Scott E. Wyssling, PE, PP, CME

**Scott E. Wyssling, PE**
76 North Meadowbrook Drive
Alpine, UT 84004
office (201) 874-3483
swyssling@wysslingconsulting.com

October 5, 2021

SCOTT E WYSSLING, PE

Digitally signed by SCOTT E WYSSLING, PE
DN: C=US, S=Utah, L=Alpine, O=Wyssling Consulting, OU=Owner, CN="SCOTT E WYSSLING, PE", E=swyssling@wysslingconsulting.com
Reason: I am the author of this document
Location: your signing location here
Date: 2021.10.05 12:52:57-06'00'
Foxit PhantomPDF Version: 10.1.3

Sigora Solar
1222 Harris Street
Charlottesville, VA 22903

Re: Engineering Services
Williams Residence
39 Old Head Way, Fuquay-Varina, NC
10.220 kW System Size

To Whom it May Concern:

Pursuant to your request, we have reviewed the following information regarding solar panel installation on the roof of the above referenced home:

1. Site Visit/Verification Form prepared by a Sigora Solar representative identifying specific site information including size and spacing of rafters for the existing roof structure.
2. Photographs of the interior and exterior of the roof system identifying existing structural members and their conditions.

Based on the above information we have evaluated the structural capacity of the existing roof system to support the additional loads imposed by the solar panels and have the following comments related to our review and evaluation:

***Description of Residence:***

The existing residence is typical wood framing construction with the roof system consisting of truss system with all chords constructed of 2 x 4 dimensional lumber at 24" on center. The attic space is unfinished and photos indicate that there was free access to visually inspect the size and condition of the roof rafters. All wood material utilized for the roof system is assumed to be Doug-Fir #2 or better with standard construction components. The existing roofing material consists of composite asphalt shingles. Photos of the dwelling also indicate that there is a permanent foundation.

***A. Loading Criteria Used***

- 115 MPH wind loading based on ASCE 7-10 Exposure Category "C" at a slope of 26 +/- degrees
- 7 PSF = Dead Load roofing/framing Live Load = 20 PSF Snow Load = 15 PSF
- 3 PSF = Dead Load solar panels/mounting hardware

*Total Dead Load =10 PSF*

*The above values are within acceptable limits of recognized industry standards for similar structures in accordance with the North Carolina Residential Code (2018). Analysis performed of the existing roof structure utilizing the above loading criteria indicates that the existing rafters will support the additional panel loading without damage, if installed correctly.*

***B. Solar Panel Anchorage***

1. The solar panels shall be mounted in accordance with the most recent "*SnapNrack Installation Manual*", which can be found on the SnapNrack website (*http://snapnrack.com/*). If during solar panel installation, the roof framing members appear unstable or deflect non-uniformly, our office should be notified before proceeding with the installation.
2. Maximum allowable pullout per lag screw is 235 lbs/inch of penetration as identified in the National Design Standards (NDS) of timber construction specifications for Southern Pine *assumed*. Based on our evaluation, the pullout value, utilizing a penetration depth of 2 ½", is less than what is allowable per connection and therefore is adequate. Based on the variable factors for the existing roof framing and installation tolerances, using a thread depth of 2 ½" with a minimum size of 5/16" lag screw per attachment point for panel anchor mounts should be adequate with a sufficient factor of safety.
3. Considering the roof slopes, the size, spacing, condition of roof, the panel supports shall be placed no greater than 48" o/c.
4. Panel supports connections shall be staggered to distribute load to adjacent trusses.

Based on the above evaluation, it is the opinion of this office that with appropriate panel anchors being utilized the roof system will adequately support the additional loading imposed by the solar panels. This evaluation is in conformance with the North Carolina Residential Code, current industry and standards, and based on information supplied to us at the time of this report.

Should you have any questions regarding the above or if you require further information do not hesitate to contact me.

Very truly yours,

Scott E. Wyssling, PE
North Carolina License No. 46546


North Carolina Firm License No. 46546

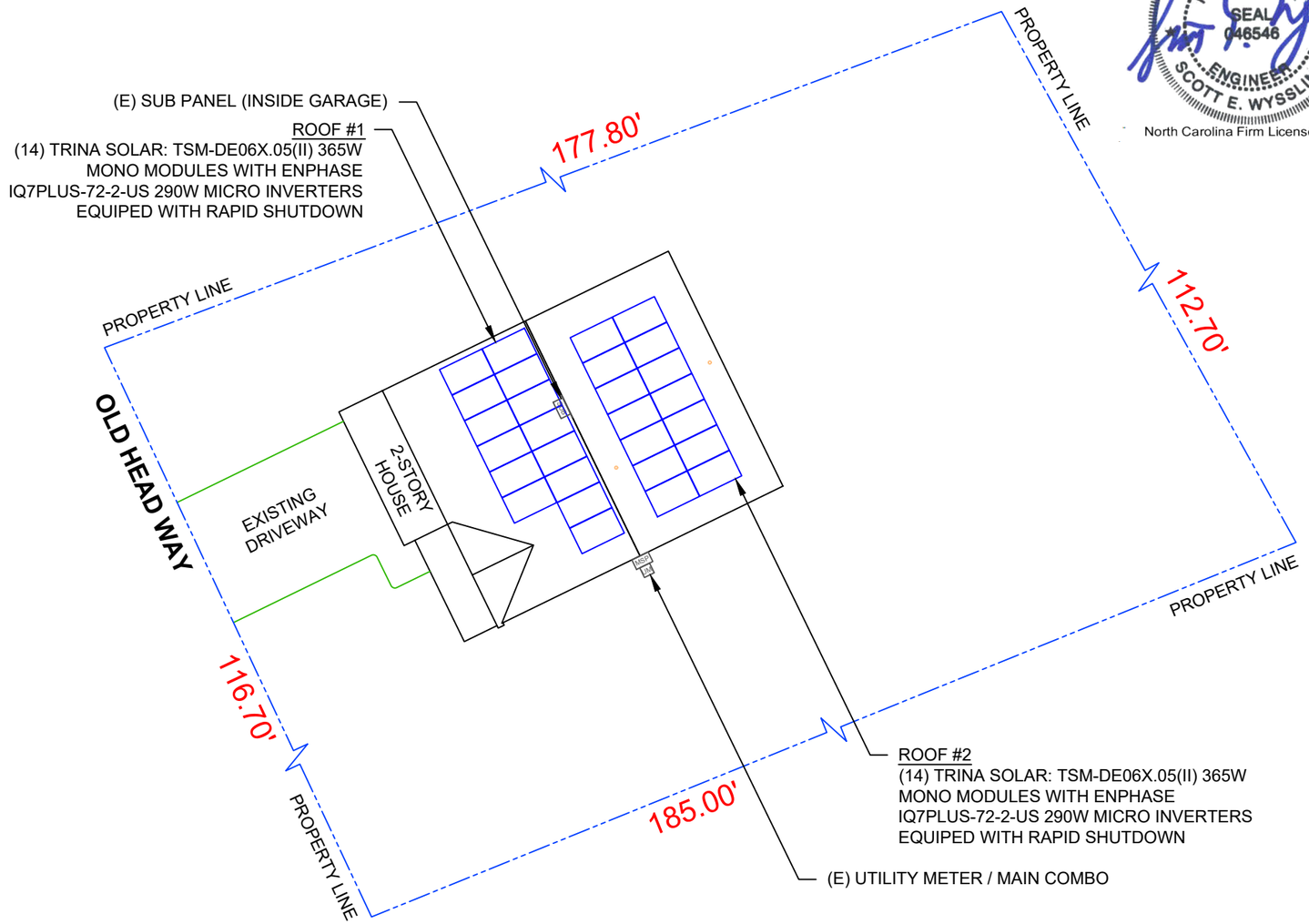
# PROJECT DESCRIPTION:

28 x TRINA SOLAR: TSM-DE06X.05(II) 365W MONO MODULES
ROOF MOUNTED SOLAR PHOTOVOLTAIC MODULES
DC SYSTEM SIZE: 10.220kW DC
AC SYSTEM SIZE: 8.120kW AC

EQUIPMENT SUMMARY
28 TRINA SOLAR: TSM-DE06X.05(II) 365W MONO MODULES
28 ENPHASE IQ7PLUS-72-2-US 290W MICRO INVERTERS
EQUIPED WITH RAPID SHUTDOWN

ROOF ARRAY AREA #1:- 277.90 SQ FT.
ROOF ARRAY AREA #2:- 277.90 SQ FT.

