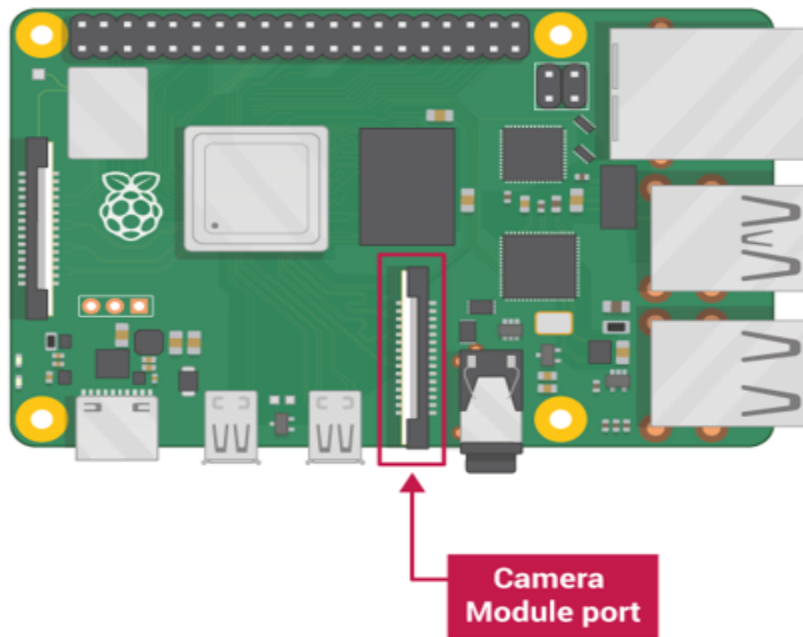


4.SPI: Camera Connection and capturing Images/Videos using SPI

Remark:

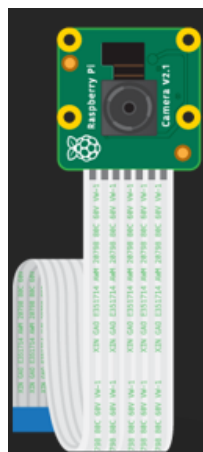
Signature:

All current models of Raspberry Pi have a port for connecting the Camera Module.



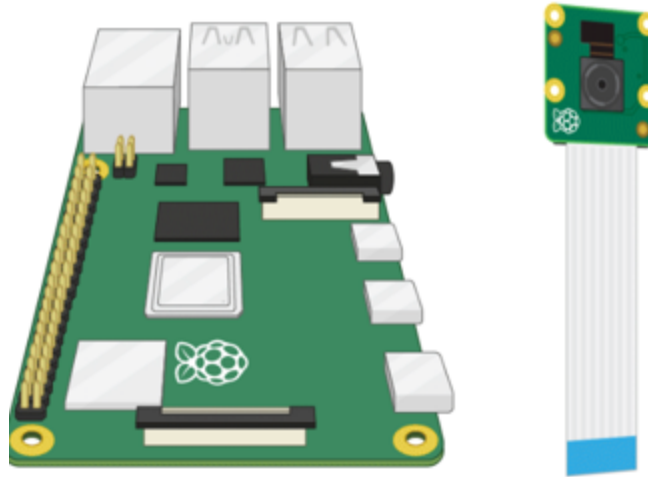
Note: If you want to use a Raspberry Pi Zero, you need a Camera Module ribbon cable that fits the Raspberry Pi Zero's smaller Camera Module port.

Raspberry Pi Camera Module

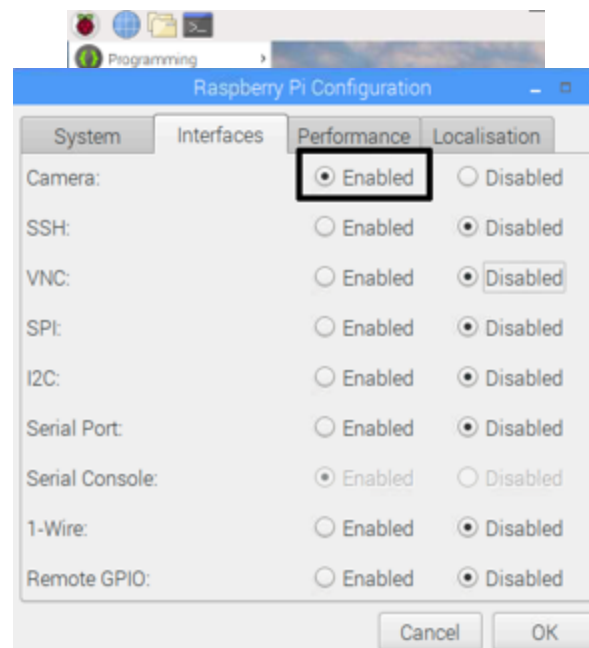


Connect the Camera Module

- Ensure your Raspberry Pi is turned off.
- Locate the Camera Module port
- Gently pull up on the edges of the port's plastic clip
- Insert the Camera Module ribbon cable; make sure the connectors at the bottom of the ribbon cable are facing the contacts in the port.
- Push the plastic clip back into place



