Princeton Engineering P. C.
Solar, Structural, Electrical and Site Engineering

Date: 08/22/2025

AHJ: HARNETT COUNTY

Re: PV Solar Post Installation Structural Certification
Solar Installer: Top Tier, 1530 Center Park Dr, Charlotte, NC, 28217
Customer Name: DONNA M JENKINS
Customer Address: 389DEWAR ST, FUQUAY-VARINA, NC, 27526
Permit Number: 420885
PE Project Number: 66.420885.C217AUGF152
PE Structural Report Date: 2025-08-06

To Code Enforcement Officials:

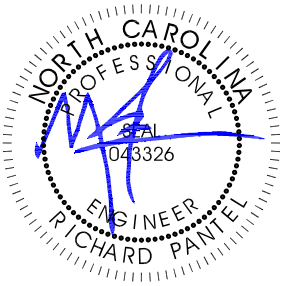
We prepared a structural assessment of the roof framing for the referenced PV solar panel installation, to determine the adequacy of the roof to support this system. The analysis used the maximum spacing of the PV support points and was based upon the wind and snow loadings indicated by the ASCE. The framing size and spacing was verified to match the size and spacing used in our analysis.

In summary, we analyzed the roof structure by combining the existing dead and live loads, along with the new PV solar panels and found the roof to be adequate to support this new PV solar system as indicated in our structural assessment report. On site personnel inspected the installation and found that the panel support locations and spacing generally conform to that used in preparation of the structural assessment report. No existing or new damage to any structural element was observed.

The PV equipment's structural installation has been inspected and will not create a negative impact on the building's structural design, and the installation is in compliance with the North Carolina Residential Code.

Regards,

Richard J. Pantel, P.E.
NC License No. 043326



08/22/2025

35091 Paxson Road - Round Hill, VA 20141
tel: 908.507.5500 - fax: 877.455.5641 - www.Princeton-Engineering.com

iRooFA™

Instant Roof Framing Analysis

www.iroofa.solar

tel: 540.313.5317 - email: info@iRooFA.solar

STRUCTURAL ANALYSIS

for the

ROOFTOP PV SOLAR INSTALLATION

Project: Donna M Jenkins, 389Dewar St, Fuquay-Varina, NC

Prepared for:

TOP TIER SOLAR SOLUTIONS

Top Tier

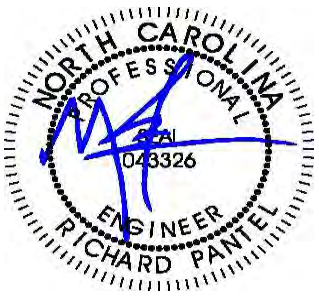
1530 Center Park Dr - Charlotte, NC 28217

Calculation Report Index

Project No: 66.420885, Rev. 0

Report Date: 08/07/2025

Report Prepared by:



Richard Pantel, P.E.

NC License No. 43326

Sealed 08/07/2025

Loading Summary

Exposure and Occupancy Categories		
C		*Exposure Category (ASCE 7-16 Table 26.7.3, Page 274)*
II		*Building Use Occupancy / Risk Category (ASCE 7-16 Table 1.5-1, Page 5)*

Wind Loading:			
v	116	*mph*	*ASCE 7-16, Figure 26.5-1 A, B or C, pp 249-251. [(116 mph, 50 year wind MRI)]*
qz	25.01	*psf*	*Velocity qz, calculated at height z [ASD]*

Snow Loading			
pg	15.00	*psf*	*Ground Snow Load pg (ASCE 7-16 Table 7.2-1, Page 56-60)*
Total Snow Load			
ps	15.00	*psf*	*Effective snow load on roof and modules*

Module Data			
JA Solar: JAM54S31-405/MR			
Dimensions	*mm*	*ft*	*in*
Length	1,722	5.65	67.80
Width	1,134	3.72	44.65
Area (m^2, ft^2)	2.0	21.02	
Weight	kg	lb	
Module	21.50	47.40	

Roof Panel (Cladding) Loading Summary		Module Loading Summary			
Support Point Loads		*Upward*	*Upward*	*Upward*	*Downward*
Roof Zones		1,2e,2r	2n,3r	3e	All
Net load per module	*lb*	-343	-437	-580	334

Positive values indicate net downward force

Primary Stanchion: IronRidge HALO ULTRAGRIP - (QM-HUG-01-B1)

StanchionFastener Pull-out and Spacing Calculations					
Framing spacing			*ft*	2.00	
Rails / Module			*ea*	2	
Max proposed stanchion span			*ft*	6.00	
# fasteners per stanchion				2	
Bolt thread embedment depth			*in*	1.75	
Safety Factor				1.10	
Pull-out for #14 threaded fasteners			*lb/in*	134	*lb per inch of embedment*
Factored max fastener uplift capacity			*lb*	425	
Fastener details	*Material*	Stainless	*Size*	#14	*Predrill hole 0.12" dia or use self tapping*
Max stanchion uplift capacity			*lb*	1100	
Max support point uplift capacity			*lb*	425	

Roof Zones			*1,2e,2r*	*2n,3r*	*3e*
Net lift per module		*lb*	343	437	580
Min tot bolt thread embedment depth rq'd		*in*	1.41	1.80	2.39
Net uplift pressure	7. 0.60D - 0.6W	*psf*	-8.69	-11.23	-15.04
Allowable lift area / support point		*sf*	48.88	37.84	28.24
Max rail span per support spacing		*ft*	6.00	6.00	6.00
Landscape Modules					
Length along rafter		*ft*	3.72		
Lift calc'ed max stanchion EW spacing		*ft*	> 6	> 6	> 6
Max stanchion EW spacing		*ft*	6.00	6.00	6.00
Maximum module area / support point		*sf*	11.16	11.16	11.16
Factored lift per support point		*lb*	-97	-125	-168
Portrait Modules					
Length along rafter		*ft*	5.65		
Lift calc'ed max stanchion EW spacing		*ft*	> 6	> 6	> 6
Max stanchion EW spacing		*ft*	6.00	6.00	6.00
Maximum module area / support point		*sf*	16.95	16.95	16.95
Factored lift per support point		*lb*	-147	-190	-255

Alternate Stanchion Fastener Pull-out and Spacing Calculations IronRidge HALO ULTRAGRIP - (QM-HUG-01-B1) - 6 screws					
Framing spacing			*ft*	2.00	
Rails / Module			*ea*	2	
Max proposed stanchion span			*ft*	6.00	
# fasteners per stanchion				6	
Bolt thread embedment depth			*in*	0.50	
Safety Factor				1.10	
Pull-out for 1/4 threaded fasteners			*lb/in*	134	
Factored max fastener uplift capacity			*lb*	364	
Fastener details	*Material*	Stainless	*Size*	1/4	*Predrill hole 0.12" dia or use self tapping*
Max stanchion uplift capacity			*lb*	1100	
Max support point uplift capacity			*lb*	364	

Roof Zones			*1,2e,2r*	*2n,3r*	*3e*
Net lift per module		*lb*	343	437	580
Min tot bolt thread embedment depth rq'd		*in*	0.47	0.60	0.80
Net uplift pressure	7. 0.60D - 0.6W	*psf*	-8.69	-11.23	-15.04
Allowable lift area / support point		*sf*	41.89	32.43	24.21
Max rail span per framing spacing		*ft*	6.00	6.00	6.00
Landscape Modules					
Length along rafter		*ft*	3.72		
Lift calc'ed max stanchion EW spacing		*ft*	> 6	> 6	> 6
Max stanchion EW spacing		*ft*	6.00	6.00	6.00

Maximum module area / support point	*sf*	11.16	11.16	11.16
Factored lift per support point	*lb*	-97	-125	-168
Portrait Modules				
Length along rafter	*ft*	5.65		
Lift calc'ed max stanchion EW spacing	*ft*	> 6	> 6	> 6
Max stanchion EW spacing	*ft*	6.00	6.00	6.00
Maximum module area / support point	*sf*	16.95	16.95	16.95
Factored lift per support point	*lb*	-147	-190	-255

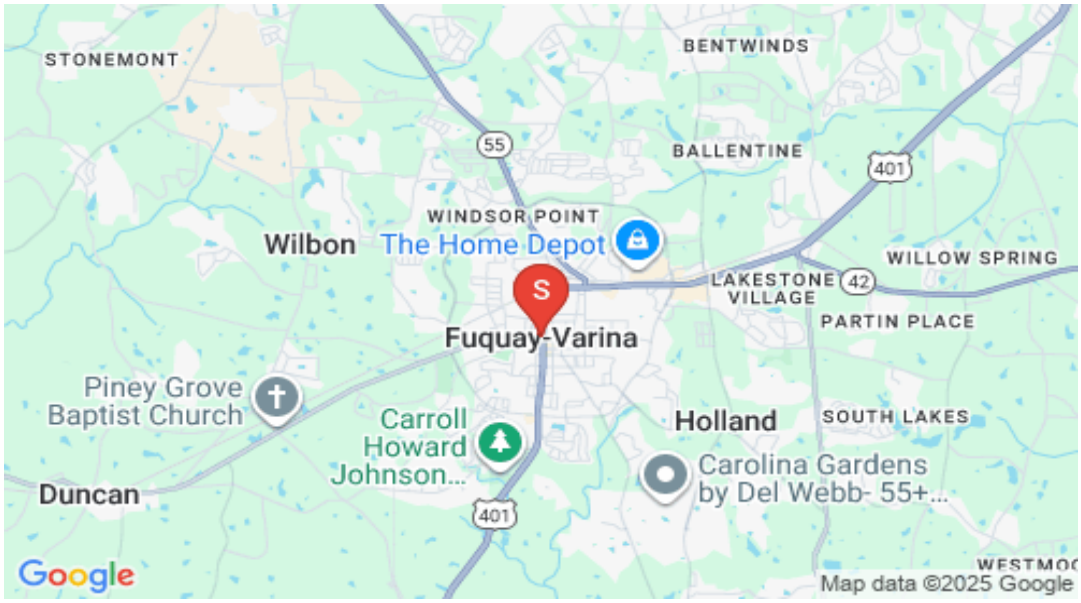
Stanchion support threaded fastener sizes are indicated in the Module Loading Summary table above. Lift forces were determined from GCp and other coefficients contained in the ASCE nomographs

Conclusions

We were asked to review the roof of Donna M Jenkins, located at 389Dewar St, Fuquay-Varina, NC, by Top Tier, to determine its suitability to support a PV solar system installation.

The referenced building's roof structure was field measured by Top Tier. The attached framing analyses reflect the results of those field measurements combined with the PV solar module locations shown on the PV solar roof layout design prepared by Top Tier. Loads are calculated to combine the existing building and environmental loads with the proposed new PV array loads.

The IronRidge XR10 Rail racking and IronRidge HALO ULTRAGRIP - (QM-HUG-01-B1) along with the alternate IronRidge HALO ULTRAGRIP - (QM-HUG-01-B1) - 6 screws stanchions were selected for this project by Top Tier. The racking and support stanchions shall be placed as shown on their plans, dated 08/06/2025, and shall be fastened to the roof framing using fastener sizes indicated in this report. Rack support spacing shall be no more than that shown above. Note that support points for alternating rows shall share the same truss. Intermediate rows shall move the support points laterally to the next truss.



Google Location Map

Framing Summary

	Ex. Framing	Total Ex DL
MP 1: Truss @ 24" OC	0.79 psf	5.94 psf
MP 2: Truss @ 24" OC	0.79 psf	5.94 psf
MP 3: Truss @ 24" OC	0.79 psf	5.94 psf

** Wood species used in these calculations assumes spruce, pine or fir, #2 grade.*

Based upon the attached calculations, the existing roofs' framing systems are capable of supporting the additional loading for the proposed PV solar system along with the existing building and environmental loads. No supplemental roof framing structural supports are required. No further structural alterations or modifications are needed to support the system. Minimum required anchorage fastening is described above.

Wood fastener notes: 1) Fastener threads must be embedded in the side grain of a roof support structural member or other structural member integrated into the building's structure. 2) Fastener must be located in the middle third of the structural member. 3) Install fasteners with head and where required, washer, flush to material surface (no gap). Do not over-torque.

References and Codes:

1) *ASCE 7-16 Minimum Design Loads for Buildings and Other Structures*
2) *2018 IBC*
3) *2018 NC Building Code*
4) *American Wood Council, NDS 2018,Table 12.2A, 12.3.3A.*
5) *American Wood Council, Wood Structural Design, 1992, Figure 6.*

Roof Structural Calculations for PV Solar Installation **Array AR-1**
Location: MP 1 ***Roof shape: Gable***
Member: Truss - Total Length 15 ft, Unsupported 15 ft

Geometric Data			
Θ	*deg.*	30.0	*Angle of roof plane from horizontal, in degrees*
ω	*deg.*	0.0	*Angle the solar panel makes with the roof surface*
L	*ft.*	15.92	*Length of roof plane, in feet (meters)*
W	*ft.*	13.83	*Plan view width of roof plane, in feet (meters)*
h	*ft.*	14.23	*Average height of roof above grade, in feet (meters)*

Roof Wind Zone Width			
	use, a =	3.00	*ft*

Wind Velocity Pressure, q_z evaluated at the height z						
q_z=	25.01	*psf*	*Vasd* q_z=	15.32	*psf*	Basic wind pressure
V=	116	mph				

Framing Data		
Wood type	US Spruce	
Wood source, moisture content	White 0.12%	
# Framing Members / Support		1
Rafter / Truss OC	*in*	24.00
Member Total Length	*ft*	15.00

3	# Rafters / Rack Support Width
6.00	Rack Support Spacing (ft)
72.00	Max. Rack Support Spacing (in)
2	Max # of mod's / Truss top chord

Member Properties		**Member**
Name		(1) 2x4
Repetitive Member Factor (Cr)		1.15

** Mem properties based upon field measurements*

Truss top chord

Module Data			
Weight	kg	lb	psf load
Module	21.50	47.40	2.26
4 Stanchions	0.91	2.0	0.10

Existing Dead Loads	*Units*	*Value*	*Description*
Roof Deck & Surface Material*	*psf*	5.15	*Truss members' self weight added to FEA analysis*

** Roof surface: Shingles, Asphalt, Architectural (Typical)*

Rack Support Spacing and Loading				
Across rafters	*ft*	6.0		
Along rafter slope	*ft*	5.6		
Area / support point	*sf*	16.9		
Uphill gap between modules	*in*	1.0	0.08	*ft*

Member Total Length	*ft*	15.00	
Maximum member free span	*ft*	15.00	Truss top chord span

ASCE 7-16 **Method for Calculating Uplift on PV Modules**

Notation
Lp = Panel chord length.
p = uplift wind pressure
γa = Solar panel pressure equalization factor, defined in Fig. 29.4-8.
γE = Array edge factor as defined in Section 29.4.4.
θ = Angle of plane of roof from horizontal, in degrees.

29.4.4 Rooftop Solar Panels Parallel to the Roof Surface on Buildings of All Heights and Roof Slopes.

Θ >= 7 deg TRUE

Min.d1: Exposed	**FALSE**
Max.d1: Exposed	**TRUE**
1.5(Lp) =	5.58
γE =	1.5
γa =	0.67

Use EXPOSED for uplift calculations

$p = qh(GCp)(\gamma_E)(\gamma_a)$ (lb/ft2) (29.4-7)

Zones	1,2e,2r	2n,3r	3e
GCp	-1.48	-1.75	-2.16
p, Windload (psf)	-22.77	-27.00	-33.36

Downward, Zones All Zones
GCp 0.77

ASCE 7-16 Chapter 2 Combinations of Loads, Table 2.4, Page 8 (in psf)				
Zones	1,2e,2r	2n,3r	3e	All Zones
2.2 SYMBOLS AND NOTATION	*Module Upward*	*Module Upward*	*Module Upward*	*Downward*
D = dead load of PV Module + Stanchion	2.35	2.35	2.35	2.35
S = snow load	15.00	15.00	15.00	15.00
W = wind load = (Vu Windload) = (Vasd Windload / 0.6)	-22.77	-27.00	-33.36	11.81

2.4 Combining Nominal Loads Using Allowable Stress Design (in psf)				
2.4.1 Basic Combinations. Loads listed herein shall be considered to act in the following combinations; whichever produces the most unfavorable effect in the building, foundation, or structural member being considered. Effects of one or more loads not acting shall be considered.				
Combination Formulae	*Upward*	*Upward*	*Upward*	*Downward*
Use this loading combination for DOWNWARD for Proposed PV Dead Load				
6. D + 0.75L - 0.75(0.60W) + 0.75(Lr or S or R)	17.35	17.35	17.35	22.66
Module Support point load (lb)	294	294	294	384
Cr Factored Module Support point load (lb)	256	256	256	334

Use this loading combination for UPWARD for Proposed PV Dead Load				
7. 0.60D - 0.6W	-8.69	-11.23	-15.04	8.29
Module Support point load (lb)	-147	-190	-255	140

DOWNWARD

Presume loading directly over member.

Combined Dead and Wind Pressure Downward Loading					
	Truss top chord span				
PV Module Row	Point load loc's from Left support	Point Load #'s	Module Support Point Load	Comment	Module Orientation
	ft from left		*lb*		
1	2.17		334		Portrait
1	7.82			Support placed on adjoining truss	Portrait
2	7.90			Support placed on adjoining truss	Portrait
2	13.55		334		Portrait

Truss Data and Loading for MP 1

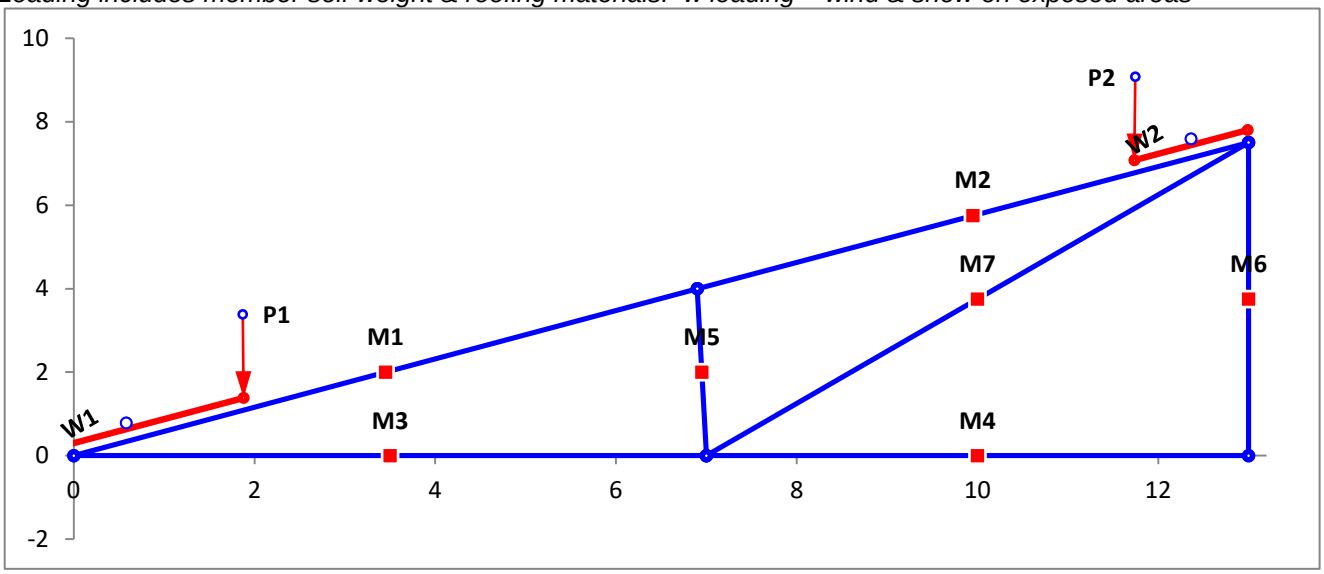
Roof slope (degrees)	30.00
Top ridge height above floor plane	7.50

	Length of roof plane	15.00
	Length of floor plane	13.00

Truss Segments

Roof Plane		*Floor Plane*		*Diagonals*		*Diagonals*	
Mem #	*Mem Type*	Mem #	*Mem Type*	Mem #	*Mem Type*	Mem #	*Mem Type*
1	2x4	3	2x4	5	2x4	7	2x4
2	2x4	4	2x4	6	2x4		

** Loading includes member self weight & roofing materials. w loading = wind & snow on exposed areas*



Geometric Data			
Θ	*deg.*	30.0	*Angle of roof plane from horizontal, in degrees*
ω	*deg.*	0.0	*Angle the solar panel makes with the roof surface*
L	*ft.*	32.50	*Length of roof plane, in feet (meters)*
W	*ft.*	19.08	*Plan view width of roof plane, in feet (meters)*
h	*ft.*	24.75	*Average height of roof above grade, in feet (meters)*

Roof Wind Zone Width			
	use, a =	3.00	*ft*

Wind Velocity Pressure, q_z evaluated at the height z						
q_z=	27.60	*psf*	*Vasd* q_z=	16.90	*psf*	Basic wind pressure
V=	116	mph				

Framing Data		
Wood type	US Spruce	
Wood source, moisture content	White 0.12%	
# Framing Members / Support		1
Rafter / Truss OC	*in*	24.00
Member Total Length	*ft*	21.00

3	# Rafters / Rack Support Width
6.00	Rack Support Spacing (ft)
72.00	Max. Rack Support Spacing (in)
3	Max # of mod's / Truss top chord

Member Properties		**Member**
Name		(1) 2x4
Repetitive Member Factor (Cr)		1.15

** Mem properties based upon field measurements*

Truss top chord

Module Data			
Weight	kg	lb	psf load
Module	21.50	47.40	2.26
4 Stanchions	0.91	2.0	0.10

Existing Dead Loads	*Units*	*Value*	*Description*
Roof Deck & Surface Material*	*psf*	5.15	*Truss members' self weight added to FEA analysis*

** Roof surface: Shingles, Asphalt, Architectural (Typical)*

Rack Support Spacing and Loading				
Across rafters	*ft*	6.0		
Along rafter slope	*ft*	5.6		
Area / support point	*sf*	16.9		
Uphill gap between modules	*in*	1.0	0.08	*ft*

Member Total Length	*ft*	21.00	
Maximum member free span	*ft*	21.00	Truss top chord span

ASCE 7-16 **Method for Calculating Uplift on PV Modules**

Notation
Lp = Panel chord length.
p = uplift wind pressure
γa = Solar panel pressure equalization factor, defined in Fig. 29.4-8.
γE = Array edge factor as defined in Section 29.4.4.
θ = Angle of plane of roof from horizontal, in degrees.

29.4.4 Rooftop Solar Panels Parallel to the Roof Surface on Buildings of All Heights and Roof Slopes.

Θ >= 7 deg TRUE

Min.d1: Exposed	**FALSE**
Max.d1: Exposed	**TRUE**
1.5(Lp) =	5.58
γE =	1.5
γa =	0.67

Use EXPOSED for uplift calculations

$p = qh(GCp)(\gamma_E)(\gamma_a)$ (lb/ft2) (29.4-7)

Zones	1,2e,2r	2n,3r	3e
GCp	-1.48	-1.75	-2.16
p, Windload (psf)	-25.13	-29.80	-36.81

Downward, Zones All Zones
GCp 0.77

ASCE 7-16 Chapter 2 Combinations of Loads, Table 2.4, Page 8 (in psf)				
Zones	1,2e,2r	2n,3r	3e	All Zones
2.2 SYMBOLS AND NOTATION	*Module Upward*	*Module Upward*	*Module Upward*	*Downward*
D = dead load of PV Module + Stanchion	2.35	2.35	2.35	2.35
S = snow load	15.00	15.00	15.00	15.00
W = wind load = (Vu Windload) = (Vasd Windload / 0.6)	-25.13	-29.80	-36.81	13.03

2.4 Combining Nominal Loads Using Allowable Stress Design (in psf)				
2.4.1 Basic Combinations. Loads listed herein shall be considered to act in the following combinations; whichever produces the most unfavorable effect in the building, foundation, or structural member being considered. Effects of one or more loads not acting shall be considered.				
Combination Formulae	*Upward*	*Upward*	*Upward*	*Downward*
Use this loading combination for DOWNWARD for Proposed PV Dead Load				
6. D + 0.75L - 0.75(0.60W) + 0.75(Lr or S or R)	17.35	17.35	17.35	23.21
Module Support point load (lb)	294	294	294	393
Cr Factored Module Support point load (lb)	256	256	256	342

Use this loading combination for UPWARD for Proposed PV Dead Load				
7. 0.60D - 0.6W	-10.11	-12.91	-17.12	8.29
Module Support point load (lb)	-171	-219	-290	140

DOWNWARD

Presume loading directly over member.

