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PV MATERIAL SUMMARY: DISTRIBUTOR	
REC365AA (fulfillment)	25
IQ7A-72-2-US	25
X-IQ-AM1-240-3-ES	1
Q-12-10-240	27
Q-12-17-240	7
Q-SEAL-10	9
Q-TERM-10	5
XR-10-168B	13
XR-10-204B	2
XR10-BOSS-01-M1	4
UFO-CL-01-B1	64
UFO-STP-30MM-B1	28
XR-LUG-03-A1	7
4 IN QB1	54
MI-BHW	25
GCC66803 Geocel Sealant	4
SOLADECK 0799-5B	3






CLIENT INFO	
KEITH WATKINS 6156 OLD US HIGHWAY 421 LILLINGTON, NC 27546	
PROJECT INFO	
DC INPUT:	9.13 kW
AC EXPORT:	8.73 kW
DOI INSPT. METHOD:	OPTION 2
CODE REFERENCES	
NATION ELECTRICAL CODE v. 2017 NC FIRE PROTECTION CODE v. 2018 NC BUILDING CODE v. 2018 NC RESIDENTIAL CODE v. 2018 ACSE v. 7-10	
SITE CONDITIONS	
WIND SPEED:	117 MPH
RISK CATEGORY:	II
EXPOSURE:	B
SNOW:	15 PSF
SHEET INDEX	
PV-1:	COVER SHEET
PV-2:	PV STRUCTURAL
PV-3:	PV ELECTRICAL
PV-4:	PV EQUIPMENT LABELS
PV-5:	PV INSTALL GUIDE
DESIGNER INFO	
DESIGNER	EJF
ENGINEER	AWK
DATE	8/18/2021
VERSION	P1
PV SYSTEM COVER PAGE	
PV-1.1	



NC SOLAR NOW

PROFESSIONAL ENGINEER
ANDREW W. KING
035689
9/2/24

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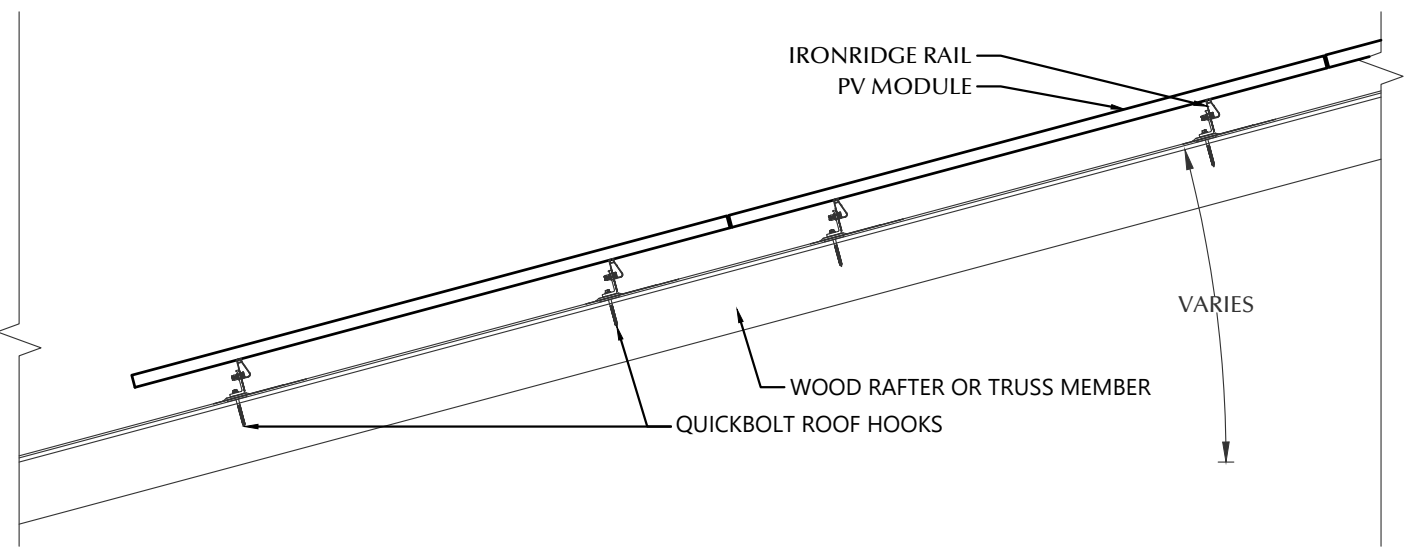
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PV SYSTEM COVER PAGE

PV-1.1

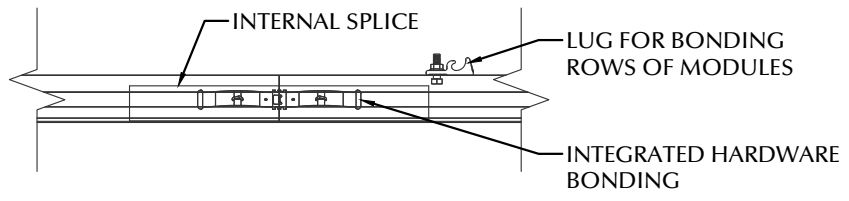
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STATEMENT OF STRUCTURAL COMPLIANCE

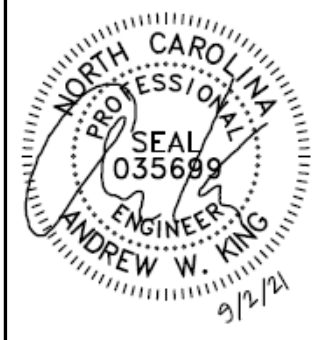
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NAME: ANDREW W. KING, PE
 SIGNED:



PV MODULES	
MAKE	REC
MODEL	REC365AA
WIDTH	40.00 IN
LENGTH	67.80 IN
THICKNESS	30 MM
WEIGHT	43.00 LBS.
ARRAY AREA	188 SQFT.
ARRAY WEIGHT	471 LBS.

ROOF SUMMARY	
STRUCTURE:	
TYPE	RAFTERS
MATERIAL	SOUTHERN PINE #2
SIZE	2 X 6
SPACING	16 IN O.C.
EFFECTIVE SPAN	162 IN
PITCH	4/12
DENSITY	
DECKING:	
TYPE	PLYWOOD
MATERIAL	COMPOSITE
THICKNESS	8/16 IN
WEIGHT	1.42 LBS./SQFT
ROOFING:	
TYPE	ASPHALT SHINGLE
MATERIAL	ASPHALT
WEIGHT	2.30 LBS./SQFT.



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SITE CONDITIONS
 WIND SPEED: 117 MPH
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 ENGINEER: AWK
 DATE: 8/18/2021
 VERSION: P1

PV SYSTEM STRUCTURAL

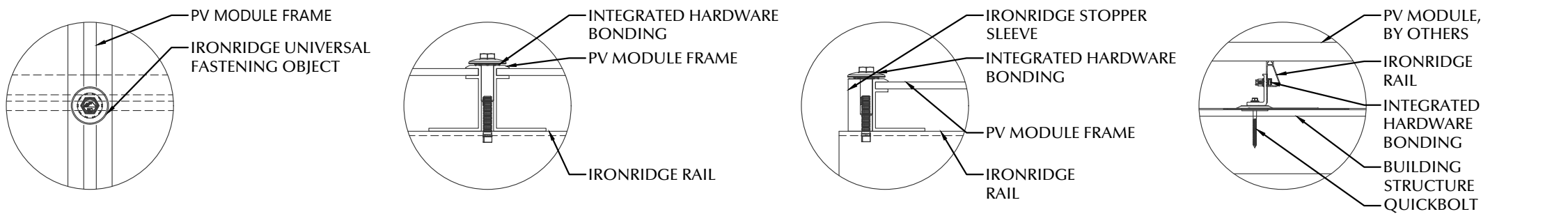
PV-2.1

ROOF MOUNT SUMMARY		
MAXIMUM (IN)	MOUNT SPACING	RAIL OVERHANG
WIND ZONE 1	PORT 64 LAND 64	19 IN
WIND ZONE 2	PORT 48 LAND 64	19 IN
WIND ZONE 3	PORT 32 LAND 48	19 IN

