

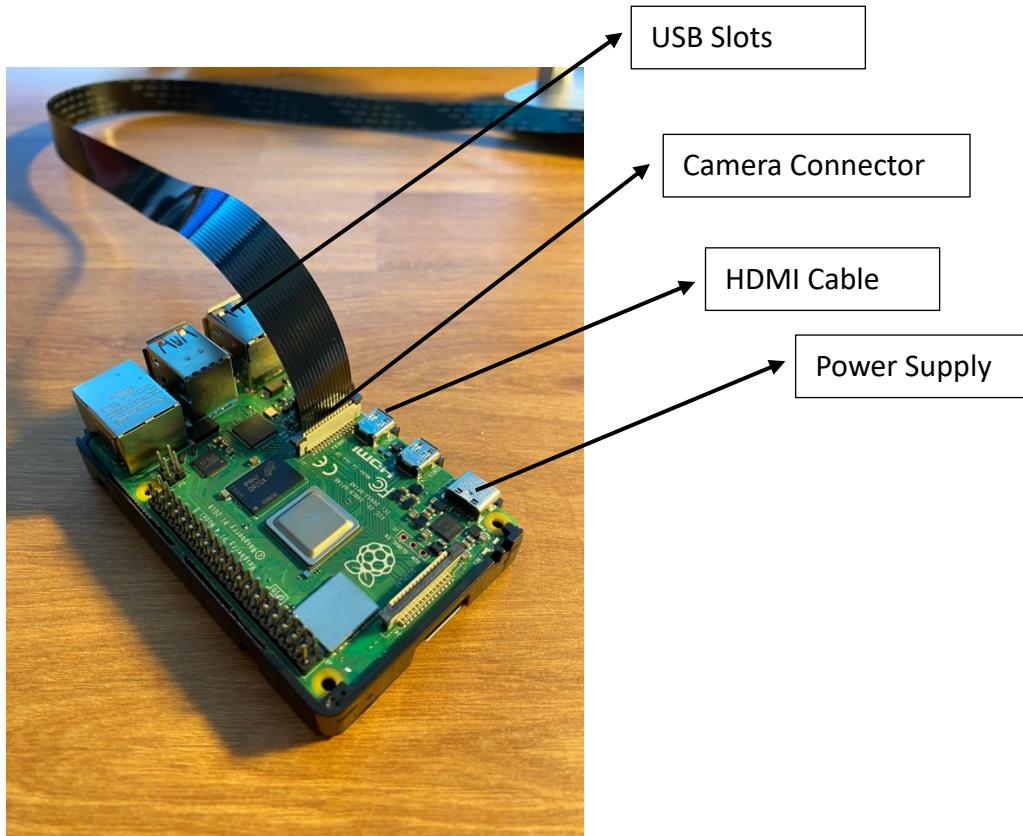
ISPEED Kit Setup

Important Notes

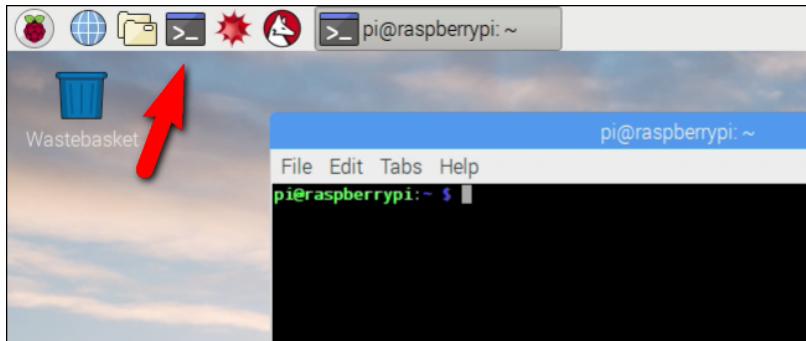
1. When plugging in/plugging out the camera, please ensure that the Raspberry Pi is powered off.
2. When handling sensitive components such as lenses and cameras, ensure that gloves are worn, and the components are placed gently on the table.