Combined Dead and Wind Pressure Downward Loading					
	Truss top chord span				
PV Module Row	Point load loc's from Left support	Point Load #'s	Module Support Point Load	Comment	Module Orientation
	ft from left		*lb*		
1	3.17		342		Portrait
1	8.82			Support placed on adjoining truss	Portrait
2	8.90			Support placed on adjoining truss	Portrait
2	14.55		342		Portrait
3	14.64		342		Portrait
3	20.29			Support placed on adjoining truss	Portrait

Truss Data and Loading for MP 2

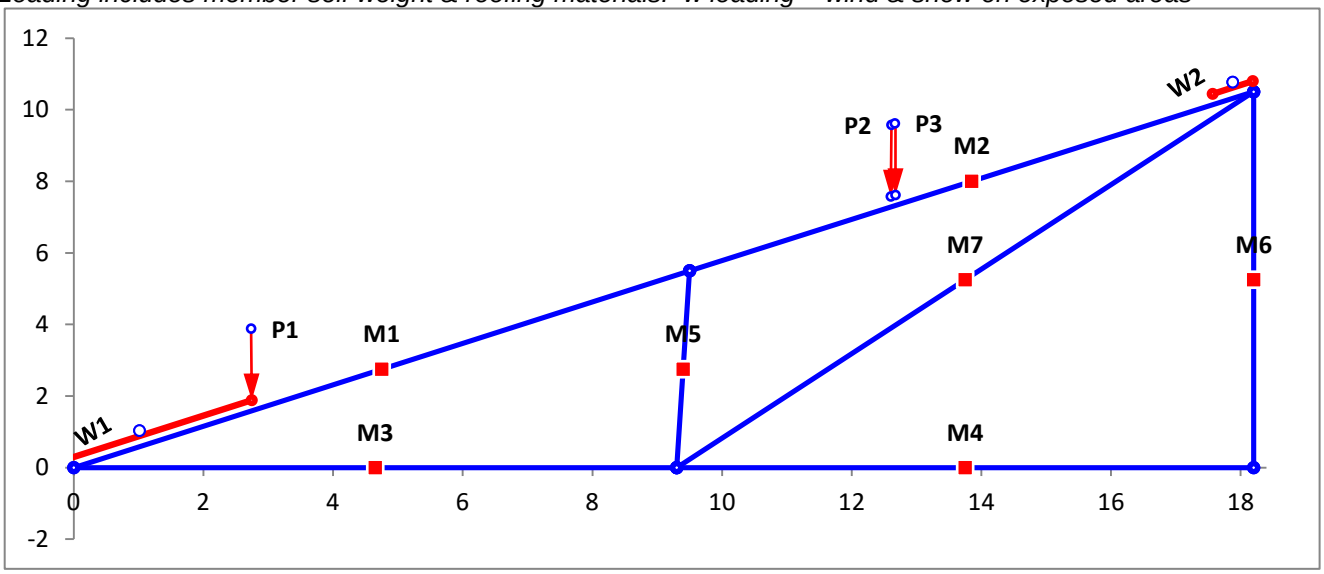
Roof slope (degrees)	30.00
Top ridge height above floor plane	10.50

	Length of roof plane	21.00
	Length of floor plane	18.25

Truss Segments

Roof Plane		*Floor Plane*		*Diagonals*		*Diagonals*	
Mem #	*Mem Type*	Mem #	*Mem Type*	Mem #	*Mem Type*	Mem #	*Mem Type*
1	2x4	3	2x4	5	2x4	7	2x4
2	2x4	4	2x4	6	2x4		

** Loading includes member self weight & roofing materials. w loading = wind & snow on exposed areas*



Geometric Data			
Θ	*deg.*	30.0	*Angle of roof plane from horizontal, in degrees*
ω	*deg.*	0.0	*Angle the solar panel makes with the roof surface*
L	*ft.*	12.92	*Length of roof plane, in feet (meters)*
W	*ft.*	19.08	*Plan view width of roof plane, in feet (meters)*
h	*ft.*	24.75	*Average height of roof above grade, in feet (meters)*

Roof Wind Zone Width			
	use, a =	3.00	*ft*

Wind Velocity Pressure, q_z evaluated at the height z						
q_z=	27.60	*psf*	*Vasd* q_z=	16.90	*psf*	Basic wind pressure
V=	116	mph				

Framing Data		
Wood type	US Spruce	
Wood source, moisture content	White 0.12%	
# Framing Members / Support		1
Rafter / Truss OC	*in*	24.00
Member Total Length	*ft*	21.00

3	# Rafters / Rack Support Width
6.00	Rack Support Spacing (ft)
72.00	Max. Rack Support Spacing (in)
3	Max # of mod's / Truss top chord

Member Properties		**Member**
Name		(1) 2x4
Repetitive Member Factor (Cr)		1.15

** Mem properties based upon field measurements*

Truss top chord

Module Data			
Weight	kg	lb	psf load
Module	21.50	47.40	2.26
4 Stanchions	0.91	2.0	0.10

Existing Dead Loads	*Units*	*Value*	*Description*
Roof Deck & Surface Material*	*psf*	5.15	*Truss members' self weight added to FEA analysis*

** Roof surface: Shingles, Asphalt, Architectural (Typical)*

Rack Support Spacing and Loading				
Across rafters	*ft*	6.0		
Along rafter slope	*ft*	5.6		
Area / support point	*sf*	16.9		
Uphill gap between modules	*in*	1.0	0.08	*ft*

Member Total Length	*ft*	21.00	
Maximum member free span	*ft*	21.00	Truss top chord span

ASCE 7-16 **Method for Calculating Uplift on PV Modules**

Notation
Lp = Panel chord length.
p = uplift wind pressure
γa = Solar panel pressure equalization factor, defined in Fig. 29.4-8.
γE = Array edge factor as defined in Section 29.4.4.
θ = Angle of plane of roof from horizontal, in degrees.

29.4.4 Rooftop Solar Panels Parallel to the Roof Surface on Buildings of All Heights and Roof Slopes.

Θ >= 7 deg TRUE

Min.d1: Exposed	**FALSE**
Max.d1: Exposed	**TRUE**
1.5(Lp) =	5.58
γE =	1.5
γa =	0.67

Use EXPOSED for uplift calculations

$p = qh(GCp)(\gamma_E)(\gamma_a)$ (lb/ft2) (29.4-7)

Zones	1,2e,2r	2n,3r	3e
GCp	-1.48	-1.75	-2.16
p, Windload (psf)	-25.13	-29.80	-36.81

Downward, Zones All Zones
GCp 0.77

ASCE 7-16 Chapter 2 Combinations of Loads, Table 2.4, Page 8 (in psf)				
Zones	1,2e,2r	2n,3r	3e	All Zones
2.2 SYMBOLS AND NOTATION	*Module Upward*	*Module Upward*	*Module Upward*	*Downward*
D = dead load of PV Module + Stanchion	2.35	2.35	2.35	2.35
S = snow load	15.00	15.00	15.00	15.00
W = wind load = (Vu Windload) = (Vasd Windload / 0.6)	-25.13	-29.80	-36.81	13.03

2.4 Combining Nominal Loads Using Allowable Stress Design (in psf)				
2.4.1 Basic Combinations. Loads listed herein shall be considered to act in the following combinations; whichever produces the most unfavorable effect in the building, foundation, or structural member being considered. Effects of one or more loads not acting shall be considered.				
Combination Formulae	*Upward*	*Upward*	*Upward*	*Downward*
Use this loading combination for DOWNWARD for Proposed PV Dead Load				
6. D + 0.75L - 0.75(0.60W) + 0.75(Lr or S or R)	17.35	17.35	17.35	23.21
Module Support point load (lb)	294	294	294	393
Cr Factored Module Support point load (lb)	256	256	256	342

Use this loading combination for UPWARD for Proposed PV Dead Load				
7. 0.60D - 0.6W	-10.11	-12.91	-17.12	8.29
Module Support point load (lb)	-171	-219	-290	140

DOWNWARD

Presume loading directly over member.

Combined Dead and Wind Pressure Downward Loading					
	Truss top chord span				
PV Module Row	Point load loc's from Left support	Point Load #'s	Module Support Point Load	Comment	Module Orientation
	ft from left		*lb*		
1	3.17		342		Portrait
1	8.82			Support placed on adjoining truss	Portrait
2	8.90			Support placed on adjoining truss	Portrait
2	14.55		342		Portrait
3	14.64		342		Portrait
3	20.29			Support placed on adjoining truss	Portrait

Truss Data and Loading for MP 3

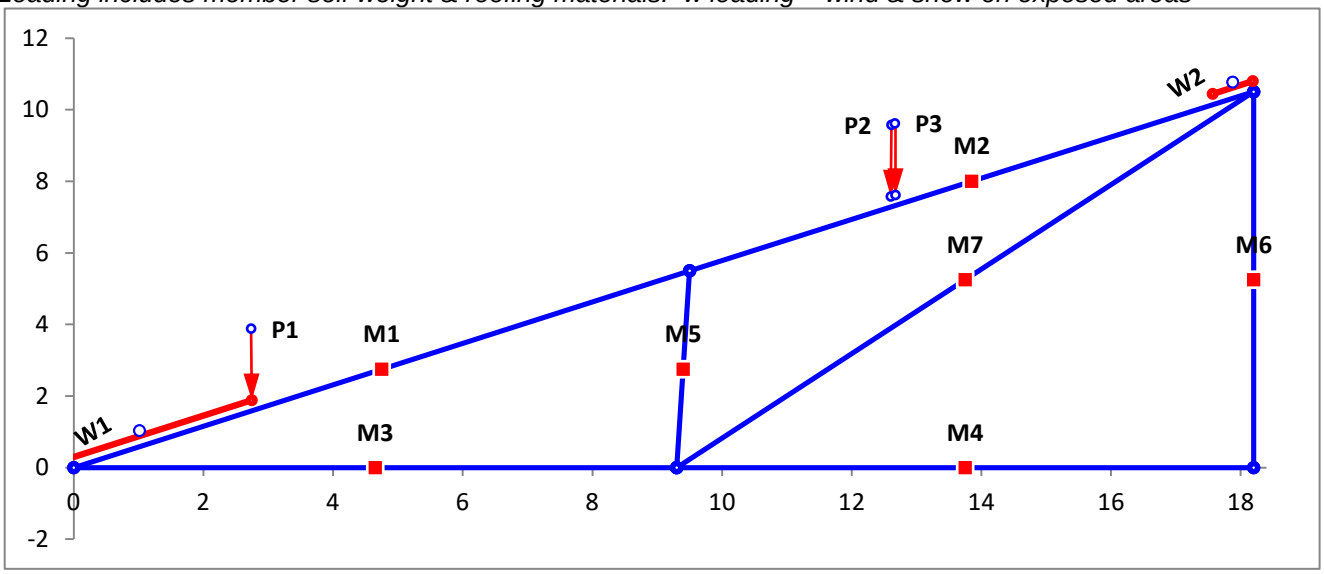
Roof slope (degrees)	30.00
Top ridge height above floor plane	10.50

	Length of roof plane	21.00
	Length of floor plane	18.25

Truss Segments

Roof Plane		*Floor Plane*		*Diagonals*		*Diagonals*	
Mem #	*Mem Type*	Mem #	*Mem Type*	Mem #	*Mem Type*	Mem #	*Mem Type*
1	2x4	3	2x4	5	2x4	7	2x4
2	2x4	4	2x4	6	2x4		

** Loading includes member self weight & roofing materials. w loading = wind & snow on exposed areas*



Snow Loading Analysis

where:

		Fully Exposed	Exposure category
Ce	=	0.9	Exposure Factor, Ce (ASCE 7-16 Table 7.3-1, Page 61)
Ct	=	1.0	Thermal Factor, Ct (ASCE 7-16 Table 7.3-2, Page 61)
Is	=	1.0	Snow Importance Factor, Is (ASCE 7-16 Table 1.5-2, Page 5)
p_g	=	15.00	Ground Snow Load pg (ASCE 7-16 Table 7.2-1, Page 56-60)
p_f	=	**0.7CeCtIsPg**	Flat Roof Snow Load, pf (ASCE 7-16 Table 7.3-1, Page 61)
p_f	=	**9.45**	psf
			but where Pf is not less than the following:
			Minimum Snow Load pm (ASCE 7-16 Table 7.3.4, Page 62)
p_m	=	**15.00**	When Pg <=20 psf, then use Pf = Pg x Is
p_f	=	**15.00**	psf. Resultant Snow pressure to be used with Roof slope factor below
p_s	=	$C_s p_f$	Sloped Roof Snow Load ps (ASCE 7-16 Table 7.4, Page 61)

Roof Type Warm Roofs

Roof slope factor Cs for Warm Roofs, where Ct = 1.0

Roof surface condition = Slippery Roof

C_s	=	1.00	Roof Slope Factor, Cs (ASCE 7-16 Table 7.4-1a, Page 62)

Total Snow Load

p_s	=	**15.00**	**psf**	Roof snow load

FEA Calculation Results for Roof Plane MP 1 for Top Tier Client DONNA M JENKINS

IDSPL - 2D Frame Analysis of a 2D frame subject to distributed loads, point loads and moments

Equilibrium check	FX	FY	0.00052
Total applied forces	0.00	1714	
Total output reactions	0.00	-1714	
Output error	-1.33E-12	-4.55E-13	

	Shear	Ax
Max (psi)	7	236
Allowable (psi)	115	5,610
# of segments/beam	1	

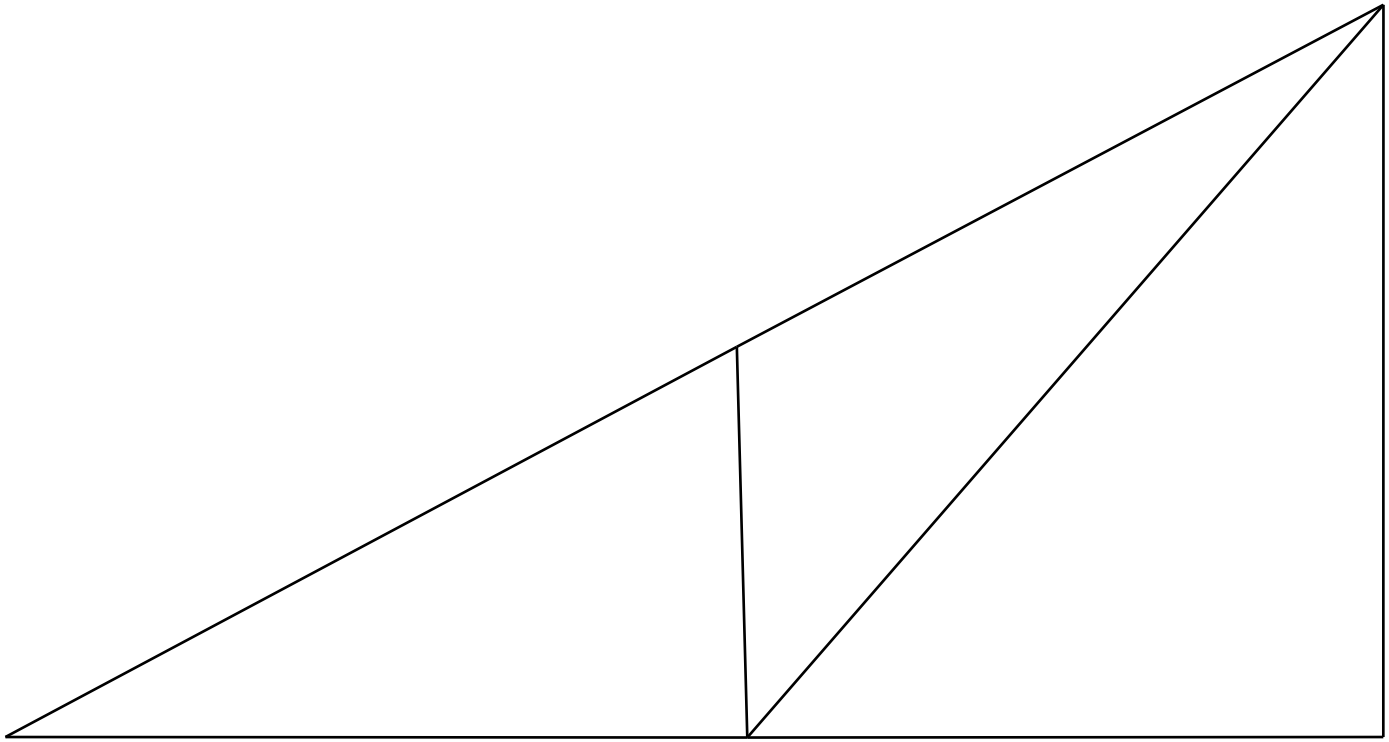
Maximum Deflections	
-1.05E-03	-2.69E-03

** vertical deflections do not take into account any supporting intermediate walls*

Node Results				Beam End Results		
Direction	Deflection	Reaction	Beam	Shear	Axial	BM
DX1	0.00E+00	0	1-1	-196	650	0
DY1	0.00E+00	-474	1-2	199	421	0
RZ1	0.00E+00	0	2-1	-167	618	0
DX2	-1.03E-03	0	2-2	745	95	0
DY2	2.69E-03	0	3-1	21	-464	0
RZ2	0.00E+00	0	3-2	125	-464	0
DX3	3.97E-04	0	4-1	0	0	0
DY3	9.82E-04	0	4-2	0	0	0
RZ3	0.00E+00	0	5-1	0	425	0
DX4	-3.45E-04	0	5-2	0	413	0
DY4	2.53E-03	0	6-1	0	1240	0
RZ4	0.00E+00	0	6-2	0	1205	0
DX5	-3.45E-04	0	7-1	-10	-713	0
DY5	0.00E+00	-1240	7-2	24	-756	0
RZ5	0.00E+00	0				
Rel1-3	5.30E-04	0				
Rel1-6	6.82E-04	0				

Beam	X	Shear	Mom	Axial	DX	DY	RZ
1	0.00	-196	0	650	0.00E+00	0.00E+00	0.00E+00
1	7.98	135	386	458	-1.05E-03	-2.68E-03	3.93E-04
2	0.00	-167	0	618	-1.03E-03	-2.69E-03	0.00E+00
2	7.03	427	6378	277	5.97E-05	-7.88E-04	-1.08E-02
3	0.00	21	0	-464	0.00E+00	0.00E+00	0.00E+00
3	7.00	61	390	-464	-3.45E-04	-2.53E-03	4.69E-04
4	0.00	0	0	0	-3.45E-04	-2.53E-03	0.00E+00
4	6.00	0	0	0	-3.45E-04	4.34E-19	-4.21E-04
5	0.00	0	0	425	-3.45E-04	-2.53E-03	0.00E+00
5	4.00	0	0	417	-1.03E-03	-2.69E-03	1.71E-04
6	0.00	0	0	1240	-3.45E-04	0.00E+00	0.00E+00
6	7.50	0	0	1212	3.97E-04	-9.81E-04	-9.91E-05
7	0.00	-10	0	-713	-3.45E-04	-2.53E-03	0.00E+00
7	9.60	19	3	-749	3.97E-04	-9.81E-04	-1.72E-04

* vertical deflections do not take into account any supporting intermediate walls



Scaled 2X Deflected Truss Plot
Roof Plane MP 1 for Top Tier Client DONNA M JENKINS

FEA Calculation Results for Roof Plane MP 2 for Top Tier Client DONNA M JENKINS

IDSPL - 2D Frame Analysis of a 2D frame subject to distributed loads, point loads and moments

Equilibrium check	FX	FY	0.00055
Total applied forces	0.00	2710	
Total output reactions	0.00	-2710	
Output error	-6.54E-13	-3.18E-12	

	Shear	Ax
Max (psi)	9	279
Allowable (psi)	115	5,610
# of segments/beam	1	

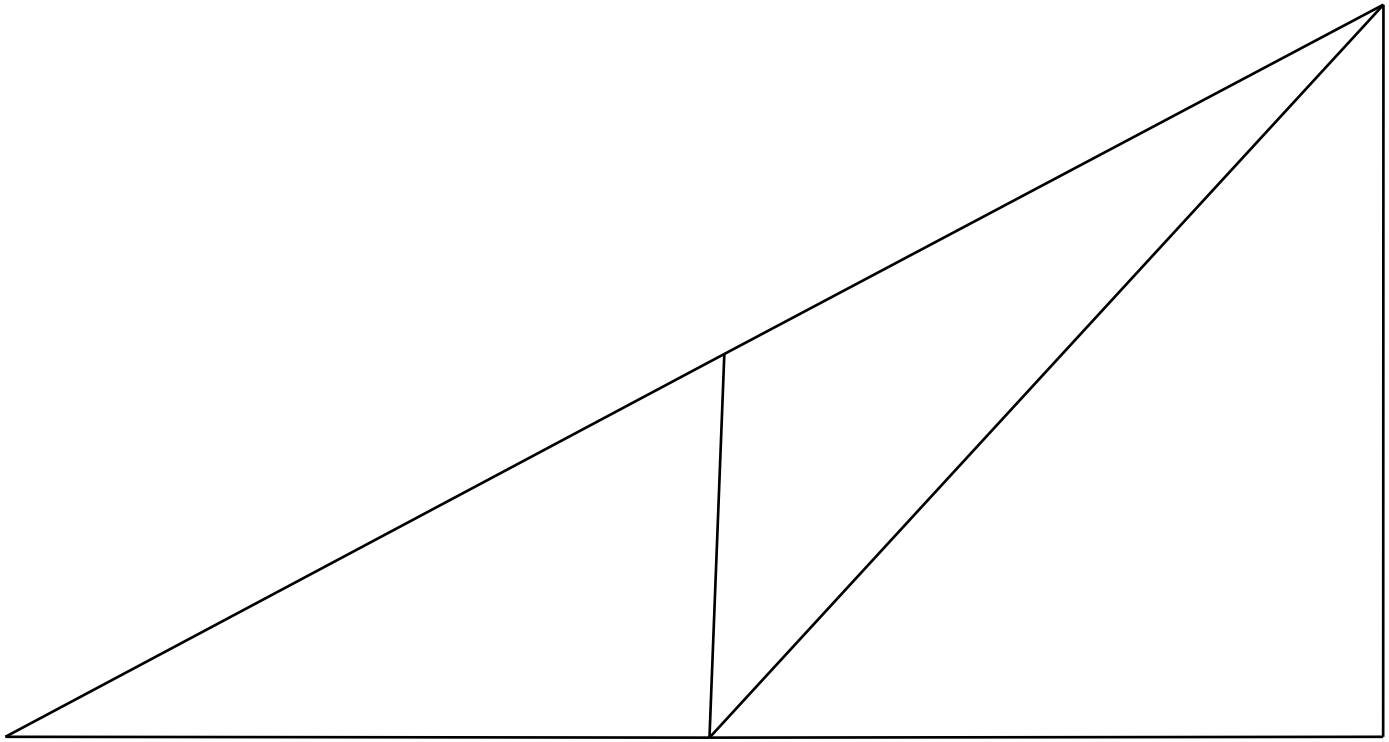
Maximum Deflections	
-2.53E-03	-6.34E-03

** vertical deflections do not take into account any supporting intermediate walls*

Node Results			Beam End Results			
Direction	Deflection	Reaction	Beam	Shear	Axial	BM
DX1	0.00E+00	0	1-1	-209	990	0
DY1	0.00E+00	-1242	1-2	247	726	0
RZ1	0.00E+00	0	2-1	-561	1230	0
DX2	-2.50E-03	0	2-2	738	484	0
DY2	6.34E-03	0	3-1	-566	-752	0
RZ2	0.00E+00	0	3-2	-75	-752	0
DX3	1.33E-03	0	4-1	0	0	0
DY3	1.62E-03	0	4-2	0	0	0
RZ3	0.00E+00	0	5-1	0	971	0
DX4	-7.44E-04	0	5-2	1	950	0
DY4	5.72E-03	0	6-1	0	1467	0
RZ4	0.00E+00	0	6-2	0	1402	0
DX5	-7.44E-04	0	7-1	-22	-1191	0
DY5	0.00E+00	-1467	7-2	48	-1274	0
RZ5	0.00E+00	0				
Rel1-3	8.29E-04	0				
Rel1-6	9.78E-04	0				