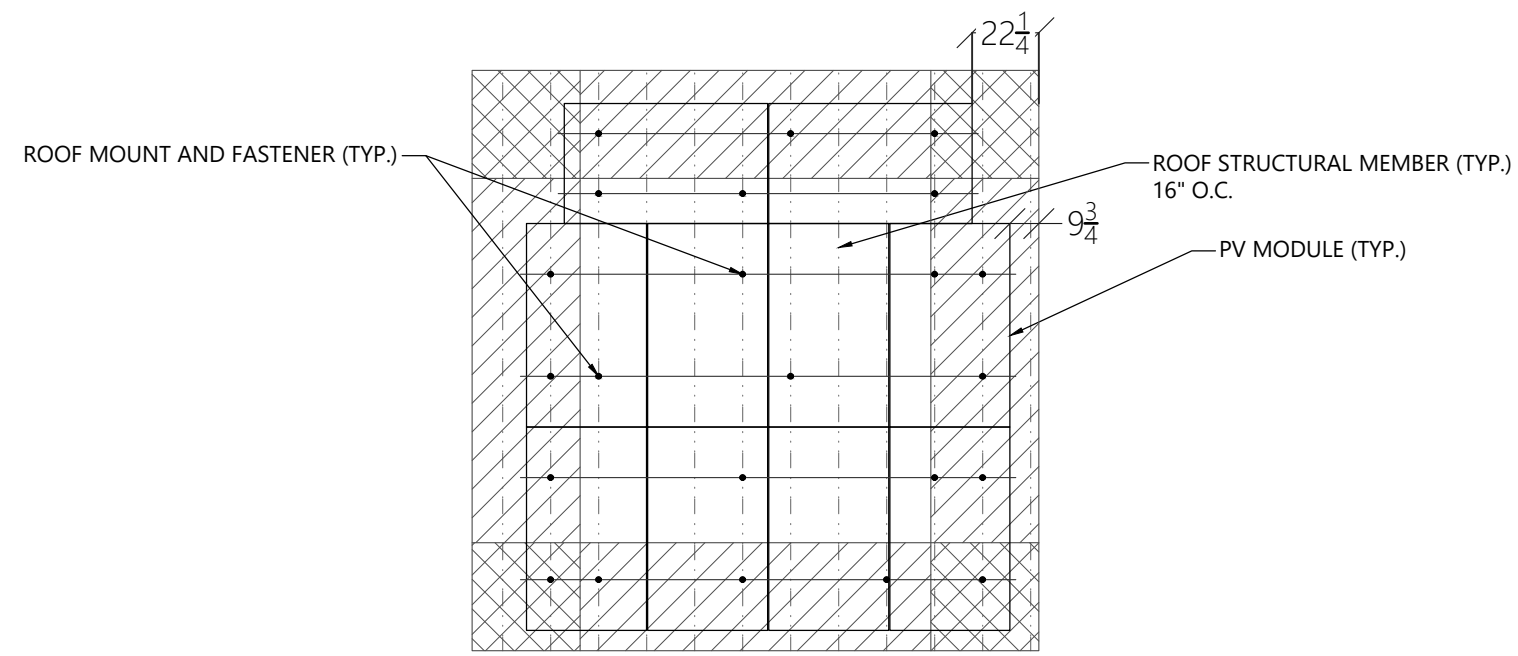
ROOF LOADING	
GROUND SNOW LOAD:	15 LBS./SQFT.
LIVE LOAD	20 LBS./SQFT.
DEAD LOAD	
ROOFING	3.9 LBS./SQFT.
PV ARRAY	2.5 LBS./SQFT.
TOTAL	6.4 LBS./SQFT.
WIND LOAD:	
UPLIFT ZONE 1	-23.0 LBS./SQFT.
UPLIFT ZONE 2	-38.0 LBS./SQFT.
UPLIFT ZONE 3	-57.1 LBS./SQFT.
DOWNWARD	13.6 LBS./SQFT.
FASTENER LOAD:	
UPLIFT ZONE 1	-303 LBS.
UPLIFT ZONE 2	-375 LBS.
UPLIFT ZONE 3	-375 LBS.
DOWNWARD	179 LBS.

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

MOUNTING RAILS	
MAKE	IRONRIDGE
MODEL	XR10
MATERIAL	ALUMINUM
WEIGHT	0.425 LBS/IN
SPACING	34 IN

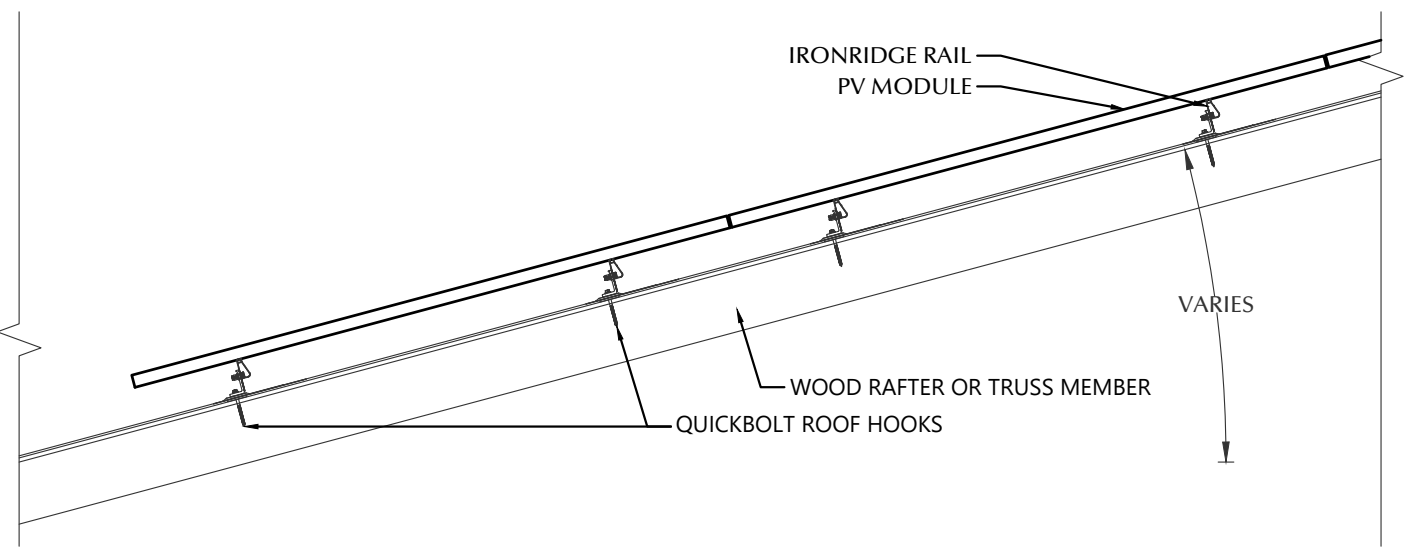


1 ROOF FASTENER DETAIL
 NOT TO SCALE



2 ARRAY LAYOUT
 3/16" = 1'-0"

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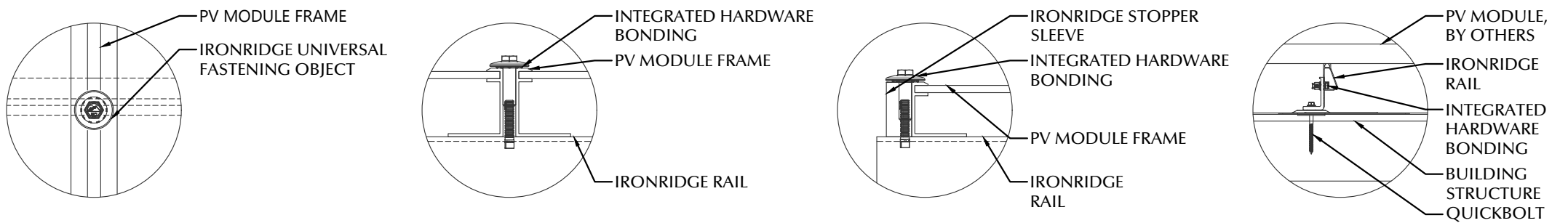
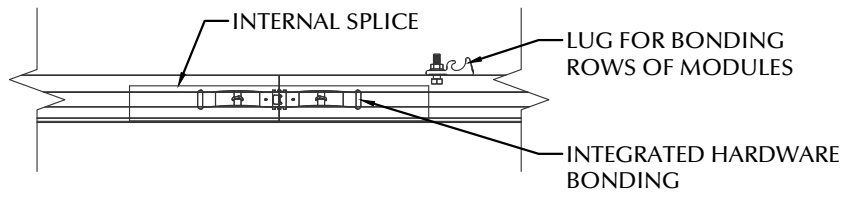
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NAME: ANDREW W. KING, PE
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PV MODULES	
MAKE	REC
MODEL	REC365AA
WIDTH	40.00 IN
LENGTH	67.80 IN
THICKNESS	30 MM
WEIGHT	43.00 LBS.
ARRAY AREA	245 SQFT.
ARRAY WEIGHT	612 LBS.

