PHOTOVOLTAIC GROUND MOUNT SYSTEM

40 MODULES-GROUND MOUNTED - 16.800 kW DC, 13.000 kW AC

1300 SW CUMORAH HILL ST., FORT WHITE, FL 32038

PROJECT DATA

PROJECT ADDRESS: 1300 SW CUMORAH HILL ST., FORT WHITE, FL 32038

OWNER: BILL FRIES

DESIGNER: ESR

SCOPE: 16.800 kW DC GROUND MOUNT SOLAR PV SYSTEM WITH
40 HANWHA Q.CELLS: Q.TRON BLK M-G2+ 420W PV MODULES WITH
40 ENPHASE: IQ8M-72-2-US 325W MICROINVERTERS EQUIPPED WITH RAPID SHUTDOWN
02 FRANKLIN WH APOWER 15 kWh BATTERY

AUTHORITIES HAVING JURISDICTION:
BUILDING: COLUMBIA COUNTY
ZONING: COLUMBIA COUNTY
UTILITY: CLAY ELECTRIC CO-OP

SHEET INDEX

SIGNATURE

GENERAL NOTES

1. ALL COMPONENTS ARE UL LISTED AND CEC CERTIFIED, WHERE WARRANTED.
2. THE SOLAR PV SYSTEM WILL BE INSTALLED IN ACCORDANCE WITH ARTICLE 690 OF THE NEC 2020.
3. THE UTILITY INTERCONNECTION APPLICATION MUST BE APPROVED AND PV SYSTEM INSPECTED PRIOR TO PARALLEL OPERATION.
4. ALL CONDUCTORS OF A CIRCUIT, INCLUDING THE EGC, MUST BE INSTALLED IN THE SAME RACEWAY, OR CABLE, OR OTHERWISE RUN WITH THE PV ARRAY CIRCUIT CONDUCTORS WHEN THEY LEAVE THE VICINITY OF THE PV ARRAY.
5. WHERE METALLIC CONDUIT CONTAINING DC CONDUCTORS IS USED INSIDE THE BUILDING, IT SHALL BE IDENTIFIED AS "CAUTION: SOLAR CIRCUIT" EVERY 10FT.
6. HEIGHT OF THE AC DISCONNECT SHALL NOT EXCEED 6'-7" PER NEC CODE 240.24.
7. A GROUNDING ELECTRODE SYSTEM IN ACCORDANCE WITH NEC 2020 690.47 AND 250.50 THROUGH 60 AND 250-166 SHALL BE PROVIDED. PER NEC GROUNDING ELECTRODE SYSTEM OF EXISTING BUILDING MAY BE USED AND BONDED TO THE SERVICE ENTRANCE. IF EXISTING SYSTEM IS INACCESSIBLE OR INADEQUATE A SUPPLEMENTAL GROUNDING ELECTRODE WILL BE USED AT THE INVERTER LOCATION CONSISTING OF A UL LISTED 8 FT. GROUND ROD WITH ACORN CLAMP. GROUNDING ELECTRODE CONDUCTORS SHALL BE NO LESS THAN #8 AWG AND NO LARGER THAN #6 AWG COPPER AND BONDED TO THE EXISTING GROUNDING ELECTRODE TO PROVIDE FOR A COMPLETE SYSTEM.
8. PHOTOVOLTAIC MODULES ARE TO BE CONSIDERED NON-COMBUSTIBLE.
9. PHOTOVOLTAIC INSTALLATION WILL NOT OBSTRUCT ANY PLUMBING. MECHANICAL, OR BUILDING GROUND VENTS.
10. ALL WIRING MUST BE PROPERLY SUPPORTED BY DEVICES OR MECHANICAL MEANS DESIGNED AND LISTED FOR SUCH USE. WIRING MUST BE PERMANENTLY AND COMPLETELY HELD OFF THE GROUND SURFACE.
11. ALL SINAGE TO BE PLACED IN ACCORDANCE WITH THE LOCAL BUILDING CODE. IF EXPOSED TO SUNLIGHT, IT SHALL BE UV RESISTANT. ALL PLAQUES AND SINAGE WILL BE INSTALLED AS REQUIRED BY THE NEC AND AHJ.
12. INVERTER(S) USED IN UNGROUNDED SYSTEM SHALL BE UL 1741 LISTED.
13. THE INSTALLATION OF EQUIPMENT AND ALL ASSOCIATED WIRING AND INTERCONNECTION SHALL BE PERFORMED ONLY BY QUALIFIED PERSONS [NEC 690.4(C)]
14. ALL OUTDOOR EQUIPMENT SHALL BE NEMA 3R RATED (OR BETTER), INCLUDING ALL GROUND MOUNTED TRANSITION BOXES AND SWITCHES.
15. ALL EQUIPMENT SHALL BE PROPERLY GROUNDED AND BONDED IN ACCORDANCE WITH NEC ARTICLE 250.
16. SYSTEM GROUNDING SHALL BE IN ACCORDANCE WITH NEC 690.41.
17. PV SYSTEM CIRCUITS INSTALLED ON OR IN BUILDINGS SHALL INCLUDE A RAPID SHUTDOWN FUNCTION IN ACCORDANCE WITH NEC 690.12
18. DISCONNECTING MEANS SHALL BE LOCATED IN A VISIBLE, READILY ACCESSIBLE LOCATION WITHIN THE PV SYSTEM EQUIPMENT OR A MAXIMUM OF 10 FEET AWAY FROM THE SYSTEM [NEC 690.13(A)]
19. ALL WIRING METHODS SHALL BE IN ACCORDANCE WITH NEC 690.31
20. WORK CLEARANCES AROUND ELECTRICAL EQUIPMENT WILL BE MAINTAINED PER NEC 110.26(A)(1), 110.26(A)(2) AND 110.26(A)(3).
21. GROUND MOUNTED PHOTOVOLTAIC PANELS AND MODULES SHALL BE TESTED, LISTED & IDENTIFIED IN ACCORDANCE WITH UL1703
22. ELECTRICAL CONTRACTOR TO PROVIDE CONDUIT EXPANSION JOINTS AND ANCHOR CONDUIT RUNS AS REQUIRED PER NEC.

VICINITY MAP

HOUSE PHOTO

CODE REFERENCES

PROJECT TO COMPLY WITH THE FOLLOWING:

FLORIDA RESIDENTIAL CODE, 8TH EDITION 2023 (FRC)
FLORIDA PLUMBING CODE, 8TH EDITION 2023 (FPC)
FLORIDA BUILDING CODE, 8TH EDITION 2023 EDITION (FBC)
FLORIDA MECHANICAL CODE, 8TH EDITION 2023 (FMC)
2020 NATIONAL ELECTRICAL CODE
FLORIDA FIRE PREVENTION CODE, 8TH EDITION 2023 (FFPC)

SOLAR BEAR
RESIDENTIAL & COMMERCIAL EFFICIENCIES
SOLAR BEAR
6101 JOHNS RD, STE 8 TAMPA, FL 33634
PHONE # - 727-471-7442

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	10/25/2024	
CLIENT COMMENT	11/15/2024	A
CLIENT COMMENT	11/20/2024	B
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RICHARD PANTEL LICENSE No. 73222 STATE OF FLORIDA PROFESSIONAL ENGINEER

Reviewed and approved
Richard Pantel, P.E.
FL Lic. No. 73222
11/21/2024

Richard Pantel
Digitally signed by Richard Pantel
Date: 2024.11.21 18:22:49 -06'00'

PROJECT NAME & ADDRESS

BILL FRIES RESIDENCE
1300 SW CUMORAH HILL ST.,FORT WHITE, FL 32038

DRAWN BY
ESR

SHEET NAME
COVER SHEET

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-1

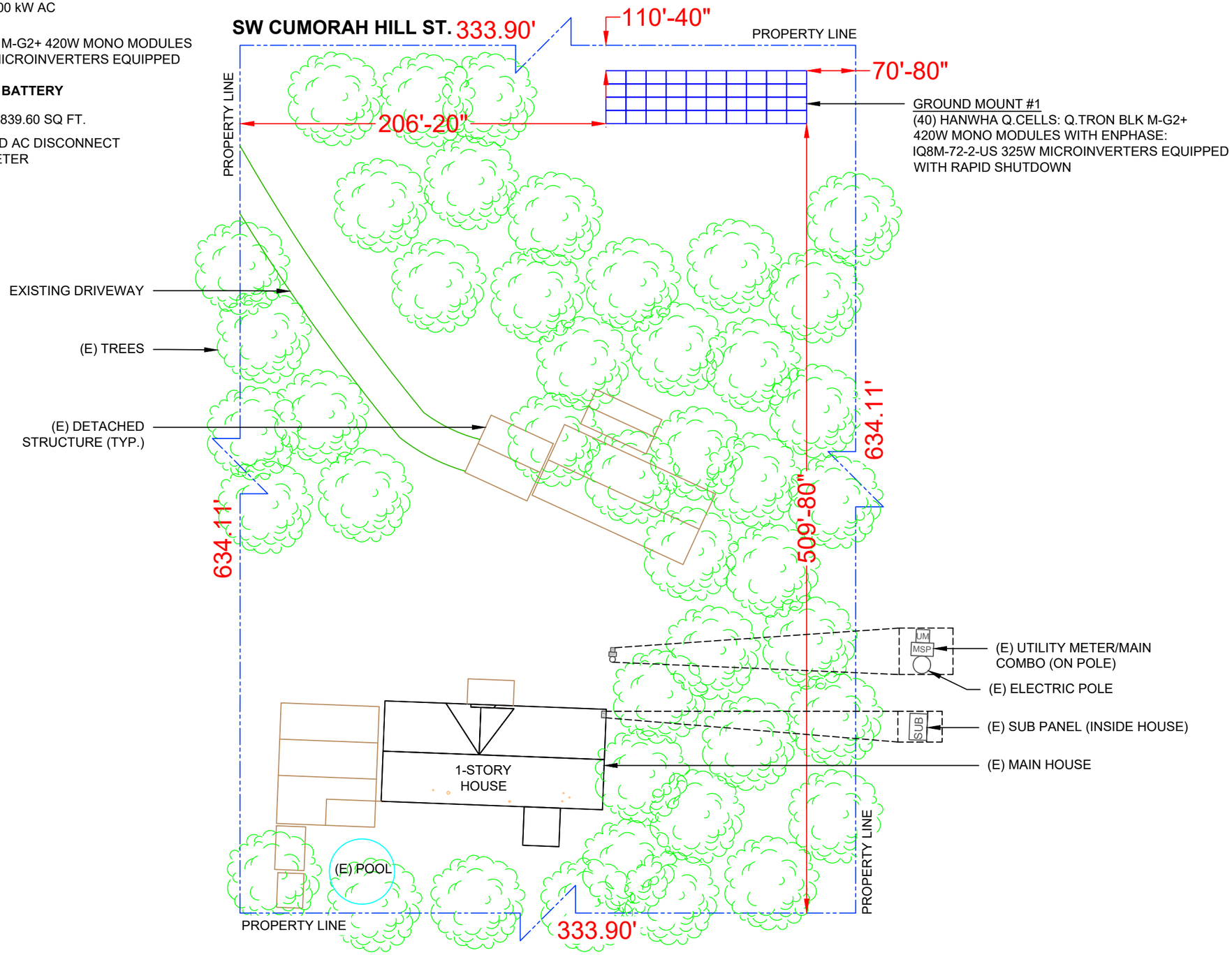
PROJECT DESCRIPTION:

40 X HANWHA Q.CELLS: Q.TRON BLK M-G2+ 420W MONO MODULES
GROUND MOUNTED SOLAR PHOTOVOLTAIC MODULES
DC SYSTEM SIZE: 40 x 420 W = 16.800 kW DC
AC SYSTEM SIZE: 40 x 325 W = 13.000 kW AC

EQUIPMENT SUMMARY
40 HANWHA Q.CELLS: Q.TRON BLK M-G2+ 420W MONO MODULES
40 ENPHASE: IQ8M-72-2-US 325W MICROINVERTERS EQUIPPED WITH RAPID SHUTDOWN
02 FRANKLIN WH APOWER 15 kWh BATTERY

GROUND MOUNT ARRAY AREA #1:- 839.60 SQ FT.