Beam	X	Shear	Mom	Axial	DX	DY	RZ
1	0.00	-209	0	990	0.00E+00	0.00E+00	0.00E+00
1	10.98	157	539	778	-2.53E-03	-6.33E-03	6.52E-04
2	0.00	-561	0	1230	-2.50E-03	-6.34E-03	0.00E+00
2	10.03	260	9736	758	8.18E-04	-1.32E-03	-1.19E-02
3	0.00	-566	0	-752	0.00E+00	0.00E+00	0.00E+00
3	9.30	-162	524	-752	-7.44E-04	-5.72E-03	9.78E-04
4	0.00	0	0	0	-7.44E-04	-5.72E-03	0.00E+00
4	8.90	0	0	0	-7.44E-04	0.00E+00	-6.42E-04
5	0.00	0	0	971	-7.44E-04	-5.72E-03	0.00E+00
5	5.50	0	0	955	-2.50E-03	-6.34E-03	3.23E-04
6	0.00	0	0	1467	-7.44E-04	0.00E+00	0.00E+00
6	10.50	0	0	1412	1.33E-03	-1.62E-03	-1.98E-04
7	0.00	-22	0	-1191	-7.44E-04	-5.72E-03	0.00E+00
7	13.76	40	4	-1264	1.33E-03	-1.62E-03	-3.59E-04

* vertical deflections do not take into account any supporting intermediate walls



Scaled 2X Deflected Truss Plot
Roof Plane MP 2 for Top Tier Client DONNA M JENKINS

FEA Calculation Results for Roof Plane MP 3 for Top Tier Client DONNA M JENKINS

IDSPL - 2D Frame Analysis of a 2D frame subject to distributed loads, point loads and moments

Equilibrium check	FX	FY
Total applied forces	0.00	2710
Total output reactions	0.00	-2710
Output error	-6.54E-13	-3.18E-12

0.0005

	Shear	Ax
Max (psi)	9	279
Allowable (psi)	115	5,610
# of segments/beam	1	

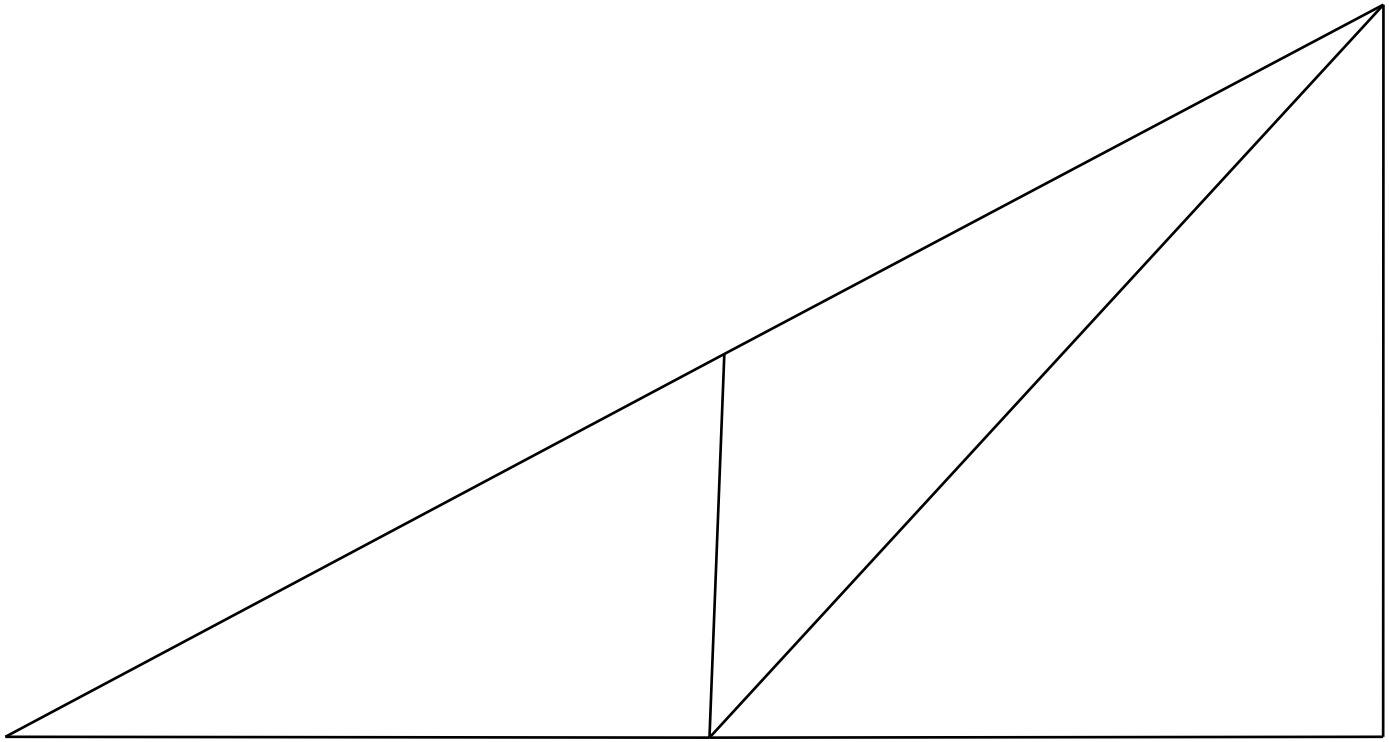
Maximum Deflections	
-2.53E-03	-6.34E-03

** vertical deflections do not take into account any supporting intermediate walls*

Node Results			Beam End Results			
Direction	Deflection	Reaction	Beam	Shear	Axial	BM
DX1	0.00E+00	0	1-1	-209	990	0
DY1	0.00E+00	-1242	1-2	247	726	0
RZ1	0.00E+00	0	2-1	-561	1230	0
DX2	-2.50E-03	0	2-2	738	484	0
DY2	6.34E-03	0	3-1	-566	-752	0
RZ2	0.00E+00	0	3-2	-75	-752	0
DX3	1.33E-03	0	4-1	0	0	0
DY3	1.62E-03	0	4-2	0	0	0
RZ3	0.00E+00	0	5-1	0	971	0
DX4	-7.44E-04	0	5-2	1	950	0
DY4	5.72E-03	0	6-1	0	1467	0
RZ4	0.00E+00	0	6-2	0	1402	0
DX5	-7.44E-04	0	7-1	-22	-1191	0
DY5	0.00E+00	-1467	7-2	48	-1274	0
RZ5	0.00E+00	0				
Rel1-3	8.29E-04	0				
Rel1-6	9.78E-04	0				

Beam	X	Shear	Mom	Axial	DX	DY	RZ
1	0.00	-209	0	990	0.00E+00	0.00E+00	0.00E+00
1	10.98	157	539	778	-2.53E-03	-6.33E-03	6.52E-04
2	0.00	-561	0	1230	-2.50E-03	-6.34E-03	0.00E+00
2	10.03	260	9736	758	8.18E-04	-1.32E-03	-1.19E-02
3	0.00	-566	0	-752	0.00E+00	0.00E+00	0.00E+00
3	9.30	-162	524	-752	-7.44E-04	-5.72E-03	9.78E-04
4	0.00	0	0	0	-7.44E-04	-5.72E-03	0.00E+00
4	8.90	0	0	0	-7.44E-04	0.00E+00	-6.42E-04
5	0.00	0	0	971	-7.44E-04	-5.72E-03	0.00E+00
5	5.50	0	0	955	-2.50E-03	-6.34E-03	3.23E-04
6	0.00	0	0	1467	-7.44E-04	0.00E+00	0.00E+00
6	10.50	0	0	1412	1.33E-03	-1.62E-03	-1.98E-04
7	0.00	-22	0	-1191	-7.44E-04	-5.72E-03	0.00E+00
7	13.76	40	4	-1264	1.33E-03	-1.62E-03	-3.59E-04

* vertical deflections do not take into account any supporting intermediate walls



Scaled 2X Deflected Truss Plot
Roof Plane MP 3 for Top Tier Client DONNA M JENKINS

PHOTOVOLTAIC ROOF MOUNT SYSTEM

26 MODULES-ROOF MOUNTED - 10.530 kW DC, 10.000 kW AC

389 DEWAR ST, FUQUAY-VARINA, NC 27526

PROJECT DATA

PROJECT ADDRESS:	389 DEWAR ST, FUQUAY-VARINA, NC 27526
OWNER:	DONNA M JENKINS
DESIGNER:	ESR

SCOPE: 10.530 kW DC ROOF MOUNT
SOLAR PV SYSTEM WITH
26 JA SOLAR: JAM54S31-405/MR 405W
PV MODULES WITH
26 SOLAREDGE: S440 POWER OPTIMIZERS AND
01 SOLAREDGE: SE10000H-US (240V/10000W)
INVERTER

AUTHORITIES HAVING JURISDICTION:
BUILDING: HARNETT COUNTY
ZONING: HARNETT COUNTY
UTILITY: DUKE ENERGY PROGRESS

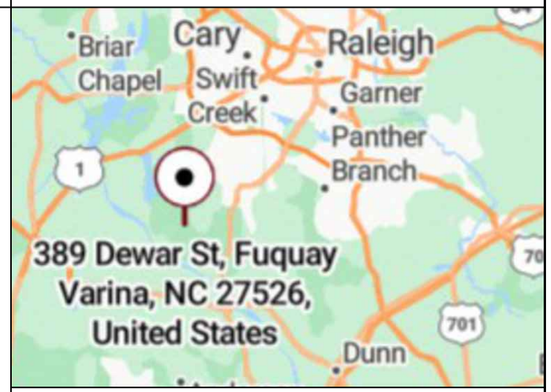
SHEET INDEX

SIGNATURE

GENERAL NOTES

1. ALL COMPONENTS ARE UL LISTED AND CEC CERTIFIED, WHERE WARRANTED.
2. THE SOLAR PV SYSTEM WILL BE INSTALLED IN ACCORDANCE WITH ARTICLE 690 OF THE NEC 2017.
3. THE UTILITY INTERCONNECTION APPLICATION MUST BE APPROVED AND PV SYSTEM INSPECTED PRIOR TO PARALLEL OPERATION.
4. ALL CONDUCTORS OF A CIRCUIT, INCLUDING THE EGC, MUST BE INSTALLED IN THE SAME RACEWAY, OR CABLE, OR OTHERWISE RUN WITH THE PV ARRAY CIRCUIT CONDUCTORS WHEN THEY LEAVE THE VICINITY OF THE PV ARRAY.
5. WHERE METALLIC CONDUIT CONTAINING DC CONDUCTORS IS USED INSIDE THE BUILDING, IT SHALL BE IDENTIFIED AS "CAUTION: SOLAR CIRCUIT" EVERY 10FT.
6. HEIGHT OF THE AC DISCONNECT SHALL NOT EXCEED 6'-7" PER NEC CODE 240.24.
7. A GROUNDING ELECTRODE SYSTEM IN ACCORDANCE WITH CEC 690.47 AND 250.50 THROUGH 60 AND 250-166 SHALL BE PROVIDED. PER NEC GROUNDING ELECTRODE SYSTEM OF EXISTING BUILDING MAY BE USED AND BONDED TO THE SERVICE ENTRANCE. IF EXISTING SYSTEM IS INACCESSIBLE OR INADEQUATE A SUPPLEMENTAL GROUNDING ELECTRODE WILL BE USED AT THE INVERTER LOCATION CONSISTING OF A UL LISTED 8 FT. GROUND ROD WITH ACORN CLAMP. GROUNDING ELECTRODE CONDUCTORS SHALL BE NO LESS THAN #8 AWG AND NO LARGER THAN #6 AWG COPPER AND BONDED TO THE EXISTING GROUNDING ELECTRODE TO PROVIDE FOR A COMPLETE SYSTEM.
8. PHOTOVOLTAIC MODULES ARE TO BE CONSIDERED NON-COMBUSTIBLE.
9. PHOTOVOLTAIC INSTALLATION WILL NOT OBSTRUCT ANY PLUMBING. MECHANICAL, OR BUILDING ROOF VENTS.
10. ALL WIRING MUST BE PROPERLY SUPPORTED BY DEVICES OR MECHANICAL MEANS DESIGNED AND LISTED FOR SUCH USE. WIRING MUST BE PERMANENTLY AND COMPLETELY HELD OFF THE ROOF SURFACE.
11. ALL SINAGE TO BE PLACED IN ACCORDANCE WITH THE LOCAL BUILDING CODE. IF EXPOSED TO SUNLIGHT, IT SHALL BE UV RESISTANT. ALL PLAQUES AND SINAGE WILL BE INSTALLED AS REQUIRED BY THE NEC AND AHJ.
12. INVERTER(S) USED IN UNGROUNDED SYSTEM SHALL BE UL 1741 LISTED.
13. THE INSTALLATION OF EQUIPMENT AND ALL ASSOCIATED WIRING AND INTERCONNECTION SHALL BE PERFORMED ONLY BY QUALIFIED PERSONS [NEC 690.4(C)]
14. ALL OUTDOOR EQUIPMENT SHALL BE NEMA 3R RATED (OR BETTER), INCLUDING ALL ROOF MOUNTED TRANSITION BOXES AND SWITCHES.
15. ALL EQUIPMENT SHALL BE PROPERLY GROUNDED AND BONDED IN ACCORDANCE WITH NEC ARTICLE 250.
16. SYSTEM GROUNDING SHALL BE IN ACCORDANCE WITH NEC 690.41.
17. PV SYSTEM CIRCUITS INSTALLED ON OR IN BUILDINGS SHALL INCLUDE A RAPID SHUTDOWN FUNCTION IN ACCORDANCE WITH NEC 690.12
18. DISCONNECTING MEANS SHALL BE LOCATED IN A VISIBLE, READILY ACCESSIBLE LOCATION WITHIN THE PV SYSTEM EQUIPMENT OR A MAXIMUM OF 10 FEET AWAY FROM THE SYSTEM [NEC 690.13(A)]
19. ALL WIRING METHODS SHALL BE IN ACCORDANCE WITH NEC 690.31
20. WORK CLEARANCES AROUND ELECTRICAL EQUIPMENT WILL BE MAINTAINED PER NEC 110.26(A)(1), 110.26(A)(2) AND 110.26(A)(3).
21. ROOFTOP MOUNTED PHOTOVOLTAIC PANELS AND MODULES SHALL BE TESTED, LISTED & IDENTIFIED IN ACCORDANCE WITH UL1703
22. ELECTRICAL CONTRACTOR TO PROVIDE CONDUIT EXPANSION JOINTS AND ANCHOR CONDUIT RUNS AS REQUIRED PER NEC.

VICINITY MAP



HOUSE PHOTO

CODE REFERENCES

2018 NORTH CAROLINA BUILDING CODE
2018 NORTH CAROLINA RESIDENTIAL CODE
2018 NORTH CAROLINA FIRE CODE
2017 NATIONAL ELECTRICAL CODE

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
08/12/2025
Harnett COUNTY NORTH CAROLINA

TOP TIER SOLAR SOLUTIONS

1530 CENTER PARK DR #2911,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	06/08/2025	

NORTH CAROLINA PROFESSIONAL SEAL 043326 ENGINEER RICHARD PANTEL

Reviewed and approved
Richard Pantel, P.E.
NC Lic. No. 043326
08/07/2025

PROJECT NAME & ADDRESS

DONNA M JENKINS RESIDENCE
389 DEWAR ST, FUQUAY-VARINA, NC 27526

DRAWN BY
ESR

SHEET NAME
COVER SHEET

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-1

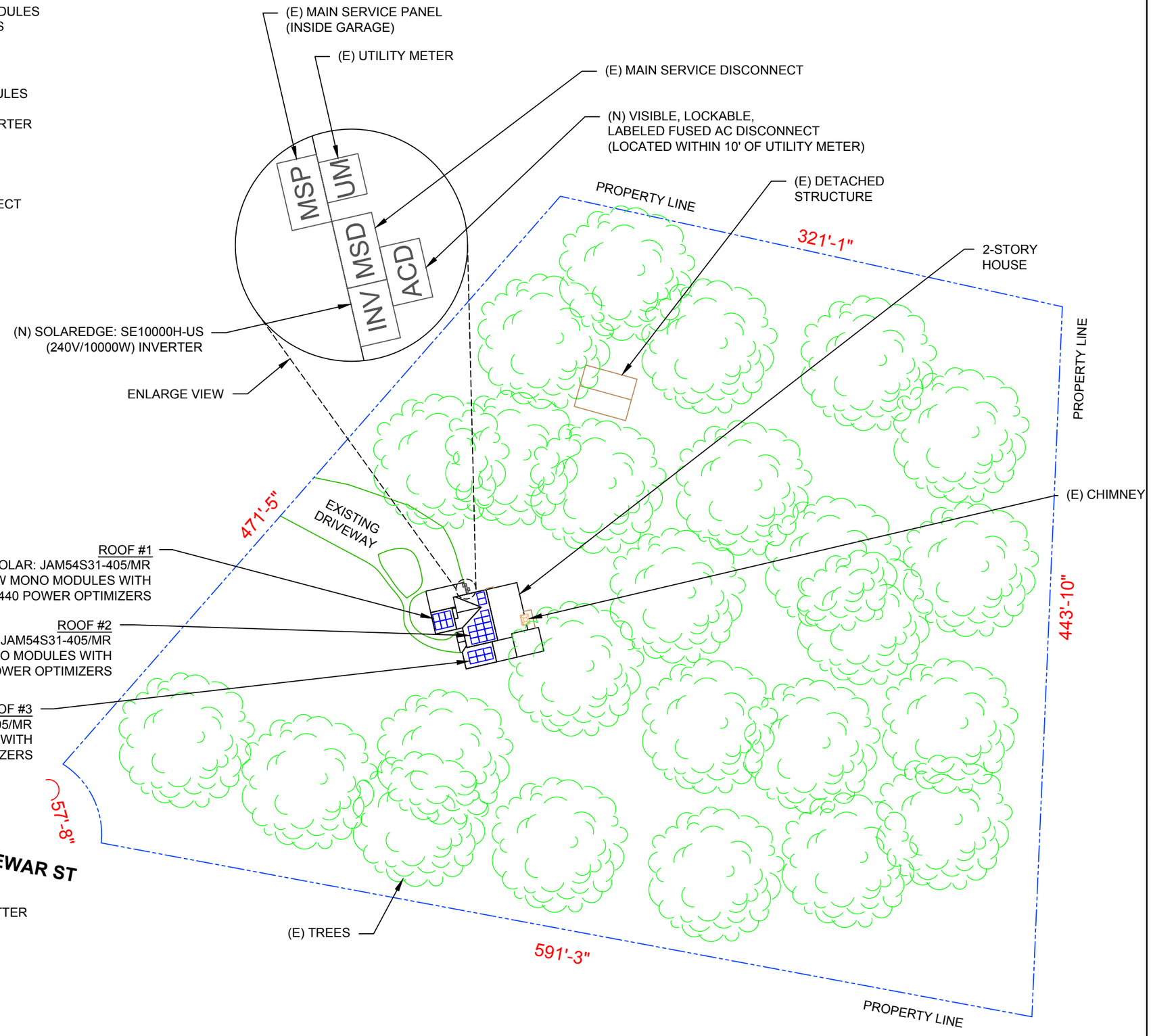
PROJECT DESCRIPTION:

26 X JA SOLAR: JAM54S31-405/MR 405W MONO MODULES
ROOF MOUNTED SOLAR PHOTOVOLTAIC MODULES
DC SYSTEM SIZE: 10.530 kW DC
AC SYSTEM SIZE: 10.000 kW AC

EQUIPMENT SUMMARY
26 JA SOLAR: JAM54S31-405/MR 405W MONO MODULES
26 SOLAREDGE: S440 POWER OPTIMIZERS
01 SOLAREDGE: SE10000H-US (240V/10000W) INVERTER

ROOF ARRAY AREA #1:- 126.06 SQ FT.
ROOF ARRAY AREA #2:- 294.14 SQ FT.
ROOF ARRAY AREA #3:- 126.06 SQ FT.

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



DESIGN SPECIFICATION
OCCUPANCY: II
CONSTRUCTION: SINGLE-FAMILY
ZONING: RESIDENTIAL
GROUND SNOW LOAD: REFER STRUCTURAL LETTER
WIND EXPOSURE: REFER STRUCTURAL LETTER
WIND SPEED: REFER STRUCTURAL LETTER

1 SITE PLAN
PV-2 SCALE: 1/64" = 1'-0"

TOP TIER SOLAR SOLUTIONS

TOP TIER SOLAR SOLUTIONS
1530 CENTER PARK DR #2911,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	06/08/2025	

NORTH CAROLINA PROFESSIONAL SEAL 043326 ENGINEER RICHARD PANTEL

Reviewed and approved
Richard Pantel, P.E.
NC Lic. No. 043326
08/07/2025

PROJECT NAME & ADDRESS
DONNA M JENKINS RESIDENCE
389 DEWAR ST,
FUQUAY-VARINA, NC 27526

DRAWN BY
ESR

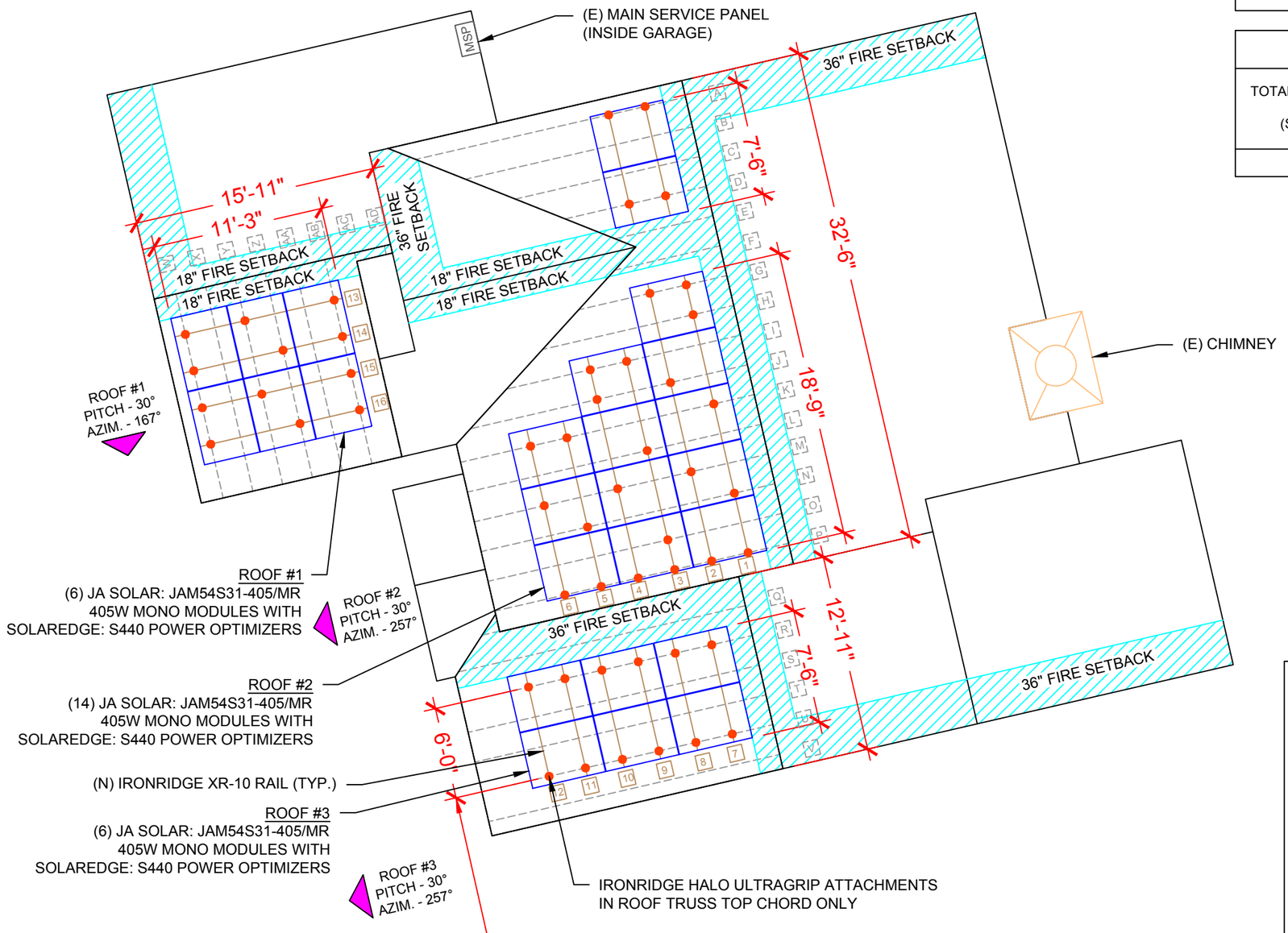
SHEET NAME
SITE PLAN

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-2

MODULE TYPE, DIMENSIONS & WEIGHT

NUMBER OF MODULES = 26 MODULES
MODULE TYPE = JA SOLAR: JAM54S31-405/MR 405W MONO MODULES
MODULE WEIGHT = 47.39 LBS / 21.5 kg.
MODULE DIMENSIONS = (67.79" x 44.65")/144 = 21.01 SF

