

7. Solar Panels and Frame

Edit New page

Alan Johnston edited this page 3 weeks ago · [1 revision](#)

If the images on this page fail to load, you can [download a PDF of this page here](#).

7. Solar Panels and Camera

In this step, you will assemble and test the solar panels and plug the Pi Camera into the Pi Zero

7.1 Assembling and Testing the Solar Panels

These instructions are for the Solar Panels.

You will need these tools:

- Safety glasses (to protect eyes while soldering or trimming leads)
- Soldering iron and solder (I use lead-free solder, but leaded solder is easier to work with)

Other tools that are helpful:

- Multimeter (to read solar panel voltage)

Video

- ▼ Pages 147
 - Find a page...
 - ▶ [Home](#)
 - ▶ [1. Main Board 1](#)
 - ▶ [2. Software Install](#)
 - ▶ [3. Ground Station](#)
 - ▶ [4. Main Board 2](#)
 - ▶ [5. Battery Board](#)
 - ▶ [6. Solar Board](#)
 - ▼ [7. Solar Panels and Frame](#)
 - 7. Solar Panels and Camera
 - 7.1 Assembling and Testing the Solar Panels
 - Video
 - Checklist
 - Solar Panels
 - Video
 - Solar Panel Soldering.
 - Solar Panel Testing
 - Open Circuit Testing
 - Short Circuit Testing
 - 7.2 Pi Camera Instructions

Here is a [video of this step](#)

Checklist

The BOM has a sheet "By Steps" which lists the parts needed for each step in order. If you have a Google account, you can make a copy of this spreadsheet ("File" then "Make a Copy") and check off each part as you install it.

For example, here is the checklist for this step:

Step 7. Solar Panels and Camera		https://github.com/alanbjohnston			
<input checked="" type="checkbox"/>	Item	Qty	Location	Image	
<input type="checkbox"/>	Solar Cell 6V 60mA 72mm x 45mm	10			
<input type="checkbox"/>	Micro JST wires	10			
<input type="checkbox"/>	Pi Zero with SD card from Step 2	1			
<input type="checkbox"/>	Pi Camera with Pi Zero ribbon cable	1			

Solar Panels

These instructions are for soldering, testing, and trial mounting on the space frame.

Video

Here is a video of this step.

Any solar panel that is 5V - 6V and less than 90mm (45mm if two panels are used) in length will work. For side with the camera and the side with the pushbutton, USB-C charging port, and the LEDs, the longest dimension of the solar panel is 45mm.

Video

- ▶ [8. Board Stack](#)
- ▶ [9. Final Testing](#)
- ▶ [Adding New Sensors](#)
- ▶ [Command and Control](#)
- ▶ [Creating the CubeSatSim Raspberr...](#)
- ▶ [CubeSatSim Lite](#)
- ▶ [CubeSatSim Loaner User Guide](#)

Show 132 more pages...

+ Add a custom sidebar

Clone this wiki locally

<https://github.com/alanbjohnston>

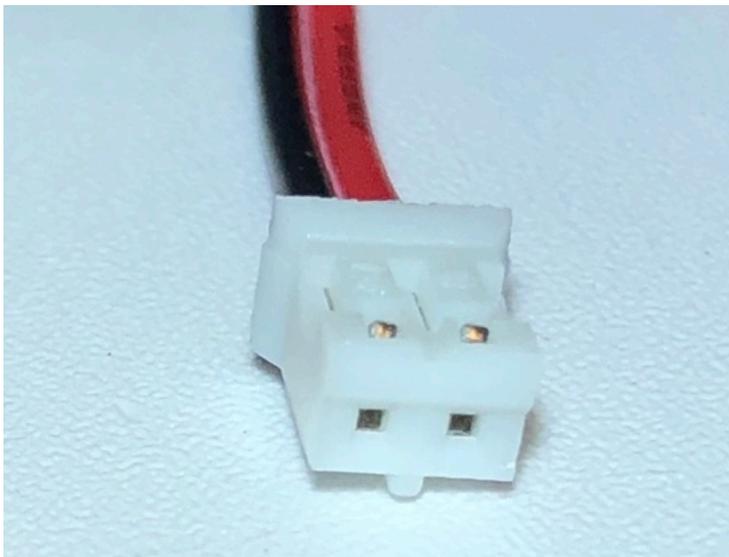


The recommended solar panels are 72mm x 45mm, and there are two mounted on each side, except the top and bottom that have just one. (You can also mount two solar panels on the top and bottom, although the solar panels are commonly sold in batches of 10.

