

GENERAL NOTES

1. ALL ELECTRICAL MATERIALS SHALL BE NEW AND LISTED BY RECOGNIZED ELECTRICAL TESTING LABORATORY

CUSTOM MADE EQUIPMENT SHALL HAVE COMPLETE TEST DATA SUBMITTED BY THE MANUFACTURER ATTESTING TO ITS SAFETY

2. OUTDOOR EQUIPMENT SHALL BE NEMA 3R RATED OR BETTER

3. ALL METALLIC EQUIPMENT SHALL BE GROUNDED

4. CONTRACTOR SHALL OBTAIN ELECTRICAL PERMITS PRIOR TO INSTALLATION AND SHALL COORDINATE ALL INSPECTIONS, TESTING COMMISSIONING AND ACCEPTANCE WITH THE CLIENT, UTILITY CO. AND CITY INSPECTORS AS NEEDED.

5. THE ELECTRICAL CONTRACTOR SHALL VERIFY THE EXACT LOCATIONS OF SERVICE POINTS AND SERVICE SIZES WITH THE SERVING UTILITY COMPANY AND COMPLY WITH ALL UTILITY COMPANIES REQUIREMENTS.

6. DRAWINGS ARE DIAGRAMMATIC ONLY, ROUTING OF RACEWAYS SHALL BE OPTION OF THE CONTRACTOR UNLESS OTHERWISE NOTED AND SHALL BE COORDINATED WITH OTHER TRADES.

7. IF THE ROOF MATERIAL OR ROOF STRUCTURE NOT ADEQUATE FOR PV INSTALLATION, CALL ENGINEER PRIOR TO INSTALL. THE CONTRACTOR IS RESPONSIBLE TO VERIFY THAT THE ROOF IS CAPABLE OF WITHSTANDING THE EXTRA WEIGHT.

8. IF THE DISTANCES FOR CABLE RUNS ARE DIFFERENT THAN SHOWN, THE CONTRACTOR SHALL NOTIFY THE ELECTRICAL ENGINEER TO VALIDATE THE WIRE SIZE. FINAL DRAWINGS WILL BE RED-LINED AND UPDATED AS APPROPRIATE.

9. WHENEVER A DISCREPANCY IN QUALITY OF EQUIPMENT ARISES ON THE DRAWING OR SPECIFICATIONS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING ALL MATERIAL AND SERVICES REQUIRED BY THE STRICTEST CONDITIONS NOTED ON THE DRAWINGS OR IN THE SPECIFICATIONS TO ENSURE COMPLETE COMPLIANCE AND LONGEVITY OF THE OPERABLE SYSTEM REQUIRED BY THE ARCHITECT/ENGINEERS.

10. ALL BROCHURES, OPERATION MANUALS, CATALOGS, SHOP DRAWINGS, ETC. SHALL BE HANDED OVER TO OWNER'S REPRESENTATIVE AT THE COMPLETION OF WORK

PHOTOVOLTAIC NOTES:

1. ROOFTOP MOUNTED PHOTOVOLTAIC PANELS AND MODULES SHALL BE TESTED, LISTED AND IDENTIFIED BY RECOGNIZED ELECTRICAL TESTING LABORATORY

2. SOLAR SYSTEM SHALL NOT COVER ANY PLUMBING OR MECHANICAL VENTS

3. MODULES AND SUPPORT STRUCTURES SHALL BE GROUNDED.

4. SOLAR INVERTER SHALL BE LISTED TO UL1741.

5. REMOVAL OF AN INTERACTIVE INVERTER OR OTHER EQUIPMENT SHALL NOT DISCONNECT THE BONDING CONNECTION BETWEEN THE GROUNDING ELECTRODE CONDUCTOR AND THE PHOTOVOLTAIC SOURCE AND/OR OUTPUT CIRCUIT GROUNDED CONDUCTORS.

6. ALL PV MODULES AND ASSOCIATED EQUIPMENT AND WIRING SHALL BE PROTECTED FROM PHYSICAL DAMAGE

7. LIVE PARTS OF PV SOURCE CIRCUITS AND PV OUTPUT CIRCUITS OVER 150V TO GROUND SHALL NOT BE ACCESSIBLE TO OTHER THAN QUALIFIED PERSONS WHILE ENERGIZED.

8. INVERTER IS EQUIPED WITH INTEGRATED GFDI, THUS PROVIDING GROUND FAULT PROTECTION

9. ALL CONDUCTORS SHALL BE COPPER AND 90 DEG RATED

10. ALL ELECTRICAL EQUIPMENT SHALL BE LISTED BY A RECOGNIZED ELECTRICAL TESTING LABORATORY.

11. A SINGLE CONDUCTOR SHALL BE PERMITTED TO BE USED TO PERFORM THE MULTIPLE FUNCTIONS OF DC GROUNDING, AC GROUNDING AND BONDING BETWEEN AC AND DC SYSTEMS.

12. NON-CURRENT CARRYING METAL PARTS OF EQUIPMENT SHALL BE EFFECTIVELY BONDED TOGETHER. BOND BOTH ENDS OF RACEWAYS.



VICINITY MAP
SCALE: NTS



SATELLITE MAP
SCALE: NTS

INDEX	
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MAIN

THE INSTALLATION OF SOLAR ARRAYS AND PHOTOVOLTAIC POWER SYSTEMS SHALL COMPLY WITH THE FOLLOWING CODES:

NATIONAL ELECTRICAL CODE 2017
INTERNATIONAL RESIDENTIAL CODE 2018
INTERNATIONAL BUILDING CODE 2018
INTERNATIONAL ENERGY CONSERVATION CODE 2018

AS ADOPTED BY THE STATE OF NORTH CAROLINA

ALL OTHER ORDINANCE ADOPTED BY THE LOCAL GOVERNING AGENCIES

PV SOLAR SYSTEM DETAILS

SYSTEM SIZE: DC STC: 8.960KW
SYSTEM SIZE: AC CEC: 8.066KW
SOLAR MODULES: (28) Hanwha 320 watt
INVERTERS: (28) Enphase IQ7 Microinverters

ELECTRICAL INFORMATION:
EXISTING
MAIN SERVICE PANEL BUS SIZE: 225A
MAIN SERVICE BREAKER SIZE: 200A
MOUNTING SYSTEM: IRONRIDGE

BUILDING INFORMATION:
CONSTRUCTION TYPE: V-B
OCCUPANCY: R3
ROOF: Asphalt Shingle
TRUSS : 2 X 4 @ 24" O.C.