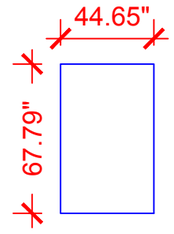


ROOF DESCRIPTION

ROOF TYPE				ASPHALT SHINGLE	
ROOF LAYER				1 LAYER	
ROOF	# OF MODULES	ROOF PITCH	AZIMUTH	TRUSS SIZE	TRUSS SPACING
#1	6	30°	167°	2"X4"	24"
#2	14	30°	257°	2"X4"	24"
#3	6	30°	257°	2"X4"	24"

ARRAY AREA & ROOF AREA CALC'S

TOTAL PV ARRAY AREA (SQ. FT.)	TOTAL ROOF AREA (Sq. Ft.)	ROOF AREA COVERED BY ARRAY (%)
473.20	2577.72	18



JA SOLAR:
JAM54S31-405/MR
405W MODULES

LEGEND

- JB - JUNCTION BOX
- INV - INVERTER
- ACD - AC DISCONNECT
- UM - UTILITY METER
- MSP - MAIN SERVICE PANEL
- SUB - SUB PANEL
- VENT, ATTIC FAN (ROOF OBSTRUCTION)
- ROOF ATTACHMENT
- TRUSS
- CONDUIT

1 ROOF PLAN & MODULES
PV-3
SCALE: 1/8" = 1'-0"

TOP TIER SOLAR SOLUTIONS
1530 CENTER PARK DR #2911,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	06/08/2025	

NORTH CAROLINA PROFESSIONAL SEAL 043326 ENGINEER RICHARD PANTEL

Reviewed and approved
Richard Pantel, P.E.
NC Lic. No. 043326
08/07/2025

PROJECT NAME & ADDRESS

DONNA M JENKINS RESIDENCE
389 DEWAR ST,
FUQUAY-VARINA, NC 27526

DRAWN BY
ESR

SHEET NAME
ROOF PLAN & MODULES

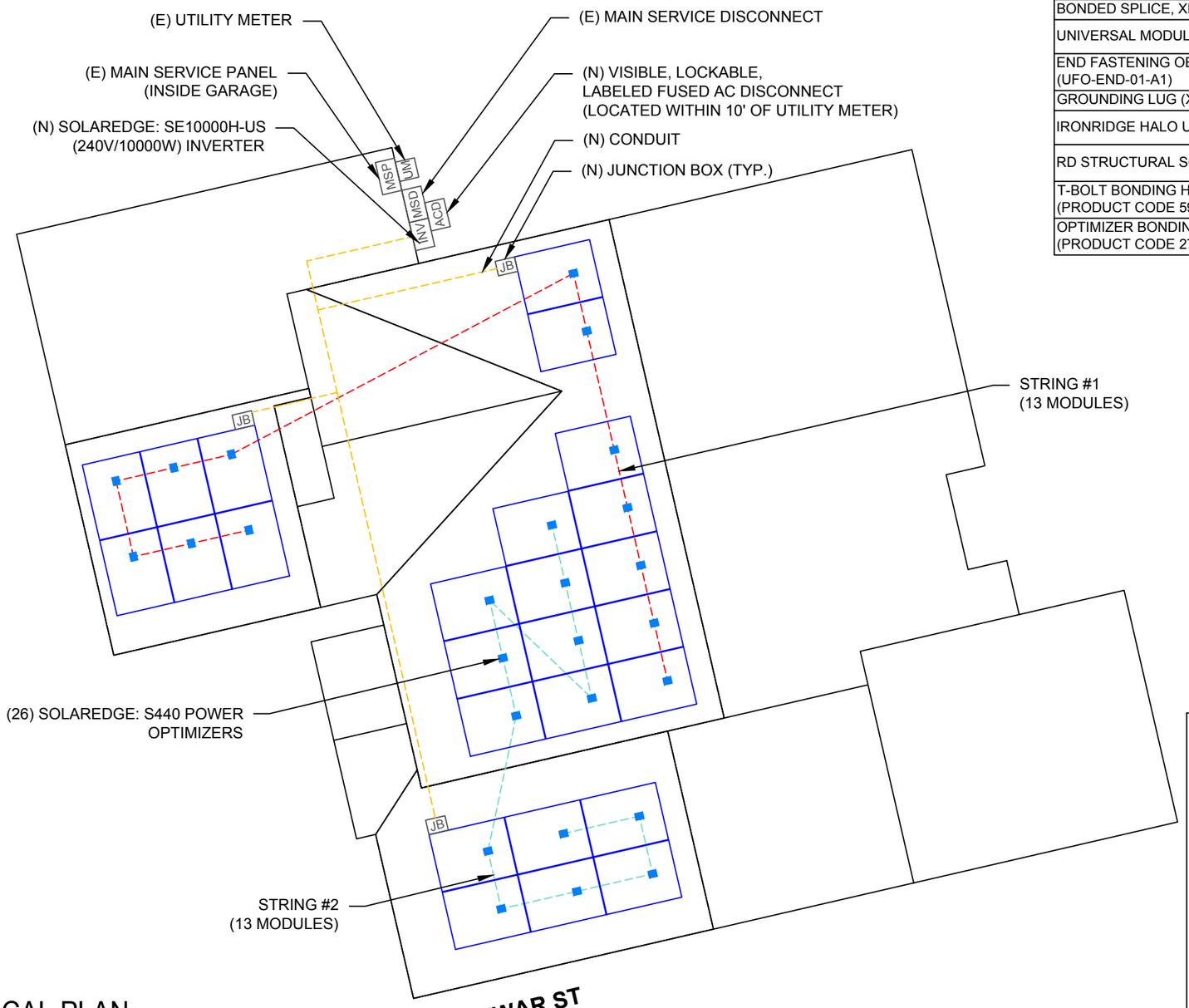
SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-3

DC SYSTEM SIZE: 10.530 kW DC
AC SYSTEM SIZE: 10.000 kW AC
(26) JA SOLAR: JAM54S31-405/MR 405W MONO MODULES
WITH (26) SOLAREDGE: S440 POWER OPTIMIZERS
LOCATED UNDER EACH PANEL AND
01 SOLAREDGE: SE10000H-US (240V/10000W) INVERTER

STRING LEGENDS

- STRING #1
- STRING #2



BILL OF MATERIALS

EQUIPMENT DESCRIPTION	QTY
SOLAR PV MODULES: JA SOLAR: JAM54S31-405/MR 405W MODULE	26
OPTIMIZERS: SOLAREDGE: S440 POWER OPTIMIZERS	26
INVERTER: SOLAREDGE: SE10000H-US (240V/10000W) INVERTER	01
JUNCTION BOXES: JUNCTION BOX UL 1741, NEMA 3R CSA C22.2 NO.290	3
AC DISCONNECT: FUSED AC DISCONNECT, 60A FUSED, (2) 60A FUSES 240V NEMA 3R, UL LISTED	1
IRONRIDGE XR10 RAIL (RAIL 168" (14 FEET) CLEAR) (XR-10-168A)	20
BONDED SPLICE, XR10 (XR10-BOSS-01-M1)	4
UNIVERSAL MODULE CLAMP, CLEAR (UFO-CL-01-A1)	34
END FASTENING OBJECT (END CLAMP, 30-40MM), MILL (UFO-END-01-A1)	36
GROUNDING LUG (XR-LUG-03-A1)	9
IRONRIDGE HALO ULTRAGRIP ATTACHMENTS (QM-HUG-01-M1)	53
RD STRUCTURAL SCREW,3.0L (HW-RD1430-01-M1)	106
T-BOLT BONDING HARDWARE (BHW-TB-02-A1) (PRODUCT CODE 590-0116)	53
OPTIMIZER BONDING HARDWARE T-BOLT (BHW-MI-01-A1) (PRODUCT CODE 270-0152)	26

LEGEND

- JB - JUNCTION BOX
- INV - INVERTER
- ACD - AC DISCONNECT
- UM - UTILITY METER
- MSP - MAIN SERVICE PANEL
- SUB - SUB PANEL
- - VENT, ATTIC FAN (ROOF OBSTRUCTION)
- - ROOF ATTACHMENT
- - TRUSS
- - CONDUIT

1 ELECTRICAL PLAN
PV-4 SCALE: 1/8" = 1'-0"

TOP TIER SOLAR SOLUTIONS
1530 CENTER PARK DR #2911,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	06/08/2025	

PROJECT NAME & ADDRESS

DONNA M JENKINS
RESIDENCE

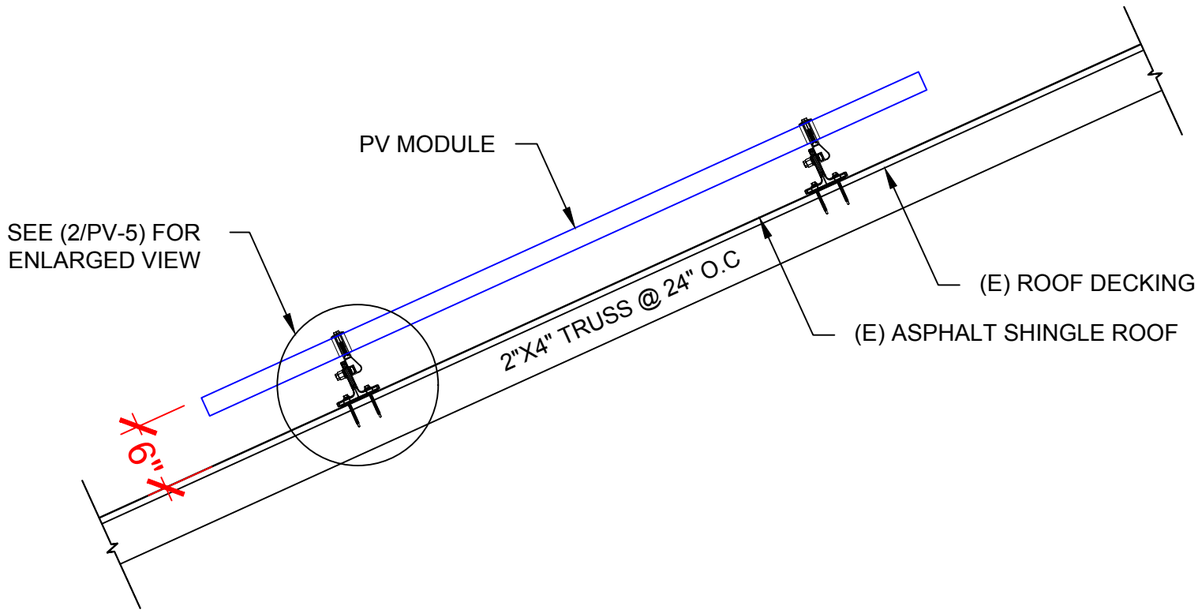
389 DEWAR ST,
FUQUAY-VARINA, NC 27526

DRAWN BY
ESR

SHEET NAME
ELECTRICAL PLAN

SHEET SIZE
ANSI B
11" X 17"

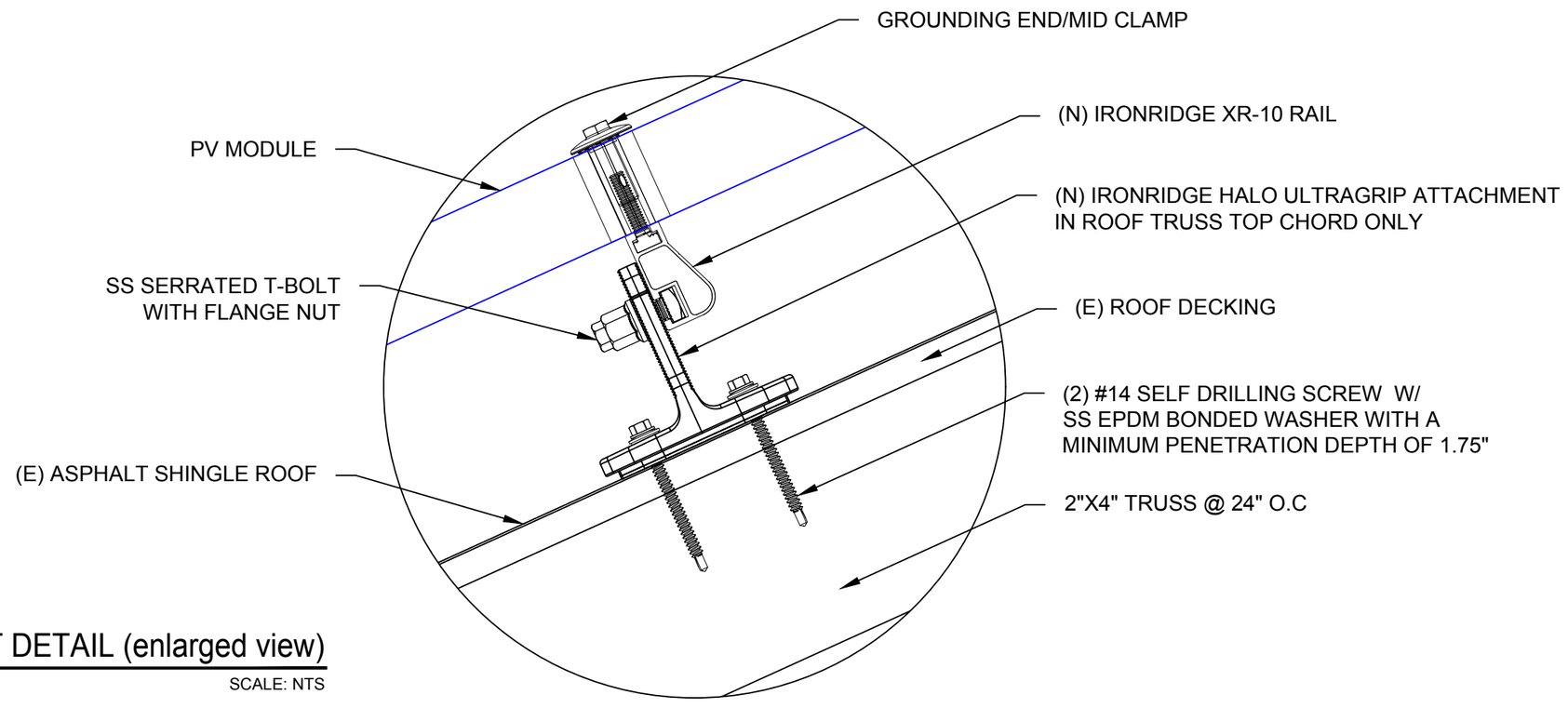
SHEET NUMBER
PV-4



1 | PV-5

STRUCTURAL ATTACHMENT (Side view)

SCALE: N.T.S



2 | PV-5

ATTACHMENT DETAIL (enlarged view)

SCALE: NTS

TOP TIER SOLAR SOLUTIONS

1530 CENTER PARK DR #2911,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	06/08/2025	

NORTH CAROLINA PROFESSIONAL SEAL 043326 ENGINEER RICHARD PANTEL

Reviewed and approved
Richard Pantel, P.E.
NC Lic. No. 043326
08/07/2025

PROJECT NAME & ADDRESS

DONNA M JENKINS
RESIDENCE

389 DEWAR ST,
FUQUAY-VARINA, NC 27526

DRAWN BY
ESR

SHEET NAME
STRUCTURAL DETAIL

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-5

DC SYSTEM SIZE: 10.530 kW DC
AC SYSTEM SIZE: 10.000 kW AC

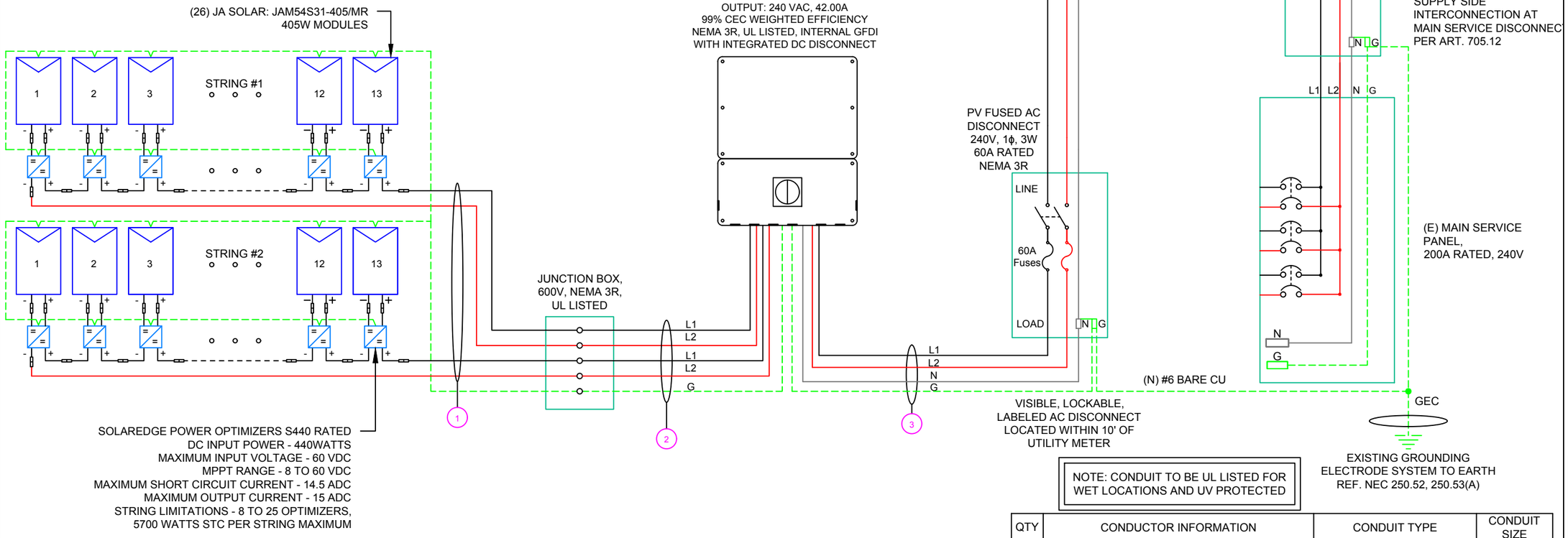
(26) JA SOLAR: JAM54S31-405/MR 405W MONO MODULES
WITH (26) SOLAREDGE: S440 POWER OPTIMIZERS
LOCATED UNDER EACH PANEL (240V) AND
(01) SOLAREDGE: SE10000H-US (240V/10000W) INVERTER
(02) STRINGS OF 13 MODULES ARE CONNECTED IN SERIES

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

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

GROUNDING & GENERAL NOTES:
1. PV GROUNDING ELECTRODE SYSTEM NEEDS TO BE INSTALLED IN ACCORDANCE WITH [NEC 690.43]
2. PV INVERTER IS UNGROUNDED, TRANSFORMER-LESS TYPE.
3. DC GEC AND AC EGC TO REMAIN UNSPLICED, OR SPLICED TO EXISTING ELECTRODE
4. ANY EXISTING WIRING INVOLVED WITH PV SYSTEM CONNECTION THAT IS FOUND TO BE INADEQUATE PER CODE SHALL BE CORRECTED PRIOR TO FINAL INSPECTION.
5. JUNCTION BOX QUANTITIES, AND PLACEMENT SUBJECT TO CHANGE IN THE FIELD - JUNCTION BOX DEPICTED ON ELECTRICAL DIAGRAM REPRESENT WIRE TYPE TRANSITIONS.
6. AC DISCONNECT NOTED IN EQUIPMENT SCHEDULE OPTIONAL IF OTHER AC DISCONNECTING MEANS IS LOCATED WITHIN 10' OF SERVICE DISCONNECT.
7. RACEWAYS AND CABLES EXPOSED TO SUNLIGHT ON ROOFTOPS SHOULD BE INSTALLED MORE THAN 7/8" ABOVE THE ROOF USING CONDUIT SUPPORTS.