ROOF SUMMARY	
STRUCTURE:	
TYPE	RAFTERS
MATERIAL	SOUTHERN PINE #2
SIZE	2 X 6
SPACING	16 IN O.C.
EFFECTIVE SPAN	162 IN
PITCH	4/12
DENSITY	30 LBS./CU.FT.
DECKING:	
TYPE	PLYWOOD
MATERIAL	COMPOSITE
THICKNESS	8/16 IN
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ROOFING:	
TYPE	ASPHALT SHINGLE
MATERIAL	ASPHALT
WEIGHT	2.30 LBS./SQFT.



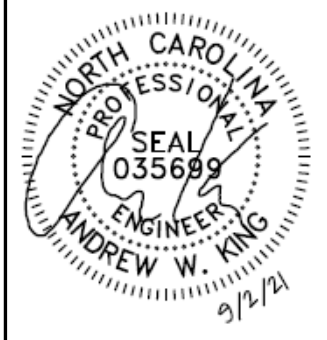
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ROOF MOUNT SUMMARY		
MAXIMUM (IN)	MOUNT SPACING	RAIL OVERHANG
WIND ZONE 1	PORT 64 LAND 64	19 IN
WIND ZONE 2	PORT 48 LAND 64	19 IN
WIND ZONE 3	PORT 32 LAND 48	19 IN

ROOF LOADING	
GROUND SNOW LOAD:	15 LBS./SQFT.
LIVE LOAD	20 LBS./SQFT.
DEAD LOAD	
ROOFING	3.9 LBS./SQFT.
PV ARRAY	2.5 LBS./SQFT.
TOTAL	6.4 LBS./SQFT.
WIND LOAD:	
UPLIFT ZONE 1	-23.0 LBS./SQFT.
UPLIFT ZONE 2	-38.0 LBS./SQFT.
UPLIFT ZONE 3	-57.1 LBS./SQFT.
DOWNWARD	13.6 LBS./SQFT.
FASTENER LOAD:	
UPLIFT ZONE 1	-284 LBS.
UPLIFT ZONE 2	-352 LBS.
UPLIFT ZONE 3	-352 LBS.
DOWNWARD	168 LBS.

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

MOUNTING RAILS	
MAKE	IRONRIDGE
MODEL	XR10
MATERIAL	ALUMINUM
WEIGHT	0.425 LBS/IN
SPACING	34 IN



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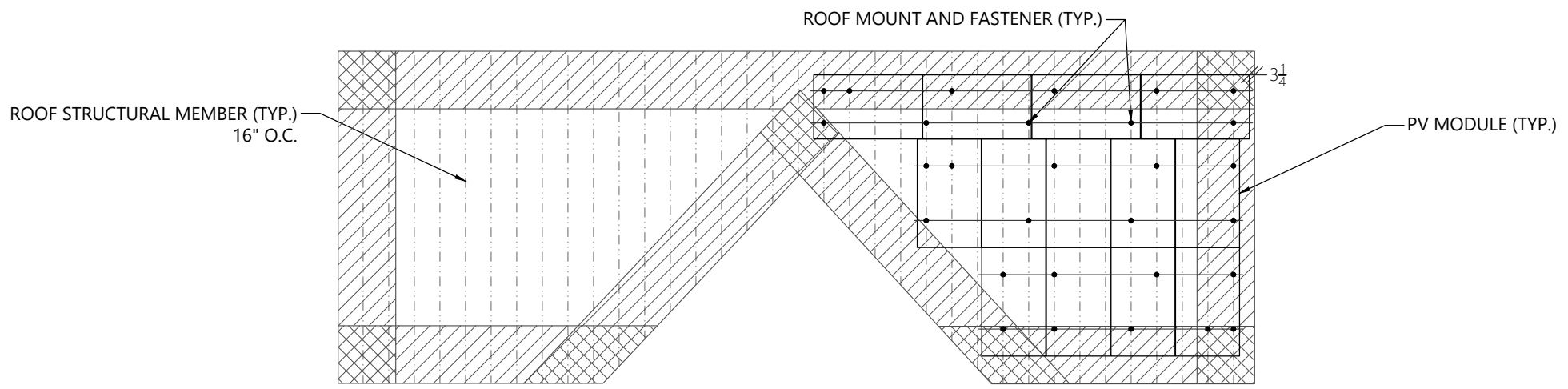
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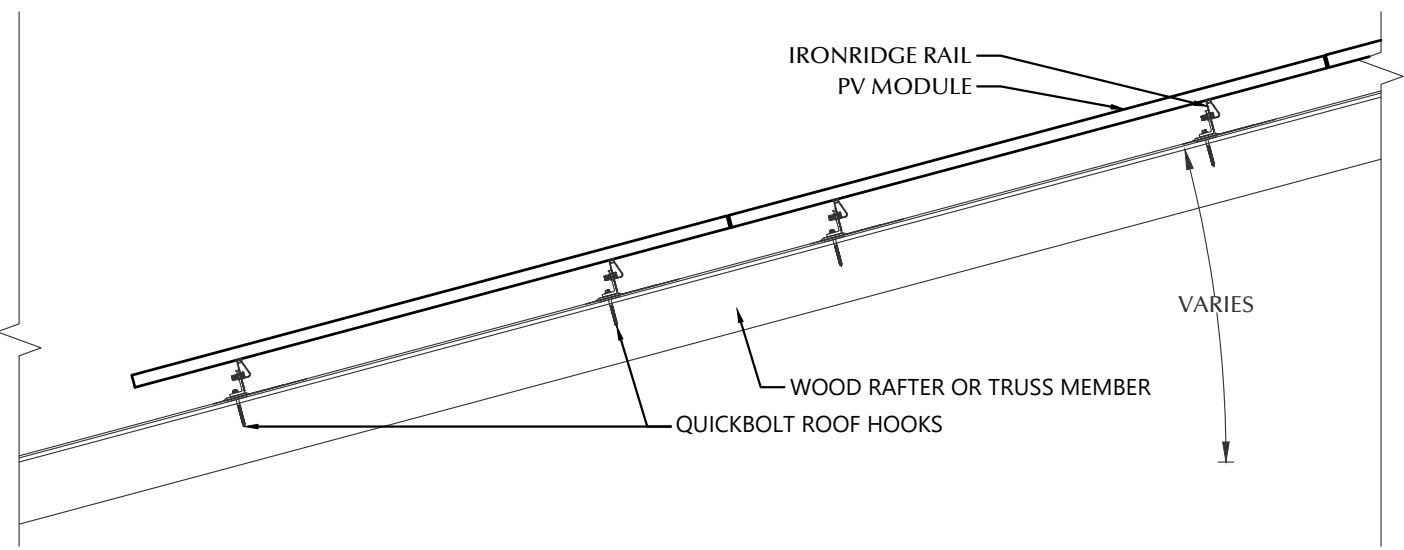
PV SYSTEM STRUCTURAL