NOTE: VISIBLE, LOCKABLE, LABELED AC DISCONNECT LOCATED WITHIN 10' OF UTILITY METER



DESIGN SPECIFICATIONS
OCCUPANCY: II
CONSTRUCTION: SINGLE-FAMILY
ZONING: RESIDENTIAL
GROUND SNOW LOAD: 0psf
WIND EXPOSURE: C
WIND SPEED: 120 MPH

1 PLOT PLAN WITH GROUND PLAN
PV-2 SCALE: 1"=30'-0"

This item has been digitally signed and sealed by Richard Pantel, P.E. on the date adjacent to the seal. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

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ESR

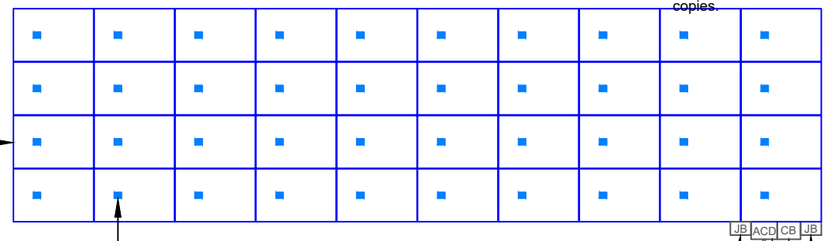
SHEET NAME
PLOT PLAN WITH GROUND PLAN

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-2

MODULE TYPE, DIMENSIONS & WEIGHT

NUMBER OF MODULES = 40 MODULES
MODULE TYPE = HANWHA Q.CELLS: Q.TRON BLK M-G2+ 420W MONO MODULES
MODULE WEIGHT = 47.20 LBS / 21.4 kG.
MODULE DIMENSIONS = 67.80" x 44.65" = 20.99 SF



GROUND MOUNT #1
(40) HANWHA Q.CELLS: Q.TRON BLK M-G2+ 420W MONO MODULES WITH ENPHASE: IQ8M-72-2-US 325W MICROINVERTERS EQUIPPED WITH RAPID SHUTDOWN

(40) ENPHASE: IQ8M-72-2-US 325W MICROINVERTERS EQUIPPED WITH RAPID SHUTDOWN

GROUND #1
PITCH - 25°
AZIM. - 180°

(N) JUNCTION BOX
(N) ENPHASE COMBINER BOX
(N) VISIBLE, LOCKABLE, LABELED NON-FUSED AC DISCONNECT (LOCATED NEAR TO COMBINER BOX) (ON ARRAY)

(N) JUNCTION BOX

AC TRENCHING THROUGH DIRT APPROX 150'-0" PVC BURIAL (MIN. 18" DEPTH)

(N) TRENCH TBD ON-SITE

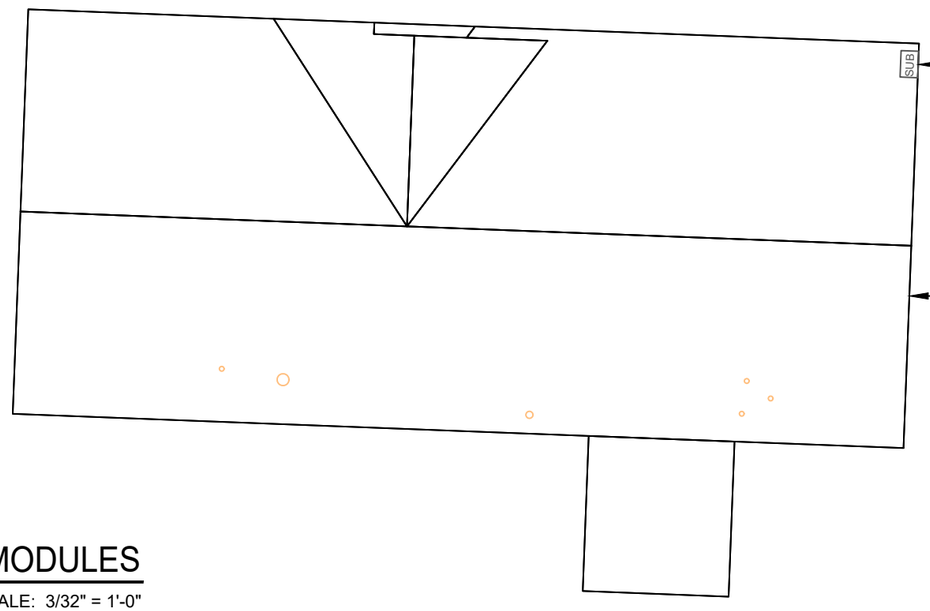
(E) UTILITY METER/MAIN COMBO (ON POLE)
(E) ELECTRIC POLE

(N) RACK

(N) 2 - FRANKLIN WH APOWER2 BATTERY (ON RACK)

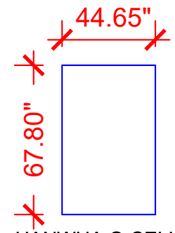
(N) BATTERY PANEL

(N) FRANKLIN WH AGATE (ON RACK)



(E) SUB PANEL (INSIDE HOUSE)

(E) MAIN HOUSE



HANWHA Q.CELLS: Q.TRON BLK M-G2+ 420W MODULES

LEGEND

- MICROINVERTER
- ACD - AC DISCONNECT
- CB - COMBINER BOX
- UM - UTILITY METER
- MSP - MAIN SERVICE PANEL
- SUB - SUBPANEL
- JB - JUNCTION BOX
- CONDUIT
- TRENCH

1 GROUND PLAN & MODULES

PV-3

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

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DRAWN BY
ESR

SHEET NAME
GROUND PLAN & MODULES

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-3

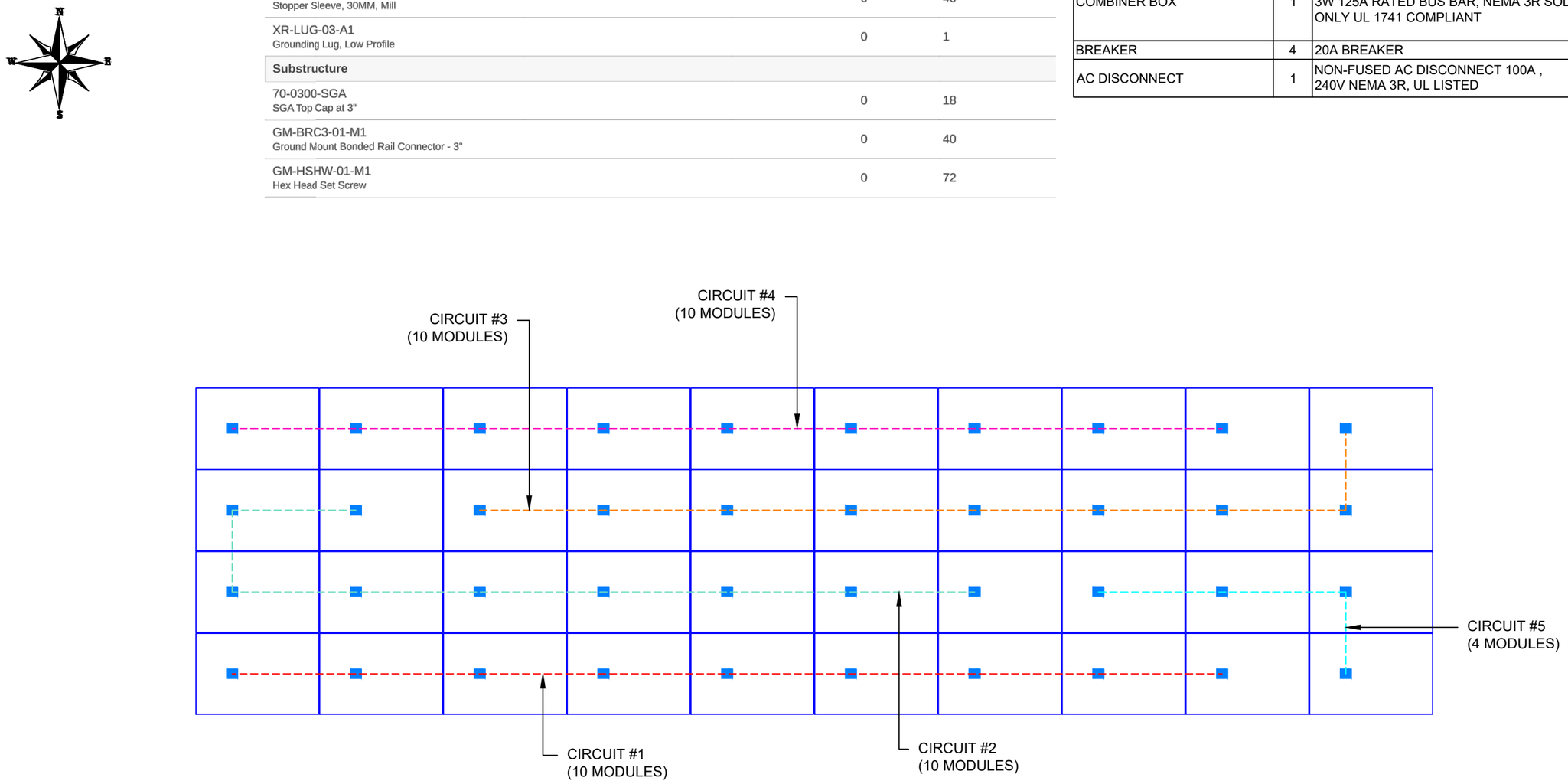
CIRCUIT LEGENDS

- CIRCUIT #1
- CIRCUIT #2
- CIRCUIT #3
- CIRCUIT #4
- CIRCUIT #5

Part	Spares	Total Qty
Rails		
XR-1000-204A XR1000, Rail 204" Clear	0	20
Clamps & Grounding		
UFO-CL-01-A1 Universal Module Clamp, Clear	0	100
UFO-STP-30MM-M1 Stopper Sleeve, 30MM, Mill	0	40
XR-LUG-03-A1 Grounding Lug, Low Profile	0	1
Substructure		
70-0300-SGA SGA Top Cap at 3"	0	18
GM-BRC3-01-M1 Ground Mount Bonded Rail Connector - 3"	0	40
GM-HSHW-01-M1 Hex Head Set Screw	0	72

BILL OF MATERIALS

EQUIPMENT	QTY	DESCRIPTION
SOLAR PV MODULE	40	HANWHA Q.CELLS: Q.TRON BLK M-G2+ 420W MODULE
MICRO INVERTER	40	ENPHASE: IQ8M-72-2-US 325W MICROINVERTERS EQUIPPED WITH RAPID SHUTDOWN
JUNCTION BOX	1	6"X6"X4" UL LISTED, STEEL WATER TIGHT NEMA TYPE 3R, UL LISTED
COMBINER BOX	1	COMBINER BOX:X-IQ-AM1-240-4/4C 120/240VAC, 1ϕ, 3W 125A RATED BUS BAR, NEMA 3R SOLAR LOADS ONLY UL 1741 COMPLIANT
BREAKER	4	20A BREAKER
AC DISCONNECT	1	NON-FUSED AC DISCONNECT 100A , 240V NEMA 3R, UL LISTED