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



NOTE: CONDUIT TO BE UL LISTED FOR WET LOCATIONS AND UV PROTECTED

	QTY	CONDUCTOR INFORMATION		CONDUIT TYPE	CONDUIT SIZE
1	(4)	#10AWG -	PV WIRE/USE-2	N/A	N/A
	(1)	#6AWG -	BARE COPPER IN FREE AIR		
2	(4)	#10AWG -	CU,THWN-2	EMT OR LFMC IN ATTIC	3/4"
	(1)	#10AWG -	CU,THWN-2 GND		
3	(2)	#6AWG -	CU,THWN-2	EMT,LFMC OR PVC	3/4"
	(1)	#6AWG -	CU,THWN-2 N		
	(1)	#6AWG -	CU,THWN-2 GND		
4	(2)	#6AWG -	CU,THWN-2	EMT, LFMC OR PVC	3/4"
	(1)	#6AWG -	CU,THWN-2 N		

1 ELECTRICAL LINE DIAGRAM
PV-6 SCALE: NTS

TOP TIER SOLAR SOLUTIONS

TOP TIER SOLAR SOLUTIONS

1530 CENTER PARK DR #2911,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	06/08/2025	

PROJECT NAME & ADDRESS

DONNA M JENKINS
RESIDENCE

389 DEWAR ST,
FUQUAY-VARINA, NC 27526

DRAWN BY
ESR

SHEET NAME
ELECTRICAL LINE DIAGRAM

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-6

SOLAR MODULE SPECIFICATIONS	
MANUFACTURER / MODEL #	JA SOLAR: JAM54S31-405/MR 405W MODULE
VMP	31.21V
IMP	12.98A
VOC	37.23V
ISC	13.87A
TEMP. COEFF. VOC	-0.275%/°C
MODULE DIMENSION	67.79"L x 44.65"W x 1.18"D (In Inch)

INVERTER SPECIFICATIONS	
MANUFACTURER / MODEL #	SOLAREDGE: SE10000H-US (240V/10000W) INVERTER
NOMINAL AC POWER	10.000 kW
NOMINAL OUTPUT VOLTAGE	240 VAC
NOMINAL OUTPUT CURRENT	42.00A

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

AMBIENT TEMPERATURE SPECS	
AMBIENT TEMP (HIGH TEMP 2%)	37°
RECORD LOW TEMPERATURE	-12°
MODULE TEMPERATURE COEFFICIENT OF Voc	-0.275%/°C

DC FEEDER CALCULATIONS

CIRCUIT ORIGIN	CIRCUIT DESTINATION	VOLTAGE (V)	FULL LOAD AMPS "FLA" (A)	FLA*1.25 (A)	OCPD SIZE (A)	GROUND SIZE	CONDUCTOR SIZE	75°C AMPACITY (A)	AMPACITY CHECK #1	AMBIENT TEMP. (°C)	TOTAL CC CONDUCTORS IN RACEWAY	90°C AMPACITY (A)	DERATION FACTOR FOR AMBIENT TEMPERATURE NEC 310.15(B)(2)(a)	DERATION FACTOR FOR CONDUCTORS PER RACEWAY NEC 310.15(B)(3)(a)	90°C AMPACITY DERATED (A)	AMPACITY CHECK #2	FEEDER LENGTH (FEET)	CONDUCTOR RESISTANCE (OHM/KFT)	VOLTAGE DROP AT FLA (%)	CONDUIT SIZE	CONDUIT FILL (%)
STRING 1	JUNCTION BOX	380	15.00	18.75	20	BARE COPPER #6 AWG	CU #10 AWG	35	PASS	38	2	40	0.91	1	36.4	PASS	5	1.24	0.049	N/A	#N/A
STRING 2	JUNCTION BOX	380	15.00	18.75	20	BARE COPPER #6 AWG	CU #10 AWG	35	PASS	38	2	40	0.91	1	36.4	PASS	5	1.24	0.049	N/A	#N/A
JUNCTION BOX	INVERTER	380	15.00	18.75	20	CU #10 AWG	CU #10 AWG	35	PASS	38	4	40	0.91	0.8	29.12	PASS	25	1.24	0.245	3/4" EMT	19.79%

String 1 Voltage Drop	0.294
String 2 Voltage Drop	0.294

AC FEEDER CALCULATIONS

CIRCUIT ORIGIN	CIRCUIT DESTINATION	VOLTAGE (V)	FULL LOAD AMPS "FLA" (A)	FLA*1.25 (A)	OCPD SIZE (A)	NEUTRAL SIZE	GROUND SIZE	CONDUCTOR SIZE	75°C AMPACITY (A)	AMPACITY CHECK #1	AMBIENT TEMP. (°C)	TOTAL CC CONDUCTORS IN RACEWAY	90°C AMPACITY (A)	DERATION FACTOR FOR AMBIENT TEMPERATURE NEC 310.15(B)(2)(a)	DERATION FACTOR FOR CONDUCTORS PER RACEWAY NEC 310.15(B)(3)(a)	90°C AMPACITY DERATED (A)	AMPACITY CHECK #2	FEEDER LENGTH (FEET)	CONDUCTOR RESISTANCE (OHM/KFT)	VOLTAGE DROP AT FLA (%)	CONDUIT SIZE	CONDUIT FILL (%)
INVERTER	AC DISCONNECT	240	42	52.5	60	CU #6 AWG	CU #6 AWG	CU #6 AWG	65	PASS	38	2	75	0.91	1	68.25	PASS	5	0.491	0.086	3/4" EMT	38.05%
AC DISCONNECT	POI	240	42	52.5	60	CU #6 AWG	N/A	CU #6 AWG	65	PASS	38	2	75	0.91	1	68.25	PASS	5	0.491	0.086	3/4" EMT	28.54%

CUMULATIVE VOLTAGE DROP	0.172

ELECTRICAL NOTES

1. ALL EQUIPMENT TO BE LISTED BY UL OR OTHER NRTL, AND LABELED FOR ITS APPLICATION.
2. ALL CONDUCTORS SHALL BE RATED UPTO 600V FOR RESIDENTIAL AND 1000V FOR COMMERCIAL AND 90 DEGREE C WET ENVIRONMENT.
3. WIRING, CONDUIT, AND RACEWAYS MOUNTED ON ROOFTOPS SHALL BE ROUTED DIRECTLY TO, AND LOCATED AS CLOSE AS POSSIBLE TO THE NEAREST RIDGE, HIP, OR VALLEY.
4. WORKING CLEARANCES AROUND ALL NEW AND EXISTING ELECTRICAL EQUIPMENT SHALL COMPLY WITH NEC 110.26.
5. DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS. CONTRACTOR SHALL FURNISH ALL NECESSARY OUTLETS, SUPPORTS, FITTINGS AND ACCESSORIES TO FULFILL APPLICABLE CODES AND STANDARDS.
6. WHERE SIZES OF JUNCTION BOX, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, THE CONTRACTOR SHALL SIZE THEM ACCORDINGLY.
7. ALL WIRE TERMINATIONS SHALL BE APPROPRIATELY LABELED AND READILY VISIBLE.
8. MODULE GROUNDING CLIPS TO BE INSTALLED BETWEEN MODULE FRAME AND MODULE SUPPORT RAIL, PER THE GROUNDING CLIP MANUFACTURER'S INSTRUCTION.
9. MODULE SUPPORT RAIL TO BE BONDED TO CONTINUOUS COPPER G.E.C. VIA WEEB LUG OR ILSCO GBL-4DBT LAY-IN LUG.
10. TEMPERATURE RATINGS OF ALL CONDUCTORS, TERMINATIONS, BREAKERS, OR OTHER DEVICES ASSOCIATED WITH THE SOLAR PV SYSTEM SHALL BE RATED FOR AT LEAST 75 DEGREE C.

TOP TIER SOLAR SOLUTIONS

1530 CENTER PARK DR #2911,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	06/08/2025	

PROJECT NAME & ADDRESS

DONNA M JENKINS
RESIDENCE

389 DEWAR ST,
FUQUAY-VARINA, NC 27526

DRAWN BY
ESR

SHEET NAME
WIRING CALCULATIONS

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-7

PHOTOVOLTAIC POWER SOURCE

EVERY 10' ON CONDUIT & ENCLOSURES

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

⚠ WARNING

ELECTRIC SHOCK HAZARD

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

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

⚠ WARNING

DUAL POWER SUPPLY

SOURCE: UTILITY GRID AND PV SOLAR ELECTRIC SYSTEM

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

SOLAR PV BREAKER:

BREAKER IS BACKFED
DO NOT RELOCATE

LABEL-4:
LABEL LOCATION:
MAIN SERVICE PANEL
CODE REF: NEC 705.12(C) & NEC 690.59

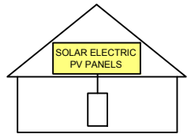
⚠ WARNING

POWER SOURCE OUTPUT CONNECTION. DO NOT RELOCATE THIS OVERCURRENT DEVICE

LABEL- 5:
LABEL LOCATION:
MAIN SERVICE PANEL (ONLY IF SOLAR IS BACK-FED)
SUBPANEL (ONLY IF SOLAR IS BACK-FED)
CODE REF: NEC 705.12(B)(3)(2)

SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN

TURN RAPID SHUTDOWN SWITCH TO THE "OFF" POSITION TO SHUT DOWN PV SYSTEM AND REDUCE SHOCK HAZARD IN THE ARRAY



LABEL- 6:
LABEL LOCATION:
AC DISCONNECT
CODE REF: [NEC 690.56(C)(1)(A)]

RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

LABEL- 7:
LABEL LOCATION:
AC DISCONNECT
MAIN SERVICE PANEL (ONLY IF SOLAR IS BACK-FED)
CODE REF: NEC 690.56(C)(2)

DC DISCONNECT

LABEL- 8:
LABEL LOCATION:
INVERTER
CODE REF: NEC 690.13(B)

AC DISCONNECT
PHOTOVOLTAIC SYSTEM POWER SOURCE

NOMINAL OPERATING AC VOLATGE	240 V
RATED AC OUTPUT CURRENT	42.00 A

LABEL- 9:
LABEL LOCATION:
AC DISCONNECT
CODE REF: NEC 690.54

MAXIMUM VOLTAGE	480 V
MAXIMUM CIRCUIT CURRENT	53.00 A
MAXIMUM RATED OUTPUT CURRENT OF THE CHARGE CONTROLLER OR DC-TO-DC CONVERTER (IF INSTALLED)	

LABEL- 10:
LABEL LOCATION:
ON THE RIGHT SIDE OF THE INVERTER (PRE-EXISTING ON THE INVERTER)
CODE REF: NEC 690.53

TOP TIER SOLAR SOLUTIONS

TOP TIER SOLAR SOLUTIONS

1530 CENTER PARK DR #2911,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	06/08/2025	

PROJECT NAME & ADDRESS

DONNA M JENKINS RESIDENCE

389 DEWAR ST,
FUQUAY-VARINA, NC 27526

DRAWN BY
ESR

SHEET NAME
LABELS

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-8

Introduction

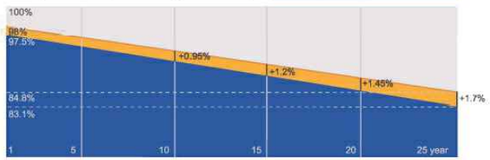
Assembled with 11BB PERC cells, the half-cell configuration of the modules offers the advantages of higher power output, better temperature-dependent performance, reduced shading effect on the energy generation, lower risk of hot spot, as well as enhanced tolerance for mechanical loading.

- Higher output power
- Lower LCOE
- Less shading and lower resistive loss
- Better mechanical loading tolerance

Superior Warranty

- 25-year product warranty
- 25-year linear power output warranty

0.55% Annual Degradation Over 25 years



New linear power warranty ■ Standard module linear power warranty

Comprehensive Certificates

- IEC 61215, IEC 61730,UL 61215, UL 61730
- ISO 9001: 2015 Quality management systems
- ISO 14001: 2015 Environmental management systems
- ISO 45001: 2018 Occupational health and safety management systems
- IEC TS 62941: 2016 Terrestrial photovoltaic (PV) modules – Guidelines for increased confidence in PV module design qualification and type approval

JA SOLAR

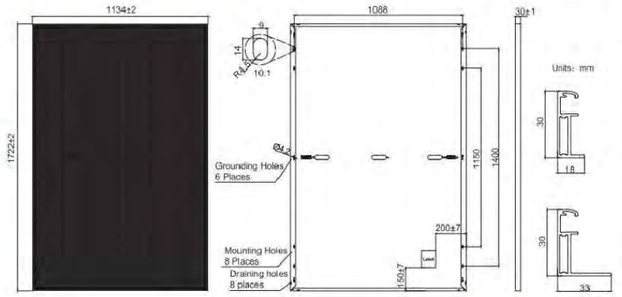
www.jasolar.com

Specifications subject to technical changes and tests.
JA Solar reserves the right of final interpretation.

JA SOLAR

JAM54S31 380-405/MR Series

MECHANICAL DIAGRAMS



Remark: customized frame color and cable length available upon request.

SPECIFICATIONS

Cell	Mono
Weight	21.5kg±3%
Dimensions	1722±2mm×1134±2mm×30±1mm
Cable Cross Section Size	4mm² (IEC) , 12 AWG(UL)
No. of cells	108(6x18)
Junction Box	IP68, 3 diodes
Connector	MC4-EVO2(1500V)
Cable Length (Including Connector)	Portrait: 300mm(+)/400mm(-); Landscape: 1200mm(+)/1200mm(-)
Packaging Configuration	36pcs/Pallet, 864pcs/40ft Container

ELECTRICAL PARAMETERS AT STC

TYPE	JAM54S31 -380/MR	JAM54S31 -385/MR	JAM54S31 -390/MR	JAM54S31 -395/MR	JAM54S31 -400/MR	JAM54S31 -405/MR
Rated Maximum Power(Pmax) [W]	380	385	390	395	400	405
Open Circuit Voltage(Voc) [V]	36.58	36.71	36.85	36.98	37.07	37.23
Maximum Power Voltage(Vmp) [V]	30.28	30.46	30.64	30.84	31.01	31.21
Short Circuit Current(Isc) [A]	13.44	13.52	13.61	13.70	13.79	13.87
Maximum Power Current(Imp) [A]	12.55	12.64	12.73	12.81	12.90	12.98
Module Efficiency [%]	19.5	19.7	20.0	20.2	20.5	20.7
Power Tolerance	±2%					
Temperature Coefficient of Isc(α_Isc)	+0.045%/℃					
Temperature Coefficient of Voc(β_Voc)	-0.275%/℃					
Temperature Coefficient of Pmax(γ_Pmp)	-0.350%/℃					
STC	Irradiance 1000W/m², cell temperature 25°C, AM1.5G					

Remark: Electrical data in this catalog do not refer to a single module and they are not part of the offer.They only serve for comparison among different module types.

ELECTRICAL PARAMETERS AT NOCT

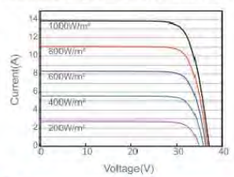
TYPE	JAM54S31 -380/MR	JAM54S31 -385/MR	JAM54S31 -390/MR	JAM54S31 -395/MR	JAM54S31 -400/MR	JAM54S31 -405/MR
Rated Max Power(Pmax) [W]	286	290	294	298	302	306
Open Circuit Voltage(Voc) [V]	34.36	34.49	34.62	34.75	34.88	35.12
Max Power Voltage(Vmp) [V]	28.51	28.68	28.87	29.08	29.26	29.47
Short Circuit Current(Isc) [A]	10.75	10.82	10.89	10.96	11.03	11.10
Max Power Current(Imp) [A]	10.03	10.11	10.18	10.25	10.32	10.38
NOCT	Irradiance 800W/m², ambient temperature 20°C,wind speed 1m/s, AM1.5G					

OPERATING CONDITIONS

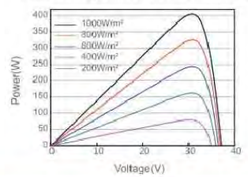
Maximum System Voltage	1000V/1500V DC
Operating Temperature	-40℃~+85℃
Maximum Series Fuse Rating	25A
Maximum Static Load,Front* Maximum Static Load,Back*	5400Pa(112lb/ft²) 2400Pa(50lb/ft²)
NOCT	45±2℃
Safety Class	Class Ⅱ
Fire Performance	UL Type 1

CHARACTERISTICS

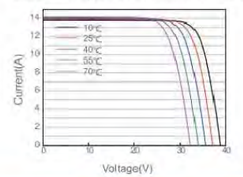
Current-Voltage Curve JAM54S31-405/MR



Power-Voltage Curve JAM54S31-405/MR



Current-Voltage Curve JAM54S31-405/MR



Premium Cells, Premium Modules

Version No. : Global_EN_20231130A

TOP TIER SOLAR SOLUTIONS

TOP TIER SOLAR SOLUTIONS
1530 CENTER PARK DR #2911,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	06/08/2025	

PROJECT NAME & ADDRESS

DONNA M JENKINS RESIDENCE

389 DEWAR ST,
FUQUAY-VARINA, NC 27526

DRAWN BY
ESR

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-9

intertek
Total Quality. Assured.

AUTHORIZATION TO MARK

This authorizes the application of the Certification Mark(s) shown below to the models described in the Product(s) Covered section when made in accordance with the conditions set forth in the Certification Agreement and Listing Report. This authorization also applies to multiple listee model(s) identified on the correlation page of the Listing Report.

This document is the property of Intertek Testing Services and is not transferable. The certification mark(s) may be applied only at the location of the Party Authorized To Apply Mark.

Applicant:	Shanghai JA Solar Technology Co., Ltd.	**Manufacturer:**	JA SOLAR VIET NAM COMPANY LIMITED.
Address:	No. 118, Lane 3111, West Huancheng Road, Fengxian District, 201401 Shanghai	**Address:**	Lot G, Quang Chau industrial park, Quang Chau Ward, Viet Yen Town, Bac Giang Province, 236110
Country:	P. R. China	**Country:**	Vietnam

Party Authorized To Apply Mark: Same as Manufacturer
Report Issuing Office: Intertek Testing Services Shanghai Limited

Control Number: *5020189* **Authorized by:** _____
for L. Matthew Snyder, Certification Manager

This document supersedes all previous Authorizations to Mark for the noted Report Number.

Intertek Testing Services NA Inc.
545 East Algonquin Road, Arlington Heights, IL 60005
Telephone 800-345-3851 or 847-439-5667 Fax 312-283-1672

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

intertek
Total Quality. Assured.

AUTHORIZATION TO MARK

Product:	Crystalline Silicon Photovoltaic modules
Brand Name:	JA SOLAR 晶澳
Models:	JAM72S03-385/PR, JAP72S03-340/SC, JAM72S10- followed by 395, 400, 405, 410 or 415 followed by /MB, JAM60S10- followed by 330, 335, 340 or 345 followed by /MB, JAM72S10- followed by 395, 400, 405, 410 or 415 followed by /MR, JAM66S10- followed by 365, 365, 370, 375 or 380 followed by /MR, JAM60S10- followed by 330, 335, 340 or 345 followed by /MR, JAM72S09- followed by 370, 375, 380, 385, 390, 395 or 400 followed by /PR, JAM60S09- followed by 310, 315, 320 or 325 followed by /PR, JAM72S09- followed by 375, 380 or 385 followed by /BP, JAM60S09- followed by 315 or 320 followed by /BP, JAM72S10- followed by 385, 390, 395 or 400 followed by /BP, JAM60S10- followed by 320, 325 or 330 followed by /BP, JAM72S10- followed by 380, 385, 390, 395, 400 or 405 followed by /PR, JAM60S10- followed by 320, 325, 330 or 335 followed by /PR, JAM72S12- followed by 365, 370, 375, 380 or 385 followed by /PR, JAM60S12- followed by 305, 310, 315 or 320 followed by /PR, 1JAM78S10- followed by 435, 440, 445, 450 or 455 followed by /MR, 1JAM6(K)-72-335/4BB/1500V, JAM60S17- followed by 320, 325, or 330 followed by /MR, JAM72S20- followed by 430, 435, 440, 445, 450, 455, 460, 465 or 470 followed by /MR, JAM60S20- followed by 355, 360, 365, 370, 375, 380, 385 or 390 followed by /MR, JAM72S30- followed by 530, 535, 540, 545, 550 or 555 followed by /MR, JAM66S30- followed by 490, 495 or 500 followed by /MR, JAM68S11- followed by 355, 360 or 365 followed by /PR, JAM68S11- followed by 345, 350, 355, 360 or 365 followed by /PR(B), JAM76S11- followed by 395, 400, 405, 410 or 415 followed by /PR(B), JAM76S11- followed by 395, 400, 405, 410 or 415 followed by /PR(B)/1000V, JAM78S30-followed by 575, 580, 585, 590, 595, 600, 605 or 610 followed by /GR, JAM72S30-followed by 535, 540, 545, 550, 555 or 560 followed by /GR, JAM66S30-followed by 490, 495, 500 or 505 followed by /GR, JAM60S30-followed by 445, 450, 455 or 460 followed by /GR, JAM54S30-followed by 400, 405, 410, 415 or 420 followed by /GR, JAM78S31-followed by 570, 575, 580, 585 or 590 followed by /GR, JAM72S31-followed by 530, 535 or 540 followed by /GR, JAM66S31-followed by 485, 490 or 495 followed by /GR, JAM60S31-followed by 440, 445 or 450 followed by /GR, JAM54S31-followed by 395, 400 , 405, 410 or 415 followed by /GR, JAM60S31-followed by 430, 435, 440, 445 or 450 followed by /GR/1000V, JAM54S31-followed by 390, 395, 400, 405, 410 or 415 followed by /GR/1000V, JAM54S30-followed by 400, 405, 410, 415, 420 or 425 followed by /MR, JAM72S31-followed by 510, 515, 520, 525, 530, 535, 540 or 545 followed by /MR, JAM54S31-followed by 385, 390, 395, 400 or 405 followed by /MR, JAM54S30-followed by 400, 405, 410, 415, 420 or 425 followed by /MR/1000V, JAM72S31-followed by 510, 515, 520, 525, 530,535, 540 or 545 followed by /MR/1000V, JAM54S31-followed by 385, 390, 395, 400 or 405 followed by /MR/1000V, JAM72S17-followed by 390, 395, 400 or 405 followed by /MR, JAM72S17-followed by 390, 395, 400 or 405 followed by /MR/1000V, JAM78S30- followed by 580, 585, 590, 595, 600 or 605 followed by /MR,JAM72S30-followed by 555, 560, 565, 570, 575, 580 followed by /LR, JAM54S30-followed by 415, 420, 425, 430, 435 followed by /LR, JAM54S31-followed by 415, 420 followed by /LR, JAM54S30-followed by 385, 390, 395, 400, 405, 410 followed by /MB, JAM54S31-followed by 385, 390, 395, 400, 405 followed by /MB, JAM54S30-followed by 410, 415, 420, 425 followed by /LB, JAM54S31-followed by 410, 415 followed by /LB · JAM72S30-followed by 535, 540, 545, 550 followed by /MB, JAM72S31-followed by 525, 530, 535, 540 followed by /MB.

TOP TIER SOLAR SOLUTIONS

TOP TIER SOLAR SOLUTIONS
1530 CENTER PARK DR #2911,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	06/08/2025	

PROJECT NAME & ADDRESS

DONNA M JENKINS RESIDENCE
389 DEWAR ST,
FUQUAY-VARINA, NC 27526

DRAWN BY
ESR

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-10

Residential Power Optimizer

For North America

S440 / S500B / S650B

POWER OPTIMIZER

PV power optimization at the module level

- Specifically designed to work with SolarEdge residential inverters
- Detects abnormal PV connector behavior, preventing potential safety issues
- Module-level voltage shutdown for installer and firefighter safety
- Superior efficiency (99.5%)
- Mitigates all types of module mismatch loss, from manufacturing tolerance to partial shading
- Faster installations with simplified wire management and easy assembly using a single bolt
- Flexible system design for maximum space utilization
- Compatible with bifacial PV modules
- Meets NEC requirements for arc fault protection (AFCI) and Photovoltaic Rapid Shutdown System (PVRSS)

solaredge.com

solaredge

Residential Power Optimizer

For North America

S440 / S500B / S650B

	S440	S500B	S650B	
INPUT				
Rated Input DC Power[1]	440[2]	500[3]	650	W
Absolute Maximum Input Voltage (Voc)	60	125	85	Vdc
MPPT Operating Range	8 – 60	12.5 – 105	12.5 – 85	Vdc
Maximum Input Current (Maximum Isc of Connected PV Module)[2]	14.5	15		Adc
Maximum Input Short Circuit Current[4]	18.75			Adc
Maximum Efficiency	99.5			%
Weighted Efficiency	98.6			%
Overvoltage Category	II			
OUTPUT DURING OPERATION (POWER OPTIMIZER CONNECTED TO OPERATING SOLAREDGE INVERTER)				
Maximum Output Current	15			Adc
Maximum Output Voltage	60	80		Vdc
OUTPUT DURING STANDBY (POWER OPTIMIZER DISCONNECTED FROM SOLAREDGE INVERTER OR INVERTER OFF)				
Safety Output Voltage per Power Optimizer	1 ± 0.1			Vdc
STANDARD COMPLIANCE				
Photovoltaic Rapid Shutdown System	CSA C22.2#330, NEC 2014 – 2023			
EMC	FCC Part 15 Class B; IEC 61000-6-2; IEC 61000-6-3			
Safety	CSA C22.2#107.1; IEC 62109-1 (Class II Safety); UL 1741			
Material	UL 94 V-0, UV Resistant			
RoHS	Yes			
Fire Safety	VDE-AR-E 2100-712:2013-05			
INSTALLATION SPECIFICATIONS				
Maximum Allowed System Voltage	1000			Vdc
Dimensions (W x L x H)	129 x 155 x 30 / 5.07 x 6.10 x 1.18	129 x 165 x 45 / 5.07 x 6.49 x 1.77		mm / in
Weight	720 / 1.6	790 / 1.74		gr / lb
Input Connector	MC4			
Input Wire Length	0.1 / 0.32			m / ft
Output Connector	MC4			
Output Wire Length	(+) 2.3, (-) 0.10 / (+) 7.54, (-) 0.32			m / ft
Operating Temperature Range[5]	-40 to +85			°C
Protection Rating	IP68 / NEMA6P			
Relative Humidity	0 – 100			%

(1) Rated power of the module at STC will not exceed the power optimizer Rated Input DC Power. Modules with up to +5% power tolerance are allowed.
(2) For S440 with part number S440-1GM4MRMP, the Rated Input DC Power is 650W, and the Maximum Input Current is 15A.
(3) For installations after Aug 1st, 2024, the Rated Input DC Power for S500B is 650W.
(4) The Maximum Input Short Circuit Current is adjusted for worst case conditions of ambient temperature, irradiance, bifacial gain, and so on, in accordance with NEC and CSA.
(5) Power derating is applied for ambient temperatures above +85°C / +185°F for S440, and for ambient temperatures above +75°C / 167°F for S500B and S650B. Refer to the Power Optimizers Temperature Derating technical note for more details.

