Raspberry Pi Absolute Beginners Guide

The Rapsberry Pi (RPi) is a miniature computer which only costs about £30 and is about the size of a deck of cards. It has a 700Mhz processor with 256Mb ram, so you can't compare it's capability with a new PC or Mac, but despite this, you will no doubt be surprised by its abilities.

The RPi is aimed at people who would really like to get under the skin of a computer, understand it, program it and perhaps even create their own hardware peripherals for it.

THE HARDWARE

The Raspberry Pi has the following connectors:

- 5 volt power in socket (micro USB, takes most USB mobile phone chargers)
- HDMI video out (up to 1080p HD including stereo sound out)
- Composite video out
- Audio out (separate 3.5mm stereo socket)
- Two USB sockets (expandable through powered USB hub)
- RJ45 Ethernet socket
- SD card slot
- General Purpose Input Output bus
- Expansion bus

WHAT ELSE DO YOU NEED?

Besides the Raspberry RPi, which you can buy from either Element 14 or RS components (http://export.farnell.com/rp/order/?COM=raspberrypi-group or http://uk.rs-online.com/web/generalDisplay.html?id=raspberrypi), as a minimum you also need:

1. A 5 volt USB power supply (with micro USB plug) for instance: http://uk.rs-online.com/web/p/plug-in-power-supply/7263069/. This power supply includes the USB cable, others may not, make sure you get the correct cable also. Make sure your supply is at least 1A in order to provide enough current for the Pi and potentially a mouse and keyboard.
2. An SD card (minimum 4Gb, ideally 8Gb or more, up to 32Gb).
3. Operating system.

OPERATING SYSTEM

There are various free operating systems available for the RPi, but the one I recommend is the latest version of Raspbian called "Wheezy". This one is the most commonly used, and recommended by the Raspberry Pi foundation, who developed the RPi. You can either buy an empty SD card and install the operating system on it yourself, or you can buy an SD card with it already installed on it. I very much recommend the latter, because installing the operating system on an SD card is far from straightforward, as it is not just a matter of copying it onto the card. You can buy preinstalled SD cards from various sources such as: http://shop.micromundi.co.uk/index.php?option=com_virtuemart&page=shop.browse&category_id=30&Itemid=53&TreeId=2

If you already happen to have a suitable SD card and you want to save a few pounds, you can install the operating system yourself. The best instructions for this I found here: http://elinux.org/RPi_Easy_SD_Card_Setup. Please note that you will find that after installing the operating system that additional memory on your SD card is not available until you follow the instructions here: http://elsmorian.com/post/23366148056/basic-raspberry-pi-setup.

OTHER HARDWARE

You now have 2 options:

SETUP 1: USING THE RPI "STAND-ALONE"

For this you need to get:

- Keyboard
- Mouse
- HDMI cable

Compatible keyboards and loads of other kit for the RPi are available here: http://thepihut.com

You also need an HDMI compatible monitor (TV or HDMI monitor) or a monitor with composite in (in which case you also need a standard video lead). If you don't have an HDMI or composite compatible monitor you can also use a VGA monitor. In this case need an adaptor. One that I use is this one: http://www.amazon.co.uk/Neewer-Black-Adapter-Converter-Laptop/dp/B007KEIRNG/ref=sr_1_4?ie=UTF8&qid=1345281809&sr=8-4. It works flawlessly and is by far the cheapest on the market.

If you use an HDMI monitor or connect your RPi via composite video, then you don't need to do anything. Just connect and it should work.

LOGIN

After all the messages you are asked to log in.

NOTE! The Login is pi and the password is raspberry.

Once logged in you are invited to type "startx". This starts the desktop.

