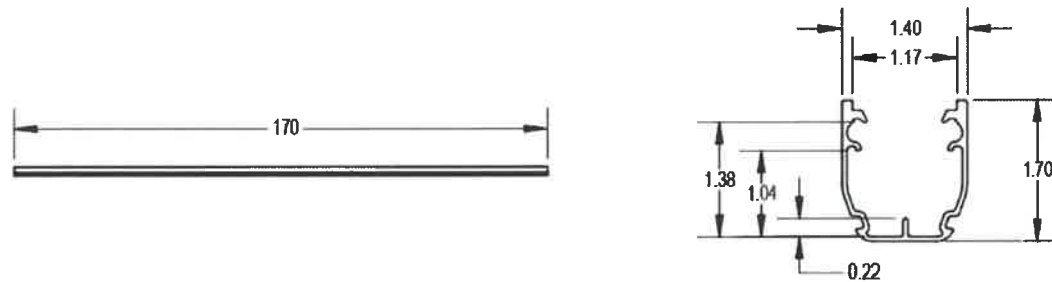
Cut Sheet



ITEM NO	DESCRIPTION	QTY IN KIT
1	Aire Rail, A1, Black(or Clear), 170	1

Part Number	Description
AE-A1-170B	AIRE RAIL, A1, BLACK, 170
AE-A1-170M	AIRE RAIL, A1, MILL, 170

1) Aire A1



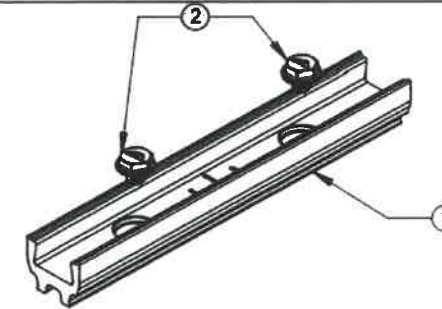
Part Number	Material	Value
AE-A1-170B	6000-Series Aluminum	Black
AE-A1-170M	6000-Series Aluminum	Clear

v1.0



AIRE TIE, A1

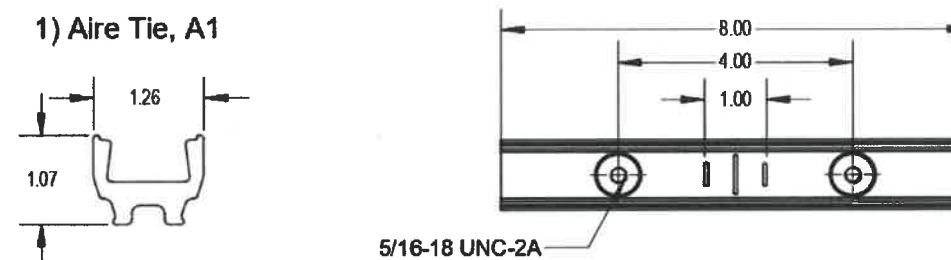
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ITEM NO	DESCRIPTION	QTY IN KIT
1	Aire Tie, A1	1
2	Aire Splc Bolt, Hex	2

Part Number	Description
AE-A1TIE-01-M1	AIRE TIE, A1 (BONDED SPLICE)

1) Aire Tie, A1



Property	Value
Material	6000 Series Aluminum
Finish	Mill

2) Aire Splc Bolt, Hex



Property	Value
Material	300 Series Stainless Steel
Finish	Clear

v1.0



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REVISIONS

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PROJECT NAME & ADDRESS

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700 MIDDLE STREET,
PORTSMOUTH, NH 03801
PHONE #: (603) 682-8321
EMAIL: mike@jewettfarms.com
10.53KW DC PHOTOVOLTAIC SYSTEM

SALES PERSON

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SHEET NAME

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SHEET SIZE

ANSI B
11" X 17"