PV System Design Using a SolarEdge Inverter[6]		SolarEdge Home Wave/Hub Single Phase	Three Phase for 208V Grid	Three Phase for 277/480V Grid	
Minimum String Length (Power Optimizers)	S440	8	10	18	
	S500B, S650B	6	8	14	
Maximum String Length (Power Optimizers)		25		50[7]	
Maximum Usable Power Delivered per String		5700	6000	12,750	W
Maximum Allowed Connected Power per String[8][10]	Inverters with Rated AC Power ≤ 5700W	Per the inverter's maximum input DC power[8]	One string: 7200 Two strings or more: 7800	15,000	W
	Inverters with Rated AC Power of 6000W	5700			
	Inverters with Rated AC Power ≥ 7600W	6800, only when connected to at least two strings			
Parallel Strings of Different Lengths or Orientations		Yes			

(6) It is not allowed to mix S-series and P-series Power Optimizers in new installations in the same string.
(7) A string with more than 30 optimizers does not meet NEC rapid shutdown requirements; safety voltage will be above the 30V requirement.
(8) Refer to the Single String Design Guidelines application note for details.
(9) For the 208V grid, the maximum is permitted only when the difference in connected power between strings is 1,000W or less.
(10) For the 240V or 277/480V grids, the maximum is permitted only when the difference in connected power between strings 2,000W or less.

Intertek RoHS

TOP TIER SOLAR SOLUTIONS

1530 CENTER PARK DR #2911,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	06/08/2025	

PROJECT NAME & ADDRESS

DONNA M JENKINS RESIDENCE

389 DEWAR ST,
FUQUAY-VARINA, NC 27526

DRAWN BY
ESR

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-11

SolarEdge Home Hub Inverter

Single Phase, for North America

For Inverters Assembled in the USA

SE3800H-US / SE5700H-US / SE7600H-US / SE10000H-US / SE11400H-US

HOME BACKUP

Single phase inverter for storage and backup applications

- The ultimate home energy manager in charge of PV production, battery storage, backup operation during a power outage*, EV Charging, and smart energy devices
- Record-breaking 99% weighted efficiency with up to 300% DC oversizing
- Supports LRA – can provide the required energy for HVAC systems starting during backup operation
- Integrates seamlessly with the complete SolarEdge Home Smart Energy Ecosystem, through SolarEdge Home Network
- Module-level monitoring and visibility of battery status, PV production, and self-consumption data
- Fast and easy installation – small and lightweight, with reduced commissioning time
- A scalable solution that supports future homeowner needs through easy connection to a growing ecosystem of products
- Advanced safety features with integrated arc fault protection and rapid shutdown for 690.11 and 690.12
- Advanced reliability with automotive-grade components
- Embedded revenue grade production data, ANSI C12.20 Class 0.5
- IP65-rated, for indoor and outdoor installations

*Requires additional hardware and firmware version upgrade.

solaredge.com

solaredge

SolarEdge Home Hub Inverter

Single Phase, for North America

SE3800H-US / SE5700H-US / SE7600H-US / SE10000H-US / SE11400H-US

Model Number[1][2]	SE3800H-US	SE5700H-US	SE7600H-US	SE10000H-US	SE11400H-US	Units
OUTPUT – AC ON GRID						
Rated AC Power	3800 @ 240V 3300 @ 208V	5760 @ 240V 5000 @ 208V	7600	10000	11,400 @ 240V 10,000 @ 208V	W
Maximum AC Power Output	3800 @ 240V 3300 @ 208V	5760 @ 240V 5000 @ 208V	7600	10000	11,400 @ 240V 10,000 @ 208V	W
AC Output Voltage (Nominal)	208 / 240					Vac
AC Output Voltage (Range)	183 – 264					Vac
AC Frequency Range (min - nom - max)	59.3 – 60 – 60.5[3]					Hz
Maximum Continuous Output Current	16	24	32	42	48	A
GFDI Threshold	1					A
Total Harmonic Distortion (THD)	< 3					%
Power Factor	1, adjustable -0.85 to 0.85					
Utility Monitoring, Islanding Protection, Country Configurable Thresholds	Yes					
Charge Battery from AC (if allowed)	Yes					
Typical Nighttime Power Consumption	< 2.5					W
OUTPUT – AC STAND-ALONE (BACKUP)[4][5]						
Rated AC Power in Stand-alone Operation	11,400[6]					W
Maximum Stand-alone Capacity	11,400					W
AC L-L Output Voltage Range in Stand-alone Operation	211 – 264					Vac
AC L-N Output Voltage Range in Stand-alone Operation	105 – 132					Vac
AC Frequency Range in Stand-alone (min - nom - max)	55 – 60 – 65					Hz
Maximum Continuous Output Current in Stand-alone Operation	48					A
GFDI	1					A
THD	< 5					%
OUTPUT – SOLAREDGE HOME EV CHARGER AC						
Rated AC Power	9600					W
AC Output Voltage Range	211 – 264					Vac
On-Grid AC Frequency Range (min - nom - max)	59.3 – 60 – 60.5					Hz
Maximum Continuous Output Current @240V (grid, PV and battery)	40					Aac
INPUT – DC (PV AND BATTERY)						
Transformer-less, Ungrounded	Yes					
Max Input Voltage	480					Vdc
Nom DC Input Voltage	380					Vdc
Reverse-Polarity Protection	Yes					
Ground-Fault Isolation Detection	600kΩ Sensitivity					
INPUT – DC (PV)						
Maximum DC Power @ 240V	11,400	11,520	15,200	20,000	22,800	W
Maximum DC Power @ 208V	6600	10,000	-	-	20,000	W
Maximum Input Current[7] @ 240V	20	30.5	40	53	60	Adc
Maximum Input Current[7] @ 208V	17.5	27	-	-	53	Adc
Maximum Input Short Circuit Current	45					Adc
Maximum Inverter Efficiency	99.2					%
CEC Weighted Efficiency	98.5		99		99 @ 240V 98.5 @ 208V	%
2-pole Disconnection	Yes					

(1) These specifications apply to inverters with part numbers SExxxxH-USMNUxxx5 and SExxxxH-USMNFxxx5 and connection unit model number DCD-1PH-US-PxH-F-x.
(2) Inverters with part number SExxxxH-USMNFxxx5 are intended for upgrade installations only, as part of the "Re-Energize" program. Use on non-upgrade installations will revoke the product warranty.
(3) For other regional settings please refer to the SolarEdge Inverters, Power Control Options Application Note.
(4) Not designed for non-grid connected applications and requires AC for commissioning. Stand-alone (backup) functionality is only supported for the 240V grid.
(5) For LRA (Locked Rotor Amperage) values please refer to the LRA for NAM Application Note.
(6) For models SE7600H-US and below, the rated AC stand-alone power is configurable between 7600W or 11,400W from CPU version 4.20.xx.
(7) A higher current source may be used. The inverter will limit its input current to the values stated.

CE ETL Intertek 4004100

TOP TIER SOLAR SOLUTIONS

TOP TIER SOLAR SOLUTIONS

1530 CENTER PARK DR #2911,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	06/08/2025	

PROJECT NAME & ADDRESS

DONNA M JENKINS
RESIDENCE

389 DEWAR ST,
FUQUAY-VARINA, NC 27526

DRAWN BY
ESR

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-12

SolarEdge Home Hub Inverter

Single Phase, for North America

SE3800H-US / SE5700H-US / SE7600H-US / SE10000H-US / SE11400H-US

Model Number[1][2]	SE3800H-US	SE5700H-US	SE7600H-US	SE10000H-US	SE11400H-US	Units
OUTPUT – DC (BATTERY)						
Supported Battery Types	SolarEdge Home Battery, LG RESU Prime					
Number of Batteries per Inverter	Up to 3 SolarEdge Home Battery, up to 2 LG RESU Prime					
Continuous Power[8]	11,400 @ 240V 3800 @ 208V	11,400 @ 240V 5000 @ 208V	11400 @240V		11,400 @ 240V 10,000 @ 208V	W
Peak Power[8]	11,400 @ 240V 3800 @ 208V	11,400 @ 240V 5000 @ 208V	11400 @240V		11,400 @ 240V 10,000 @ 208V	W
Maximum Input Current	30					Adc
2-pole Disconnection	Up to the inverter's rated stand-alone power					
SMART ENERGY CAPABILITIES						
Consumption Metering	Built-in[9]					
Stand-alone & Battery Storage	With Backup Interface (purchased separately) for service up to 200A; up to 3 inverters					
EV Charging	Direct connection to the SolarEdge Home EV Charger					
ADDITIONAL FEATURES						
Supported Communication Interfaces	RS485, Ethernet, Cellular[10], Wi-Fi (optional), SolarEdge Home Network (optional)					
Revenue Grade Metering, ANSI C12.20	Built-in[9]					
Integrated AC, DC and Communication Connection Unit	Yes					
Inverter Commissioning	With the SetApp mobile application using built-in Wi-Fi Access Point for local connection					
DC Voltage Rapid Shutdown (PV and Battery)	Yes, NEC 690.12					
STANDARD COMPLIANCE						
Safety	UL 1741, UL 1741SA, UL 1741SB, UL 1699B, CSA 22.2#107.1, C22,2#330, C22.3#9, ANSI/CAN/UL 9540					
Grid Connection Standards	IEEE1547 and IEEE-1547.1, Rule 21, Rule 14H					
Emissions	FCC Part 15 Class B					
INSTALLATION SPECIFICATIONS						
AC Terminals	L1, L2, N terminal blocks, PE busbar for inverter connection L1, L2 terminal blocks, PE busbar for EV Charger AC connection					
DC Terminals	4 x terminal block pairs for PV input, 1 x terminal block pair for battery input					
AC Output and EV AC Output Conduit Size / AWG Range	1" maximum / 14-4 AWG					
DC Input (PV and Battery) Conduit Size / AWG Range	1" maximum / 14-6 AWG					
Dimensions with Connection Unit (H x W x D)	21.06 x 14.6 x 8.2 / 535 x 370 x 208					in / mm
Weight with Connection Unit	44.9 / 20.3					lb / kg
Noise	< 50					dBA
Cooling	Natural Convection					
Operating Temperature Range	-40 to +140 / -40 to +60[11]					°F / °C
Protection Rating	NEMA 4X					

(8) Discharge power is limited up to the inverter's rated AC power for on-grid and stand-alone applications, as well as up to the installed batteries' rating.
(9) For consumption metering current transformers should be ordered separately: SECT-SPL-225A-T-20 or SEACT1250-400NA-20. Revenue-grade metering is only for production metering.
(10) Information concerning the data plan terms & conditions is available in SolarEdge Communication Plan Terms and Conditions.
(11) Full power up to at least 50°C / 122°F; for power derating information refer to the Temperature Derating Technical Note for North America.

CE

TOP TIER SOLAR SOLUTIONS

TOP TIER SOLAR SOLUTIONS
1530 CENTER PARK DR #2911,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	06/08/2025	

PROJECT NAME & ADDRESS

DONNA M JENKINS
RESIDENCE

389 DEWAR ST,
FUQUAY-VARINA, NC 27526

DRAWN BY
ESR

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-13

Tech Brief

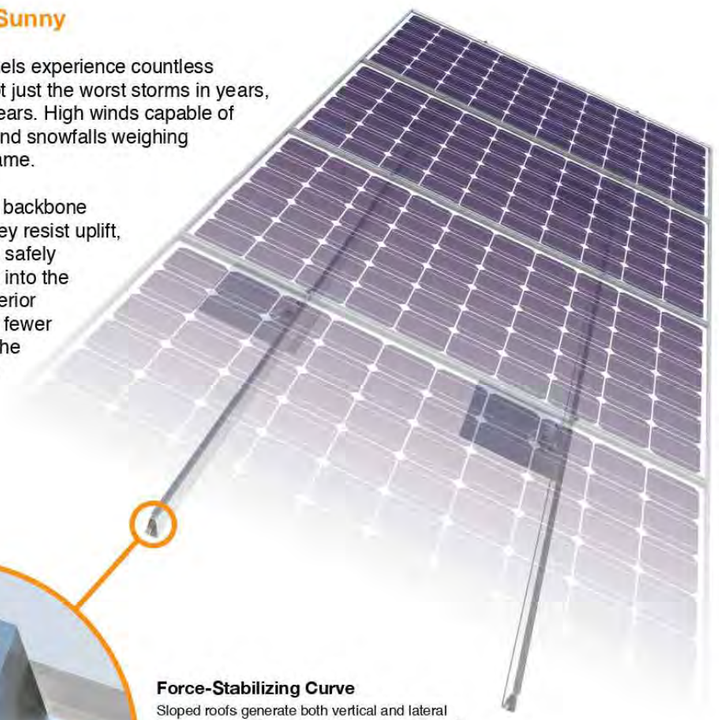
IRONRIDGE

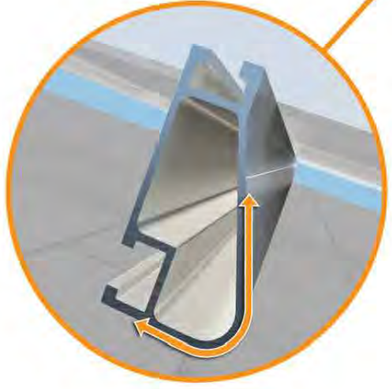
XR Rail® Family

Solar Is Not Always Sunny

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

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





Force-Stabilizing Curve

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

Compatible with Flat & Pitched Roofs

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

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

Corrosion-Resistant Materials

All XR Rails® are made of 6000-series aluminum alloy, then protected with an anodized finish. Anodizing prevents surface and structural corrosion, while also providing a more attractive appearance.

Tech Brief

XR Rail® Family

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

XR10

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

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

XR100

XR100 is a residential and commercial mounting rail. It supports a range of wind and snow conditions, while also maximizing spans up to 10 feet.

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

XR1000

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

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

Rail Selection

The table below was prepared in compliance with applicable engineering codes and standards.* Values are based on the following criteria: ASCE 7-16, Gable Roof Flush Mount, Roof Zones 1 & 2e, Exposure B, Roof Slope of 8 to 20 degrees and Mean Building Height of 30 ft. Visit IronRidge.com for detailed certification letters.

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

*Table is meant to be a simplified span chart for conveying general rail capabilities. Use approved certification letters for actual design guidance.

TOP TIER SOLAR SOLUTIONS

TOP TIER SOLAR SOLUTIONS

1530 CENTER PARK DR #2911,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	06/08/2025	

PROJECT NAME & ADDRESS

DONNA M JENKINS
RESIDENCE

389 DEWAR ST,
FUQUAY-VARINA, NC 27526

DRAWN BY
ESR

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-14

Tech Brief

IRONRIDGE

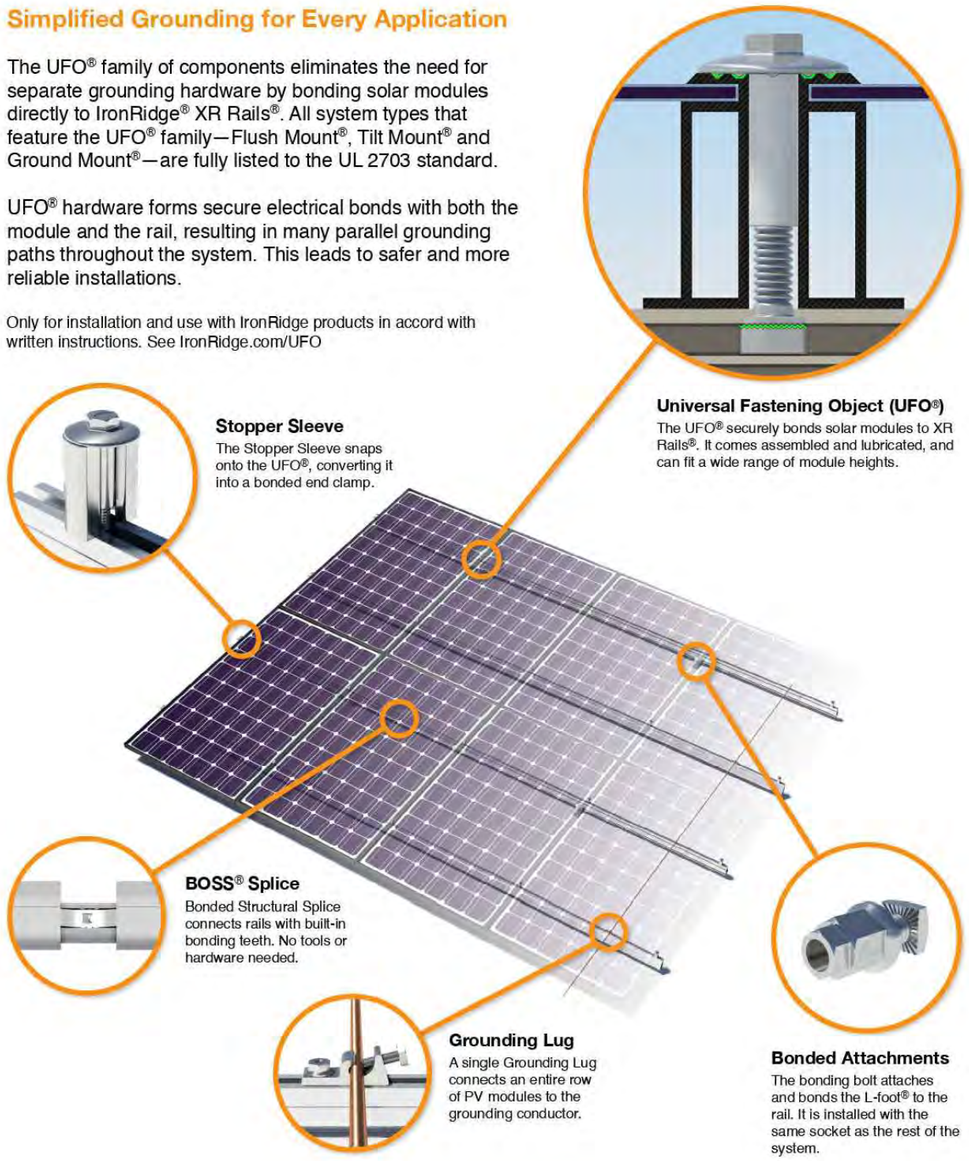
UFO® Family of Components

Simplified Grounding for Every Application

The UFO® family of components eliminates the need for separate grounding hardware by bonding solar modules directly to IronRidge® XR Rails®. All system types that feature the UFO® family—Flush Mount®, Tilt Mount® and Ground Mount®—are fully listed to the UL 2703 standard.

UFO® hardware forms secure electrical bonds with both the module and the rail, resulting in many parallel grounding paths throughout the system. This leads to safer and more reliable installations.

Only for installation and use with IronRidge products in accord with written instructions. See IronRidge.com/UFO



Universal Fastening Object (UFO®)
The UFO® securely bonds solar modules to XR Rails®. It comes assembled and lubricated, and can fit a wide range of module heights.

Stopper Sleeve
The Stopper Sleeve snaps onto the UFO®, converting it into a bonded end clamp.

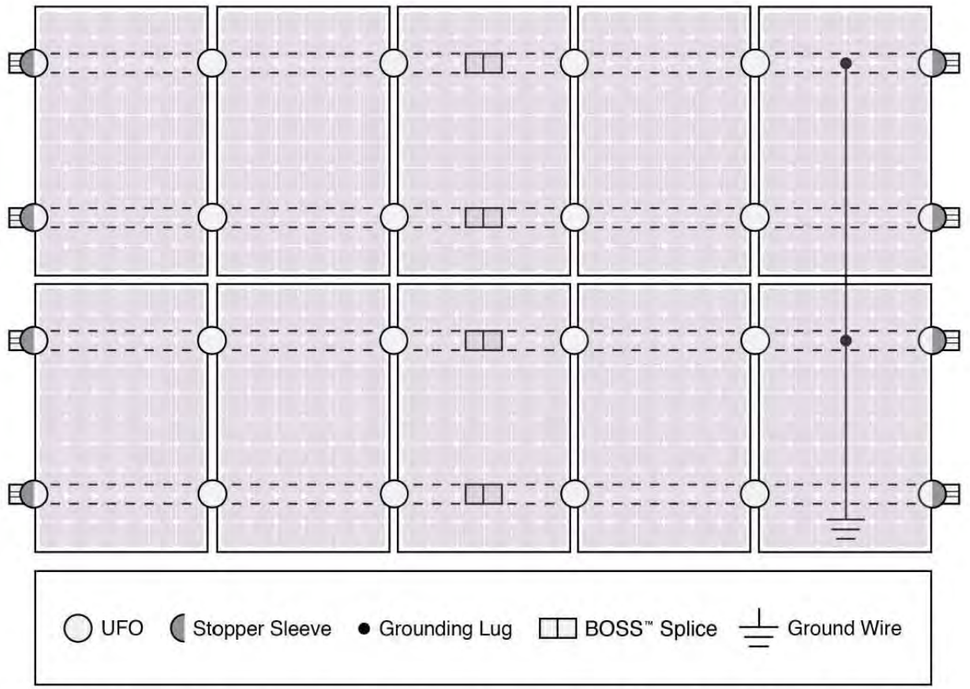
BOSS® Splice
Bonded Structural Splice connects rails with built-in bonding teeth. No tools or hardware needed.

Grounding Lug
A single Grounding Lug connects an entire row of PV modules to the grounding conductor.

Bonded Attachments
The bonding bolt attaches and bonds the L-foot® to the rail. It is installed with the same socket as the rest of the system.

Tech Brief

System Diagram



Approved Enphase microinverters can provide equipment grounding of IronRidge systems, eliminating the need for grounding lugs and field installed equipment ground conductors (EGC). A minimum of two microinverters mounted to the same rail and connected to the same Engage cable is required. Refer to installation manuals for additional details.

UL Certification

The IronRidge® Flush Mount®, Tilt Mount®, and Ground Mount Systems have been listed to UL 2703 by Intertek Group plc.

UL 2703 is the standard for evaluating solar mounting systems. It ensures these devices will maintain strong electrical and mechanical connections over an extended period of time in extreme outdoor environments.

Go to IronRidge.com/UFO

Cross-System Compatibility			
Feature	**Flush Mount**	**Tilt Mount**	**Ground Mount**
XR Rails®	✔	✔	XR100 & XR1000
UFO®/Stopper	✔	✔	✔
BOSS® Splice	✔	✔	N/A
Grounding Lugs	1 per Row	1 per Row	1 per Array
Microinverters & Power Optimizers	Compatible with most MLPE manufacturers. Refer to system installation manual.		
Fire Rating	Class A	Class A	N/A
Modules	Tested or Evaluated with over 400 Framed Modules Refer to installation manuals for a detailed list.		

