ELECTRICAL RESIDENTIAL

910-893-7525

www.harnett.org

PERMIT NUMBER

ERES2505-0008

JOB ADDRESS: 466 WOODWIND DR	**PERMIT SUBTYPE:** RESIDENTIAL SOLAR PANELS	**PARCEL NO:** 0534-51-4734.000
DESCRIPTION: 26 roof mounted solar panels	**DATE ISSUED:** 5/20/2025	**DATE EXPIRED:**
PLAN NAME:	**ZONING DISTRICT:** RA-20R - 0.35 acres (100.0%)	

APPLICANT: Top Tier Solar Solutions, LLC 1530 Center Park Dr. Charlotte, NC 28217	**PHONE:** (855)997-1213 **EMAIL:** nc@toptiersolarsolutions.com
CONTRACTOR: Top Tier Solar Solutions, LLC 1530 Center Park Dr. Charlotte, NC 28217	**PHONE:** (855)997-1213 **EMAIL:** nc@toptiersolarsolutions.com
OWNER: HARRISON SHIRLEY M 466 WOODWIND DR SPRING LAKE, NC 28390 SPRING LAKE, NC 28390-0000	**PHONE:** **EMAIL:**

REQUIRED INSPECTIONS

INSPECTION TYPE	APPROVAL	DATE	COMMENTS
FINAL**			
ROUGH IN			

PV LETTERS

Contractor Address: Top Tier Solar Solutions
1530 Center Park Dr #2911,
Charlotte, NC 28217

May 09, 2025

Subject: Proposed Solar Panel Installation
Shirley Harrison Residence, 466 Woodwind Dr, Spring Lake, NC
DC System Size: 10.530 kW
PV Letters Job #004-22515

To Whom it May Concern,

We have reviewed information, provided by our client, related to the proposed solar panel installation at the above-referenced address. The purpose of the review was to determine if the existing roof is structurally adequate for the proposed installation. Based on our review and analysis of the given information, and in accordance with governing building codes, I certify that the capacity of the structural roof framing that directly supports the additional gravity loading due to the solar panel supports and modules had been reviewed and determined to meet or exceed the requirements in accordance with the Design Criteria.

Design Parameter Summary

Governing Building Code: 2018 North Carolina Residential Code
Risk Category: II
Wind Exposure: C
Design Wind Speed: 120 mph
Ground Snow Load: 15 psf

Roof Information

Roof Structure: 2x4 @ 24" O.C. (Assumed)
Roofing Material: Metal Roof
Roof Slope: 18, 36 degrees

Roof Connection Details

S-5! ProteaBracket to existing metal roof, at 45" O.C. max
Stagger attachments to avoid overloading any individual truss top chord.

Engineering Analysis

The proposed installation - including weight of panels, racking, mounts, and inverters where applicable - will be approximately 3 psf. In the areas where panels are installed, roof live loads will not be present. The reduction of roof live load is adequate to fully or partially compensate for the addition of the panel installation. Because the member forces in the area of the solar panels are not increased by more than 5%, and so per provisions in the adopted building codes, the structure need not be altered for gravity loading.

The proposed installation will be 6" max. above the roof surface (flush mounted) and parallel to the roof surface. Therefore, any increase in wind loading on the building structure from the solar panel installation is expected to be negligible. Wind is the governing lateral load case. Because the increase in lateral loading is not increased by more than 10%, per provisions in the adopted building codes, the structure need not be altered for lateral loading.

Wind uplift on the panels has been calculated in accordance with the relevant provisions of ASCE 7-10. This loading has been used to verify the adequacy of the connection specified above. Connection locations should be in accordance with design drawings.

IronRidge XR10 rails will support the modules and will fasten to the roof structure with S-5! ProteaBracket along the rail.

Conclusion

The roof structure need not be altered for either gravity loading (including snow) or lateral loading (including wind). Therefore, the existing structure is permitted to remain unaltered. Connections to the roof must be made per the "Roof Connection Details" section above. Copies of all relevant calculations are enclosed.

Limitations and Disclaimers

Electrical design is excluded from this analysis. Waterproofing is the sole responsibility of the installer and is also excluded from this analysis. Solar panels must be installed per manufacturer specifications. Structural design and analysis of the adequacy of solar panels, racks, mounts, and other components is performed by each component's respective manufacturer; the undersigned makes no statement of opinion regarding such components. This letter and the opinions expressed herein are rendered solely for the benefit of the permitting authority (city or county building department) and your office, and may not be utilized or relied on by any other party.

If you have any questions or concerns, please contact us at (208)-994-1680, or by email at Projects@pvletters.com.

Sincerely,

Trevor A. Jones, P.E.
5/9/2025

NORTH CAROLINA PROFESSIONAL SEAL 056724 ENGINEER TREVOR JONES

PV LETTERS

Standard Loading Comparison (Roof 1)

This calculation justifies the additional solar load by comparing existing to proposed gravity loads in the location of the solar panels.

	Without Solar	With Solar	
Dead Load			
Metal Roof	3	3	psf
1/4" Plywood	1	1	psf
Framing	4	4	psf
Insulation	1	1	psf
1/2" Gypsum Ceiling	2	2	psf
M,E, & Misc	1.5	1.5	psf
Solar Panel	0	3	psf
Total Dead Load	12.5	15.5	psf
Snow Load			
Ground Snow Load, P_g	15		psf
Exposure Factor, C_e	1.00		
Thermal Factor, C_t	1.1		
Importance Factor, I_s	1		
Flat Roof Snow Load	12		ASCE 7 Eqn. 7.3-1 or jurisdiction min.
Slope	36		degrees
Unobstructed Slippery Surface?	No	No	
Slope Factor, C_s	1.00	1.00	
Sloped Roof Snow Load	11.6	11.6	psf
Live Load			
Roof Live Load	20	0	psf
Load Combination			
D + Lr	32.5	15.5	psf
D + S	24.1	27.1	psf
Max. Load	32.5	27.1	psf
% of original		**83.23%**	

Result: **Because the total forces are decreased, per the relevant code provisions stated in the body of the letter, the existing roof structure is permitted to remain unaltered.**

PV LETTERS

Bracket Connection Calculation (per ASCE 7-10) (Roof 1)

This calculation justifies the connection of the solar panels to existing roof members, by showing the connection capacity is equal to or greater than the uplift force demands.

Connection Demand

Spacing perpendicular to rail, in	34
Roof Angle, degrees	36
Roof Layout	Gable
Wind Speed, mph	120
Exposure Coefficient, K_z	0.85
Topographic Factor, K_{zt}	1.00
Directionality Factor, K_d	0.85
Elevation Factor, K_e	1.00
Velocity Pressure q_z, psf	26.5
Prying Coefficient	1

Zones:	1	2	3
Spacing parallel to rail, in	45	45	45
GC_p (max)	1.00	2.00	2.00
Exposed Panels? (γ_E = 1.5)	No	No	No
Effective Wind Area on each con., ft^2	10.6	10.6	10.6
Pressure Equalization Factor, γ_a	0.79	0.79	0.79
Uplift Force, psf	20.9	41.9	41.9
Max. Uplift Force / Connection (0.6 WL), lbs	133.1	266.1	266.1
Solar Dead Load (0.6 DL). Lbs	19.1	19.1	19.1
Max. Uplift Force (0.6 WL - 0.6 DL), lbs	**114.0**	**247.1**	**247.1**

Connection Capacity

Connection Type	S-5! ProteaBracket
Ultimate Capacity, lbs	817
Factor of Safety	2.50
Total Capacity, lbs	**326.8**

Compare ASD Factored Demand to Capacity

Demand, lbs	247.1
Capacity, lbs	326.8
Result	**Capacity exceeds demands. Therefore, connection passes.**

PV LETTERS

Standard Loading Comparison (Roof 2)

This calculation justifies the additional solar load by comparing existing to proposed gravity loads in the location of the solar panels.