Setting up Raspberry Pi

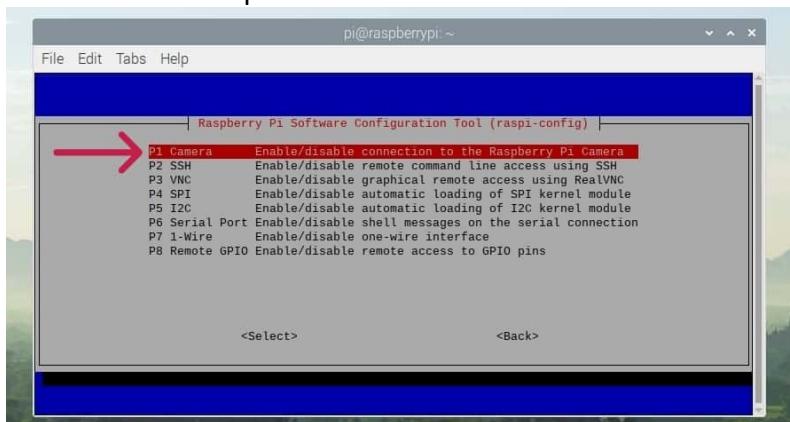
1. Plug in the HDMI cable, SD card, power cable, USB mouse and USB keyboard into the Raspberry pi.



2. SD Cards come pre-installed with NOOB (new out the box) software which contains the installer to install everything needed.
3. Once power cable is plugged in, Raspberry Pi should power on. Select Raspbian OS to install and wait for install to complete (this might take a couple of minutes).
4. Once you see the desktop, open the terminal (black icon)



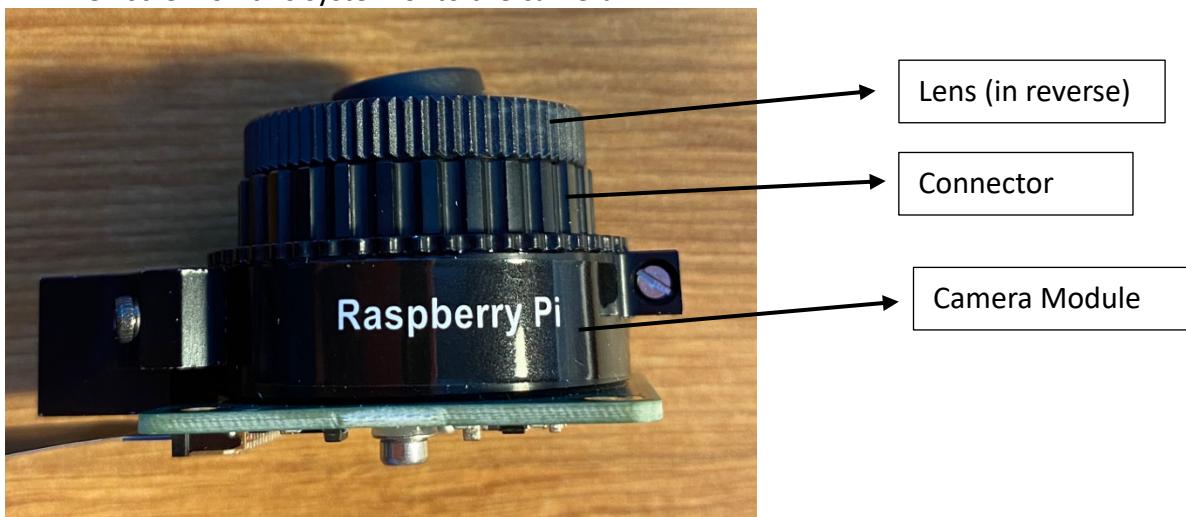
- 5.
6. Type the following and hit enter: `sudo raspi-config`
7. Go to "Interface Options" > "Camera."