PV-2.2



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

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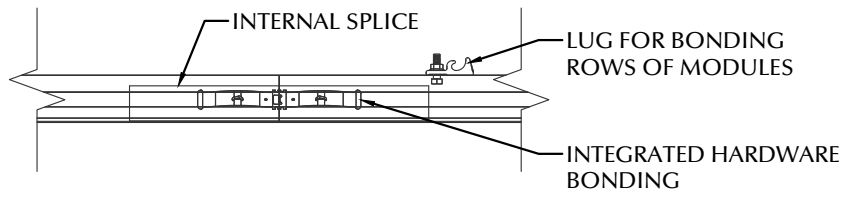
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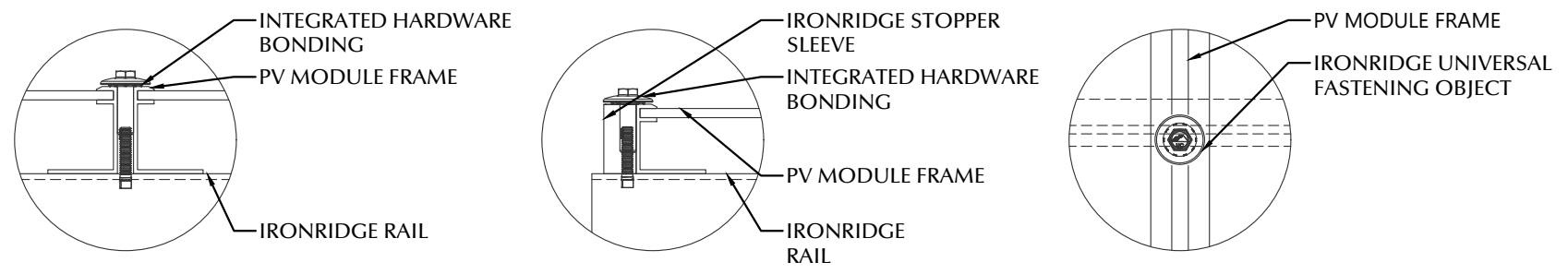
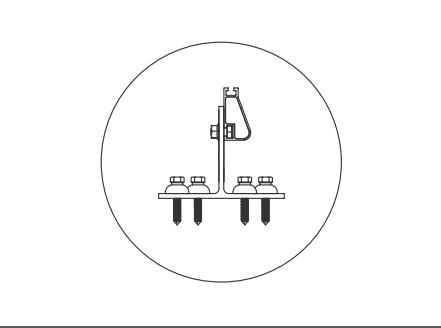
SIGNED:

PV MODULES	
MAKE	REC
MODEL	REC365AA
WIDTH	40.00 IN
LENGTH	67.80 IN
THICKNESS	30 MM
WEIGHT	43.00 LBS.
ARRAY AREA	38 SQFT.
ARRAY WEIGHT	94 LBS.

ROOF SUMMARY	
STRUCTURE:	
TYPE	RAFTERS
MATERIAL	SOUTHERN PINE #2
SIZE	2 X 6
SPACING	16 IN O.C.
EFFECTIVE SPAN	108 IN
PITCH	4/12
DENSITY	30 LBS./CU.FT.
DECKING:	
TYPE	PLYWOOD
MATERIAL	COMPOSITE
THICKNESS	8/16 IN
WEIGHT	1.42 LBS./SQFT
ROOFING:	
TYPE	ASPHALT SHINGLE
MATERIAL	ASPHALT
WEIGHT	2.30 LBS./SQFT.



ALTERNATIVE ATTACHMENT:
MAY BE USED WHERE STRUCTURAL MEMBERS ARE NOT ACCESSIBLE

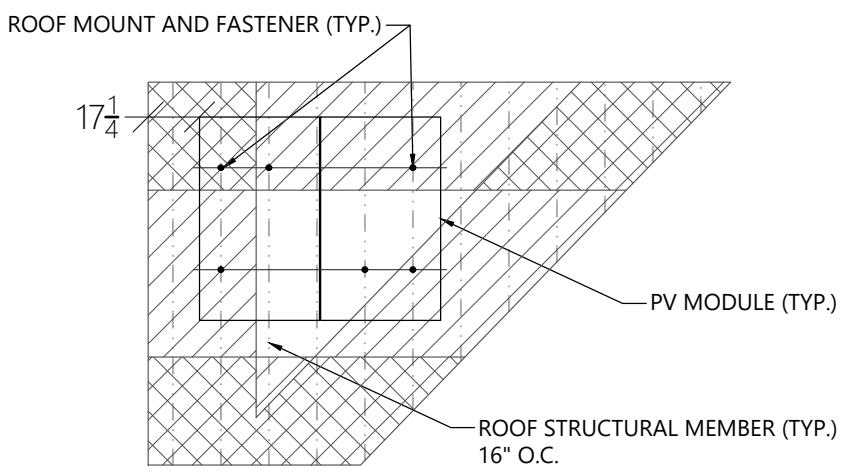


1 ROOF FASTENER DETAIL
NOT TO SCALE

ROOF MOUNT & FASTENER	
ROOF MOUNT:	
MAKE	QUICKBOLT
MODEL	QB DECK MOUNT 16317
MATERIAL	STAINLESS / EPDM
FASTENER:	
MAKE	QUICK SCREWS
MODEL	HEX LAG PN# 16318
MATERIAL	304 SS
SIZE	5/16" X 1-3/4"
GENERAL:	
WEIGHT	0.8819
FASTENERS PER MOUNT	4
MAX. PULL-OUT FORCE	705.0 LBS.
SAFETY FACTOR	3
DESIGN PULL-OUT FORCE	235.0 LBS.

ROOF MOUNT SUMMARY		
MAXIMUM (IN)	MOUNT SPACING	RAIL OVERHANG
WIND ZONE 1	43 IN	9 IN
WIND ZONE 2	23 IN	9 IN
WIND ZONE 3	14 IN	6 IN

ROOF LOADING	
FASTENER LOAD:	
UPLIFT ZONE 1	-232 LBS.
UPLIFT ZONE 2	-205 LBS.
UPLIFT ZONE 3	-187 LBS.
DOWNWARD	137 LBS.



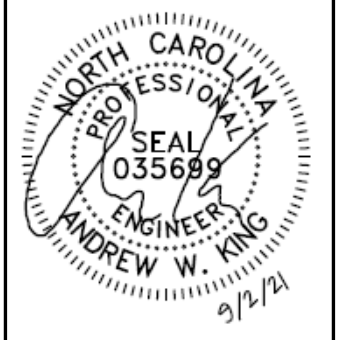
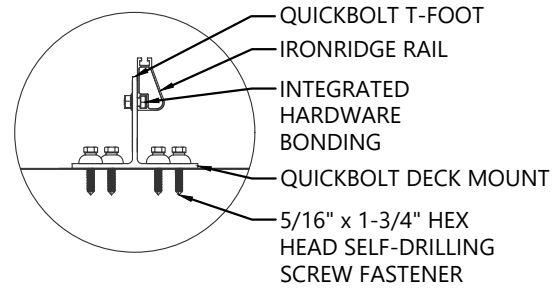
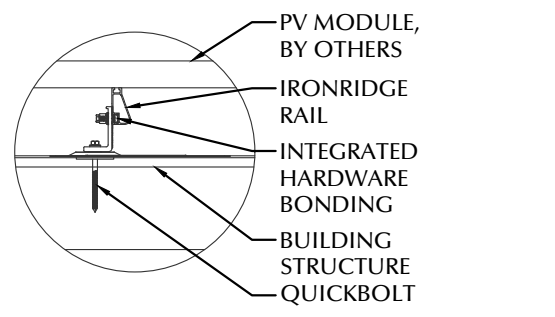
2 ARRAY LAYOUT
3/16" = 1'-0"

ROOF MOUNT SUMMARY		
MAXIMUM (IN)	MOUNT SPACING	RAIL OVERHANG
WIND ZONE 1	64 IN	19 IN
WIND ZONE 2	48 IN	19 IN
WIND ZONE 3	16 IN	12 IN

ROOF LOADING	
GROUND SNOW LOAD:	15 LBS./SQFT.
LIVE LOAD	20 LBS./SQFT.
DEAD LOAD	
ROOFING	3.9 LBS./SQFT.
PV ARRAY	2.5 LBS./SQFT.
TOTAL	6.4 LBS./SQFT.
WIND LOAD:	
UPLIFT ZONE 1	-23.0 LBS./SQFT.
UPLIFT ZONE 2	-38.0 LBS./SQFT.
UPLIFT ZONE 3	-57.1 LBS./SQFT.
DOWNWARD	13.6 LBS./SQFT.
FASTENER LOAD:	
UPLIFT ZONE 1	-345 LBS.
UPLIFT ZONE 2	-427 LBS.
UPLIFT ZONE 3	-214 LBS.
DOWNWARD	204 LBS.