	Without Solar	With Solar	
Dead Load			
Metal Roof	3	3	psf
1/4" Plywood	1	1	psf
Framing	4	4	psf
Insulation	1	1	psf
1/2" Gypsum Ceiling	2	2	psf
M,E, & Misc	1.5	1.5	psf
Solar Panel	0	3	psf
Total Dead Load	12.5	15.5	psf
Snow Load			
Ground Snow Load, P_g	15		psf
Exposure Factor, C_e	1.00		
Thermal Factor, C_t	1.1		
Importance Factor, I_s	1		
Flat Roof Snow Load	12		ASCE 7 Eqn. 7.3-1 or jurisdiction min.
Slope	18		degrees
Unobstructed Slippery Surface?	No	No	
Slope Factor, C_s	1.00	1.00	
Sloped Roof Snow Load	11.6	11.6	psf
Live Load			
Roof Live Load	20	0	psf
Load Combination			
D + Lr	32.5	15.5	psf
D + S	24.1	27.1	psf
Max. Load	32.5	27.1	psf
% of original		**83.23%**	

Result: **Because the total forces are decreased, per the relevant code provisions stated in the body of the letter, the existing roof structure is permitted to remain unaltered.**

PV LETTERS

Bracket Connection Calculation (per ASCE 7-10) (Roof 2)

This calculation justifies the connection of the solar panels to existing roof members, by showing the connection capacity is equal to or greater than the uplift force demands.

Connection Demand

Spacing perpendicular to rail, in	34
Roof Angle, degrees	18
Roof Layout	Gable
Wind Speed, mph	120
Exposure Coefficient, K_z	0.85
Topographic Factor, K_{zt}	1.00
Directionality Factor, K_d	0.85
Elevation Factor, K_e	1.00
Velocity Pressure q_z, psf	26.5
Prying Coefficient	1

Zones:	1	2	3
Spacing parallel to rail, in	45	45	37.5
GC_p (max)	0.90	2.20	2.60
Exposed Panels? (γ_E = 1.5)	No	No	No
Effective Wind Area on each con., ft^2	10.6	10.6	8.8
Pressure Equalization Factor, γ_a	0.79	0.79	0.80
Uplift Force, psf	18.8	46.1	55.1
Max. Uplift Force / Connection (0.6 WL), lbs	119.8	292.7	292.0
Solar Dead Load (0.6 DL). Lbs	19.1	19.1	15.9
Max. Uplift Force (0.6 WL - 0.6 DL), lbs	**100.7**	**273.7**	**276.1**

Connection Capacity

Connection Type	S-5! ProteaBracket
Ultimate Capacity, lbs	817
Factor of Safety	2.50
Total Capacity, lbs	**326.8**

Compare ASD Factored Demand to Capacity

Demand, lbs	276.1
Capacity, lbs	326.8
Result	**Capacity exceeds demands. Therefore, connection passes.**

PV LETTERS

June 30, 2025

Subject: Shirley Harrison Solar Panel Installation
466 Woodwind Dr, Spring Lake, NC

Contractor Name: Top Tier Solar Solutions
Contractor Address: 1530 Center Park Dr #2911, Charlotte, NC

To Whom It May Concern,

This letter is submitted on behalf of my client, EnergyScape Renewables.

I am a North Carolina registered Professional Engineer. A field inspection of the installation has been performed by a person under my direct supervisory control. I hereby affirm the following:

1. The PV equipment's structural installation has been designed and inspected,
2. The equipment will not create a negative impact on the building's structural design, including any additional loads imposed (dead, snow, wind), and
3. The installation is in compliance with the North Carolina Residential Code.

Limitations and Disclaimers

Electrical design is excluded from this analysis. Structural design and analysis of the adequacy of solar panels, racks, mounts, rails, and other components is performed by each component's respective manufacturer. This letter and the opinions expressed herein are rendered solely for the benefit of the permitting authority (city or county building department) and my client's office and may not be utilized or relied on by any other party.

Sincerely,

Trevor Jones, P.E.

June 30, 2025

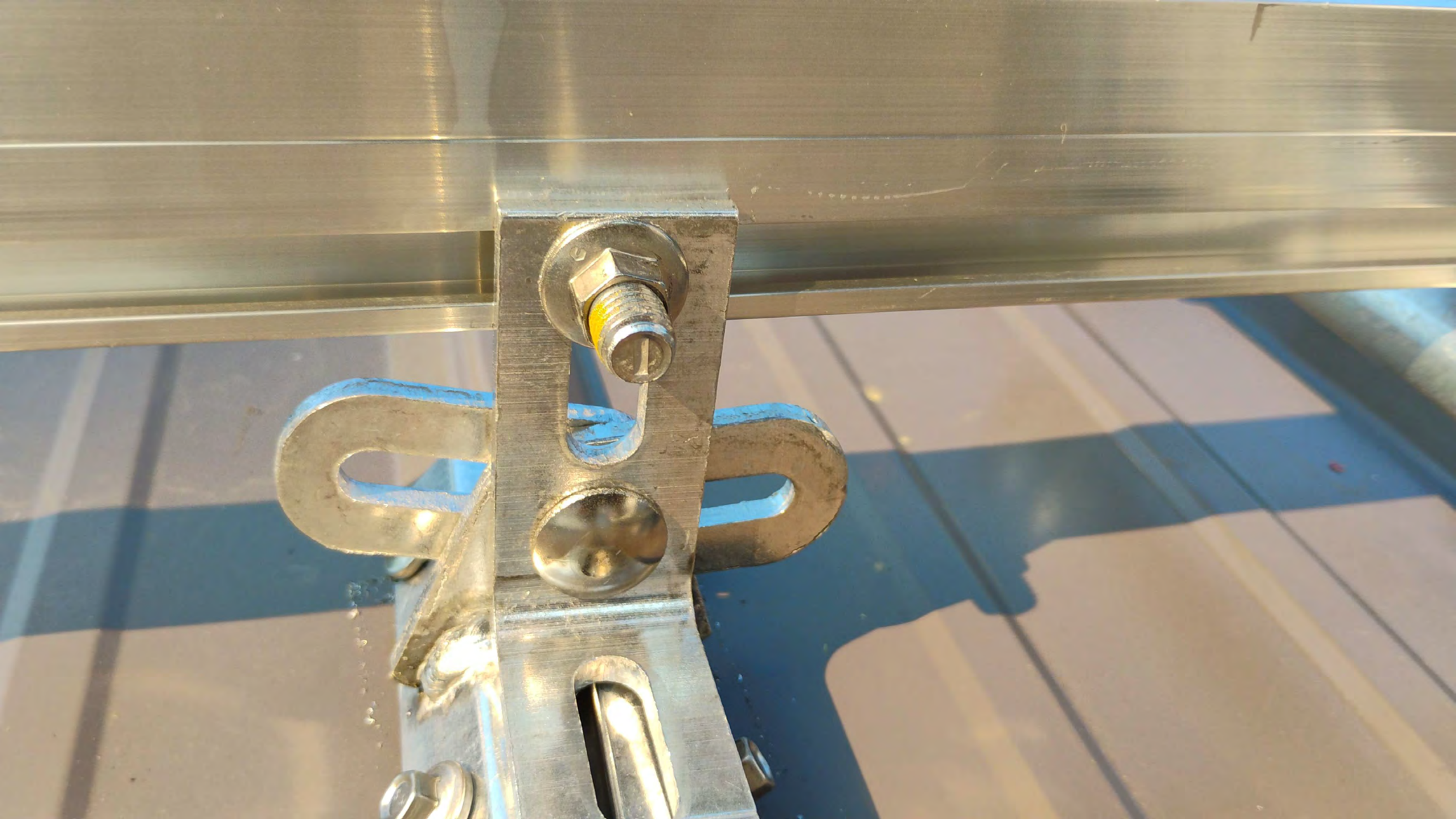
Do not disconnect under load

Do not disconnect under load

STOP


019224A3E-C3
01921B751-42
0192241D1-4D
01922F20A-37
01922D622-33
019222FC8-32
019223104-70

S-5!
SOLUTIONS




019224A8B-10
019227541-F1
0192266D6-77
0192273E8-96
0192269CA-6E
019230F75-C0
0192319C2-17
0192269CC-70
019226AAB-50
01922AC82-69
019226CFF-A6
0192273B9-67
019226C7C-23
0192265D7-77