Project Name:
Robert Grant
Property address:
46 Silk Oak DR,
Bunnlevel, NC 28323

CONTRACTOR

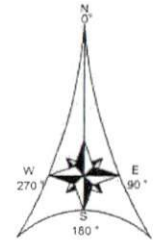
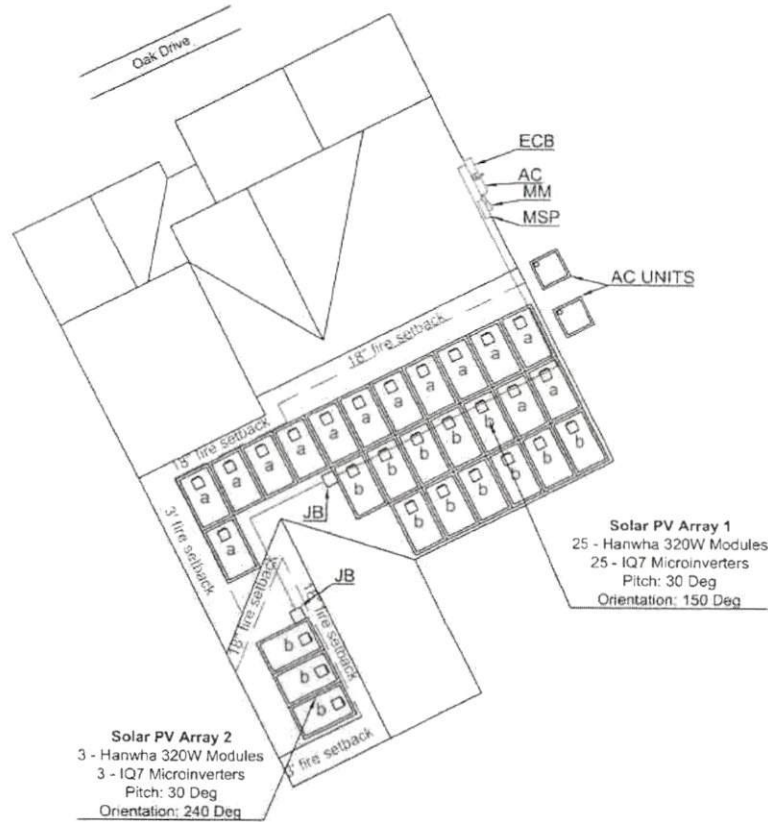
Lighting Electric
Address: 230 Blacksnake Rd
Stanley, NC 28164
Phone: (704) 361-8011

LIGHTING ELECTRIC

DATE: 06/27/2022

INDEX	
MSP	(E) Main Service Panel
MM	(E) Main Meter
ECB	(N) Enphase Combiner Box
AC	(N) AC Disconnect
JB	(N) Junction Box
	MicroInverter
	Solar Module
	Conduit
	Setback

Total Roof Area: 2029
 Total Module Area: 504
 24.83% of Coverage



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

1 ROOF PLAN

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ITEM	DESCRIPTION	QTY
1	PV MODULE Hanwha 320 Watt Q.PEAK DUO BLK-G5 Voc = 40.56V, Vmp = 33.80V Isc = 9.94A, Imp = 9.47A	28
2	INVERTERS ENPHASE IQ7 MICROINVERTERS IQ7-60-2-US (240V) PEAK PWR TRACKING VOLTAGE: = 27-37 V CEC EFFICIENCY: = 97.0 % ENCLOSURE: NEMA 6 MAXIMUM INPUT CURRENT: = 15 A MAXIMUM OUTPUT CURRENT: = 1 A MAXIMUM INPUT POWER: = 235 - 350W+ MAXIMUM OUTPUT POWER: = 240 VA	28
3	JUNCTION BOX 4"x4"x2" UL LISTED WATER TIGHT NEMA TYPE 3	2
4	AC DISCONNECT 60A 240V NON - FUSIBLE AC DISCONNECT	1
5	MAIN SERVICE PANEL (E) MAIN SERVICE PANEL 225A BUSBAR & 200A MAIN BREAKER	1
6	ENPHASE MONITORING (N)ENVOY 3G PV MONITORING SYSTEM	1
7	ENPHASE COMBINER BOX (N)ENPHASE IQ COMBINER 3 120/240V, NEMRA 3R	1
8	MAIN METER UTILITY METER	1

120% RULE CALCULATION PER NEC 705.12(D)(2)(3)		
MAIN BUSBAR RATING:	225	AMPS
MAIN SERVICE BREAKER RATING:	200	AMPS
PV BACKFEDDING CURRENT:	40	AMPS
BUSBAR X 120% - MAIN BREAKER	=	MAX PV BREAKER
270	- 200	= 70

WIRE CHART						
#	MAX AMPS X NEC MULT = DESIGN AMPS	BREAKER SIZE (A)	WIRE TYPE	EGC	WIRE RATING X TEMP DERATE X CONDUCTOR DERATE = DERATED WIRE	CONDUIT SIZE
1	14 X 1.25 X 1 = 17.5A	20	2) #12 AWG. ENPHASE Q CABLE	(1) #6 BARE SOLID COPPER GEC	30 X .71 X 1 = 21.3 >= 17.5	IN FREE AIR
2	14 X 1.25 X 1 = 17.5A	20	4) #10 AWG. CU-THWN-2	(1) #8 AWG. CU-THWN-2 EGC	40 X .71 X .8 = 22.72 >= 17.5	3/4" EMT
3	28 X 1.25 X 1 = 35 A	40	3) #8 AWG. CU-THWN-2	(1) #8 AWG. CU-THWN-2 EGC	55 X .91 X 1 = 50.05 >= 35	3/4" EMT

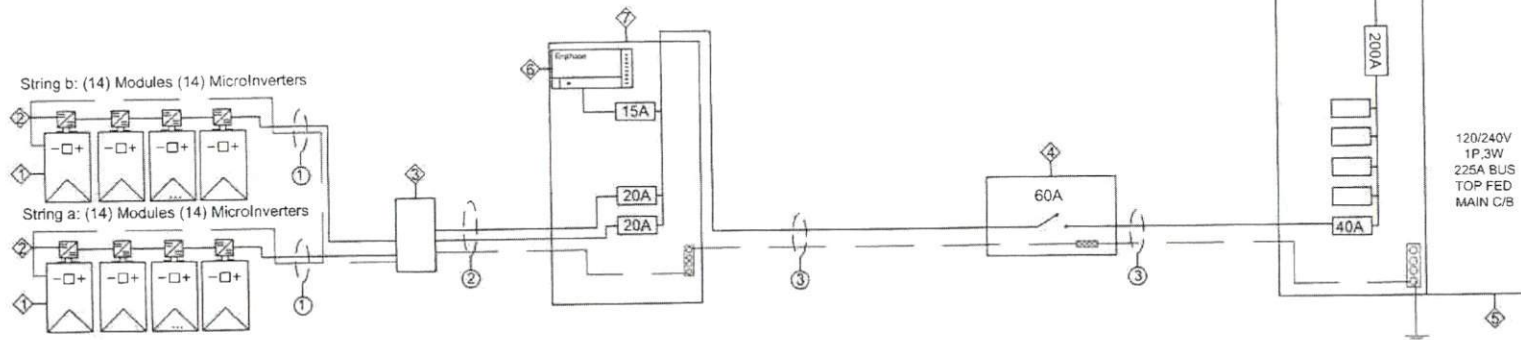
KEY NOTES:

