Session 2022-03-30

Raspberry Pi Introduction

Welcome! The Raspberry Pi (RPi) is a great tool to empower your creativity. Discover the multiple possibilities this single board computer brings to you.

> Interactive link https://doc.clickup.com/36177258/d/h/12g1ba-160/beb602325a60716

Compare boards

You could use the following table to quickly compare two versions of the RPi.

Raspberry Pi 3 Model B	Raspberry Pi 4 Model B
Broadcom BCM2837	Broadcom BCM2711
Quad-Core 64bit @ 1.2GHz	Quad-core 64bit @ 1.5GHz
Cortex A53 (ARM v8)	Cortex A72 (ARM v8)
1GB LPDDR2 SDRAM	2GB, 4GB or 8GB LPDDR4
100 Base Ethernet	Gigabit Ethernet
Official page	Official page

Terminology

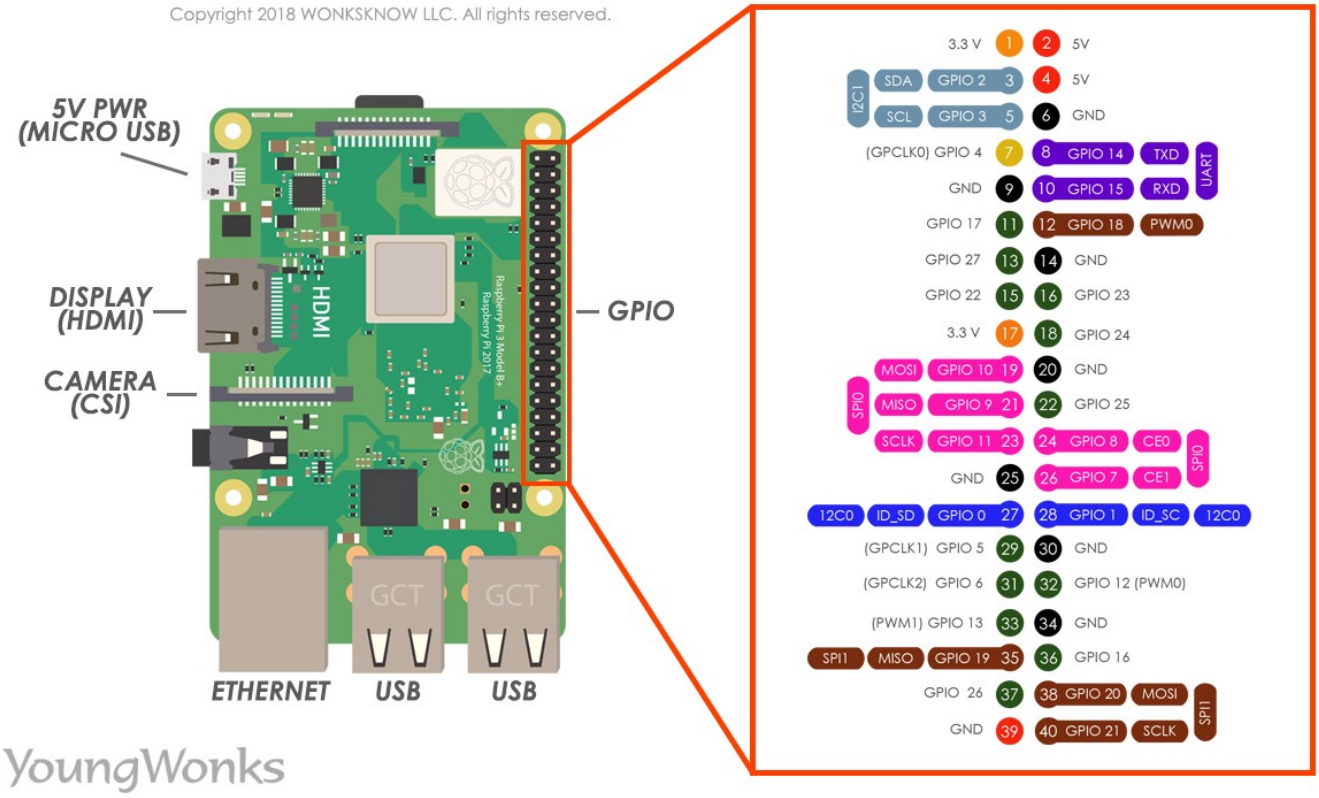
- **RPi**: Raspberry Pi is a series of small single-board computers (SBCs) developed in the United Kingdom by the Raspberry Pi Foundation in association with Broadcom.
- **SBC**: Single board computer is a complete computer built on a single circuit board, with microprocessor(s), memory, input/output (I/O), and other features required of a functional computer. [source]

Pin-out

A great advantage about RPi is that you can interact with the hardware. Also, consider using a hat for this purpose.