13
CAUTION
WARNING
AVERTISSEMENT

CAUTION
RISK OF ELECTRIC SHOCK
DO NOT DISCONNECT UNDER LOAD

15

S440
DO NOT
REMOVE

019226AAB-50

Made in USA
from imported parts

CE FC

SolarEdge Technologies Ltd.
Power Optimizer

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

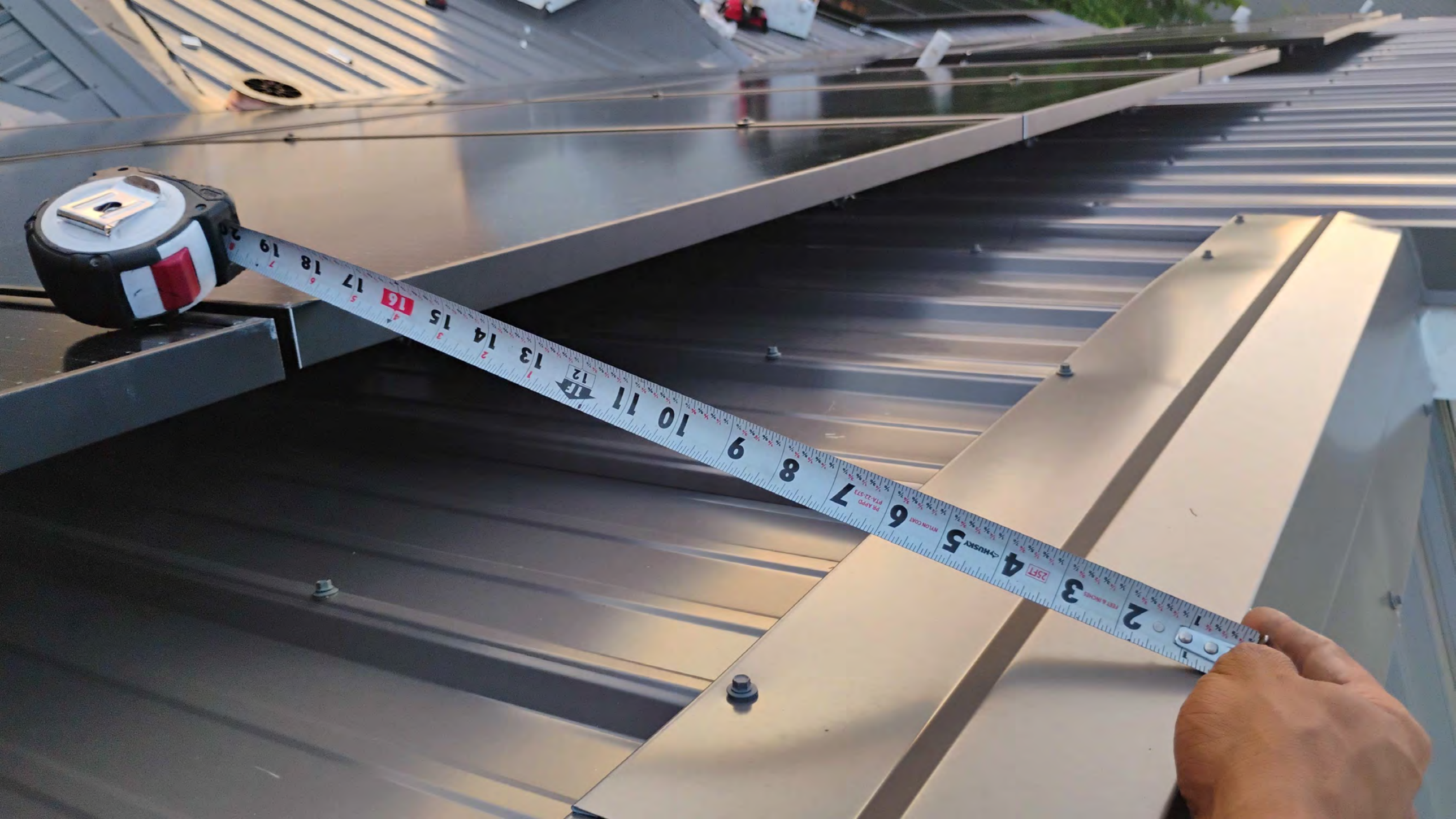
CAUTION

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.

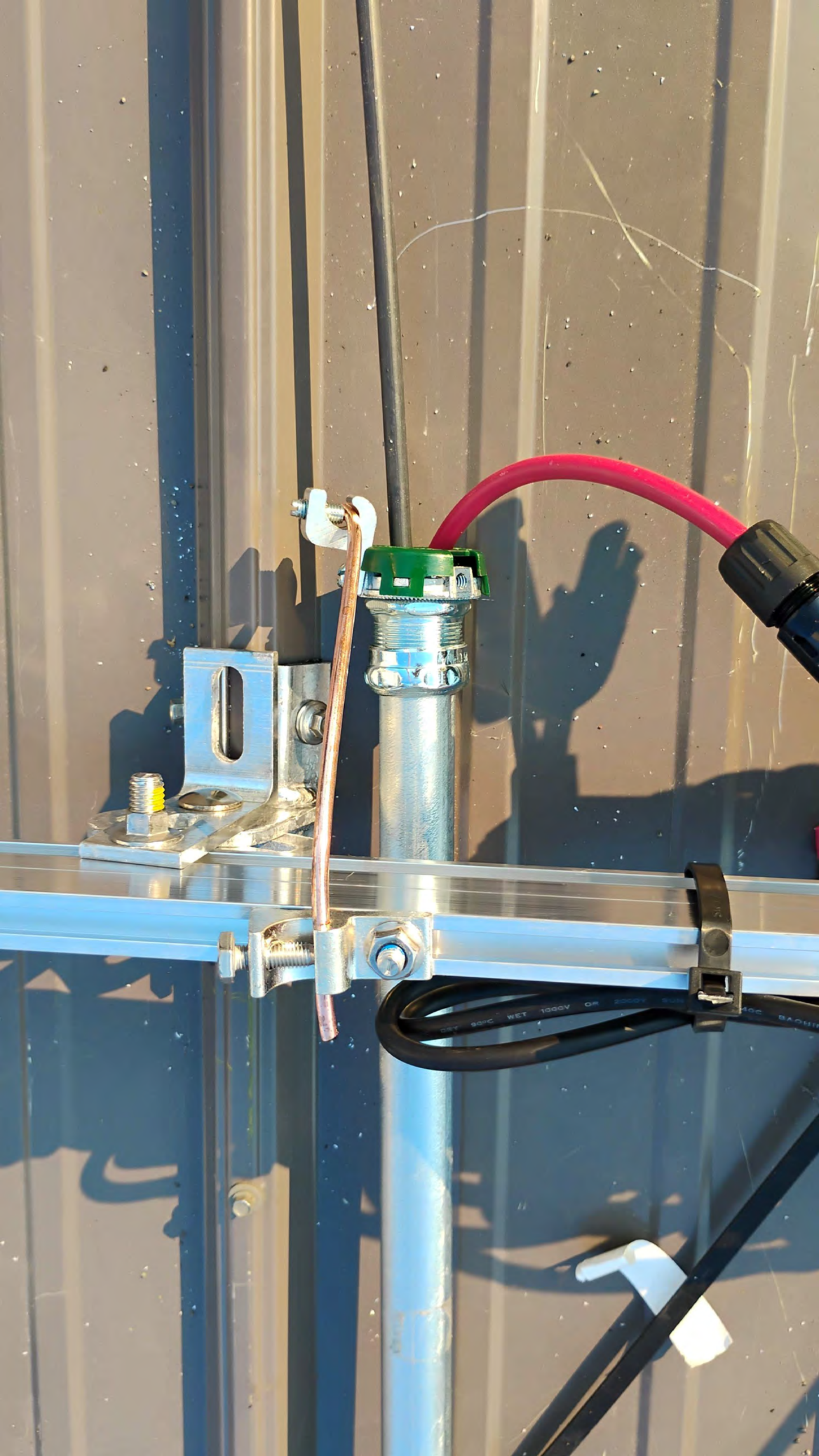
WARNING ELECTRIC SHOCK HAZARD. THE DC CONDUCTORS OF THIS PHOTOVOLTAIC SYSTEM ARE UNGROUNDED AND MAY BE ENERGIZED.