- SOLID BARE G.E.C (FREE-AIR) MOUNTED UNDER ARRAY
- PER NEC ARTICLE 690.35 INVERTER GROUND FAULT PROTECTION PROVIDED
- ALL GROUNDS AND NEUTRALS BONDED TO EXISTING GROUNDING CONDUCTOR W/IRREVERSIBLE CRIMP CONNECTOR.
- BACKFED BREAKERS MUST BE LOCATED @ OPPOSITE END OF BUS BAR FROM MAIN BREAKER OR MAIN LUG ON GRID SIDE. WHEN A BACKFED BREAKER IS THE METHOD OF UTILITY INTERCONNECTION, BREAKER SHALL NOT READ LINE.
- PER CEC 250.65(C); CONDUCTOR SPLICES ONLY ALLOWED WITH COMPRESSION CONNECTORS OR EXOTHERMIC WELDING
- ALL GROUNDS AND NEUTRALS BONDED TO EXISTING GROUNDING CONDUCTOR W/IRREVERSIBLE CRIMP CONNECTOR.
- VERIFY (E) UFER GROUND NEAR MSP. IF (E) UFER IS NOT ACCESSIBLE OR VERIFIABLE, INSTALL A NEW 5/8" Ø X 8' LONG GROUNDING ROD AND BOND SOLAR SYSTEM EQUIPMENT GROUNDING ACCORDINGLY.

ALL DC CONNECTORS TO MODULES OR INVERTERS MUST BE OF MATCHING MANUFACTURE BRAND AND STYLE. DO NOT USE 'COMPATIBLE' CONNECTORS WHICH HAVE NOT BEEN UL TESTED FOR COMPATIBILITY, PERFORMANCE AND FIRE DAMAGE MAY RESULT FROM MIS-MATCHED CONNECTOR USAGE
NOTE: AC DISCONNECT VISIBLE AND LOCKABLE

AC SYSTEM SIZE CALCULATION						
Module PTC Rating (W)	x	NO. of Modules	x	Average Inverter CEC Efficiency	=	AC System Size
297	x	28	x	97%	=	8.066 kW AC

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



2 SINGLE LINE DIAGRAM

Project Name:
Robert Grant
Property address:
46 Silk Oak DR,
Bunnlevel, NC 28323

CONTRACTOR

Lighting Electric

Address: 230 Blacksnake Rd
Stanley, NC 28154

Phone: (704) 361-8011

LIGHTING ELECTRIC

DATE: 06/27/2022

1

**CAUTION
AUTHORIZED SOLAR
PERSONNEL ONLY!**

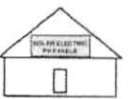
2

**PV LOAD CENTER SIZED FOR PV
BREAKERS ONLY OR RENDERED UNABLE
TO ACCEPT ANY ADDITIONAL LOADS.**

(STICKER LOCATED
ON THE PV SUB PANEL)

**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



Stickers will have red background & white lettering

3

PV SUB-PANEL ONLY

(TO BE LOCATED ON
SUB-PANEL ONLY
WHEN SUB-PANEL IS
DEDICATED FOR PV ONLY)

4

**AC DISCONNECT
AC PHOTOVOLTAIC POWER SOURCE
RATED AC OUTPUT CURRENT: 35 A MAX
NOMINAL AC OPERATING VOLTAGE: 240 Vac**

5

**THIS PANEL FED BY
MULTIPLE SOURCES
(UTILITY & SOLAR)**

6

SOLAR

(STICKER LOCATED
INSIDE PANEL
NEXT TO SOLAR BREAKER)

7

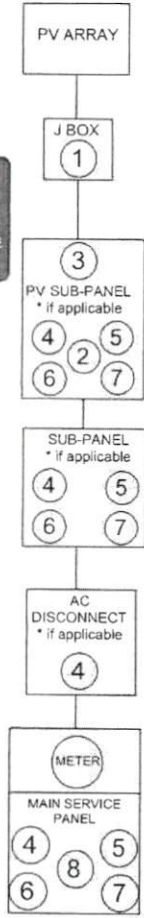
**WARNING!
INVERTER OUTPUT CONNECTION. DO NOT
RELOCATE THIS OVERCURRENT DEVICE**

(STICKER LOCATED
INSIDE PANEL
BELOW PV BREAKER)

8

**PHOTOVOLTAIC SYSTEM
EQUIPPED WITH
RAPID SHUT DOWN**

(STICKER LOCATED
ON THE MAIN SERVICE PANEL)



MARKINGS, LABELS AND WIRING SIGNS

- A. Purpose: Provide emergency responders with appropriate warning and guidance with respect to isolating solar electric system.
This can facilitate identifying energated electrical lines that connect solar panels to the inverter, as these should not be cut when venting for smoke removal
- B. Main Service Disconnect
- Residential buildings - The marking main be placed within the main service disconnect. The marking shall be placed outside cover if the main service disconnect is operable with the service panel closed.
 - Commercial buildings - The marking shall be placed adjacent to the main service disconnect clearly visible from the location where the level is operated
3. Markings: Verbiage, Format and Type of Material
- Verbiage: CAUTION: SOLAR ELECTRIC SYSTEM CONNECTED
 - Format: White lettering on a red background. Minimum 3/8 inches letter height. All letters shall be capitalized. Arial or similar font, non bold.
 - Material: Reflective, weather resistant material suitable for the environment (use UL-969 as standard for weather rating). Durable adhesive materials meet this requirement.
- C. Marking Requirements on DC conduit, raceways, enclosures, cable assemblies, DC combiners and junction boxes:
- Markings: Verbiage, Format and Type of Material
 - Placement: Markings shall be placed every 10 feet on all interior and exterior DC conduits, raceways, enclosures, and cable assemblies, at turns, above and for below penetrations, all DC combiners and junction boxes
 - Verbiage: CAUTION: SOLAR CIRCUIT. Note: The format and type of material shall adhere to "V-3b, c" of this requirement.
 - Inverters are not required to have caution markings
- 1 Marking is required on all interior and exterior DC conduit, raceways, enclosures, cable assemblies and junction boxes, combiner boxes and disconnects.
- 2 The materials used for marking shall be reflective, weather resistant material suitable for the environment.
- Minimum 3/8 "letter height; all upper case letters Arial or similar font; Red background with white lettering.
- 3 Marking shall contain the words: **WARNING : PHOTOVOLTAIC POWER SOURCE**
- 4 Marking shall be placed adjacent to the main service disconnect in a location clearly visible from the location where the disconnect is operated.

Permanent directory or plaque providing location of service disconnecting means and photovoltaic system disconnecting means, if not located at the same location. (Plaques shall be metal or plastic, with engraved or machine printed letters, or electro-photo plating, in a contrasting color to the plaque. Plaques shall be permanently attached to the equipment or in the required location using an approved method that is suitable to withstand the environment to which it is exposed. Plaques and signage shall meet legibility, defacement, exposure and adhesion requirements of Underwriters Laboratories marking and labeling system 969(UL969).

