Freedom Forever
Planset Revision Letter

9/20/2023
REV #3

Attn. Harnett County (NC):

The changes outlined in Revision Details have been applied to the plans corresponding to the following customer:

TROY HARRIS
132 COOPER CREEK AVENUE, SPRING LAKE, NC 28390

Revision Details:
REV3:
LAYOUT HAS BEEN UPDATED.

All corresponding changes are notated on the plans by revision clouds.

Thank you for your time in reviewing these plans. Please reach out if you have any additional questions or concerns.

Construction Engineering
Freedom Forever
engineering@freedomforever.com

ROOF MOUNT PHOTOVOLTAIC SYSTEM

CODES:

THIS PROJECT COMPLIES WITH THE FOLLOWING:
2018 NORTH CAROLINA BUILDING CODE
2018 NORTH CAROLINA RESIDENTIAL CODE
2018 NORTH CAROLINA PLUMBING CODE
2018 NORTH CAROLINA MECHANICAL CODE
2018 NORTH CAROLINA FUEL GAS CODE
2017 NATIONAL ELECTRICAL CODE
AS ADOPTED BY HARNETT COUNTY (NC)

VICINITY MAP:

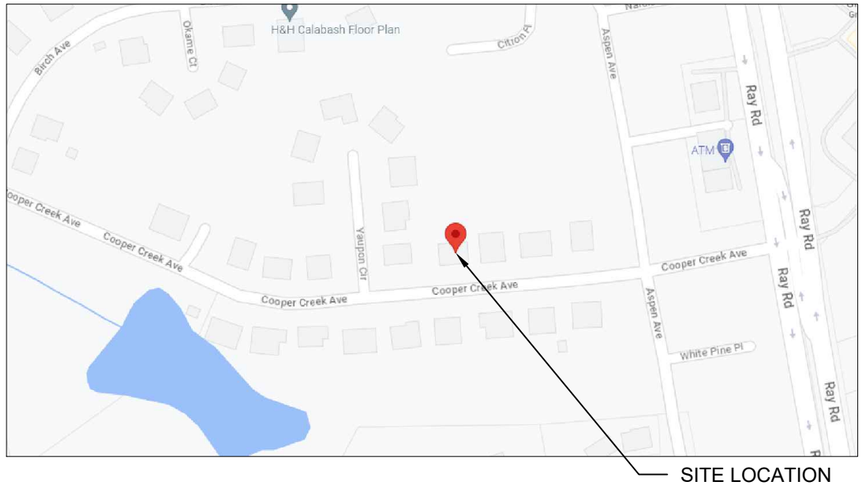


TABLE OF CONTENTS:

CONSTRUCTION NOTES:

CONDUIT AND CONDUCTOR SPECIFICATIONS ARE BASED ON MINIMUM CODE REQUIREMENTS AND ARE NOT MEANT TO LIMIT UP-SIZING AS REQUIRED BY FIELD CONDITIONS.

ALL SOLAR ENERGY SYSTEM EQUIPMENT SHALL BE SCREENED TO THE MAXIMUM EXTENT POSSIBLE AND SHALL BE PAINTED A COLOR SIMILAR TO THE SURFACE UPON WHICH THEY ARE MOUNTED.

MODULES SHALL BE TESTED , LISTED AND INDENTIFIED WITH FIRE CLASSIFICATION IN ACCORDANCE WITH UL 2703. SMOKE AND CARBON MONOXIDE ALARMS ARE REQUIRED PER SECTION R314 AND 315 TO BE VERIFIED AND INSPECTED BY INSPECTOR IN THE FIELD.

DIG ALERT (811) TO BE CONTACTED AND COMPLIANCE WITH EXCAVATION SAFETY PRIOR TO ANY EXCAVATION TAKING PLACE

PHOTOVOLTAIC SYSTEM GROUND WILL BE TIED INTO EXISTING GROUND AT MAIN SERVICE FROM DC DISCONNECT/INVERTER AS PER 2017 NEC SEC 250.166(A).

SOLAR PHOTOVOLTAIC SYSTEM EQUIPMENT WILL BE INSTALLED IN ACCORDANCE WITH REQUIREMENTS OF ART. 690 OF THE 2017 NEC

THE MAIN SERVICE PANEL WILL BE EQUIPPED WITH A GROUND ROD OR UFER

UTILITY COMPANY WILL BE NOTIFIED PRIOR TO ACTIVATION OF THE SOLAR PV SYSTEM

INSTALL CREW TO VERIFY ROOF STRUCTURE PRIOR TO COMMENCING WORK. EMT CONDUIT ATTACHED TO THE ROOF USING CONDUIT MOUNT.

THIS SYSTEM DESIGNED WITH:
WIND SPEED: 130
WIND EXPOSURE: B
SNOW LOAD: 15

NOTICE TO CONTRACTOR
All construction must comply with current NC Building Codes and is subject to field inspection and verification.
APPROVED
Limited building only review
Permit holder responsible for full compliance with the code
09/28/2023
Harnett COUNTY NORTH CAROLINA

Permit REV2

CLIENT:
TROY HARRIS
132 COOPER CREEK AVENUE, SPRING LAKE NC 28390
AHJ: HARNETT COUNTY (NC)
UTILITY: SOUTH RIVER EMC
METER: 14482581
PHONE: (407) 704-9388
EMAIL: TROYCHARRIS@HOTMAIL.COM
FINANCE: OTHER

SYSTEM:
SYSTEM SIZE (DC): 26 X 400 = 10.400 kW
SYSTEM SIZE (AC): 7.540 kW @ 240V
MODULES: 26 X FREEDOM FOREVER: FF-MP-BBB-400
MICROINVERTERS: 26 X ENPHASE IQ8PLUS-72-2-US

2

	REVISIONS	
NO.	REVISED BY	DATE
1	A.G.	6/19/2023
2	A.A.	9/15/2023
3	A.A.	9/20/2023

freedom FOREVER

FREEDOM FOREVER LLC
415 INDUSTRIAL CT., GREER, SC 29651
Tel: (800) 385-1075

GREG ALBRIGHT

CONTRACTOR LICENSE:
ELECTRICAL CONTRACTOR U.34043

SITE LOCATION

JOB NO:	DATE:	DESIGNED BY:	SHEET:
337821	9/20/2023	A.A.	PV-1

LEGEND:

- CHIMNEY
- PIPE VENT
- ATTACHMENTS
- MODULES
- RAFTERS
- RAIL
- SETBACK
- AC — AC DISCONNECT
- MSP — MSP
- JB — JUNCTION BOX
- PM — PRODUCTION METER
- DC / AC — MICRO INVERTER
- CB — COMBINER BOX

PV SYSTEM
10.400 kW-DC
7.540 kW-AC

1

THIS SYSTEM DESIGNED WITH:
WIND SPEED: 130
WIND EXPOSURE: B
SNOW LOAD: 15

TOTAL ROOF AREA RIDGE SETBACK CALCS:
TOTAL ROOF AREA: 2633.12 SQ FT
SINGLE MODULE AREA: 21.01937947 SQ FT
TOTAL NUMBER OF MODULES: 26
TOTAL AREA OF MODULES: 546.50 SQ FT
ROOF COVERAGE: 20.75%
FIRE SPRINKLERS : NO

1

BOS WILL BE AS CLOSE AS POSSIBLE TO MSP WITHIN 10'

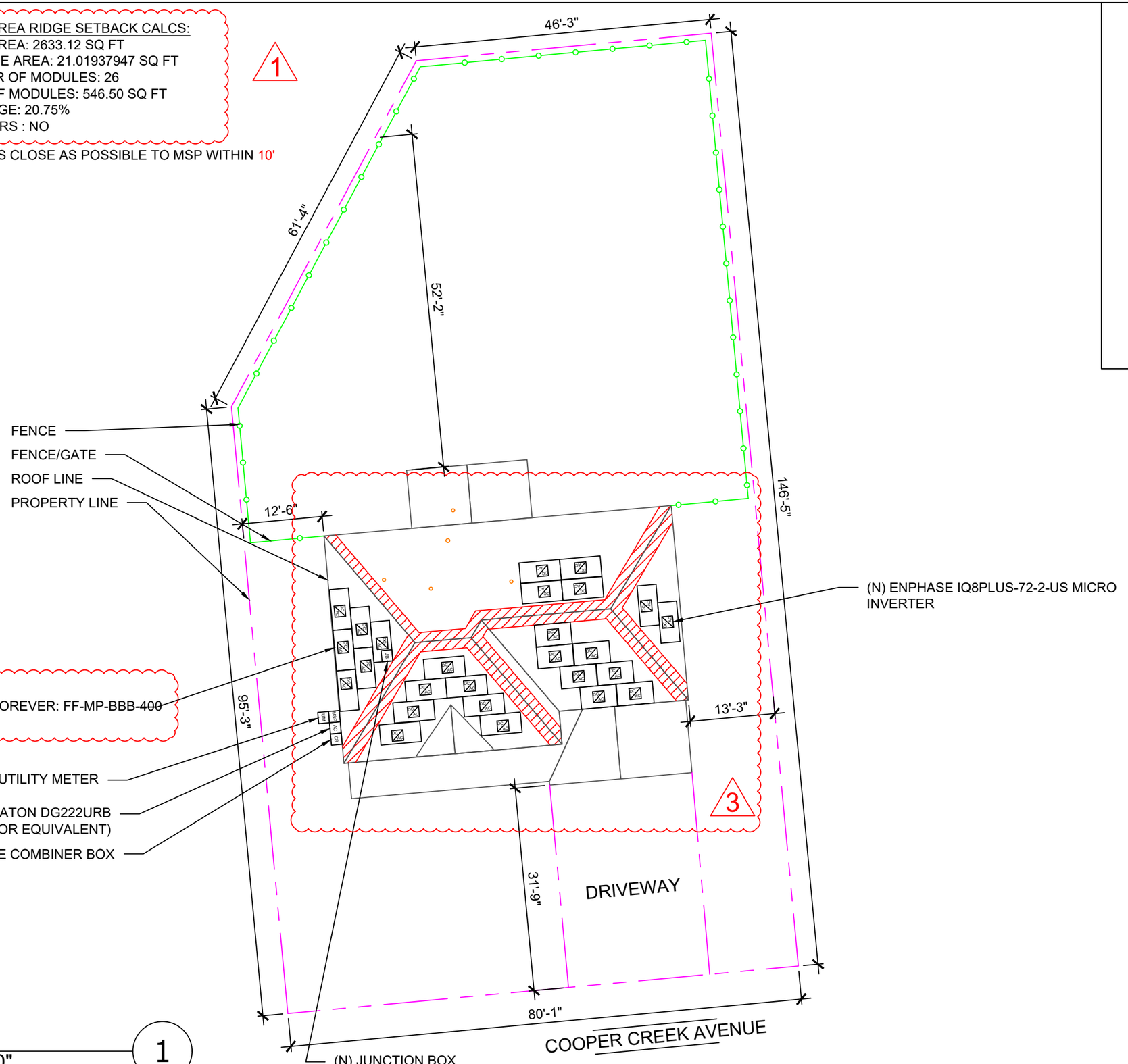
2

(N) 26 FREEDOM FOREVER: FF-MP-BBB-~~400~~

(E) MAIN SERVICE PANEL/UTILITY METER

(N) UTILITY DISCONNECT EATON DG222URB
(OR EQUIVALENT)

ENPHASE COMBINER BOX



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

1

ROOF AREA: 2633.12 SQ FT

CLIENT:
TROY HARRIS
132 COOPER CREEK AVENUE, SPRING LAKE NC 28390
AHJ: HARNETT COUNTY (NC)
UTILITY: SOUTH RIVER EMC
METER: 14482581
PHONE: (407) 704-9388
EMAIL: TROYCHARRIS@HOTMAIL.COM
FINANCE: OTHER

SYSTEM:
SYSTEM SIZE (DC): 26 X 400 = 10.400 kW
SYSTEM SIZE (AC): 7.540 kW @ 240V
MODULES: 26 X FREEDOM FOREVER: FF-MP-BBB-400
MICROINVERTERS: 26 X ENPHASE IQ8PLUS-72-2-US

2

REVISIONS		
NO.	REVISED BY	DATE
1	A.G.	6/19/2023
2	A.A.	9/15/2023
3	A.A.	9/20/2023

FREEDOM FOREVER LLC
415 INDUSTRIAL CT., GREER, SC 29651
Tel: (800) 385-1075

GREG ALBRIGHT

CONTRACTOR LICENSE:
ELECTRICAL CONTRACTOR U.34043

SITE PLAN

JOB NO:	DATE:	DESIGNED BY:	SHEET:
337821	9/20/2023	A.A.	PV-2

LEGEND:

- CHIMNEY
- PIPE VENT
- ATTACHMENTS
- MODULES
- RAFTERS
- RAIL
- SETBACK
- AC DISCONNECT
- MSP
- JUNCTION BOX
- PRODUCTION METER
- MICRO INVERTER
- COMBINER BOX