AUTHORITIES HAVING JURISDICTION
BUILDING: HARNETT, COUNTY OF (NC)
ZONING: HARNETT, COUNTY OF (NC)




1 PLOT PLAN WITH ROOF PLAN
PV-1 SCALE: 1/16" = 1'-0"

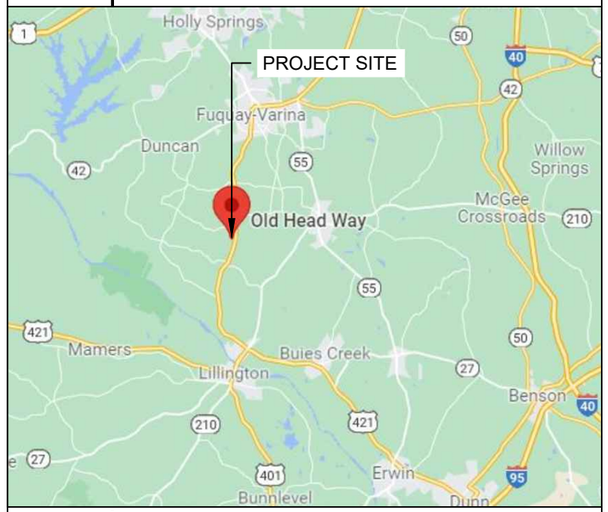
NORTH CAROLINA PROFESSIONAL SEAL 046546 ENGINEER SCOTT E. WYSSLING

North Carolina Firm License No. 46546

APPLICABLE CODES & STANDARDS
NCBC 2018
NEC 2017

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


2 HOUSE PHOTO
PV-1 SCALE: NTS




3 VICINITY MAP
PV-1 SCALE: NTS

SHEET INDEX




SIGORA SOLAR
SIGORA SOLAR LLC
490 WESTFIELD RD STE A
CHARLOTTESVILLE, VA 22901


REVISIONS

| DESCRIPTION | DATE | REV |
|---|---|---|
| INITIAL | 10/05/2021 | |
| | | |
| | | |
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| | | |
| | | |

DATE:10/05/2021

PROJECT NAME & ADDRESS
AMANDA WILLIAMS RESIDENCE
39 OLD HEAD WAY,
FUQUAY-VARIANA, NC 27526

DRAWN BY
ESR

SHEET NAME
PLOT PLAN WITH ROOF PLAN

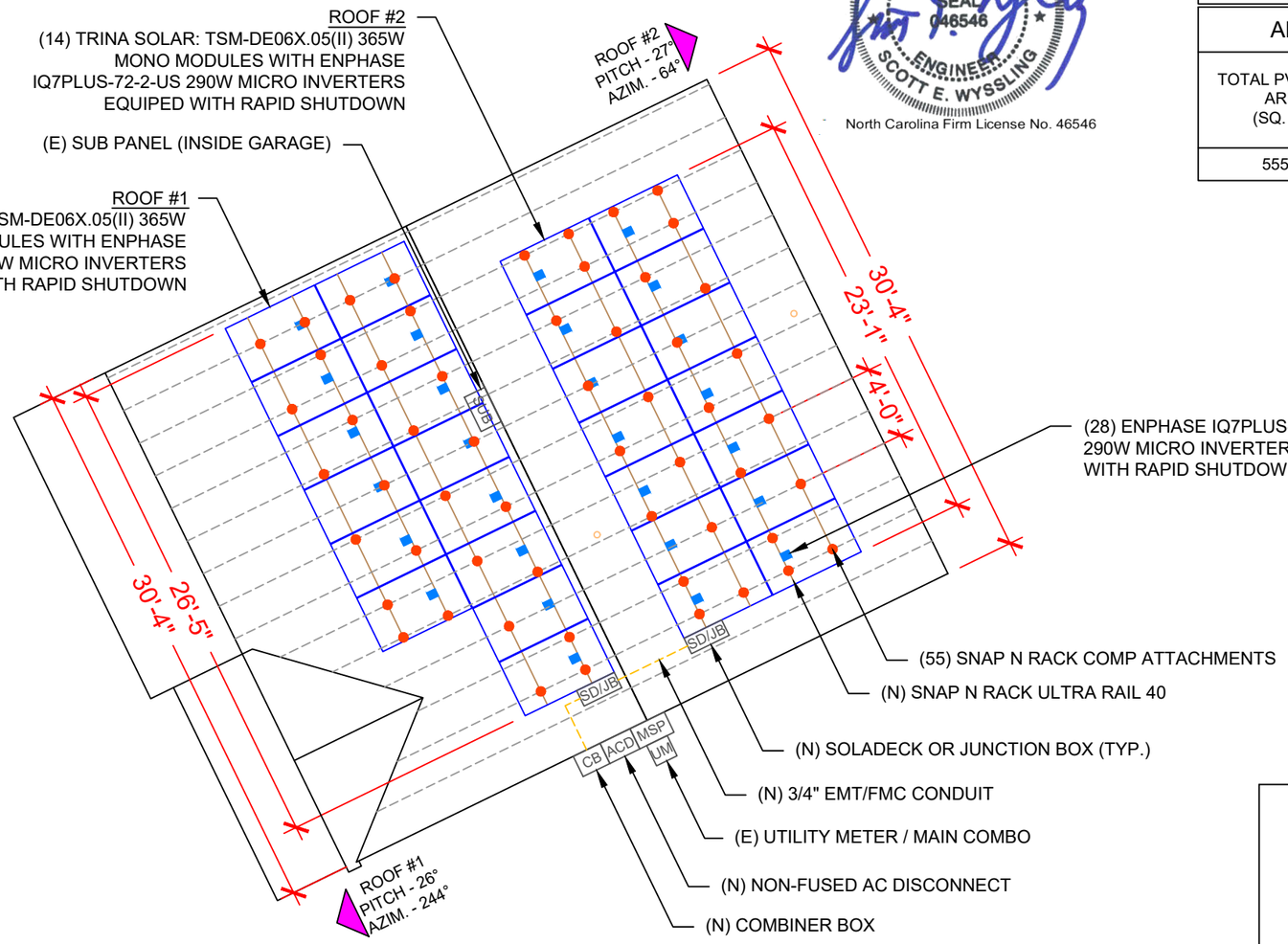
SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-1

## MODULE TYPE, DIMENSIONS & WEIGHT

NUMBER OF MODULES = 28 MODULES
MODULE TYPE = TRINA SOLAR: TSM-DE06X.05(II) 365W MONO MODULES
MODULE WEIGHT = 43.4 LBS / 19.7KG
MODULE DIMENSIONS = 72.91"x 39.21" = 19.85 SF

- TOTAL WEIGHT OF PV MODULES AND RAILS = 1667.4 LBS
- WEIGHT PER ATTACHMENT POINT = 30 LBS
- DISTRIBUTED WEIGHT OF PV MODULE = 2.19 LBS/SF

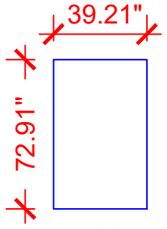





North Carolina Firm License No. 46546

| ROOF DESCRIPTION | | | | | |
|---|---|---|---|---|---|
| ROOF TYPE | | | | ASPHALT SHINGLE | |
| ROOF LAYER | | | | 1 LAYER | |
| ROOF | # OF MODULES | ROOF PITCH | AZIMUTH | TRUSS SIZE | TRUSS SPACING |
| #1 | 14 | 26° | 244° | 2X4 | 24" |
| #2 | 14 | 27° | 64° | 2X4 | 24" |

| ARRAY AREA & ROOF AREA CALC'S | | |
|---|---|---|
| TOTAL PV ARRAY AREA (SQ. FT.) | TOTAL ROOF AREA (Sq. Ft.) | ROOF AREA COVERED BY ARRAY (%) |
| 555.80 | 1275.96 | 44 |




TRINA SOLAR:
TSM-DE06X.05(II)
365W MODULES

### LEGEND

- SD/JB - SOLADECK OR JUNCTION BOX
- INV - INVERTER
- CB - COMBINER BOX
- ACD - AC DISCONNECT
- LC - LOAD CENTER
- UM - UTILITY METER
- MSP - MAIN SERVICE PANEL
- VENT, ATTIC FAN (ROOF OBSTRUCTION)
- ROOF ATTACHMENT
- TRUSS
- CONDUIT

1 ROOF PLAN & MODULES
PV-2 SCALE: 1/8" = 1'-0"

SIGORA SOLAR
SIGORA SOLAR LLC
490 WESTFIELD RD STE A
CHARLOTTESVILLE, VA 22901

| REVISIONS | | |
|---|---|---|
| DESCRIPTION | DATE | REV |
| INITIAL | 10/05/2021 | |

DATE:10/05/2021

PROJECT NAME & ADDRESS
AMANDA WILLIAMS RESIDENCE
39 OLD HEAD WAY, FUQUAY-VARIANA, NC 27526

DRAWN BY
ESR

SHEET NAME
ROOF PLAN & MODULES

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-2

| CIRCUIT LEGENDS |
|---|
| CIRCUIT #1 |
| CIRCUIT #2 |
| CIRCUIT #3 |


## BILL OF MATERIALS

| EQUIPMENT | QTY | DESCRIPTION |
|---|---|---|
| SOLAR PV MODULES | 28 | TRINA SOLAR: TSM-DE06X.05(II) 365W |
| MICRO INVERTERS | 28 | ENPHASE IQ7PLUS-72-2-US 290W MICRO INVERTERS EQUIPED WITH RAPID SHUTDOWN |
| SOLADECKS OR JUNCTION BOXES | 2 | SOLADECKS OR JUNCTION BOXES |
| MODULE CLAMPS | 48 | MID MODULE CLAMPS |
| END CLAMPS | 16 | END CLAMPS / STOPPER SLEEVE |
| ATTACHMENT | 55 | SNAP N RACK COMP |
| BOLT | 55 | LAG BOLT |

1 ROOF PLAN WITH CIRCUIT LAYOUT

PV-2A SCALE: 3/16" = 1'-0"

SIGORA SOLAR

SIGORA SOLAR LLC
490 WESTFIELD RD STE A
CHARLOTTESVILLE, VA 22901

| REVISIONS | | |
|---|---|---|
| DESCRIPTION | DATE | REV |
| INITIAL | 10/05/2021 | |
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DATE:10/05/2021