USING A VGA MONITOR OR PROJECTOR

 If you use a VGA monitor or projector with an HDMI to VGA adaptor, then you have to make some changes in the setup of your RPi in order to get a picture. There are 2 options here:

VGA setup option 1. Put your SD card in an SD card reader connected to your PC and then find "config.txt" in the "boot" folder. You may not be able to access the SD card via a PC in which case you need to follow the instructions in option 2 below. Use notepad to make the following changes (don't use word, as it creates the wrong type of file):

hdmi_force_hotplug=1
hdmi_group=2
hdmi_mode=16

The value of hdmi_mode depends on your monitor. Value 16 is for a resolution of 1024x768 at 60Hz. Using this mode is fairly safe as most monitors will happily do this. For other values of hdmi_mode, check this webpage about halfway the pages for hdmi_mode settings for group 2: http://elinux.org/RPi_config.txt.

You may also find that you get a large dark border around your image on the screen. This has to do with overscan settings. I found that on the monitors I tried the following setting works fine:

disable_overscan=1

Note that you may need to remove the # in front of this line to activate this command. If this doesn't do the trick you can also set this to 0 (zero) and use the following to fill the screen make sure you remove the # in front of these lines to make these commands active:

overscan_left=16
overscan_right=16
overscan_top=16
overscan_bottom=16

You may need to change the values of these to fill the whole screen.

Now safe the file and put your SD card back in your RPi. It should now hopefully work on your VGA monitor. Please note that your RPi now won't work with HDMI monitor anymore. If you want to change it back, just repeat the above, but change hdmi_force_hotplug back to 0 (zero).

VGA setup option 2. Is much like the above, but then making the changes to config.txt directly on the RPi. You therefore need access to your RPi either via a HDMI or composite monitor or temporarily use setup 2 below. Start the RPi and log in (remember, it is pi and raspberry for login and password). Don't type "startx" to start the desktop, but instead type:

sudo nano /boot/config.txt

This starts the nano editor. Now make the changes as explained in option 1 above and then press Ctrl-X followed by the "y" key and then press enter Enter and then type (and this is important!):

sudo poweroff (or sudo reboot if you use setup 2 below)

Once the RPi is powered down (takes a while), unplug the power supply, disconnect the HDMI or composite monitor, connect the VGA monitor and power the RPi back up. Hopefully you will now have an image. If not you need to repeat the above and check if the config.txt has the correct settings.

The advantage of using setup 2 below is that you can have the VGA monitor attached at the same time and after using sudo reboot you would immediately see the results.

SETUP 2: CONNECTING THROUGH A LAPTOP OR PC.

This option has the benefit that you don't need an additional keyboard, mouse or screen, but also has some disadvantages such as the requirement to install a so called VNC server on your RPi and a VNC client on your PC if you wish to use the desktop. There are some additional limitations also, so I would normally recommend that you would use setup 1 above to work with your RPi.

For this setup you only need the basic stuff i.e. the Raspberry Pi, a power supply, and also an Ethernet cable. I assume here that you have a broadband internet connection and a router with additional network sockets available.

SSH

SSH is the protocol we will be using to access your RPi. This is already pre-activated on the latest version of Raspbian, so it should work out of the box. You do need an SSH client for your PC. The best one is PuTTY, which you can download for free here
http://the.earth.li/~sgtatham/putty/latest/x86/putty.exe

You don't need to install PuTTY. Just start the exe file. You may have to click Run (on Windows 7).

Plug the Ethernet cable in the RPi and the other end into your router. Make sure the PC is also connected to your router (either directly or via WiFi) and switched on. Switch on the RPi and wait a minute or so.

IP ADDRESS

You also need to know the network (IP) address of your RPi. This is a bit trickier, but if you have not given your PC a fixed IP address (if you don't know you probably haven't) and there are no other PCs or laptops on the network, AND providing you started your PC before you connected and started your PC, then you can simply look for the IP address and add 1. So to check the IP address of your PC. If you have windows XP etc. follow instructions here: http://windows.microsoft.com/en-gb/windows-vista/Find-your-computers-IP-address. For windows 7, follow these instructions:

1. Go to Start and Control Panel. The choose the option "Network and Sharing Centre".
2. Click the Local Area Connection for the connection currently being used. Note: If you have an ethernet adapter and a wireless network adapter make sure to select the connection you are currently using to connect to the network otherwise the IP address you obtain may be useless.
3. When the Local Area Connection Status window opens, click the Details button to pull the information from the connection you selected.Note: Don't let the plethora of numbers and addresses confuse you. The value you are interested to determine the computer's IP address is the IPv4 Address.
4. The IP address used the network device you selected will be listed next to the IPv4 Address – the number should start with something like a 192... if you are using a residential router with standard settings.