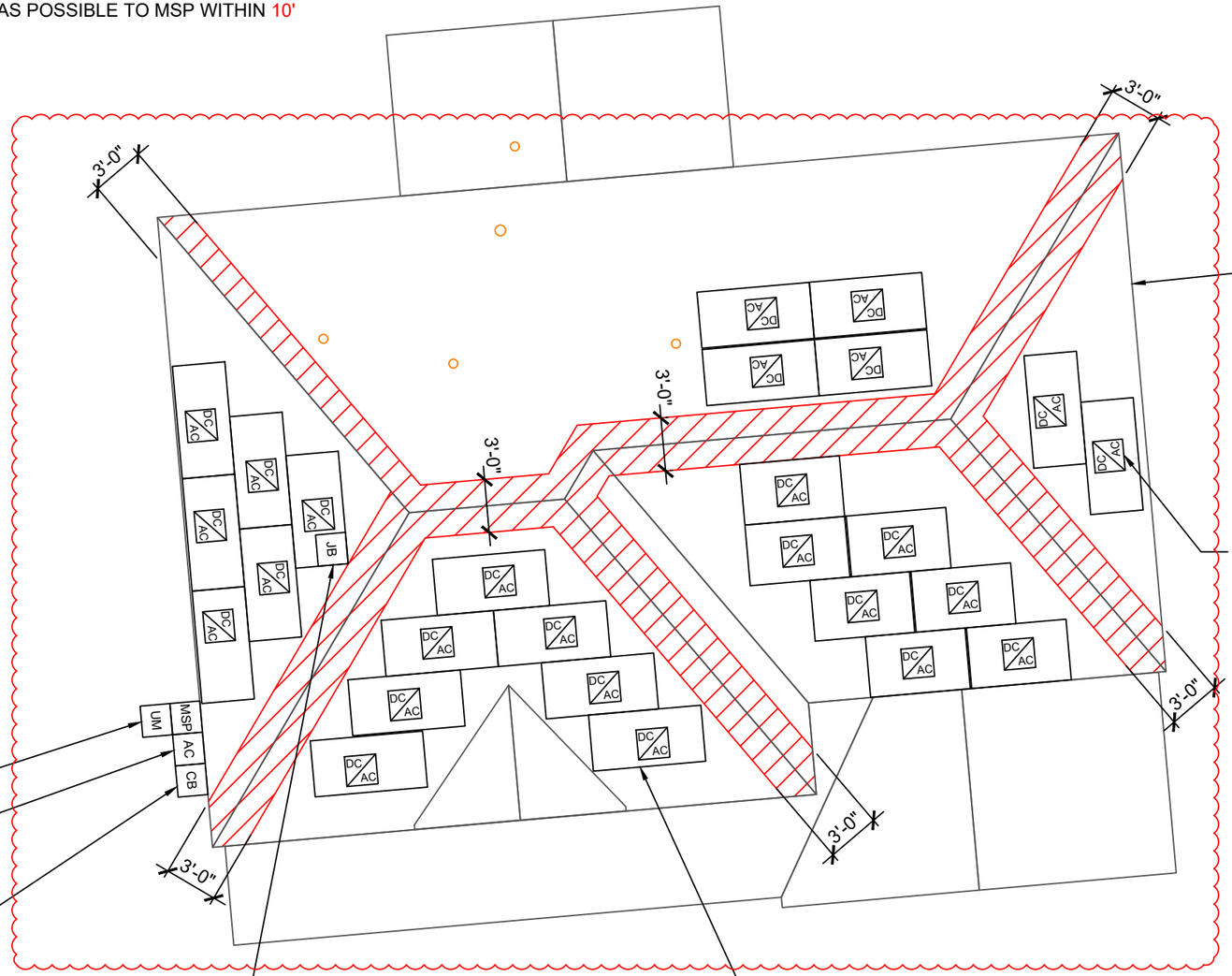
PV SYSTEM
10.400 kW-DC
7.540 kW-AC

THIS SYSTEM DESIGNED WITH:
WIND SPEED: 130
WIND EXPOSURE: B
SNOW LOAD: 15

MODIFIED SETBACKS PROPOSED AT RIDGE:
TOTAL ARRAY AREA = 546.50 SF
TOTAL ROOF AREA = 2633.12 SF
TOTAL ARRAY AREA AS A % TO ROOF AREA = 20.75%
20.75% < 33%

TOTAL ROOF AREA: 2633.12 SQ FT
TOTAL ARRAY AREA: 546.50 SQ FT
ARRAY COVERAGE: 20.75%
SYSTEM DISTRIBUTED WEIGHT: 2.32 LBS
UNIRAC: FLASHKIT PRO POINT-LOAD: 21.47 LBS

BOS WILL BE AS CLOSE AS POSSIBLE TO MSP WITHIN 10'



1

2

2

2

ROOF PLAN
SCALE: 1/8" = 1'-0"

1

NOTES:
1. EMT CONDUIT ATTACHED TO THE ROOF USING CONDUIT MOUNTS
2. ATTACHED CLAMPS AT 25% FROM THE EDGE AND 50% FROM THE CENTER OF THE MODULES
3. JUNCTION BOX IS MOUNTED TO THE RAIL.

ROOF AREA: 2633.12 SQ FT

CLIENT:
TROY HARRIS
132 COOPER CREEK AVENUE, SPRING LAKE NC 28390
AHJ: HARNETT COUNTY (NC)
UTILITY: SOUTH RIVER EMC
METER: 14482581
PHONE: (407) 704-9388
EMAIL: TROYCHARRIS@HOTMAIL.COM
FINANCE: OTHER

SYSTEM:
SYSTEM SIZE (DC): 26 X 400 = 10.400 kW
SYSTEM SIZE (AC): 7.540 kW @ 240V
MODULES: 26 X FREEDOM FOREVER: FF-MP-BBB-400
MICROINVERTERS: 26 X ENPHASE IQ8PLUS-72-2-US

REVISIONS		
NO.	REVISED BY	DATE
1	A.G.	6/19/2023
2	A.A.	9/15/2023
3	A.A.	9/20/2023

FREEDOM FOREVER LLC
415 INDUSTRIAL CT., GREER, SC 29651
Tel: (800) 385-1075

GREG ALBRIGHT

CONTRACTOR LICENSE:
ELECTRICAL CONTRACTOR U.34043

ROOF PLAN WITH MODULES LAYOUT

JOB NO:	DATE:	DESIGNED BY:	SHEET:
337821	9/20/2023	A.A.	PV-2A

ROOF DETAILS:

TOTAL ROOF AREA: 2633.12 SQ FT
TOTAL ARRAY AREA: 546.50 SQFT
ARRAY COVERAGE: 20.75%
SYSTEM DISTRIBUTED WEIGHT: 2.32 LBS
UNIRAC: FLASHKIT PRO POINT-LOAD: 21.47 LBS

ROOF AREA STATEMENT						
ROOF	MODULE QUANTITY	ROOF PITCH	ARRAY PITCH	AZIMUTH	ROOF AREA	ARRAY AREA
ROOF 1	7	30	30	175	335 SQ FT	147.14 SQ FT
ROOF 2	7	22	22	175	364 SQ FT	147.14 SQ FT
ROOF 3	2	30	30	85	192 SQ FT	42.04 SQ FT
ROOF 4	6	22	22	265	262 SQ FT	126.12 SQ FT
ROOF 5	4	22	22	355	750 SQ FT	84.08 SQ FT
----	----	----	----	----	SQ FT	SQ FT
----	----	----	----	----	SQ FT	SQ FT
----	----	----	----	----	SQ FT	SQ FT
----	----	----	----	----	SQ FT	SQ FT
----	----	----	----	----	SQ FT	SQ FT

3

CLIENT:
TROY HARRIS
132 COOPER CREEK AVENUE, SPRING LAKE NC 28390
AHJ: HARNETT COUNTY (NC)
UTILITY: SOUTH RIVER EMC
METER: 14482581
PHONE: (407) 704-9388
EMAIL: TROYCHARRIS@HOTMAIL.COM
FINANCE: OTHER

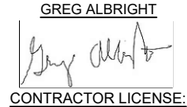
SYSTEM:
SYSTEM SIZE (DC): 26 X 400 = 10.400 kW
SYSTEM SIZE (AC): 7.540 kW @ 240V
MODULES: 26 X FREEDOM FOREVER: FF-MP-BBB-400
MICROINVERTERS: 26 X ENPHASE IQ8PLUS-72-2-US

2

REVISIONS		
NO.	REVISED BY	DATE
1	A.G.	6/19/2023
2	A.A.	9/15/2023
3	A.A.	9/20/2023

FREEDOM FOREVER LLC
415 INDUSTRIAL CT., GREER, SC 29651
Tel: (800) 385-1075

GREG ALBRIGHT



CONTRACTOR LICENSE:
ELECTRICAL CONTRACTOR U.34043

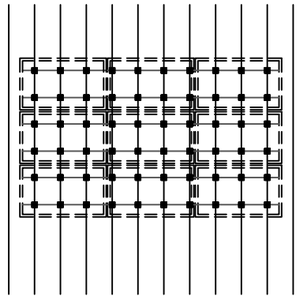
ROOF DETAILS

JOB NO:	DATE:	DESIGNED BY:	SHEET:
337821	9/20/2023	A.A.	PV-2B

TABLE 1 - ARRAY INSTALLATION

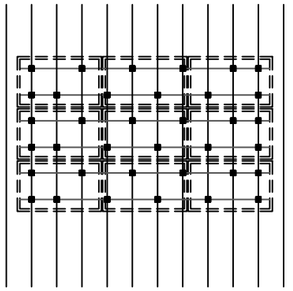
	ROOF PITCH	ROOFING TYPE	ATTACHMENT TYPE	FRAMING TYPE1	MAX UNBRACED LENGTH(FT.)1	RAFTER/TRUSS SISTERING	PENETRATION PATTERN2	MAX ATTACHMENT SPACING (IN.)2	MAX RAIL OVERHANG(IN.)3
ROOF 1	30	COMP SHINGLE	UNIRAC FLASHKIT PRO	2X4 TRUSS @ 16" OC	6.00'	NOT REQ'D	STAGGERED	48" OC	16"
ROOF 2	22	COMP SHINGLE	UNIRAC FLASHKIT PRO	2X4 TRUSS @ 16" OC	6.00'	NOT REQ'D	STAGGERED	48" OC	16"
ROOF 3	30	COMP SHINGLE	UNIRAC FLASHKIT PRO	2X4 TRUSS @ 16" OC	6.00'	NOT REQ'D	STAGGERED	48" OC	16"
ROOF 4	22	COMP SHINGLE	UNIRAC FLASHKIT PRO	2X4 TRUSS @ 16" OC	6.00'	NOT REQ'D	STAGGERED	48" OC	16"
ROOF 5	22	COMP SHINGLE	UNIRAC FLASHKIT PRO	2X4 TRUSS @ 16" OC	6.00'	NOT REQ'D	STAGGERED	48" OC	16"

1. CONTRACTOR TO VERIFY FRAMING TYPE AND MAX UNBRACED LENGTH PRIOR TO INSTALLATION. IF THE ABOVE INFORMATION DOES NOT MATCH FIELD CONDITIONS, NOTIFY ENGINEER OF RECORD IMMEDIATELY.
2. WHERE COLLAR TIES OR RAFTER SUPPORTS EXIST, CONTRACTOR SHALL USE RAFTERS WITH COLLAR TIES AS ATTACHMENT POINTS.
3. WHERE APPLICABLE FOR RAILED ATTACHMENT INSTALLATIONS.