PROJECT NAME & ADDRESS

AMANDA WILLIAMS RESIDENCE

39 OLD HEAD WAY,
FUQUAY-VARIANA, NC 27526

DRAWN BY

ESR

SHEET NAME

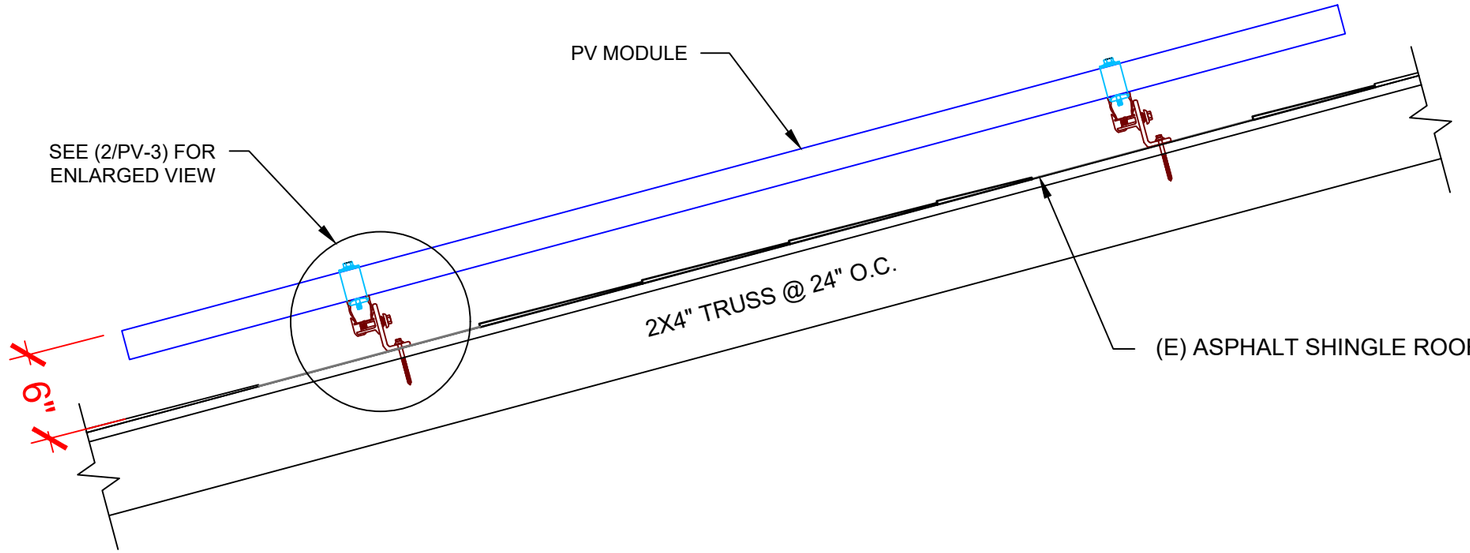
CIRCUIT LAYOUT

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

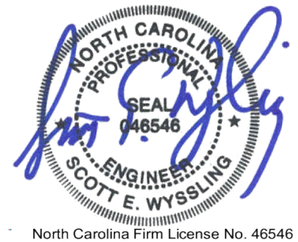
PV-2A



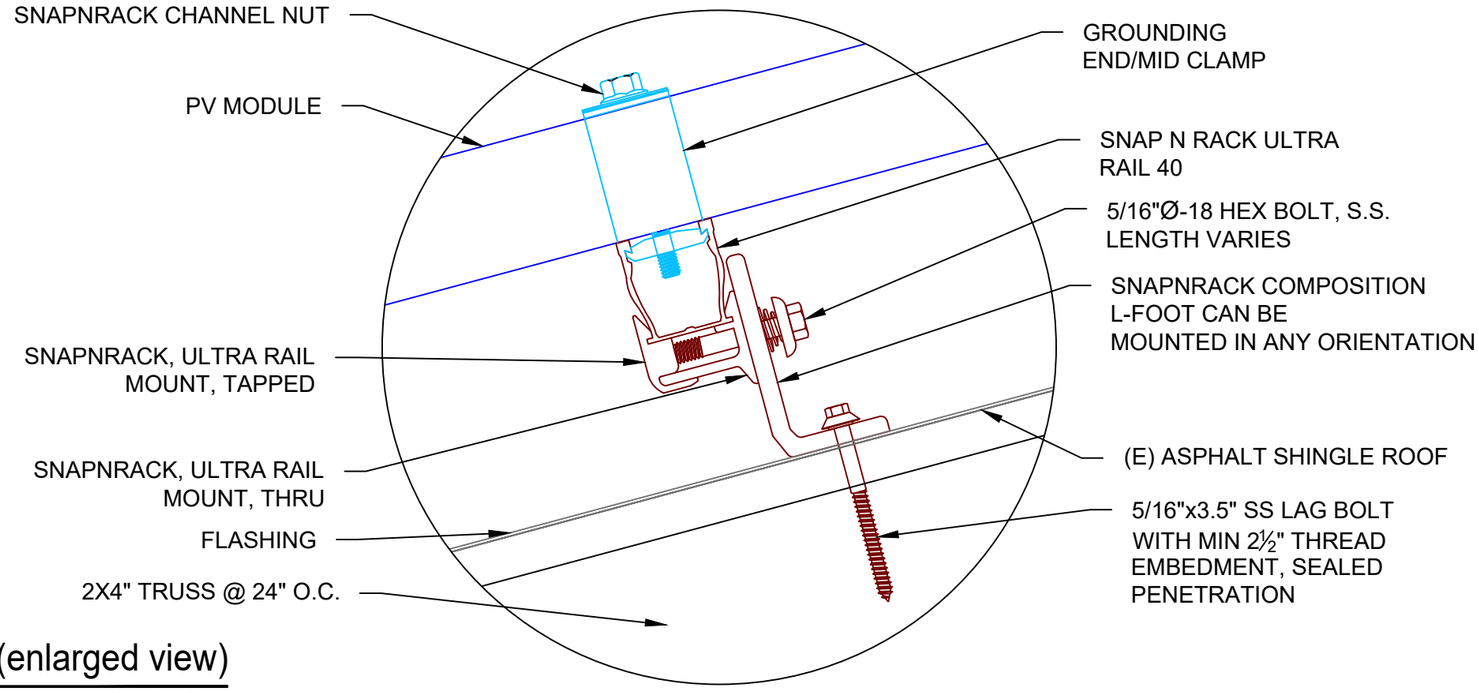

1 | PV-3

## STRUCTURAL ATTACMENT (SIDE VIEW)

SCALE: N.T.S




North Carolina Firm License No. 46546




2 | PV-3

## ATTACHMENT DETAIL (enlarged view)

SCALE: N.T.S

SIGORA SOLAR

SIGORA SOLAR LLC
490 WESTFIELD RD STE A
CHARLOTTESVILLE, VA 22901

REVISIONS

| DESCRIPTION | DATE | REV |
|---|---|---|
| INITIAL | 10/05/2021 | |
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DATE:10/05/2021

PROJECT NAME & ADDRESS

AMANDA WILLIAMS
RESIDENCE

39 OLD HEAD WAY,
FUQUAY-VARIANA, NC 27526

DRAWN BY
ESR

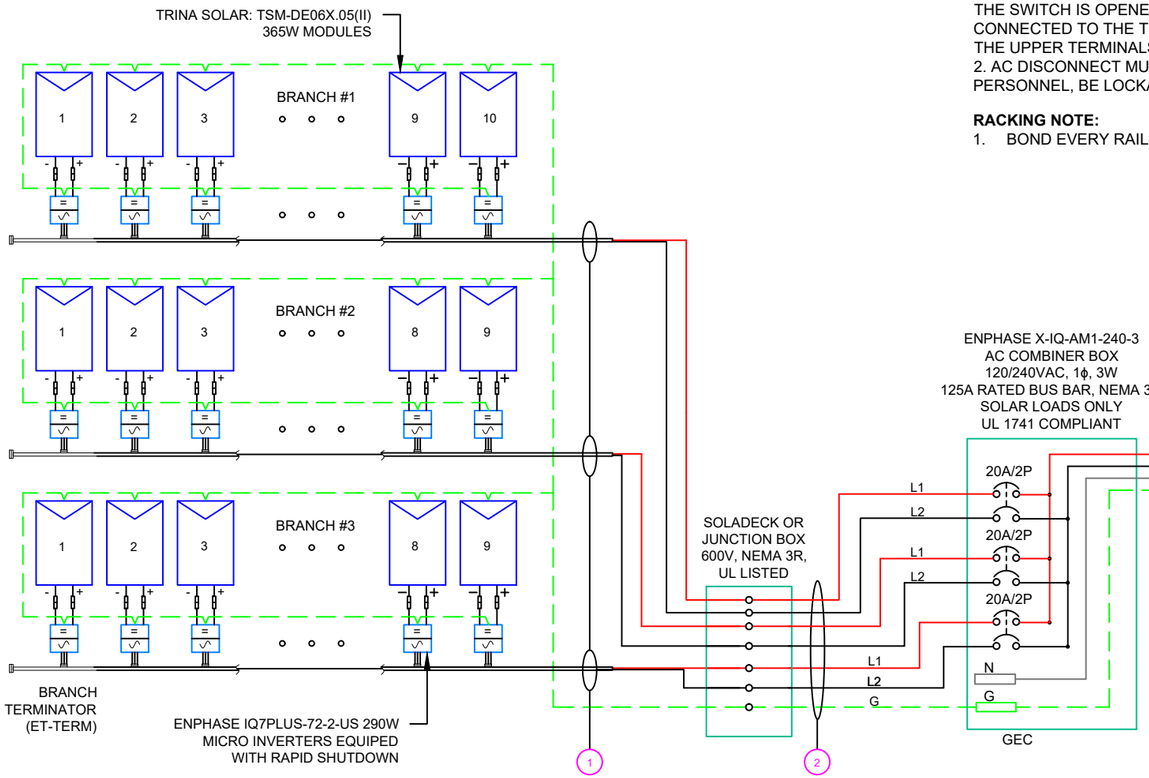
SHEET NAME
ATTACHMENT
DETAIL

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-3

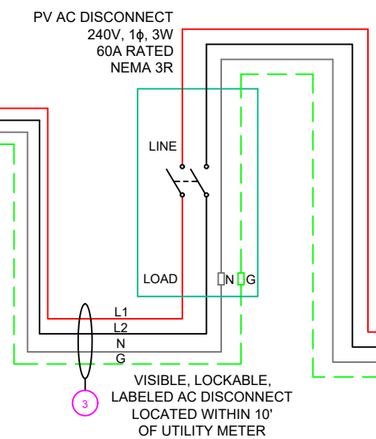
DC SYSTEM SIZE: 10.220 kW DC
AC SYSTEM SIZE: 8.120 kW AC