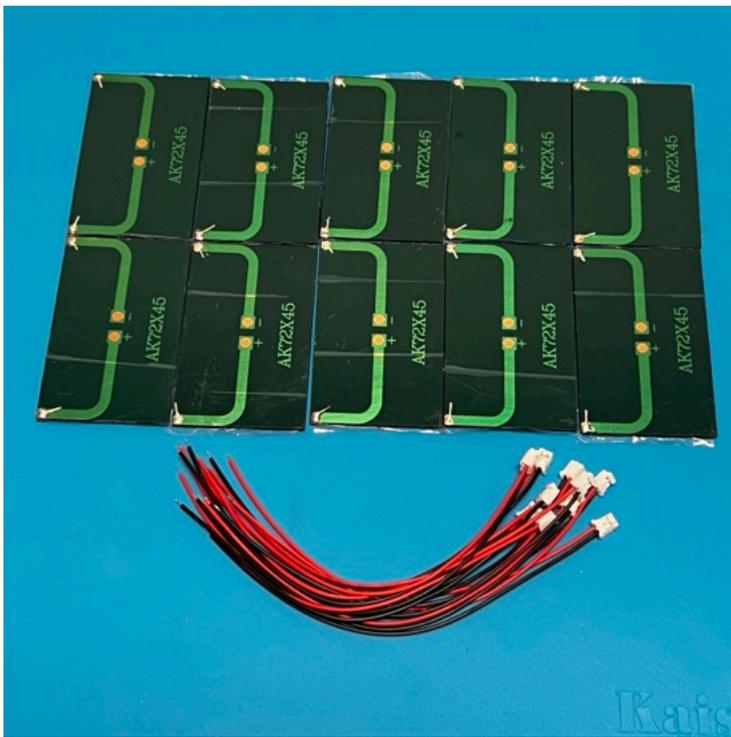
Your set of solar panels may contain a mix of panels.

Solar Panel Soldering.

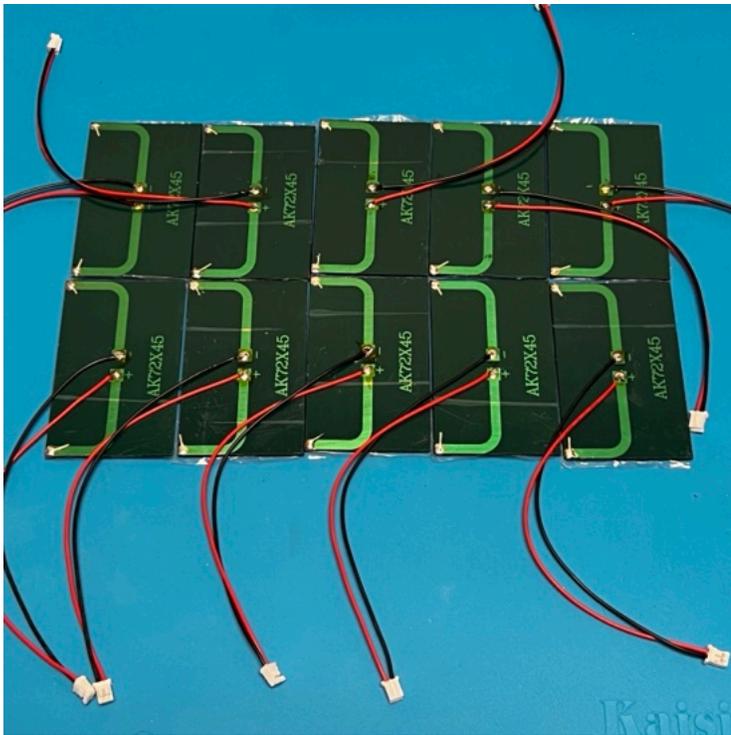
Before using any of your JST connector wires, make sure they have the correct polarity. There is no standard in the industry for red and black, unfortunately, and some suppliers will supply different polarities in different orders. Verify your polarity against this image, and swap if they are reversed:



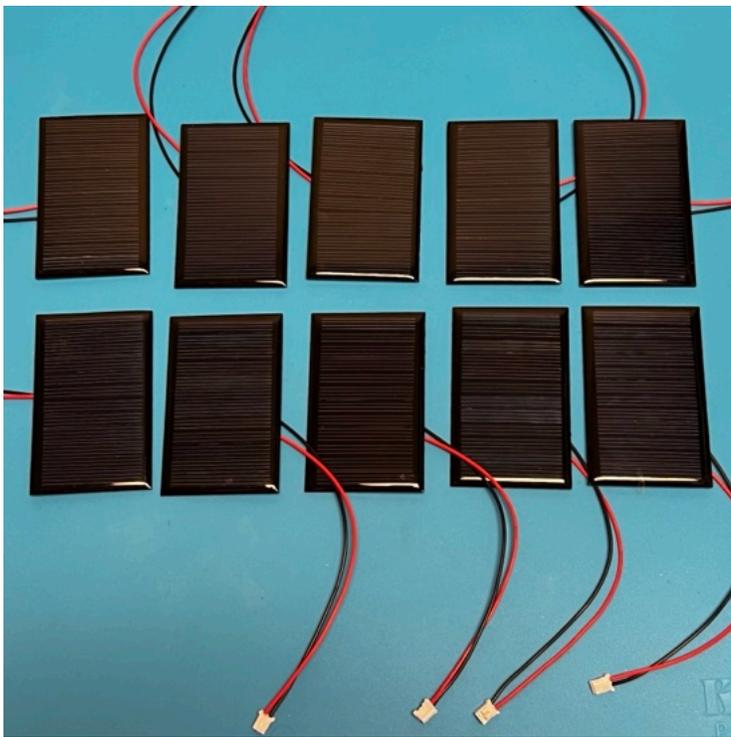
The 10 solar panels need to have the JST 2.0 connectors soldered on:



Some liquid flux can be applied to each pad of the solar panels to make soldering easier. Also, hot glue can be used to stick the insulation of the wires to the panel to provide extra strength.



Here's how the panels look after the protective film is removed:



Solar Panel Testing

The solar panels are tested with the Digital Multi Meter (DMM). They should be tested in constant illumination such as from the LED lamp.

Open Circuit Testing

Open circuit testing measures the maximum voltage output. Put the DMM on the DC volts scale and measure while illuminated.

Test each panel to make sure they work.

Note down the maximum voltage for each size of solar panel.

Short Circuit Testing

Short circuit testing measures the maximum current output from the solar panel. Put the DMM in DC Current (or Amps) mode and measure across the red and black leads while illuminated.

Test each panel to make sure they work.

Note down the maximum voltage for each size of solar panel.

The Solar Panels are now ready to attach to the frame.

7.2 Pi Camera Instructions

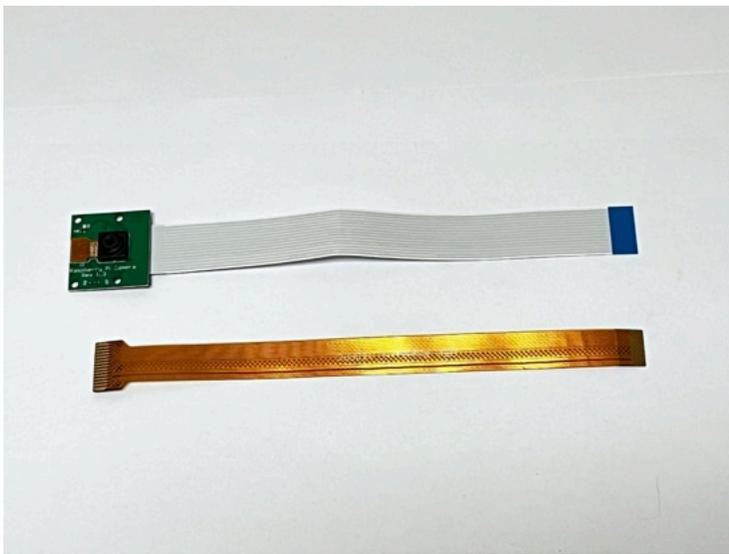
Here are the parts you need for the Pi Camera:

- Side frame with camera mount
- Two small 80mm x 35mm solar panels (or 57mm x 28mm), wired in parallel
- Pi Camera
- 6.3 inch (16 mm) Camera cable for the Pi Zero W