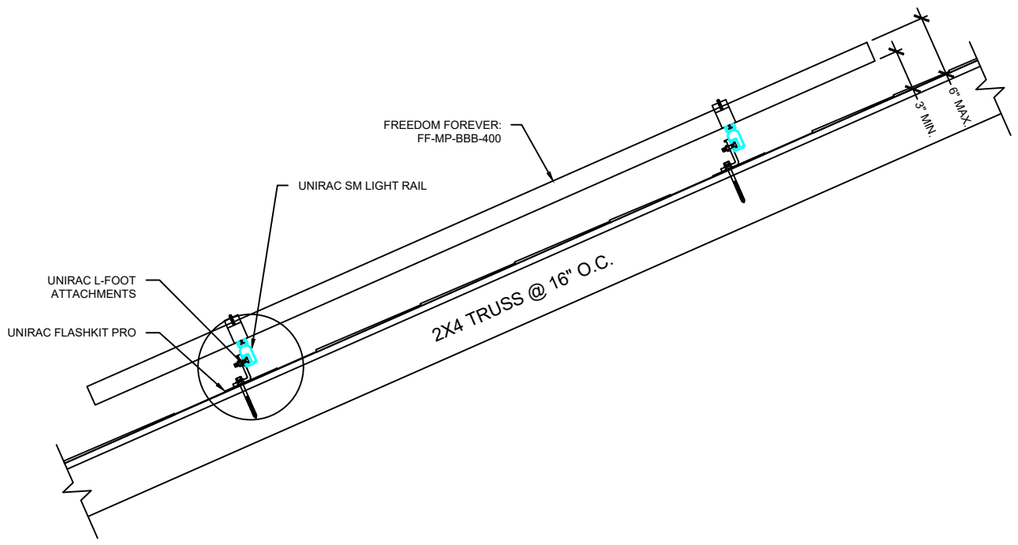
STACKED DETAIL

For Illustration purposes only



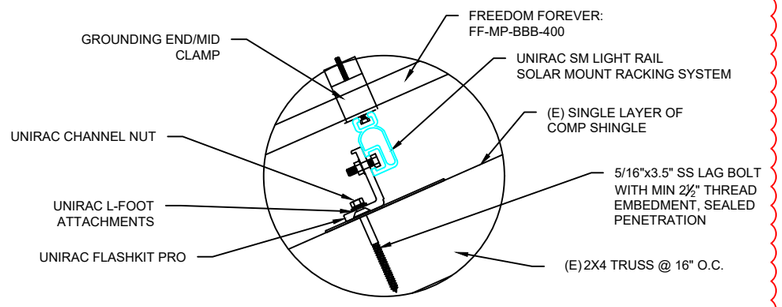
STAGGERED DETAIL

For Illustration purposes only



SOLAR PV ARRAY SECTION VIEW

Scale: NTS



ATTACHMENT DETAIL

Scale: NTS

CLIENT:
TROY HARRIS
132 COOPER CREEK AVENUE, SPRING LAKE NC 28390
AHJ: HARNETT COUNTY (NC)
UTILITY: SOUTH RIVER EMC
METER: 14482581
PHONE: (407) 704-9388
EMAIL: TROYCHARRIS@HOTMAIL.COM
FINANCE: OTHER

SYSTEM:
SYSTEM SIZE (DC): 26 X 400 = 10.400 kW
SYSTEM SIZE (AC): 7.540 kW @ 240V
MODULES: 26 X FREEDOM FOREVER: FF-MP-BBB-400
MICROINVERTERS: 26 X ENPHASE IQ8PLUS-72-2-US

	REVISIONS	
NO.	REVISED BY	DATE
1	A.G.	6/19/2023
2	A.A.	9/15/2023
3	A.A.	9/20/2023

FREEDOM FOREVER LLC
415 INDUSTRIAL CT., GREER, SC 29651
Tel: (800) 385-1075

GREG ALBRIGHT

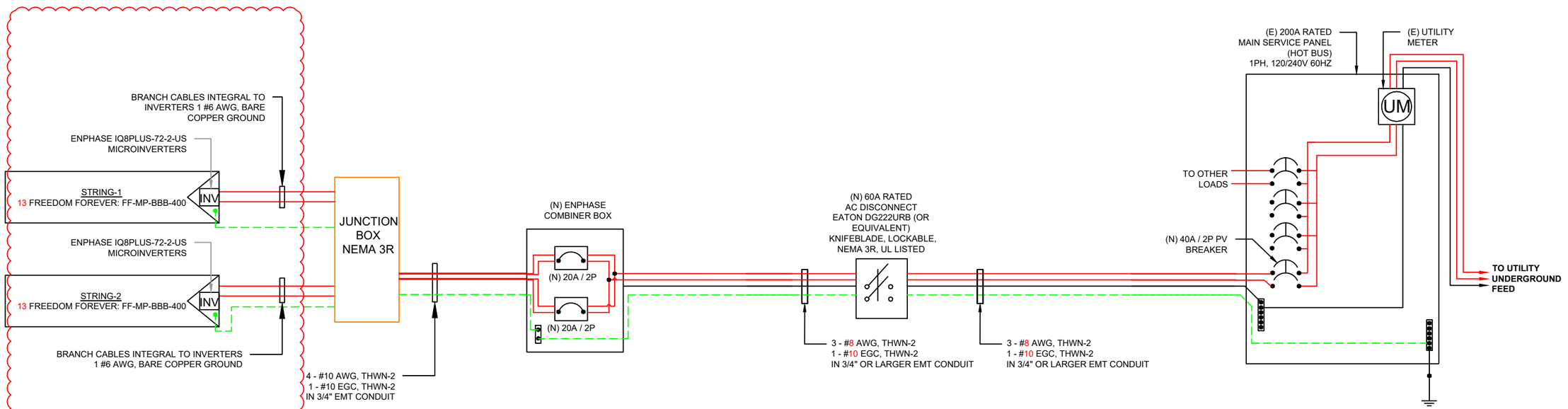
CONTRACTOR LICENSE:
ELECTRICAL CONTRACTOR U.34043

MOUNTING DETAILS

JOB NO:	DATE:	DESIGNED BY:	SHEET:
337821	9/20/2023	A.A.	PV-3

BACKFEED BREAKER SIZING					
MAX. CONTINUOUS OUTPUT 31.46A @ 240V					
31.46	X	1.25	=	39AMPS	40A BREAKER - OK

PV SYSTEM
10.400 kW-DC
7.540 kW-AC



NOTE:
CONDUIT AND CONDUCTORS SPECIFICATIONS ARE BASED ON MINIMUM CODE REQUIREMENTS AND ARE NOT MEANT TO LIMIT UP-SIZING AS REQUIRED BY FIELD CONDITIONS

CLIENT:
TROY HARRIS
132 COOPER CREEK AVENUE, SPRING LAKE NC 28390
AHJ: HARNETT COUNTY (NC)
UTILITY: SOUTH RIVER EMC
METER: 14482581
PHONE: (407) 704-9388
EMAIL: TROYCHARRIS@HOTMAIL.COM
FINANCE: OTHER

SYSTEM:
SYSTEM SIZE (DC): 26 X 400 = 10.400 kW
SYSTEM SIZE (AC): 7.540 kW @ 240V
MODULES: 26 X FREEDOM FOREVER: FF-MP-BBB-400
MICROINVERTERS: 26 X ENPHASE IQ8PLUS-72-2-US

2

REVISIONS		
NO.	REVISED BY	DATE
1	A.G.	6/19/2023
2	A.A.	9/15/2023
3	A.A.	9/20/2023

FREEDOM FOREVER LLC
415 INDUSTRIAL CT., GREER, SC 29651
Tel: (800) 385-1075

GREG ALBRIGHT

CONTRACTOR LICENSE:
ELECTRICAL CONTRACTOR U.34043

THREE LINE DIAGRAM

JOB NO:	DATE:	DESIGNED BY:	SHEET:
337821	9/20/2023	A.A.	PV-4

WIRE SCHEDULE

RACEWAY #	1 EQUIPMENT				CONDUCTOR QTY.	AWG WIRE SIZE	STARTING ALLOWABLE AMPACITY @ 90°C 310.15(B)(16)	STARTING CURRENT APPLIED TO CONDUCTORS IN RACEWAY	TEMPERATURE CORRECTION FACTOR 310.15(B)(2)(a)	ADJUSTMENT FACTOR FOR MORE THAN 3 CONDUCTORS 310.15(B)(3)(a)	ADJUSTED CONDUCTOR AMPACITY @ 90°C	MAXIMUM CURRENT APPLIED TO CONDUCTORS IN RACEWAY
1	DC	MODULE	TO	MICROINVERTER	2	10	40	17.24	0.91	1	36.40	21.55
2	AC	MICROINVERTER	TO	JUNCTION BOX	2	10	40	15.73	0.91	1	36.40	19.66
3	AC	JUNCTION BOX	TO	ENPHASE COMBINER BOX	4	10	40	15.73	0.91	0.8	29.12	19.66
4	AC	ENPHASE COMBINER BOX	TO	AC DISCONNECT	3	8	55	31.46	0.91	1	50.05	39.33
5	AC	AC DISCONNECT	TO	POI	3	8	55	31.46	0.91	1	50.05	39.33

CONDUCTOR AMPACITY CALCULATIONS IN ACCORDANCE WITH NEC 690.8.

CLIENT:
TROY HARRIS
132 COOPER CREEK AVENUE, SPRING LAKE NC 28390
AHJ: HARNETT COUNTY (NC)
UTILITY: SOUTH RIVER EMC
METER: 14482581
PHONE: (407) 704-9388
EMAIL: TROYCHARRIS@HOTMAIL.COM
FINANCE: OTHER

SYSTEM:
SYSTEM SIZE (DC): 26 X 400 = 10.400 kW
SYSTEM SIZE (AC): 7.540 kW @ 240V
MODULES: 26 X FREEDOM FOREVER: FF-MP-BBB-400
MICROINVERTERS: 26 X ENPHASE IQ8PLUS-72-2-US

2

NO.	REVISIONS REVISED BY	DATE
1	A.G.	6/19/2023
2	A.A.	9/15/2023
3	A.A.	9/20/2023

FREEDOM FOREVER LLC
415 INDUSTRIAL CT., GREER, SC 29651
Tel: (800) 385-1075

GREG ALBRIGHT

CONTRACTOR LICENSE:
ELECTRICAL CONTRACTOR U.34043

CONDUCTOR CALCULATIONS

JOB NO:	DATE:	DESIGNED BY:	SHEET:
337821	9/20/2023	A.A.	PV-5

OCPD SIZES:

20A BREAKER
20A BREAKER
40A BREAKER

SERVICE LIST:

NONE

MATERIAL LIST:

2

QTY.	PART	PART #	DESCRIPTION
26	MODULES	PV-110-400	FREEDOM FOREVER: FF-MP-BBB-400
1	FITTINGS/ANCHORS	RAC-261-527	600VDC NEMA 3R UL LISTED JUNCTION BOX
4	ELECTRICAL ACCESSORIES	EA-350-326	STAUBLI / MULTI-CONTACT MC4 CONNECTORS (FEMALE)
4	EQUIPMENT ACCESSORIES	EA-350-327	STAUBLI / MULTI-CONTACT MC4 CONNECTORS (MALE)
26	INVERTERS	INV-120-015	ENPHASE IQ8PLUS-72-2-US
1	MONITORING EQUIPMENT	ME-180-100-3C	"ENPHASE AC COMBINER W/ ENVOY PCB, 80A"
30	ELECTRICAL ACCESSORIES	EA-160-106	"ENPHASE, Q CABLE PORTRAIT FOR 60/72 CELL"
30	ELECTRICAL ACCESSORIES	EA-160-105	"ENPHASE, Q CABLE LANDSCAPE 60 CELL"
1	MONITORING EQUIPMENT	ME-180-200	ENPHASE COMBINER BOX NEMA 3R RATED
1	WIRE	WR-310-300	"ENPHASE, RAW TRUCK CABLE (300 FT. ROLL)"
208	ELECTRICAL ACCESSORIES	EA-160-110	ENPHASE TIE WRAPS / CABLE CLIPS
7	ELECTRICAL ACCESSORIES	EA-160-107	ENPHASE SEALING CAPS FOR Q CABLE
3	ELECTRICAL ACCESSORIES	EA-160-109	ENPHASE TERMINATOR
1	DISCONNECTS	EE-321-060	60A RATED 240VAC NEMA 3R UL LISTED
59	FITTINGS/ANCHORS	RAC-241-250	UNIRAC: FLASHKIT PRO
21	RAILS	RAC-211-100	UNIRAC SM LIGHT RAIL 168 INCH (TOTAL 294 FEET NEEDED)
26	FITTINGS/ANCHORS	RAC-261-517	BND T-BOLT AND NUT SS
28	ENDS/MIDS	RAC-221-101	SM MIDCLAMP PRO DRK
28	ENDS/MIDS	RAC-221-209	SM ENDCLAMP PRO W/ END CLAMP
9	FITTINGS/ANCHORS	RAC-261-600	BND SPLICE BAR PRO SERIES MILL
28	FITTINGS/ANCHORS	RAC-261-510	MICRO MNT BND TBOLT SS
8	RAILS	RAC-211-209-NS	E-BOSS CONDUIT MOUNT COMP KIT
15	RAILS	RAC-211-200	E-BOSS RAIL TRAY
5	RAILS	RAC-211-206	E-BOSS BRIDGE TRAY
8	RAILS	RAC-211-207	E-BOSS BRIDGE CLIPS
42	FITTINGS/ANCHORS	RAC-260-300	BURNDY GROUND WEEB-LUG
45	FOOTINGS	RAC-241-100	UNIRAC L-FOOT SERRATED W/T-BOLT CLEAR (KIT)

CLIENT:
TROY HARRIS
132 COOPER CREEK AVENUE, SPRING LAKE
NC 28390
AHJ: HARNETT COUNTY (NC)
UTILITY: SOUTH RIVER EMC
METER: 14482581
PHONE: (407) 704-9388
EMAIL: TROYCHARRIS@HOTMAIL.COM
FINANCE: OTHER

