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SOLAR

Solar Installer Training

Rooftop Solar Installation Training Guide

Contents

Installation and Configuration of Rooftop Solar Systems

- Drawing Package
- Mounting System Installation
- Inverter Installation and Configuration
- Panel Installation
- Wiring and Installation
- Testing and Commissioning
- Common Mistakes

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Drawing Packages for Installers

These drawings (site layout, SLD) will be provided to you prior to installation. You will need to confirm that you have all of the equipment listed on the drawings prior to leaving the shop.

Installing to the system ***exactly*** as shown on the drawings is required to pass inspections.

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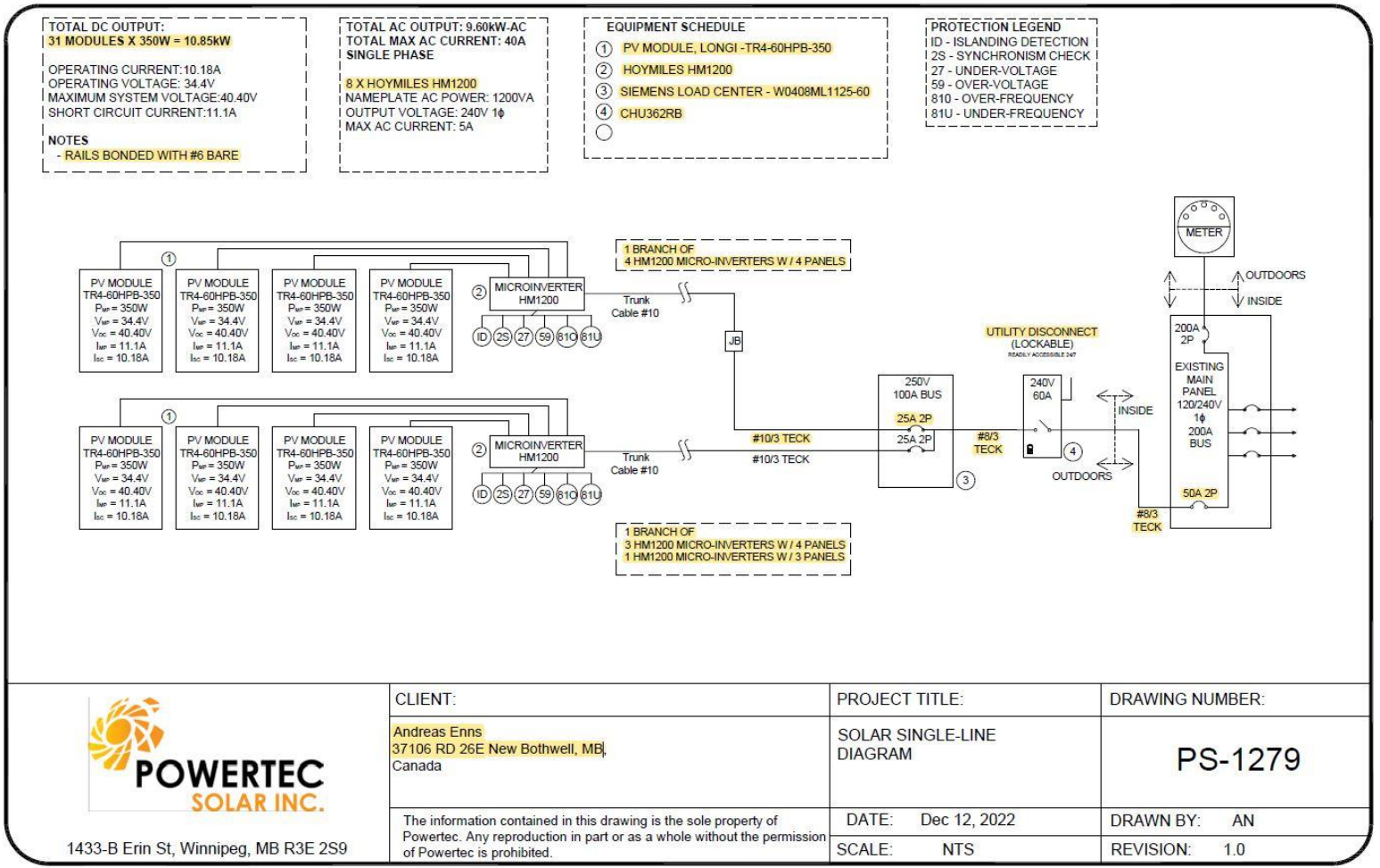
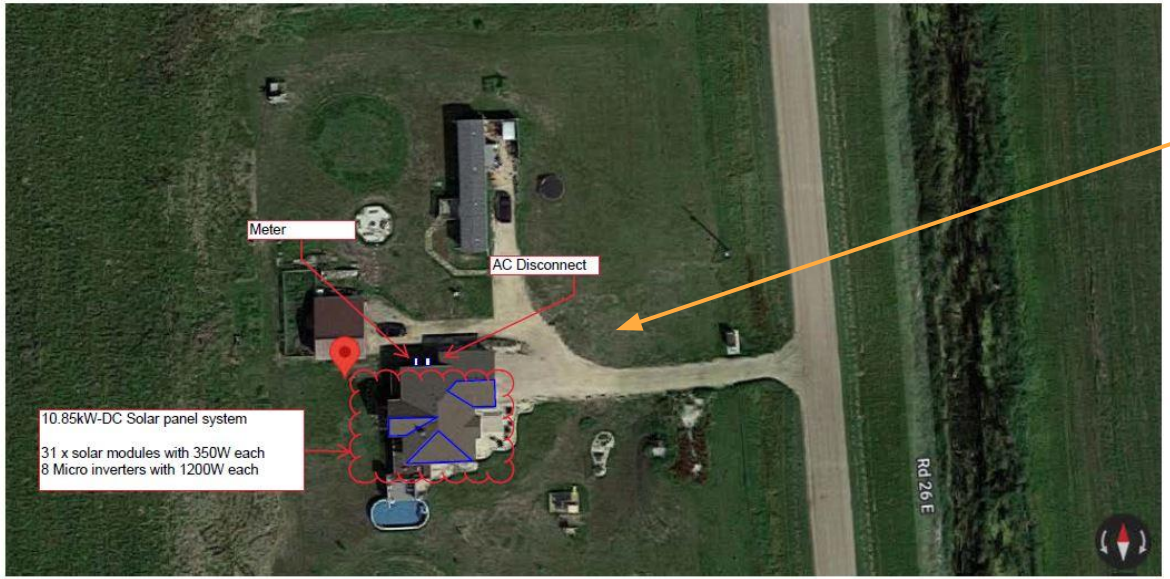
Single Line Diagram