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

MOUNTING RAILS	
MAKE	IRONRIDGE
MODEL	XR10
MATERIAL	ALUMINUM
WEIGHT	0.425 LBS/IN
SPACING	34 IN



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DESIGNER INFO
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ENGINEER: AWK
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VERSION: P1

PV SYSTEM STRUCTURAL

PV-2.3

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CONDUCTOR SCHEDULE

TAG	CURRENT CARRYING CONDUCTORS			GROUNDING CONDUCTORS			CONDUIT/RACEWAY			NOTES
	QTY.	SIZE	INSULATION	QTY.	SIZE	INSULATION	QTY.	SIZE	LOCATION	
C1	6	10 AWG	DG CABLE	1	6 AWG	BARE	-	-	FREE AIR	1
C2	6	12 AWG	THWN	1	12 AWG	THWN	1	3/4"	EXT/INT	2,4
C3	3	8 AWG	THWN	1	10 AWG	THWN	1	3/4"	EXTERIOR	2,4
C4	3	6 AWG	THWN	-	-	-	1	3/4"	EXTERIOR	2,4
C5	3	4 AWG	THWN	1	8 AWG	THWN	1	1"	EXTERIOR	2,4
C6	3	6 AWG	THWN	1	10 AWG	THWN	1	1"	EXT/INT	2,4
XC	-	-	-	-	-	-	-	-	-	3

NOTES:

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

MAKE	SQUARE D
MODEL	BX26R
ENCL. RATING	NEMA 3R
VOLT. RATING	240
BUS RATING	200 AMPS
UL LIST. (Y/N)	YES
MAIN BREAKER (Y/N)	NO
MAIN BREAKER RATING	N/A

MAKE	GENERIC
MODEL	NA
ENCL. RATING	NEMA 3R
VOLT. RATING	240 VOLTS
BUS RATING	125 AMPS
UL LIST. (Y/N)	YES
MAIN BREAKER (Y/N)	NO
MAIN BREAKER RATING	N/A

- RELOCATE DOUBLE POLE BREAKER FROM METER PANEL COMBO TO NEW SUB PANEL
- CONNECT NEW SUB PANEL TO EXISTING POWER SOURCE VIA 80 A BREAKER INSIDE MD PANEL

- CONNECT EV CHARGER TO NEW SUB PANEL VIA 60 A BREAKER

MAKE	REC
MODEL	REC365AA
NOM. POWER (PNOM)	365 WATTS
NOM. VOLT. (VMPP)	38.0 VOLTS
O.C. VOLT. (VOC)	44.3 VOLTS
MAX. SYS. VOLT.	1000 VOLTS
NOM. CURR. (IMPP)	9.6 AMPS
S.C. CURR. (ISC)	10.3 AMPS
TEMP. COEF. (PMPP)	-0.26 %/C
TEMP. COEF. (Voc)	-0.24 %/C
MAX SERIES FUSE	25 AMPS
UL LIST. (Y/N)	YES

MAKE	ENPHASE
MODEL	X-IQ-AM1-240-3-ES
INPUT:	
MAX BRANCH CIRCUITS	4 TOTAL
BRANCH CIRCUIT OCPD	50 AMPS
OUTPUT:	
MAX POWER	15600 WATTS
NOM. VOLTAGE	240 VOLTS
BUS RATING	125 AMPS
MAIN BREAKER Y/N	NO
ENCL. RATING	NEMA TYPE 3R
UL LIST. (Y/N)	YES

MAKE	ENPHASE
MODEL	IQ7A-72-2-US
DC INPUT:	
POWER RANGE (WATTS)	295-460
MIN/MAX START VOLT.	33 / 58
OPERATING VOLT. RANGE	18-58
MAX. CURRENT	15 AMPS
MODULE COMPATIBILITY	60, 66, & 72 CELL
AC OUTPUT:	
MAX. POWER	366 WATTS
NOM. POWER	349 WATTS
NOM. VOLT.	211-240-264
MAX. CURR.	1.45 AMPS
DC DISC. (Y/N)	NO
RAPID SHUTDOWN (Y/N)	YES
PROTECT. RATING	NEMA TYPE 6
UL LIST. (Y/N)	YES
CONSUMPTION MONITOR	YES

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

MAKE	TESLA
MODEL	N/A
PRO. RATING	NEMA 3R
VOLT. RATING	240 VOLTS
AMP RATING	60 AMPS
UL LISTED	YES

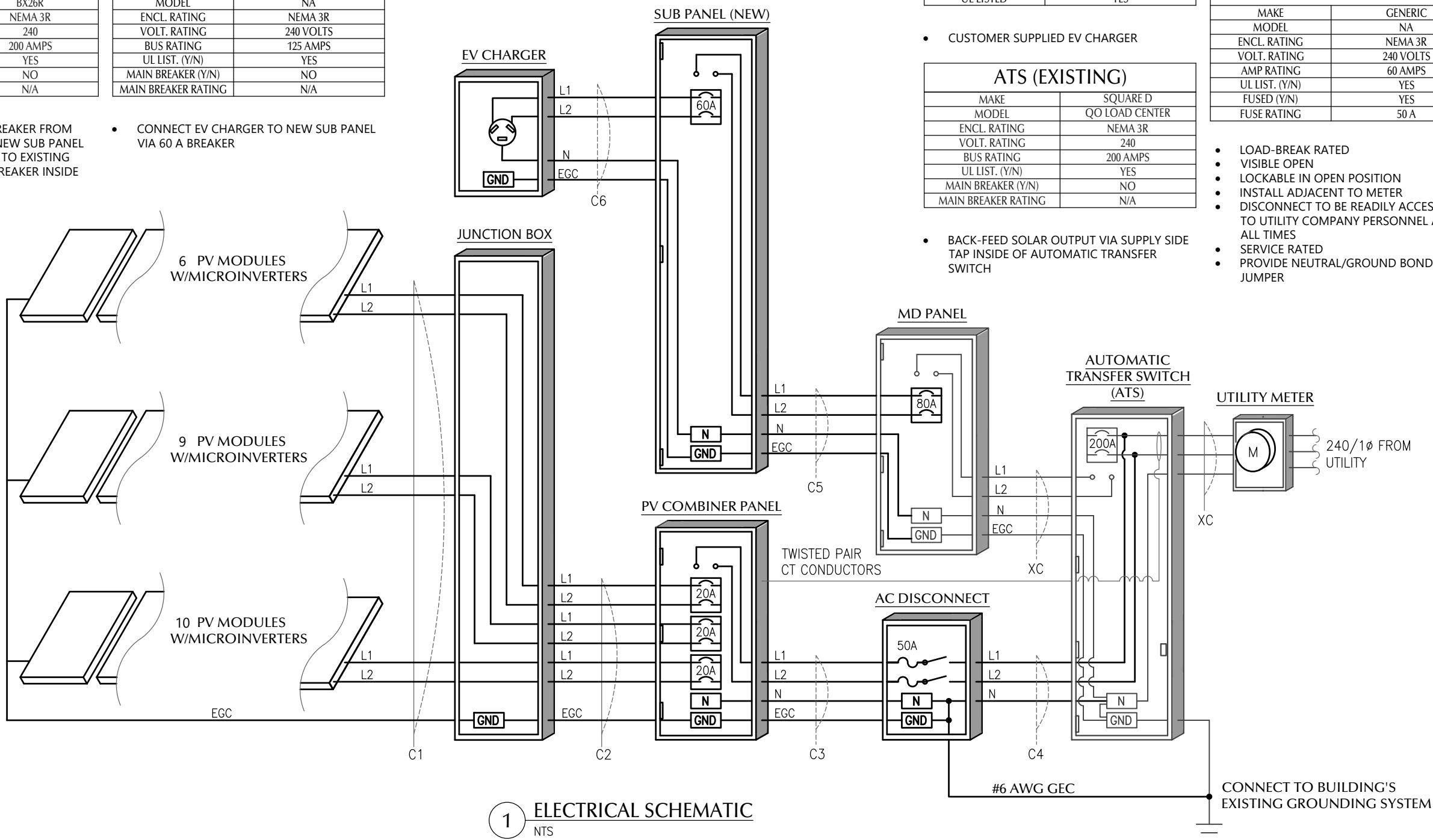
MAKE	GENERIC
MODEL	NA
ENCL. RATING	NEMA 3R
VOLT. RATING	240 VOLTS
AMP RATING	60 AMPS
UL LIST. (Y/N)	YES
FUSED (Y/N)	YES
FUSE RATING	50 A

- CUSTOMER SUPPLIED EV CHARGER

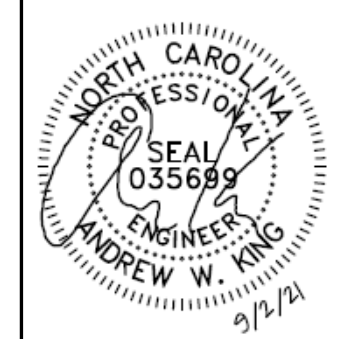
MAKE	SQUARE D
MODEL	QO LOAD CENTER
ENCL. RATING	NEMA 3R
VOLT. RATING	240
BUS RATING	200 AMPS
UL LIST. (Y/N)	YES
MAIN BREAKER (Y/N)	NO
MAIN BREAKER RATING	N/A