SYSTEM:
SYSTEM SIZE (DC): 26 X 400 = 10.400 kW
SYSTEM SIZE (AC): 7.540 kW @ 240V
MODULES: 26 X FREEDOM FOREVER: FF-MP-BBB-400
MICROINVERTERS: 26 X ENPHASE IQ8PLUS-72-2-US

2

	REVISIONS	
NO.	REVISED BY	DATE
1	A.G.	6/19/2023
2	A.A.	9/15/2023
3	A.A.	9/20/2023

FREEDOM FOREVER LLC
415 INDUSTRIAL CT., GREER, SC 29651
Tel: (800) 385-1075

GREG ALBRIGHT

CONTRACTOR LICENSE:
ELECTRICAL CONTRACTOR U.34043

EQUIPMENT & SERVICE LIST

JOB NO:	DATE:	DESIGNED BY:	SHEET:
337821	9/20/2023	A.A.	PV-6

MAIN PHOTOVOLTAIC SYSTEM DISCONNECT

690.13(B)

DO NOT DISCONNECT UNDER LOAD

NEC 690.15 (B) & NEC 690.33(D)(2)

⚠ WARNING

SINGLE 120-VOLT SUPPLY
DO NOT CONNECT
MULTIWIRE BRANCH CIRCUITS

NEC 710.15(C) & 692.9 (C)

⚠ WARNING DUAL POWER SOURCE
SECOND SOURCE IS PHOTOVOLTAIC SYSTEM

NEC 705.12(D) & NEC 690.59

⚠ WARNING

TURN OFF PHOTOVOLTAIC AC DISCONNECT PRIOR TO WORKING INSIDE PANEL

NEC 110.27(C) & OSHA 1910.145(F)(7)

⚠ WARNING

ELECTRICAL SHOCK HAZARD

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

706.15(C)(4) & 690.13(B)

⚠ WARNING

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

NEC 705.12(B)(3)(3)

⚠ WARNING

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

NEC 690.31(E)

RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

690.56(C)(3)

M

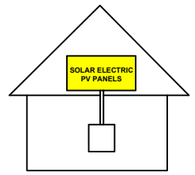
AC

PM

INVERTER

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



IFC 605.11.3.1(1) & 690.56(C)

⚠ CAUTION
PHOTOVOLTAIC SYSTEM CIRCUIT IS BACKFED

NEC 705.12(D) & NEC 690.59

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

NEC 705.12(C) & NEC 690.59

⚠ WARNING
ARC FLASH AND SHOCK HAZARD
APPROPRIATE PPE REQUIRED

24 INCH FLASH HAZARD BOUNDARY
3 CAL/CM^2 FLASH HAZARD AT 18 INCHES
480 VAC SHOCK HAZARD WHEN COVER IS REMOVED
42 INCH LIMITED APPROACH
12 INCH RESTRICTED APPROACH - 500 V CLASS 00 GLOVES
1 INCH PROHIBITED APPROACH - 500 V CLASS 00 GLOVES

LOCATION: 132 COOPER CREEK AVENUE,SPRING LAKE, NC 28390

NEC 706.15(C) AND NEC 110.16

PHOTOVOLTAIC AC DISCONNECT

NEC 690.13(B)

PHOTOVOLTAIC AC DISCONNECT

RATED AC OUTPUT CURRENT: 31.46A
NOMINAL OPERATING AC VOLTAGE: 240V

NEC 690.54

⚠ WARNING DUAL POWER SOURCE
SECOND SOURCE IS PHOTOVOLTAIC SYSTEM

NEC 705.12(D) & NEC 690.59

SOLAR PV DC CIRCUIT

EVERY 10' ON CONDUIT AND ENCLOSURES
NEC 690.31

PHOTOVOLTAIC POWER SOURCE

EVERY 10' ON CONDUIT AND ENCLOSURES
NEC 690.31(D)(2)

MAXIMUM VOLTAGE	60	V
MAXIMUM CIRCUIT CURRENT	N/A	A
MAX DC-DC CONVERTER OUTPUT CURRENT	15	A

DC

J/B

1

PHOTOVOLTAIC DC DISCONNECT

NEC 690.13(B)

MAXIMUM DC VOLTAGE OF PV SYSTEM

NEC 690.53

⚠ WARNING

ELECTRICAL SHOCK HAZARD

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

DC VOLTAGE IS ALWAYS PRESENT WHEN SOLAR MODULES ARE EXPOSED TO SUNLIGHT

706.15(C)(4) & 690.13(B)

⚠ WARNING

ELECTRICAL SHOCK HAZARD

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

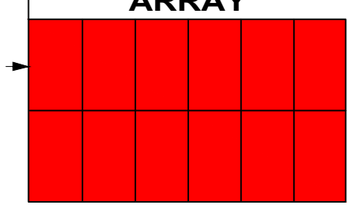
706.15(C)(4) & 690.13(B)

⚠ WARNING

TURN OFF PHOTOVOLTAIC AC DISCONNECT PRIOR TO WORKING INSIDE PANEL

NEC 110.27(C) & OSHA 1910.145(F)(7)

ARRAY



NEC 690.31(G)(3) & (4)

NOTES:

1. NEC ARTICLES 690 AND 705 AND IRC SECTION R324 MARKINGS SHOWN HEREON.
2. ALL MARKING SHALL CONSIST OF THE FOLLOWING:
   - A. UV RESISTANT SIGN MATERIAL WITH ENGRAVED OR MACHINE PRINTED LETTERS OR ELECTRO-PLATING.
   - B. RED BACKGROUND COLOR WHITE TEXT AND LINE WORK.
   - C. ARIAL FONT.
3. ALL SIGNS SHALL BE SIZED APPROPRIATELY AND PLACED IN THE LOCATIONS SPECIFIED. SIGNAGE CANNOT BE HAND-WRITTEN.
4. SIGNS SHALL BE ATTACHED TO THE SERVICE EQUIPMENT WITH POP-RIVETS OR SCREWS

CLIENT:
TROY HARRIS
132 COOPER CREEK AVENUE, SPRING LAKE NC 28390
AHJ: HARNETT COUNTY (NC)
UTILITY: SOUTH RIVER EMC
METER: 14482581
PHONE: (407) 704-9388
EMAIL: TROYCHARRIS@HOTMAIL.COM
FINANCE: OTHER

SYSTEM:
SYSTEM SIZE (DC): 26 X 400 = 10.400 kW
SYSTEM SIZE (AC): 7.540 kW @ 240V
MODULES: 26 X FREEDOM FOREVER: FF-MP-BBB-400
MICROINVERTERS: 26 X ENPHASE IQ8PLUS-72-2-US

2

REVISIONS		
NO.	REVISED BY	DATE
1	A.G.	6/19/2023
2	A.A.	9/15/2023
3	A.A.	9/20/2023

freedom FOREVER

FREEDOM FOREVER LLC
415 INDUSTRIAL CT., GREER, SC 29651
Tel: (800) 385-1075

GREG ALBRIGHT

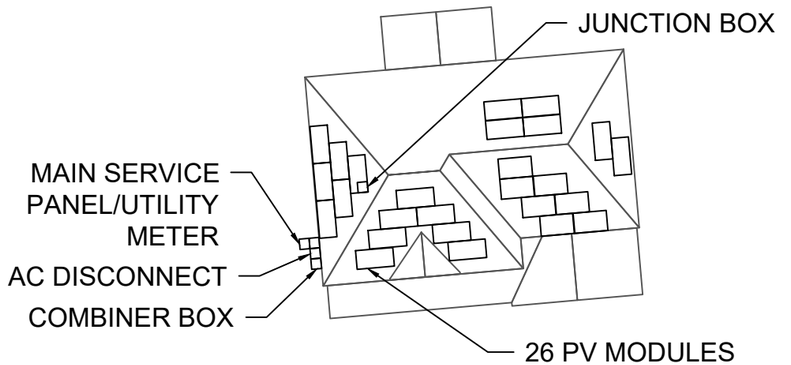
CONTRACTOR LICENSE:
ELECTRICAL CONTRACTOR U.34043

LABELS

JOB NO:	DATE:	DESIGNED BY:	SHEET:
337821	9/20/2023	A.A.	PV-7

CAUTION:

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



WARNING

TURN OFF PHOTOVOLTAIC AC DISCONNECT PRIOR TO WORKING INSIDE PANEL

1

NOTES:

1. NEC ARTICLES 690 AND 705 AND IRC SECTION R324 MARKINGS SHOWN HEREON.
2. ALL MARKING SHALL CONSIST OF THE FOLLOWING:
   - A. UV RESISTANT SIGN MATERIAL WITH ENGRAVED OR MACHINE PRINTED LETTERS OR ELECTRO-PLATING.
   - B. RED BACKGROUND COLOR WHITE TEXT AND LINE WORK.
   - C. AERIAL FONT.
3. ALL SIGNS SHALL BE SIZED APPROPRIATELY AND PLACED IN THE LOCATIONS SPECIFIED. SIGNAGE CANNOT BE HAND-WRITTEN.
4. SIGNS SHALL BE ATTACHED TO THE SERVICE EQUIPMENT WITH POP-RIVETS OR SCREWS.

CLIENT:
TROY HARRIS
132 COOPER CREEK AVENUE, SPRING LAKE NC 28390
AHJ: HARNETT COUNTY (NC)
UTILITY: SOUTH RIVER EMC
METER: 14482581
PHONE: (407) 704-9388
EMAIL: TROYCHARRIS@HOTMAIL.COM
FINANCE: OTHER

SYSTEM:
SYSTEM SIZE (DC): 26 X 400 = 10.400 kW
SYSTEM SIZE (AC): 7.540 kW @ 240V
MODULES: 26 X FREEDOM FOREVER: FF-MP-BBB-400
MICROINVERTERS: 26 X ENPHASE IQ8PLUS-72-2-US

2

	REVISIONS	
NO.	REVISED BY	DATE
1	A.G.	6/19/2023
2	A.A.	9/15/2023
3	A.A.	9/20/2023

FREEDOM FOREVER LLC
415 INDUSTRIAL CT., GREER, SC 29651
Tel: (800) 385-1075

GREG ALBRIGHT

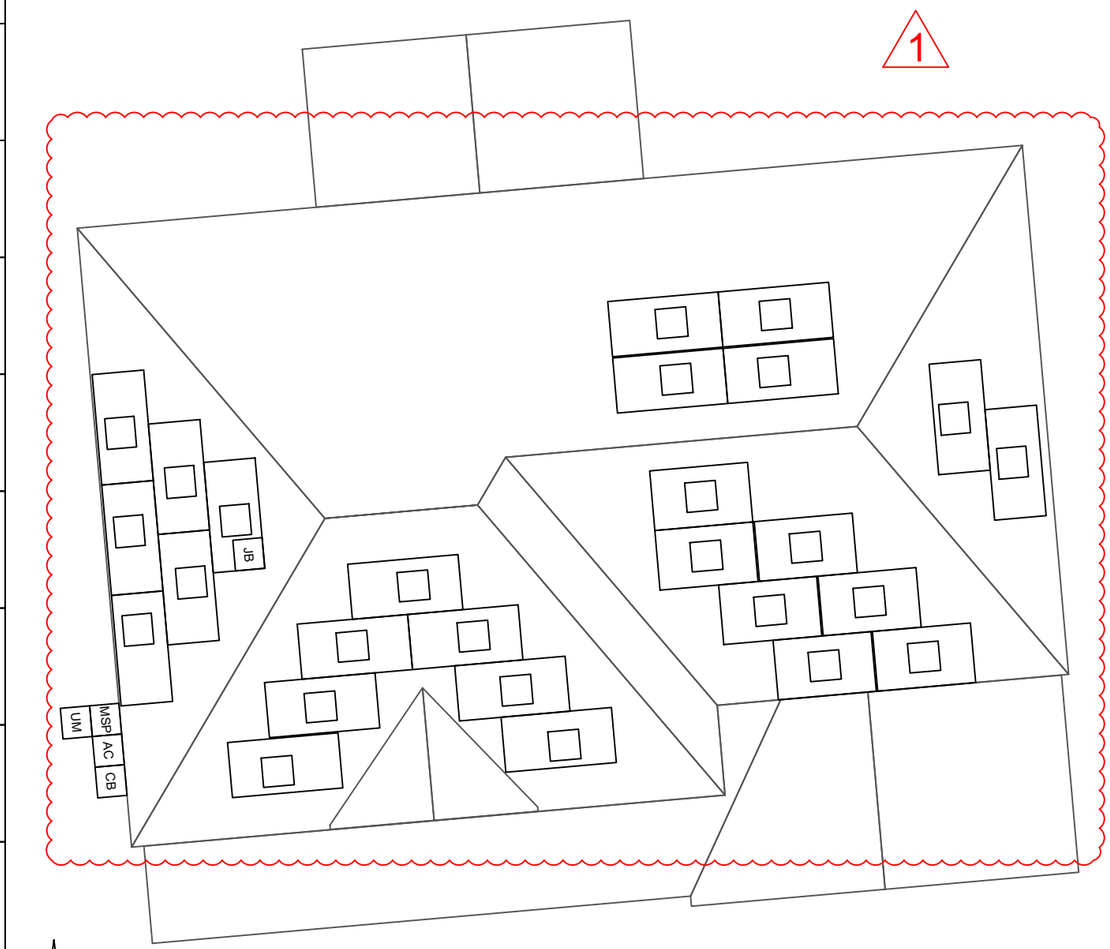
CONTRACTOR LICENSE:
ELECTRICAL CONTRACTOR U.34043