- Start up your Raspberry Pi
- Go to the main menu and open the Raspberry Pi Configuration tool.



Select the Interfaces tab and ensure that the camera is enabled:

Reboot your Raspberry Pi.

How to control the Camera Module via the command line

Now your Camera Module is connected and the software is enabled, try out the command line tools `raspistill` and `raspivid`.

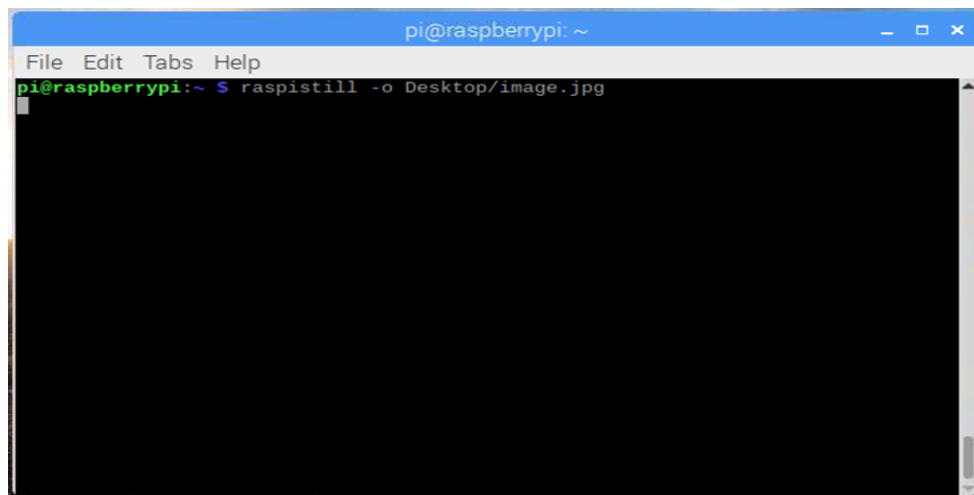
- Open a terminal window by clicking the black monitor icon in the taskbar:



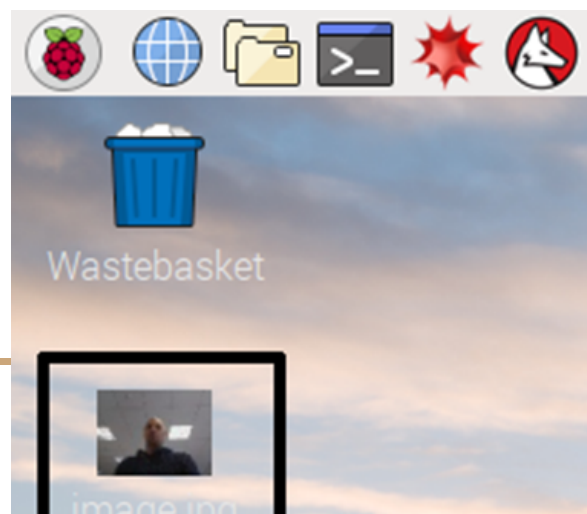
- Type in the following command to take a still picture and save it to the Desktop:

```
raspistill -o Desktop/image.jpg
```

- Press Enter to run the command.
- When the command runs, you can see the camera preview open for five seconds before a still picture is taken.



- Look for the picture file icon on the Desktop, and double-click the file icon to open the picture.



By adding different options, you can set the size and look of the image the `raspistill` command takes.

