

OCR Raspberry Pi



Getting Started Tutorials

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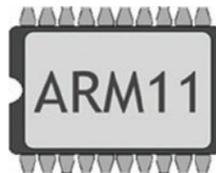
What is the Raspberry Pi?

The **Raspberry Pi** is a small computer about the size of a credit card and costs approximately £25. It was developed in the UK by the Raspberry Pi Foundation with the hope of inspiring a generation of learners to be creative and to discover how computers are programmed and how they function.



This small computer features amazing HD (high-definition) quality video playback, sports high quality audio and has the ability to play 3D games. The device uses the **ARM** processor which does most of the hard work in order to run the Raspberry Pi.

ARM processors can be thought of as the brains of the device.



These processors are mainly used in small devices such as mobile phones, hand held mobile gaming devices and other small digital devices. The reason for this is that ARM processors are extremely efficient and fast when used in small devices. This makes the ARM processor the obvious choice for the Raspberry Pi.



What is the Raspberry Pi?

Even though the Raspberry Pi is a computer it does not have a hard drive like traditional computers, instead it relies on the SD card for the starting up and storing of information. For the Raspberry Pi the SD card does the same job as a hard drive does in a traditional computer.

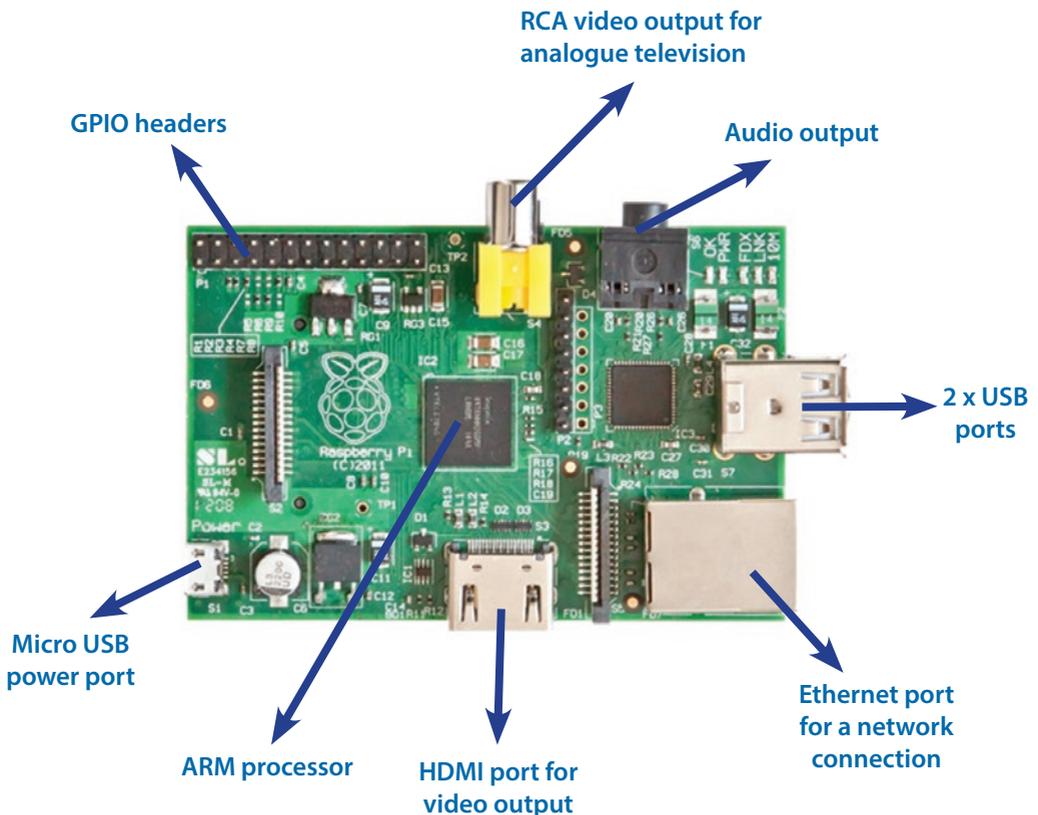


The SD card must contain the operating system, programs and the data needed to run the Raspberry Pi. The operating system tells the Raspberry Pi how to function, how to handle any input from the user and how to manage programs when they are running.



Hardware

Hardware is a physical device that can be touched or held, like a hard drive or a mobile phone. **Software** can be thought of as a program or a collection of programs that instruct a computer on what to do and how to do it. Below is an image of the Raspberry Pi which describes some of the components that make up the hardware.



Micro USB power port

The micro USB power port is used to power the Raspberry Pi device.

HDMI port

The HDMI output is used to plug into a modern television or monitor.