SITE PLACARD

JOB NO:	DATE:	DESIGNED BY:	SHEET:
337821	9/20/2023	A.A.	PV-7A

ENPHASE MICROINVERTER CHART

	1-10	11-20	21-30	31-40	41-50	51-60
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						



CLIENT:
TROY HARRIS
132 COOPER CREEK AVENUE, SPRING LAKE NC 28390
AHJ: HARNETT COUNTY (NC)
UTILITY: SOUTH RIVER EMC
METER: 14482581
PHONE: (407) 704-9388
EMAIL: TROYCHARRIS@HOTMAIL.COM
FINANCE: OTHER

SYSTEM:
SYSTEM SIZE (DC): 26 X 400 = 10.400 kW
SYSTEM SIZE (AC): 7.540 kW @ 240V
MODULES: 26 X FREEDOM FOREVER: FF-MP-BBB-400
MICROINVERTERS: 26 X ENPHASE IQ8PLUS-72-2-US

2

REVISIONS		
NO.	REVISED BY	DATE
1	A.G.	6/19/2023
2	A.A.	9/15/2023
3	A.A.	9/20/2023

FREEDOM FOREVER LLC
415 INDUSTRIAL CT., GREER, SC 29651
Tel: (800) 385-1075

GREG ALBRIGHT

CONTRACTOR LICENSE:
ELECTRICAL CONTRACTOR U.34043

MICROINVERTER CHART

JOB NO:	DATE:	DESIGNED BY:	SHEET:
337821	9/20/2023	A.A.	PV-8

SAFETY PLAN

INSTRUCTIONS:

1. USE SYMBOLS IN KEY TO MARK UP THIS SHEET.
2. SAFETY PLAN MUST BE MARKED BEFORE JOB STARTS AS PART OF THE PRE-PLAN
3. DOCUMENT ALL ADDITIONAL HAZARDS ON THIS PAGE & MAKE NOTES ON THE JHA SHEET

INCIDENT REPORTING:

INJURIES - CALL INJURY HOTLINE

(855) 400-7233

**If injury is life threatening, call 911 first THEN the Injury Hotline*

NON-INJURIES - USE MOBILE INCIDENT REPORTING
(Auto, Property Damage, Near Miss)

NEAREST OCCUPATIONAL/INDUSTRIAL CLINIC:

NAME: _____

ADDRESS: _____

NEAREST HOSPITAL:

NAME: _____

ADDRESS: _____

SAFETY COACH CONTACT INFORMATION:

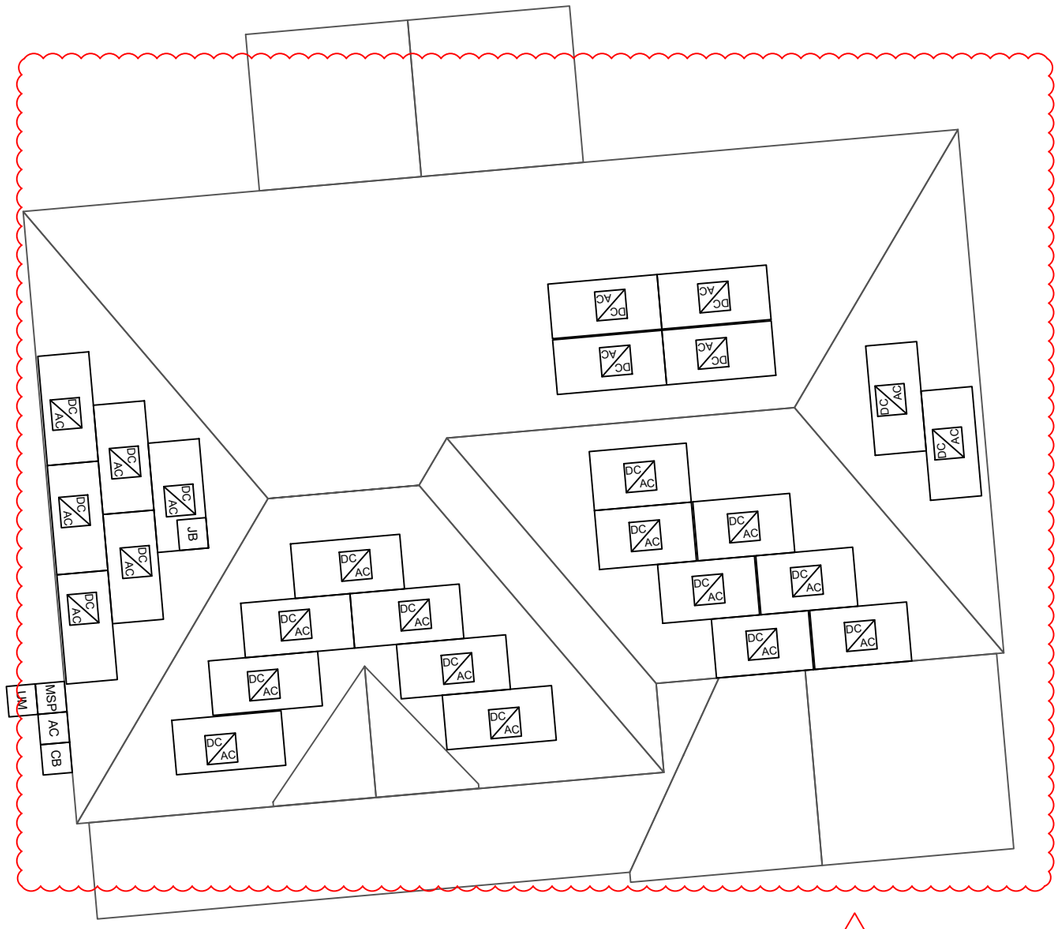
NAME: _____

PHONE NUMBER: _____

ALL EMPLOYEES ON SITE SHALL BE MADE AWARE OF THE SAFETY PLAN AND SIGN INDICATING THAT THEY ARE AWARE OF THE HAZARDS ON-SITE AND THE PLAN FOR WORKING SAFELY.

NAME	SIGNATURE
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

DATE: _____ TIME: _____



1

MARK UP KEY

- (P) PERMANENT ANCHOR
- (T) TEMPORARY ANCHOR
- IL INSTALLER LADDER
- B JUNCTION / COMBINER BOX
- S STUB-OUT
- SKYLIGHT
- NO LADDER ACCESS (STEEP GRADE OR GROUND LEVEL OBSTRUCTIONS)
- RESTRICTED ACCESS
- CONDUIT
- (GAS) GAS SHUT OFF
- (H_2O) WATER SHUT OFF
- (7) SERVICE DROP
- (Z) POWER LINES

BREAK AND WATER LOG

THIS LOG IS TO BE FILLED OUT ANY TIME THE TEMP EXCEEDS **90** DEGREES. THE CREW LEAD AND ROOF LEAD ARE RESPONSIBLE FOR ENSURING THIS IS COMPLETED AND UPLOADED AT THE END OF EVERYDAY WHEN TEMPS EXCEED **90** DEGREES

NAME	0800HRS	0900HRS	1000HRS	1100HRS	1200HRS	1300HRS	1400HRS	1500HRS	1600HRS

CLIENT:
TROY HARRIS
132 COOPER CREEK AVENUE, SPRING LAKE NC 28390
AHJ: HARNETT COUNTY (NC)
UTILITY: SOUTH RIVER EMC
METER: 14482581
PHONE: (407) 704-9388
EMAIL: TROYCHARRIS@HOTMAIL.COM
FINANCE: OTHER

SYSTEM:
SYSTEM SIZE (DC): 26 X 400 = 10.400 kW
SYSTEM SIZE (AC): 7.540 kW @ 240V
MODULES: 26 X FREEDOM FOREVER: FF-MP-BBB-400
MICROINVERTERS: 26 X ENPHASE IQ8PLUS-72-2-US

2

REVISIONS		
NO.	REVISED BY	DATE
1	A.G.	6/19/2023
2	A.A.	9/15/2023
3	A.A.	9/20/2023

FREEDOM FOREVER LLC
415 INDUSTRIAL CT., GREER, SC 29651
Tel: (800) 385-1075

GREG ALBRIGHT

CONTRACTOR LICENSE:
ELECTRICAL CONTRACTOR U.34043

SAFETY PLAN

JOB NO:	DATE:	DESIGNED BY:	SHEET:
337821	9/20/2023	A.A.	PV-9

JOB HAZARD ANALYSIS

Crew leader to fill out all sections below, hold a pre-job safety meeting with all personnel, and upload this completed document and the Safety Plan to Site Capture

Ladder Access
- Ladders must be inspected before each use.
- Extension ladders must be set up on a firm and level surface at a 4-to-1 rise to run angle (or 75 degrees) and the top must be secured to the structure. Extension style ladders placed on uneven, loose or slippery surfaces must additionally have the base firmly anchored or lashed so the base will not slip out.
- Extension ladders must be used with walk-through devices or the ladder must extend 36" above the stepping off point.
- A-frame ladders must only be climbed with the ladder spreader bars locked in the open position; A-frame ladders shall not be climbed while in the closed position (ex, closed and used while leaned against a structure).
- Additional notes:

Mobile Equipment
- Only Qualified operators will operate equipment; operators must maintain a certification on their person for the equipment being operated.
- Type(s) of mobile equipment (Type/Make/Model):
- Qualified operator(s):

Material Handling and Storage
- Materials will be staged/stored in a way that does not present a hazard to client, personnel or public. Materials stored on the roof will be physically protect from failing or sliding off.

Fall Protection
- A site-specific plan for fall prevention and protection is required prior to starting work and must remain onsite at all times until work is complete; a fall rescue plan must be outlined and discussed among the crew prior to work start.
- First-person-Up (FPU) must install their anchor and connect before any other task, including installing other anchors. The Last-Person-Down (LPD) must be the only person on a roof uninstalling fall protection.
- FPCP (name and title):
- FPU and LPD (name and title):

Electrical Safety
- The Electrical Qualified Person (EQP) is required onsite to perform electrical work.
- All electrical work will be performed with equipment in an electrically safe condition (de-energized) unless approval has been granted prior to work.
- Service drops and overhead electrical hazards will be indentified and protected from contact, as neccessary.
- EQP (name and tile):

Public Protection
- The safety of the Client and Public must be maintained at all times.
- The Client and the Public shall be prevented from entering the work zone through the use of barriers and/or signage, as required.
- Company, Client and Public property shall be protected from falling objects.
- Pets (including dogs) shall be secured by their owners prior to work start.
- The Client should not leave pets, family members, or others in charge or care of Employees, Contractors, or Temporary Workers.
- Crew leader responsible for communication with the client:
- Client and public is excluded from work area by barricades (N/A, Yes, No):

Training and Pre-Job Safety Briefing
- All employees onsite shall be made aware of the specific hazards of this project and review this HJA during a pre-job briefing, and their signature indicates awareness of site conditions and the plan to eliminate any hazards identified prior to and during the project.

- Crew leader (name/title):
- Crew member (name/title):
- Crew member (name/title):
- Crew member (name/title):
- Crew member (name/title):
- Crew member (name/title):

Airborne Contaminants:
- Asbestos-containing (Transite) piping (ACP) - Do not disturb (move, drill, cut fracture, etc.)
- Asbestos-containing thermal insulation (ACI) and Asbestos-containing duct wrapping (ACW) - do not disturb, no attic or crawlspace access is allowed if work to be performed could cause exposure to personnel, client or public.