1 ELECTRICAL PLAN
PV-4 SCALE: 3/16" = 1'-0"

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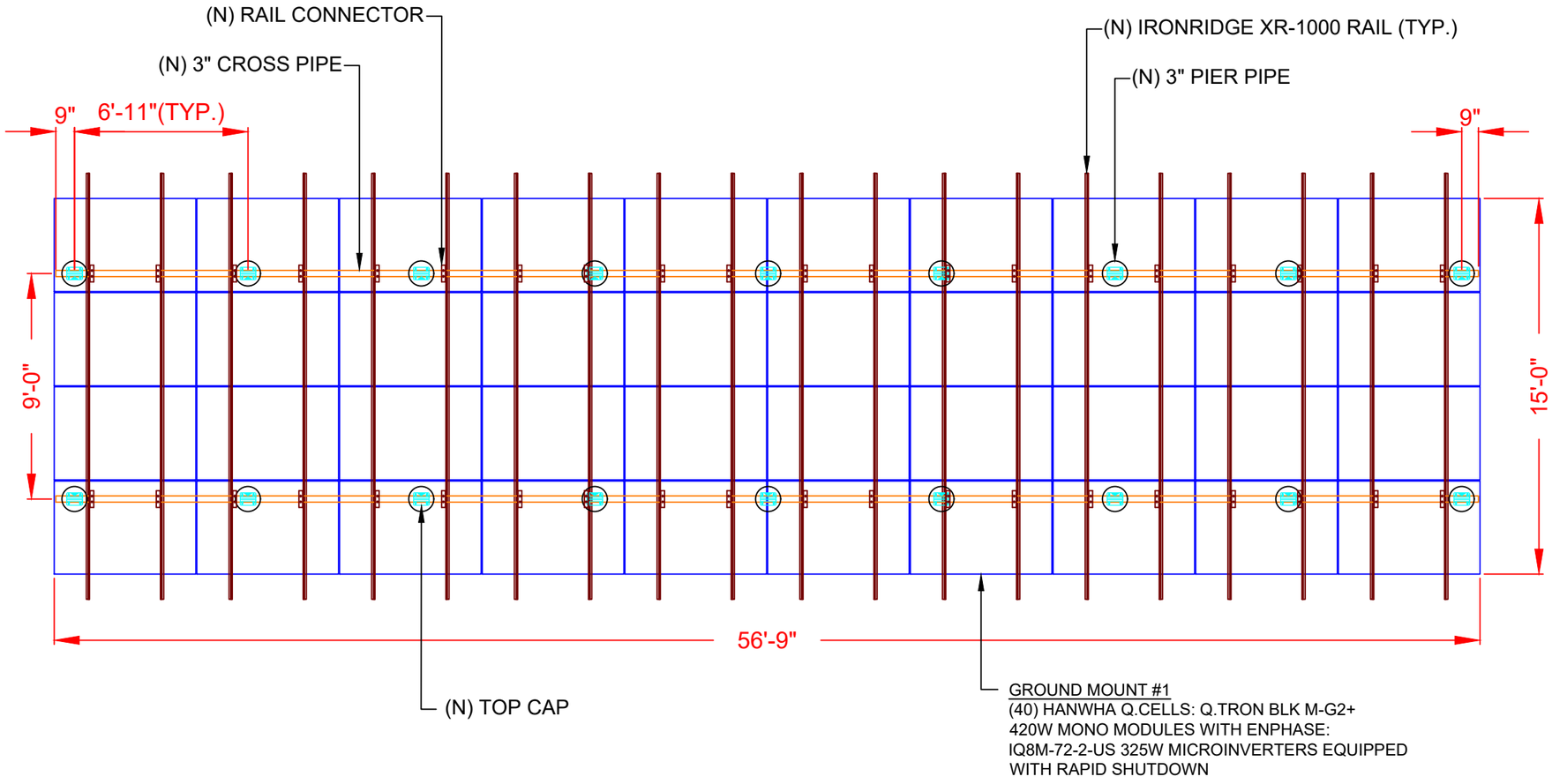
ESR

SHEET NAME
ELECTRICAL PLAN

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-4



1 ARRAY PLAN WITH MOUNTING DETAIL-1

PV-5

SCALE: 3/16" = 1'-0"

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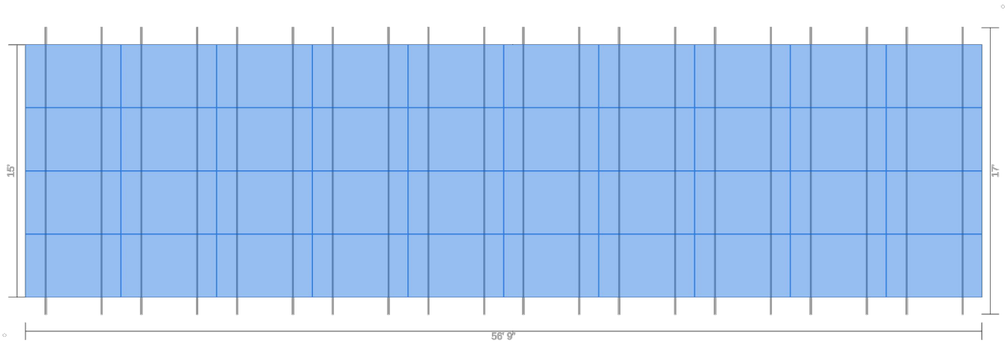
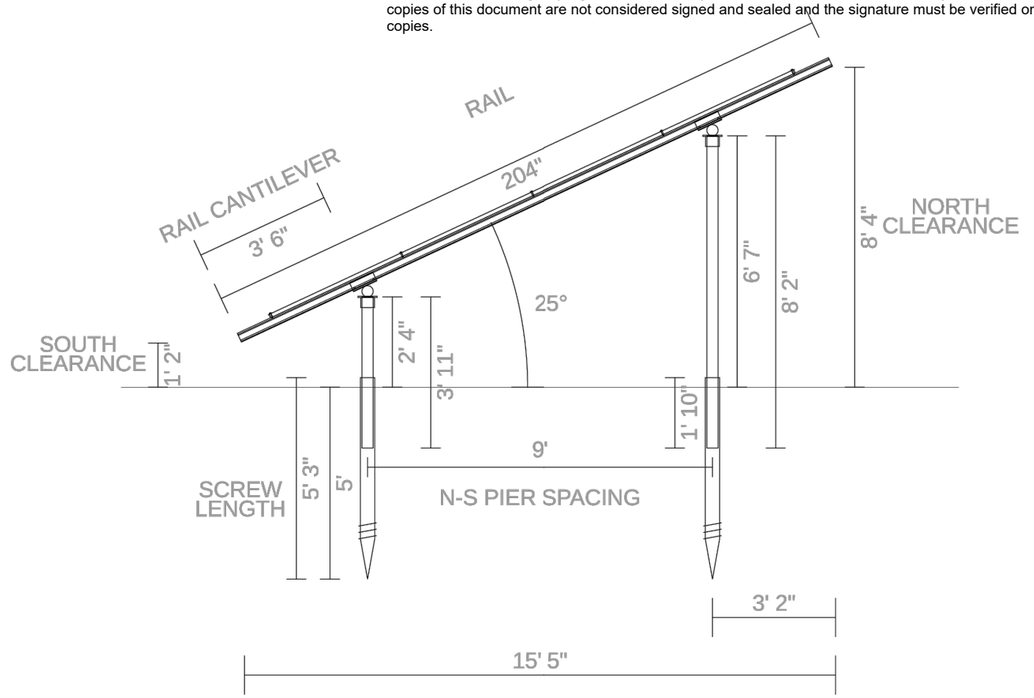
ESR