Ethernet port

The Ethernet port is used to connect the Raspberry Pi to the internet or a local network.

USB ports

USB 2.0 ports are used to plug in a keyboard, mouse, web cam, external hubs etc.

Audio output

The audio output can be used to plug into an external amplifier or an audio docking station.

GPIO headers

The GPIO headers are used to connect the Raspberry Pi to other hardware devices. For example, they can be used to connect to LEDs, motors and other electronic components.

RCA video output

The video output is used to connect to an older type television.

ARM processor

The ARM processor can be thought of as the brains of the Raspberry Pi.



Ingredients

1 x SD Card - 4GB or above



1 x Monitor or TV with a HDMI cable
(or RCA cable if it is an analogue TV)



Note: Some monitors do not have HDMI ports – in this situation you will need to have an adapter – you can get a HDMI to DVI or a HDMI to VGA.



1 x Mouse



1 x Keyboard



1 x Ethernet LAN cable
(optional - needed if you require a network connection)



1 x Micro USB power supply
(many mobile phone chargers will work but it must supply 5V and have at least 700mA)





Preparing the Raspberry Pi

Before you can connect and power up the Raspberry Pi you will have to create a working operating system. In order to install the operating system you will need a blank SD card. It is recommended that the SD is at least 4 GB in size. You can also use a larger SD card if you intend to store a lot of data. If you will be using a pre-loaded SD card then you can skip over this tutorial.

Installing Raspberry Pi using Windows XP / Vista / 7 / 8

You can download an operating system from the official Raspberry Pi website www.raspberrypi.org/downloads - the recommended operating system is Raspbian "wheezy".

If you are using Microsoft Windows you will need to save your downloaded operating system image to a folder and extract the contents. This will create a file that ends with a '**xxxx.img**' file extension. The file name may vary depending on which version is available at the time. The main point is that you have a file ending in 'img'.

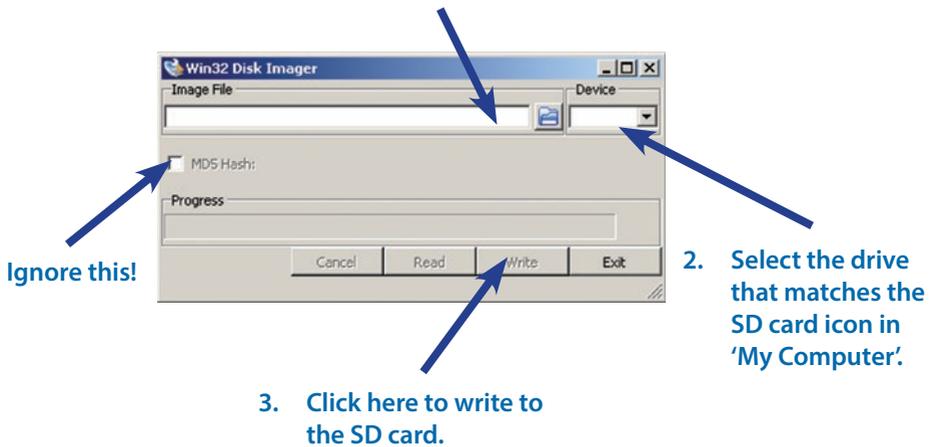
In order to write this image (.img) file to the SD card you will need a program to do this. Download the following program called 'Win32 Disk Imager' and extract it. The download can be found by visiting www.raspberrypi.com/preparing-raspberry-pi and clicking the 'Download here' link.



Warning! When you write the Raspberry Pi image to your SD card you will lose all of the data that was on the card so make sure you save anything you want to keep somewhere else!

When the program is opened it will be expecting the image file which is the operating system image. It also requires a device to write to. You can ignore the MD5 hash check box as we want to concentrate on making this installation as easy as possible.

1. Browse to the operating system image.



Click on the blue folder icon and browse to the image file. Select your SD card device letter by clicking on the device drop down. Check that you are writing to the SD card device. If you have any doubt you can double click on My Computer and see that the drive letter that has the SD icon next to it.

When you are sure that you have selected the correct image file and the correct device to write to, click on the **write button** and wait for the progress bar to reach 100%.

When this has completed, safely eject your SD card. Make sure your Raspberry Pi is powered off and plug your SD card into it.

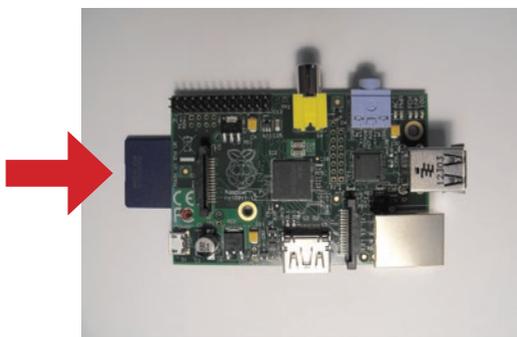


Connecting the Raspberry Pi

DO NOT plug in your power adapter until the final step. There is no on and off switch on your Raspberry Pi and it can only be powered on by inserting the power adapter.