- If yes, list specific tasks and protection in place:

Weather and Environment
- The site supervisor shall forecast the weather conditions at the job site, prior to crew arrival, in order to mitigate any hazards associated with inclement weather (heat, cold, wind, rain, etc.)
- The site supervisor will utilized a portable wind meter (anemometer) to verify actual onsite wind conditions, by checking at the ground and on any elevated work surface (ex, rooftop) prior to work start, at midday and prior to solar panel staging on a roof.
- Elevated work involving the moving or maneuvering of solar panels shall cease at 25mph (sustained wind) until wind subsides.
- Forecasted weather maximum temp (degrees f):

Heat Related Illness Prevention
- Employees shall have access to potable drinking water that is fresh, pure, and suitably cool. The water shall be located as close as practicable to the areas where employees are working. Water shall be supplied in sufficient quantity at the beginning of the work shift to provide at least one quart per employee per hour for drinking for the entire shift. Employees may begin the shift with smaller quantities of water if they identify the location and have effective means for replenishment during the shift to allow employees to drink on quart or more per hour. The frequent drinking of water shall be encouraged.
- Shade shall be present when temperature exceeds 80 degrees Fahrenheit. When the outdoor temperature in the work exceeds 80 degrees Fahrenheit, employees shall have and maintain one or more areas with shade at all times.
- New employees must be acclimatized. New employees will be monitored by their Crew Leader (site supervisor) for the first two (2) weeks of employment or longer when necessary.
- Employees will be allowed and encouraged to implement scheduled breaks during each shift. Employees must take cool-down breaks in the shade any time they feel the need to do so to protect them from overheating. Supervisors are REQUIRED to allow employees any break period they need during high heat conditions.
- Cool Vests are encouraged for all employees at all times during periods of high heat.
- Identify the location of the closet Occupational/Industrial Clinic or Hospital in case a crew member becomes ill.

What is the specific plan to provide and replenish sufficient water for all employees on site?
- If offsite replenish is necessary, where will you go to replenish water (location/address):
- Who will replenish the drinking water (name):

Restroom facilities
- Employees shall have access to restroom facilities with hand-washing stations. Use of onsite restroom is at the client's discretion (location is annotated below). If client does not give permission, location of suitable restroom facilities with hand-washing stations offsite will be provided. The onsite supervisor will identify location and make arrangements to ensure all employees have access at any point.
- Restroom facilities will be (circle one): Onsite - Offsite
- If Offsite, add location name and address:

Incident Reporting Procedure
- Contact your Site Supervisor
  - Name:
  - Phone:
- Contact your Manager
  - Name:
  - Phone:
- Contact your Site Supervisor
  - Name:
  - Phone:

With: Your full name, phone number, office location, brief description of what happen and when.

NOTE ADDITIONAL HAZARDS NOT ADDRESSED ABOVE
(add as many as necessary by using additional sheets)

Define the Hazard:	Method/steps to prevent incident:
Define the Hazard:	Method/steps to prevent incident:
Define the Hazard:	Method/steps to prevent incident:
Define the Hazard:	Method/steps to prevent incident:

CLIENT:
TROY HARRIS
132 COOPER CREEK AVENUE, SPRING LAKE NC 28390
AHJ: HARNETT COUNTY (NC)
UTILITY: SOUTH RIVER EMC
METER: 14482581
PHONE: (407) 704-9388
EMAIL: TROYCHARRIS@HOTMAIL.COM
FINANCE: OTHER

SYSTEM:
SYSTEM SIZE (DC): 26 X 400 = 10.400 kW
SYSTEM SIZE (AC): 7.540 kW @ 240V
MODULES: 26 X FREEDOM FOREVER: FF-MP-BBB-400
MICROINVERTERS: 26 X ENPHASE IQ8PLUS-72-2-US

2

	REVISIONS	
NO.	REVISED BY	DATE
1	A.G.	6/19/2023
2	A.A.	9/15/2023
3	A.A.	9/20/2023

FREEDOM FOREVER LLC
415 INDUSTRIAL CT., GREER, SC 29651
Tel: (800) 385-1075

GREG ALBRIGHT

CONTRACTOR LICENSE:
ELECTRICAL CONTRACTOR U.34043

SAFETY PLAN

JOB NO:	DATE:	DESIGNED BY:	SHEET:
337821	9/20/2023	A.A.	PV-10

FOR INSTALLATION REFERENCE ONLY

SCAN QR CODE TO ACCESS REFERENCE LINK

FREEDOM REFERENCES

INSTALL HOTLINE

PV INSTALLATION REFERENCES

ENPHASE IQ8

SOLAREDGE HD WAVE

TESLA INVERTER

BATTERY INSTALLATION REFERENCES

TESLA POWERWALL 2

SHIFT/SELF CONSUMPTION

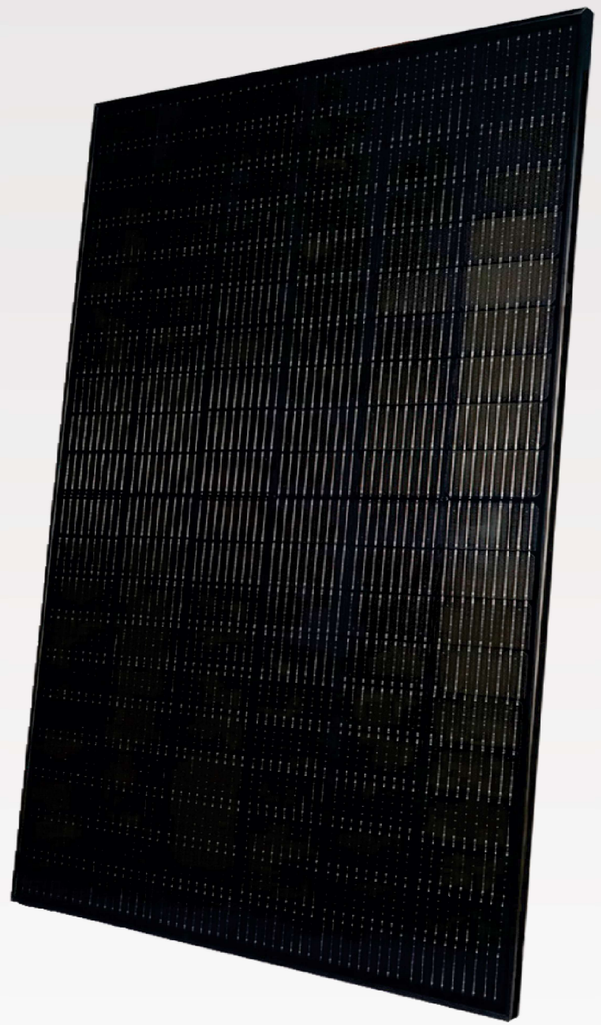
SOLAREDGE ENERGY BANK

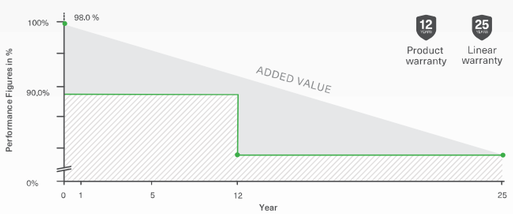
SOLAREDGE LG RESU (BACKUP)

TESLA POWERWALL+ (BACKUP)

V1.2

400W MODULE





MODULE SPECIFICATIONS

ELECTRICAL CHARACTERISTICS

Characteristics	FF-MP-BBB-400
Maximum Power (Pmax)	400W
Maximum Power Voltage (Vmp)	31.01V
Maximum Power Current (Imp)[A]	12.90A
Open Circuit Voltage (Voc)[V]	37.04V
Short Circuit Current (Isc)[A]	13.79A
Module Efficiency	20.48%
Power Tolerance	0/+5W
STC	Irradiance of 1000W/m², AM1.5, Cell Temperature 25°C

MECHANICAL CHARACTERISTICS

Cell Type	Mono perc, 182 mm-half cells, 108 (6x9+6x9)
Weight	22.1 kgs (48.7 lbs)
Dimension	1722 x 1134 x 35 mm (67.80 x 44.65 x 1.38 in)
Front Glass	3.2 mm (.13 in)
Junction Box	IP68 (3 Bypass Diodes)
Output Cables	1200 mm (47.24 in)
Connector	Staubli MC4
Frame & Installation	Anodized aluminum profile

OPERATIONS CHARACTERISTICS

Operational Temperature	-40°C~+85°
Max System Voltage	1500V
Max Series Fuse Rating	25A
Safety Class	Class II
Fire Rating	Type 1

MECHANICAL LOADING

Snow Load	5,400Pa (113lb/ft2)
Rear Side Design Load	2,400Pa (50lb/ft2)

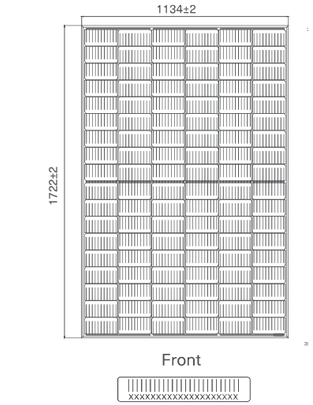
PACKAGING INFORMATION

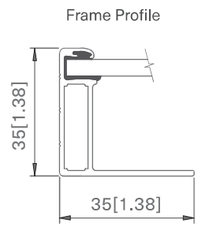
Container	20' GP	40' HC
Pallets per Container	6	26
Panels per Container	186	806
Panels per Pallet	31	31
Packaging Bon Weight	679 kg (1497 lbs)	
Panels per Pallet	1785 x 1130 x 1180 mm (70.28 x 44.49 x 46.46 in)	

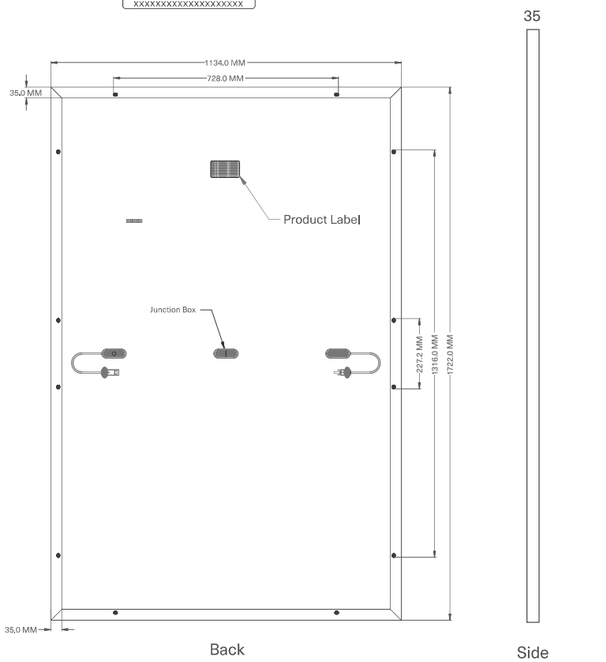
TEMPERATURE RATINGS

Temperature Coefficient of P_{max}	-0.350%/°C
Temperature Coefficient of V_{oc}	-0.275%/°C
Temperature Coefficient of I_{sc}	+0.045%/°C
Nominal Operating cell Temperature (NOCT)	42°C±2°C

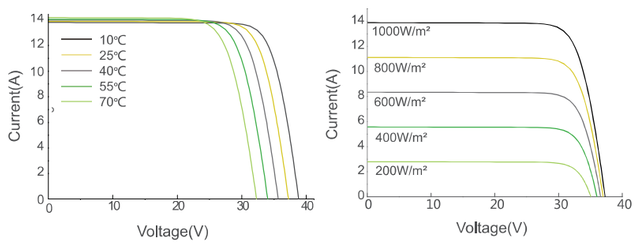
UL 61730 | UL 61215 | ISO 9001 | ISO 14001







CURRENT-VOLTAGE CURVE



CERTIFICATE
OF COMPLIANCE

intertek
Total Quality. Assured.

This certificate confirms the model(s) for the product listed are in compliance and authorized to bear the Certification Mark(s) shown below when made in accordance with the conditions set forth in the Certification Agreement and Listing Report. This document is for use with the Design Light Consortium or California Energy Commission application only.

Basic Listee:	PT IDN SOLAR TECH	**Multiple Listee:**	Freedom Forever Procurement LLC
Address:	KOMPLEK KABIL INDONUSA ESTATE, BLOK A NOMOR 19B, BATU BESAR, Batam	**Address:**	43445 Business Park Drive, Suite 110, Temecula, CA 92590
Country:	Indonesia	**Country:**	USA

Party Authorized to Apply Label: PT IDN SOLAR TECH
Report Issuing Office: Intertek Testing Services Shanghai Limited

Control Number: 5019087 **Authorized by:** Jordan Holbert
for L. Matthew Snyder, Certification Manager

VALID LISTING MARKS

C ETL US LISTED Intertek

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

Standard(s):	Photovoltaic (PV) Module Safety Qualification - Part 1: Requirements for Construction [UL 61730-1:2017 Ed.1+R:30Apr2020] Photovoltaic (PV) Module Safety Qualification - Part 1: Requirements for Construction [CSA C22.2#61730-1:2019 Ed.2] Photovoltaic (PV) Module Safety Qualification - Part 2: Requirements for Testing [UL 61730-2:2017 Ed.1+R:30Apr2020]

CERTIFICATE
OF COMPLIANCE

intertek
Total Quality. Assured.