POWERTEC SOLAR INC. 1433-B Erin St, Winnipeg, MB R3E 2S9	CLIENT: Andreas Enns 37106 RD 26E New Bothwell, MB, Canada	PROJECT TITLE: SOLAR SINGLE-LINE DIAGRAM	DRAWING NUMBER: PS-1279
	The information contained in this drawing is the sole property of Powertec. Any reproduction in part or as a whole without the permission of Powertec is prohibited.	DATE: Dec 12, 2022 SCALE: NTS	DRAWN BY: AN REVISION: 1.0

POWERTEC SOLAR INC SITE PLAN



Site Layout

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1433-B Erin St, Winnipeg, MB R3E 2S9

Customer Name
and address

December 7, 2022

PROJECT NUMBER

PS-1279

Site Layout with panel quantity

Racking System Components and Installation

The following slides will provide you with the basic components of the roof-mounted racking system and a general overview of how they are assembled

Having a proper racking layout is integral to ensuring that the system fits properly on the roof.

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Components

ID	PART	CODE
1	L Foot	FR-FOOT-ROS-KIT
2	Rail	FR-RAIL-UL-XX
3	Splice	FR-SPLICE
4	End Clamp	FR-END-XX
5	Mid Clamp	FR-MIGS-XX
6	Ground Lug	FR-GNDLUG-C
7	Bond Strap	FR-BJ-8.0-KIT
8	Accessory Bond Kit	FR-MGH-16/25
9	Hidden End Clamp	FR-HEC

Hardware

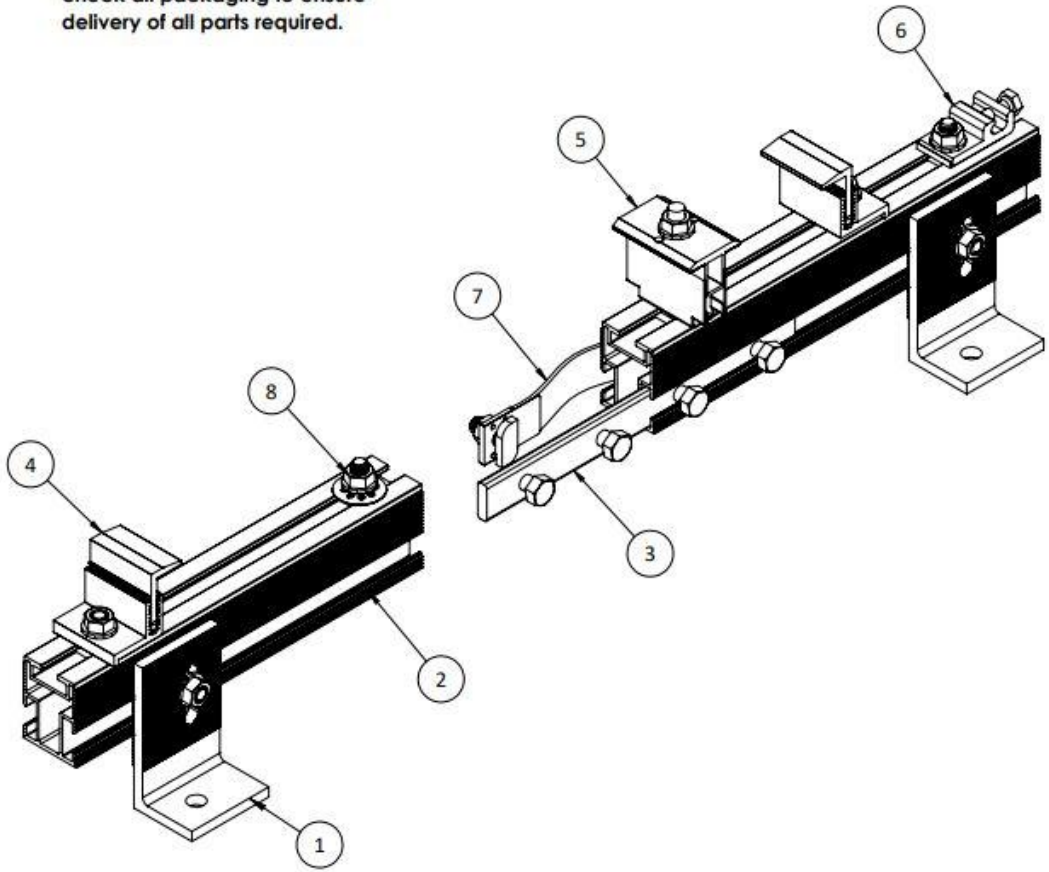
ID	SIZE	TYPE
A	M8 x 25	T-Bolt
B	M8	Flanged Hex Nut