Step 1

Pay attention to the gold connectors on the SD card. These gold connectors must make contact with the gold connectors on the Raspberry Pi.



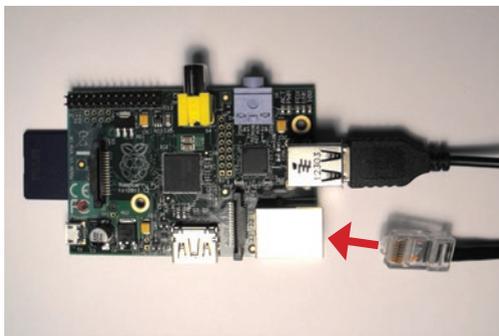
Step 2

Plug in your mouse and keyboard into the USB ports.



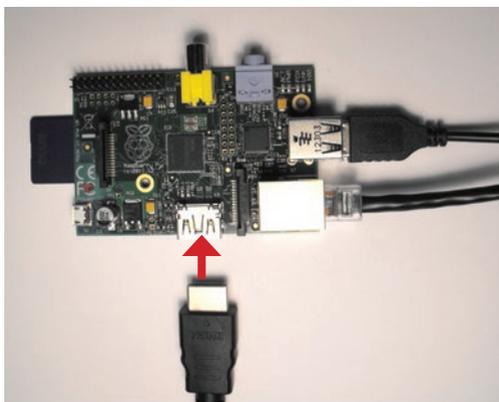
Step 3

If you want to connect your Raspberry Pi to the internet or a network you will need to plug in the Ethernet cable.



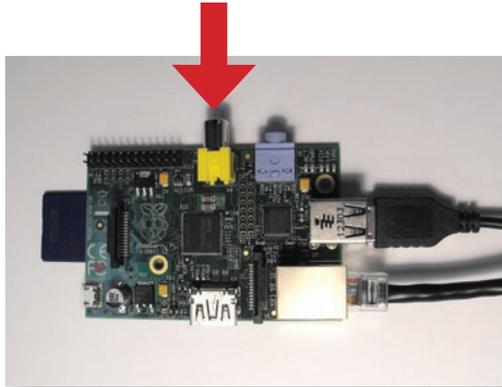
Step 4

If you have a HDMI TV or monitor then you can plug in your HDMI cable into the Raspberry Pi and plug the other end into your TV. If you have a composite video connection on your TV then go to step 5. (If your TV/monitor does not have a HDMI port you will need to use an adapter - this will either be a HDMI to DVI or a HDMI to VGA.)



Step 5

Insert the composite video connection if you are using a TV that does not support HDMI and plug it into your television.



Step 6

Insert your power cable into the Raspberry Pi power connector.

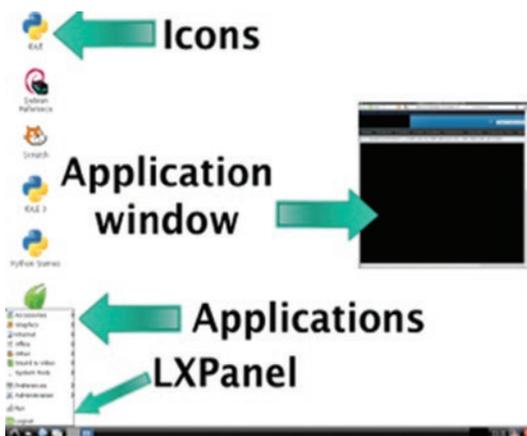
Your Raspberry Pi will now boot up. If you are using a TV make sure you have the correct channel selected.





Raspberry Pi Desktop

When the Raspberry Pi powers up, your screen will display a spectrum of colours. These colours are only displayed for a very short time and then the screen will be filled with scrolling messages. The pre-loaded SD card image uses the LXDE window manager for the desktop.

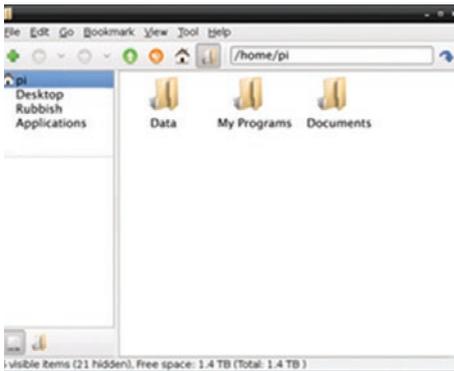


The desktop is used to make the user experience more intuitive by providing visual buttons, menus, icons and windows. The desktop removes the complexity of manually entering commands in a terminal. LXDE has been selected for the Raspberry Pi because it is light weight, uses less processing power than most window managers and does not require 3D acceleration to complete graphic tasks. LXDE can be customised for your own desktop preferences. It also uses very low memory making it ideal for the Raspberry Pi and other small low powered devices.