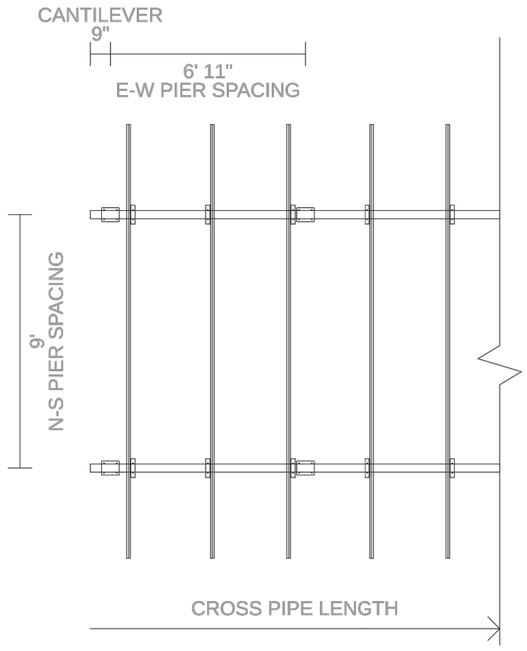
SHEET NAME
MODULE DETAIL-1

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-5





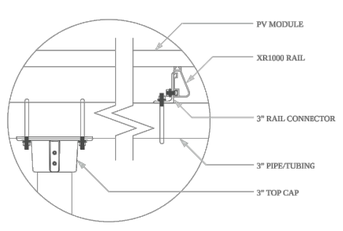


1 MOUNTING DETAIL-2

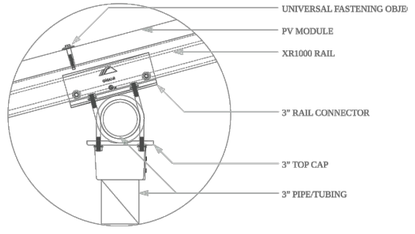
PV-5A SCALE: NTS

Pipe Fitting Detail

XR1000 Rail

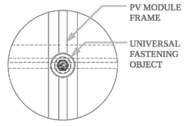


Front View

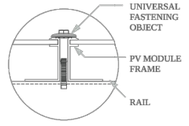


Side View

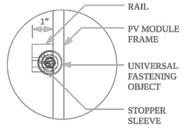
Clamp Detail



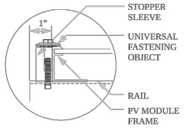
Mid Clamp, Plan



Mid Clamp, Front



End Clamp, Plan



End Clamp, Front

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PROJECT NAME & ADDRESS

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DRAWN BY
ESR

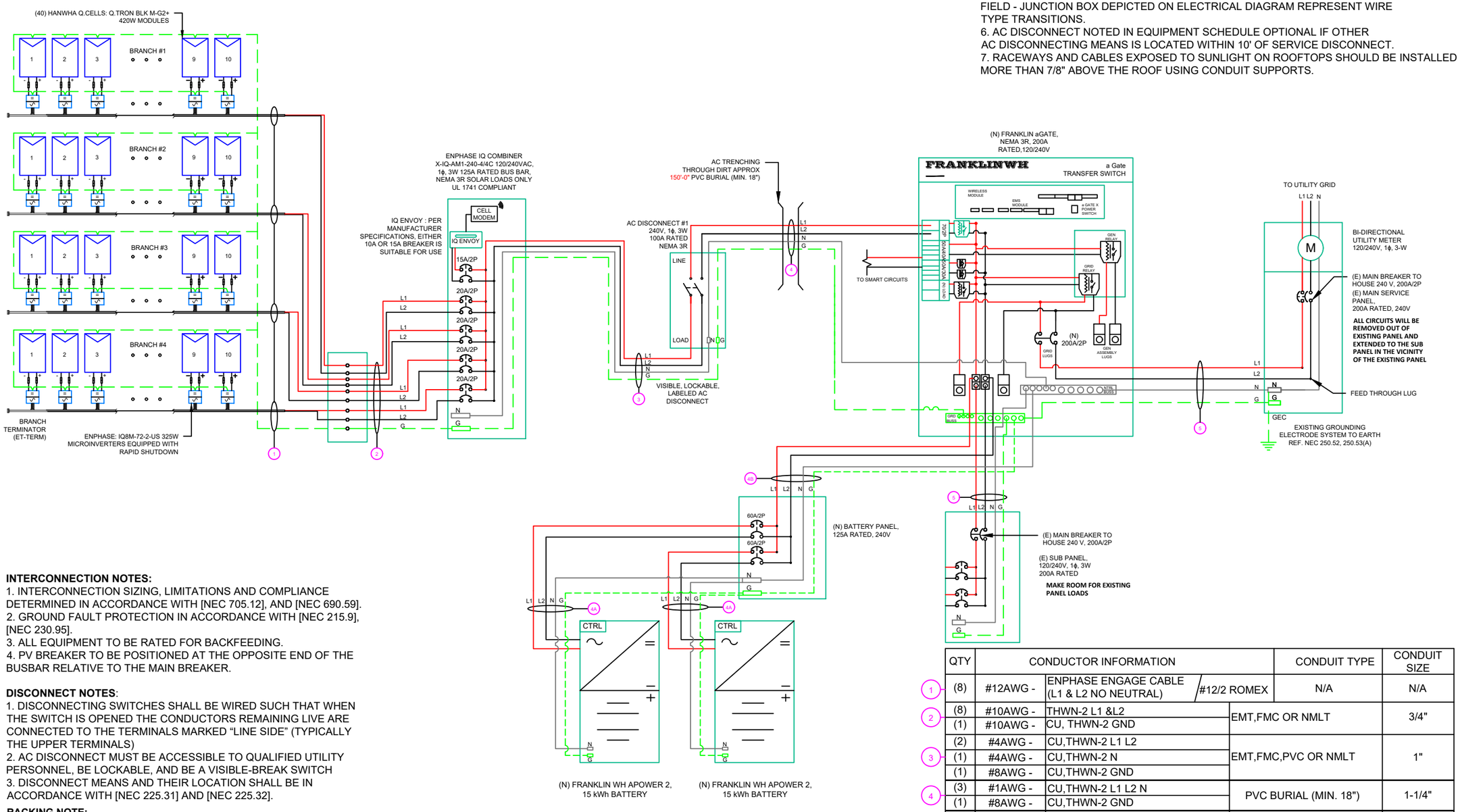
SHEET NAME
MODULE DETAIL-2

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-5A

DC SYSTEM SIZE: 40 x 420W = 16.800 kW DC
AC SYSTEM SIZE: 40 x 325W = 13.000 kW AC

(40) HANWHA Q.CELLS: Q.TRON BLK M-G2+ 420W MONO MODULES
WITH (40) ENPHASE: IQ8M-72-2-US 325W MICROINVERTERS EQUIPPED WITH RAPID SHUTDOWN
02 FRANKLIN WH APOWER 2,15kWh BATTERY
(04) BRANCH CIRCUITS OF 10 MODULES ARE CONNECTED IN PARALLEL



INTERCONNECTION NOTES:
1. INTERCONNECTION SIZING, LIMITATIONS AND COMPLIANCE DETERMINED IN ACCORDANCE WITH [NEC 705.12], AND [NEC 690.59].
2. GROUND FAULT PROTECTION IN ACCORDANCE WITH [NEC 215.9], [NEC 230.95].
3. ALL EQUIPMENT TO BE RATED FOR BACKFEEDING.
4. PV BREAKER TO BE POSITIONED AT THE OPPOSITE END OF THE BUSBAR RELATIVE TO THE MAIN BREAKER.

DISCONNECT NOTES:
1. DISCONNECTING SWITCHES SHALL BE WIRED SUCH THAT WHEN THE SWITCH IS OPENED THE CONDUCTORS REMAINING LIVE ARE CONNECTED TO THE TERMINALS MARKED “LINE SIDE” (TYPICALLY THE UPPER TERMINALS)
2. AC DISCONNECT MUST BE ACCESSIBLE TO QUALIFIED UTILITY PERSONNEL, BE LOCKABLE, AND BE A VISIBLE-BREAK SWITCH
3. DISCONNECT MEANS AND THEIR LOCATION SHALL BE IN ACCORDANCE WITH [NEC 225.31] AND [NEC 225.32].

RACKING NOTE:
1. BOND EVERY OTHER RAIL WITH #6 BARE COPPER

1 ELECTRICAL LINE DIAGRAM

PV-6 SCALE: NTS

GROUNDING & GENERAL NOTES:
1. **GROUNDING ELECTRODES AND GROUNDING ELECTRODE CONDUCTORS.** ADDITIONAL GROUNDING ELECTRODES SHALL BE PERMITTED TO BE INSTALLED IN ACCORDANCE WITH 250.52 AND 250.54.GROUNDING ELECTRODES SHALL BE PERMITTED TO BE CONNECTED DIRECTLY TO THE PV MODULE FRAME(S) OR SUPPORT STRUCTURE PER [NEC 690.47(B)]
2. PV INVERTER IS UNGROUNDED, TRANSFORMER-LESS TYPE.
3. DC GEC AND AC EGC TO REMAIN UNSPLICED, OR SPLICED TO EXISTING ELECTRODE
4. ANY EXISTING WIRING INVOLVED WITH PV SYSTEM CONNECTION THAT IS FOUND TO BE INADEQUATE PER CODE SHALL BE CORRECTED PRIOR TO FINAL INSPECTION
5. JUNCTION BOX QUANTITIES, AND PLACEMENT SUBJECT TO CHANGE IN THE FIELD - JUNCTION BOX DEPICTED ON ELECTRICAL DIAGRAM REPRESENT WIRE TYPE TRANSITIONS.
6. AC DISCONNECT NOTED IN EQUIPMENT SCHEDULE OPTIONAL IF OTHER AC DISCONNECTING MEANS IS LOCATED WITHIN 10' OF SERVICE DISCONNECT.
7. RACEWAYS AND CABLES EXPOSED TO SUNLIGHT ON ROOFTOPS SHOULD BE INSTALLED MORE THAN 7/8" ABOVE THE ROOF USING CONDUIT SUPPORTS.

QTY	CONDUCTOR INFORMATION			CONDUIT TYPE	CONDUIT SIZE
1	(8)	#12AWG -	ENPHASE ENGAGE CABLE (L1 & L2 NO NEUTRAL) / #12/2 ROMEX	N/A	N/A
2	(8)	#10AWG -	THWN-2 L1 &L2	EMT,FMC OR NMLT	3/4"
	(1)	#10AWG -	CU, THWN-2 GND		
3	(2)	#4AWG -	CU,THWN-2 L1 L2	EMT,FMC,PVC OR NMLT	1"
	(1)	#4AWG -	CU,THWN-2 N		
	(1)	#8AWG -	CU,THWN-2 GND		
4	(3)	#1AWG -	CU,THWN-2 L1 L2 N	PVC BURIAL (MIN. 18")	1-1/4"
	(1)	#8AWG -	CU,THWN-2 GND		
4A	(3)	#6AWG -	CU,THWN-2 L1 L2 N	EMT,FMC,PVC OR NMLT	3/4"
	(1)	#10AWG -	CU,THWN-2 GND		
4B	(3)	#2AWG -	CU,THWN-2 L1 L2 N	EMT,FMC,PVC OR NMLT	1- 1/4"
	(1)	#8AWG -	CU,THWN-2 GND		
5	(3)	#3/0AWG -	CU,THWN-2 L1 L2 N	EMT,FMC,PVC OR NMLT	2"
	(1)	#6AWG -	CU,THWN-2 GND		

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CLIENT COMMENT	11/20/2024	B
CLIENT COMMENT	11/21/2024	C

RICHARD PANTEL LICENSE No. 73222 STATE OF FLORIDA PROFESSIONAL ENGINEER

Reviewed and approved
Richard Pantel, P.E.
FL Lic. No. 73222
11/21/2024

PROJECT NAME & ADDRESS
BILL FRIES RESIDENCE
1300 SW CUMORAH HILL ST.,FORT WHITE, FL 32038

DRAWN BY
ESR

SHEET NAME
ELECTRICAL LINE DIAGRAM

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-6

INVERTER SPECIFICATIONS	
MANUFACTURER / MODEL #	ENPHASE: IQ8M-72-2-US 325W MICROINVERTERS EQUIPPED WITH RAPID SHUTDOWN
MIN/MAX DC VOLT RATING	22V MIN/ 58V MAX
MAX INPUT POWER	260W-460W
NOMINAL AC VOLTAGE RATING	240V/ 211-264V
MAX AC CURRENT	1.35A
MAX MODULES PER STRING	11 (SINGLE PHASE)
MAX OUTPUT POWER	325 VA

SOLAR MODULE SPECIFICATIONS	
MANUFACTURER / MODEL #	HANWHA Q.CELLS: Q.TRON BLK M-G2+ 420W MODULE
VMP	32.77V
IMP	12.82A
VOC	38.64V
ISC	13.46A
TEMP. COEFF. VOC	-0.24%/°C
MODULE DIMENSION	67.80"L x 44.65"W x 1.18"D (In Inch)

AMBIENT TEMPERATURE SPECS	
AMBIENT TEMP (HIGH TEMP 2%)	37°
RECORD LOW TEMP	-5°
MODULE TEMPERATURE COEFFICIENT OF Voc	-0.24%/°C