Now if, for example, your PC has the IP address 192.168.1.50, then your RPi has most likely 192.168.1.51.

Note! If you are able at this point to connect an HDMI monitor to your RPi at this point, then you would be able to see the IP address of your RPi after you switch it on in the list of information just above where you are asked to log in.

Finally, you can also access your router (if you know the password and how to access it) and check for DHCP clients or similar (you will find a list of devices connected to your router. One of them would be the RPi (you can use the above instructions to check your IP address of your PC to eliminate that one from the list).

USING PUTTY

Start PuTTY and then do the following:

1. Type the IP address of your RPi under "Host Name or IP address". Type 22 under "Port".
2. From Connection Type choose SSH.
3. Type Raspberry Pi in Saved Session and click "Save".
4. Click "Open".

A window opens and after a few seconds you are asked to log in. Just use pi and raspberry again to log in and you are now logged into your RPi.

IMPORTANT! You can't start the desktop here. So "startx" will result in some text. If you have accidentally done this, just press Ctrl-C and you should get back to normal.

The next time you use PuTTY you simply double click on "Raspberry Pi" (providing the IP address hasn't changed).

FTP

FTP is really handy if you want to send files to your RPi from your PC or back up files from your RPi. The best FTP client is FileZilla, which is again free and you can download here: http://filezilla-project.org/download.php

Once installed start it. Now do the following:

1. From "File" click "Site manager".
2. When the site manager appears, click "New Site".
3. Give your "Site" a new name for instance Raspberry Pi.
4. At the top left type the IP address of your RPi in "Host:", leave "Port" blank.
5. From "Protocol " choose "SFTP – SSH File Transfer Protocol"
6. Change "Logon type:" to "normal"
7. Type in "User: " pi
8. Type in "Password": raspberry
9. Click "Connect".

It may take a while to figure out the FTP screen, but casically on the left are the files your PC, to the right are the files on your RPi. You can now copy files from one to the other.

Note that when you want go get back to the RPi the next time you don't need to do all the above, go the the Site Manager and click on Raspberry Pi under "Select Entry" and click connect.

VNC

This allows you to remotely access a desktop on your RPi. For this you need VNC client on your PC, which you can download free of charge here: http://www.tightvnc.com/download.php

To install a VNC server on your RPi, This is really simple and goes as follows:

Start your RPi, login but don't go to the desktop. If you are already in the desktop, you can start the XLTerminal, which also opens a Linux command line session, either/or works. Now type the following:

sudo apt-get install tightvncserver

and press Enter.

Once installed, type:

tightvncserver

and press Enter again.

You are asked to fill in a password (twice). Do this. Make sure the password is about 8 characters long. You don't have to create a read only password, so just type n.

Now you are ready. I normally just type vncserver and press Enter. The vnc server starts automatically. It will also tell you the desktop ID it's created which is usually :1, but if you repeat the above, you will get a second virtual desktop with ID :2, etc.

You can also give it some additional information:

vncserver :1 –geometry 1024x768 –depth 24

The above sets desktop with ID :1 with size 1024x768 pixels and 24 bit colour depth.

To stop a VNC desktop you can type:

vncserver –kill :1

Which would stop virtual desktop with ID :1.

On your PC you now need to start the tightVNC client. Type in the IP address of the RPi followed directly by the desktop ID, for example 192.168.1.51:1

If all goes well , after a few seconds, you will then be asked for the password. This is the password you typed when you ran the tightvncserver command (see above). When you then type OK, your RPi desktop should appear within a few seconds.

Note that this remote desktop is not the same one as that may be currently visible on your RPi directly.