2nd Edition

RASPBERRY PI QUICK START GUIDE

VILROS

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Updated for Pi 4

TABLE OF CONTENTS

CHAPTER 1 – GETTING STARTED

1.1 INTRODUCTION

The Raspberry Pi is a small computer – a very small computer.

It consists of mostly the same parts as a standard desktop computer or laptop. A central processing unit (CPU) acts as a brain, random access memory (RAM) and long-term storage devices are used to hold data, a video display shows you what is happening, and you interact with all of this using mice, keyboards, joysticks, and other universal serial bus (USB) devices. The Pi may be less powerful than your Windows PC or Macintosh, but it is still impressive that it fits all of this on a board only slightly larger than a credit card.

The original goal of the UK-based Raspberry Pi Foundation was to create a device that would address their perception of falling standards in the teaching of computer science. As computers have evolved, they have become more difficult to write software for at a "low-level" – with close interaction between hardware and software. And as they have become more integrated in our daily lives, the consequences of breaking your computer by experimenting have become more severe...and expensive.

So, unlike conventional systems, the Pi is a machine that is designed to be played with and used for experiments. Its diminutive form factor and relatively low cost mean that you can do what you want with it, and this attracts far more diverse groups of users than just students and teachers.

1.2 TECHNICAL SPECIFICATIONS

The following diagram shows the available connectors on the Raspberry Pi 4 Model B

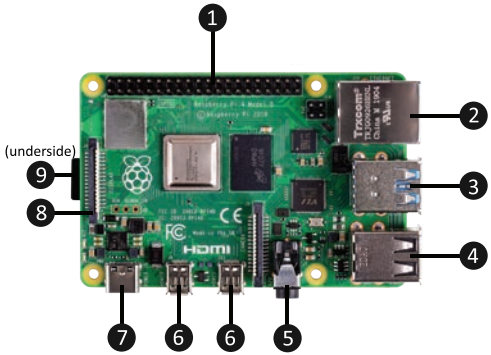

Figure 1. Connectors on the Raspberry Pi

1	General purpose input/output (GPIO) header – these pins can be controlled from software.
2	10/100 Mb/s Ethernet (RJ45) socket for connecting to a network router.
3	Universal serial bus (USB 3.0) socket for attaching peripheral devices such as mice, keyboards, or memory sticks. This is a dual socket and two USB devices can be connected at the same time.
4	Universal serial bus (USB 2.0) socket for attaching peripheral devices such as mice, keyboards, or memory sticks. This is a dual socket and two USB devices can be connected at the same time.
5	4-pole 3.5 mm output jacket for audio and video.
6	2x Micro High-definition Mutilmedia Interface (HDMI) Video Output Ports.
7	Power in via USB-C socket.
8	Display Serial Interface (DSI) flexible flat cable connector for liquid crystal displays. (LCDs)
9	MicroSD socket.The card socket is attached to the underside of the board. (image shows with card inserted).

1.3 BASIC SETUP

Fitting a Heat Sink

When the components in a computer system work hard, they generate heat. And above a certain level, this heat can reduce the lifespan of the components or even break them altogether. A "heat sink" is a carefully designed block of metal that takes the heat away from the electronic component and then passes it into the air surrounding the device.

There are four chips on a Raspberry Pi that can get very hot if the device is working hard: the central processing unit and 3 more chips that control various functions on the board.

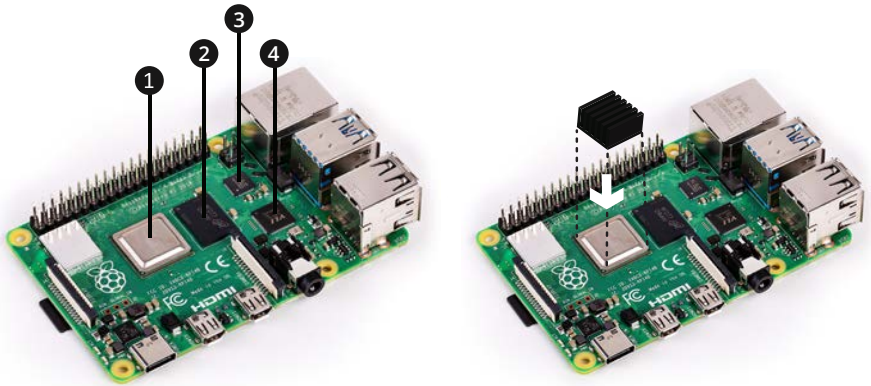

Figure 2. The main heat-out points on a Pi (left); and installing a heat sink on the CPU (right)

To install a heat sink:

1.Unplug the Pi and leave it to cool before attempting to handle the device.
2.Find the heat sink that matches the size of the chip.
3.On the bottom of the heat sink, peel away the plastic backing that covers the adhesive.
4.Press the heat sink down firmly and directly onto the chip. Hold the pressure for a few seconds to allow the adhesive to work.