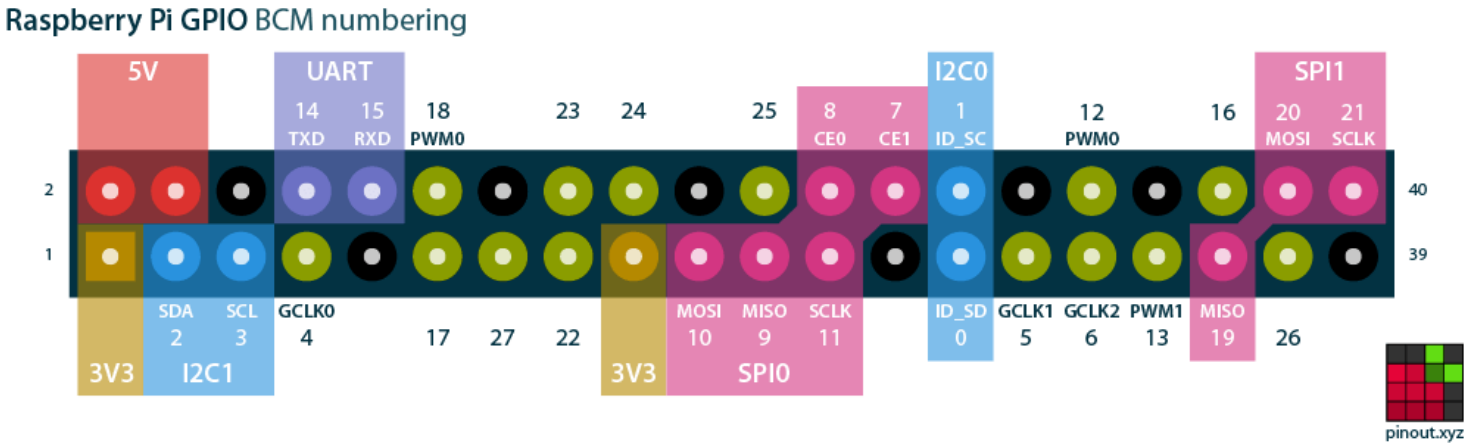
Friendly orientation

The image is of the RPi 3, but it applies to the RPi 4. More details
https://medium.com/youngwonks/raspberry-pi-3-pinout-50b904ed41f0



Interactive guide

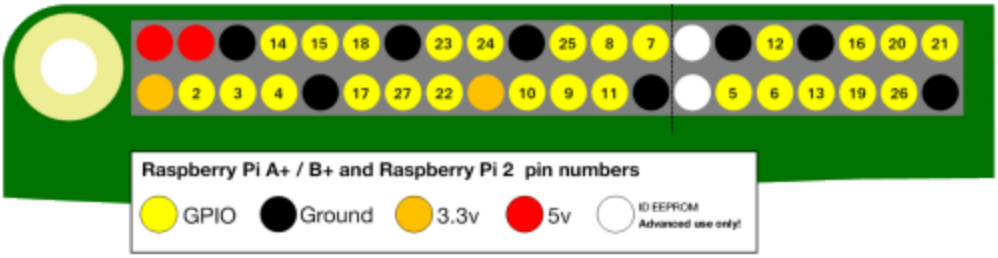
More details *https://pinout.xyz/*



```
# https://gpiozero.readthedocs.io/en/stable/installing.html
sudo apt update
sudo apt install python3-gpiozero
pinout
```

Other considerations

Take note of the white pins. More details https://projects.raspberrypi.org/en/projects/physical-computing/1



For older versions

Setup

Requirements

Basic elements

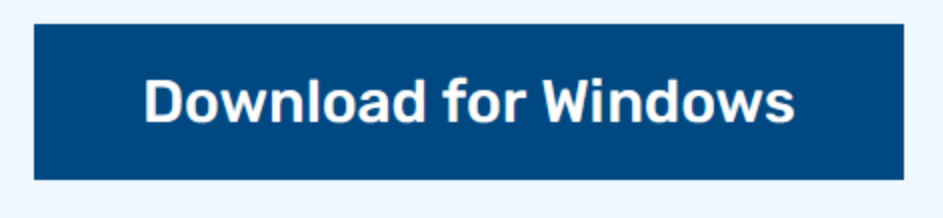
- Raspberry Pi 3 Model B
- SD card 32GB
- Power cable 2.5A MicroUSB

There are two options; please make sure to have one of the following options.