***all hardware included in component kits**

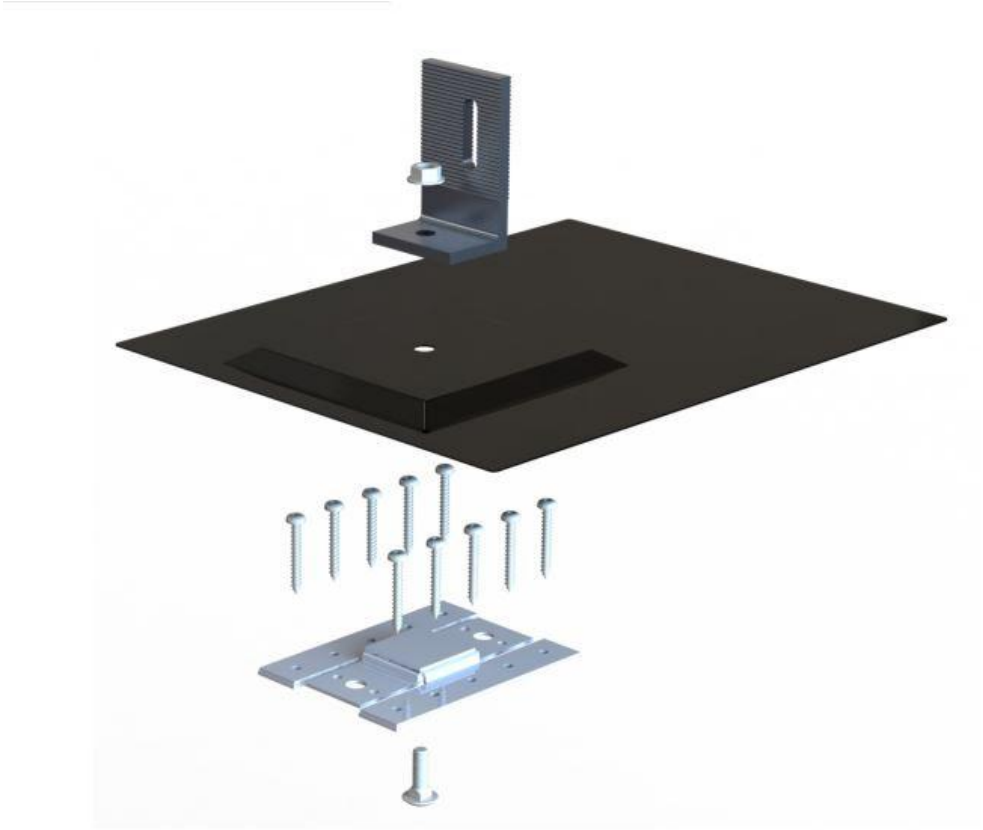
Tools

- Drill/driver
- 13mm Open end wrench, socket and ratchet
- Torque wrench
- Wire snips/side cutters
- String line/chalk line
- Tape measure
- Level
- Stud finder
- Hand or chop saw

⚠ **Upon receipt of goods, make sure to check all packaging to ensure delivery of all parts required.**



L-Foot and Flashing



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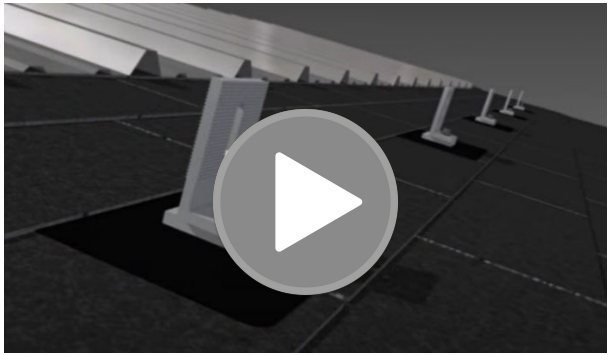
Feet and Flashing

1. Distance between L-Feet should be no greater than 4ft (48in). Stagger each row of L-brackets to distribute the load evenly between all trusses.
2. Distance from last L-Foot to rail end should be no more than 1 ft (12in).
3. If panels are overhanging the roof (this should be avoided), spacing between L-brackets should be 2ft (24in) on the rail closest to the edge.
4. Normal installation will have the L-bracket sitting just 1 rib from flush to rail, depending on how level the roof sheeting is, you may need to adjust their height.
5. When adding a joiner to rails, you must leave a gap ¼” - ⅜” for thermal expansion. A bonding strap is also required between expansion joints.
6. The talon flashings are required to sit under 1.5 - 2 shingles so that only the raised part that holds the L-bracket is exposed. This may mean moving your row up or down a couple inches so your talon plate does not cross over 2 shingles.

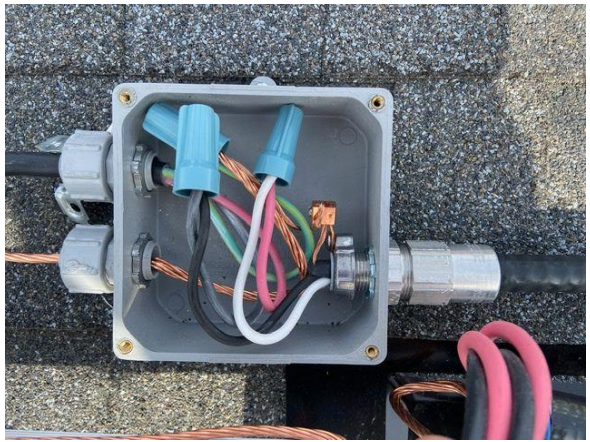
Talon and Fast Rack Installation Videos

Fast Rack Talon Solar Installation Overview



Fast Rack and Low Profile Demo

Bonding



All rails, conduits, flex, junction boxes and other metal parts on the rooftop must be bonded with the No.6 bare bond cable.