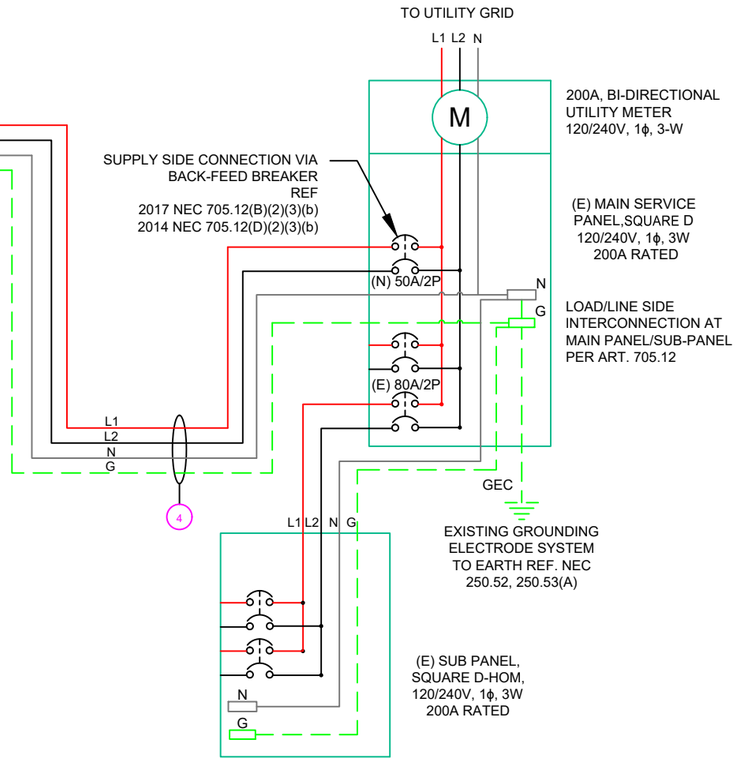
(28) TRINA SOLAR: TSM-DE06X.05(II) 365W MONO MODULES
WITH (28) ENPHASE IQ7PLUS-72-2-US 290W MICRO INVERTERS
EQUIPED WITH RAPID SHUTDOWN
(1) BRANCH CIRCUIT OF 10 MODULES AND
(2) BRANCH CIRCUITS OF 9 MODULES CONNECTED IN PARALLEL










**INTERCONNECTION NOTES:**
1. INTERCONNECTION SIZING, LIMITATIONS AND COMPLIANCE DETERMINED IN ACCORDANCE WITH [NEC 705.12], AND [NEC 690.64].
2. GROUND FAULT PROTECTION IN ACCORDANCE WITH [NEC 215.9], [NEC 230.95] AND [NEC 690.5]
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

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

**GROUNDING & GENERAL NOTES:**
1. A SECOND FACILITY GROUNDING ELECTRODE IS NOT REQUIRED PER [NEC 690.47(C)(3)]
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. SOLADECK OR JUNCTION BOX QUANTITIES, AND PLACEMENT SUBJECT TO CHANGE IN THE FIELD - SOLADECK OR 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.
8. 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.

| | QTY | CONDUCTOR INFORMATION | | CONDUIT TYPE | CONDUIT SIZE |
|---|---|---|---|---|---|
| 1 | (6) | #12AWG - | ENPHASE ENGAGE CABLE (L1 & L2 NO NEUTRAL) | N/A | N/A |
| | (1) | #6AWG - | BARE COPPER IN FREE AIR | | |
| 2 | (6) | #10AWG - | CU,THWN-2 | EMT OR FMC IN ATTIC | 3/4" |
| | (1) | #10AWG - | CU,THWN-2 GND | | |
| 3 | (2) | #8AWG - | CU,THWN-2 | EMT, LFMC OR PVC | 3/4" |
| | (1) | #8AWG - | CU,THWN-2 N | | |
| | (1) | #10AWG - | CU,THWN-2 GND | | |
| 4 | (2) | #8AWG - | CU,THWN-2 | EMT, LFMC OR PVC | 3/4" |
| | (1) | #8AWG - | CU,THWN-2 N | | |
| | (1) | #10AWG - | CU,THWN-2 GND | | |

1 ELECTRICAL LINE DIAGRAM
PV-4 SCALE: NTS

SIGORA SOLAR
SIGORA SOLAR LLC
490 WESTFIELD RD STE A
CHARLOTTESVILLE, VA 22901

REVISIONS

| DESCRIPTION | DATE | REV |
|---|---|---|
| INITIAL | 10/05/2021 | |
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| | | |
| | | |

DATE:10/05/2021

PROJECT NAME & ADDRESS

AMANDA WILLIAMS RESIDENCE
39 OLD HEAD WAY,
FUQUAY-VARIANA, NC 27526

DRAWN BY
ESR

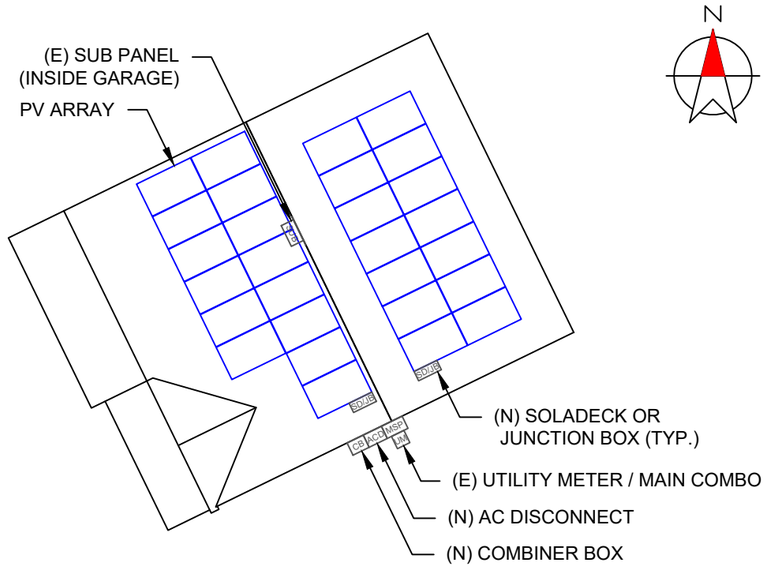
SHEET NAME
ELECTRICAL LINE DIAGRAM

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-4

# CAUTION

POWER TO THIS BUILDING IS ALSO SUPPLIED FROM MULTIPLE SOURCES OF POWER WITH SAFETY DISCONNECTS AS SHOWN:



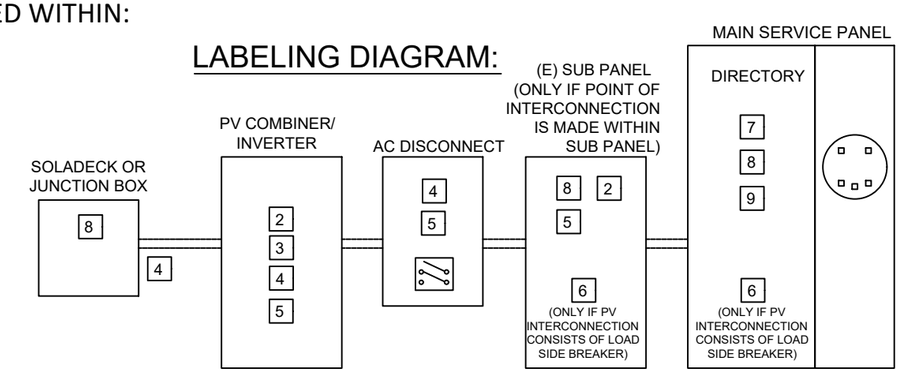

39 OLD HEAD WAY,FUQUAY-VARIANA, NC 27526

DIRECTORY

PERMANENT PLAQUE OR DIRECTORY PROVIDING THE LOCATION OF THE SERVICE DISCONNECTING MEANS AND THE PHOTOVOLTAIC SYSTEM.