TOP TIER SOLAR SOLUTIONS

TOP TIER SOLAR SOLUTIONS
1530 CENTER PARK DR #2911,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	06/08/2025	

PROJECT NAME & ADDRESS

DONNA M JENKINS RESIDENCE
389 DEWAR ST,
FUQUAY-VARINA, NC 27526

DRAWN BY
ESR

SHEET NAME
EQUIPMENT SPECIFICATION

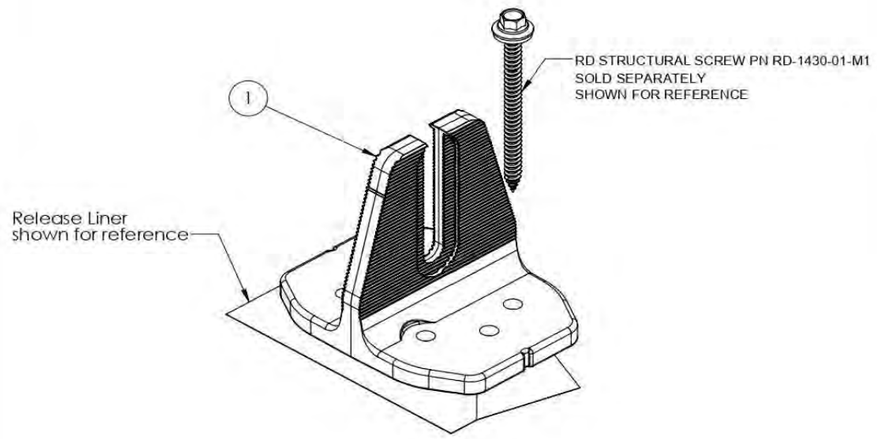
SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-15

Cut Sheet

IRONRIDGE

QuickMount® Halo UltraGrip

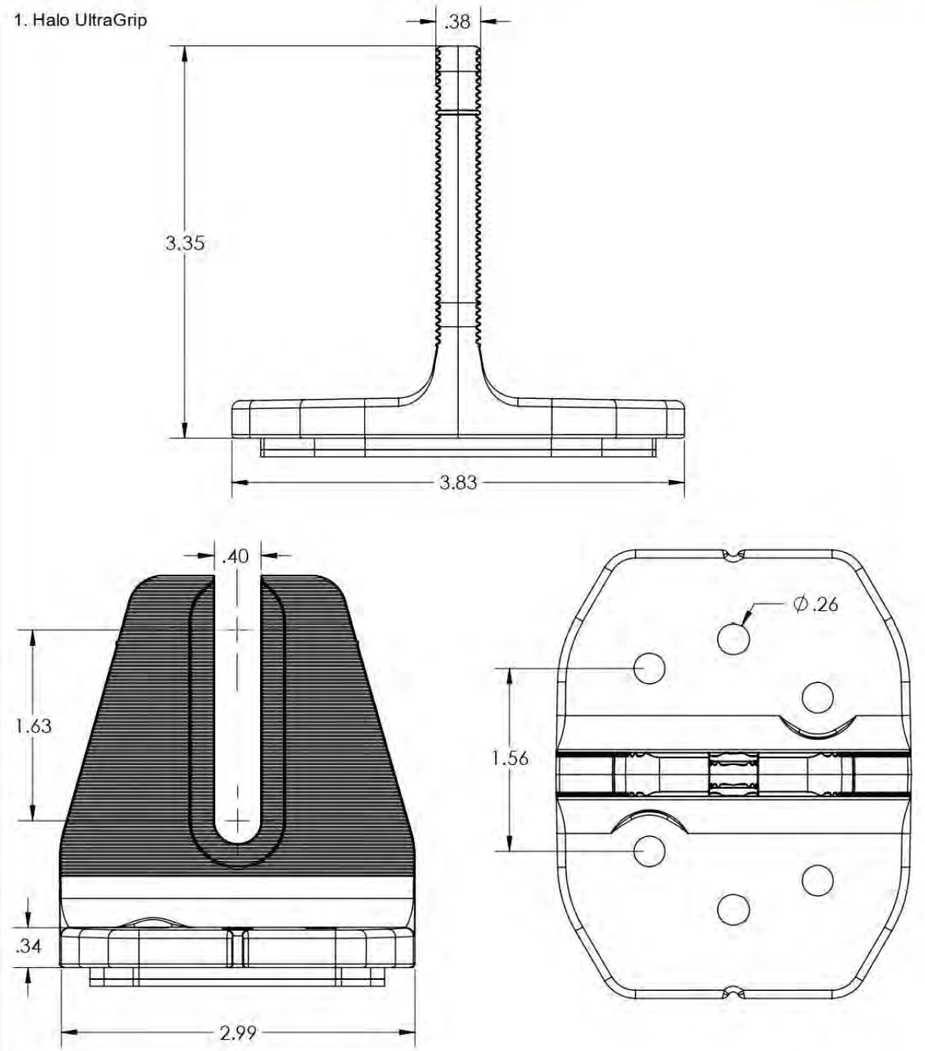


ITEM NO	DESCRIPTION	QTY IN KIT
1	QM Halo UltraGrip(Mill or Black)	1

PART NUMBER	DESCRIPTION
QM-HUG-01-M1	Halo UltraGrip - Mill
QM-HUG-01-B1	Halo UltraGrip - Black

Cut Sheet

1. Halo UltraGrip



Property	Value
Material	3000 Series Aluminium
Finish	Mill or Black

© 2022 IronRidge, Inc. All rights reserved. Visit www.ir-patents.com for patent information.

QM-HUG-01-B1 or QM-HUG-01-M1 Cut Sheet Rev 1.0

TOP TIER SOLAR SOLUTIONS

TOP TIER SOLAR SOLUTIONS

1530 CENTER PARK DR #2911,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	06/08/2025	

PROJECT NAME & ADDRESS

DONNA M JENKINS
RESIDENCE

389 DEWAR ST,
FUQUAY-VARINA, NC 27526

DRAWN BY
ESR

SHEET NAME
EQUIPMENT SPECIFICATION

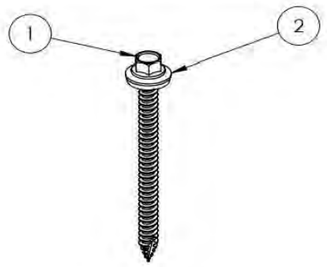
SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-16

Cut Sheet

IRONRIDGE

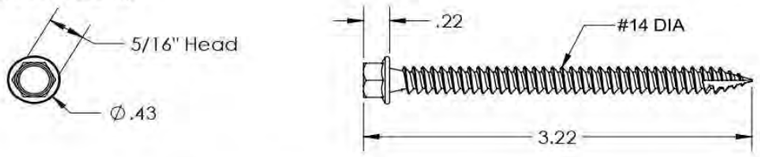
QuickMount® RD Structural Screw



ITEM NO	DESCRIPTION	QTY IN KIT
1	Self Drilling Screw, #14, Wood Tip	1
2	Washer, EPDM Backed	1

PART NUMBER	DESCRIPTION
RD-1430-01-M1	RD Structural Screw

1. Self Drilling Screw, #14, Wood Tip



Property	Value
Material	300 Series Stainless Steel
Finish	Clear

2. Washer, EPDM Backed

Property	Value
Material	300 Series Stainless Steel
Finish	Clear

QM-RD-1430-01-M1 Cut Sheet Rev 1.0

TOP TIER SOLAR SOLUTIONS

TOP TIER SOLAR SOLUTIONS

1530 CENTER PARK DR #2911,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	06/08/2025	

PROJECT NAME & ADDRESS

DONNA M JENKINS
RESIDENCE

389 DEWAR ST,
FUQUAY-VARINA, NC 27526

DRAWN BY

ESR

SHEET NAME

EQUIPMENT
SPECIFICATION

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-17

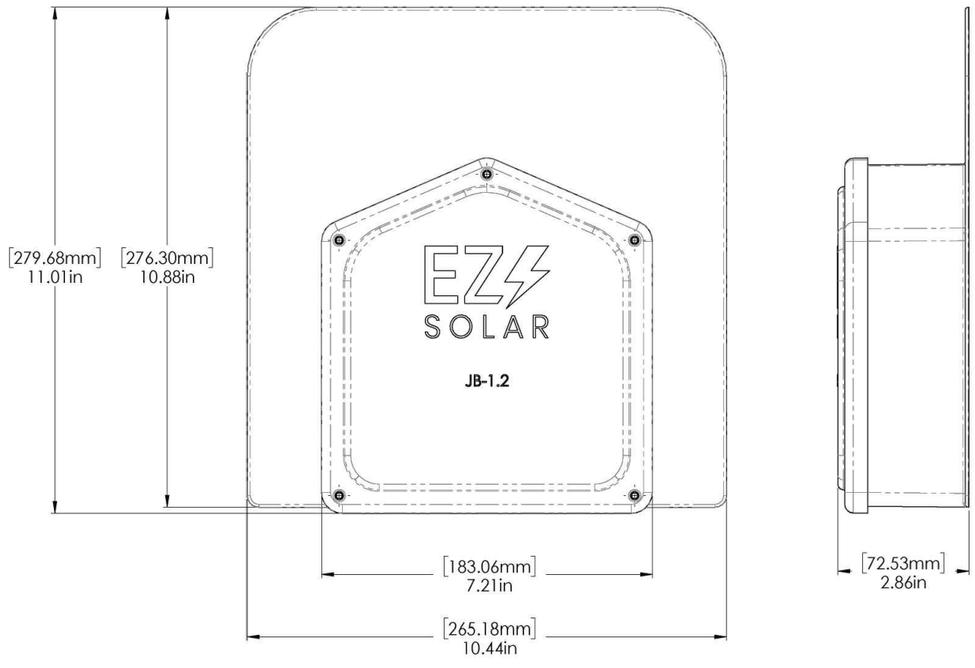
EZ SOLAR
making solar simple.

PHONE: 385-202-4150
WWW.EZSOLARPRODUCTS.COM

ITEM NO.	PART NUMBER	DESCRIPTION	QTY
1	JB-1.2 BODY	POLYCARBONATE WITH UV INHIBITORS	1
2	JB-1.2 LID	POLYCARBONATE WITH UV INHIBITORS	1
3	#10 X 1-1/4" PHILLIPS PAN HEAD SCREW		6
4	#8 X 3/4" PHILLIPS PAN HEAD SCREW		6

SIZE	DWG. NO.	REV
B	JB-1.2	
SCALE: 1:2	WEIGHT: 1.45 LBS	SHEET 1 OF 3

TORQUE SPECIFICATION:	15-20 LBS
CERTIFICATION:	UL 1741, NEMA 3R CSA C22.2 NO. 290
WEIGHT:	1.45 LBS

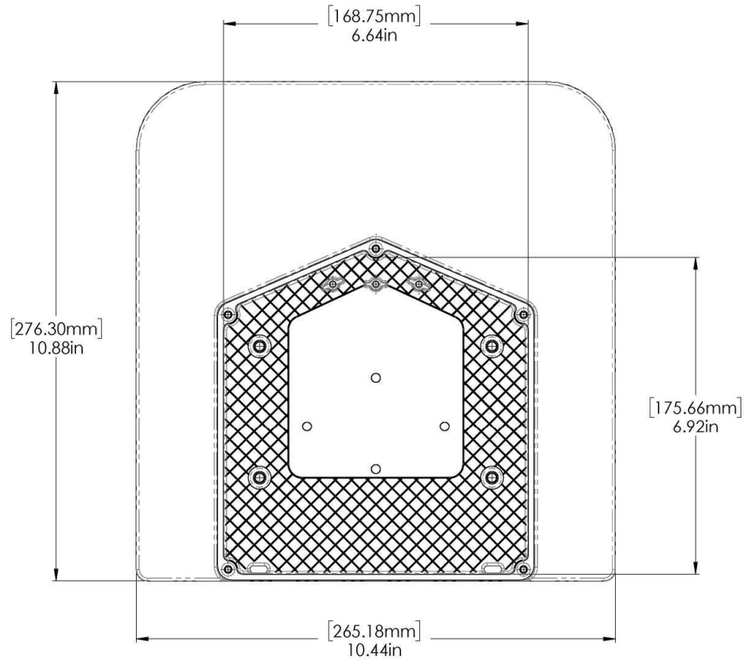


Intertek 5015705

EZ SOLAR
making solar simple.

PHONE: 385-202-4150
WWW.EZSOLARPRODUCTS.COM

SIZE	DWG. NO.	REV
B	JB-1.2	
SCALE: 1:2	WEIGHT: 1.45 LBS	SHEET 2 OF 3



PROPRIETARY AND CONFIDENTIAL: THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF EZ SOLAR. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF EZ SOLAR IS PROHIBITED.

Intertek 5015705

TOP TIER SOLAR SOLUTIONS

TOP TIER SOLAR SOLUTIONS
1530 CENTER PARK DR #2911,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	06/08/2025	

PROJECT NAME & ADDRESS

DONNA M JENKINS RESIDENCE

389 DEWAR ST,
FUQUAY-VARINA, NC 27526

DRAWN BY
ESR

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-18

019248DB0-7A

S440
DO NOT
REMOVE

019248DB0-7A

Made in USA
from imported parts

CE FC

SolarEdge Technologies Ltd.
Power Optimizer

Solaredge Technologies GmbH/
Werner-Eckert-Straße 6/81829
Munich/Germany

CAUTION

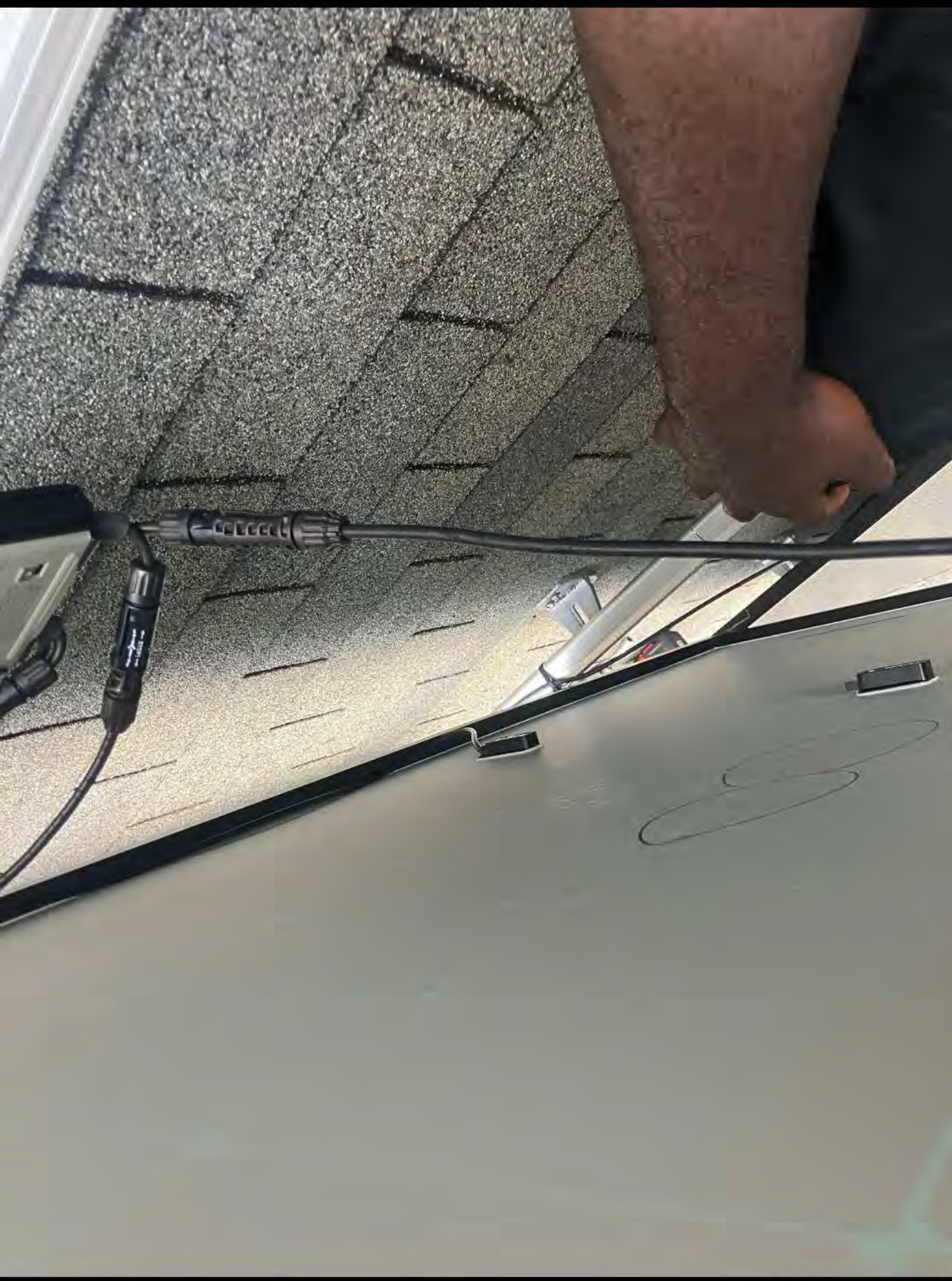
HOT SURFACES-TO REDUCE THE RISK OF BURNS-DO NOT TOUCH
RISK OF ELECTRIC SHOCK-WHEN THE PHOTOVOLTAIC ARRAY IS EXPOSED TO LIGHT, IT SUPPLIES A DC VOLTAGE TO EQUIPMENT. COVER PV MODULE WITH OPAQUE MATERIAL BEFORE CONNECTING OR DISCONNECTING THIS OPTIMIZER.
DURING FAULT, ZERO CURRENT IS SOURCED INTO DC ARRAY BY CONVERTER.

WARNING ELECTRIC SHOCK HAZARD. THE DC CONDUCTORS OF THIS PHOTOVOLTAIC SYSTEM ARE UNGROUNDED AND MAY BE ENERGIZED.

AVERTISSEMENT

RISQUE DE CHOC ELECTRIQUE: QUAND LE CHAMP PHOTOVOTAIQUE EST EXPOSE A LA LUMIERE, UNE TENSION CC EST FOURNIE A CET EQUIPEMENT. SURFACES CHAUDES: NE PAS TOUCHER. AFIN DE REDUIRE LES RISQUES DE BRULURES LE COURANT DE RETOUR INJECTE PAR LE CONVERTISSEUR EN CAS DE DEFAILLANCE DANS LE MODULE PV EST TOUJOURS NUL

FORGE




POWER SOURCE

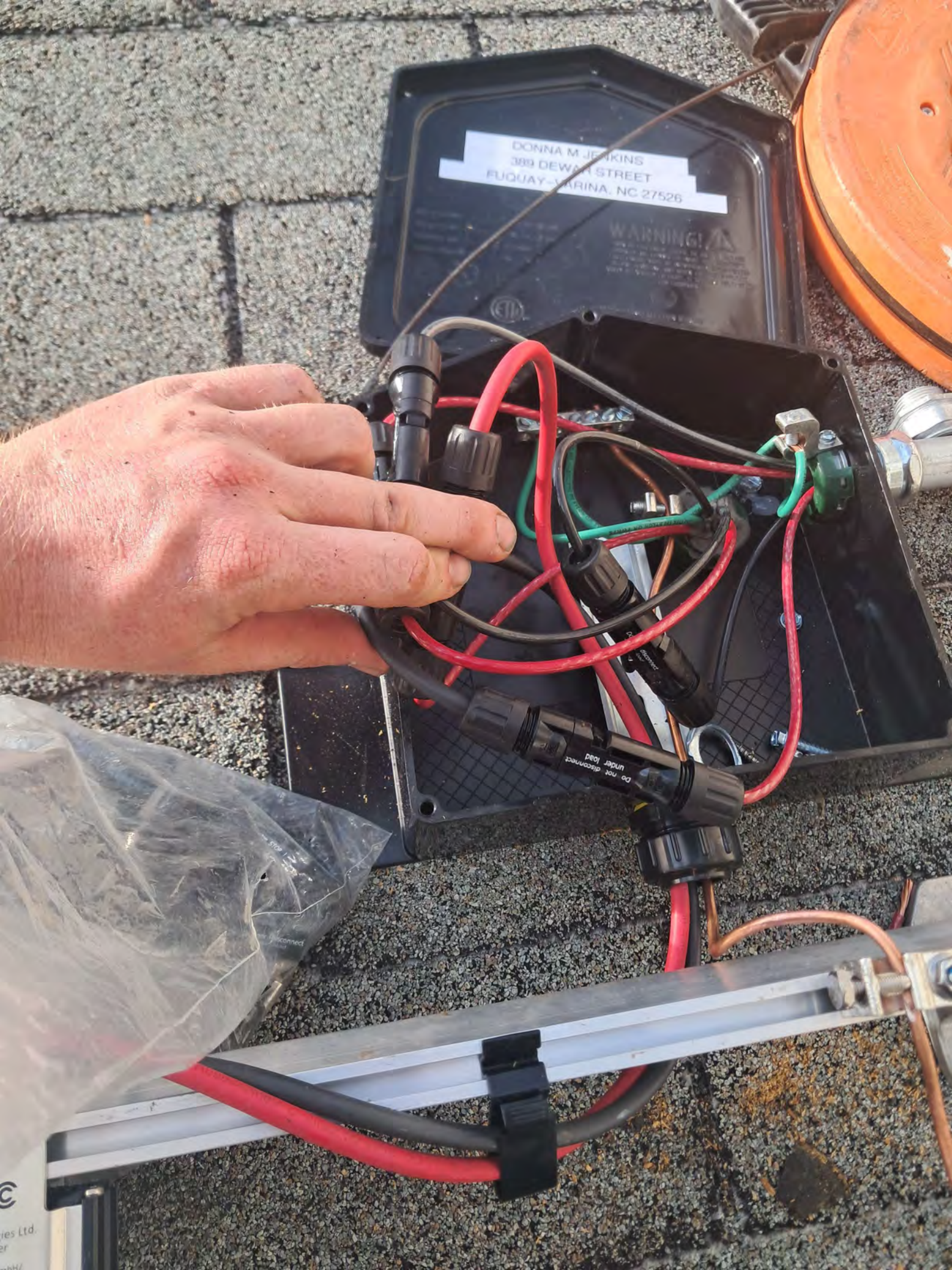
Mike Weber No need to apologize, thank yo...


PHOTOVOLTAIC POWER SOURCE


E491006
3/4" COVER

E49105
3/4" COVER


PHOTOVOLTAIC POWER SOURCE
USA


DONNA M JENKINS
389 DEWAN STREET
FUQUAY-VARINA, NC 27526
WARNING!
Do not disconnect under load

DONNA M JENKINS
389 DEWAR STREET
FUQUAY-VARINA, NC 27526

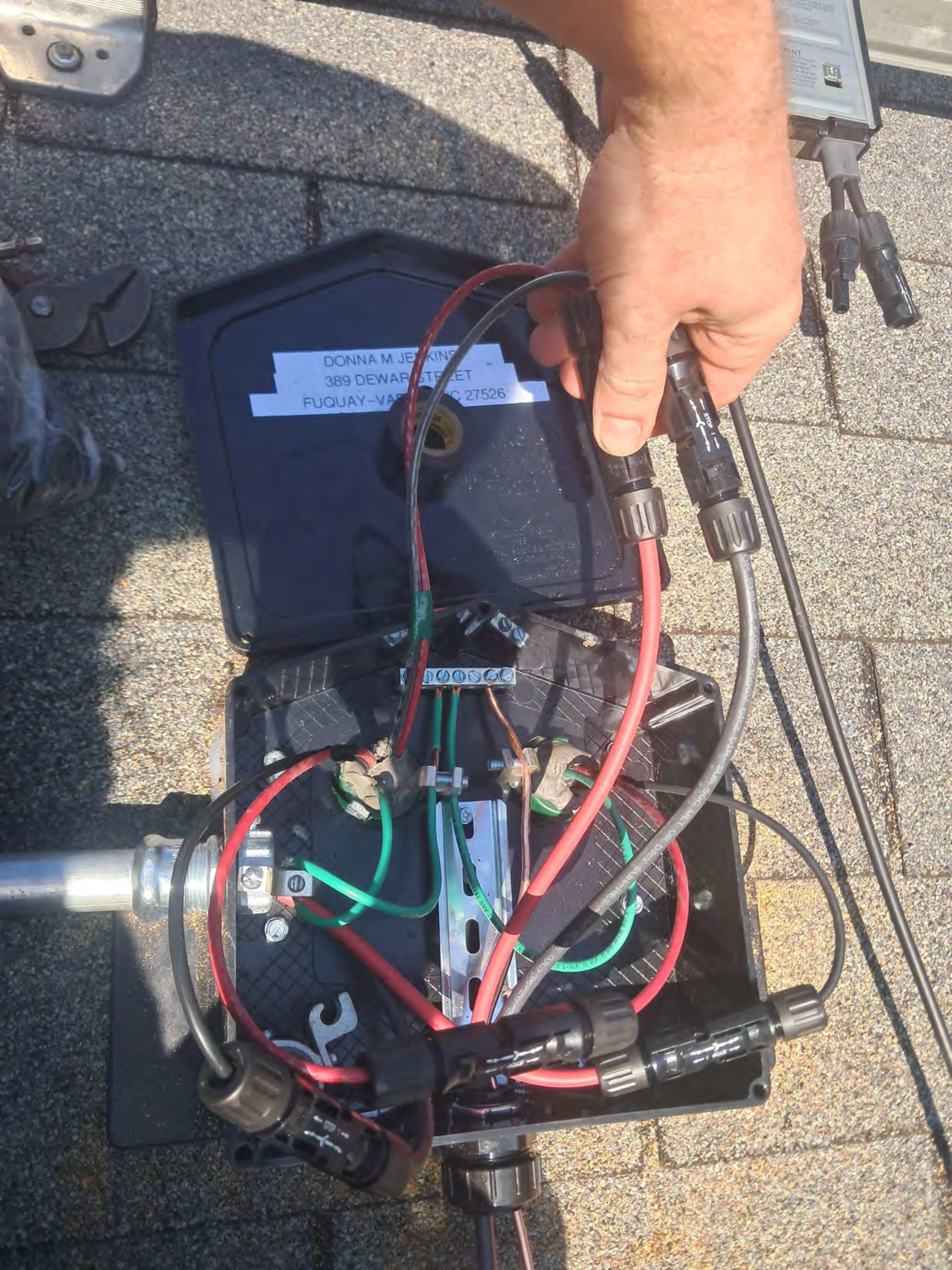

PHOTOVOLTAIC POWER SOURCE


DONNA M JENKINS
389 DEWAR STREET
FUQUAY-VARINA, NC 27526


STOP
VARINA, NC 27526


PHOTOVOLTAIC POWER SOURCE

DONNA M JENKINS
389 DEWAR STREET
FUQUAY-VA[illegible]C 27526


389 DEWAR
27526


XC8.0
M18 REDLITHIUM
FORGE


PHOTOVOLTAIC POWER SOURCE


PHOTOVOLTAIC POWER SOURCE
DONNA M JENKINS
389 DEWAR STREET
FUQUAY-VARINA, NC 27526
WARNING!