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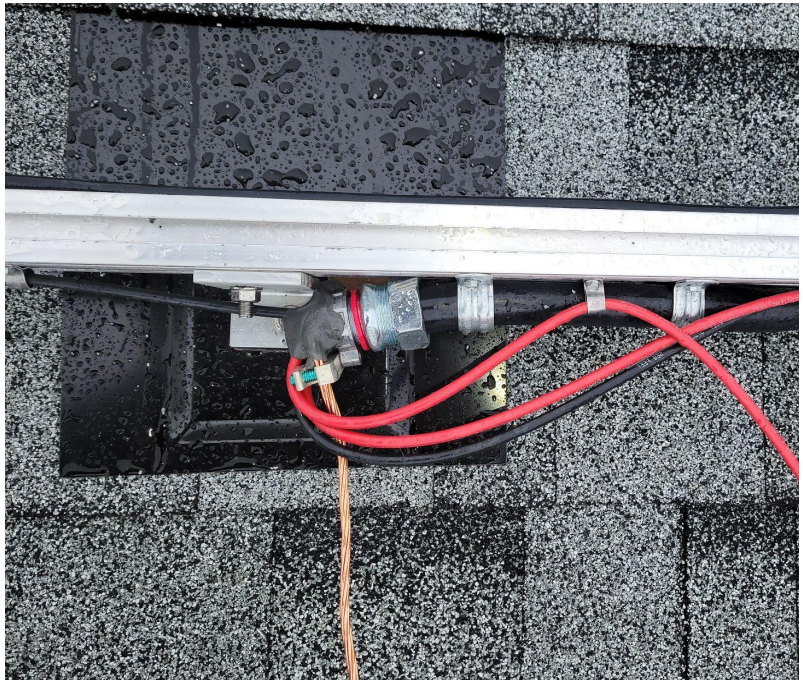
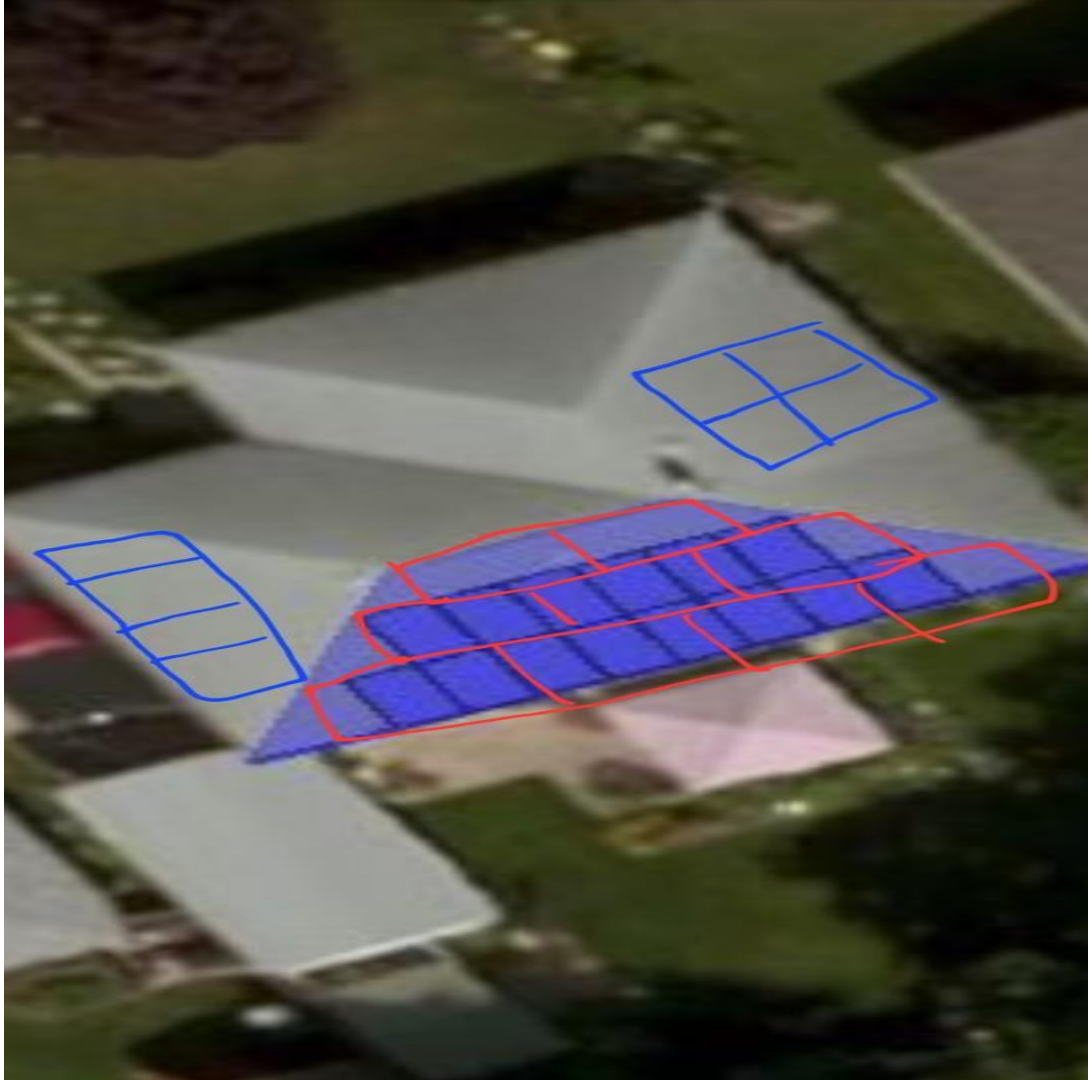
All Rails must be connected by a continuous bond. This includes when running through liquid tight or zip tied to the teck to join sections of the array when it is broken up.

When arrays are broken up, **Metallic** Flex (liquid-tight) must be used to shield the RPVU from mechanical damage.

One 1 end, a connector and ground bushing are required and just a bushing or insulated sleeve on the other end.

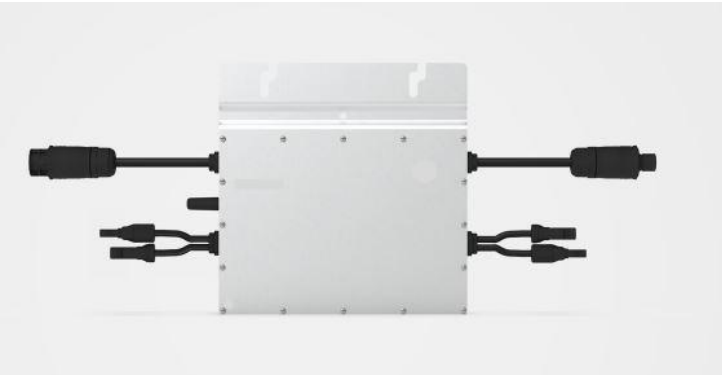


Once all cables have been run through, both ends of the liquid tight should be duct-sealed.