- BACK-FEED SOLAR OUTPUT VIA SUPPLY SIDE TAP INSIDE OF AUTOMATIC TRANSFER SWITCH

- LOAD-BREAK RATED
- VISIBLE OPEN
- LOCKABLE IN OPEN POSITION
- INSTALL ADJACENT TO METER
- DISCONNECT TO BE READILY ACCESSIBLE TO UTILITY COMPANY PERSONNEL AT ALL TIMES
- SERVICE RATED
- PROVIDE NEUTRAL/GROUND BONDING JUMPER



1 ELECTRICAL SCHEMATIC
NTS



CLIENT INFO

KEITH WATKINS
6156 OLD US HIGHWAY 421
LILLINGTON, NC 27546

PROJECT INFO

DC INPUT: 9.13 kW
AC EXPORT: 8.73 kW
DOI INSPT. METHOD: OPTION 2

CODE REFERENCES

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

SITE CONDITIONS

WIND SPEED: 117 MPH
RISK CATEGORY: II
EXPOSURE: B
SNOW: 15 PSF

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DESIGNER INFO

DESIGNER: EJF
ENGINEER: AWK
DATE: 8/18/2021
VERSION: P1

PV SYSTEM ELECTRICAL

PV-3.1

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

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

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

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

⚠ WARNING
THREE POWER SOURCES
 SOURCES: UTILITY, GENERATOR AND PV SOLAR ELECTRIC SYSTEM

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

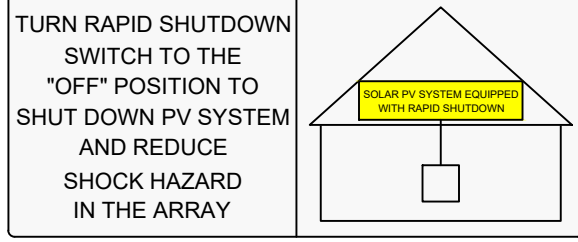
WARNING: PHOTOVOLTAIC POWER SOURCE

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

RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

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

SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN



NEC 690.56 (C)(1)(a)
 PLACE WITHIN 3FT OF SERVICE DISCONNECTING MEANS TO WHICH THE PV SYSTEMS ARE CONNECTED AND SHALL INDICATE THE LOCATIONS OF RAPID SHUTDOWN SWITCHES

PV SYSTEM DISCONNECT

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

PHOTOVOLTAIC POWER SOURCE
 OPERATING AC VOLTAGE 240 V
 MAXIMUM OPERATING AC OUTPUT CURRENT 36.25 A

NEC 690.54
 PLACE ON INTERCONNECTION DISCONNECTING MEANS

SERVICE DISCONNECT LOCATED: EXTERIOR NORTH WALL OF HOME
GENERATOR DISCONNECT LOCATED: EXTERIOR NORTH WALL OF HOME
PV DISCONNECT LOCATED: EXTERIOR NORTH WALL OF HOME

NEC 705.10
 PLACE AT THE LOCATIONS OF THE SYSTEM DISCONNECTS FOR ALL ELECTRIC POWER PRODUCTION SOURCES. FIELD VERIFY EQUIPMENT LOCATIONS AND LABEL ACCORDINGLY. LABEL CAN BE ADJUSTED ON SITE.

⚠ WARNING
PHOTOVOLTAIC SYSTEM COMBINER PANEL
DO NOT ADD LOADS

NEC 705.12 (B)(2)(c)
 PLACE ON PV COMBINER PANEL.

LABEL NOTES

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

DC WIRING NOTES

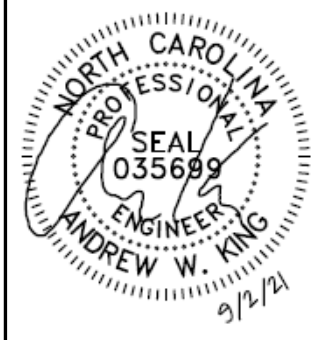
1. CONDUCTORS SHALL BE COPPER, RATED AT NOT LESS THAN 600 VOLTS FOR RESIDENTIAL CONSTRUCTION AND NOT LESS THAN 1000 VOLTS FOR COMMERCIAL CONSTRUCTION.
2. MINIMUM SIZE SHALL BE #10 AWG UNLESS OTHERWISE NOTED ON THE DRAWINGS.
3. EXPOSED WIRING CONDUCTOR INSULATION SHALL BE TYPE PV WIRE, USE-2, OR RHW-2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

AC WIRING NOTES

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

CONSTRUCTION NOTES

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



CLIENT INFO

KEITH WATKINS
 6156 OLD US HIGHWAY 421
 LILLINGTON, NC 27546

PROJECT INFO

DC INPUT: 9.13 kW
 AC EXPORT: 8.73 kW
 DOI INSPT. METHOD: OPTION 2

CODE REFERENCES

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

SITE CONDITIONS

WIND SPEED: 117 MPH
 RISK CATEGORY: II
 EXPOSURE: B
 SNOW: 15 PSF

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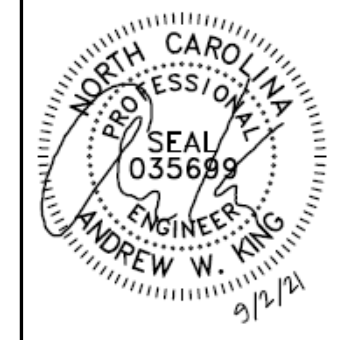
DESIGNER INFO