3


SIGNAGE

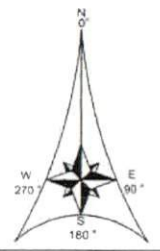
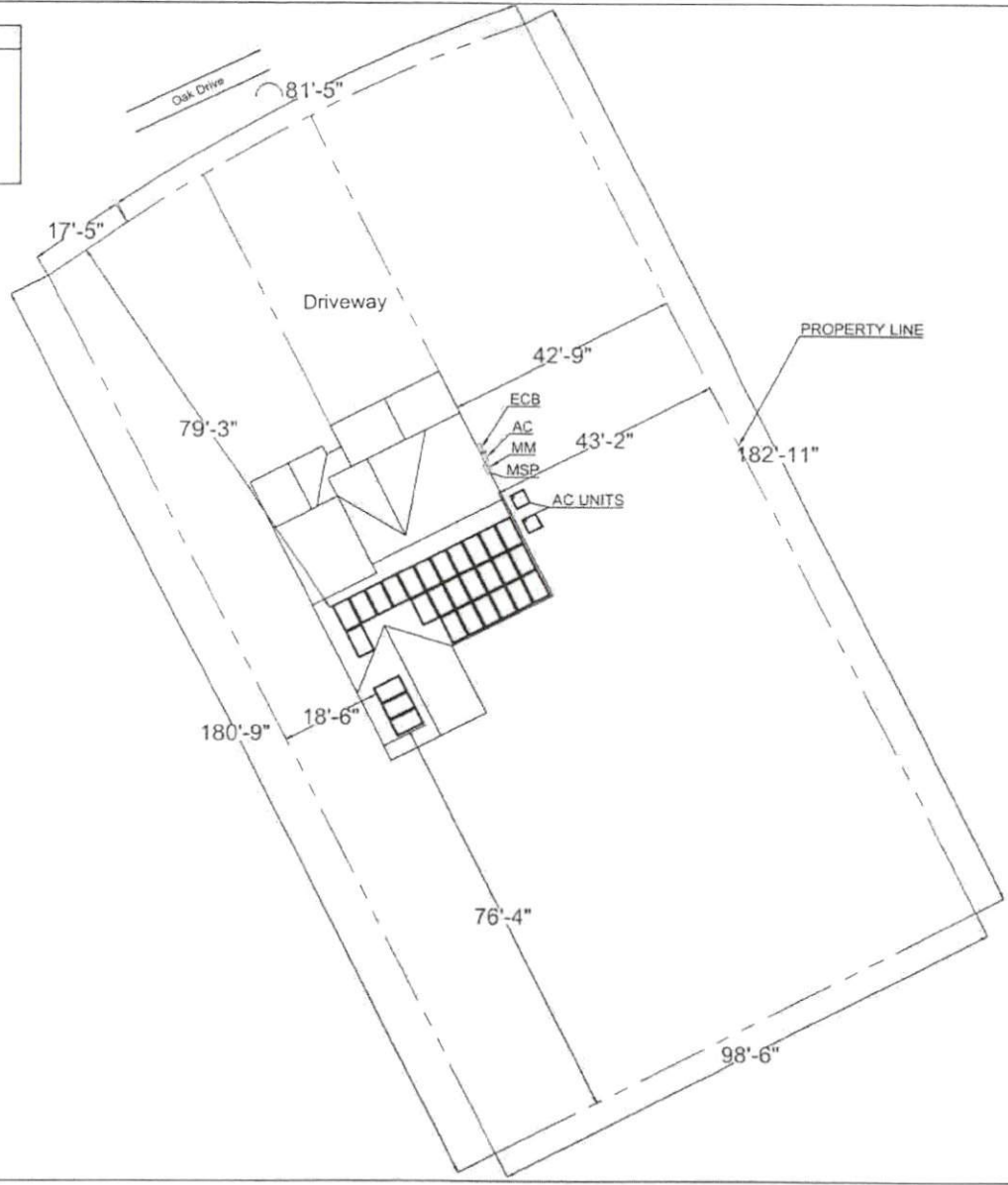
Project Name:
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CONTRACTOR

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LIGHTING ELECTRIC

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MSP	(E) Main Service Panel
MM	(E) Main Meter
ECB	(N) Enphase Combiner Box
AC	(N) AC Disconnect
	Solar Module



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

4 SITE PLAN

Project Name:
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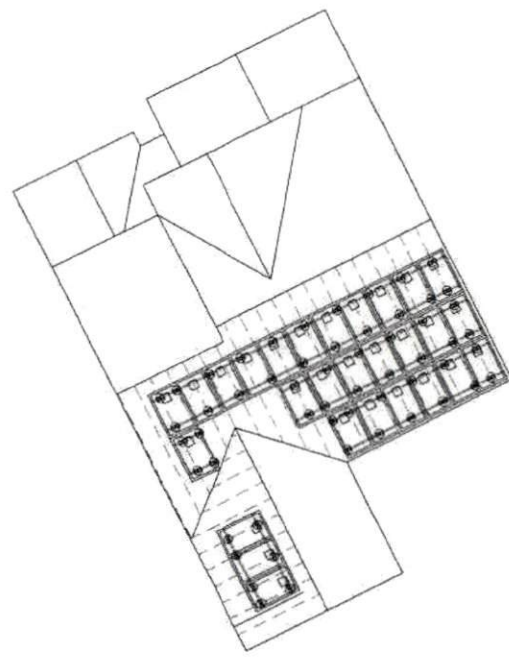
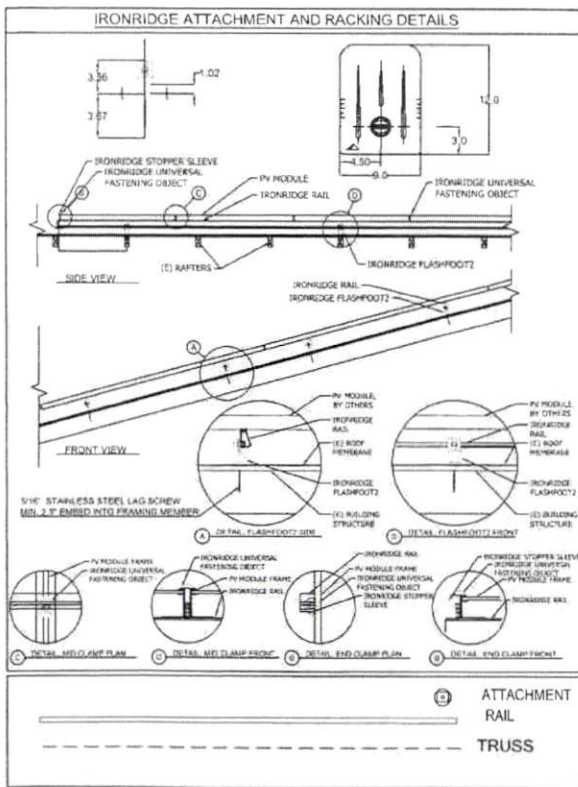
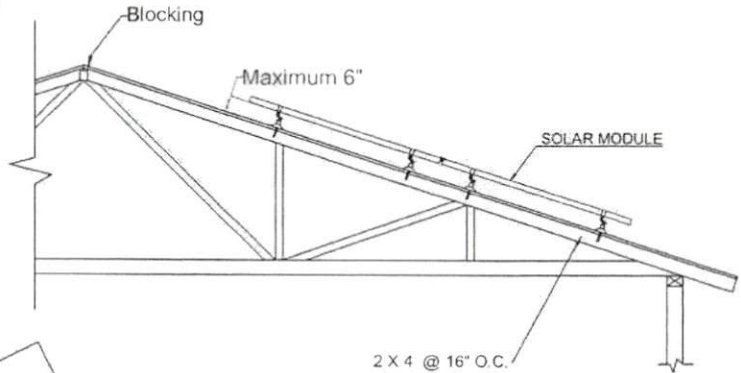
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LIGHTING ELECTRIC