	Photovoltaic (PV) Module Safety Qualification - Part 2: Requirements for Testing [CSA C22.2#61730-2:2019 Ed.2] Terrestrial Photovoltaic (Pv) Modules - Design Qualification And Type Approval - Part 1: Test Requirements [UL 61215-1:2017 Ed.1] Terrestrial Photovoltaic (PV) Modules - Design Qualification And Type Approval - Part 1-1: Special Requirements For Testing of Crystalline Silicon Photovoltaic (PV) Modules [UL 61215-1-1:2017 Ed.1] Terrestrial Photovoltaic (Pv) Modules - Design Qualification And Type Approval - Part 2: Test Procedures[UL 61215-2:2017 Ed.1]
Product:	Crystalline Silicon Photovoltaic (PV) Modules
Brand Name:	Freedom Forever
Models:	MULTIPLE LISTEE 12 MODELS: FF-MP-BBB- followed by 365, 370, 375 or 380. FF-MP-BBB- followed by 395, 400, 405 or 410. BASIC LISTEE MODELS: NUSA120H- followed by 365, 370, 375 or 380; followed by MB. NUSA108H- followed by 395, 400, 405 or 410; followed by MB.

ENPHASE

DATA SHEET

IQ8 and IQ8+ Microinverters

Our newest IQ8 Microinverters are the industry's first microgrid-forming, software defined microinverters with split-phase power conversion capability to convert DC power to AC power efficiently. The brain of the semiconductor-based microinverter is our proprietary application specific integrated circuit (ASIC) which enables the microinverter to operate in grid-tied or off-grid modes. This chip is built 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.

UL 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.

Easy to install

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

High productivity and reliability

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

Microgrid-forming

- Complies with the latest advanced grid support**
- Remote automatic updates for the latest grid requirements
- Configurable to support a wide range of grid profiles
- Meets CA Rule 21 (UL 1741-SA) and IEEE 1547:2018 (UL 1741-SB 3rd Ed.)

Note:

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

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

IQ8 and IQ8+ Microinverters

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

OUTPUT DATA (AC)		IQ8-60-2-US	IQ8PLUS-72-2-US
Peak output power	VA	245	300
Max. continuous output power	VA	240	290
Nominal (L-L) voltage / range[2]	V	240 / 211 – 264	
Max. continuous output current	A	1.0	1.21
Nominal frequency	Hz	60	
Extended frequency range	Hz	47 – 68	
AC short circuit fault current over 3 cycles	Arms	2	
Max. units per 20 A (L-L) branch circuit[3]		16	13
Total harmonic distortion		<5%	
Overvoltage class AC port		III	
AC port backfeed current	mA	30	
Power factor setting		1.0	
Grid-tied power factor (adjustable)		0.85 leading – 0.85 lagging	
Peak efficiency	%	97.7	
CEC weighted efficiency	%	97	
Night-time power consumption	mW	60	

MECHANICAL DATA	
Ambient temperature range	-40°C to +60°C (-40°F to +140°F)
Relative humidity range	4% to 100% (condensing)
DC Connector type	MC4
Dimensions (H x W x D)	212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")
Weight	1.08 kg (2.38 lbs)
Cooling	Natural convection – no fans
Approved for wet locations	Yes
Pollution degree	PD3
Enclosure	Class II double-insulated, corrosion resistant polymeric enclosure
Environ. category / UV exposure rating	NEMA Type 6 / outdoor

COMPLIANCE	
Certifications	CA Rule 21 (UL 1741-SA), UL 62109-1, IEEE 1547:2018 (UL 1741-SB 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.

IQ8SP-12A-DS-0067-03-EN-US-2022-12-27

Eaton DG222URB

Catalog Number: DG222URB

Eaton General duty non-fusible safety switch, single-throw, 60 A, NEMA 3R, Rainproof, Painted galvanized steel, Two-pole, Two-wire, 240 V

General specifications

Product Name
Eaton general duty non-fusible safety switch

Catalog Number
DG222URB

UPC
782113144238

Product Length/Depth
7.38 in

Product Height
14.38 in

Product Width
8.69 in

Product Weight
9 lb

Warranty
Eaton Selling Policy 25-000, one (1) year from the date of installation of the Product or eighteen (18) months from the date of shipment of the Product, whichever occurs first.

Certifications
UL Listed

Catalog Notes
WARNING! Switch is not approved for service entrance unless a neutral kit is installed.

Product specifications

Product Category
General duty safety switch

Enclosure material
Painted galvanized steel

Type
Non-fusible, single-throw

Fuse configuration
Non-fusible

Number of wires
2

Enclosure
NEMA 3R

Voltage rating
240V

Amperage Rating
60A

Number Of Poles
Two-pole

Resources

Catalogs
Eaton's Volume 2—Commercial Distribution

Multimedia
Double Up on Safety

Switching Devices Flex Center

Specifications and datasheets
Eaton Specification Sheet - DG222URB

Warranty guides
Selling Policy 25-000 - Distribution and Control Products and Services

Eaton Corporation plc
Eaton House
30 Pembroke Road
Dublin 4, Ireland
Eaton.com

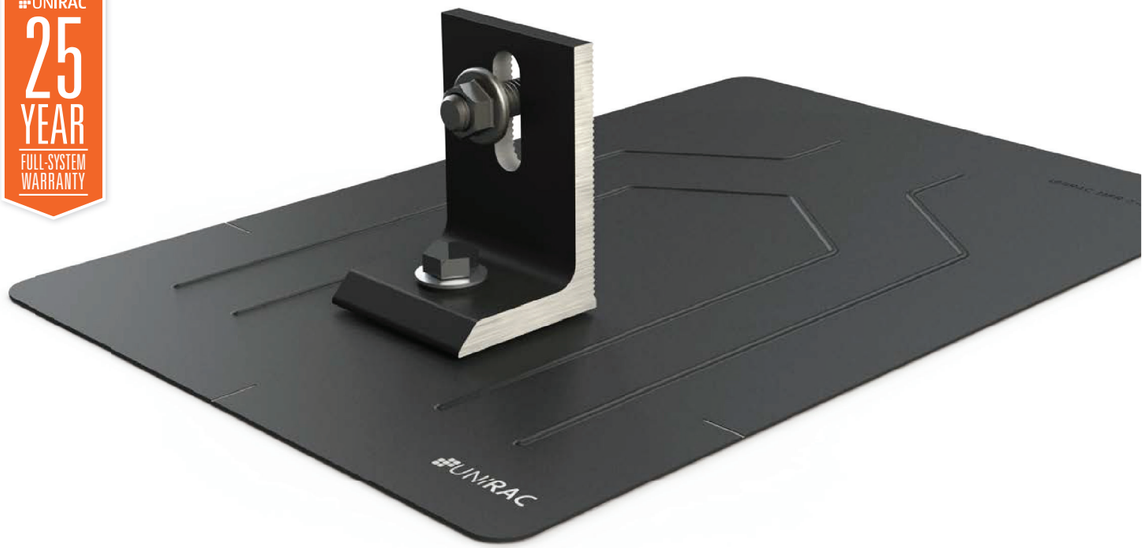
Eaton.com/socialmedia

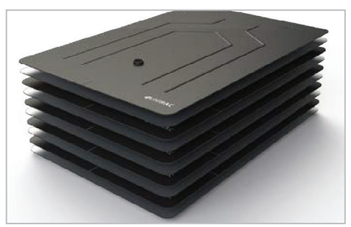
FLASHKIT PRO

UNIRAC®
FEATURING SHED & SEAL TECHNOLOGY

FLASHKIT PRO is the complete attachment solution for composition shingle roofs. Featuring Unirac's patented **SHED & SEAL** technology, a weather proof system which provides the ultimate protection against roof leaks. Kitted in 10 packs for maximum convenience, flashings and hardware are available in Mill or Dark finishes. With **FLASH**KIT pro, you have everything you need for a quick, professional installation.

UNIRAC 25 YEAR FULL-SYSTEM WARRANTY





TRUSTED WATER SEAL FLASHINGS
FEATURING SHED & SEAL TECHNOLOGY

YOUR COMPLETE SOLUTION
Flashings, lags, continuous slot L-Feet and hardware

CONVENIENT 10 PACKS
Packaged for speed and ease of handling

THE COMPLETE ROOF ATTACHMENT SOLUTION

FOR QUESTIONS OR CUSTOMER SERVICE VISIT UNIRAC.COM OR CALL (505) 248-2702

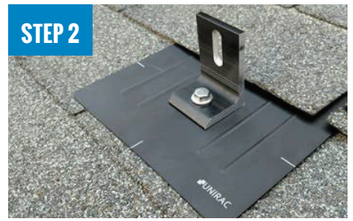
FLASHKIT PRO

INSTALLATION GUIDE

UNIRAC®
FEATURING SHED & SEAL TECHNOLOGY

FLASHKIT PRO IS THE COMPLETE FLASHING AND ATTACHMENT SOLUTION FOR COMPOSITION ROOFS.

INSTALL **FLASH**KIT PRO FLASHING



INSTALL L-FOOT

ATTACH L-FOOT TO RAIL

PRE-INSTALL

- Locate roof rafters and snap chalk lines to mark the installation point for each roof attachment.
- Drill a 7/32" pilot hole at each roof attachment. Fill each pilot hole with sealant.

STEP 1 INSTALL **FLASH**KIT PRO FLASHING

- Add a U-shaped bead of roof sealant to the underside of the flashing with the open side of the U pointing down the roof slope. Slide the aluminum flashing underneath the row of shingles directly up slope from the pilot hole as shown. Align the indicator marks on the lower end of the flashing with the chalk lines on the roof to center the raised hole in the flashing over the pilot hole in the roof. When installed correctly, the flashing will extend under the two courses of shingles above the pilot hole.

STEP 2 INSTALL L-FOOT

- Fasten L-foot and Flashing into place by passing the included lag bolt and pre-installed stainless steel-backed EPDM washer through the L-foot EPDM grommet, and the raised hole in the flashing, into the pilot hole in the roof rafter.
- Drive the lag bolt down until the L-foot is held firmly in place. It is normal for the EPDM on the underside of the stainless steel backed EPDM washer to compress and expand beyond the outside edge of the steel washer when the proper torque is applied.

TIP:

- Use caution to avoid over-torqueing the lag bolt if using an impact driver.
- Repeat Steps 1 and 2 at each roof attachment point.

STEP 3 ATTACH L-FOOT TO RAIL

- Insert the included 3/8"-16 T-bolts into the lower slot on the Rail (sold separately), spacing the bolts to match the spacing between the roof attachments.
- Position the Rail against the L-Foot and insert the threaded end of the T-Bolt through the continuous slot in the L-Foot. Apply anti-seize to bolt threads to prevent galling of the T-bolt and included 3/8" serrated flange nut. Place the 3/8" flange nut on the T-bolt and finger tighten. Repeat STEP 3 until all L-Feet are secured to the Rail with a T-bolt. Adjust the level and height of the Rail and torque each bolt to 30ft-lbs.

FASTER INSTALLATION. 25-YEAR WARRANTY.

FOR QUESTIONS OR CUSTOMER SERVICE VISIT UNIRAC.COM OR CALL (505) 248-2702

SOLARMOUNT

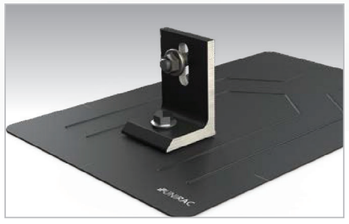
UNIRAC

SOLARMOUNT is the professionals' choice for residential PV mounting applications. Every aspect of the system is designed for an easier, faster installation experience. **SOLAR**MOUNT is a complete solution with revolutionary universal clamps, **FLASHKIT** PRO, full system UL 2703 certification and 25-year warranty. Not only is **SOLAR**MOUNT easy to install, but best-in-class aesthetics make it the most attractive on any block!

New & Improved:

THE PROFESSIONALS' CHOICE

With Superior Aesthetics



NOW FEATURING FLASHKIT PRO

The Complete Roof Attachment Solution

FEATURING SHED & SEAL TECHNOLOGY

NOW WITH UNIVERSAL MIDCLAMPS

Accommodates 30mm-51mm module frames
One tool, one-person installs are here!

REVOLUTIONARY NEW ENDCLAMPS

Concealed design and included End Caps

THE PROFESSIONALS' CHOICE FOR RESIDENTIAL RACKING

BEST INSTALLATION EXPERIENCE • CURB APPEAL • COMPLETE SOLUTION • UNIRAC SUPPORT

FOR QUESTIONS OR CUSTOMER SERVICE VISIT UNIRAC.COM OR CALL (505) 248-2702

SOLARMOUNT

UNIRAC

BETTER DESIGNS

TRUST THE INDUSTRY'S BEST DESIGN TOOL

Start the design process for every project in our U-Builder on-line design tool. It's a great way to save time and money.