DESIGNER: EJF
 ENGINEER: AWK
 DATE: 8/18/2021
 VERSION: P1

PV SYSTEM EQUIPMENT LABELS

PV-4.1

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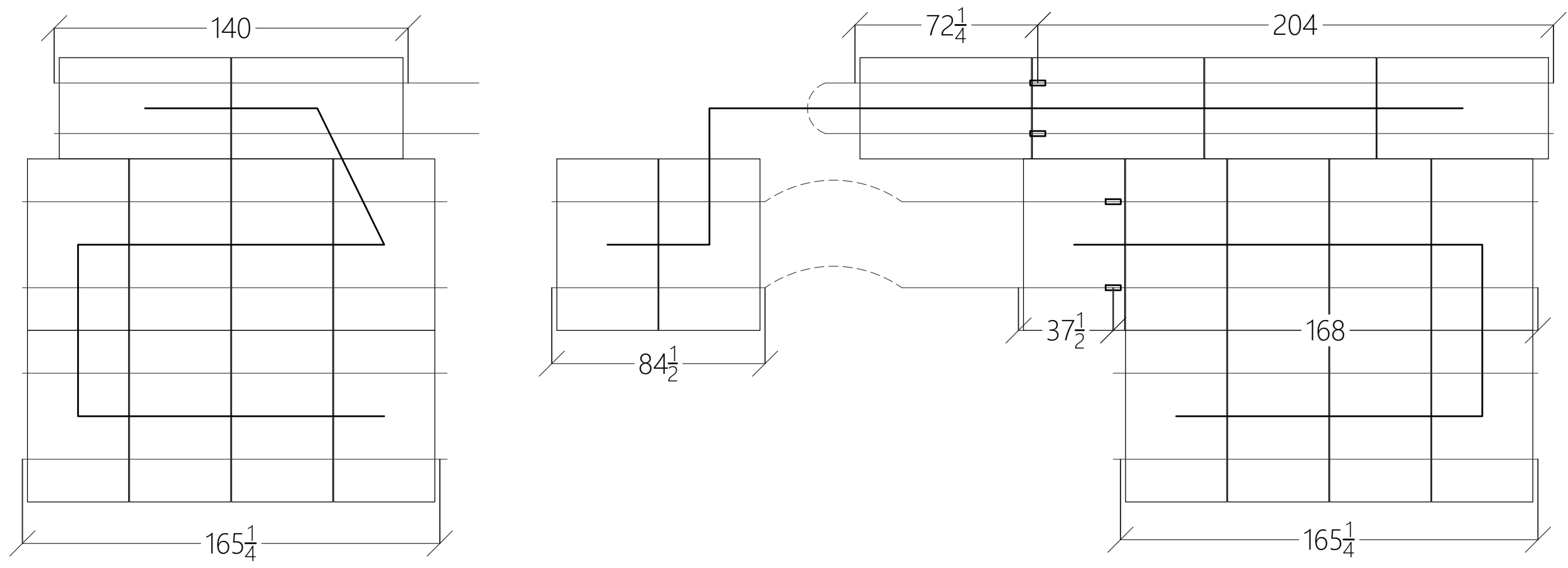
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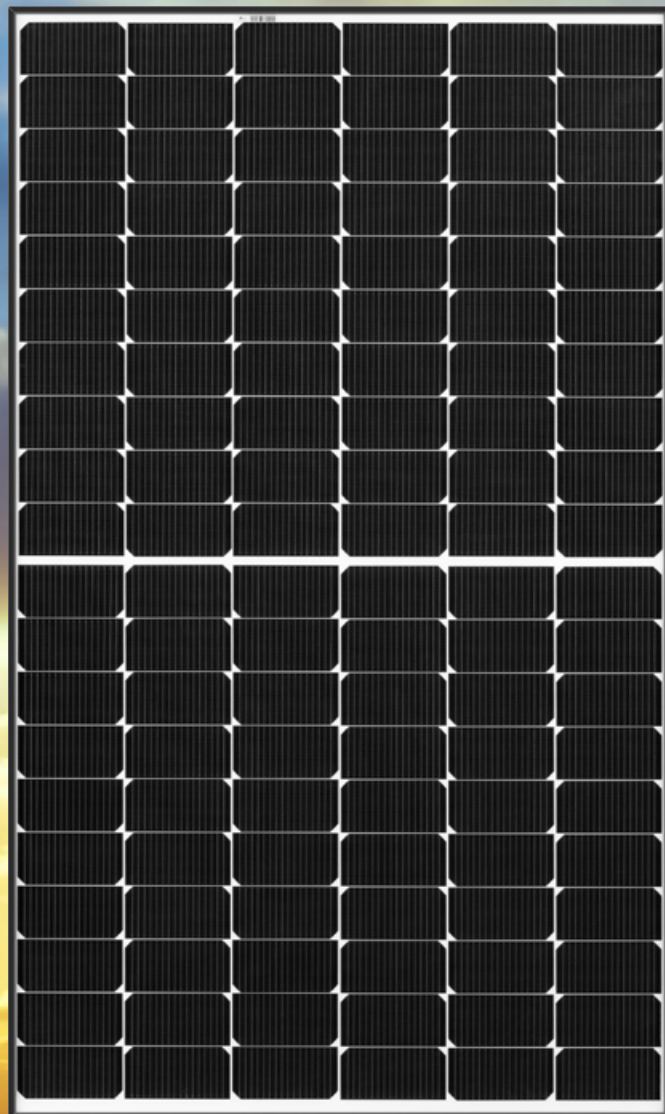
PV SYSTEM INSTALL GUIDE

PV-5.1



1 ARRAY LAYOUT DETAIL
NOT TO SCALE

SOLAR'S MOST TRUSTED



REC ALPHA SERIES

380 W_P POWER

20 YEAR PRODUCT WARRANTY

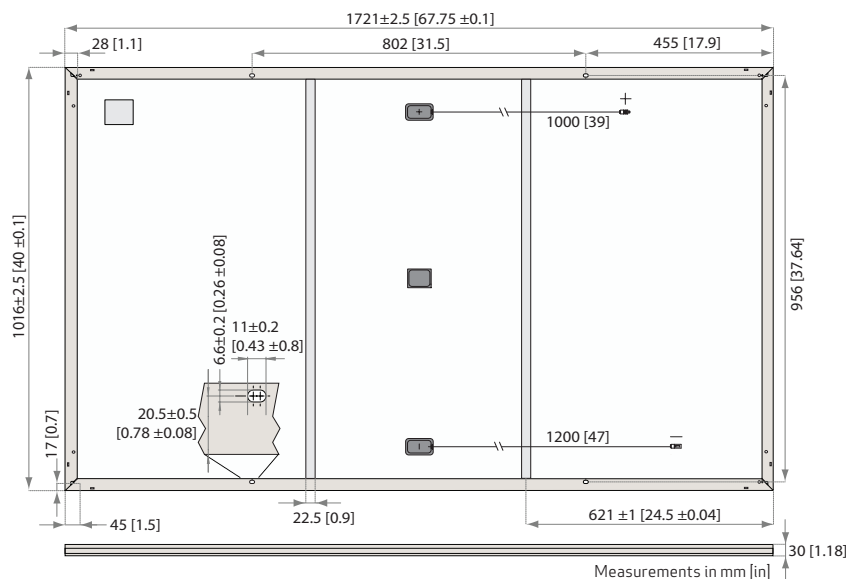
25 YEAR POWER OUTPUT WARRANTY



recgroup.com/alpha

REC ALPHA SERIES

PRODUCT DATASHEET



GENERAL DATA

Cell type:	120 half-cut cells with REC heterojunction cell technology 6 strings of 20 cells in series	Junction box:	3-part, 3 bypass diodes, IP67 rated in accordance with IEC 62790
Glass:	0.13 in (3.2 mm) solar glass with anti-reflection surface treatment	Cable:	12 AWG (4 mm ²) PV wire, 39 + 47 in (1 + 1.2 m) in accordance with EN 50618
Backsheet:	Highly resistant polymeric construction	Connectors:	Stäubli MC4PV-KBT4/KST4, 12 AWG (4 mm ²) in accordance with IEC 62852 IP68 only when connected
Frame:	Anodized aluminum (black)	Origin:	Made in Singapore

ELECTRICAL DATA @ STC

Product Code*: RECxxxAA

	360	365	370	375	380
Nominal Power - P _{MPP} (Wp)	360	365	370	375	380
Watt Class Sorting - (W)	-0/+5	-0/+5	-0/+5	-0/+5	-0/+5
Nominal Power Voltage - V _{MPP} (V)	37.7	38.0	38.3	38.7	39.0
Nominal Power Current - I _{MPP} (A)	9.55	9.60	9.66	9.72	9.76
Open Circuit Voltage - V _{OC} (V)	44.1	44.3	44.5	44.6	44.7
Short Circuit Current - I _{SC} (A)	10.23	10.26	10.30	10.40	10.46
Panel Efficiency (%)	20.6	20.9	21.2	21.4	21.7

Values at standard test conditions (STC: air mass AM1.5, irradiance 10.75 W/sq ft (1000 W/m²), temperature 77°F (25°C), based on a production spread with a tolerance of V_{OC} & I_{SC} ±3% within one watt class. *Where xxx indicates the nominal power class (P_{MPP}) at STC above.

ELECTRICAL DATA @ NMOT

Product Code*: RECxxxAA

	274	278	282	286	290
Nominal Power - P _{MPP} (Wp)	274	278	282	286	290
Nominal Power Voltage - V _{MPP} (V)	35.5	35.8	36.1	36.4	36.7
Nominal Power Current - I _{MPP} (A)	7.71	7.76	7.80	7.85	7.88
Open Circuit Voltage - V _{OC} (V)	41.6	41.7	41.9	42.0	42.1
Short Circuit Current - I _{SC} (A)	8.26	8.29	8.32	8.40	8.45

Nominal module operating temperature (NMOT: air mass AM1.5, irradiance 800 W/m², temperature 68°F (20°C), windspeed 3.3 ft/s (1 m/s). *Where xxx indicates the nominal power class (P_{MPP}) at STC above.

CERTIFICATIONS

IEC 61215:2016, IEC 61730:2016, UL 1703, UL 61730	
IEC 62804	PID
IEC 61701	Salt Mist
IEC 62716	Ammonia Resistance
UL 1703	Fire Type Class 2
IEC 62782	Dynamic Mechanical Load
IEC 61215-2:2016	Hailstone (35mm)
AS4040.2 NCC 2016	Cyclic Wind Load
ISO 14001:2004, ISO 9001:2015, OHSAS 18001:2007	



WARRANTY

20 year product warranty
25 year linear power output warranty
Maximum annual power degradation of 0.25% p.a.
Guarantees 92% of power after 25 years
See warranty conditions for further details.