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MODULE WEIGHT (lbs)	41.2
# OF MODULES	28
TOTAL MODULE WEIGHT (lbs)	1153.6
RACK WEIGHT (lbs)	230.72
MICROINVERTERS WEIGHT (lbs)	66.64
TOTAL SYSTEM WEIGHT (lbs)	1450.96
# OF STANDOFFS	56
MAX SPAN BETWEEN STANDOFFS (in)	48
LOADING PER STANDOFF (lbs)	25.91
TOTAL AREA (sq. ft.)	504
LOADING (PSF)	2.87

1. IronRidge Racking System
 2. IronRidge FlashFoot 2 Attachment
 3. Roof attachment hardware to be mounted to existing structure (2 X 4 @ 24" O.C. TRUSS) with 48" O.C. rail spans or less.
 4. Lag bolts are 5/16" X 3.5" stainless steel with 2.5" minimum embedment into the center of the roof
 5. Roof sheathed with 1/2" plywood and upper surface is faced with felt paper.
- Finished roof surface is One layer of Asphalt Shingle.



5 ATTACHMENT LAYOUT

Project Name:
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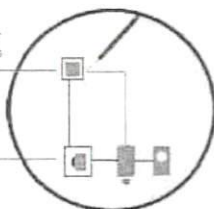
Rapid shutdown is built-in

The 2014 edition of the National Electrical Code (NEC 2014) added new rapid shutdown requirements for PV systems installed on buildings. Enphase Microinverters fully meet rapid shutdown requirements in the new code without the need to install any additional electrical equipment.

What's new in NEC 2014:
NEC 2014, Section 690.12 applies to PV conductors over 10 feet from the PV array and requires that the conductors be shut down to 30 volts and 240 mA or less within 10 seconds of rapid shutdown initiation.

String inverters require work arounds for rapid shutdown

Work around:
Specialized Rapid Shutdown electrical box installed on the roof within 10 feet of array.

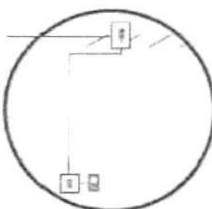


Residential String Inverter

Work around:
Shutoff switch that is easily accessible to first responders on the ground.



Work around:
String inverter installed on roof in hostile environment that string inverters are not built to survive in.

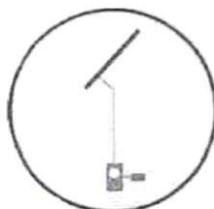


Commercial String Inverter

Work around:
Extra conduct in inverter.

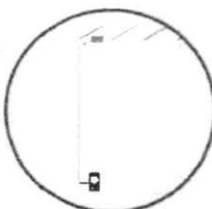
Enphase comes standard with rapid shutdown capability

All Enphase microinverters, even those that were previously installed in series, meet rapid shutdown requirements; no additional equipment or work-around needed.



Residential Microinverter

Enphase microinverters can safely shut down automatically, leaving only low-voltage DC electricity isolated to the PV module.



Commercial Microinverter

To learn more, visit enphase.com



Planning for Microinverter Installation

The Enphase IQ 7 Micro is compatible with 60-cell PV modules, and the IQ 7+ Micro and IQ 7A Micro support PV modules with 60 or 72 Cells. The IQ 7X requires a 96-cell PV module. All of them install quickly and easily. The microinverter housing is designed for outdoor installation and complies with the NEMA 250, type 6 environmental enclosure rating standard.



NEMA 6 rating definition: Indoor or outdoor use primarily to provide a degree of protection against hose-directed water, the entry of water during occasional temporary submersion at a limited depth, and damage from external ice formation.

The Enphase Q Cable is available with connector spacing options to accommodate installation of PV modules in portrait or landscape orientation. For Enphase Q Cable ordering information, see "Enphase Q Cable Planning and Ordering" on page 27.

Compatibility

The Enphase IQ Series Micros are electrically compatible with PV modules as listed in the following table. For specifications, see "Technical Data" on page 29 of this manual. You can refer to the Enphase Compatibility Calculator at: enphase.com/en-us/support/module-compatibility to verify PV module electrical compatibility. To ensure mechanical compatibility, be sure to order the correct connector type for both microinverter and PV module from your distributor.



WARNING: Risk of fire. The PV module DC conductors must be labeled "PV Wire" or "PV Cable" to comply with NEC for Ungrounded PV Power Systems.

Microinverter model	Connector type	PV module cell count
IQ7-60-2-US	MC-4 locking type	Pair only with 60-cell modules
IQ7PLUS-72-2-US	MC-4 locking type	Pair with 60 or 72-cell modules
IQ7X-96-2-US	MC-4 locking type	Pair only with 96-cell modules
IQ7A-72-2-US	MC-4 locking type	Pair with 60 or 72-cell modules

Grounding Considerations

The Enphase Microinverter models listed in this guide do not require grounding electrode conductors (GEC), equipment grounding conductors (EGC), or grounded conductor (neutral). Your Authority Having Jurisdiction (AHJ) may require you to bond the mounting bracket to the racking. If so, use UL2703 hardware or star washers. The microinverter itself has a Class II double-insulated rating, which includes ground fault protection (GFP). To support GFP, use only PV modules equipped with DC cables labeled PV Wire or PV Cable.

7

**RSD
DATA SHEET**

Project Name:
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CONTRACTOR

Lighting Electric
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powered by
Q.ANTUM DUO

Q.PEAK DUO BLK-G5 300-320

Q.ANTUM SOLAR MODULE

The new Q.PEAK DUO BLK-G5 solar module from Q CELLS impresses with its outstanding visual appearance and particularly high performance on a small surface thanks to the innovative Q.ANTUM DUO Technology. Q.ANTUM's world-record-holding cell concept has now been combined with state-of-the-art circuitry half cells and a six-busbar design, thus achieving outstanding performance under real conditions — both with low-intensity solar radiation as well as on hot, clear summer days.



Q.ANTUM TECHNOLOGY. LOW LEVELIZED COST OF ELECTRICITY
Highly yield per surface area, lower BOS costs, higher power classes, and an efficiency rate of up to 19.3%.



INNOVATIVE ALL-WEATHER TECHNOLOGY
Optimal yields, whatever the weather with excellent low-light and temperature behavior.