AVERTISSEMENT

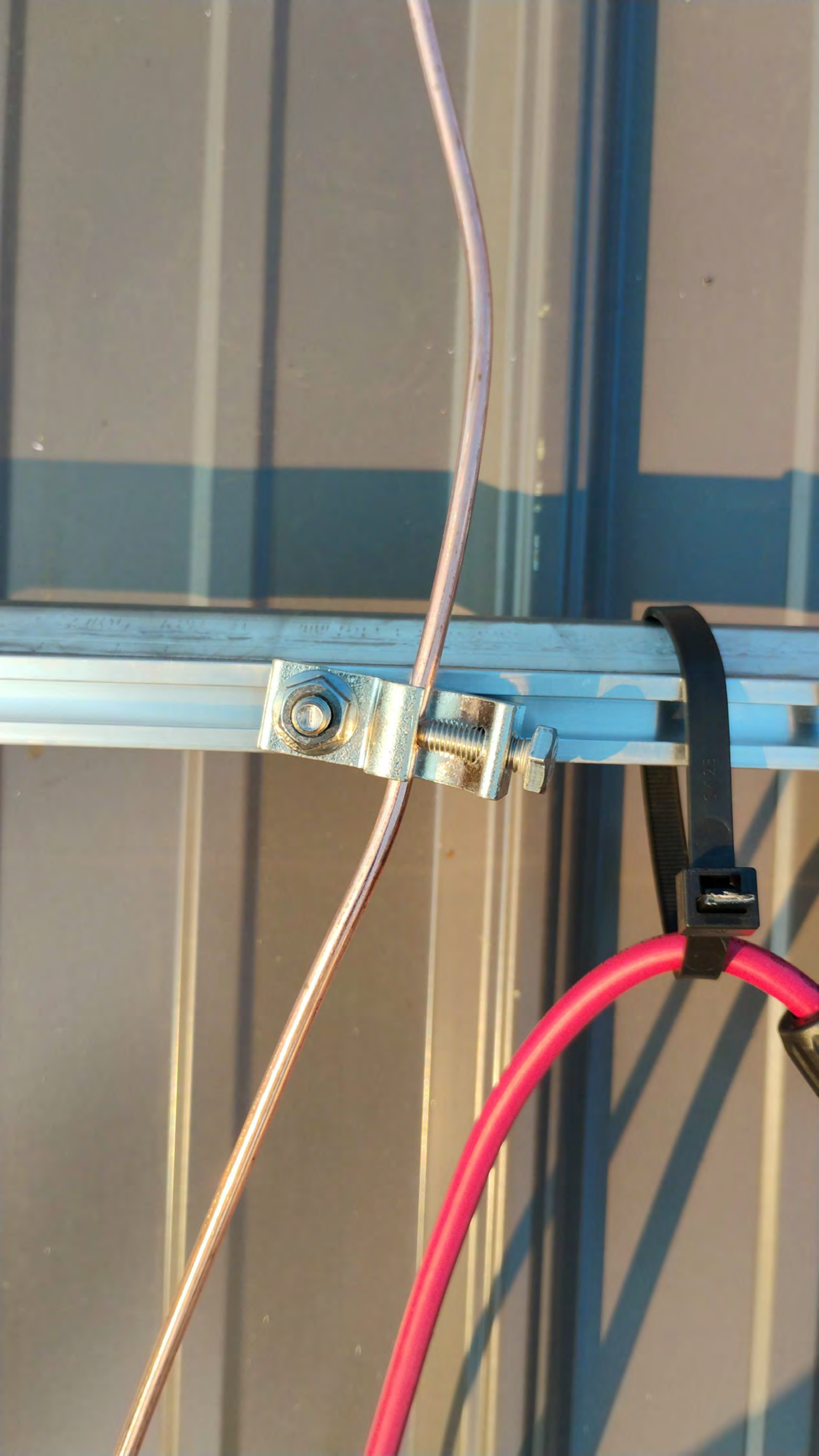
RISQUE DE CHOC ELECTRIQUE: QUAND LE CHAMP PHOTOVOTAIQUE EST EXPOSE A LA LUMIERE, UNE TENSION CC EST FOURNIE A CET EQUIPEMENT.
SURFACES CHAUDES: NE PAS TOUCHER, AFIN DE REDUIRE LES RISQUES DE BRULURES LE COURANT DE RETOUR INJECTE PAR LE CONVERTISSEUR EN CAS DE DEFAILLANCE DANS LE MODULE PV EST TOUJOURS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