(ALL PLAQUES AND SIGNAGE WILL BE INSTALLED AS OUTLINED WITHIN: NEC 690.56(B)&(C), [NEC 705.10])

LABELING DIAGRAM:




** ELECTRICAL DIAGRAM SHOWN ABOVE IS FOR LABELING PURPOSES ONLY. NOT AN ACTUAL REPRESENATION OF EQUIPMENT AND CONNECTIONS TO BE INSTALLED. LABEL LOCATIONS PRESENTED MAY VERY DEPENDING ON TYPE OF INTERCONNECTION METHOD AND LOCATION PRESENTED ELECTRICAL DIAGRAM PAGE. **

LABELING NOTES:

1. LABELS CALLED OUT ACCORDING TO ALL COMMON CONFIGURATIONS. ELECTRICIAN TO DETERMINE EXACT REQUIREMENTS IN THE FIELD PER CURRENT NEC AND LOCAL CODES AND MAKE APPROPRIATE ADJUSTMENTS.
2. LABELING REQUIREMENTS BASED ON THE 2017 NATIONAL ELECTRIC CODE, OSHA STANDARD 19010.145, ANSI Z535.
3. MATERIAL BASED ON THE REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION.
4. LABELS TO BE OF SUFFICIENT DURABILITY TO WITHSTAND THE ENVIRONMENT INVOLVED [NEC 110.21]
5. LABELS TO BE A MINIMUM LETTER HEIGHT OF 3/8", WHITE ON RED BACKGROUND; REFLECTIVE, AND PERMANENTLY AFFIXED [IFC 605.11.1.1]


SIGORA SOLAR

SIGORA SOLAR LLC
490 WESTFIELD RD STE A
CHARLOTTESVILLE, VA 22901


REVISIONS

| DESCRIPTION | DATE | REV |
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| INITIAL | 10/05/2021 | |
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| | | |

DATE:10/05/2021

PROJECT NAME & ADDRESS

AMANDA WILLIAMS
RESIDENCE

39 OLD HEAD WAY,
FUQUAY-VARIANA, NC 27526

DRAWN BY

ESR

SHEET NAME

PLACARD

SHEET SIZE

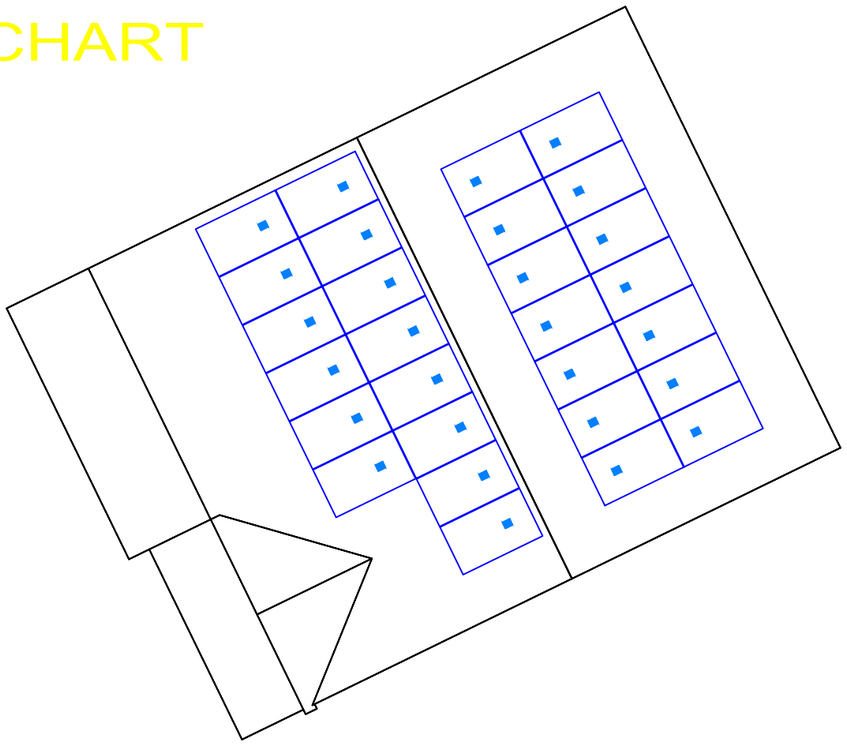
ANSI B
11" X 17"

SHEET NUMBER

PV-5

| | 1-10 | 11-20 | 21-30 | 31-40 | 41-50 | 51-60 | 61-70 | 71-80 | 81-90 | 91-100 | 101-110 | 111-120 | 121-130 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |

# MICRO INVERTER CHART



SIGORA SOLAR LLC
490 WESTFIELD RD STE A
CHARLOTTESVILLE, VA 22901

REVISIONS

| DESCRIPTION | DATE | REV |
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| | | |

DATE:10/05/2021

PROJECT NAME & ADDRESS

AMANDA WILLIAMS
RESIDENCE

39 OLD HEAD WAY,
FUQUAY-VARIANA, NC 27526

DRAWN BY

ESR

SHEET NAME

MICRO INVERTER CHART

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

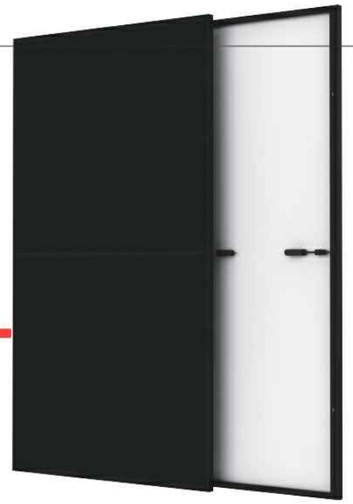
PV-6

Mono Multi Solutions

THE

# Residential Module

MULTI-BUSBAR MONO PERC MODULE



**132-Cell**
MONOCRYSTALLINE MODULE

**355-380W**
POWER OUTPUT RANGE

**20.6%**
MAXIMUM EFFICIENCY

**0~+5W**
POSITIVE POWER TOLERANCE

| PRODUCTS | POWER RANGE |
|---|---|
| TSM-DE06X.05(II) | 355-380W |

## High power and High Efficiency

- Up to 380W front power and 20.6% module efficiency with half-cut and MBB (Multi Busbar) technology bringing more BOS savings
- Reduce BOS cost with higher power bin and 1500V system voltage

## Outstanding visual appearance

- Designed with aesthetics in mind
- High standard Production, Excellent cell color control by dedicated cell blackening treatment and machine selection
- Thinner wires that appear all black at a distance

## High reliability

- Ensured PID resistance through cell process and module material control
- Resistant to salt, acid and ammonia
- Mechanical performance: Up to 5400 Pa positive load and 2400 Pa negative load

## Certified to withstand the most chanllenging environmental conditions

- Excellent IAM and low light performance validated by 3rd party with cell process and module material optimization
- Lower temp co-efficient (-0.34%) and NOCT bring more energy leading to lower LCOE
- Better anti-shading performance and lower operating temperature


Founded in 1997, Trina Solar is the world's leading total solution provider for solar energy. With local presence around the globe, Trina Solar is able to provide exceptional service to each customer in each market and deliver our innovative, reliable products with the backing of Trina as a strong, bankable brand. Trina Solar now distributes its PV products to over 100 countries all over the world. We are committed to building strategic, mutually beneficial collaborations with installers, developers, distributors and other partners in driving smart energy together.

## Comprehensive Products and System Certificates

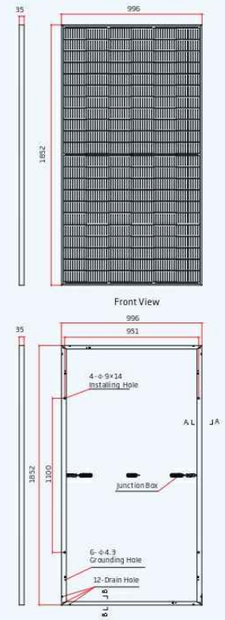
IEC61215/IEC61730/IEC61701/IEC62716/UL61730
ISO 9001: Quality Management System
ISO14001: Environmental Management System
ISO14064: Greenhouse Gases Emissions Verification
OHSAS 18001: Occupation Health and Safety Management System

Trinasolar

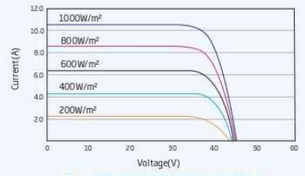
# Residential Module

MULTI-BUSBAR MONO PERC MODULE

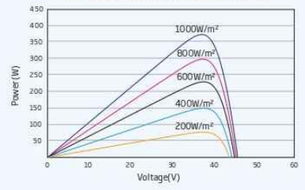
DIMENSIONS OF PV MODULE(mm)




I-V CURVES OF PV MODULE(370W)




P-V CURVES OF PV MODULE(370W)




## ELECTRICAL DATA (STC)

| | | | | | | |
|---|---|---|---|---|---|---|
| Peak Power Watts-$P_{MAX}$ (Wp)* | 355 | 360 | 365 | 370 | 375 | 380 |
| Power Output Tolerance-$P_{MAX}$ (W) | | | 0 ~ +5 | | | |
| Maximum Power Voltage-$V_{MPP}$ (V) | 36.8 | 37.0 | 37.2 | 37.4 | 37.6 | 37.8 |
| Maximum Power Current-$I_{MPP}$ (A) | 9.66 | 9.74 | 9.82 | 9.90 | 9.98 | 10.07 |
| Open Circuit Voltage-$V_{OC}$ (V) | 44.6 | 44.8 | 45.0 | 45.2 | 45.3 | 45.5 |
| Short Circuit Current-$I_{SC}$ (A) | 10.24 | 10.30 | 10.35 | 10.40 | 10.45 | 10.51 |
| Module Efficiency $\eta_m$ (%) | 19.2 | 19.5 | 19.8 | 20.1 | 20.3 | 20.6 |

STC: Irradiance 1000W/m², Cell Temperature 25°C, Air Mass AM1.5.
*Measurement tolerance: ± 3%.

## ELECTRICAL DATA (NOCT)

| | | | | | | |
|---|---|---|---|---|---|---|
| Maximum Power-$P_{MAX}$ (Wp) | 268 | 272 | 276 | 279 | 283 | 287 |
| Maximum Power Voltage-$V_{MPP}$ (V) | 34.4 | 34.7 | 34.9 | 35.1 | 35.3 | 35.6 |
| Maximum Power Current-$I_{MPP}$ (A) | 7.80 | 7.85 | 7.90 | 7.96 | 8.01 | 8.06 |
| Open Circuit Voltage-$V_{OC}$ (V) | 42.0 | 42.2 | 42.4 | 42.6 | 42.6 | 42.8 |
| Short Circuit Current-$I_{SC}$ (A) | 8.25 | 8.30 | 8.34 | 8.38 | 8.42 | 8.47 |

NOCT: Irradiance at 800W/m², Ambient Temperature 20°C, Wind Speed 1m/s.

