# RPi Buying Guide

From eLinux.org

# Contents

Back to the Hub.

**Getting Started:**

***Buying Guide*** *- for advice on buying the Raspberry Pi.*

*Preload your Card - for info on how to make the SD Card used to boot your Pi.*

*Basic Setup - for help with buying other hardware and setting it up.*

*Advanced Setup - for more extensive information on setting up.*

*Beginners Guide - you are up and running, now what can you do?*

Raspberry Pi has appointed Farnell (http://www.element14.com/raspberrypi) and RS Components (http://rswww.com) as its authorised manufacturing parners distributors.

As of July 16th 2012, both Premier Farnell (http://www.element14.com/raspberrypi) and RS Components (http://rswww.com) have removed their "one per customer" restriction. Both consumers and businesses alike should now be able to buy bulk stock of the Raspberry Pi.

Raspberry Pi's distributors will ship worldwide to the best of their ability (ie subject to origin export and local import laws).

Countries that are currently subject to UK (including EU and UN) export restrictions include North Korea, Iran, Ivory Coast, Liberia and Zimbabwe. A full list and further details are provided at [1] (http://www.businesslink.gov.uk/bdotg/action/layer?topicId=1084100244)

Farnell have also been refusing to sell direct to some consumers in the EU, to the best of my knowlage they have not given full details of why.

There are three main options for buying a raspberry Pi, buying direct from the distributor, buying from a subsidary or sister company of the distributor or buying from a third party reseller which option is best will depend on the location of the customer, the number of Pis being purchased, and the urgency of the order.

All new orders from the main distributors should now be filled with 512MB rev 2 raspberry Pi's, however some third party resellers may still have stock of the older models.

Note that stock status may change quickly. It may be worth checking a local supplier even if they are listed as out of stock here.

# Main distributors and subsidaries/sister companies

# Farnell

http://www.farnell.com/ Farnell are one of the two main distributors, as of 21-NOV-2012 their main european operation is out of stock and quoting a 3-week lead time. Reports from the forum are that farnell usually beat their delivery estimates.

For european customers, the customer is asked whether they are "consumer" or "buisness", if the customer selects buisness they are taken back to Farnell's regular website to order. If the customer selects consumer they are taken to a dedicated raspberry Pi site which only offers a small selection of Pi related products and gives no information on stock status. Farnell's site claims that consumers who do not have a previous account cannot use the "buisness" option but it is not clear if this is actually true for all countries. For some countries consumers are directed to third party resellers. The order code for the raspberry pi is 2191863.

## Element14

http://www.element14.com The "Element14" brand is used by a number of different operations within the Premier Farnell group and is also used for the groups "social" operation. In the asia-pacific region the Element 14 brand has completely replaced the previous "Premier Electronics" brand for asia and the previous "Farnell" brand for australia and new-zealand. In Europe the Element14 brand is used in paralell with the Farnell brand. In North america the element14 brand is used in parallel with the Newark brand.

## Newark

http://www.newark.com/ Newark is the main american branch of the Premier Farnell group (Farnell's parent company). As of 21-NOV-2012 they are out of stock of raspberry Pis but claim 1321 Expected to ship 26 Nov, 2012 and Further stock expected to ship 20 Dec, 2012.

## Element14 AU/NZ

http://au.element14.com/ http://nz.element14.com/ On element14's australian operation (which also serves new zealand) as of 21-NOV-2012 availability is listed as "please call" and "supplier lead time" is listed as 30 days. The order code for the raspberry pi is 2191863.

## Element 14 asia

http://cn.element14.com/ http://hk.element14.com/ http://in.element14.com/ http://cn.element14.com/ http://kr.element14.com/ http://my.element14.com/ http://ph.element14.com/ http://sg.element14.com/ http://tw.element14.com/ http://th.element14.com/ Element14 have warehouses in singapore and shanghi, it appears that some countries are served from both warehouses while others are served from only one or the other. UK stock is also listed on these sites. As of 21-NOV-2012 Element14's asian operation has 331 raspberry Pis in stock in shanghi and 617 raspberry Pis in stock in singapore. The order code for the raspberry pi is 2191863.

## CPC

http://cpc.farnell.com/ CPC is a branch of the Premier Farnell group in the UK based in Preston. As of 21-NOV-2012 they have 3100 raspberry Pis in stock. The order code for the raspberry Pi is SC12590.

### MCM

http://www.mcmelectronics.com/ MCM is a branch of the Premier Farnell group in the US based in Centerville, Ohio. As of 21-NOV-2012 they are out of stock and give an estimated ship date of december 7th.

## RS components

http://rswww.com/ RS are the other main distributor. Like Farnell they have a consumer site and buisness option with the consumer option taking users to a dedicated Pi store while the buisness option takes them back to the regular RS site. They do not state whether consumers must use the consumer site or not. The order code for the raspberry Pi is 756-8308. As of 21-NOV-2012 the Pi is listed as "Temporarily out of stock - back order for despatch 21/12/2012"

RS have delayed existing orders on several occasions and are reported on the forum as being very difficult to communicate with.

### Allied electronics

http://www.alliedelec.com/ Allied electronics is the US sister company of RS. The order code for the raspbery pi is 70229569. They website does not give a predicted dispatch date and state that "the estimated delivery time is uncertain and will likely take several months".

Reports from the forum are that Allied are easier to communicate with than RS but do not appear to be being kept will informed of the stock situation by RS.

## Resellers

There are now many companies reselling the raspberry Pi.