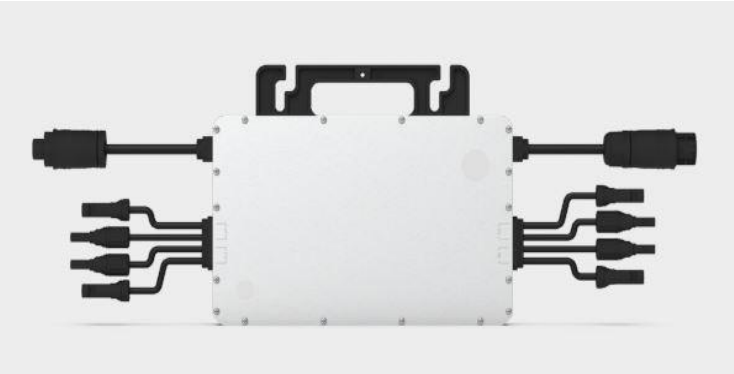


Micro-Inverters

2 Panel Inverters



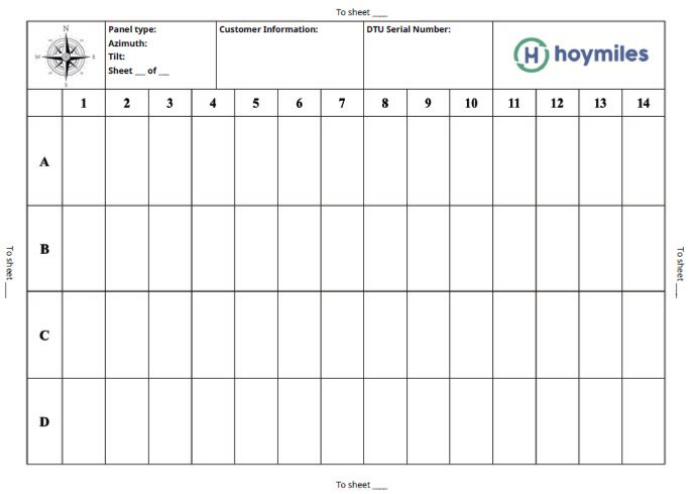
4 Panel Inverters

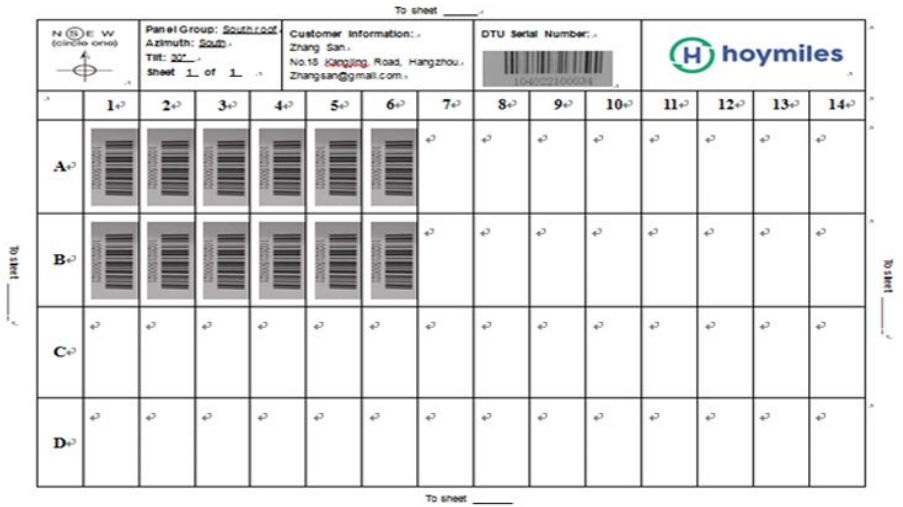


Hoymiles Micro-Inverter Installation video.

Inverter Mapping

Inverter mapping is important for monitoring the clients system after install completion. This is done as the inverters are installed, and the racking should be mounted at this point.





Array Wiring Methods

MC4 Connectors

RPVU Cable

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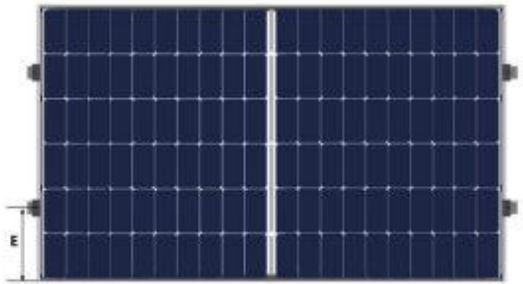
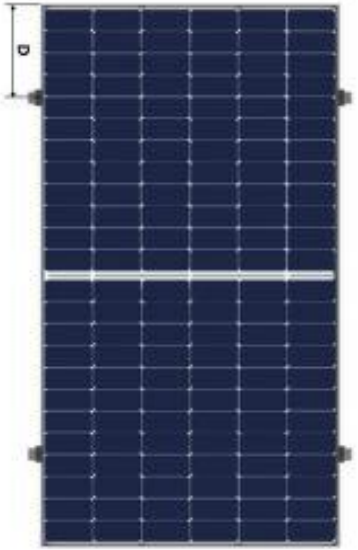
Module Orientation and Mounting

Landscape vs Portrait



150mm≤E≤250mm



1/4L-50mm(2") ≤ D ≤ 1/4L+50mm

Lamacoid Labels

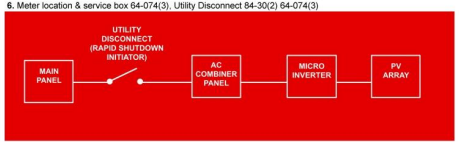
Common Photovoltaic Labels

Site Name: *Ryan Kuchar*

All labels are required to be lamacoids red background with white lettering

6. Meter location & service box 64-074(3), Utility Disconnect 84-30(2) 64-074(3)

QTY: **2**



7. Backfed breaker - 64-112(4)(b)(iii) - Do not relocate overcurrent device

7A
QTY: **1**

WARNING
INVERTER OUTPUT CONNECTION
DO NOT RELOCATE
THIS OVERCURRENT DEVICE

8. Utility disconnect - 84-30(1), Meter socket 84-030 - warning & diagram
(will accept diagram located on an adjacent meter socket)