## MECHANICAL DATA

| | |
|---|---|
| Solar Cells | Monocrystalline |
| Cell Orientation | 132 cells |
| Module Dimensions | 1852 × 996 × 35 mm (72.91 × 39.21 × 1.38 inches) |
| Weight | 19.7 kg (43.4 lb) |
| Glass | 3.2 mm (0.13 inches), High Transmission, AR Coated Heat Strengthened Glass |
| Encapsulant Material | EVA |
| Backsheet | Black-White |
| Frame | 35 mm ( inches) Anodized Aluminium Alloy |
| J-Box | IP 68 rated |
| Cables | Photovoltaic Technology Cable 4.0mm² (0.006 inches²),<br>Portrait: N 280mm/P 280mm(11.02/11.02inches)<br>Landscape: N 1400 mm /P 1400 mm (55.12/55.12 inches) |
| Connector | MC4 EVO2 |
| Fire Type | Type 2 |

## TEMPERATURE RATINGS

| | |
|---|---|
| NOCT (Nominal Operating Cell Temperature) | 43°C (±2°C) |
| Temperature Coefficient of $P_{MAX}$ | - 0.34%/°C |
| Temperature Coefficient of $V_{OC}$ | - 0.25%/°C |
| Temperature Coefficient of $I_{SC}$ | 0.04%/°C |

## MAXIMUM RATINGS

| | |
|---|---|
| Operational Temperature | -40~+85°C |
| Maximum System Voltage | 1500V DC (IEC) |
| Max Series Fuse Rating | 20A |

## WARRANTY

25 year Product Workmanship Warranty
25 year Linear Power Warranty
(Please refer to product warranty for details)

## PACKAGING CONFIGURATION

Modules per box: 31 pieces
Modules per 40' container: 744 pieces

Trinasolar


Version number: TSM_DE06X.05(II)_NA_2020_PA3 www.trinasolar.com

SIGORA SOLAR

SIGORA SOLAR LLC
490 WESTFIELD RD STE A
CHARLOTTESVILLE, VA 22901

| REVISIONS | | |
|---|---|---|
| DESCRIPTION | DATE | REV |
| INITIAL | 10/05/2021 | |

DATE:10/05/2021

PROJECT NAME & ADDRESS

AMANDA WILLIAMS RESIDENCE

39 OLD HEAD WAY,
FUQUAY-VARIANA, NC 27526

DRAWN BY
ESR

SHEET NAME
MODULE SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-7

Data Sheet
**Enphase Microinverters**
Region: AMERICAS

# Enphase IQ 7 and IQ 7+ Microinverters

The high-powered smart grid-ready **Enphase IQ 7 Micro™** and **Enphase IQ 7+ Micro™** dramatically simplify the installation process while achieving the highest system efficiency.

Part of the Enphase IQ System, the IQ 7 and IQ 7+ Microinverters integrate with the Enphase IQ Envoy™, Enphase IQ Battery™, and the Enphase Enlighten™ monitoring and analysis software.

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


## Easy to Install

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

## Productive and Reliable

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

## Smart Grid Ready

- Complies with advanced grid support, voltage and frequency ride-through requirements
- Remotely updates to respond to changing grid requirements
- Configurable for varying grid profiles
- Meets CA Rule 21 (UL 1741-SA)

* The IQ 7+ Micro is required to support 72-cell modules.

UL CERTIFIED
SAFETY US-CA E341165

To learn more about Enphase offerings, visit **enphase.com**

ENPHASE

## Enphase IQ 7 and IQ 7+ Microinverters

| INPUT DATA (DC) | IQ7-60-2-US | | IQ7PLUS-72-2-US | |
|---|---|---|---|---|
| Commonly used module pairings[1] | 235 W - 350 W + | | 235 W - 440 W + | |
| Module compatibility | 60-cell PV modules only | | 60-cell and 72-cell PV modules | |
| Maximum input DC voltage | 48 V | | 60 V | |
| Peak power tracking voltage | 27 V - 37 V | | 27 V - 45 V | |
| Operating range | 16 V - 48 V | | 16 V - 60 V | |
| Min/Max start voltage | 22 V / 48 V | | 22 V / 60 V | |
| Max DC short circuit current (module Isc) | 15 A | | 15 A | |
| Overvoltage class DC port | II | | II | |
| DC port backfeed current | 0 A | | 0 A | |
| PV array configuration | 1 x 1 ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit | | | |
| **OUTPUT DATA (AC)** | **IQ 7 Microinverter** | | **IQ 7+ Microinverter** | |
| Peak output power | 250 VA | | 295 VA | |
| Maximum continuous output power | 240 VA | | 290 VA | |
| Nominal (L-L) voltage/range[2] | 240 V / 211-264 V | 208 V / 183-229 V | 240 V / 211-264 V | 208 V / 183-229 V |
| Maximum continuous output current | 1.0 A (240 V) | 1.15 A (208 V) | 1.21 A (240 V) | 1.39 A (208 V) |
| Nominal frequency | 60 Hz | | 60 Hz | |
| Extended frequency range | 47 - 68 Hz | | 47 - 68 Hz | |
| AC short circuit fault current over 3 cycles | 5.8 Arms | | 5.8 Arms | |
| Maximum units per 20 A (L-L) branch circuit[3] | 16 (240 VAC) | 13 (208 VAC) | 13 (240 VAC) | 11 (208 VAC) |
| Overvoltage class AC port | III | | III | |
| AC port backfeed current | 0 A | | 0 A | |
| Power factor setting | 1.0 | | 1.0 | |
| Power factor (adjustable) | 0.85 leading ... 0.85 lagging | | 0.85 leading ... 0.85 lagging | |
| **EFFICIENCY** | **@240 V** | **@208 V** | **@240 V** | **@208 V** |
| Peak efficiency | 97.6 % | 97.6 % | 97.5 % | 97.3 % |
| CEC weighted efficiency | 97.0 % | 97.0 % | 97.0 % | 97.0 % |
| **MECHANICAL DATA** | | | | |
| Ambient temperature range | -40°C to +65°C | | | |
| Relative humidity range | 4% to 100% (condensing) | | | |
| Connector type (IQ7-60-2-US & IQ7PLUS-72-2-US) | MC4 (or Amphenol H4 UTX with additional Q-DCC-5 adapter) | | | |
| Dimensions (WxHxD) | 212 mm x 175 mm x 30.2 mm (without bracket) | | | |
| Weight | 1.08 kg (2.38 lbs) | | | |
| Cooling | Natural convection - No fans | | | |
| Approved for wet locations | Yes | | | |
| Pollution degree | PD3 | | | |
| Enclosure | Class II double-insulated, corrosion resistant polymeric enclosure | | | |
| Environmental category / UV exposure rating | NEMA Type 6 / outdoor | | | |
| **FEATURES** | | | | |
| Communication | Power Line Communication (PLC) | | | |
| Monitoring | Enlighten Manager and MyEnlighten monitoring options. Both options require installation of an Enphase IQ Envoy. | | | |
| Disconnecting means | The AC and DC connectors have been evaluated and approved by UL for use as the load-break disconnect required by NEC 690. | | | |
| Compliance | CA Rule 21 (UL 1741-SA) UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01 This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC-2014 and NEC-2017 section 690.12 and C22.1-2015 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according manufacturer's instructions. | | | |

1. No enforced DC/AC ratio. See the compatibility calculator at https://enphase.com/en-us/support/module-compatibility.
2. Nominal voltage range can be extended beyond nominal if required by the utility.
3. Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

To learn more about Enphase offerings, visit **enphase.com**

ENPHASE


2019-3-26

SIGORA SOLAR

SIGORA SOLAR LLC
490 WESTFIELD RD STE A
CHARLOTTESVILLE, VA 22901

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DATE:10/05/2021

PROJECT NAME & ADDRESS

AMANDA WILLIAMS RESIDENCE

39 OLD HEAD WAY,
FUQUAY-VARIANA, NC 27526

DRAWN BY
ESR

SHEET NAME
INVERTER SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-8

Data Sheet
Enphase Networking

# Enphase IQ Combiner 3

(X-IQ-AM1-240-3)

The **Enphase IQ Combiner 3**™ with Enphase IQ Envoy™ consolidates interconnection equipment into a single enclosure and streamlines PV and storage installations by providing a consistent, pre-wired solution for residential applications. It offers up to four 2-pole input circuits and Eaton BR series busbar assembly.