HUSKY
25FT
FEET & INCHES
NYLON COAT
PR APPD
FTA-22-373

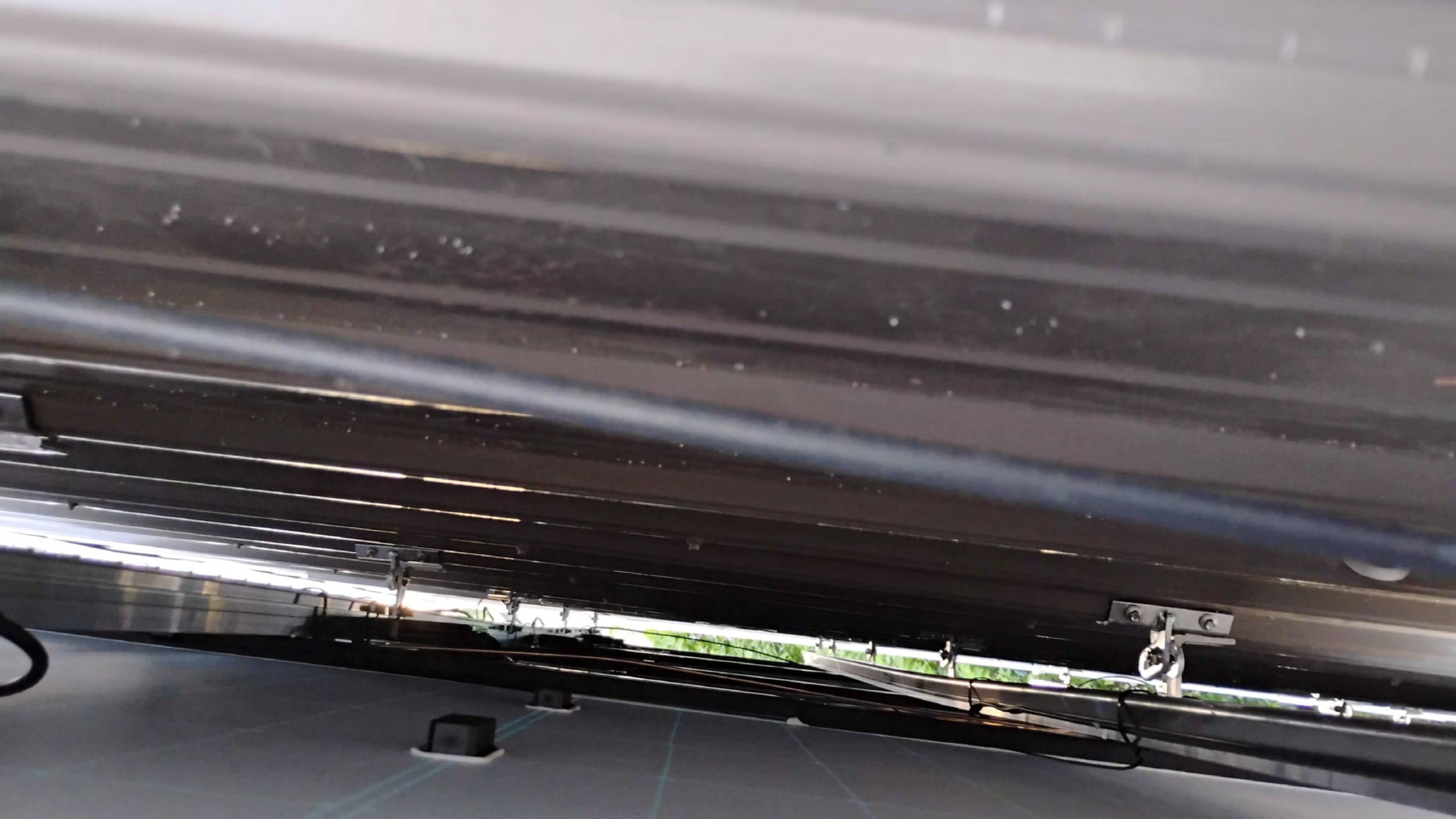

CAUTION
WARNING
AVERTISSEMENT



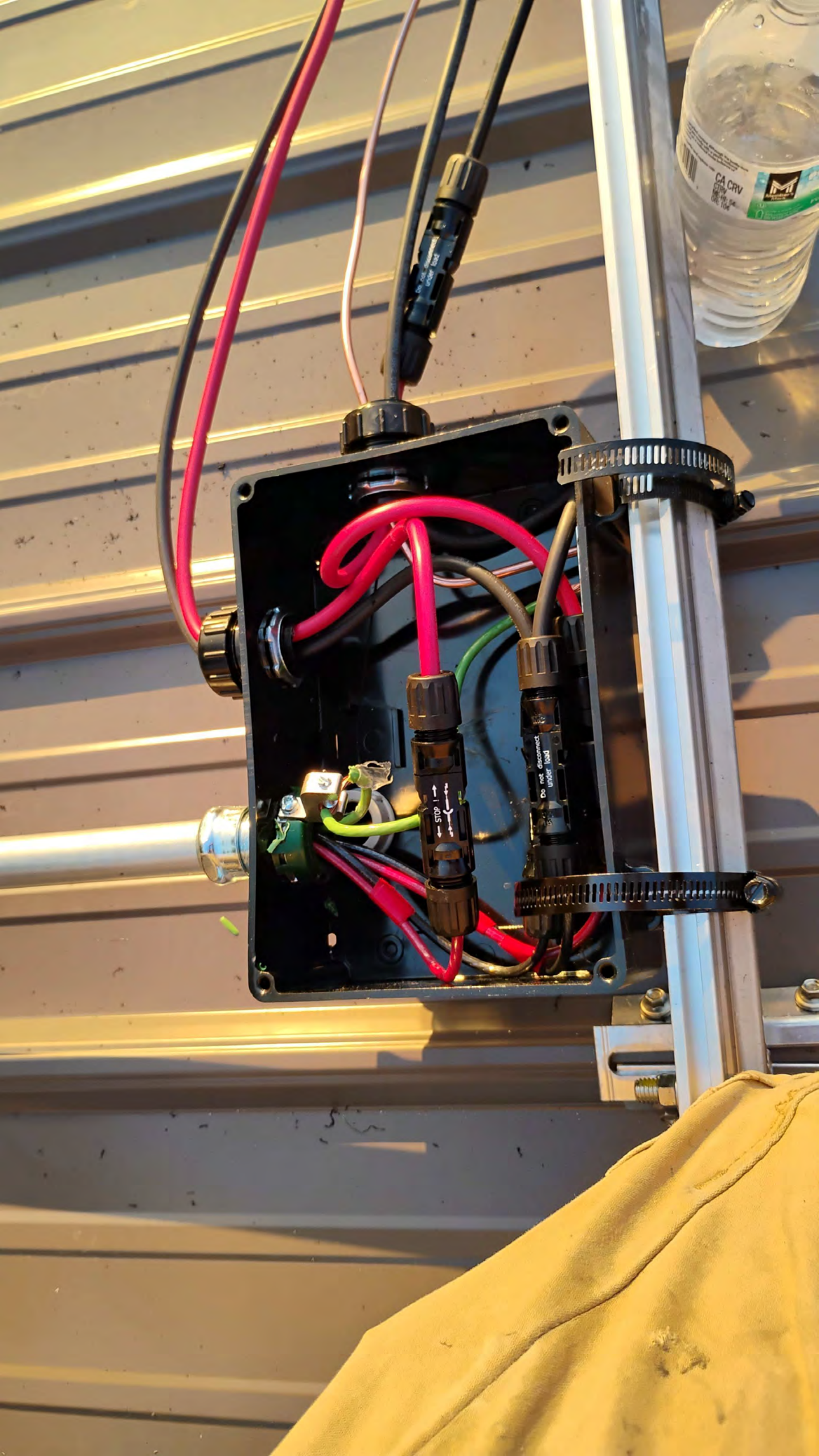
3




CAUTION
WARNING
AVERTISSEMENT




BRIDGEPORT


STOP
Do not disconnect under load

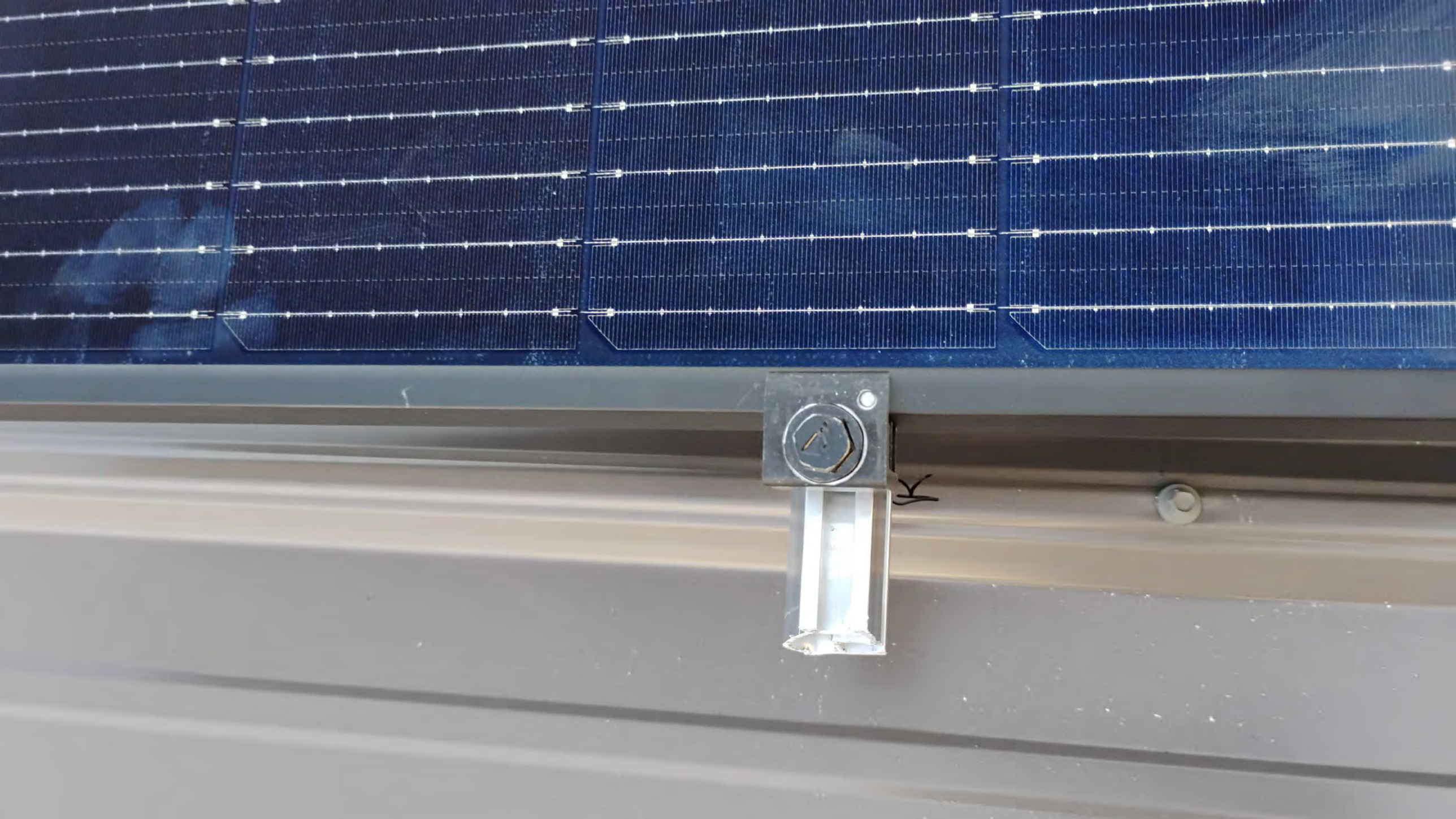

PHOTOVOLTAIC POWER SOURCE


BRIDGEPORT


SHIRLEY HARRISON
466 WOOD WIND DR
SPRING LAKE, NC
REFER TO INSTALLATION MANUAL
VOLUME 109 CU INCHES
TORQUE FOR ALL SCREWS & BOLTS: 15-20 LB-IN
CONFORMS TO UL STANDARD 1741
Do not disconnect under load


PHOTOVOLTAIC POWER SOURCE


0192269CA-6E
019230F75-C0
0192319C2-17
01923168B-DD
01922ECFF-26
01922F209-36
01922F4C6-F5
019215D30-C7
0192273B9-67
019226C7C-23
0192265D7-77



019224A8B-10
019227541-F1
0192266D6-77
0192273E8-96
0192269CA-6E
019230F75-C0
0192319C2-17
01923168B-DD
01922ECFF-26
01922F209-36
01922F4C6-F5
019215D30-C7
CC-70
019226AAB-50
01922AC82-69
019226CFF-A6
0192273B9-67
019226C7C-23
0192265D7-77
019224A3E-C3
01921B751-42
0192241D1-4D
01922F20A-37
750FD888-E4
019222D622-33
019222FC8-32
019223104-70
Shirlex
Harisson
5/6/25


solaredge
Made in the USA
from imported parts
ON
OFF
RAPID SHUTDOWN
SWITCH FOR
SOLAR PV SYSTEM
DC DISCONNECT
solaredge


RAPID SHUTDOWN
SWITCH FOR
SOLAR PV SYSTEM
DC DISCONNECT
EATON
SOLAR PV SYSTEM