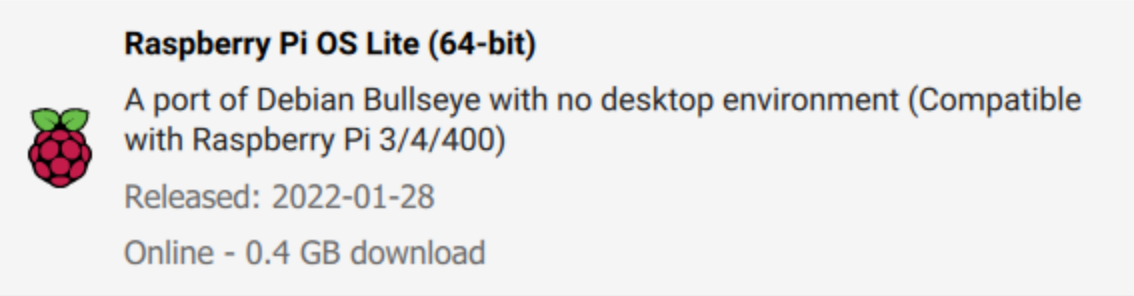
1. External monitor option
    a. HDMI monitor
    b. HDMI cable
    c. USB keyboard
2. Ethernet cable option
    a. Ethernet Cable
    b. A computer with an RJ45 port

Installation Steps

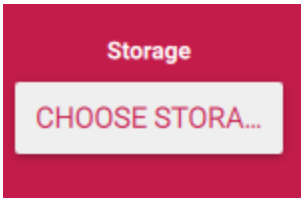
1. Download Raspberry Pi Imager



2. Install the application. Use default options
3. Open Raspberry Pi Imager
4. Choose **Raspberry Pi OS (other) > Raspberry Pi OS Lite(64-bit)**



5. Select your SD as storage



6. Click on Gear Icon ⚙
7. Use the following values.
   - ○ Disable overscan
   - ○ Set hostname
   - ✓ ~~Enable SSH~~
     - ✓ ~~Use password authentication~~
     - ○ ~~Allow public-key authentication only~~
   - ✓ ~~Set username and password~~
     - ~~Username: pi~~
     - ~~Password: raspberry~~
   - ○ Configure wifi
   - ○ Set locale settings

- [ ] Play sound when finished
- [x] ~~Eject media when finished~~
- [x] ~~Enable telemetry~~

8. Click on **WRITE > YES**

Login instructions

> *Get the ip of the raspberry from the powershell* `ping raspberrypi.local -4`

1. Connect the external devices
   a. Option A: Connect a keyboard, power, and monitor
   b. Option B: Connect ethernet to your computer and power
      i. Open a PowerShell
      ii. Install 64-but x86 PuTTY with default options
      iii. Open PuTTY
      iv. Set Host Name `raspberrypi.local`
      v. Connection type ssh
      vi. Click on **Save** and then **Open**
      vii. Click on **Accept** in the Security Alert
2. Set credentials
   a. raspberrypi login (login as): pi
   b. Password: raspberry
3. Optional, turn off the RPi `shutdown now`

> *You can also connect via* `ssh pi@raspberrypi.local`

Wi-Fi instructions

1. Set country code ISO 3166-1

```
sudo raspi-config nonint do_wifi_country MX
```

2. Open the *wpa_supplicant.conf,* the purpose is to use this file to configure your Wi-Fi connections. This process is similar when you put the connections on your smartphone

```
sudo nano /etc/wpa_supplicant/wpa_supplicant.conf
```

3. f

1. Add network configuration

Wireless network `wpa_passphrase "network_name"`

```
network={
  ssid="network_name"
  scan_ssid=1
  psk=e647e6a0df46537ad98c7687fa75fa33f0e0489f80fec9ed0180058647724073
}
```

PEAP network `echo -n "plaintext_password" | iconv -t utf16le | openssl md4`

```
network={
  ssid="<<network_name>>"
  priority=1
  proto=RSN
  key_mgmt=WPA-EAP
  pairwise=CCMP
  auth_alg=OPEN
  eap=PEAP
  identity="<<user_name>>"
  password=hash:<<the_hash>>
  phase1="peaplabel=0"
  phase2="auth=MSCHAPV2"
}
```

1. Apply changes

```
sudo reboot
```

Switch a LED

1. Open a python shell

```
python
```

1. Declare LED

```
from gpiozero import LED
led = LED(14)
```

1. Turn on LED

```
led.on()
```

1. Turn off LED

```
led.off()
```

1. Exit

```
exit()
```

VSCode setup

1. Download VS Code
2. Install Remote SSH Extension
3. Add ssh project
4. Open workspace folder
5. Run python scripts as `python blink_simple.py`

Node-RED installation

```
bash <(curl -sL https://raw.githubusercontent.com/node-red/linux-
installers/master/deb/update-nodejs-and-nodered)
```

Then you can start the service with

```
node-red-start
```

More details at https://nodered.org/docs/getting-started/raspberrypi

Other resources

https://github.com/raspberrypilearning/physical-computing-guide/blob/master/pull_up_down.md
https://gpiozero.readthedocs.io/en/stable/

System monitor

```
htop
```