Some features of the desktop are:

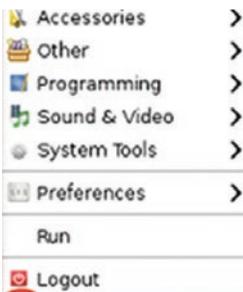
File manager

The file manager is used to manage files by providing an easy interface to display, copy, delete and edit a file. It also provides a way of navigating through the Raspberry Pi file system.



Menu

The menu provides a way of organising related programs and provides easy access to applications.





The LXPanel/task bar

The LXPanel or task bar provides a user friendly desktop panel which manages open programs and allows access to the application menu. It can be configured to your personal preference using preferences.





Basic Networking

Computer networks are made up of a group of computers or devices. Each computer requires a unique address in order to know where to send data to. When a letter is sent in the post it will contain the name of the person, the house number and the area they are located in. This is the same when data is sent over the internet. An example of an address looks like this:

192.168.100.1

This type of internet addressing is called IPv4 and stands for Internet Protocol version 4. The problem with IPv4 has become clear since more and more devices are being connected to the internet. Each device that connects to the internet needs an address and IPv4 has a limited amount of addresses available. The answer to this was to create a new version called IPv6 which allows for more devices to be connected. An example of IPv6 looks like this:

2001:0db8:85a3:0042:0000:8a2e:0370:7334

A network consists of client computers and servers each having a unique internet address. Clients will request information from the server and the server returns this information. When you are visiting a web site your web browser is the client and the web site host is the server. When a client asks the server for this information it is called a **client request**.



Servers listen for client requests using a port. A port is like a door waiting for someone to knock on it. When it receives a request from a client the server will respond with the information. Each port has a number which determines the type of data to be sent. Some ports are reserved so that when a client sends a request for information, it always uses the same port number. For example when you enter an address into your Raspberry Pi's web browser, it will connect to port 80 which is reserved for delivering web pages. The browser takes care of which port number to use so that you don't have to concern yourself with this.

You can view the following file which lists your network interfaces:

`/etc/network/interfaces`

A snippet of the file looks like this:

`iface eth0 inet dhcp`

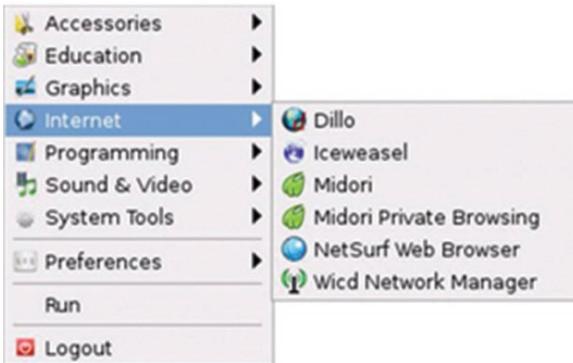
The word `iface` is referring to an interface and `eth0` is referring to the Ethernet port. `Eth0` is the only Ethernet interface on the Raspberry Pi. The rest of the line uses something called DHCP (dynamic host configuration protocol) a protocol used to configure network devices. DHCP is used to automatically obtain a unique IP address which allows your Raspberry Pi to be connected to a network.



Internet Overview

You can connect your Raspberry Pi to the internet by using a network cable plugged into your school/home network - your Raspberry Pi will automatically detect the settings. You can also use a Wi-Fi device to connect to a wireless network. To connect your wireless network you will need a wireless SSID and the password.

To browse the internet you can use a number of web browsers. The Midori web browser can be used which is a light weight and low memory web browser. This web browser is found in most Raspberry Pi distributions along with the Dillo web browser. A number of other web browsers are available including Iceweasel and NetSurf. Web browsers can be found in the Internet menu.





Shutting Down

Before you can power off the Raspberry Pi you will have to first shut it down safely.

To shutdown the Raspberry Pi using the desktop simply left click the mouse button on the red power icon at the bottom right hand corner of your desktop.



The next window will display a number of options including rebooting the Raspberry Pi. Click on the shutdown button to shutdown the device.



When the Raspberry Pi has shutdown the screen will turn black. Wait at least 5 seconds before you power off the Raspberry Pi from the mains.