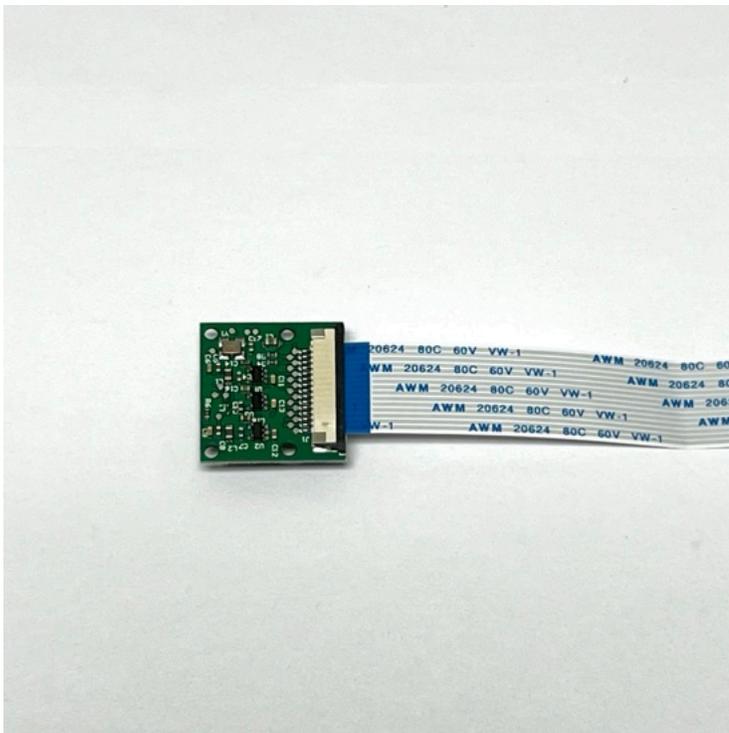
Video

Here is a video on the Raspberry Pi Camera Installation (only the first 8 minutes are relevant): <https://youtu.be/5ras2Y0Cfec>

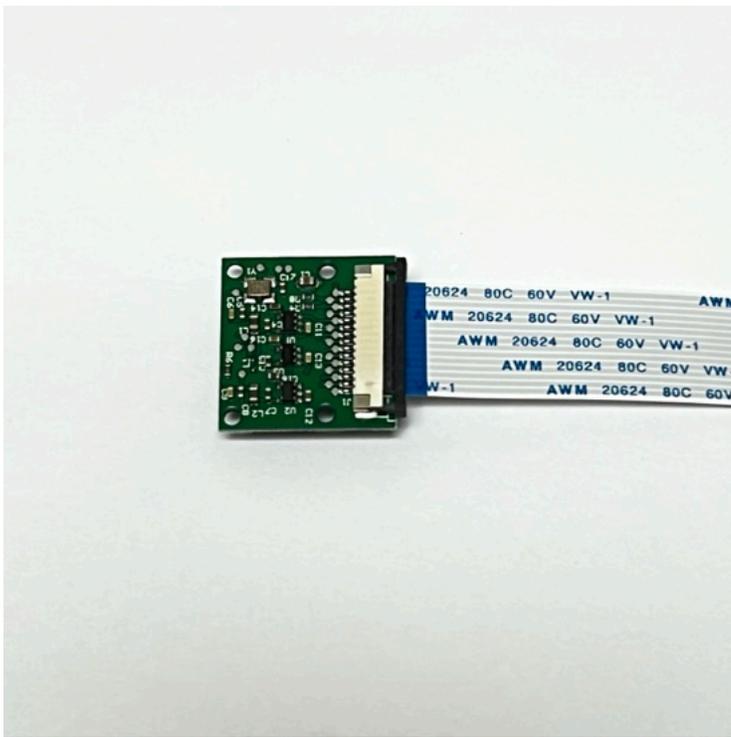
Most Pi Cameras come with the cable to connect to a full sized Pi, so you may need to buy a Pi Zero W Camera Cable as well:



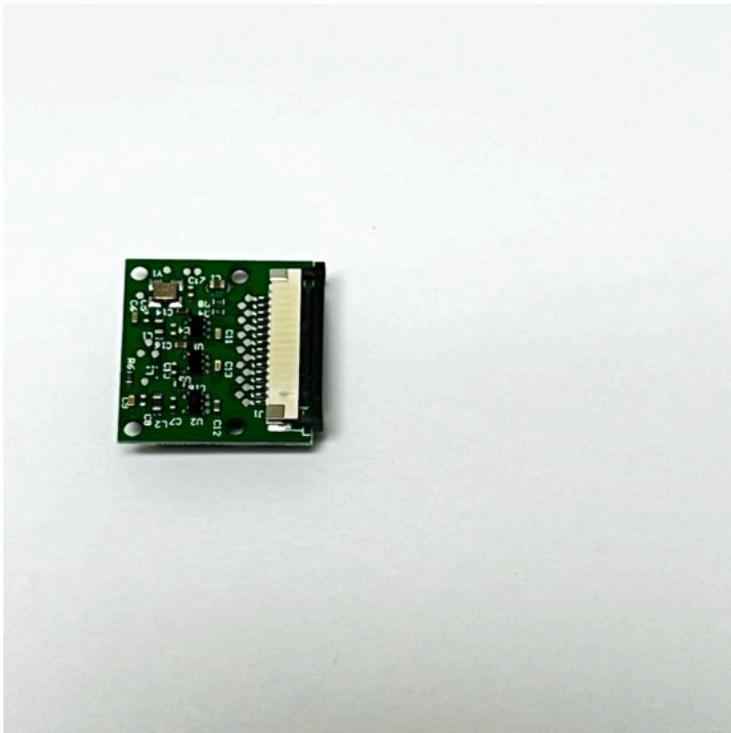
To disconnect the Pi Camera Cable, identify the slide lock on the connector on the back of the Pi Camera. In this photo it is the black plastic piece:



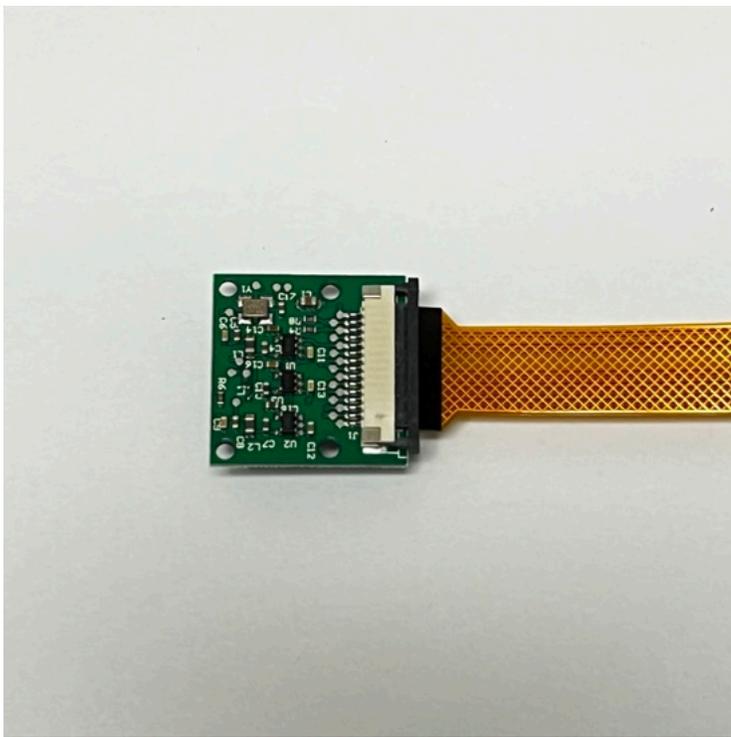
Carefully move the slide lock away from the board, to the right in this photo. You might need to move it a little on one side, then the other side. It only moves out a few millimeters and does not come completely off:



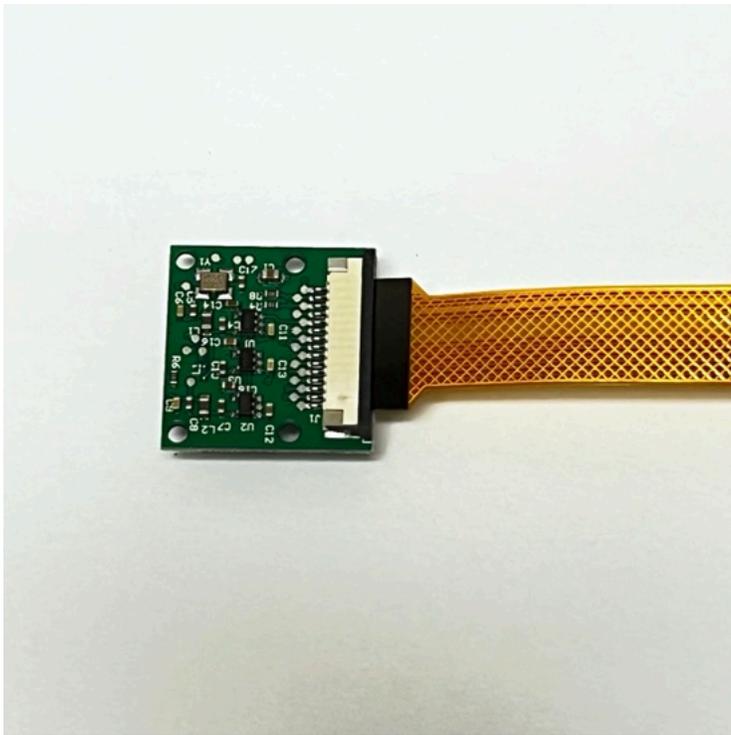
The cable will now be loose and you can slide it out and remove it.