MECHANICAL DATA

Dimensions:	678 x 40 x 1.2 in (1721 x 1016 x 30 mm)
Area:	18.8 sq ft (1.75 m ²)
Weight:	43 lbs (19.5 kg)

MAXIMUM RATINGS

Operational temperature:	-40 ... +85°C
Maximum system voltage:	1000 V
Design load (+): snow	4666 Pa (97.5 lbs/sq ft)*
Maximum test load (+):	7000 Pa (146 lbs/sq ft)*
Design load (-): wind	2666 Pa (55.6 lbs/sq ft)*
Maximum test load (-):	4000 Pa (83.5 lbs/sq ft)*
Max series fuse rating:	25 A
Max reverse current:	25 A

* Calculated using a safety factor of 1.5
* See installation manual for mounting instructions

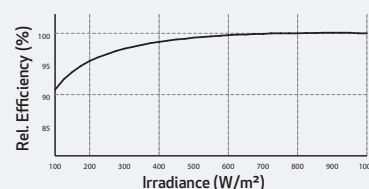
TEMPERATURE RATINGS*

Nominal Module Operating Temperature:	44°C (±2°C)
Temperature coefficient of P _{MPP} :	-0.26 %/°C
Temperature coefficient of V _{OC} :	-0.24 %/°C
Temperature coefficient of I _{SC} :	0.04 %/°C

*The temperature coefficients stated are linear values

LOW LIGHT BEHAVIOUR

Typical low irradiance performance of module at STC:



Founded in Norway in 1996, REC is a leading vertically integrated solar energy company. Through integrated manufacturing from silicon to wafers, cells, high-quality panels and extending to solar solutions, REC provides the world with a reliable source of clean energy. REC's renowned product quality is supported by the lowest warranty claims rate in the industry. REC is a Bluestar Elkem company with headquarters in Norway and operational headquarters in Singapore. REC employs around 2,000 people worldwide, producing 1.5 GW of solar panels annually.



Enphase IQ 7A Microinverter

The high-powered smart grid-ready **Enphase IQ 7A Micro™** dramatically simplifies the installation process while achieving the highest system efficiency for systems with 60-cell and 72-cell modules.

Part of the Enphase IQ System, the IQ 7A Micro integrates with the Enphase IQ Envoy™, Enphase IQ Battery™, and the Enphase Enlighten™ monitoring and analysis software.

The IQ Series Microinverters extend the reliability standards set forth by previous generations and undergo over a million hours of power-on testing, enabling Enphase to provide an industry-leading warranty of up to 25 years.



High Power

- Peak output power 366 VA @ 240 VAC and 295 VA @ 208 VAC

Easy to Install

- Lightweight and simple
- Faster installation with improved, lighter two-wire cabling
- Built-in rapid shutdown compliant (NEC 2014 & 2017)

Efficient and Reliable

- Optimized for high powered 60-cell and 72-cell modules
- Highest CEC efficiency of 97%
- More than a million hours of testing
- Class II double-insulated enclosure
- UL listed

Smart Grid Ready

- Complies with advanced grid support, voltage and frequency ride-through requirements
- Envoy and Internet connection required
- Configurable for varying grid profiles
- Meets CA Rule 21 (UL 1741-SA)



Enphase IQ 7A Microinverter

INPUT (DC)		IQ7A-72-2-US	
Commonly used module pairings ¹	295 W–460 W +		
Module compatibility	60-cell, 66-cell, and 72-cell PV modules		
Maximum input DC voltage	58 V		
Power point tracking voltage range ²	18 V–58 V		
Min/Max start voltage	33 V / 58 V		
Max DC short circuit current (module I _{sc}) ³	15 A		
Overvoltage class DC port	II		
DC port backfeed current	0 A		
PV array configuration	1 x 1 ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit		
OUTPUT (AC)		@ 240 VAC	@ 208 VAC
Peak output power	366 VA	295 VA	
Maximum continuous output power	349 VA	290 VA	
Nominal (L-L) voltage/range ⁴	240 V / 211–264 V	208 V / 183–229 V	
Maximum continuous output current	1.45 A (240 VAC)	1.39 A (208 VAC)	
Nominal frequency	60 Hz		
Extended frequency range	47–68 Hz		
AC short circuit fault current over 3 cycles	5.8 Arms		
Maximum units per 20 A (L-L) branch circuit ⁵	11 (240 VAC)	11 (208 VAC)	
Overvoltage class AC port	III		
AC port backfeed current	18 mA		
Power factor setting	1.0		
Power factor (adjustable)	0.85 leading ... 0.85 lagging		
EFFICIENCY		@240 VAC	@208 VAC
CEC weighted efficiency	97.0 %	96.5%	
MECHANICAL			
Ambient temperature range	-40°C to +60°C		
Relative humidity range	4% to 100% (condensing)		
Connector type: DC (IQ7A-72-2-US)	MC4		
Dimensions (HxWxD)	212 mm x 175 mm x 30.2 mm (without bracket)		
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		
Environmental category / UV exposure rating	NEMA Type 6 / outdoor		
FEATURES			
Communication	Power Line Communication (PLC)		
Monitoring	Enlighten Manager and MyEnlighten monitoring options Compatible with Enphase IQ Envoy		
Disconnecting means	The AC and DC connectors have been evaluated and approved by UL for use as the load-break disconnect required by NEC 690.		
Compliance	CA Rule 21 (UL 1741-SA) UL 62109-1, UL1741/IEEE1547, 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 Shut Down Equipment and conforms with NEC-2014 and NEC-2017 section 690.12 and C22.1-2015 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according manufacturer's instructions.		

1. No enforced DC/AC ratio. See the compatibility calculator at <https://enphase.com/en-us/support/module-compatibility>.

2. CEC peak power tracking voltage range is 38 V to 43 V.

3. Maximum continuous input DC current is 10.2A.

4. Voltage range can be extended beyond nominal if required by the utility.

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

To learn more about Enphase offerings, visit enphase.com

Enphase IQ Combiner 3-ES/3C-ES

X-IQ-AM1-240-3-ES
X-IQ-AM1-240-3C-ES

The **Enphase IQ Combiner 3-ES/3C-ES™** with Enphase IQ Envoy™ and integrated LTE-M1 cell modem (included only with IQ Combiner 3C-ES) consolidates interconnection equipment into a single enclosure and streamlines PV 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 Envoy for communication and control
- Includes LTE-M1 cell modem (included only with IQ Combiner 3C-ES)
- Includes solar shield to match Ensemble esthetics 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

- Reduced size from IQ Combiner+ (X-IQ-AM1-240-2)
- Centered mounting brackets support single stud mounting
- Supports back and side conduit entry
- Up to four 2-pole branch circuits for 240 VAC plug-in breakers (not included)
- 80 A 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
- UL listed



To learn more about Enphase offerings, visit enphase.com

Enphase IQ Combiner 3-ES / 3C-ES

MODEL NUMBER	
IQ Combiner 3-ES (X-IQ-AM1-240-3-ES)	IQ Combiner 3-ES with Enphase IQ Envoy 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 Encharge storage system and Enpower smart switch and to deflect heat.
IQ Combiner 3C-ES (X-IQ-AM1-240-3C-ES)	IQ Combiner 3C-ES with Enphase IQ Envoy printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes Enphase Mobile Connect LTE-M1 (CELLMODEM-M1), 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 Encharge storage system and Enpower smart switch and to deflect heat.
ACCESSORIES and REPLACEMENT PARTS	
(not included, order separately)	
Ensemble Communications Kit (COMMS-CELLMODEM-M1)	Includes COMMS-KIT-01 and CELLMODEM-M1 with 5-year data plan for Ensemble sites
Circuit Breakers BRK-10A-2-240 BRK-15A-2-240 BRK-20A-2P-240	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
EPLC-01	Power line carrier (communication bridge pair), quantity - one pair
XA-SOLARSHIELD-ES	Replacement solar shield for Combiner 3-ES / 3C-ES
XA-PLUG-120-3	Accessory receptacle for Power Line Carrier in IQ Combiner 3-ES / 3C-ES (required for EPLC-01)
XA-ENV-PCBA-3	Replacement IQ Envoy printed circuit board (PCB) for Combiner 3-ES / 3C-ES
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 / 90A with IQ Envoy breaker included
Production metering CT	200 A solid core pre-installed and wired to IQ Envoy
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 4G based LTE-M1 cellular modem (included only with IQ Combiner 3C-ES). 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, 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 Envoy	UL 60601-1/CANCSA 22.2 No. 61010-1

To learn more about Enphase offerings, visit enphase.com

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