- For example, add `-h` and `-w` to change the height and width of the image:

```
raspistill -o Desktop/image-small.jpg -w 640 -h 480
```

- Now record a video with the Camera Module by using the following `raspivid` command:

```
raspivid -o Desktop/video.h264
```

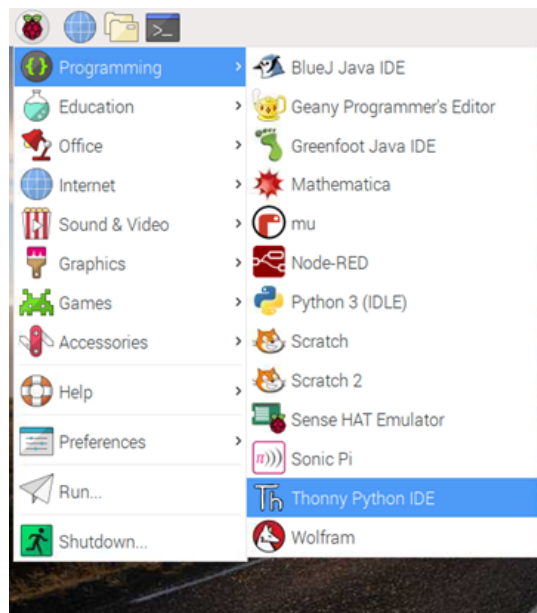
- In order to play the video file, double-click the `video.h264` file icon on the Desktop to open it in VLC Media Player.

For more information and other options you can use with these commands, read the [documentation for raspistill](#) and the [documentation for raspivid](#)

How to control the Camera Module with Python code

The Python `picamera` library allows you to control your Camera Module and create amazing projects.

- Open a Python 3 editor, such as Thonny Python IDE:



- Open a new file and save it as `camera.py`.

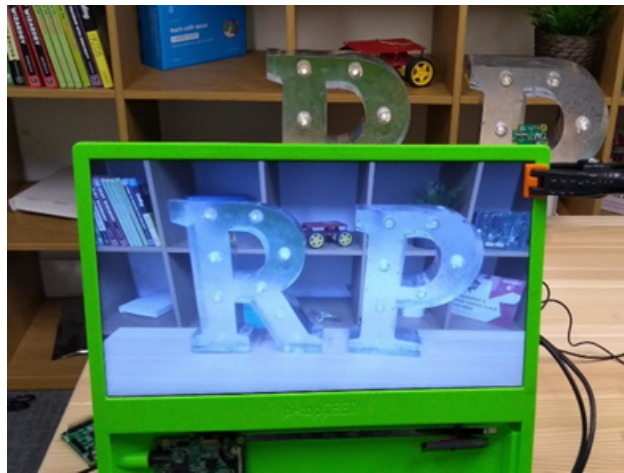
Note: it's important that you never save the file as `picamera.py`.

- Enter the following code:

```
from picamera import PiCamera
```

```
o from time import sleep
o camera = PiCamera()
o camera.start_preview()
o sleep(5)
camera.stop_preview()
```

- Save and run your program. The camera preview should be shown for five seconds and then close again.



Note: the camera preview only works when a monitor is connected to your Raspberry Pi. If you are using remote access (such as SSH or VNC), you won't see the camera preview.

- If your preview is upside-down, you can rotate it by 180 degrees with the following code:

```
camera = PiCamera()
```

```
camera.rotation = 180
```

You can rotate the image by 90, 180, or 270 degrees. To reset the image, set `rotation` to 0 degrees.

It's best to make the preview slightly see-through so you can see whether errors occur in your program while the preview is on.

- Make the camera preview see-through by setting an `alpha` level:

```
camera.start_preview(alpha=200)
```

The `alpha` value can be any number between 0 and 255.

Take still pictures with Python code

Now use the Camera Module and Python to take some still pictures.

Amend your code to add a `camera.capture()` line:

```
camera.start_preview()
```

```
sleep(5)
```

```
camera.capture('/home/pi/Desktop/image.jpg')
```

```
camera.stop_preview()
```

Note: it's important to `sleep` for at least two seconds before capturing an image, because this gives the camera's sensor time to sense the light levels.

- Run the code.

You should see the camera preview open for five seconds, and then a still picture should be captured. As the picture is being taken, you can see the preview briefly adjust to a different resolution.

Your new image should be saved to the Desktop.

- Now add a loop to take five pictures in a row:

```
camera.start_preview()
```

```
for i in range(5):
```

```
sleep(5)
```

```
camera.capture('/home/pi/Desktop/image%s.jpg' % i)
```

```
camera.stop_preview()
```

The variable `i` counts how many times the loop has run, from `0` to `4`. Therefore, the images get saved as `image0.jpg`, `image1.jpg`, and so on.

- Run the code again and hold the Camera Module in position.

The camera should take one picture every five seconds. Once the fifth picture is taken, the preview closes.

- Look at your Desktop to find the five new pictures.