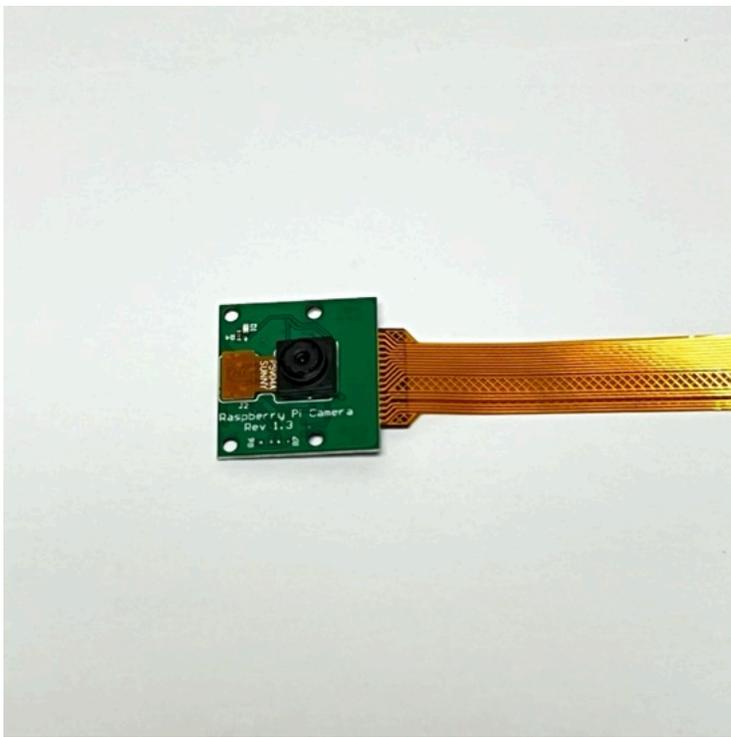
Slide the 6.3 inch (16 mm) Pi Zero Camera Cable into the connector. Make sure the metal contacts on the cable are facing the PCB, in this photo the contacts face down:



Carefully move the slide lock towards the board (to the right in this photo) to hold the cable securely. Make sure the cable doesn't slide over or get crooked:

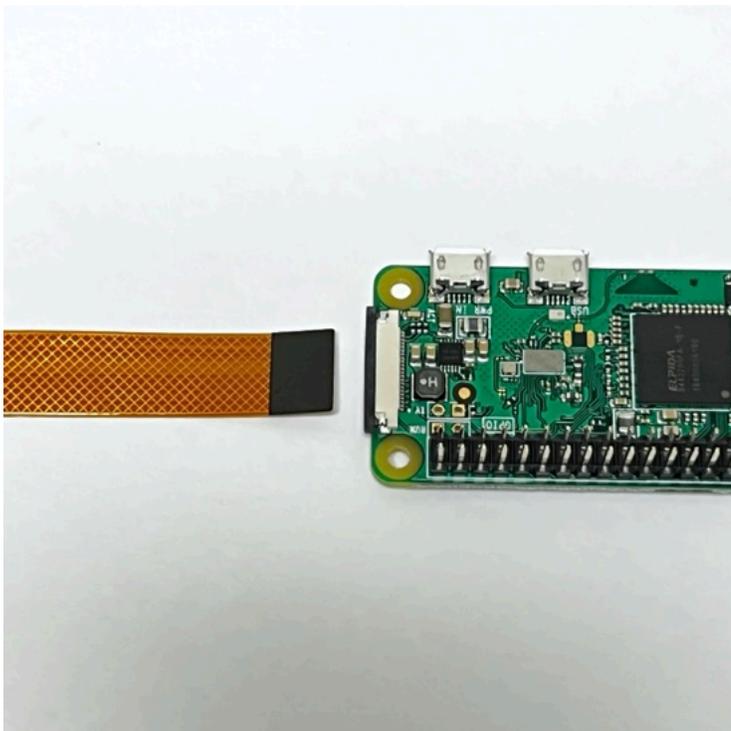


This is how it looks on the other side.