EQUIPPED WITH
RAPID SHUTDOWN
PV DISCONNECT
WARNING
WARNING
CAUTION
181471

EATON

General Duty Safety Switch
Interrupteur de sécurité à usage général
Interruptor de seguridad de servicio general

60 A, 240 V~, 50 Hz

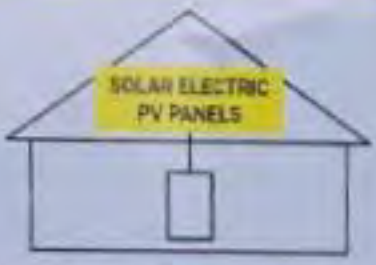
Complete ratings inside
Valeurs nominales complètes à l'intérieur
Información completa de capacidades en el interior

Further instructions inside
Autres instructions à l'intérieur
Instrucciones adicionales en el interior

Made in U.S.A. / Fabriqué aux É.-U. / Hecho en E.U.A.

MADE IN U.S.A.

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

AC DISCONNECT

PHOTOVOLTAIC SYSTEM POWER SOURCE

RATED AC OUTPUT CURRENT 42 AMPS

NOMINAL OPERATING AC VOLTAGE 240 VOLTS

⚠ WARNING

POWER SOURCE OUTPUT CONNECTION DO NOT RELOCATE THIS OVERCURRENT DEVICE

⚠ WARNING

ELECTRIC SHOCK HAZARD

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

CAUTION:

MULTIPLE SOURCES OF POWER. THE SERVICE DISCONNECT IS LOCATED INSIDE OPPOSITE THE UTILITY METER


WARNING
WARNING
CAUTION
WARNING
PHOTOVOLTAIC
SYSTEM kWh METER
181471


WARNING
DUAL POWER SUPPLY
SOURCES: UTILITY GRID
AND PV SOLAR
ELECTRIC SYSTEM
PHOTOVOLTAIC
SYSTEM kWh METER
MILBANK
1814

KOBALT

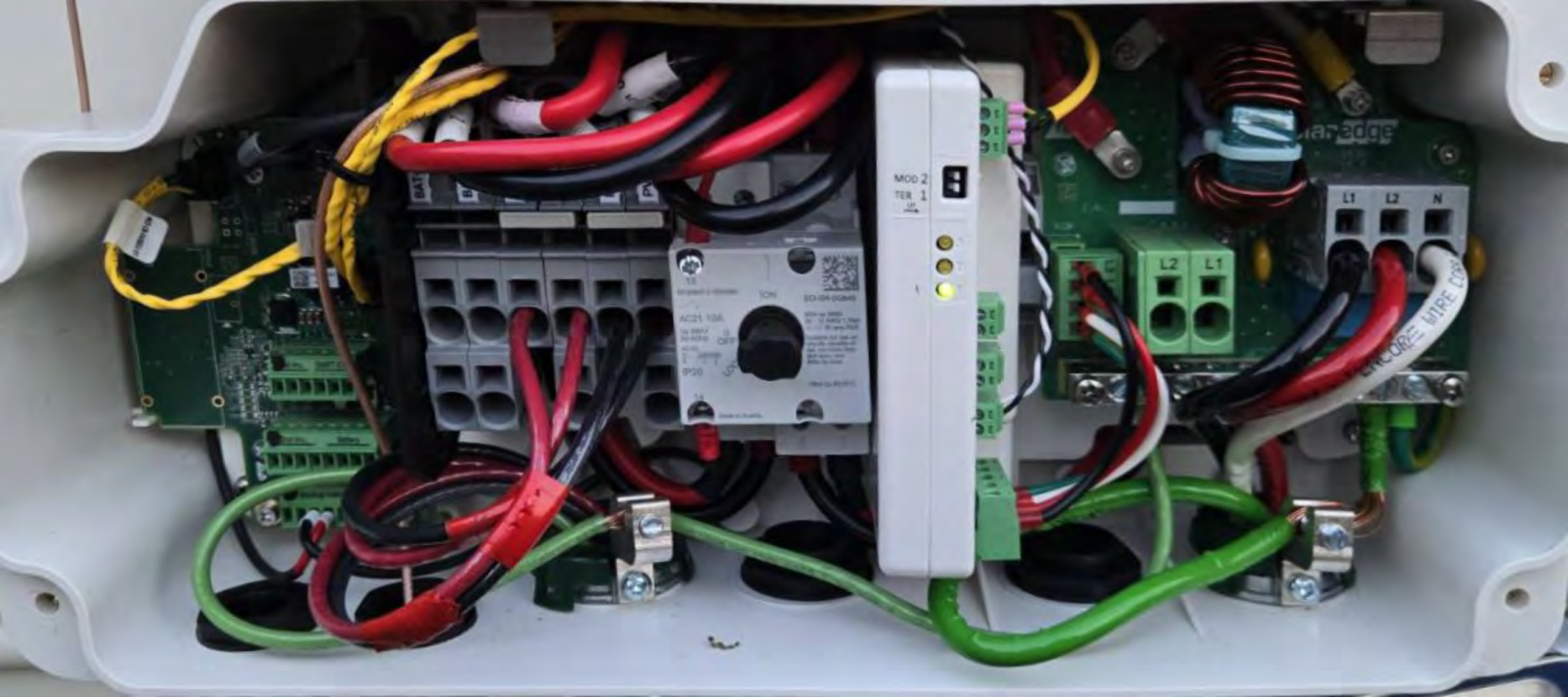
400Ã
40Ã
Temp
°C°F
Ω
CAP
V
V Hz
OFF
NCV
AUTO POWER