QTY: **1**

WARNING
INTERCONNECTED PHOTOVOLTAIC
POWER SOURCE

9. Meter socket 84-030 & inspection notice (provide location of utility disconnect when permitted to be not adjacent)

QTY: **0**

WARNING
UTILITY DISCONNECT LOCATED
ON THE NORTHEAST CORNER OF ARRAY

10. Utility disconnect - 84-024(1)(j)

QTY: **1**

UTILITY DISCONNECT
DO NOT LOCK

11. Rapid Shutdown - 64-218(6) - supply authority meter location and at the consumer's service equipment location.

11A
QTY: **2**

PHOTOVOLTAIC SYSTEM
EQUIPPED WITH
RAPID SHUTDOWN

Common Photovoltaic Labels

Site Name: *Ryan Kuchar*

All labels are required to be lamacoids red background with white lettering

1. DC Disconnect - 64-200(1) - PV output circuit at an accessible location — **DC Disconnects**

QTY: **0**

PV SYSTEM DC DICONNECT

OPERATING CURRENT:	10.92A
OPERATING VOLTAGE:	41.7V
MAXIMUM SYSTEM VOLTAGE:	49.5V
SHORT CIRCUIT CURRENT:	11.66A

2. DC combiners, DC junction boxes, DC Disconnects, Inverters - 64-066(1)(c) (Ungrounded systems only)

QTY: **0**

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

3. Inverters and equipment fed from two sources - 14-414(3) - One for each source disconnect
or one label on equipment idicating multiple disconnects must be opened

QTY: **3**

WARNING
MULTIPLE POWER SUPPLIES
DISCONNECT BOTH PHOTOVOLTAIC AND UTILITY
SUPPLIES BEFORE SERVICING

Inverters, AC equipment other than Disconnects

4. AC disconnects - 64-060(10) & 84-024(1)(i) - Inverter, utility, and isolation AC **(disconnects)**

QTY: **3**

WARNING
ELECTRIC SHOCK HAZARD
DO NOT TOUCH TERMINALS
TERMINALS ON BOTH LINE AND LOAD SIDES
MAY BE ENERGIZED IN THE OPEN POSITION

VERBATIM PER APP B

5. All PV interactive points with other sources 64-072 - AC disconnects for inverters,
panelboards, splitters etc.

5A
QTY: **3**

PHOTOVOLTAIC
AC DISCONNECT

RATED AC OUTPUT CURRENT:	25.0A
NOMINAL OPERATING AC VOLTAGE:	120/240V

5B
QTY:
2

PHOTOVOLTAIC
AC DISCONNECT

RATED AC OUTPUT CURRENT:	12.5A
NOMINAL OPERATING AC VOLTAGE:	120/240V

Lamacoid Labels & Locations

Panel

Multiple power supplies

Electric shock hazard

AC numerical values (whole system)

Single line Diagram

Photovoltaic system equipped with rapid shutdown

Inverter output location (located as close to the solar breaker as possible.

*The solar breaker must be positioned at the opposite (load) end from the input feeder location.

Meter & Utility Disconnect

Interconnected Photovoltaic Source

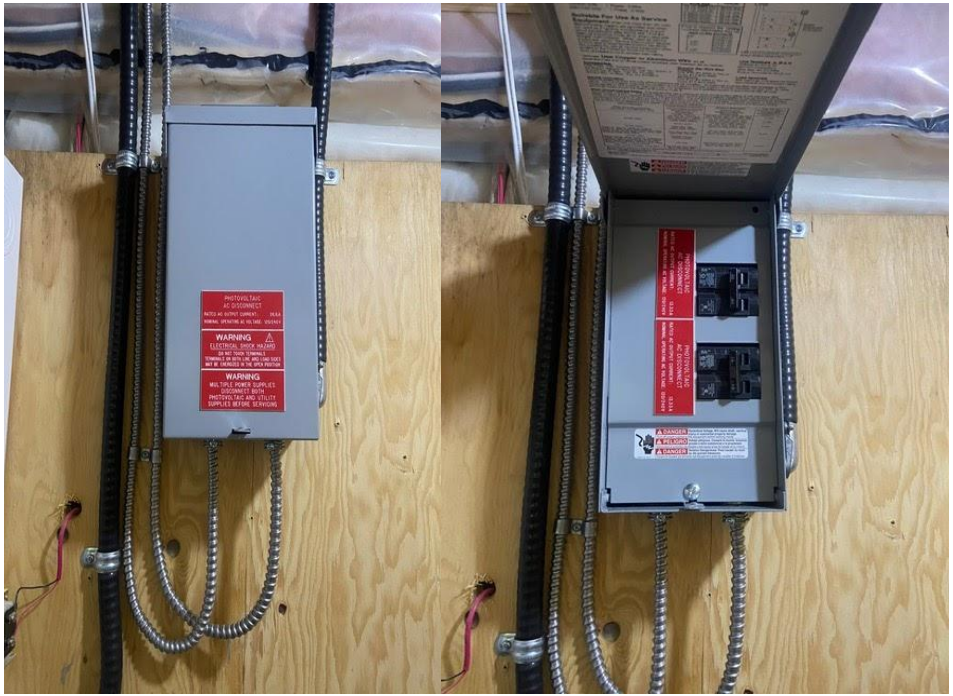
Single Line Diagram

Photovoltaic system equipped with rapid shutdown

Note: In AC disconnects the feed from the grid is wired to the “line” side, inverter feed is wired to the “load” side.

Lamacoid Labels & Locations

AC Combiner Panel



Multiple power supplies

Electric shock hazard

AC numerical values (whole system)

AC numerical values (Individual strings/breakers)

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Other Lamacoid Locations

All junction boxes including on the roof, in the basement, beside the panel, that are part of the solar circuit must have a “Multiple Power Supplies” label put on.

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Rooftop Junction Boxes

Do's

Here's an example of a proper install of the junction box. One important thing to note is that, you always want to mount the junction box to the rail whenever possible.

&

Don'ts

The junction box you see above was installed incorrectly. Junction boxes should never be installed directly into the roof without flashing. Flashing is important as it prevents water damage to the customers home.

Commissioning the System

Hoymiles Inverters use DTU monitoring.

Once the system is installed you will need to install the monitoring system inside the home and connect it to the homeowners network. The monitoring systems differ depending on the inverter brand.

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Apsystems ECU Setup

There are about 10 steps to follow when setting up the ECU for the customer.