BETTER SYSTEMS

ONE SYSTEM - MANY APPLICATIONS

Quickly set modules flush to the roof on steep pitched roofs. Orient a large variety of modules in Portrait or Landscape. Tilt the system up on flat or low slow roofs. Components available in mill, clear, and dark finishes to optimize your design financials and aesthetics.

BETTER RESULTS

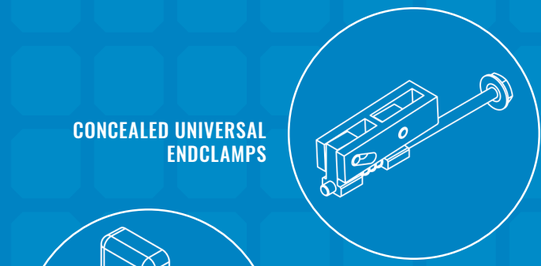
MAXIMIZE PROFITABILITY ON EVERY JOB

Trust Unirac to help you minimize both system and labor costs from the time the job is quoted to the time your teams get off the roof. Faster installs. Less Waste. More Profits.

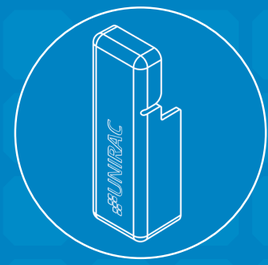
BETTER SUPPORT

WORK WITH THE INDUSTRIES MOST EXPERIENCED TEAM

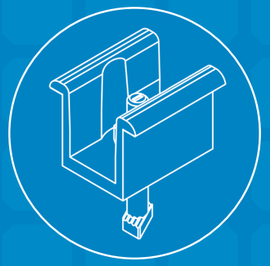
Professional support for professional installers and designers. You have access to our technical support and training groups. Whatever your support needs, we've got you covered. Visit Unirac.com/solarmount for more information.



CONCEALED UNIVERSAL ENDCLAMPS



END CAPS INCLUDED WITH EVERY ENDCLAMP



UNIVERSAL SELF STANDING MIDCLAMPS

U-BUILDER ONLINE DESIGN TOOL SAVES TIME & MONEY

Visit design.unirac.com

LISTED **UL2703**

BONDING & GROUNDING
MECHANICAL LOADING
SYSTEM FIRE CLASSIFICATION

UNIRAC CUSTOMER SERVICE MEANS THE HIGHEST LEVEL OF PRODUCT SUPPORT

UNMATCHED EXPERIENCE | CERTIFIED QUALITY | ENGINEERING EXCELLENCE | BANKABLE WARRANTY | DESIGN TOOLS | PERMIT DOCUMENTATION

TECHNICAL SUPPORT

Unirac's technical support team is dedicated to answering questions & addressing issues in real time. An online library of documents including engineering reports, stamped letters and technical data sheets greatly simplifies your permitting and project planning process.

CERTIFIED QUALITY PROVIDER

Unirac is the only PV mounting vendor with ISO certifications for 9001:2008, 14001:2004 and OHSAS 18001:2007, which means we deliver the highest standards for fit, form, and function. These certifications demonstrate our excellence and commitment to first class business practices.

BANKABLE WARRANTY

Don't leave your project to chance. Unirac has the financial strength to back our products and reduce your risk. Have peace of mind knowing you are providing products of exceptional quality. SOLARMOUNT is covered by a 25 year limited product warranty and a 5 year limited finish warranty.

ENHANCE YOUR REPUTATION WITH QUALITY RACKING SOLUTIONS BACKED BY ENGINEERING EXCELLENCE AND A SUPERIOR SUPPLY CHAIN

PUB2018AUG31 - PRINTED UPDATE

FOR QUESTIONS OR CUSTOMER SERVICE VISIT UNIRAC.COM OR CALL (505) 248-2702

Certificate of Compliance

Certificate: 70131735 **Master Contract:** 266909

Project: 80082031 **Date Issued:** 2021-06-02

Issued To: **Unirac**
1411 Broadway NE
Albuquerque, New Mexico, 87102
United States

Attention: Klaus Nicolaedis

The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US or with adjacent indicator 'US' for US only or without either indicator for Canada only.

Issued by: Michael Hoffnagle
Michael Hoffnagle

C US

PRODUCTS

CLASS - C531302 - POWER SUPPLIES - PHOTOVOLTAICS-PV Racking and clamping systems
CLASS - C531382 - POWER SUPPLIES - PHOTOVOLTAICS-PV Racking and clamping systems - Certified to US Standards

Models:	SM	-	SOLARMOUNT Flush-to-Roof is an extruded aluminum rail PV racking system that is installed parallel to the roof in landscape or portrait orientations.
	ULA	-	Unirac Large Array is a ground mount system using the SolarMount (SM) platform for the bonding and grounding of PV modules.

Solarmount

The system listed is designed to provide bonding/grounding, and mechanical stability for photovoltaic modules. The system is secured to the roof with the L-Foot components through the roofing material to building structure. Modules are secured to the racking system with stainless steel or aluminum mid clamps and Aluminum end clamps. The modules are bonded to the racking system with the stainless-steel bonding mid clamps with piercing points. The system is grounded with 10 AWG copper wire to bonding/grounding lugs. Fire ratings of Class A with Type 1, 2, 3, 10, 19, 22 or 25 for steep slope. Tested at 5" interstitial gap which allows installation at any stand-off height.

The grounding of the system is intended to comply with the latest edition of the National Electrical Code, to include NEC 250 & 690. Local codes compliance is required, in addition to national codes. All grounding/bonding connections are to be torqued in accordance with the Installation Manual and the settings used during the certification testing for the current edition of the project report.

The system may employ optimizers/micro-inverters and used for grounding when installed per installation instructions.

UL 2703 Mechanical Load ratings:

Downward Design Load (lb/ft²)	113.5
Upward Design Load (lb/ft²)	50.7
Down-Slope Load (lb/ft²)	16.13

Test Loads:

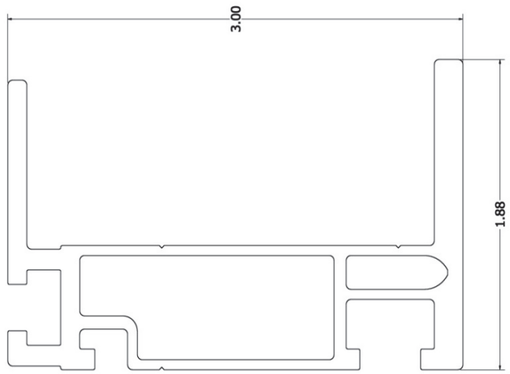
Downward Load (lb/ft²)	170.20
Upward Load (lb/ft²)	76.07
Down-Slope Load (lb/ft²)	24.2

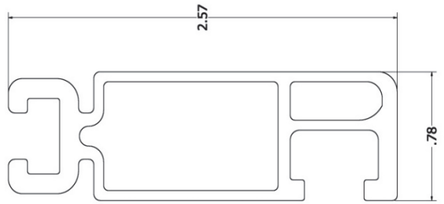
Unirac Large Array

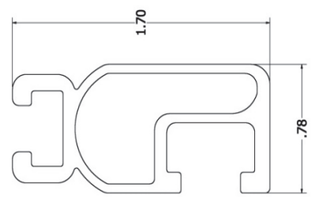
ULA is a ground mount system using the SolarMount (SM) platform for the bonding and grounding of PV modules. ULA aluminum components merge with SM rails and installer-supplied steel pipe. The SM rail system is secured to the horizontal Pipe using the Rail Bracket components. The Rear and Front cap secures the horizontal Pipe to the vertical Pipe. The Front cap is also used to secure the Cross brace. A Slider is attached to the vertical Pipe to secure the Cross brace. The SM rails, caps, slider, rail brackets, and cross braces materials are 6105-T5 aluminum extrusion. Fasteners materials are 304 stainless steel. Horizontal and vertical pipe materials meet the minimum requirements of ASTM A53 for galvanized steel pipe in 2" and 3" diameter.

The mechanical load ratings from the SM test data will be applied to the ULA model.

Fire Testing is not applicable due to being a ground mount system.







PAGE H3

Properties	SOLARMOUNT Light	SOLARMOUNT Rail Profile 2	SOLARMOUNT HD	Units
BEAM HEIGHT	1.70	2.57	3.00	in
APPROX WEIGHT	0.491	0.728	1.271	plf
CROSS SECTION AREA	0.409	0.625	1.059	in^2
SECTION MODULUS (X-AXIS)	0.15	0.363	0.898	in^3
SECTION MODULUS (Y-AXIS)	0.067	0.113	0.221	in^3
MOMENT OF INERTIA (X-AXIS)	0.13	0.467	1.45	in^4
MOMENT OF INERTIA (Y-AXIS)	0.026	0.045	0.267	in^4
RADIUS OF GYRATION (X-AXIS)	0.564	0.865	1.17	in
RADIUS OF GYRATION (Y-AXIS)	0.254	0.269	0.502	in

SM SOLAR MOUNT

TÜV Rheinland PTL

Certificate

Certificate no. US 82160015 01

License Holder:
Unirac Inc.
1411 Broadway NE
Albuquerque NM 87102
USA

Manufacturing Plant:
Unirac Inc.
1411 Broadway NE
Albuquerque NM 87102
USA

Test report no.: USA- 31440029 005
Tested to: UL 2703:2015

Client Reference: Tom Young

Certified Product: Module Rack Mounting System — **License Fee - Units**

Model Designation: SolarMount (SM) — 7

Max System Voltage of PV Module: 1000 VDC
Max Size of PV Module: 20.8 sq.ft. surface area
Max Overcurrent Protection Rating of PV Module:
30 A when using the qualified grounding lugs;
20 A when using the Enphase micro inverter EGC.

Fire Rating: Class A when installed with
Type 1, Type 2, Type3, or Type 10 fire rated modules.

(continued)

7

Appendix: 1,1-5

Licensed Test mark:

TÜVRheinland US

Date of Issue (day/mo/yr)
27/07/2016

March 28, 2022

Unirac
1411 Broadway Blvd. NE
Albuquerque, NM 87102

Attn.: Unirac - Engineering Department

Re: Engineering Certification for the Unirac U-Builder 2.0 SOLARMOUNT Flush Rail

PZSE, Inc. - Structural Engineers has reviewed the Unirac SOLARMOUNT rails, proprietary mounting system constructed from modular parts which is intended for rooftop installation of solar photovoltaic (PV) panels; and has reviewed the U-builder Online tool. This U-Builder software includes analysis for the SOLARMOUNT LIGHT rail, SOLARMOUNT STANDARD rail, and SOLARMOUNT HEAVY DUTY rail with Standard and Pro Series hardware. All information, data and analysis contained within are based on, and comply with the following codes and typical specifications:

1. Minimum Design Loads for Buildings and other Structures, ASCE/SEI 7-05 and ASCE/SEI 7-10
2. 2006-2015 International Building Code, by International Code Council, Inc.
3. 2006-2015 International Residential Code, by International Code Council, Inc.
4. AC428, Acceptance Criteria for Modular Framing Systems Used to Support Photovoltaic (PV) Panels, November 1, 2012 by ICC-ES.
5. 2015 Aluminum Design Manual, by The Aluminum Association, 2015

Following are typical specifications to meet the above code requirements:

Design Criteria: Ground Snow Load = 0 - 100 (psf)
Basic Wind Speed = 85 - 190 (mph)
Roof Mean Height = 0 - 60 (ft)
Roof Pitch = 0 - 45 (degrees)
Exposure Category = B, C & D

Attachment Spacing: Per U-builder Engineering report.

Cantilever: Maximum cantilever length is L/3, where "L" is the span noted in the U-Builder online tool.

Clearance: 2" to 10" clear from top of roof to top of PV panel.

Tolerance(s): 1.0" tolerance for any specified dimension in this report is allowed for installation.

Installation Orientation: See SOLARMOUNT Rail Flush Installation Guide.
Landscape - PV Panel long dimension is parallel to ridge/eave line of roof and the PV panel is mounted on the long side.
Portrait - PV Panel short dimension is parallel to ridge/eave line of roof and the PV panel is mounted on the short side.

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

Notes:
1) U-builder Online tool analysis is only for Unirac SM SOLARMOUNT Rail Flush systems only and do not include roof capacity check.
2) Risk Category II per ASCE 7-10.
3) Topographic factor, kzt is 1.0.
4) Average parapet height is 0.0 ft.
5) Wind speeds are LRFD values.
6) Attachment spacing(s) apply to a seismic design category E or less.

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

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

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

This certification excludes evaluation of the following components:

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

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

If you have any questions on the above, do not hesitate to call.

Prepared by:
PZSE, Inc. – Structural Engineers
Roseville, CA

DIGITALLY SIGNED
NORTH CAROLINA PROFESSIONAL SEAL 41973 EXP. 12/31/2022 ENGINEER PAUL K. ZACHER
03/28/2022