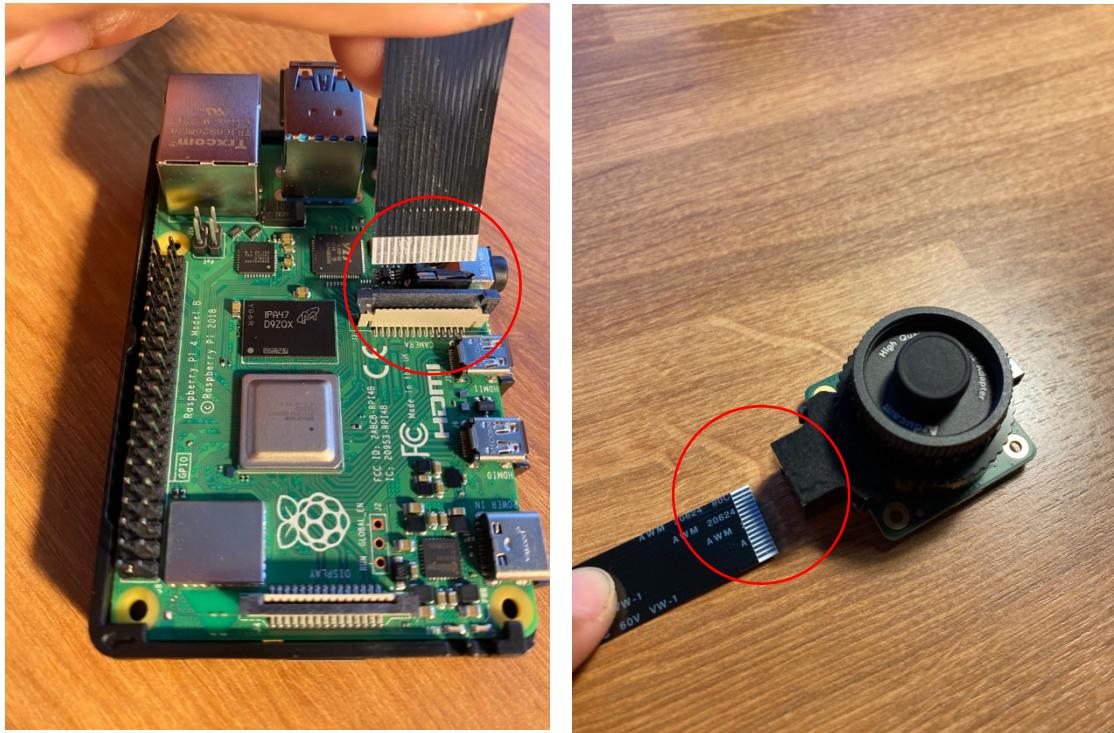
- 8.
9. Click enter and then enable camera. Then exit Raspi-config and reboot the Raspberry pi.

Building the Microscope Lens

1. *Make sure the raspberry pi board is powered off before completing this section.*
2. Please wear gloves for this process. Please be careful to not touch the lens and the camera sensor directly. Always grip the sides.
3. Remove the cap from the macro lens and screw on the lens holder.
4. Then screw on this system onto the camera.