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

AC CALCULATIONS

CIRCUIT ORIGIN	CIRCUIT DESTINATION	VOLTAGE (V)	FULL LOAD AMPS "FLA" (A)	FLA*1.25 (A)	OCPD SIZE (A)	NEUTRAL SIZE	GROUND SIZE	CONDUCTOR SIZE	75°C AMPACITY (A)	AMPACITY CHECK #1	AMBIENT TEMP. (°C)	TOTAL CC CONDUCTORS IN RACEWAY	90°C AMPACITY (A)	DERATION FACTOR FOR AMBIENT TEMPERATURE NEC 310.15(B)(1)	DERATION FACTOR FOR CONDUCTORS PER RACEWAY NEC 310.15(C)(1)	90°C AMPACITY DERATED (A)	AMPACITY CHECK #2	FEEDER LENGTH (FEET)	CONDUCTOR RESISTANCE (OHM/KFT)	VOLTAGE DROP AT FLA (%)	CONDUIT SIZE	CONDUIT FILL (%)
CIRCUIT 1	JUNCTION BOX	240	13.5	16.875	20	N/A	BARE COPPER #6 AWG	CU #12 AWG	25	PASS	35	2	30	0.96	1	28.8	PASS			0.52	N/A	#N/A
CIRCUIT 2	JUNCTION BOX	240	13.5	16.875	20	N/A	BARE COPPER #6 AWG	CU #12 AWG	25	PASS	35	2	30	0.96	1	28.8	PASS			0.52	N/A	#N/A
CIRCUIT 3	JUNCTION BOX	240	13.5	16.875	20	N/A	BARE COPPER #6 AWG	CU #12 AWG	25	PASS	35	2	30	0.96	1	28.8	PASS			0.52	N/A	#N/A
CIRCUIT 4	JUNCTION BOX	240	13.5	16.875	20	N/A	BARE COPPER #6 AWG	CU #12 AWG	25	PASS	35	2	30	0.96	1	28.8	PASS			0.52	N/A	#N/A
JUNCTION BOX	COMBINER BOX	240	13.5	16.875	20	N/A	CU #10 AWG	CU #10 AWG	35	PASS	35	4	40	0.96	0.8	30.72	PASS	20	1.24	0.279	3/4" EMT	19.79362
COMBINER BOX	AC DISCONNECT	240	54	67.5	70	CU #4 AWG	CU #8 AWG	CU #4 AWG	85	PASS	35	2	95	0.96	1	91.2	PASS	5	0.308	0.069	1" EMT	32.84722
AC DISCONNECT	FRANKLIN WH AGATE	240	54	67.5	70	CU #1 AWG	CU #8 AWG	CU #1 AWG	130	PASS	35	2	145	0.96	1	139.2	PASS	150	0.154	1.040	1 1/4" PVC	34.76944
FRANKLIN WH AGATE	BATTERY PANEL	240	84	105	110	CU #2 AWG	CU #8 AWG	CU #2 AWG	115	PASS	35	2	130	0.96	1	124.8	PASS	5	0.194	0.068	1 1/4" EMT	25.66845
BATTERY PANEL	FRANKLIN WH APOWER	240	42	52.5	60	CU #6 AWG	CU #10 AWG	CU #6 AWG	65	PASS	35	2	75	0.96	1	72	PASS	5	0.491	0.086	3/4" EMT	32.49531
FRANKLIN WH AGATE	SUB PANEL	240	166	166	200	CU #3/0 AWG	CU #6 AWG	CU #3/0 AWG	200	PASS	35	2	225	0.96	1	216	PASS	24	0.0766	0.254	2" EMT	25.45888
FRANKLIN WH AGATE	POI	240	166	166	200	CU #3/0 AWG	CU #6 AWG	CU #3/0 AWG	200	PASS	35	2	225	0.96	1	216	PASS	5	0.0766	0.053	2" EMT	25.45888

Circuit 1 Voltage Drop	1.908
Circuit 2 Voltage Drop	1.908
Circuit 3 Voltage Drop	1.908
Circuit 4 Voltage Drop	1.908

ELECTRICAL NOTES

1. ALL EQUIPMENT TO BE LISTED BY UL OR OTHER NRTL, AND LABELED FOR ITS APPLICATION.
2. ALL CONDUCTORS SHALL BE COPPER, RATED FOR 600 V AND 90 DEGREE C WET ENVIRONMENT.
3. WIRING, CONDUIT, AND RACEWAYS MOUNTED ON GROUNDTOPS SHALL BE ROUTED DIRECTLY TO, AND LOCATED AS CLOSE AS POSSIBLE TO THE NEAREST RIDGE, HIP, OR VALLEY.
4. WORKING CLEARANCES AROUND ALL NEW AND EXISTING ELECTRICAL EQUIPMENT SHALL COMPLY WITH NEC 110.26.
5. DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS. CONTRACTOR SHALL FURNISH ALL NECESSARY OUTLETS, SUPPORTS, FITTINGS AND ACCESSORIES TO FULFILL APPLICABLE CODES AND STANDARDS.
6. WHERE SIZES OF JUNCTION BOX, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, THE CONTRACTOR SHALL SIZE THEM ACCORDINGLY.
7. ALL WIRE TERMINATIONS SHALL BE APPROPRIATELY LABELED AND READILY VISIBLE.
8. MODULE GROUNDING CLIPS TO BE INSTALLED BETWEEN MODULE FRAME AND MODULE SUPPORT RAIL, PER THE GROUNDING CLIP MANUFACTURER'S INSTRUCTION.
9. MODULE SUPPORT RAIL TO BE BONDED TO CONTINUOUS COPPER G.E.C. VIA WEEB LUG OR ILSCO GBL-4DBT LAY-IN LUG.
10. TEMPERATURE RATINGS OF ALL CONDUCTORS, TERMINATIONS, BREAKERS, OR OTHER DEVICES ASSOCIATED WITH THE SOLAR PV SYSTEM SHALL BE RATED FOR AT LEAST 75 DEGREE C.

SOLAR BEAR
RESIDENTIAL & COMMERCIAL EFFICIENCIES
SOLAR BEAR
6101 JOHNS RD, STE 8 TAMPA,
FL 33634
PHONE # - 727-471-7442

REVISIONS

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Reviewed and approved
Richard Pantel, P.E.
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11/21/2024

PROJECT NAME & ADDRESS

BILL FRIES
RESIDENCE
1300 SW CUMORAH HILL
ST.,FORT WHITE, FL 32038

DRAWN BY
ESR

SHEET NAME
WIRING CALCULATIONS

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-7

This item has been digitally signed and sealed by Richard Pantel, P.E. on the date adjacent to the seal. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

PHOTOVOLTAIC POWER SOURCE

EVERY 10' ON CONDUIT & ENCLOSURES

LABEL- 1:
LABEL LOCATION:
EMT/CONDUIT RACEWAY
SOLADECK / JUNCTION BOX
CODE REF: NEC 690.31 (D)(2)

⚠ WARNING

ELECTRICAL SHOCK HAZARD

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

LABEL- 2:
LABEL LOCATION:
CODE REF: NEC 690.13(B)

⚠WARNING TRI POWER SOURCE
SECOND SOURCE IS PHOTOVOLTAIC SYSTEM
THIRD SOURCE IS ESS SYSTEM

LABEL- 3:
LABEL LOCATION:
UTILITY METER
MAIN SERVICE PANEL
SUBPANEL
CODE REF: NEC 705.12(C) & NEC 690.59

⚠ WARNING

TURN OFF PHOTOVOLTAIC AC DISCONNECT PRIOR TO WORKING INSIDE PANEL

LABEL- 4:
LABEL LOCATION:
MAIN SERVICE PANEL
SUBPANEL
MAIN SERVICE DISCONNECT
COMBINER
CODE REF: NEC 110.27(C) & OSHA 1910.145 (f) (7)

⚠ CAUTION

PHOTOVOLTAIC SYSTEM CIRCUIT IS BACKFEED

LABEL- 5:
LABEL LOCATION:
MAIN SERVICE PANEL (ONLY IF SOLAR IS BACK-FED)
SUBPANEL (ONLY IF SOLAR IS BACK-FED)
CODE REF: NEC 705.12(B)(3-4) & NEC 690.59

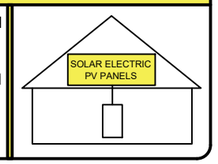
⚠ WARNING

POWER SOURCE OUTPUT CONNECTION. DO NOT RELOCATE THIS OVERCURRENT DEVICE

LABEL- 6:
LABEL LOCATION:
MAIN SERVICE PANEL (ONLY IF SOLAR IS BACK-FED)
SUBPANEL (ONLY IF SOLAR IS BACK-FED)
CODE REF: NEC 705.12(B)(3)(2)

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- 7:
LABEL LOCATION:
AC DISCONNECT
CODE REF: FFPC 11.12.1.1.1.1 & NEC 690.56(C)

RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

LABEL- 8:
LABEL LOCATION:
AC DISCONNECT
CODE REF: NEC 690.56(C)(2)

PHOTOVOLTAIC

AC DISCONNECT

LABEL- 9:
LABEL LOCATION:
AC DISCONNECT
CODE REF: NEC 690.13(B)

PHOTOVOLTAIC AC DISCONNECT #1

NOMINAL OPERATING AC VOLATGE	240 V
RATED AC OUTPUT CURRENT	54.0 A

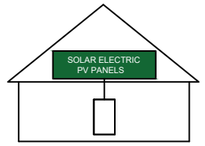
LABEL- 10:
LABEL LOCATION:
MAIN SERVICE PANEL
SUBPANEL
AC DISCONNECT
CODE REF: NEC 690.54

MAIN PHOTOVOLTAIC SYSTEM DISCONNECT

LABEL- 11:
LABEL LOCATION:
MAIN SERVICE DISCONNECT (ONLY IF MAIN SERVICE DISCONNECT IS PRESENT)
CODE REF: NEC 690.13(B)

EMERGENCY RESPONDER: THIS SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN

TURN RAPID SHUTDOWN SWITCH TO THE 'OFF' POSITION TO SHUTDOWN ENTIRE PV SYSTEM



THE LABEL SHALL BE REFLECTIVE, WITH ALL LETTERS CAPITALIZED AND HAVING A MINIMUM HEIGHT OF 3/8 IN. (9.5 MM), IN WHITE ON A RED BACKGROUND.

LABEL- 12
LABEL LOCATION:
AC DISCONNECT
CODE REF:NFPA 1 (11.12.2.1.1.1.1)

1. THE RAPID SHUTDOWN LABEL SHALL BE LOCATED ON OR NO MORE THAN 3 FT (1 M) FROM THE SERVICE DISCONNECTING MEANS
2. (HEIGHT OF LABEL IS 3/8 IN. (9.5 MM), IN WHITE ON A RED BACKGROUND)

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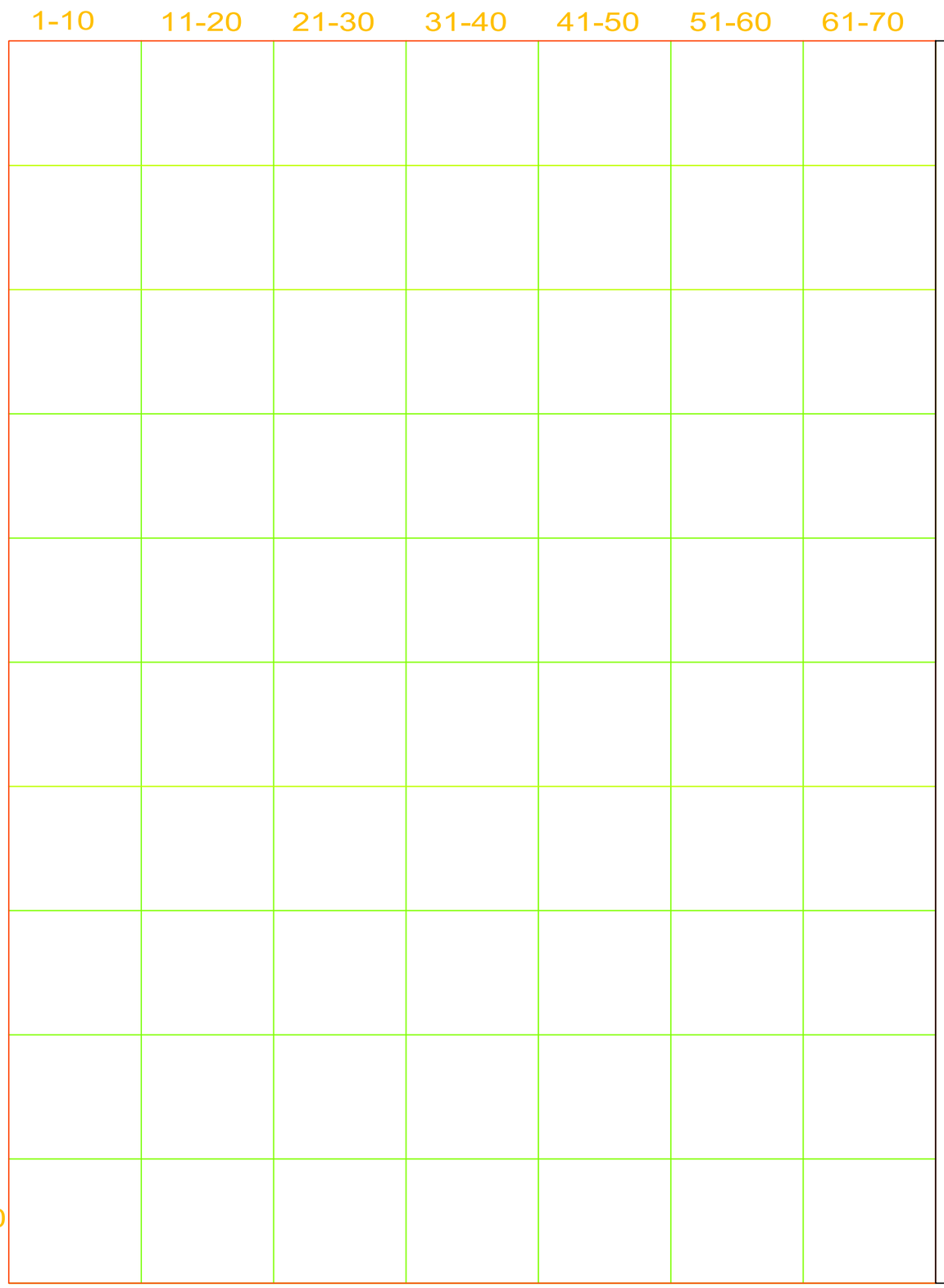
DRAWN BY
ESR