ENDURING HIGH PERFORMANCE
Long-term yield security with Anti LID Technology, Anti-PID Technology¹, Hot-Spot Protect and Traceable Quality Tra.Q™



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



A RELIABLE INVESTMENT
Inclusive 12-year product warranty and 25-year linear performance guarantee².

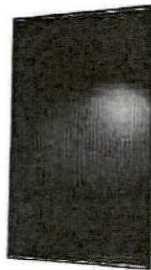


STATE OF THE ART MODULE TECHNOLOGY
Q.ANTUM DUO combines cutting edge cell separation and innovative wiring with Q.ANTUM Technology.

THE IDEAL SOLUTION FOR:



Engineered in Germany

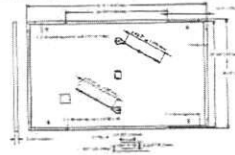


1) IFT test conditions according to IEC TS 61215-1:2015, method B (-1500V, 168h)
2) See data sheet on rear for further information

Q CELLS

MECHANICAL SPECIFICATION

Format: 66.3 in x 39.4 in x 1.25 in (including frame)
(1683 mm x 1000 mm x 32 mm)
Weight: 41.2 lbs (18.7 kg)
Front Cover: 0.13 in (3.2 mm) thermally pre-stressed glass with anti-reflection technology
Back Cover: Composite film
Frame: Black anodized aluminum
Cell: 6 x 20 monocrystalline Q.ANTUM solar half cells
Position box: 2.76-3.35 in x 1.97-2.76 in x 0.51-0.83 in
(70.85 mm x 50.76 mm x 13.21 mm), Decentralized IP67
Cable: Annular solar cable: (+) 2 x 4.3 in (1100 mm) (-) 2 x 4.3 in (1100 mm)
Controller: Multi-Contact MC4-IP68

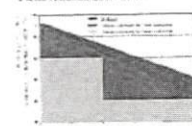


ELECTRICAL CHARACTERISTICS

POWER CLASS	300	305	310	315	320	
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC (POWER TOLERANCE +5 W / -0 W)						
Power at MPP ¹	P_{MPP} [W]	300	305	310	315	320
Short-Circuit Current ¹	I_{sc} [A]	9.72	9.78	9.83	9.89	9.94
Open-Circuit Voltage ¹	V_{oc} [V]	39.46	39.75	40.02	40.29	40.56
Current at MPP	I_{MPP} [A]	9.25	9.31	9.36	9.41	9.47
Voltage at MPP	V_{MPP} [V]	32.43	32.78	33.12	33.46	33.80
Efficiency ¹	η [%]	>17.8	>18.1	>18.4	>18.7	>19.0
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT²						
Power at MPP	P_{MPP} [W]	224.1	227.8	231.6	235.3	239.1
Short-Circuit Current	I_{sc} [A]	7.83	7.88	7.92	7.97	8.01
Open-Circuit Voltage	V_{oc} [V]	37.15	37.40	37.65	37.91	38.17
Current at MPP	I_{MPP} [A]	7.28	7.37	7.37	7.41	7.45
Voltage at MPP	V_{MPP} [V]	30.78	31.11	31.44	31.76	32.08

Minimum values: P_{MPP} ±1%, I_{sc} ±0.5%, V_{oc} ±0.2% IEC 61215:2016, 25 ±2°C AM 1.5 G according to IEC 60904-3. NMOT: New NMOT according to IEC 61215:2016

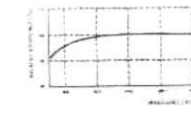
Q CELLS PERFORMANCE ASSESSMENT



At least 98% of nominal power during first year
Thereafter max. 0.34% degradation per year
At least 93.1% of nominal power up to 10 years
At least 85% of nominal power up to 25 years

All data within measurement tolerances
Full warranty in accordance with the warranty terms of the Q CELLS solar organization of your respective country

PERFORMANCE AT LOW IRRADIANCE



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

TEMPERATURE COEFFICIENTS

Temperature Coefficient of I_{sc}	α [%/K]	+0.04	Temperature Coefficient of V_{oc}	β [%/K]	-0.28
Temperature Coefficient of P_{MPP}	γ [%/K]	-0.37	Normal Operating Module Temperature	NMOT [°F]	109 ± 5.4 (43 ± 3.0)

PROPERTIES FOR SYSTEM DESIGN

Maximum System Voltage V_{max}	[V]	1000 (IEC) / 1000 (UL)	Safety Class	II
Maximum System Fuse Rating	[kA DC]	20	Fuse Rating	C (IEC) / TYPE 1 (UL)
Max. Design Load, Push / Pull (UL)	[lb/ft²]	75 (3300 Pa) / 55 (2467 Pa)	Permitted surface temperature on continuous duty	-40 °F up to +185 °F (-40 °C up to +85 °C)
Max. Test Load, Push / Pull (UL)	[lb/ft²]	313 (14000 Pa) / 84 (4000 Pa)	¹ See installation manual	

QUALIFICATIONS AND CERTIFICATES

UL 1703, IEC 61215, IEC 61216, IEC 61730-1, IEC 61730-2, IEC 61730-3, IEC 61730-4, IEC 61730-5, IEC 61730-6, IEC 61730-7, IEC 61730-8, IEC 61730-9, IEC 61730-10, IEC 61730-11, IEC 61730-12, IEC 61730-13, IEC 61730-14, IEC 61730-15, IEC 61730-16, IEC 61730-17, IEC 61730-18, IEC 61730-19, IEC 61730-20, IEC 61730-21, IEC 61730-22, IEC 61730-23, IEC 61730-24, IEC 61730-25, IEC 61730-26, IEC 61730-27, IEC 61730-28, IEC 61730-29, IEC 61730-30, IEC 61730-31, IEC 61730-32, IEC 61730-33, IEC 61730-34, IEC 61730-35, IEC 61730-36, IEC 61730-37, IEC 61730-38, IEC 61730-39, IEC 61730-40, IEC 61730-41, IEC 61730-42, IEC 61730-43, IEC 61730-44, IEC 61730-45, IEC 61730-46, IEC 61730-47, IEC 61730-48, IEC 61730-49, IEC 61730-50, IEC 61730-51, IEC 61730-52, IEC 61730-53, IEC 61730-54, IEC 61730-55, IEC 61730-56, IEC 61730-57, IEC 61730-58, IEC 61730-59, IEC 61730-60, IEC 61730-61, IEC 61730-62, IEC 61730-63, IEC 61730-64, IEC 61730-65, IEC 61730-66, IEC 61730-67, IEC 61730-68, IEC 61730-69, IEC 61730-70, IEC 61730-71, IEC 61730-72, IEC 61730-73, IEC 61730-74, IEC 61730-75, IEC 61730-76, IEC 61730-77, IEC 61730-78, IEC 61730-79, IEC 61730-80, IEC 61730-81, IEC 61730-82, IEC 61730-83, IEC 61730-84, IEC 61730-85, IEC 61730-86, IEC 61730-87, IEC 61730-88, IEC 61730-89, IEC 61730-90, IEC 61730-91, IEC 61730-92, IEC 61730-93, IEC 61730-94, IEC 61730-95, IEC 61730-96, IEC 61730-97, IEC 61730-98, IEC 61730-99, IEC 61730-100