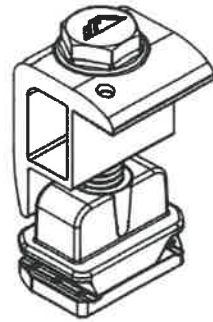
SHEET NUMBER

PV-10



Cut Sheet

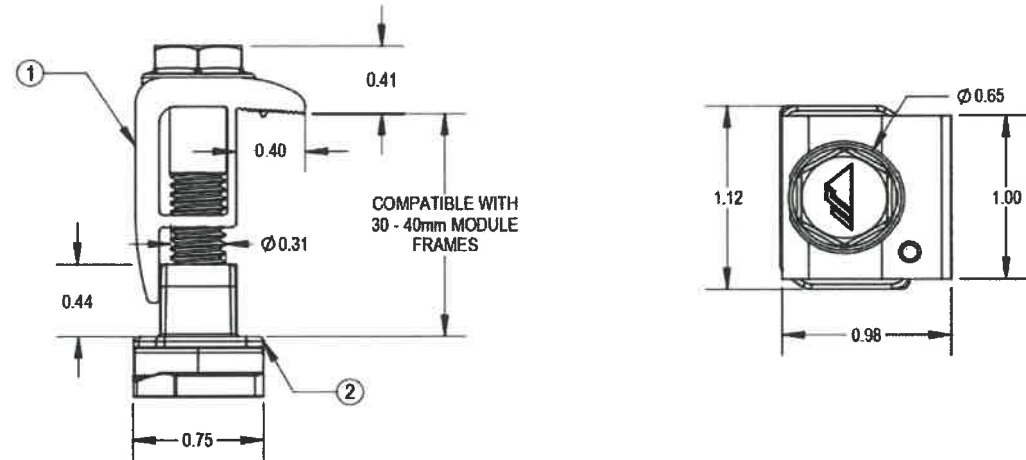
AIRE LOCK END



ITEM NO	DESCRIPTION	QTY IN KIT
1	Aire Lock End, Black	1

Part Number	Description
AE-END-01-B1	AIRE LOCK END, BLACK

1) Aire Lock End



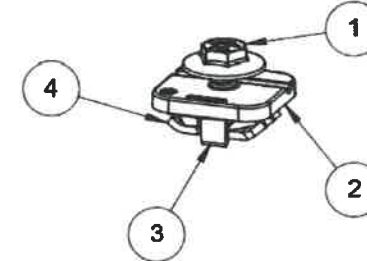
Item No	Material	Value
1	300 Series Stainless Steel	Clear and Black
2	Polypropelene	Black

v1.0



Cut Sheet

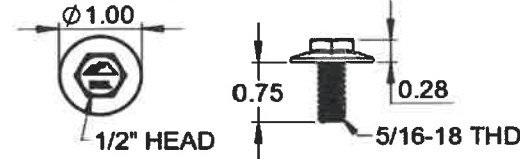
AIRE LUG



ITEM NO.	DESCRIPTION	QTY IN KIT
1	CAP SCREW, 5/16 X 3/4, HEX HEAD	1
2	TOP PLATE GROUNDING LUG	1
3	RETAINING CLIP, GROUNDING LUG	1
4	T-NUT, SHEET METAL	1

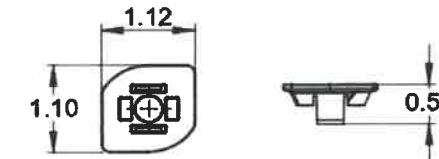
PART NUMBER	DESCRIPTION	WIRE SIZE RANGE (AWG)
AE-LUG-01-M1	AIRE LUG	6-10

1) CAP SCREW, 5/16 X 3/4



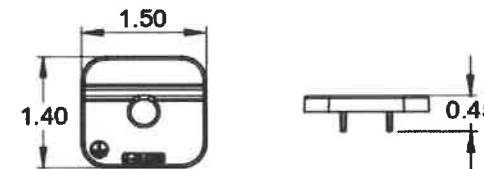
Property	Value
Material	300 Series Stainless Steel
Finish	Clear

3) RETAINING CLIP



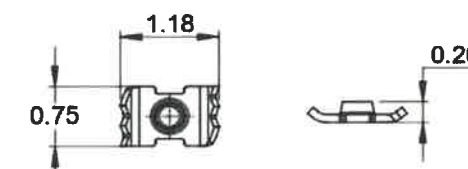
Property	Value
Material	Polypropylene
Finish	Black

2) TOP PLATE



Property	Value
Material	Tin Plated Aluminum
Finish	Clear Matte

4) T-NUT, SHEET METAL



Property	Value
Material	300 Series Stainless Steel
Finish	Clear

v1.0



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REVISIONS		
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MIKE MYERS
700 MIDDLE STREET,
PORTSMOUTH, NH 03801
PHONE #: (603) 682-8321
EMAIL: mike@jewettfarms.com
10.53KW DC PHOTOVOLTAIC SYSTEM

SALES PERSON
JOEY

SHEET NAME
DATA SHEET

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

SHEET NUMBER
PV-11

ITEM NO	DESCRIPTION	QTY IN KIT
1	FOOT, EXTRUDED L - SLOTTED	4

PART NUMBER	DESCRIPTION
FM-LFT-003	Kit, 4Pcs, Slotted L-Foot, Mill
FM-LFT-003-B	Kit, 4Pcs, Slotted L-Foot, Black

1) Foot, Extruded L - Slotted

Technical drawing dimensions:
 Top view: .42 (height), .35 (height to slot), .40 (width), .94 (width), 1.92 (height)
 Side view: .40 (width), 3.00 (height), 1.22 (height to slot)
 End view: .11 (width), .31 (width), 1.92 (height)

v1.11

REVISIONS		
DESCRIPTION	DATE	REV

PROJECT NAME & ADDRESS

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 700 MIDDLE STREET,
 PORTSMOUTH, NH 03801
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 EMAIL: mike@jewettfarms.com
 10.53kW DC PHOTOVOLTAIC SYSTEM