CE FC
AVERTISSEMENT


CAUTION
WARNING
AVERTISSEMENT
SolarEdge Technologies Ltd
Power Optimizer
Do not disconnect under load


CAUTION
WARNING
AVERTISSEMENT
SolarEdge Technologies Ltd
Power Optimizer
Made in USA
Do not disconnect
under load

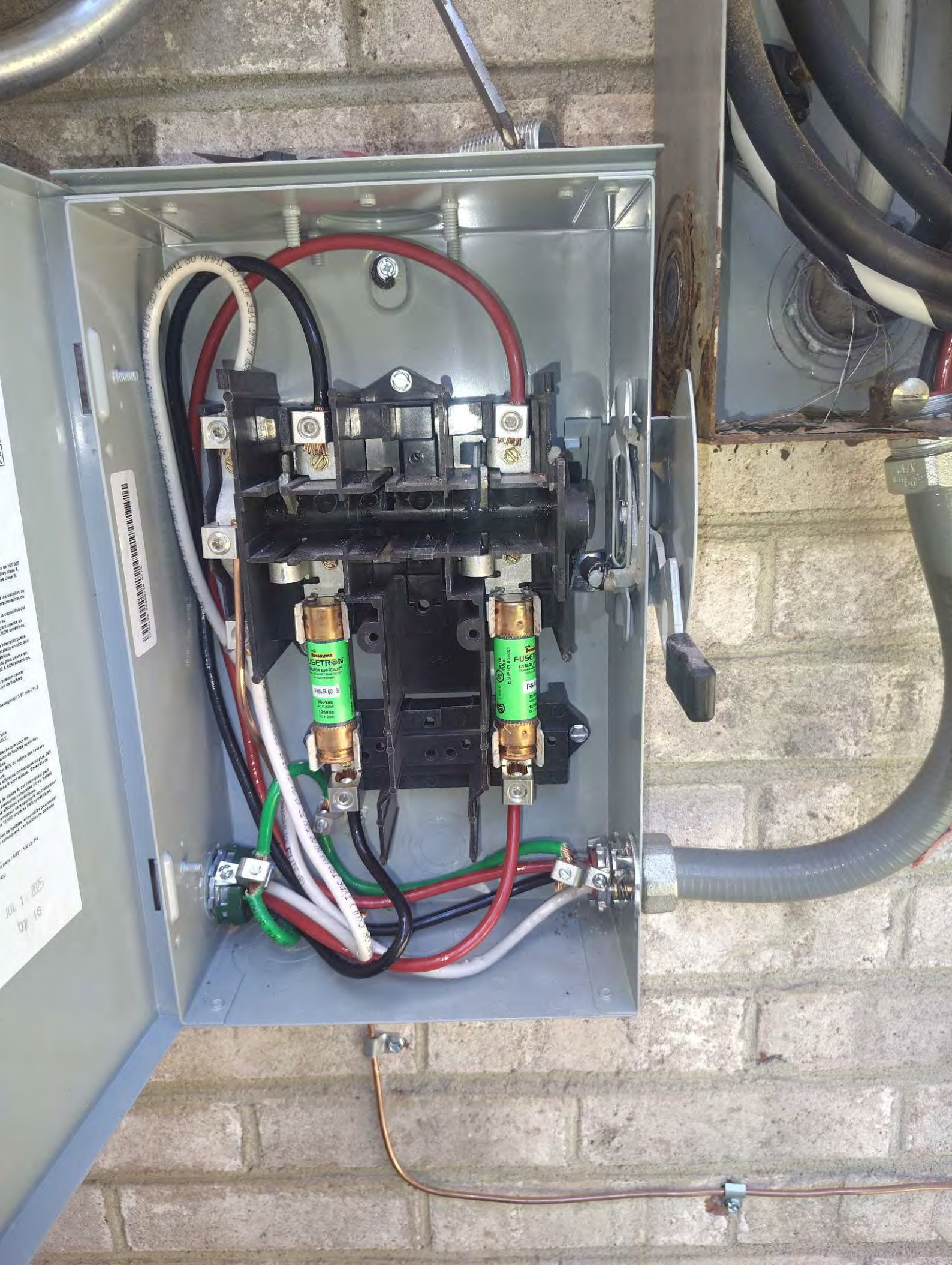

650W/5-60V/15A
8-60V/15A
1V
S42524-019245AC9-60
S440-1GM4MRMP


019245AC9-60
S440
DO NOT
REMOVE
019245AC9-60
Made in USA
from imported parts
CAUTION
HOT SURFACES-TO REDUCE THE RISK OF BURNS-DO NOT TOUCH.
RISK OF ELECTRIC SHOCK-WHEN THE PHOTOVOLTAIC ARRAY IS EXPOSED TO LIGHT, IT SUPPLIES A DC VOLTAGE TO EQUIPMENT. COVER PV MODULE WITH OPAQUE MATERIAL BEFORE CONNECTING OR DISCONNECTING THIS OPTIMIZER.
DURING FAULT, ZERO CURRENT IS SOURCED INTO DC ARRAY BY CONVERTER.
SolarEdge Technologies Ltd.
Power Optimizer
Solaredge Technologies GmbH/
Werner-Eckert-Straße 6/81829
Munich/Germany
WARNING ELECTRIC SHOCK HAZARD. THE DC CONDUCTORS OF THIS PHOTOVOLTAIC SYSTEM ARE UNGROUNDED AND MAY BE ENERGIZED.
AVERTISSEMENT
RISQUE DE CHOC ELECTRIQUE: QUAND LE CHAMP PHOTOVOTAIQUE EST EXPOSE A LA LUMIERE, UNE TENSION CC EST FOURNIE A CET EQUIPEMENT.
SURFACES CHAUDES: NE PAS TOUCHER. AFIN DE REDUIRE LES RISQUES DE BRULURES LE COURANT DE RETOUR INJECTE PAR LE CONVERTISSEUR EN CAS DE DEFAILLANCE DANS LE MODULE PV EST TOUJOURS NUL.
MODULE

PHOTOVOLTAIC POWER SOURCE
EATON

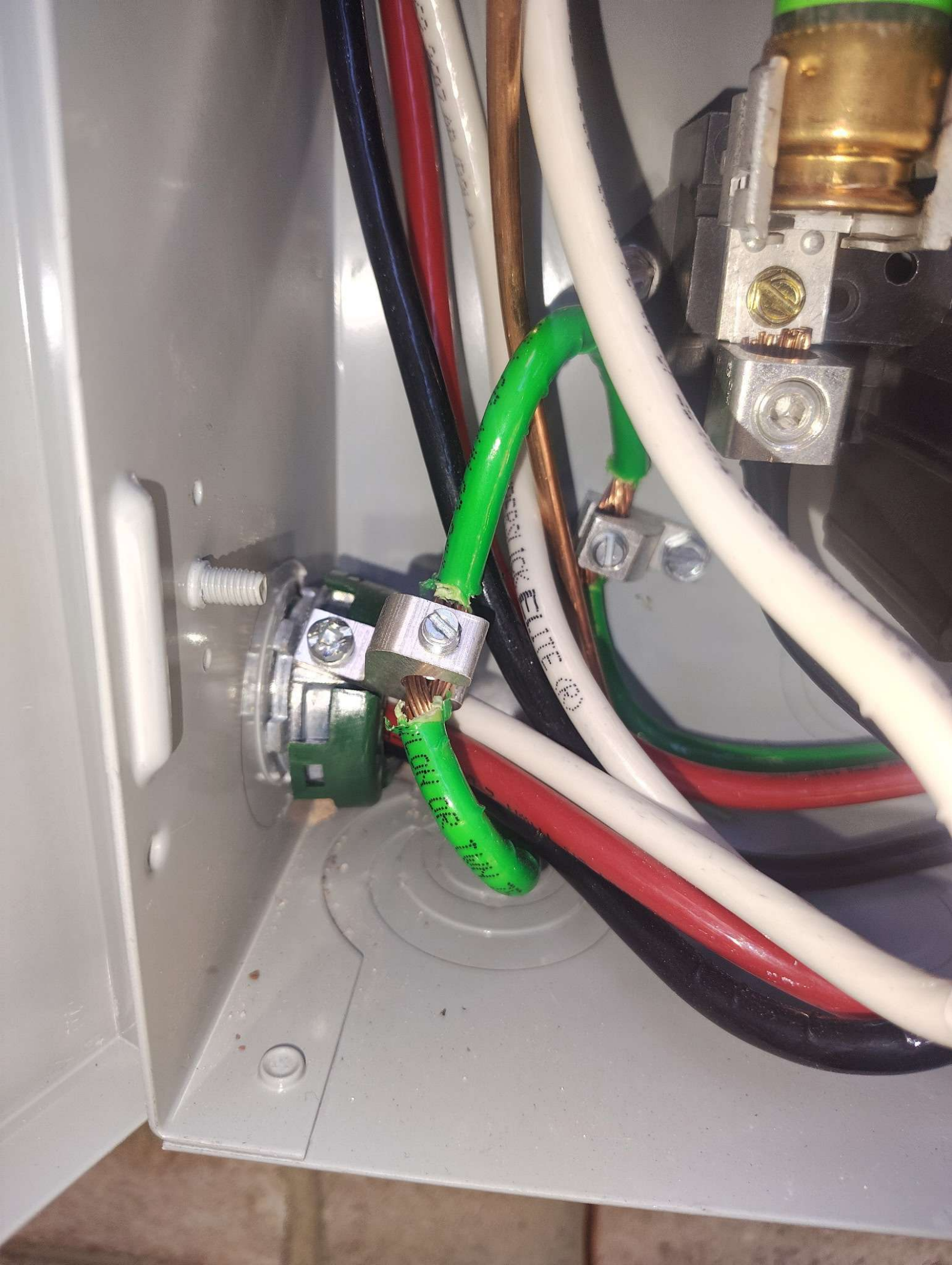

PHOTOVOLTAIC POWER SOURCE


TELEPHONE
NETWORK
INTERFACE
SNAP
CUSTOMER
ACCESS
SCREW
MFG. BY
SIECOR

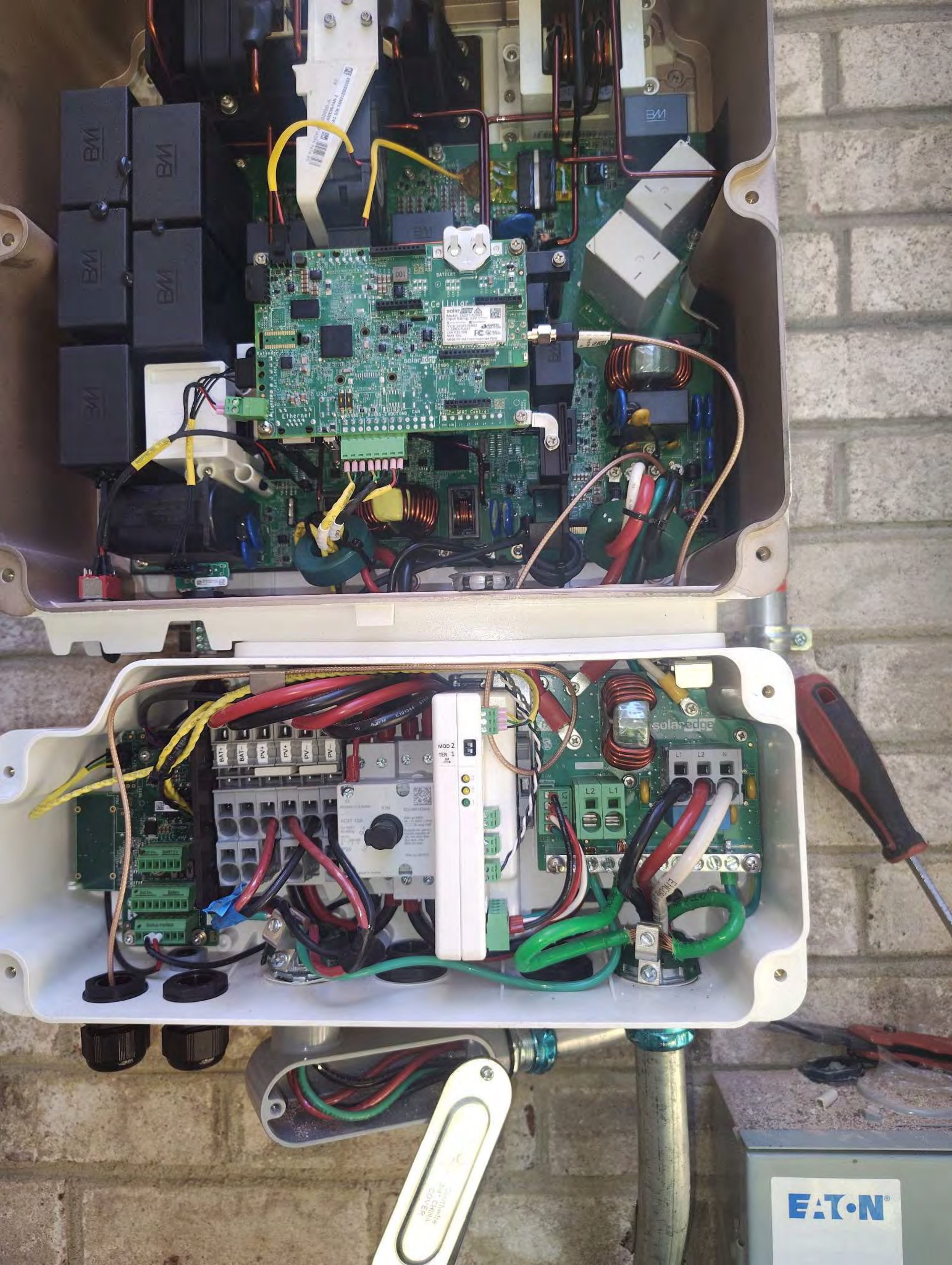

FRN-R-60
250Vac
130Vdc


Bussmann
FUSETRON
ENERGY EFFICIENT
DUAL-ELEMENT TIME-DELAY
CLASS RK5 FUSE
FRN-R-60
250Vac
AC IR 200kA
125Vdc
DC IR 20kA

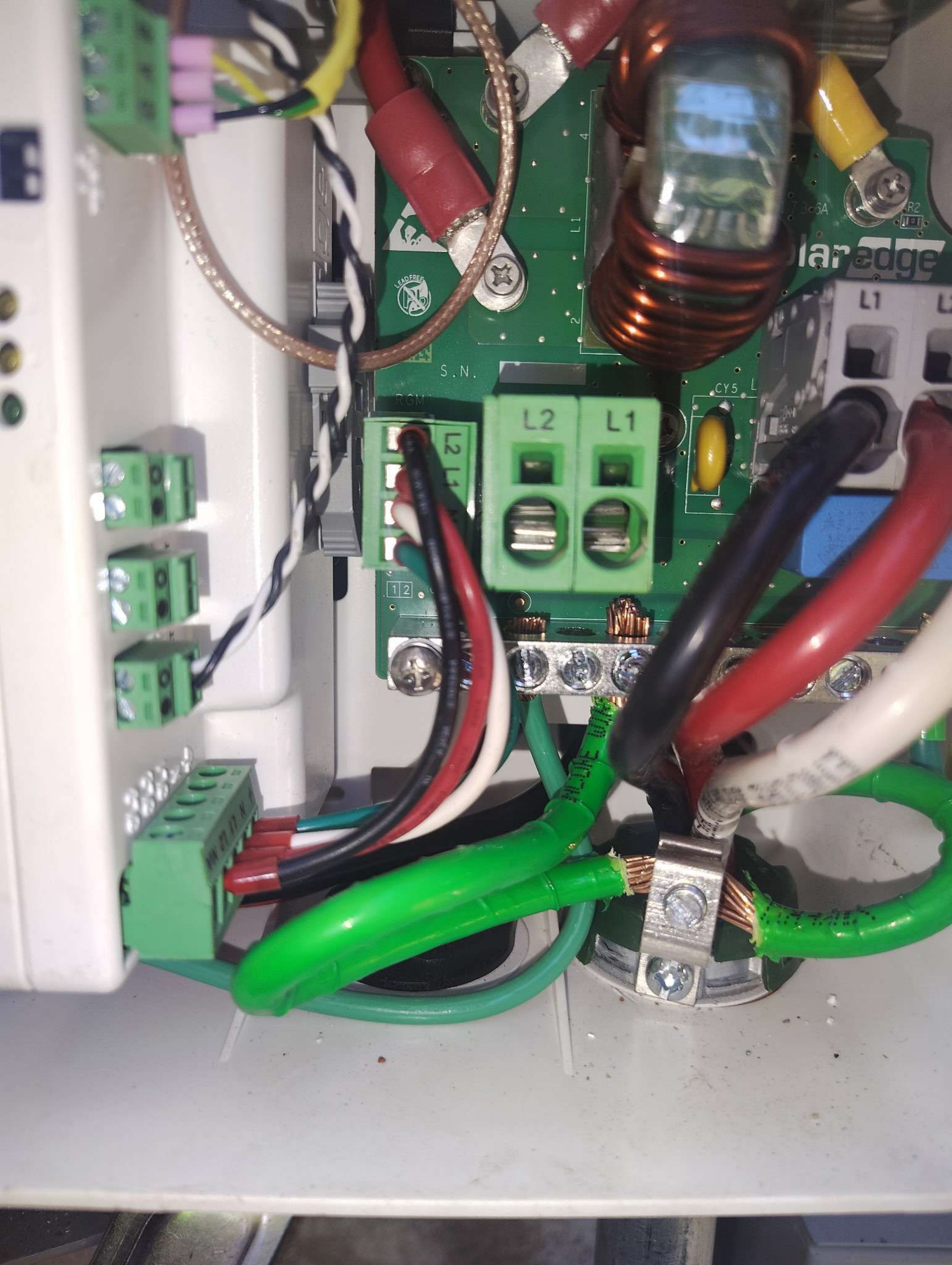

Bussmann
FUSETRON
ENERGY EFFICIENT
DUAL-ELEMENT TIME-DELAY
CLASS RK5 FUSE
FRN-R-60
250Vac
AC IR 200kA
125Vdc
DC IR 20kA

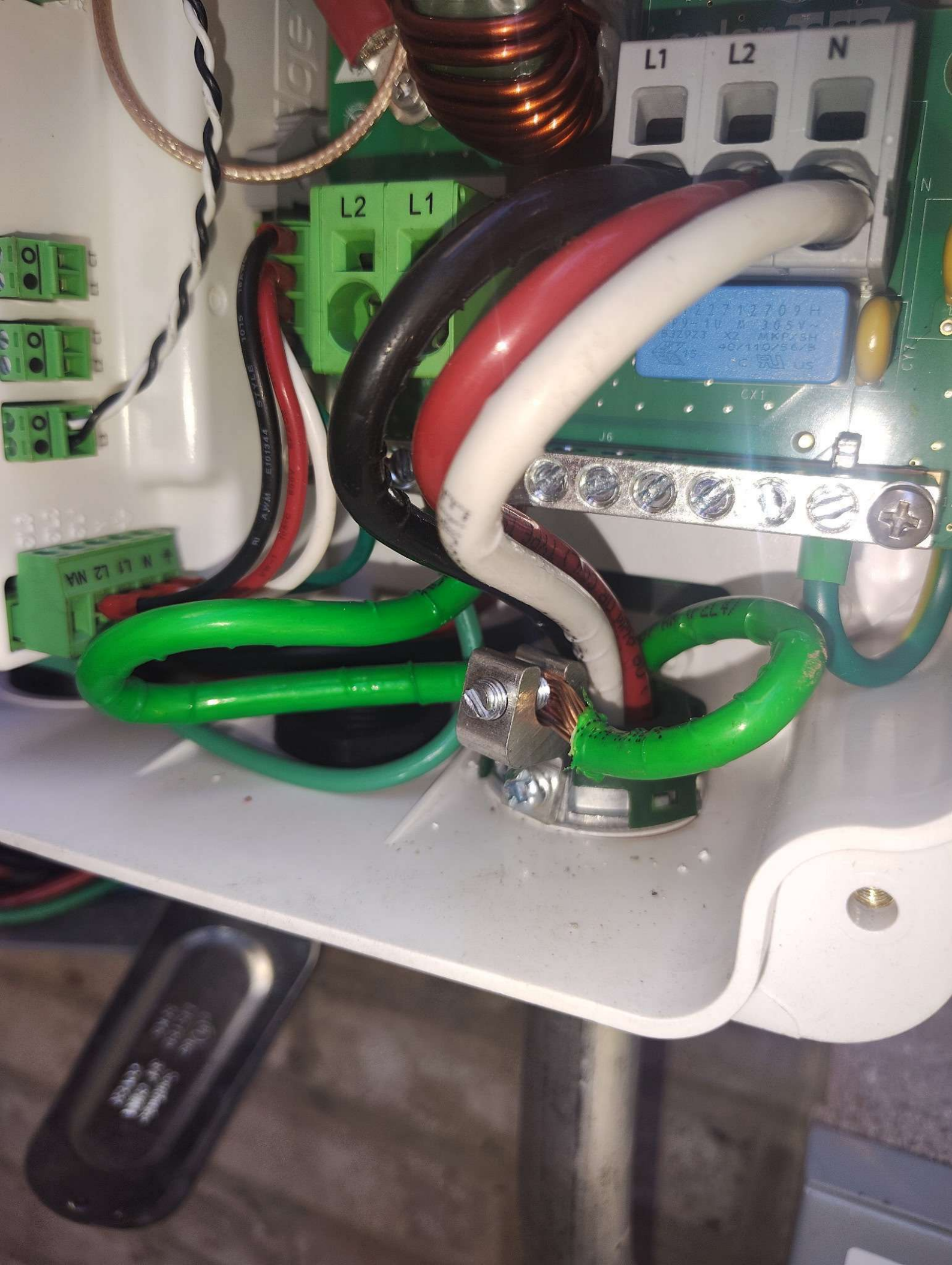



CB-1
TYPE D
FUSE


BAT+
BAT-
PV+
PV+
PV-
PV-
MOD 2
TER 1
solaredge
L1 L2 N
L2 L1
EATON


BAT+
BAT−
PV+
PV+
PV−
PV−
13
IEC60947-3 VDE0660
ON
ECI-SW-DQ64S
AC21 10A
Ue 690V
50-60Hz
0
OFF
AC15
V~ 230 400
A 3 2
LOCK
Wire Cu 60/75°C
Made in Austria
AWM
MOD
TER
UP


S.N.
RGM
L2
L1
CY5
L1


L1
L2
N
L2
L1
N
J6
CX1
CX2

PHOTOVOLTAIC POWER SOURCE

SIEMENS

ON

OFF


Und. Lab. Inc. List.
Circuit Breaker
2 Pole Unit
Issue No. MJ-4510
SIEMENS
Pc. No. 61534
ON


PHOTOVOLTAIC POWER SOURCE


OLTAIC POWER SOURCE


Kitchen
Fragile
Heavy
Not OK


PHOTOVOLTAIC POWER SOURCE


OTOVOLTAIC POWER SOURCE


SUN-RES
OTOVOLTAIC POWER SOURCE


PHOTOVOLTAIC POWER SOURCE


PHOTOVOLTAIC POWER SOURC


CAUTION


CAUTION
CHICK-FIL-A, INC.


CAU
SOLAR ELECTRIC


CAUTION
SOLAR ELECTRIC SYSTEM CONNECTED