DT-9180D

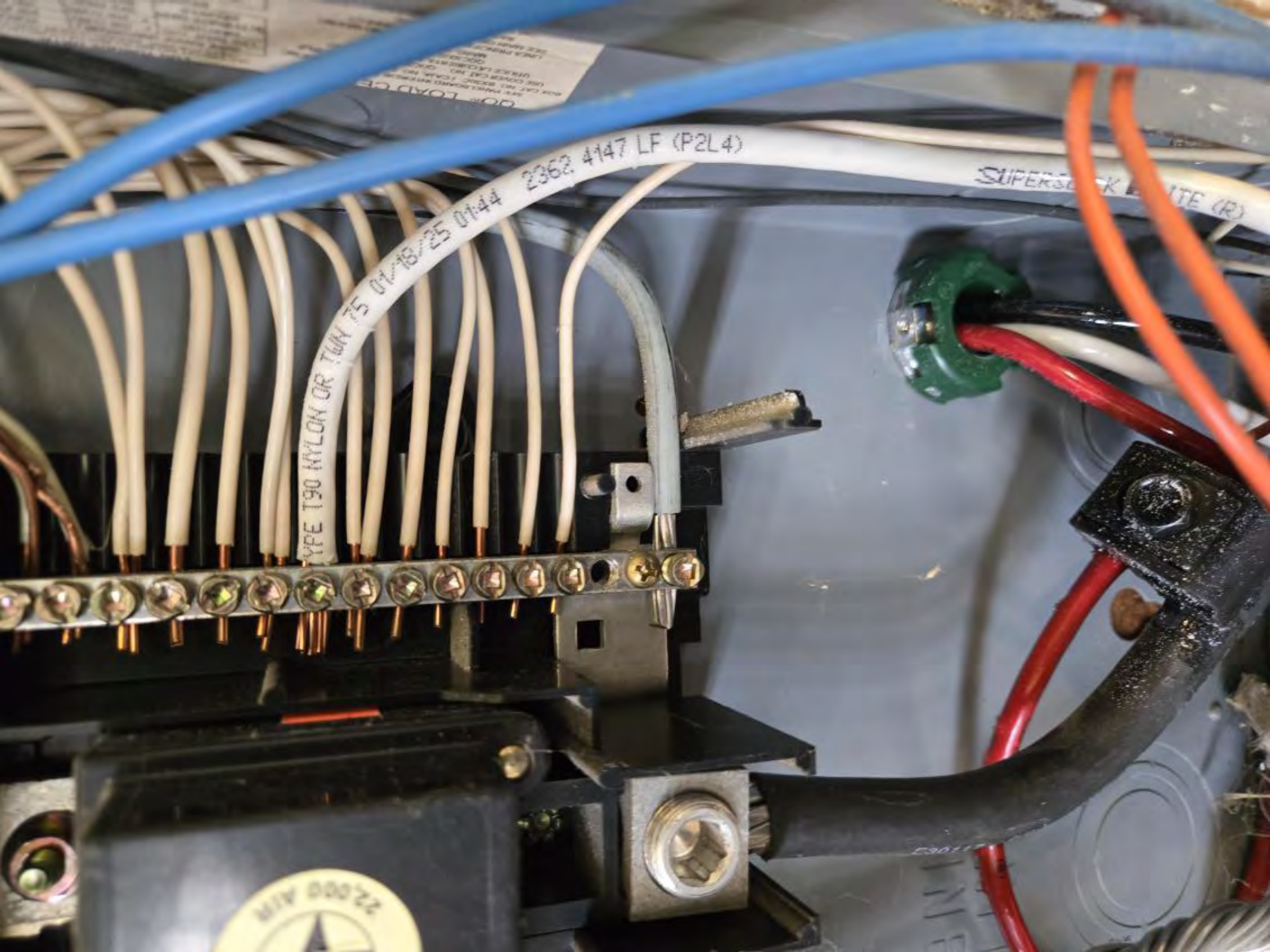
-13.16 V

RANGE
MODE
MAX MIN

AC TRMS CLAMP METER


MOD 2
TER 1
L1
L2
N
L2
L1
ENCORE WIRE CO


KOBALT
400Ã
40Ã
Temp
°C°F
Ω
CAP
V
Ṽ Hz
OFF
NCV
AUTO
POWER
OFF
DT-9180D
13.18
V
RANGE
MODE
MAX
MIN
AC TRMS CLAMP METER

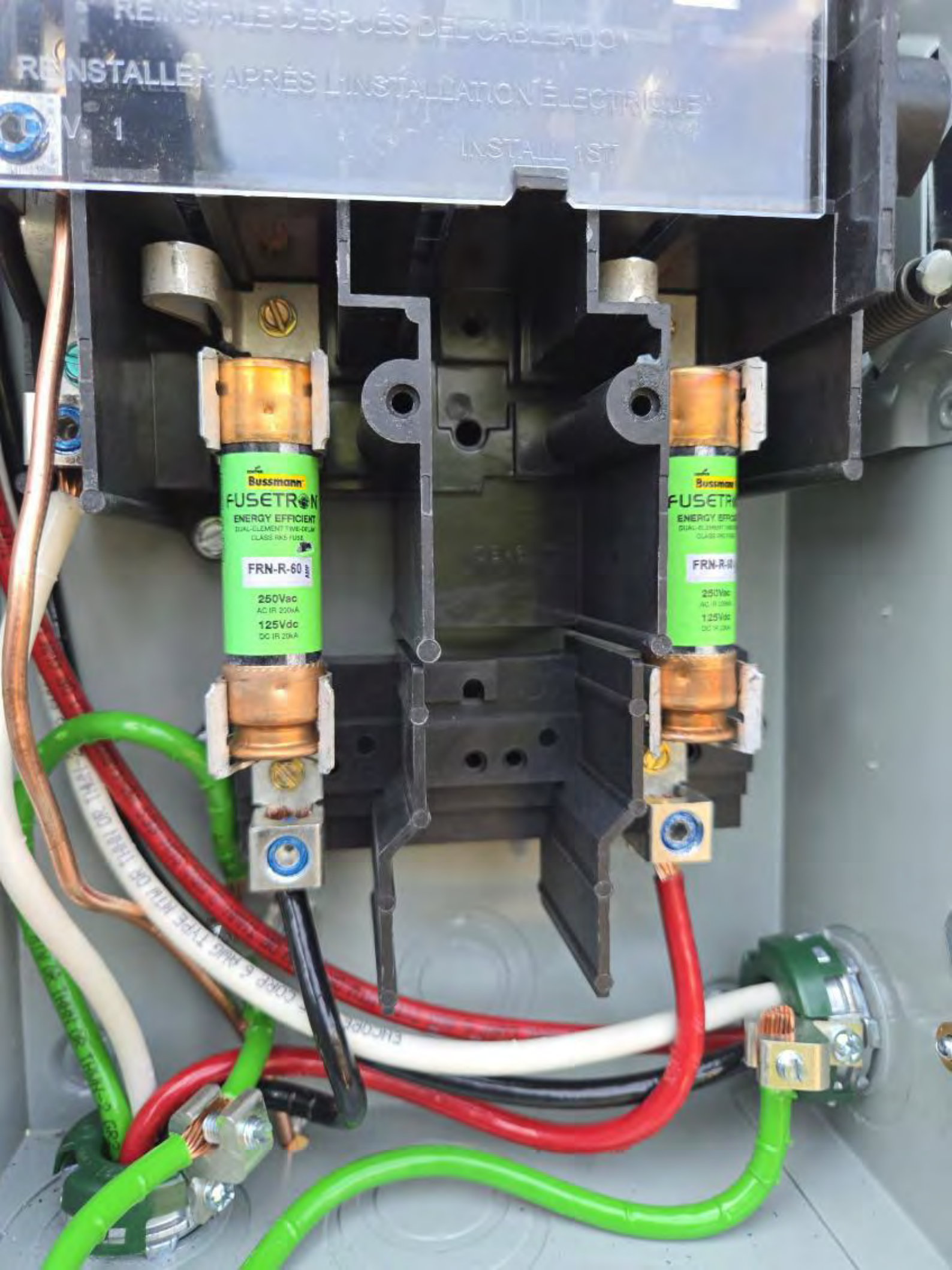

TYPE 190 NYLON OR TWN 75 07/18/25 01:44 2362 4147 LF (P2L4)


WARNING / ADVERTENCIA
DANGER / PELIGRO
QO LOAD CENTER COVER / CUBIERTA DEL CENTRO DE CARGA QO
SQUARE D COMPANY
NOM
FOR SERVICE
CALL
THREE WAY ELECTRIC CO.
(310) 492-1110
TM BATH
KIT
POOL

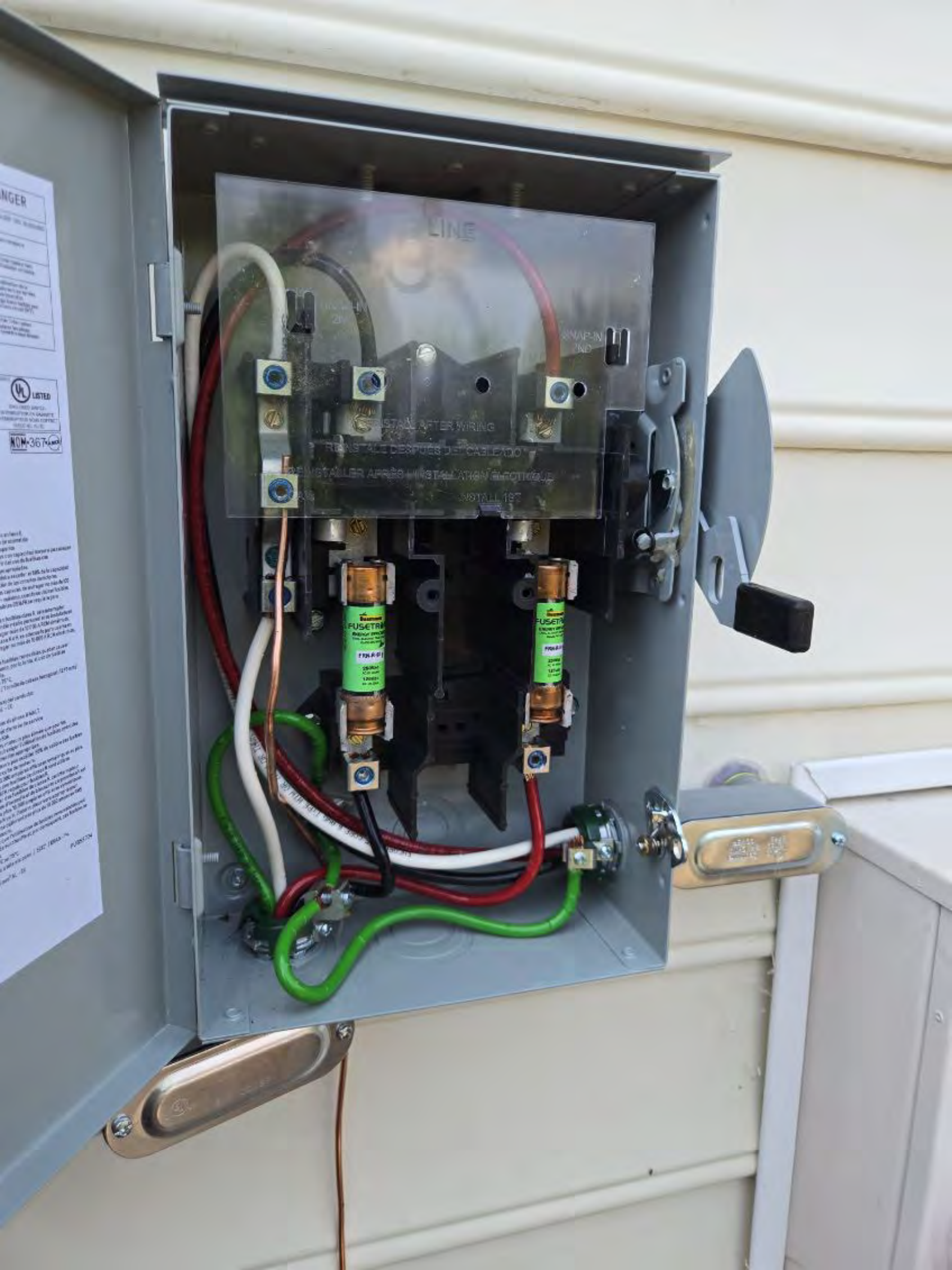
POINT OF INTERCONNECTION

CAUTION:
MULTIPLE SOURCES OF POWER
THE PV DISCONNECT IS LOCATED
BESIDE THE SERVICE METER

WARNING
DUAL POWER SUPPLY
SOURCES: UTILITY GRID
AND PV SOLAR
ELECTRIC SYSTEM


REINSTALLER APRÈS L'INSTALLATION ÉLECTRIQUE
Bussmann
FUSETRON
ENERGY EFFICIENT
FRN-R-60
250Vac
125Vdc


NORTH CAROLINA
ELECTRIC MEMBERSHIP
CORPORATION
CODE 040404
NCEMC SN
POWER INPUT 18W. MAX
RELAYS CONTACTS
DRIVER
REGENCY


LINE
SNAP-IN
2ND
INSTALL AFTER WIRING
INSTALL 1ST


General Duty Safety
Interrupteur de sécu
Interruptor de segur
60 A, 240 V~, 60 Hz
Complete ratings in
Valeurs nominales
Información comple
interior
Further instructions
Autres instructions
Instrucciones adicio
Made in U.S.A. / Fabr

BOSCH
RH540M
Boschhammer


AWG 4/0
COMPACT
CONTINENTAL VN-TC