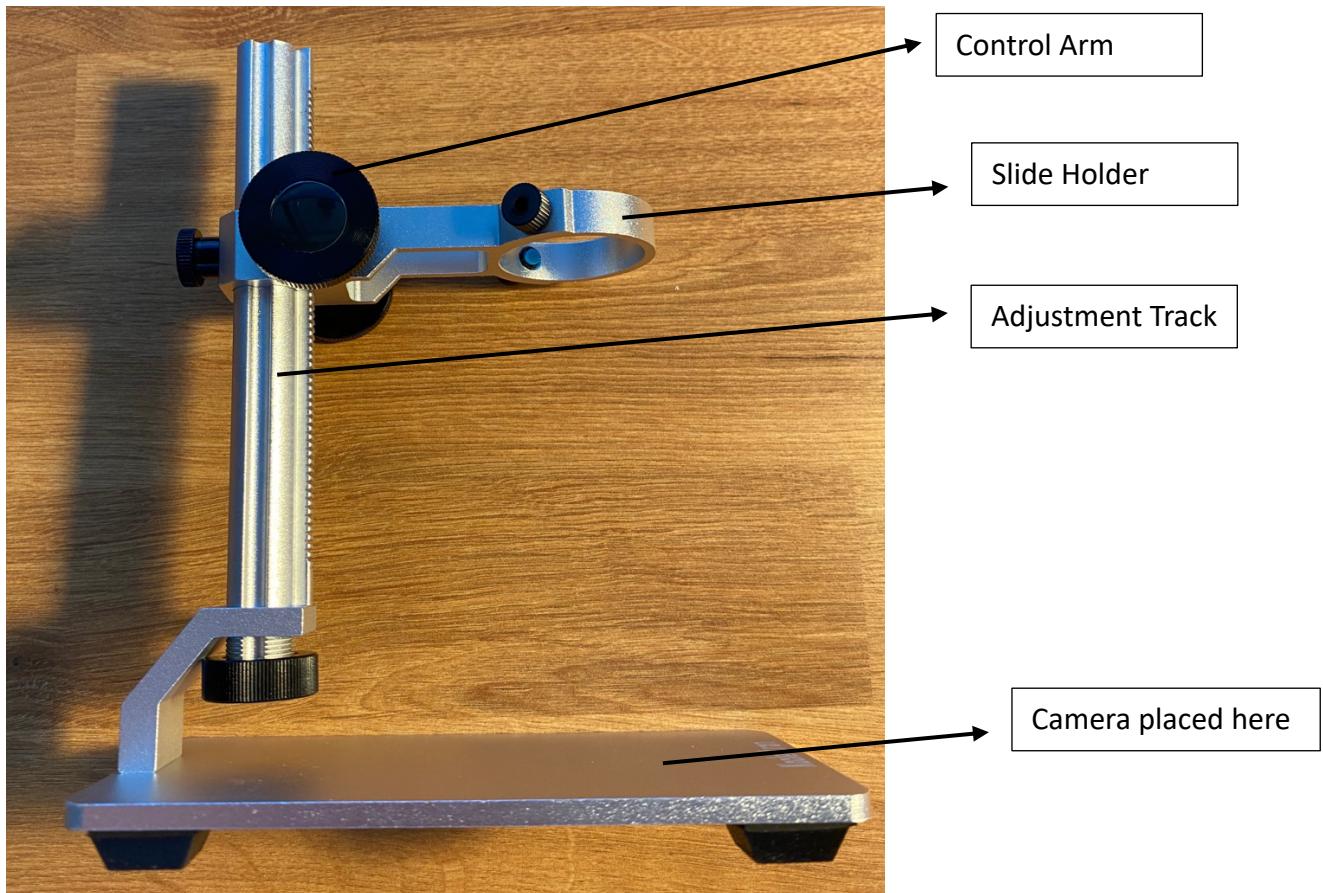
5. Connect the ribbon cable to the camera by lifting the light brown tab, slotting the cable in such that the metal contacts are aligned (please do not connect them in the wrong way).
6. Push the tabs down to lock it in place. Please be gentle and do not yank or force the tabs in.



7. Connect the other end of the ribbon cable to the connector labelled "camera" (please don't insert it into the connector labelled "display", they look very similar).
8. Power on the raspberry pi.

Setting up the microscope stage

1. Assemble the microscope stand according to the provided instructions. Ensure that by twisting the black knob, the arm moves up and down as expected. If not, double check that you have installed the pieces in the correct orientation.



2. Place a box on the base of the stage and then mount the camera above it such that you can move the stage down towards the box.
 - a. The choice of box height will be a challenge left to you to figure out what height is needed to get good images.
3. Place a slide on top of the circular holder.
4. Twist the black knob to lower the stage towards the camera until you get a focused image.
5. To pull up a live preview of the camera feed while this occurs, open the "terminal" program on the raspberry pi.
6. Type in the following command: raspistill -s
 - a. A live preview will pop up that will help you in focusing your camera correctly to correct distance such that you can obtain a focused image.

Completed Microscope Setup



Acquiring images via Python Code

1. Open Thonny Python IDE (should already be pre-installed)
2. Open a new file save it as camera.py (important to **never** save the file name as picamera.py)
3. Enter the following code:

```
from picamera import PiCamera
from time import sleep

camera = PiCamera()

camera.start_preview()
sleep(5)
camera.stop_preview()
```

4. Once camera is working, amend your code as follows:

```
from picamera import PiCamera
from time import sleep

camera = PiCamera()

camera.start_preview()
sleep(5)
camera.capture('/home/pi/Desktop/image.jpg')
camera.stop_preview()
```

Note: It is important to let the camera sleep for at least 2 seconds before capturing an image so that the camera sensor has time to sense the light levels.

5. Image resolution and adding text to your image can be done using the following guide:

<https://projects.raspberrypi.org/en/projects/getting-started-with-picamera/7>

Support and Additional Resources

1. All the instructions, code and parts lists used are available for free at this link:

<https://github.com/MantejSingh21/ISpeed-Microscopy>