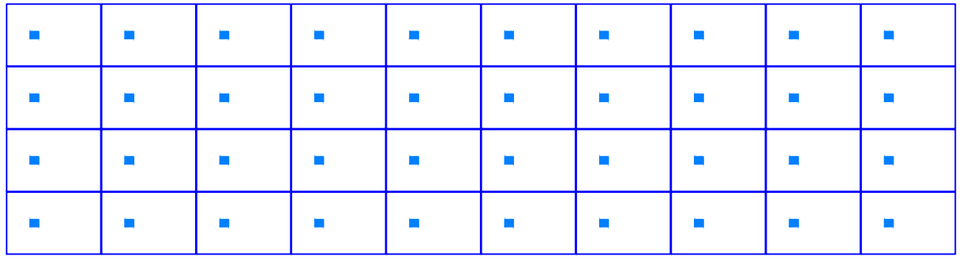
SHEET NAME
LABELS

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-8



MICRO INVERTER CHART



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PROJECT NAME & ADDRESS

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RESIDENCE

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ST.,FORT WHITE, FL 32038

DRAWN BY
ESR

SHEET NAME
MICRO INVERTER CHART

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-9

Q.TRON BLK M-G2+ SERIES

410-430Wp | 108Cells
22.4% Maximum Module Efficiency

PRELIMINARY

MODEL Q.TRON BLK M-G2+

High performance Qcells N-type solar cells

Q.ANTUM NEO Technology with optimized module layout boosts module efficiency up to 22.4%.

A reliable investment

Inclusive 25-year product warranty and 25-year linear performance warranty[1].

Enduring high performance

Long-term yield security with Anti LeTID Technology, Anti PID Technology[2], Hot-Spot Protect.

Extreme weather rating

High-tech aluminium alloy frame, certified for high snow (5400Pa) and wind loads (3600Pa).

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 (−1500V, 96h)

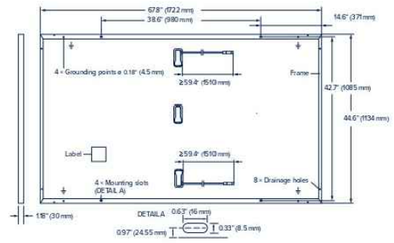
The ideal solution for:

Rooftop arrays on residential buildings

Q.TRON BLK M-G2+ SERIES

Mechanical Specification

Format	67.8 in × 44.6 in × 1.18 in (including frame) (1722 mm × 1134 mm × 30 mm)
Weight	47.2 lbs (21.4 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 × 18 monocrystalline Q.ANTUM NEO 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), Protection class IP67, with bypass diodes
Cable	4 mm² Solar cable; (+) ≥59.4 in (1510 mm), (−) ≥59.4 in (1510 mm)
Connector	Stäubli MC4; IP68

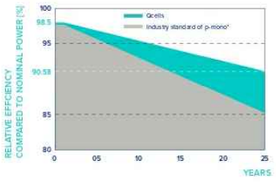


Electrical Characteristics

POWER CLASS				410	415	420	425	430
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC[1] (POWER TOLERANCE +5W/−0W)								
Minimum	Power at MPP[1]	P_{MPP}	[W]	410	415	420	425	430
Minimum	Short Circuit Current[1]	I_{SC}	[A]	13.39	13.42	13.46	13.49	13.53
Minimum	Open Circuit Voltage[1]	V_{OC}	[V]	38.58	38.61	38.64	38.67	38.70
Minimum	Current at MPP	I_{MPP}	[A]	12.68	12.75	12.82	12.88	12.95
Minimum	Voltage at MPP	V_{MPP}	[V]	32.32	32.55	32.77	32.98	33.20
Minimum	Efficiency[1]	η	[%]	≥21.4	≥21.6	≥21.9	≥22.2	≥22.4
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT[2]								
Minimum	Power at MPP	P_{MPP}	[W]	310.0	313.8	317.6	321.4	325.2
Minimum	Short Circuit Current	I_{SC}	[A]	10.79	10.82	10.84	10.87	10.90
Minimum	Open Circuit Voltage	V_{OC}	[V]	36.61	36.63	36.66	36.69	36.71
Minimum	Current at MPP	I_{MPP}	[A]	9.97	10.03	10.09	10.15	10.21
Minimum	Voltage at MPP	V_{MPP}	[V]	31.09	31.29	31.48	31.66	31.85

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

Qcells PERFORMANCE WARRANTY

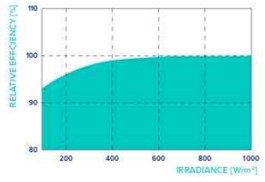


At least 98.5% of nominal power during first year. Thereafter max. 0.33% degradation per year. At least 95.53% of nominal power up to 10 years. At least 90.58% of nominal power up to 25 years.

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]	−0.24
Temperature Coefficient of P_{MPP}	γ	[%/K]	−0.30	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	C / TYPE 2
Max. Design Load, Push/Pull[3]		[lbs/ft²]	75 (3600 Pa)/50 (2400 Pa)	Permitted Module Temperature on Continuous Duty	−40°F up to +185°F (−40°C up to +85°C)
Max. Test Load, Push/Pull[3]		[lbs/ft²]	113 (5400 Pa)/75 (3600 Pa)		

[3] See Installation Manual

Qualifications and Certificates

Quality Controlled PV - TÜV Rheinland; IEC 61215:2016; IEC 61730:2016. This data sheet complies with DIN EN 50380.

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

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DRAWN BY
ESR

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-10

ENPHASE

DATA SHEET

IQ8M and IQ8A 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.

Enphase 25 year limited warranty

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.

CERTIFIED SAFETY

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

*Only when installed with IQ System Controller 2, meets UL 1741.
**IQ8M and IQ8A support split-phase, 240V installations only.

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.

IQ8M and IQ8A Microinverters

INPUT DATA (DC)		IQ8M-72-2-US	IQ8A-72-2-US
Commonly used module pairings[1]	W	260 – 460	295 – 500
Module compatibility		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	30 – 45	32 – 45
Operating range	V	16 – 58	
Min. / Max. start voltage	V	22 / 58	
Max. input DC voltage	V	60	
Max. continuous input DC current	A	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)		**IQ8M-72-2-US**	**IQ8A-72-2-US**
Peak output power	VA	330	366
Max. continuous output power	VA	325	349
Nominal (L-L) voltage / range[2]	V	240 / 211 – 264	
Max. continuous output current	A	1.35	1.45
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]		11	
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	%	97.8	97.7
CEC weighted efficiency	%	97.5	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 3rd Ed.), FCC Part 15 Class B, ICES-0003 Class B, CAN / CSA-C22.2 NO. 107.1-01 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.

IQ8MA-12A-DS-0069-03-EN-US-2022-12-27

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PHONE # - 727-471-7442

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CLIENT COMMENT	11/15/2024	A
CLIENT COMMENT	11/20/2024	B
CLIENT COMMENT	11/21/2024	C

PROJECT NAME & ADDRESS

BILL FRIES RESIDENCE
1300 SW CUMORAH HILL ST.,FORT WHITE, FL 32038

DRAWN BY
ESR

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-11

Data Sheet
Enphase Networking

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

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

LISTED

To learn more about Enphase offerings, visit **enphase.com**

ENPHASE

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	• 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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PROJECT NAME & ADDRESS
BILL FRIES RESIDENCE
1300 SW CUMORAH HILL ST.,FORT WHITE, FL 32038

DRAWN BY
ESR

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-12

FRANKLINWH

aPower 2

AC-coupled battery

Store solar generated power while the sun is shining. Use the stored energy when needed to lower electric bills. Run heavy loads such as air conditioners and water heaters as usual even during grid outages. Provide homeowner peace of mind by fully charging before severe weather events.

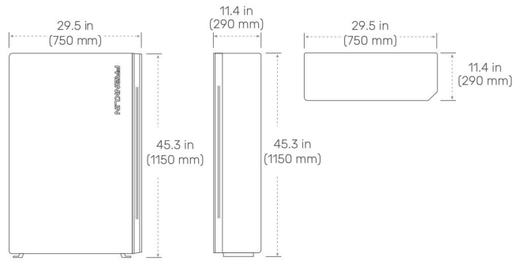
- 10 kW continuous / 15 kW peak for 10s
- 8 kW charge power
- 15 kWh per unit, up to 225 kWh (15 units) per aGate
- 10,000 battery cycles
- 60 MWh throughput

PERFORMANCE SPECIFICATIONS

Model Number	aPower X-20
Battery Chemistry	Lithium Iron Phosphate (LFP)
Usable System Energy	15 kWh per unit, up to 15 units per aGate[1]
Aggregate Throughput	60 MWh
Real Power (charge)	8 kW continuous
Real Power (discharge)	10 kW continuous, 15 kW peak for 10 seconds
Nominal AC Voltage	120 / 208 V, 120 / 240 V, 50 Hz / 60 Hz
Coupling	AC-coupled
Phase	2 W+N+PE
Round Trip Efficiency	90%[2]
Work Modes	Self-Consumption Time of Use Emergency Backup
Noise Emission	30 dB(A)[3]
User Interface	FranklinWH App
Warranty	15 years

MECHANICAL SPECIFICATIONS

Dimensions (H × W × D)	45.3 in × 29.5 in × 11.4 in (1150 mm × 750 mm × 290 mm)
Weight	357 lb. (162 kg)
Mounting	Wall or floor mount
Cooling	Natural air-cooled design



COMPLIANCE INFORMATION

Certifications	UL 9540, UL 9540A, UL 1973, UL 1741, UL1741 SB, UL 1741 PCS, IEEE 1547, IEEE 1547.1, UN 38.3, CSA C22.2 No. 107.1:16
Seismic	AC 156, OSHPD, IEEE 693-2005 (high)
Environmental	California Proposition 65 RoHS Directive 2011 / EU
Emissions	FCC Part 15 Class B, ICES 003

ENVIRONMENTAL SPECIFICATIONS

Enclosure Type	Type 3R
Ingress Protection	IP56 (Wiring) IP67 (Battery Pack & Inverter)
Operating Temperature	-4° F to 130° F (-20° C to 55° C)
Operating Humidity (RH)	Up to 100% RH, condensing
Altitude	Maximum 9,843 ft (3,000 m)
Environment	Indoor and outdoor rated

1. For 120/208V applications, max. 2 aPowers per aGate can be connected in parallel. Please contact us if you have large capacity requirements.
2. At beginning of life, AC to battery to AC, 30% power rating.
3. An ambient temperature of 30°C and a load consumption of 1 kW.