PACKAGING INFORMATION

Number of Modules per Pallet	32
Number of Pallets per 20' Trailer	26
Number of Pallets per 40' High Cube Container	52
Pallet Dimensions S x W x H	68.3 in x 45.3 in x 46.9 in (1760 mm x 1140 mm x 1190 mm)
Pallet Weight	1415 lbs (642 kg)

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

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8 MODULE DATA SHEET

Project Name:
Robert Grant
Property address:
**46 Silk Oak DR,
Bunnlevel, NC 28323**

CONTRACTOR

Lighting Electric
Address: 230 Blacksnake Rd
Stanley, NC 28164
Phone: (704) 361-8011

LIGHTING ELECTRIC

DATE: 06/27/2022



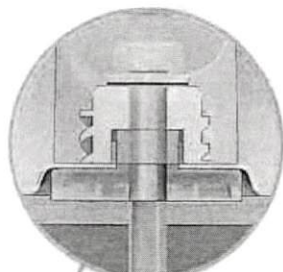
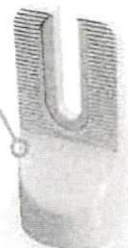
FlashFoot2

The Strongest Attachment in Solar

IronRidge FlashFoot2 raises the bar in solar roof protection. The unique water seal design is both elevated and encapsulated, delivering redundant layers of protection against water intrusion. In addition, the twist-on Cap perfectly aligns the rail attachment with the lag bolt to maximize mechanical strength.

Twist-On Cap

FlashFoot2's unique Cap design encapsulates the lag bolt and locks into place with a simple twist. The Cap helps FlashFoot2 deliver superior structural strength, by aligning the rail and lag bolt in a concentric load path.



Three-Tier Water Seal

FlashFoot2's seal architecture utilizes three layers of protection. An elevated platform diverts water away, while a stack of rugged components raises the seal an entire inch. The seal is then fully encapsulated by the Cap. FlashFoot2 is the first solar attachment to pass the TAS-100 Wind-Driven Rain Test.



Water-Shedding Design
An elevated platform diverts water away from the water seal.

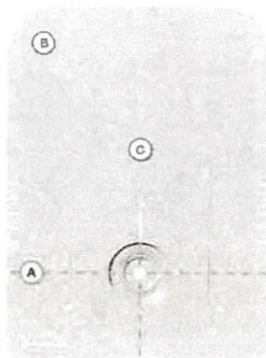
Single Socket Size

A custom-design lag bolt allows you to install FlashFoot2 with the same 7/16" socket size used on other Flush Mount System components.

Tech Brief

Tech Brief

Installation Features



A Alignment Markers

Quickly align the flashing with chalk lines to find pilot holes.

B Rounded Corners

Makes it easier to handle and insert under the roof shingles.

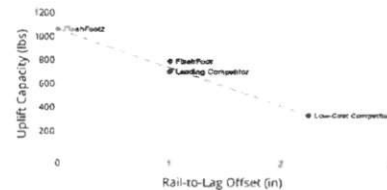
C Reinforcement Ribs

Help to stiffen the flashing and prevent any bending or crinkling during installation.

Benefits of Concentric Loading

Traditional solar attachments have a horizontal offset between the rail and lag bolt, which introduces leverage on the lag bolt and decreases uplift capacity.

FlashFoot2 is the only product to align the rail and lag bolt. This concentric loading design results in a stronger attachment for the system.



Testing & Certification

Structural Certification

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

Water Seal Ratings

Water Sealing Tested to UL 441 Section 27 "Rain Test" and TAS 100-95 "Wind Driven Rain Test" by Intertek. Ratings applicable for composition shingle roofs having slopes between 2:12 and 12:12.

UL 2703

Conforms to UL 2703 Mechanical and Bonding Requirements. See Flush Mount Install Manual for full ratings.

9 ATTACHMENT DATA SHEET

Project Name:
Robert Grant
Property address:
46 Silk Oak DR,
Bunnlevel, NC 28323

CONTRACTOR

Lighting Electric

Address: 230 Blacksnake Rd
Stanley, NC 28164

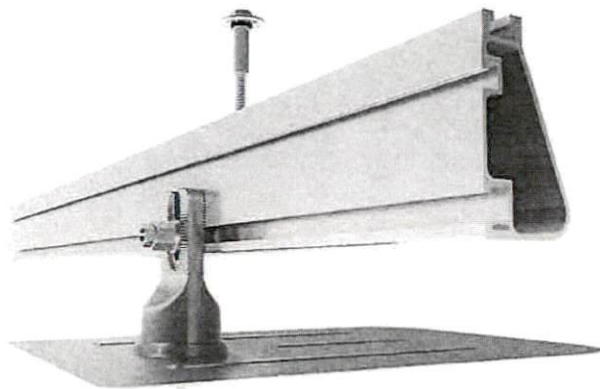
Phone: (704) 361-8011

LIGHTING ELECTRIC

DATE: 06/27/2022



Flush Mount System



Built for solar's toughest roofs.

IronRidge builds the strongest mounting system for pitched roofs in solar. Every component has been tested to the limit and proven in extreme environments.

Our rigorous approach has led to unique structural features, such as curved rails and reinforced flashings, and is also why our products are fully certified, code compliant and backed by a 25-year warranty.



Strength Tested

All components evaluated for superior structural performance.



Class A Fire Rating

Certified to maintain the fire resistance rating of the existing roof.



UL 2703 Listed System

Entire system and components meet newest effective UL 2703 standard



PE Certified

Pre-stamped engineering letters available in most states.



Design Assistant

Online software makes it simple to create, share, and price projects.



25-Year Warranty

Products guaranteed to be free of impairing defects.

XR10 Rail



A low-profile mounting rail for regions with light snow.

- 6' spanning capability
- Moderate load capability
- Clear and black finish

XR100 Rail



The ultimate residential solar mounting rail.

- 8' spanning capability
- Heavy load capability
- Clear and black finish

XR1000 Rail



A heavyweight mounting rail for commercial projects.

- 12' spanning capability
- Extreme load capability
- Clear anodized finish

Bonded Splices



All rails use internal splices for seamless connections.

- Self-drilling screws
- Varying versions for rails
- Forms secure bonding

Clamps & Grounding

UFOs



Universal Fastening Objects bond modules to rails.

- Fully assembled & lubed
- Single, universal size
- Clear and black finish

Stopper Sleeves



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

- Bonds modules to rails
- Sized to match modules
- Clear and black finish

CAMO



Bond modules to rails while staying completely hidden.

- Universal end-cam clamp
- Tool-less installation
- Fully assembled

Grounding Lugs



Connect arrays to equipment ground.