SALES PERSON

JOEY

SHEET NAME

DATA SHEET

SHEET SIZE

**ANSI B
 11" X 17"**

SHEET NUMBER

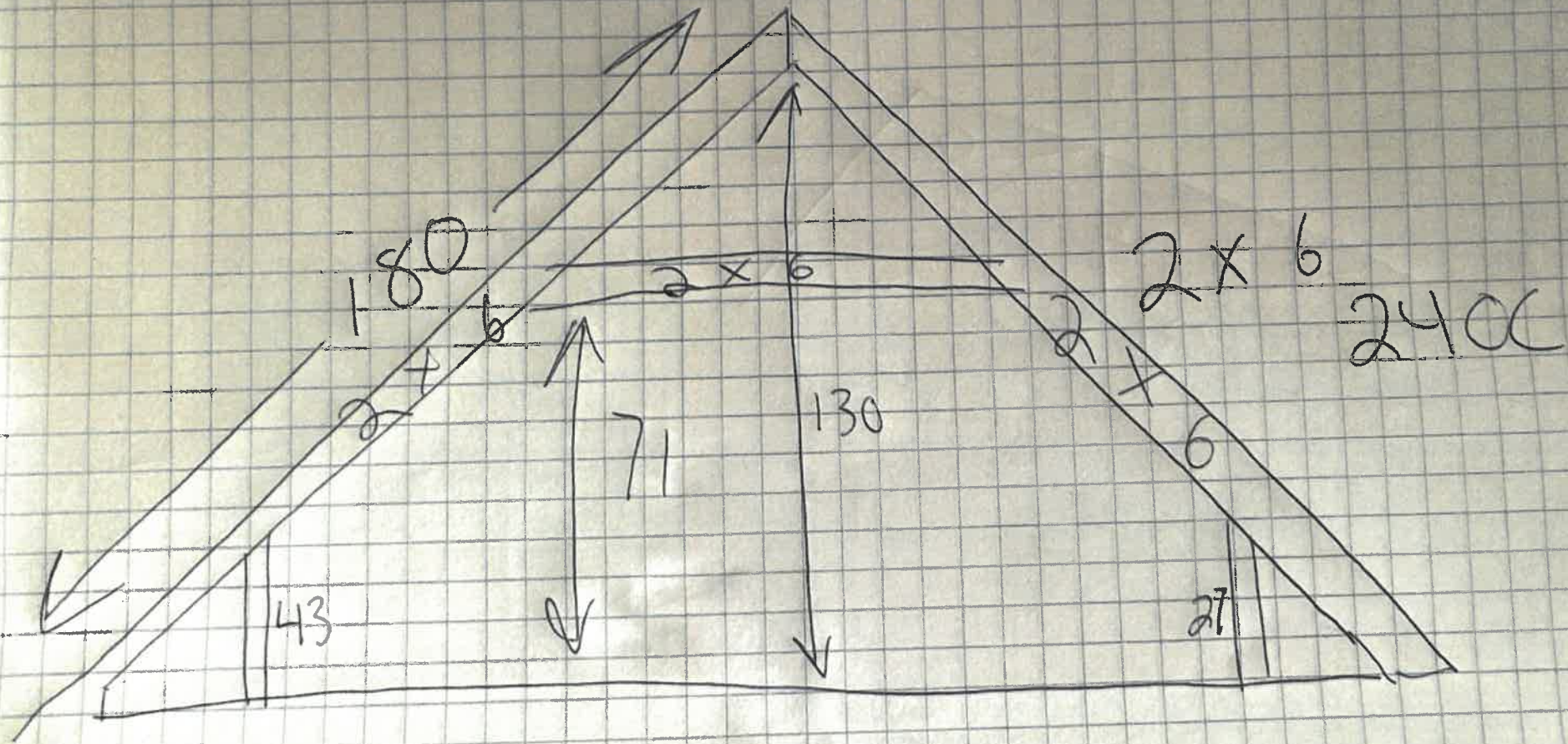
PV-12











700 MIDDLE ST

Location 700 MIDDLE ST

Mblu 0148/ 0029/ 0000/ /

Acct# 34564

Owner MYERS MICHAEL B

PBN

Assessment \$719,300

Appraisal \$719,300

PID 34564

Building Count 1

Current Value

Appraisal			
Valuation Year	Improvements	Land	Total
2022	\$385,600	\$333,700	\$719,300

Assessment			
Valuation Year	Improvements	Land	Total
2022	\$385,600	\$333,700	\$719,300

Owner of Record

Owner MYERS MICHAEL B
Co-Owner TAYLOR STEPHANIE G
Address 700 MIDDLE ST
PORTSMOUTH, NH 03801

Sale Price \$475,000
Certificate
Book & Page 4867/0438
Sale Date 12/04/2007
Instrument 15

Ownership History

Ownership History					
Owner	Sale Price	Certificate	Book & Page	Instrument	Sale Date
MYERS MICHAEL B	\$475,000		4867/0438	15	12/04/2007

Building Information

Building 1 : Section 1

Year Built: 1880
Living Area: 2,101
Replacement Cost: \$443,309
Building Percent Good: 71