### Smart

- Includes IQ Envoy for communication and control
- Flexible networking supports Wi-Fi, Ethernet, or cellular
- Optional AC receptacle available for PLC bridge
- Provides production metering and optional consumption monitoring

### Simple

- Reduced size from previous combiner
- Centered mounting brackets support single stud mounting
- Supports back and side conduit entry
- Up to four 2-pole branch circuits for 240 VAC plug-in breakers (not included)
- 80 A total PV or storage branch circuits

### Reliable

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

LISTED

To learn more about Enphase offerings, visit **enphase.com**

ENPHASE

## Enphase IQ Combiner 3

| | |
|---|---|
| **MODEL NUMBER** | |
| IQ Combiner 3 X-IQ-AM1-240-3 | IQ Combiner 3 with Enphase IQ Envoy™ printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and optional* consumption monitoring (+/- 2.5%). |
| **ACCESSORIES** and **REPLACEMENT PARTS** (not included, order separately) | |
| Enphase Mobile Connect™<br>CELLMODEM-03 (4G / 12-year data plan)<br>CELLMODEM-01 (3G / 5-year data plan)<br>CELLMODEM-M1 (4G based LTE-M / 5-year data plan) | Plug and play industrial grade cellular modem with data plan for systems up to 60 microinverters. (Available in the US, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.) |
| Consumption Monitoring* CT<br>CT-200-SPLIT | Split core current transformers enable whole home consumption metering (+/- 2.5%). |
| Circuit Breakers<br>BRK-10A-2-240<br>BRK-15A-2-240<br>BRK-20A-2P-240 | Supports Eaton BR210, BR215, BR220, BR230, BR240, BR250, and BR260 circuit breakers.<br>Circuit breaker, 2 pole, 10A, Eaton BR210<br>Circuit breaker, 2 pole, 15A, Eaton BR215<br>Circuit breaker, 2 pole, 20A, Eaton BR220 |
| EPLC-01 | Power line carrier (communication bridge pair), quantity 2 |
| XA-PLUG-120-3 | Accessory receptacle for Power Line Carrier in IQ Combiner 3 (required for EPLC-01) |
| XA-ENV-PCBA-3 | Replacement IQ Envoy printed circuit board (PCB) for Combiner 3 |
| **ELECTRICAL SPECIFICATIONS** | |
| Rating | Continuous duty |
| System voltage | 120/240 VAC, 60 Hz |
| Eaton BR series busbar rating | 125 A |
| Max. continuous current rating (output to grid) | 65 A |
| Max. fuse/circuit rating (output) | 90 A |
| Branch circuits (solar and/or storage) | Up to four 2-pole Eaton BR series Distributed Generation (DG) breakers only (not included) |
| Max. continuous current rating (input from PV) | 64 A |
| Max. total branch circuit breaker rating (input) | 80A of distributed generation / 90A with IQ Envoy breaker included |
| Production Metering CT | 200 A solid core pre-installed and wired to IQ Envoy |
| **MECHANICAL DATA** | |
| Dimensions (WxHxD) | 49.5 x 37.5 x 16.8 cm (19.5" x 14.75" x 6.63"). Height is 21.06" (53.5 cm with mounting brackets). |
| Weight | 7.5 kg (16.5 lbs) |
| Ambient temperature range | -40° C to +46° C (-40° to 115° F) |
| Cooling | Natural convection, plus heat shield |
| Enclosure environmental rating | Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction |
| Wire sizes | • 20 A to 50 A breaker inputs: 14 to 4 AWG copper conductors<br>• 60 A breaker branch input: 4 to 1/0 AWG copper conductors<br>• Main lug combined output: 10 to 2/0 AWG copper conductors<br>• Neutral and ground: 14 to 1/0 copper conductors<br>Always follow local code requirements for conductor sizing. |
| Altitude | To 2000 meters (6,560 feet) |
| **INTERNET CONNECTION OPTIONS** | |
| Integrated Wi-Fi | 802.11b/g/n |
| Ethernet | Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included) |
| Cellular | Optional, CELLMODEM-01 (3G) or CELLMODEM-03 (4G) or CELLMODEM-M1 (4G based LTE-M) (not included) |
| **COMPLIANCE** | |
| Compliance, Combiner | UL 1741<br>CAN/CSA C22.2 No. 107.1<br>47 CFR, Part 15, Class B, ICES 003<br>Production metering: ANSI C12.20 accuracy class 0.5 (PV production) |
| Compliance, IQ Envoy | UL 60601-1/CANCSA 22.2 No. 61010-1 |

* Consumption monitoring is required for Enphase Storage Systems.

To learn more about Enphase offerings, visit **enphase.com**


2018-09-13

ENPHASE

SIGORA SOLAR

SIGORA SOLAR LLC
490 WESTFIELD RD STE A
CHARLOTTESVILLE, VA 22901

| REVISIONS | | |
|---|---|---|
| DESCRIPTION | DATE | REV |
| INITIAL | 10/05/2021 | |
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DATE:10/05/2021

PROJECT NAME & ADDRESS

AMANDA WILLIAMS RESIDENCE

39 OLD HEAD WAY,
FUQUAY-VARIANA, NC 27526

DRAWN BY

ESR

SHEET NAME

COMBINER SPECIFICATION

SHEET SIZE

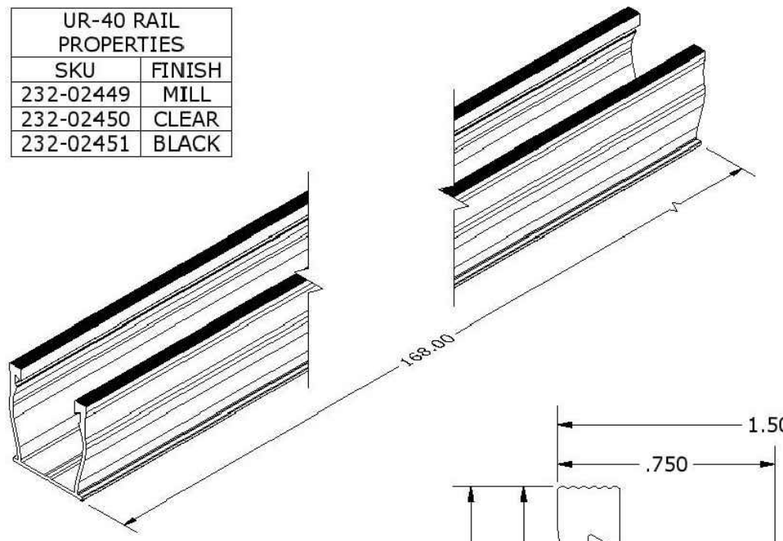
ANSI B
11" X 17"

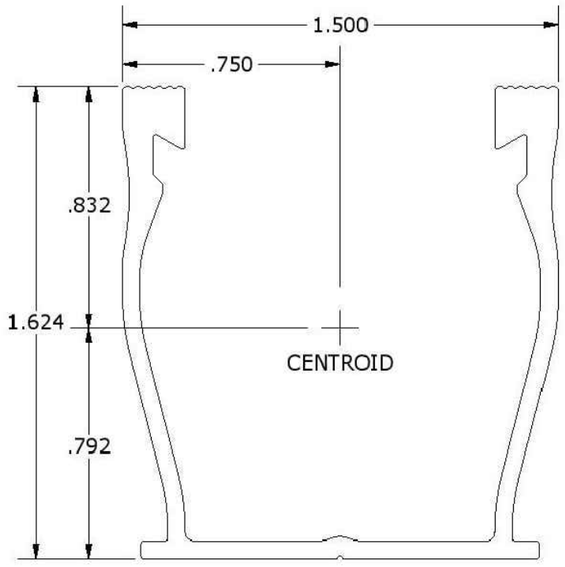
SHEET NUMBER

PV-9

| DESCRIPTION: | DRAWN BY: | SnapNrack™ Solar Mounting Solutions |
|---|---|---|
| SNAPNRACK, UR-40 RAIL | mwatkins | |
| PART NUMBER(S): | REVISION: | 595 MARKET STREET, 29TH FLOOR • SAN FRANCISCO, CA 94105 USA.<br>PHONE (415) 580-6900 • FAX (415) 580-6902 |
| 232-02449, 232-02450, 232-02451 | B | THE INFORMATION IN THIS DRAWING IS CONFIDENTIAL AND PROPRIETARY. ANY REPRODUCTION, DISCLOSURE, OR USE THEREOF IS PROHIBITED WITHOUT THE WRITTEN CONSENT OF SUNRUN SOUTH LLC. |

| UR-40 RAIL PROPERTIES | |
|---|---|
| SKU | FINISH |
| 232-02449 | MILL |
| 232-02450 | CLEAR |
| 232-02451 | BLACK |




| SECTION PROPERTIES | |
|---|---|
| A | 0.357 in² |
| Ixx | 0.125 in⁴ |
| Iyy | 0.132 in⁴ |
| Sx (TOP) | 0.150 in³ |
| Sx (BOT) | 0.158 in³ |
| Sy (LEFT) | 0.175 in³ |
| Sy (RIGHT) | 0.175 in³ |

ALL DIMENSIONS IN INCHES

| | | |
|---|---|---|
| MATERIALS: | 6000 SERIES ALUMINUM | OPTIONS: |
| DESIGN LOAD (LBS): | N/A | CLEAR / BLACK ANODIZED |
| ULTIMATE LOAD (LBS): | N/A | MILL FINISH |
| TORQUE SPECIFICATION: | N/A LB-FT | BUNDLES OF 144 |
| CERTIFICATION: | UL 2703, FILE E359313 | BOXES OF 8 |
| WEIGHT (LBS): | 5.85 | |