WWW.FRANKLINWH.COM

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CLIENT COMMENT	11/21/2024	C

PROJECT NAME & ADDRESS

BILL FRIES RESIDENCE
1300 SW CUMORAH HILL ST.,FORT WHITE, FL 32038

DRAWN BY
ESR

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-13

FRANKLINWH

aGate

Intelligent energy management system

The aGate serves as the controller for all home power sources by interconnecting solar, grid, batteries, and a standby generator to supply electricity to the home. It seamlessly transitions the home supply from grid power to backup power so that always-on appliances, such as the refrigerator and network router, will not be affected when the grid goes down.

The aGate can be installed at the service entrance, connected to the main load center, or used as a load center.

Robust

- Micro-grid interconnect device (MID)
- EMS Integrated PV and grid metering
- UL1741 certified PCS function & 280A busbar to avoid Main Panel Upgrades
- 12-year limited warranty

Hassle-free

- Precise control of electricity usage through Smart Circuits Module
- Standby generator integration via generator module
- Remarkable black start function ensures battery charge after a prolonged outage or extended trip
- Vehicle to loads (V2L) function to power essential home appliances during an emergency
- Commissioning through the aGate Wifi hotspot or Bluetooth

Flexible

- Compatible with micro and string solar inverter
- Indoor and outdoor / wall-mounted

Easy installation

- Built-in design Smart Circuits and Generator Modules
- Conduit entry options from the bottom, left, or right

Intertek C US

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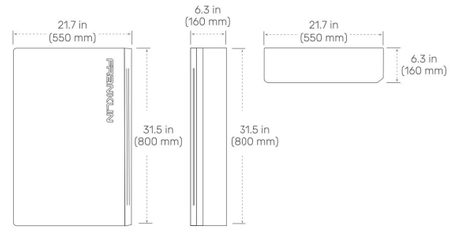
DATASHEET

PERFORMANCE SPECIFICATIONS

Model Number	aGate X
Coupling	AC-coupled
Nominal AC Voltage	120 / 208 V, 120 / 240 V, 60 Hz
Phase	2 W+N+PE
aPower Over Current Protection Device	100 A Max
Solar Input Over Current Protection Device	80 A Max
Backup Load Port Over Current Protection Device	200 A Max
Generator Over Current Protection Device[1]	200 A Max
Smart Circuits Over Current Protection Device[2]	Opt. a 1 × 80 A Max @ 208 V / 240 V & 1 × 50 A Max @ 208 V / 240 V Opt. b 1 × 80 A Max @ 208 V / 240 V & 2 × 50 A Max @ 120 V
Maximum Supply Fault Current	22 kA
Busbar Rating	280 A
Work Modes	Self-Consumption, Time of Use, Emergency Backup
Communications	Ethernet / 4G / Wifi /Bluetooth
User Interface	FranklinWH App
Warranty	12-year limited

MECHANICAL SPECIFICATIONS

Dimensions (H × W × D)	31.5 in × 21.7 in × 6.3 in (800 mm × 550 mm × 160 mm)
Weight	38.6 lb (17.5 kg)
Mounting	Wall mount



1. Generator Module is optional.
2. Smart Circuit Module is optional.

COMPLIANCE INFORMATION

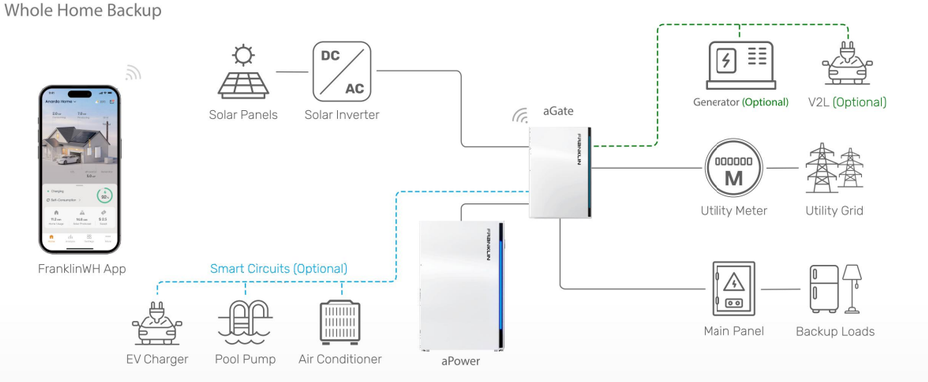
Certifications	UL 1741, UL 1741 PCS, UL 67, UL 869A, UL 916, CAN / CSA C22.2 No. 107.1-16, CSA C22.2 No. 29, CSA C22.2 No. 0.19
Seismic	AC 156, OSHPD, IEEE 693-2005 (high)
Environmental	California Proposition 65 RoHS Directive 2011 / EU
Emissions	FCC Part 15 Class B, ICES 003

ENVIRONMENTAL SPECIFICATIONS

Enclosure Type	NEMA 3R
Operating Temperature	-4°F to 122°F (-20°C to 50°C)
Operating Humidity (RH)	Up to 100% RH, condensing
Altitude	Maximum 9,843 ft (3,000 m)
Environment	Indoor and outdoor rated

Franklin Home Power Solution

Whole Home Backup



Address: 1731 Technology Dr., Suite 530 San Jose, CA 95110 **Telephone:** +1 888-837-2655 **Email:** info@franklinwh.com **Website:** www.franklinwh.com

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FRANKLINWH

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REVISIONS

DESCRIPTION	DATE	REV
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CLIENT COMMENT	11/20/2024	B
CLIENT COMMENT	11/21/2024	C

PROJECT NAME & ADDRESS

BILL FRIES RESIDENCE
1300 SW CUMORAH HILL ST.,FORT WHITE, FL 32038

DRAWN BY
ESR

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-14

DATASHEET

FRANKLINWH

FranklinWH aPbox

Remotely and automatically manage a solar system

There are circumstances in which a solar (PV) system cannot be connected through the aGate X solar breaker, either on grid side or load side. The FranklinWH aPbox is a junction that provides an intelligent solution, linking those PV systems into the Franklin Home Power architecture for ease of management and control.

When installing a Franklin Home Power (FHP) system alongside a PV system, there are multiple PV installation configurations which require different methods to connect them with a home energy management system such as the FHP. The aPbox is designed to help installers address those issues. It is also designed to protect the aPower X battery from overcharging while maximizing the utilization of photovoltaics.

The aPbox has built-in meters and current transformers (CTs) to measure electricity. It can also connect and disconnect the solar systems as conditions require.

Applicable Scenarios

Remote solar system

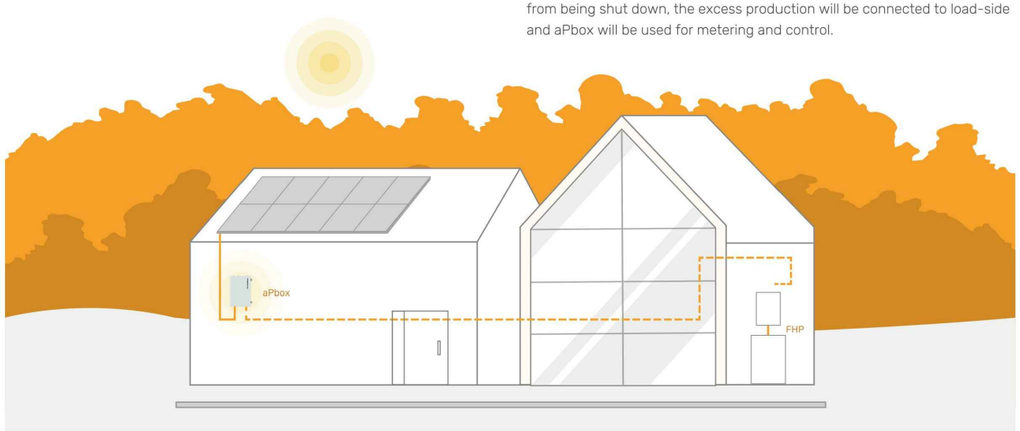
An existing solar system is far from the aGate X installation location and changing the power line wiring will increase overall costs. An aPbox can be used for easier connection without changing the power line route. Newly added solar systems can also use aPbox for control or metering. An aPbox can disconnect the solar system when it is over generating power in an off-grid or blackout situation, or when excess generation can't be exported to the grid due to regulatory limitations.

Oversized solar system

The total power of a solar system exceeds the maximum continuous current of 64A for the 80A solar circuit breaker in the aGate X. Panels providing the excess can be connected to load-side of the aGate X, and the aPbox will be used for metering and control.

Over generating solar system

The generated power of the solar system exceeds the total continuous power of the aPower X batteries installed. To prevent the entire solar system from being shut down, the excess production will be connected to load-side and aPbox will be used for metering and control.



Features

Flexible Configuration

Flexibly arrange the power generated by the solar system to realize the maximum utilization of solar energy.

Highly Compatible

One aGate X can control up to 2 aPbox units, a maximum of 130A controllable solar current.

Simple Installation

Easily connect remote solar systems to the aGate X, saving labor costs and shortening project time.

Easy control

Automatically manage your solar system. In off-grid or blackout scenario, it will automatically control the over generating solar system.

Specification

Electrical Specifications

Nominal Voltage	120/240VAC, split
Frequency	60 Hz
Rated Output Current	1 circuit, max 65A
Rated Input Current	2 circuits, max 65A total

Mechanical Specifications

Dimensions (W x H x D)	11.8 in x 17.7 in x 5.9 in (300mm x 450mm x 150mm)
Weight	21.2 lbs. (9.6kg)
Mounting Options	Wall mount (Indoors/Outdoors)

Environmental Specifications

Operating Temperature Range	-4°F~122°F (-20°C~50°C)
Storage Temperature Range	-22°F~140°F (-30°C~60°C)
Operating Humidity (RH)	0~100%
Maximum Altitude	9843 feet (3000 meters)
Type of Enclosure	NEMA 3R

Compliance Information

Compliance	UL 1741
Environment	California Proposition 65
Emissions	FCC Part 15 Class B, ICES 003

Address: 1731 Technology Dr., Suite 530 San Jose, CA 95110 **Telephone:** +1 888-837-2655 **Email:** info@franklinwh.com **Website:** www.franklinwh.com