1. The first step is to download the EMA Manager App. 2.
2. Next step is to turn off your cell phone data as this interferes with the setup.
3. Following this you are going to press the white button on the side of the unit marked AP
4. At this point your phone should pick up a wifi signal thats named ECU-R followed by a bunch of numbers ex. ECU-R 216200004314.
5. The password for wifi should be 88888888.

Apsystem Inverters use ECU monitoring

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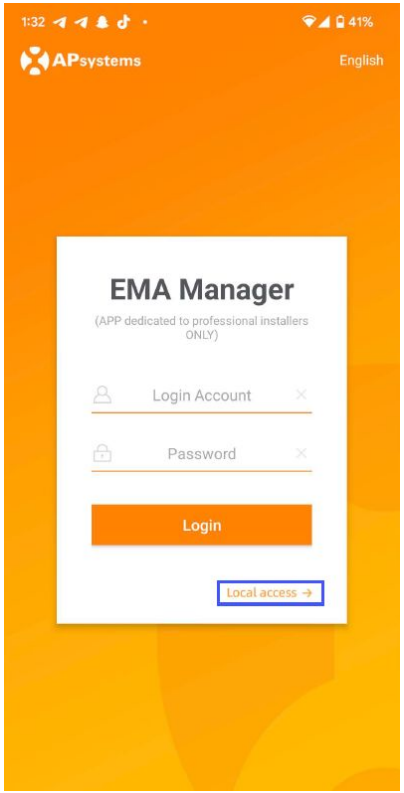
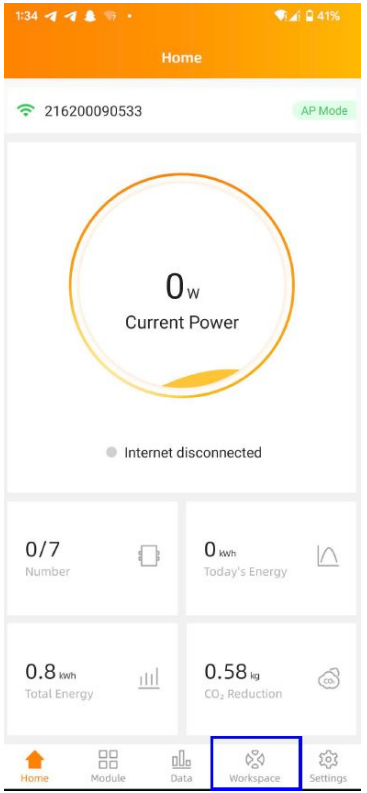
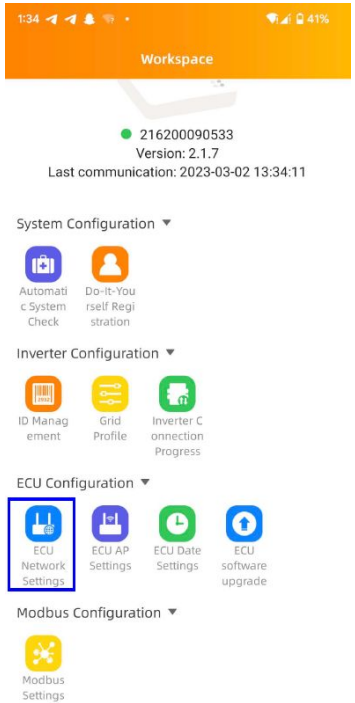
6. Now you can sign in, go to your EMA monitoring app and click local access button highlighted in blue as shown in the figure.



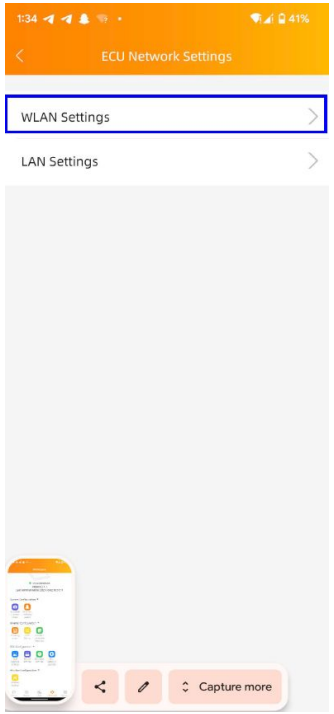
7. On your next screen here you should see an option at the bottom that says workspace, click that and it should take you to a new screen

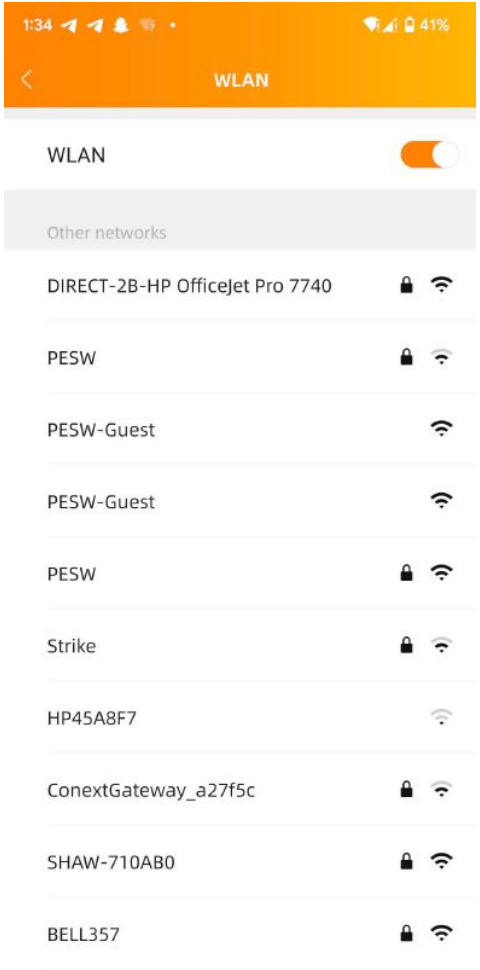


8. Click on ECU network settings highlighted below and it should bring you to the next screen.



9. Click on the WLAN settings and click the switch to on.





10. The last step is to connect your network. Find your network below and put in your current wifi password and it should be all set!