If you buy heat sinks for your Pi, only use the thermal adhesive that they arrive with; never use any other type of adhesive or sticky plastic to install a heat sink on a Raspberry Pi. The adhesive must be a special compound so that it effectively transfers heat from the chip on the Pi to the metal of the heat sink.

Connecting Power

Power is fed to the Pi through the USB-C socket or, if you have a suitable connector, through the general purpose input output pins. However, providing power through the GPIO header pins bypasses the on-board protection circuitry that is designed to prevent damage to the device. For this reason, it should only be attempted by people who are experienced in building electronic circuits.

Connecting a Display

HDMI offers a high-quality video and audio signal, and is the preferred way of connecting all models of Raspberry Pi to a modern television. To connect a high-definition television:

Important Note:
If you are using just 1 HDMI port and not both be sure to connect the cable to the port named HDMI0 (the port that is closer to the USB-C Power Port)

•Plug one end of an HDMI cable into the Raspberry Pi's HDMI socket, and the other end into an HDMI input on your TV. If your display does not support HDMI, you can use the composite video and audio outputs to the auxiliary A/V input of most other televisions. These connections are colored yellow, red, and white.

Figure 3. Connecting a display to the Raspberry Pi

Connecting USB Devices

With most operating systems that you run on the Pi, human interface devices (HIDs) that connect using USB (such as mice, keyboards, and game controllers), and storage devices (such as USB memory sticks and hard drives) work without any problems or installation processes.

The Raspberry Pi can only supply a limited amount of power to USB devices. It is recommended that you do not connect any devices that draw over 100 mA. To use more power-hungry devices, you can use a powered USB "hub" – a device that allows multiple USB peripherals to be connected to a single USB socket on the Pi, and that has its own power supply.

Connecting to a Network

Your Raspberry Pi can connect to a network wireless or via the Ethernet port on the board.

To make a wired network connection between the Pi and a network router:

1.Plug one end of a CAT5 or CAT6 Ethernet cable with RJ45 connectors into the Ethernet socket on the Raspberry Pi.

2.Plug the other end of the cable into your network router.

You must insert an SD card with a bootable operating system for the Pi's Ethernet support to be activated. If all of the cables are working correctly, the light-emitting diode (LED) on the right-hand side of the Ethernet socket will light or flash.

If you prefer a wireless connection you will be prompted to wireless connect to a network when you install raspbian.

1.4 SD Cards

In the next chapter, you will learn about Raspberry Pi operating systems (in particularly, Raspbian Linux) and how to install them onto an SD card. This will complete the set-up of the Pi.

Inserting and Removing SD Cards

It is likely that you will need a memory card with more than 8 GB capacity, if you are intending to run an operating system on the Pi. MicroSD cards are widely available and generally very cost-effective.

To insert an SD card:

1.Unplug the Raspberry Pi from its power supply.

2.Locate the SD card socket on the underside of the Pi's board.

3.When looking from above, the SD card's contacts should be facing up.

4.Gently, push the SD card into the socket.

Figure 4. Inserting SD cards into the Raspberry Pi

To remove the SD card:

- Gently pull the card out.

When inserting and removing SD cards in other computers, it is not always necessary to turn off the device. However, as the memory card contains its operating system, the Pi may access it at any time. Removing the card while the Pi is accessing it can corrupt data and, in extreme cases, may stop the card working at all.

CHAPTER 2 – INTRODUCING RASPBIAN

2.1 RASPBIAN AND LINUX

An operating system (OS) is a unique type of application that you run on your computer. It is an environment in which many other applications can run at the same time, with a consistent user interface and sharing the same resources.
Microsoft Windows and Apple's Mac OS X are probably the two most well-known operating systems, but there are others.

Raspbian is a Linux distribution that is based on Debian, another popular version of Linux. It is designed for the Raspberry Pi and is the OS recommended by the Raspberry Pi Foundation. Once you are familiar with Raspbian, you will find that you are able to use other varieties of Linux without much help.

2.2 INSTALLATION OF RASPBIAN WITH NOOBS

New out of Box Software (NOOBS) is a tool that you can run on your Raspberry Pi, and it will help you install an OS. It stays on the SD card, even after the OS installed, and you can also use it to edit the Pi's main configuration file or replace the installed OS. If you purchased a kit that includes an SD card then SD should already contain NOOBS. If you purchased a kit that does not contain an SD card and you want to install NOOBS on an blank SD card, see section 2.3 Installation of NOOBS on a microSD Card.

Installing Raspbian

To install Raspbian, you will need to connect a keyboard, mouse, and display to your Pi.
First, ensure the Pi is completely off and unplugged, and then insert the SD card into the Pi's memory card socket.Reconnect the power to your Pi.
The Pi will start and load the NOOBS tool.