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PROJECT NAME & ADDRESS

BILL FRIES
RESIDENCE

1300 SW CUMORAH HILL
ST.,FORT WHITE, FL 32038

DRAWN BY
ESR

SHEET NAME
EQUIPMENT
SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-15

Tech Brief

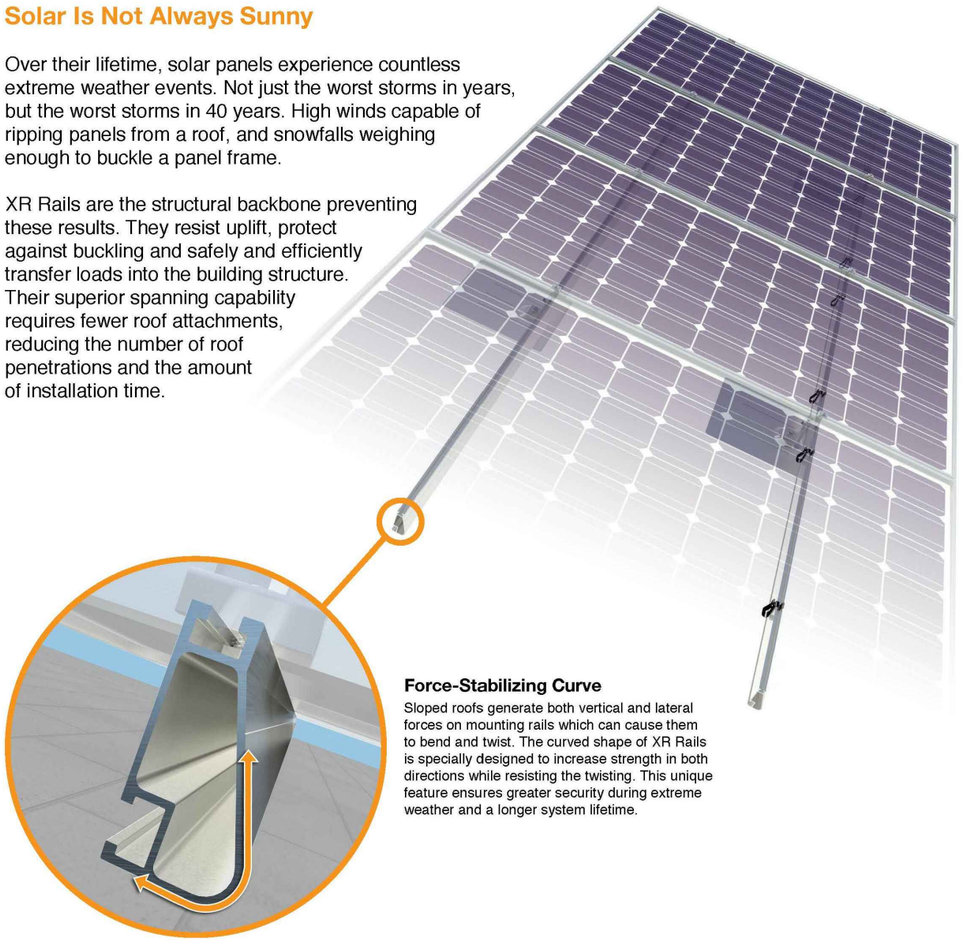
IRONRIDGE

XR Rail Family

Solar Is Not Always Sunny

Over their lifetime, solar panels experience countless extreme weather events. Not just the worst storms in years, but the worst storms in 40 years. High winds capable of ripping panels from a roof, and snowfalls weighing enough to buckle a panel frame.

XR Rails are the structural backbone preventing these results. They resist uplift, protect against buckling and safely and efficiently transfer loads into the building structure. Their superior spanning capability requires fewer roof attachments, reducing the number of roof penetrations and the amount of installation time.



Force-Stabilizing Curve

Sloped roofs generate both vertical and lateral forces on mounting rails which can cause them to bend and twist. The curved shape of XR Rails is specially designed to increase strength in both directions while resisting the twisting. This unique feature ensures greater security during extreme weather and a longer system lifetime.

Compatible with Flat & Pitched Roofs

XR Rails are compatible with FlashFoot and other pitched roof attachments.

IronRidge offers a range of tilt leg options for flat roof mounting applications.

Corrosion-Resistant Materials

All XR Rails are made of marine-grade aluminum alloy, then protected with an anodized finish. Anodizing prevents surface and structural corrosion, while also providing a more attractive appearance.

Tech Brief

XR Rail Family

The XR Rail Family offers the strength of a curved rail in three targeted sizes. Each size supports specific design loads, while minimizing material costs. Depending on your location, there is an XR Rail to match.

XR10

XR10 is a sleek, low-profile mounting rail, designed for regions with light or no snow. It achieves 6 foot spans, while remaining light and economical.

- 6' spanning capability
- Moderate load capability
- Clear anodized finish
- Internal splices available

XR100

XR100 is the ultimate residential mounting rail. It supports a range of wind and snow conditions, while also maximizing spans up to 8 feet.

- 8' spanning capability
- Heavy load capability
- Clear & black anodized finish
- Internal splices available

XR1000

XR1000 is a heavyweight among solar mounting rails. It's built to handle extreme climates and spans 12 feet or more for commercial applications.

- 12' spanning capability
- Extreme load capability
- Clear anodized finish
- Internal splices available

Rail Selection

The following table was prepared in compliance with applicable engineering codes and standards. Values are based on the following criteria: ASCE 7-10, Roof Zone 1, Exposure B, Roof Slope of 7 to 27 degrees and Mean Building Height of 30 ft. Visit IronRidge.com for detailed span tables and certifications.

Load		Rail Span					
Snow (PSF)	Wind (MPH)	4'	5' 4"	6'	8'	10'	12'
None	100	XR10		XR100		XR1000	
	120						
	140						
	160						
10-20	100						
	120						
	140						
	160						
30	100						
	160						
40	100						
	160						
50-70	160						
80-90	160						

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DRAWN BY
ESR

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-16

Datasheet

IRONRIDGE

Ground Mount System

All-Terrain Mounting

The IronRidge® Ground Mount System combines our XR100® or XR1000® rails with locally-sourced steel pipes or mechanical tubing, to create a cost-effective structure capable of handling any site or terrain challenge.

Installation is simple with only a few structural components and no drilling, welding, or heavy machinery required. In addition, the system works with a variety of foundation options—including concrete piers, ground screws, helical or driven piles, and above-ground ballast blocks.

Rugged Construction
Engineered steel and aluminum components ensure durability.

PE Certified
Pre-stamped engineering letters available in most states.

UL 2703 Listed System
Meets newest effective UL 2703 standard.

Design Software
Online tool generates engineering values and bill of materials.

Flexible Architecture
Multiple foundation and array configuration options.

25-Year Warranty
Products guaranteed to be free of impairing defects.

Datasheet

360° Product Tour
Visit ironridge.com

Substructure

Top Caps

Connect vertical piers with cross pipes or tubing.

Bonded Rail Connectors

Attach and bond XR Rails® to cross pipes or tubing.

Diagonal Braces

Optional brace provides additional support.

Cross Pipe & Piers

Steel pipes or mechanical tubing for substructure.

Rail Assembly

XR100® & XR1000® Rails

Curved XR Rails® increase spanning capabilities.

UFO®

Universal Fastening Objects bond modules to rails.

Stopper Sleeves

Snap onto the UFO® to turn into a bonded end clamp.

CAMO

Bond modules to rails while staying completely hidden.

Resources

Design Assistant
Go from rough layout to fully engineered system. For free.
Go to ironridge.com/design

NABCEP Certified Training
Earn free continuing education credits, while learning more about our systems.
Go to ironridge.com/training

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CLIENT COMMENT	11/15/2024	A
CLIENT COMMENT	11/20/2024	B
CLIENT COMMENT	11/21/2024	C

PROJECT NAME & ADDRESS

BILL FRIES
RESIDENCE

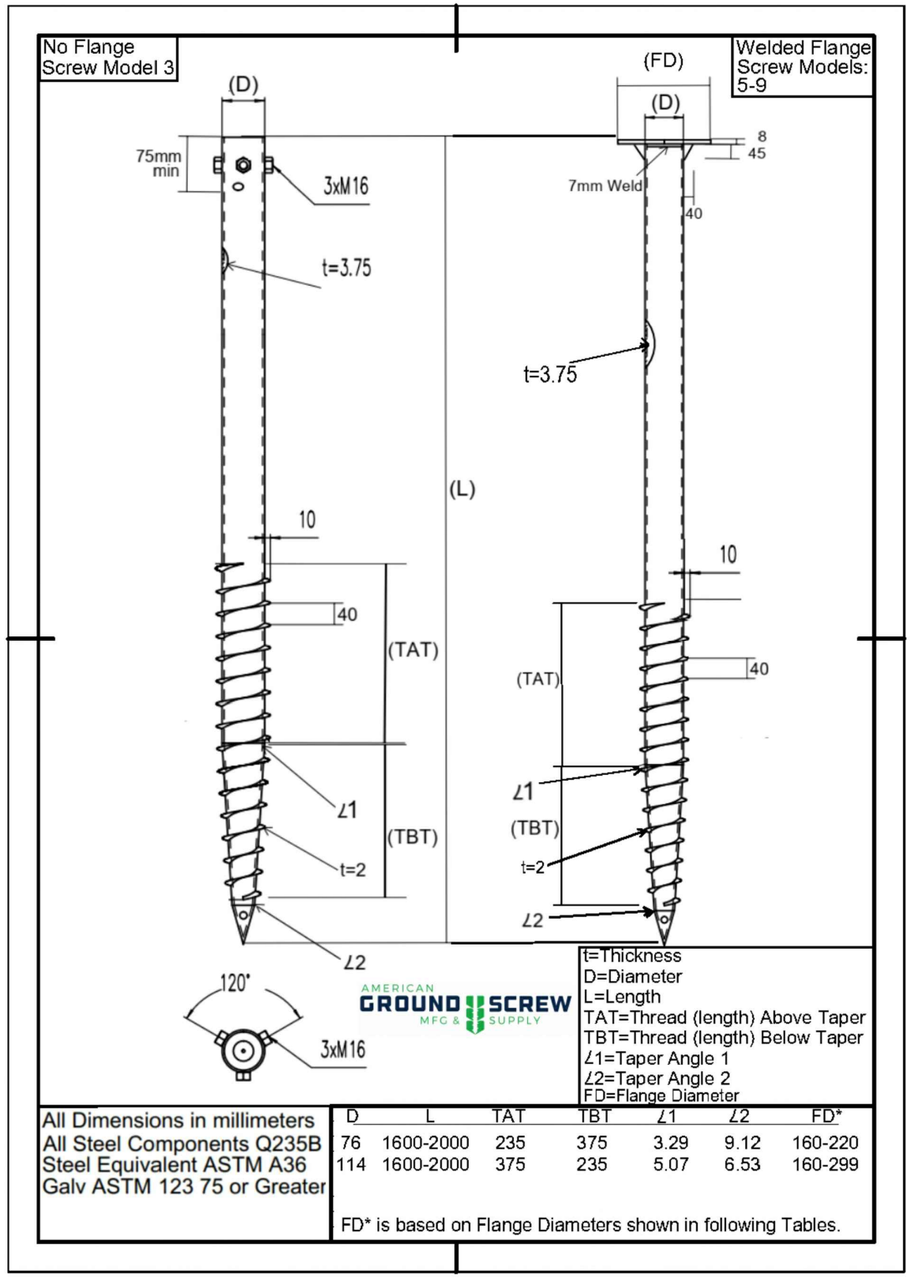
1300 SW CUMORAH HILL
ST.,FORT WHITE, FL 32038

DRAWN BY
ESR

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-17



D	L	TAT	TBT	∠1	∠2	FD*
76	1600-2000	235	375	3.29	9.12	160-220
114	1600-2000	375	235	5.07	6.53	160-299

FIGURE 3—MODEL 3 AND WELDED FLANGE GROUND SCREWS (units in metric)

SOLAR BEAR
RESIDENTIAL & COMMERCIAL EFFICIENCIES
SOLAR BEAR
6101 JOHNS RD, STE 8 TAMPA,
FL 33634
PHONE # - 727-471-7442

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	10/25/2024	
CLIENT COMMENT	11/15/2024	A
CLIENT COMMENT	11/20/2024	B
CLIENT COMMENT	11/21/2024	C

PROJECT NAME & ADDRESS

BILL FRIES
RESIDENCE

1300 SW CUMORAH HILL
ST.,FORT WHITE, FL 32038

DRAWN BY
ESR

SHEET NAME
EQUIPMENT
SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-18