SIGORA SOLAR

SIGORA SOLAR LLC
490 WESTFIELD RD STE A
CHARLOTTESVILLE, VA 22901

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| | | |

DATE:10/05/2021

PROJECT NAME & ADDRESS

AMANDA WILLIAMS RESIDENCE

39 OLD HEAD WAY,
FUQUAY-VARIANA, NC 27526

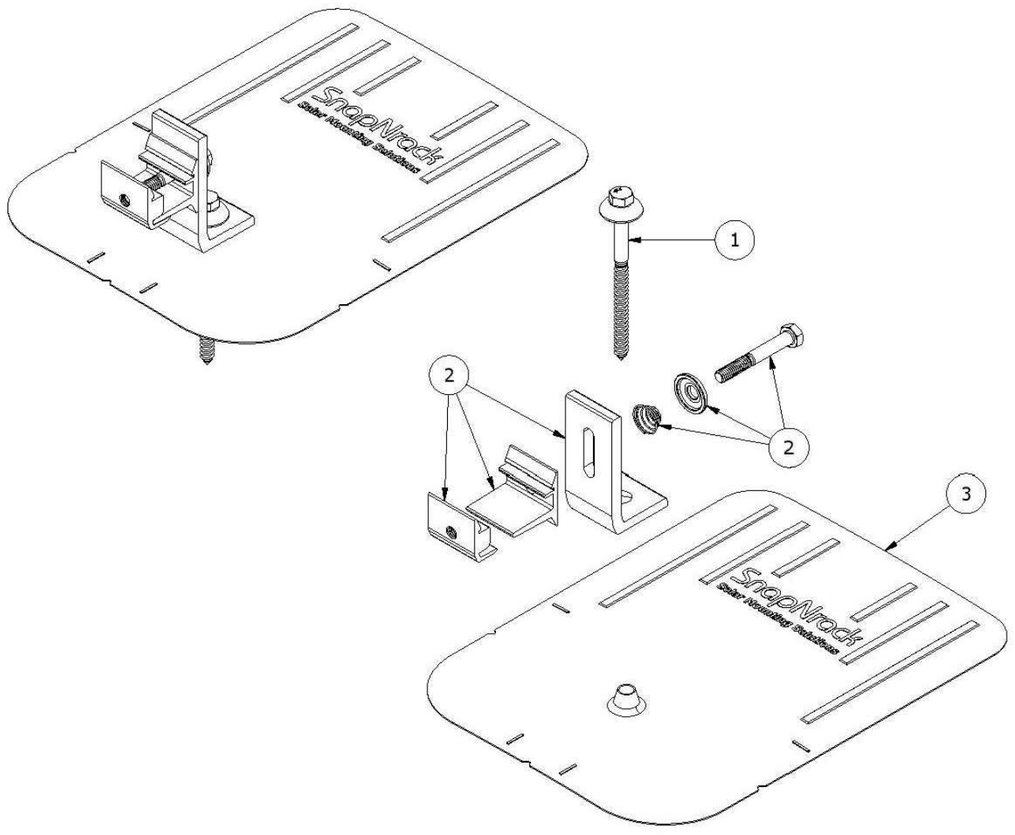
DRAWN BY
ESR

SHEET NAME
RAIL SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-10

| DESCRIPTION: | DRAWN BY: | SnapNrack™ Solar Mounting Solutions |
|---|---|---|
| SNAPNRACK, ULTRA RAIL COMP KIT | mwatkins | |
| PART NUMBER(S): | REVISION: | 595 MARKET STREET, 29TH FLOOR • SAN FRANCISCO, CA 94105 USA<br>PHONE (415) 580-6900 • FAX (415) 580-6902 |
| SEE BELOW | B | THE INFORMATION IN THIS DRAWING IS CONFIDENTIAL AND PROPRIETARY. ANY REPRODUCTION, DISCLOSURE, OR USE THEREOF IS PROHIBITED WITHOUT THE WRITTEN CONSENT OF SUNRUN SOUTH LLC. |




| PARTS LIST | | | |
|---|---|---|---|
| ITEM | QTY | PART NUMBER | DESCRIPTION |
| 1 | 1 | 242-92266 | SNAPNRACK, UMBRELLA LAG, TYPE 3, 4IN, SS |
| 2 | 1 | 242-01219, 242-01220 | SNAPNRACK, ULTRA FOOT FOR U FLASHING, SILVER / BLACK |
| 3 | 1 | 232-01375, 232-01376 | SNAPNRACK, COMP FLASHING, 9IN X 12IN, SILVER / BLACK ALUM |

| | |
|---|---|
| MATERIALS: | 6000 SERIES ALUMINUM, STAINLESS STEEL, RUBBER |
| DESIGN LOAD (LBS): | 802 UP, 1333 DOWN, 356 SIDE |
| ULTIMATE LOAD (LBS): | 2005 UP, 4000 DOWN, 1070 SIDE |
| TORQUE SPECIFICATION: | 12 LB-FT |
| CERTIFICATION: | UL 2703, FILE E359313; WIND-DRIVEN RAIN TEST FROM UL SUBJECT 2582 |
| WEIGHT (LBS): | 0.80 |


| DESCRIPTION: | DRAWN BY: | SnapNrack™ Solar Mounting Solutions |
|---|---|---|
| SNAPNRACK, ULTRA RAIL COMP KIT | mwatkins | |
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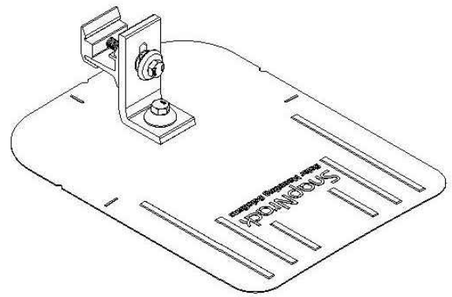
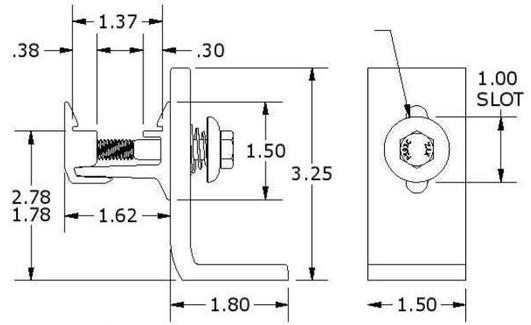
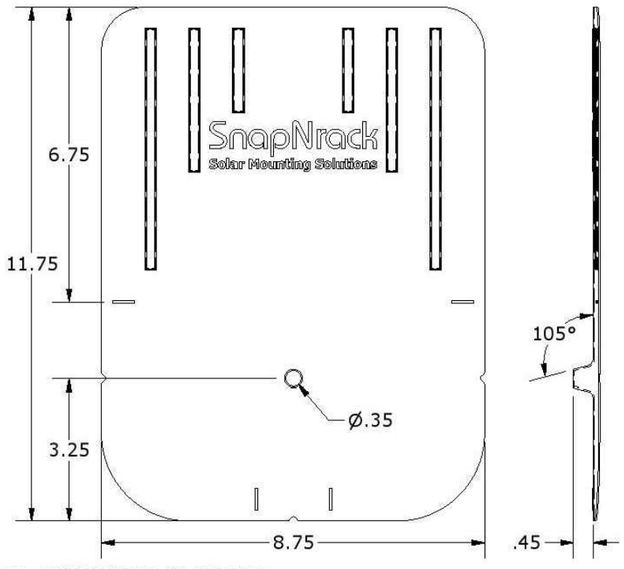
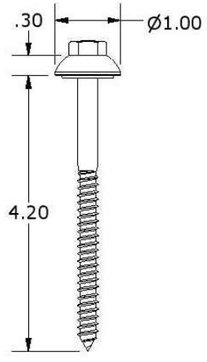



| UMBRELLA L FOOT PROPERTIES | |
|---|---|
| SKU | DESCRIPTION |
| 242-01219 | ULTRA RAIL UMBRELLA L FOOT, SILVER |
| 242-01220 | ULTRA RAIL UMBRELLA L FOOT, BLACK |




| COMP FLASHING PROPERTIES | |
|---|---|
| SKU | DESCRIPTION |
| 232-01375 | COMP FLASHING, 9" X 12", BLACK ALUM |
| 232-01376 | COMP FLASHING, 9" X 12", SILVER ALUM |

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DRAWN BY
ESR

SHEET NAME
ATTACHMENT SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-11

# SolaDeck

FLASHED PV ROOF-MOUNT COMBINER/ENCLOSURE

**Basic Features**

- Stamped Seamless Construction
- 18 Gauge Galvanized Steel
- Powder Coated Surfaces
- Flashes into the roof deck
- 3 Roof deck knockouts .5", .75", 1"
- 5 Centering dimples for entry/exit fittings or conduit
- 2 Position Ground lug installed
- Mounting Hardware Included

SolaDeck Model SD 0783

## SolaDeck UL50 Type 3R Enclosures

Available Models:
Model SD 0783 - (3" fixed Din Rail)
Model SD 0786 - (6" slotted Din Rail)

## SolaDeck UL 1741 Combiner/Enclosures

Models SD 0783-41 and SD 0786-41 are labeled and ETL listed UL STD 1741 according to the UL STD 1741 for photovoltaic combiner enclosures.

Max Rated - 600VDC, 120AMPS

**Model SD 0783-41** 3" Fixed Din Rail fastened using Norlock System

****Typical System Configuration**

4- Din Rail Mounted Fuse Holders 600VDC 30 AMP
1- Power Distribution Block 600VDC 175AMP
1- Bus Bar with UL lug

**Model SD 0786-41** 6" Slotted Din Rail fastened using steel studs

****Typical System Configuration**

4- Din Rail Mounted Fuse Holders 600VDC 30 AMP
4- Din Rail Mounted Terminal Blocks
Bus Bars with UL lug

**Fuse holders and terminal blocks added in the field must be UL listed or recognized and meet 600 VDC 30 AMP 110C for fuse holders, 600V 50 AMP 90C for rail mounted terminal blocks and 600 V 175 AMP 90C for Power Distribution Blocks. Use Copper Wire Conductors.

Cover is trimmed to allow conduit or fittings, base is center dimpled for fitting locations.

Model SD 0783-41, wired with Din Rail mounted fuse holders, bus bar and power distribution block.

Model SD 0786-41, wired with Din Rail mounted fuse holders, terminal blocks and bus bars.

*RSTC Enterprises, Inc • 2219 Heimstead Road • Eau Cliare, WI 54703*
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SIGORA SOLAR LLC
490 WESTFIELD RD STE A
CHARLOTTESVILLE, VA 22901

REVISIONS

| DESCRIPTION | DATE | REV |
|---|---|---|
| INITIAL | 10/05/2021 | |
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| | | |
| | | |

DATE:10/05/2021

PROJECT NAME & ADDRESS

AMANDA WILLIAMS RESIDENCE

39 OLD HEAD WAY,
FUQUAY-VARIANA, NC 27526

DRAWN BY
ESR

SHEET NAME
SOLADECK SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-12