NOTE:If you are using an official Pre-flashed card from the Raspberry PI Foundation the System will automatically boot into raspbian, If you want to install a different OS then hold the shift key down as the system boots and the system will then boot into the NOOBS root menu.

NOOBS only comes with the files that you need install Raspbian. If you want to install other operating systems, connect your Pi to your network router using an Ethernet cable and then restart NOOBS. Other operating system will populate.

To install Raspbian:

1. Click the box next to **Raspbian**.
2. On the toolbar, click **Install**.

When the installation is complete, the Raspberry Pi restarts and loads the raspi-config tool. This helps you to Update/change certain important settings such as your time zone, Connect to Wi-Fi & Updating to the latest version of Software.
If you use NOOBS to install multiple operating systems on the same SD card then you will be asked which OS you want to use.

2.3 INSTALLATION OF NOOBS ON A MICROSD CARD

If you purchased a kit that includes an SD card the card should already be Preloaded with NOOBS. However, if you want to install NOOBS onto a blank microSD card, you can download the filesthat you need from the Raspberry Pi website.

To install NOOBS:

1. Insert a FAT16 or FAT32-formatted microSD card into a suitable card slot on your computer. You may need a USB adapter for this.
2. Download the latest version of NOOBS from:
   http://downloads.raspberrypi.org/NOOBS_latest
3. Unzip the NOOBS zip file.
4. Open the NOOBS .zip file.
5. Drag the contents of the .zip file onto your microSD card.
6. Safely eject the microSD card.
7. Ensure the Pi is completely off and unplugged, and then insert the SD card into the Pi's memory card socket.
8. Reconnect the Pi's power supply.

2.4 RASPBIAN'S DESKTOP ENVIRONMENT

Raspbian's desktop is similar to Windows 7 Desktop and many of the ways that you use it are the same. To interact with icons and buttons, click them with the mouse. If you right-click an icon, Raspbian displays a context menu. The options in a context menu only apply to the item that you clicked. The desktop takes up most of the screen. This is where your programs will appear when you start them. If you save files to the /home/pi/Desktop directory you can see links to these files appear on the desktop.

On the **top left** of the screen you will find the Raspbian menu, the Application Launcher, and the Wastebasket. On the **top right** of the screen, you can find the network monitor, the volume control, and the clock.

1	Menu: the Raspbian menu provides access to the system settings, applications and tools
2	Application Launcher: Click an icon to launch desired application
3	Terminal Window
4	Bluetooth: Find and connect to Bluetooth devices
5	Network Monitor: Configure WiFi, shows status of network connection
6	Volume Control
7	Clock: With a calendar that launches when you click on the clock
8	Waste Basket: Where your files go when deleted

Connecting to Wifi

To connect to a Wifi network click on the network monitor (5 in diagram) then select the desired network.

Using the File Manager

You can use the File Manager to copy, rename, delete, and change the properties of files that are stored on the SD card or any USB storage devices that you attach to the Pi.
To open the file manager:

- On the Application Launcher, click File Manager; or
- Click the Raspbian Menu button, point to Accessories, and then click File Manager.

Accessing the Command Line

While most tasks can be completed using the desktop environment, there are still some things that you have to do from the command line.
To access the command line from the graphical environment:
On the Application Launcher, click LXTerminal; or
Click the Raspbian Menu button, point to Accessories, and then click LXTerminal.

If you only want to run a single command, you can do this from the Raspbian menu. Click the Raspbian Menu button and then click Run. Type your command and then press Enter.

Understanding Linux Users and Superusers

If you have used more recent versions of Microsoft Windows then you may be used to running certain applications as an administrator. This idea is also in Linux.
Superusers (often called "root") have full access to the system. Any applications you run as a superuser will also have full access to the system. To protect the system from accidental or malicious damage, you rarely login to Raspbian as a superuser.

Normal users have less access to the core files needed by the OS, and this means that any applications that they run also have less access to the system. In Raspbian, pi is the user that logs into the desktop environment, and it is a normal user.

When you do need to change part of the system, or perform a task that only superuser can do, you can use the command line:

- Type **sudo** followed by a space, and then the command that needs superuser access privileges.

If you start a desktop program with sudo then the program also has full access to the system.

2.5 RESTARTING AND SHUTTING DOWN THE RASPBERRY PI

To restart the Pi:

1. Click the Raspbian Menu button and then click Shutdown...
2. Click Reboot, and then click OK.

To shut down the Pi:

1. Click the Raspbian Menu button and then click Shutdown...
2. Click Shutdown and then click OK.

Questions? Comments?
Problems With Hardware?

We Love Hearing from our Customers!

Please contact us at
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