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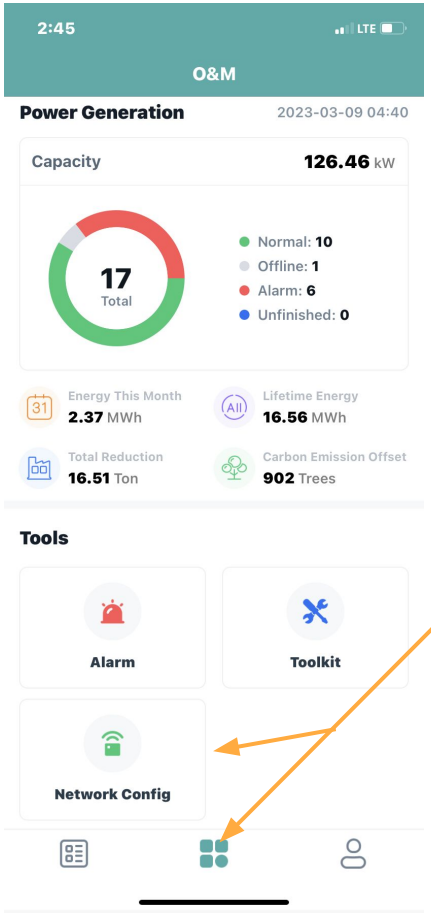
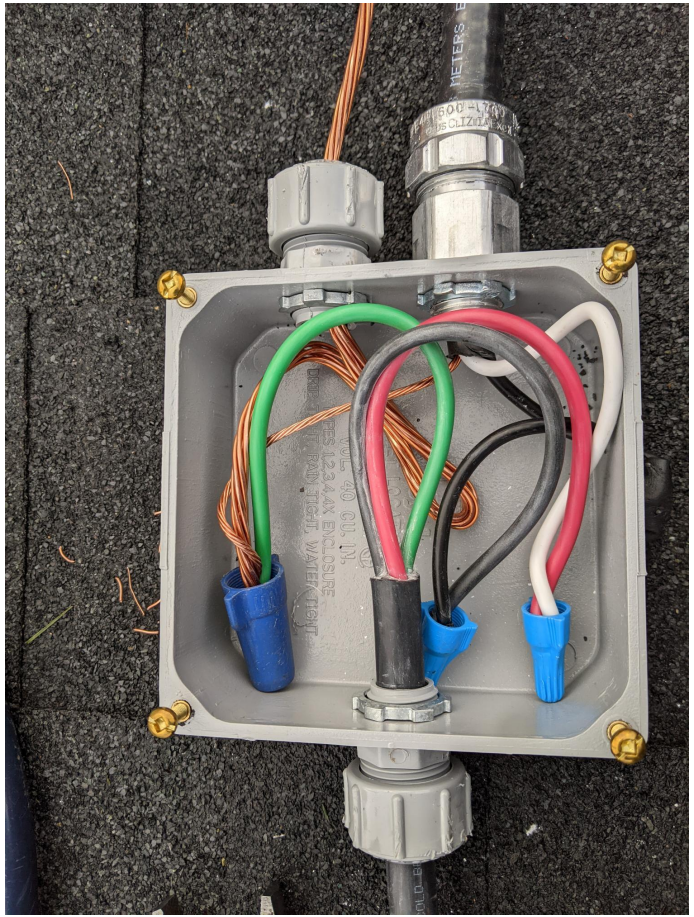
Hoymiles DTU Setup



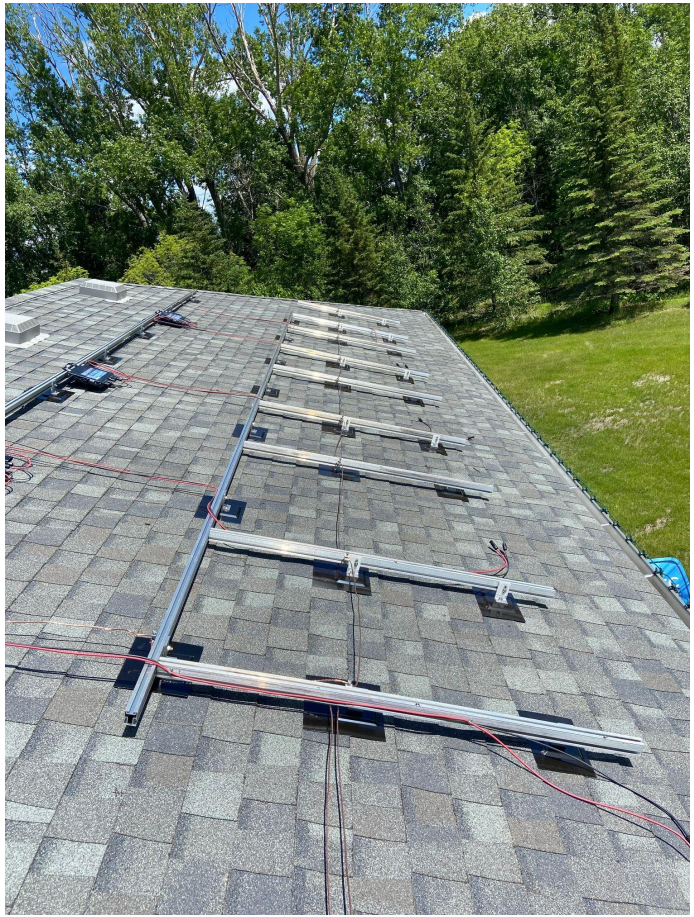
The Hoymiles DTU takes 6 steps to setup.

1. Download the S-miles Installer
2. Open the app and log in.
3. Select the bottom middle tab and open Network Config, this will prompt you to locate the DTU through wifi.
4. Connect DTU through wifi or LAN.
5. You may need to add the network name and password both manually.
6. And lastly, the DTU can either be connected directly to the router or connected through wifi.

Inspection Photos



Inspection Photos



Hands on Skills Required

- Installing anchor points & roof patching
- Measuring a roof for panel and racking layout
- Crimping RPVU Cables

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Common Mistakes

- Installation differs from plans (different equipment, locations, wire or breaker sizes
- Missing Lamacoids
- Missing note
- Roof and junction box photos
- Wires not clipped up off roof properly
- Ground bushings or rail bonding not installed or documented
- Mixing up line and load in disconnects

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