- Low profile
- Single tool installation
- Mounts in any direction

Attachments

FlashFoot2



Flash and mount XR Rails with superior waterproofing.

- Twist-on Cap eases install
- Wind-driven rain tested
- Mill and black finish

Conduit Mount



Flash and mount conduit, strut, or junction boxes.

- Twist-on Cap eases install
- Wind-driven rain tested
- Secures 3/4" or 1" conduit

Slotted L-Feet



Drop-in design for rapid rail attachment.

- Secure rail connections
- Slot for vertical adjusting
- Clear and black finish

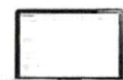
Bonding Hardware



Bond and attach XR Rails to roof attachments.

- T & Square Bolt options
- Nut uses 7/16" socket
- Assembled and lubricated

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. See IronRidge.com/training

10

RACKING DATA SHEET

Project Name:
Robert Grant
Property address:
46 Silk Oak DR,
Bunnlevel, NC 28323

CONTRACTOR

Lighting Electric

Address: 230 Blacksnake Rd
Stanley, NC 28164

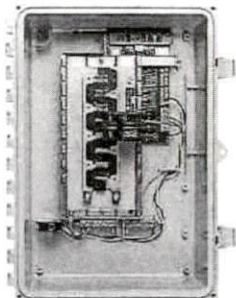
Phone: (704) 361-8011

LIGHTING ELECTRIC

DATE: 06/27/2022

Enphase IQ Combiner 3 (X-IQ-AM1-240-3)

The Enphase IQ Combiner 3™ with Enphase IQ Envoys™ 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 Envoys for communication and control
- Flexible networking supports Wi-Fi, Ethernet, or cellular
- Optional AC receptacle available for PLC bridge
- Provides production metering and optional consumption monitoring

Simple

- Reduced size from three combiners
- Centered mounting brackets support simple slide mounting
- Supports back and side conduit entry
- Up to four 2-pole branch circuits for 240 VAC plug-in breakers (not included)
- 60 A total PV or storage branch circuits

Reliable

- Durable NRTL certified NEMA type 3R enclosure
- Five-year limited warranty
- UL listed



To learn more about Enphase offerings, visit enphase.com



Enphase IQ Combiner 3

MODEL NUMBER	
IQ Combiner 3 X-IQ-AM1-240-3	IQ Combiner 3 with Enphase IQ Envoys™ printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and optional™ consumption metering (41.2.5%)
ACCESSORIES and REPLACEMENT PARTS (not included, order separately)	
Enphase Smart Switch™ CELLMODEM-03 (45/12-year data plan) CELLMODEM-01 (30/3-year data plan) CELLMODEM-M1 (4G based LTE-M/ NB-IoT data plan) Consumption Monitoring CT CT-200-3P(1)	Plug and play industrial grade cellular modem with data plan for systems up to 60 micro-inverters (Available in the US, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area) 50 A, 100 A, 200 A current transformers (not included, order separate consumption metering kit) (2.5%)
Wireless USB adapter COMMS-KT-01	Installed at the IQ Envoys. For communications with Enphase Etronage™ storage and Enphase Enpower™ smart switch. Includes USB cable for connection to IQ Envoys or Enphase IQ Combiner™ and allows redundant wireless communications with Enphase and Enpower.
Circuit Breakers BRK 104-2-140 BRK 154-2-240 BRK 204-2P-240	Supports Eaton BR210, BR215, BR216, BR218, BR220, BR225, BR230, BR240, BR250, and BR260 circuit breakers. Circuit breakers: 2 pole, 10A, Eaton BR210 Circuit breaker, 2 pole, 15A, Eaton BR215 Circuit breaker, 2 pole, 20A, Eaton BR220
EPIC 01	Power line carrier (communications bridge pair), quantity: one pair
XA-PI US-120-3	Accessory receptacle for Power Line Carrier in IQ Combiner 3 (required for EPIC 01)
XA-ENV PCB-A-3	Replacement IQ Envoys printed circuit board (PCB) for Combiner 3
ELECTRICAL SPECIFICATIONS	
Rating	Continuous duty
System voltage	120/240 VAC, 60 Hz
Eaton BR series busbar rating	125 A
Max. continuous current rating (output to grid)	95 A
Max. fault-current rating (output)	90 A
Branch circuits (output and/or storage)	Up to four 2-pole Eaton BR series 3-structured Generation (DG) breakers (not included)
Max. continuous current rating (input from PV)	54 A
Max. total branch circuit breaker rating (output)	60 A (not distributed generation, 40 A with IQ Envoys breaker included)
Production Metering CT	200 A, solid core pre-installed and wired to IQ Envoys
MECHANICAL DATA	
Dimensions (WxHxD)	49.5 x 375 x 16.8 cm (19.5" x 14.75" x 6.63"). Height is 21.05" (53.5 cm) with mounting brackets
Weight	7.5 kg (16.5 lbs)
Ambient temperature range	40° C to +45° C 40° to 115° F
Cooling	Natural convection, passive heat sink
Enclosure environmental rating	Outdoor, NRTL certified, NEMA type 3R, polycarbonate construction
Wire sizes	• 2/0 AL, 200 A breaker (input), 14 AWG, 4 AWG, 10 AWG, 12 AWG, 14 AWG, 16 AWG, 18 AWG, 20 AWG, 22 AWG, 24 AWG, 26 AWG, 28 AWG, 30 AWG, 32 AWG, 34 AWG, 36 AWG, 38 AWG, 40 AWG, 42 AWG, 44 AWG, 46 AWG, 48 AWG, 50 AWG, 52 AWG, 54 AWG, 56 AWG, 58 AWG, 60 AWG, 62 AWG, 64 AWG, 66 AWG, 68 AWG, 70 AWG, 72 AWG, 74 AWG, 76 AWG, 78 AWG, 80 AWG, 82 AWG, 84 AWG, 86 AWG, 88 AWG, 90 AWG, 92 AWG, 94 AWG, 96 AWG, 98 AWG, 100 AWG, 102 AWG, 104 AWG, 106 AWG, 108 AWG, 110 AWG, 112 AWG, 114 AWG, 116 AWG, 118 AWG, 120 AWG, 122 AWG, 124 AWG, 126 AWG, 128 AWG, 130 AWG, 132 AWG, 134 AWG, 136 AWG, 138 AWG, 140 AWG, 142 AWG, 144 AWG, 146 AWG, 148 AWG, 150 AWG, 152 AWG, 154 AWG, 156 AWG, 158 AWG, 160 AWG, 162 AWG, 164 AWG, 166 AWG, 168 AWG, 170 AWG, 172 AWG, 174 AWG, 176 AWG, 178 AWG, 180 AWG, 182 AWG, 184 AWG, 186 AWG, 188 AWG, 190 AWG, 192 AWG, 194 AWG, 196 AWG, 198 AWG, 200 AWG, 202 AWG, 204 AWG, 206 AWG, 208 AWG, 210 AWG, 212 AWG, 214 AWG, 216 AWG, 218 AWG, 220 AWG, 222 AWG, 224 AWG, 226 AWG, 228 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