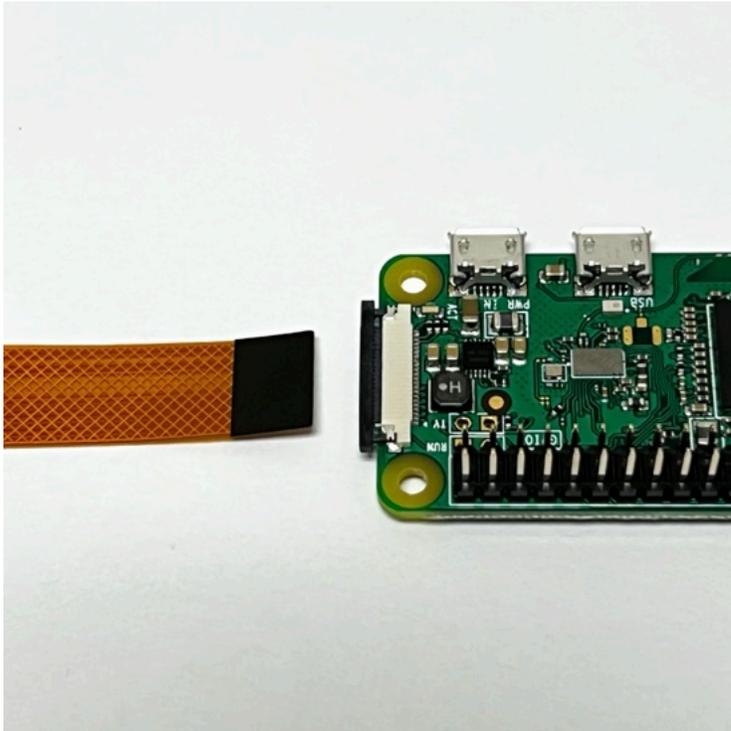


Don't forget to remove the plastic film over the camera lens!

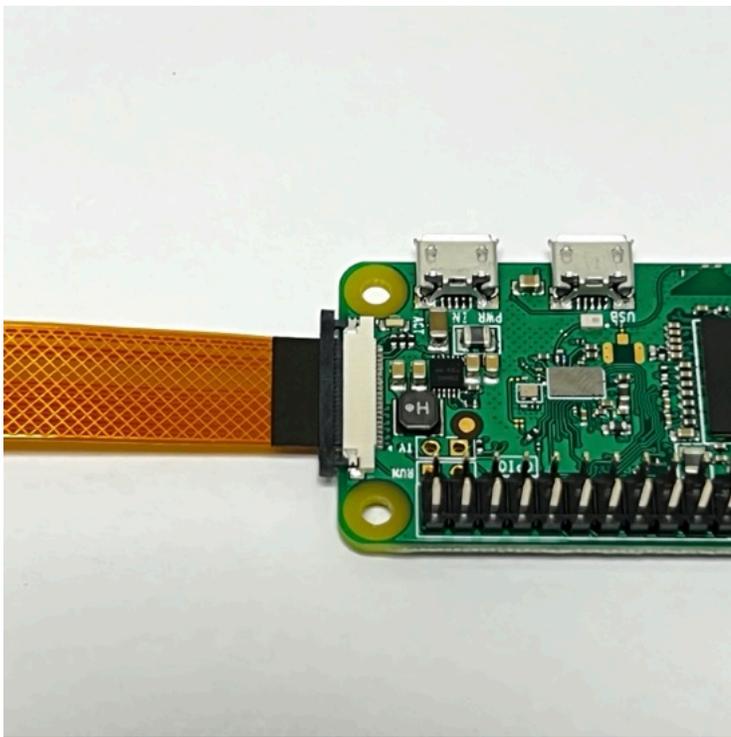
The camera cable plugs into the Pi Zero on the opposite side to the micro SD card. This is how the Pi Zero Camera Cable and the Pi look when ready to connect:



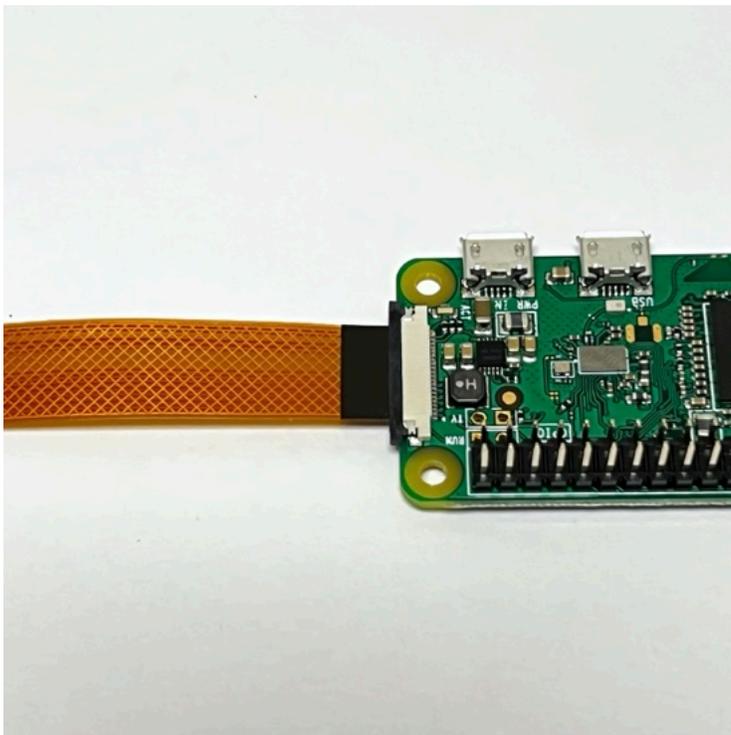
The other end of the Pi Zero Camera Cable connects to the Pi Zero WH on the opposite side to the micro SD card slot. Identify the slide lock, in this photo it is the black plastic:



Carefully move the slide lock away from the board, in this photo to the left. Be very very careful - it is very easy to break it. You might need to move it a little on one side, then the other side. It only moves out a few millimeters and does not come completely off. There may be a plastic "blank" in the slot - you can remove it.

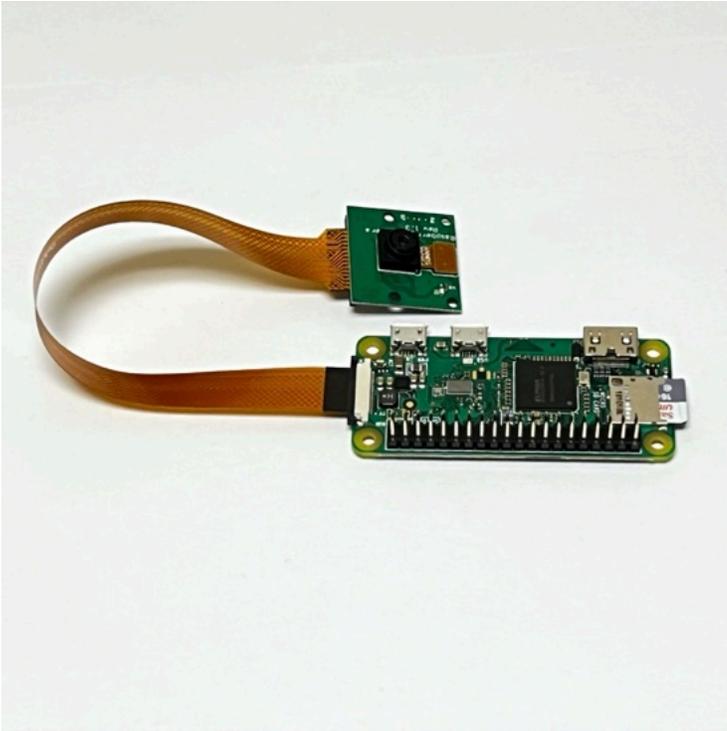


Insert the Pi Zero Camera Cable into the connector. Make sure the metal contacts are facing the PCB, in this photo facing down:



Carefully move the slide lock towards the board (to the left in this photo) to hold the cable securely. Make sure the cable doesn't slide over or get crooked.

Here is what the Pi Zero W and the Pi Camera look like:



Note that the LED on the Pi Camera will blink once when the Pi Zero boots up and whenever it takes a photo.

The next step is to [Step 8 Board Stack](#).

+ Add a custom footer