### RPF endorsed resellers

#### Maplin

Maplin sell the raspberry Pi in the UK but only as part of a kit including power supply, keyboard and mouse, programmed 4GBSD card, HDMI cable and wireless dongle. As of 21-NOV-2012 they list the raspberry Pi kit as in stock for home delivery and also in stock in some stores.

## Farnell Approved resellers

Farnell now direct consumers in many countries to "approved retailers" rather than selling to them directly. Some of these suppliers specialise in the Pi while others are general farnell resellers.

**Electrocomponentes S.A**

http://www.electrocomponentes.com/ Electrocomponentes S.A sell farnell producs in argentina.

**Arabian Electric & Electronics Est.**

fisuoyla@batelco.com.bh Arabian Electric & Electronics Est sell farnell products in barhain.

**Minifo**

http://www.minifo.com/ Minifo is a raspberry Pi retailer in belgium. As of 21-NOV-2012 they list the raspberry Pi as in stock but do not state how much stock they have.

**Electromin S.A.**

http://www.electromin.cl/ Electromin S.A. sell farnell producs in Chile.

**Betatech Ltd**

http://www.farnell.com/distributors/cyprus_bet.htm Betatech Ltd sell farnell products in cyprus.

**Grand soloutions**

http://www.gs.com.eg/ Grand soloutions sell farnell producs in eygypt, unfortunately searching their website by farnell part number seems to be broken currently.

**Partco Oy**

http://www.partco.biz/ Partco sell the Raspberry Pi, ardunio and a selection of electronic components in Finland. As of 21-NOV-2012 they list the raspberry Pi as in stock but do not state how much stock they have.

**kubii**

http://www.kubii.fr/ kubii sell the Raspberry Pi, together with a selection of accessories. The website was created when Farnell changed their distribution policy.

**Málna PC Magyarország**

http://malnapc.hu/ Málna PC Magyarország is a raspberry Pi reseller in hungary.

**Midbaejarradio EHF**

Midbaejarradio EHF is the authorised Farnell distributor for Iceland.

**Lion**

http://www.lion.co.il/h?q=RASPBERRY Lion sell the raspberry Pi in israel. As of 21-NOV-2012 they do not appear to have stock.

**International Oilfield Supplies**

http://www.farnell.com/distributors/malta_int.htm International Oilfield Supplies are the authorised Farnell distributor for Malta.

**Makkays**

http://www.farnell.com/distributors/pakistan_mak.htm Makkays is the authorised Farnell distributor for Pakistan.

**kamami**

http://www.kamami.pl/ kamami sell the raspberry Pi in poland.

**mixtronica**

http://www.mixtronica.com/ Mixtronica sell Farnell products in portugal.

**Computer and Engineering Specialists Co**

http://www.farnell.com/distributors/saudiarabia_ces.htm CESCO Group is an authorised farnell distributor for Saudi Arabia

**Dialogue s.r.o**

http://www.dialogue.sk/index.php?page=textaktual&id=71 Dialogue s.r.o sell the raspberry Pi and accessories in slovakia.

**IC elektronika d.o.o.**

http://www.ic-elect.si/ IC elektronika d.o.o. sell farnell products in slovenia.

**Electrocomp express**

http://www.eexpress.co.za/ Electrocomp express sell farnell products in south africa. As of 21-NOV-2012 they list the raspberry Pi as awaiting delivery and do not give a lead time.

**Orel Solutions (PVT) Ltd**

http://www.farnell.com/distributors/srilanka_osp.htm Orel Solutions (PVT) Ltd is the authorised farnell distributor for Sri Lanka.

**Mikro-Kit Elektronik AB**

https://www.microkit.se/ Mikro-Kit Elektronik AB sell the raspberry Pi (and it would appear other farnell producs too) in sweeden. As of 21-NOV-2012 they list the raspberry Pi as out of stock with expected delivery 2012-12-11.

**digitec**

http://www.digitec.ch/ Digitec sell the raspberry Pi in switzerland

**Yildrim**

http://www.yildirimelektronik.com/ Yildrim sell farnell products in turkey.

**DGM distribution**

http://www.farnell.com/distributors/unitedarabemirates_dgm.htm DGM distribution is the authorised farnell distributor for dubai.

## Other resellers

### Newit

http://www.newit.co.uk/ Newit are a British company selling a variety of arm hardware and accessories including the raspberry Pi. As of 21-NOV-2012 they list the raspberry Pi as in stock but do not state how much stock they have.

### Makershed

http://www.makershed.com/ Makershed is a US company that sells various stuff aimed at hardware hackers including the raspberry pi. As of 21-NOV-2012 they list the raspberry Pi as out of stock.

### Tandy

http://www.tandyonline.co.uk/ Tandy is a UK company that sells a small selection of electronics stuff. As of 21-NOV-2012 tandy has the raspberry Pi in stock but the Pis they have in stock are older 256MB "rev 1.1" models.

Note that the current Tandy is a division of adslnation and other than buying the name has little relationship to the Tandy of old.

### Adafruit

http://www.adafruit.com/ Adafruit is a US company that makes a variety of boards for hardware hackers and tinkerers, some specifically designed for use with the raspberry Pi. They do not sell the raspberry Pi separately but do sell it as part of a large starter kit including everything needed to start experimenting with the Pi and external hardware on the GPIO. They also currently include a free raspberry pi with orders over $350. As of 21-NOV-2012 they expect to have their Pi kit in stock in 5-10 business days.

### SNOOTLAB

SNOOTLAB http://snootlab.com/ sell products in French as well as English. They also sell a number of different components and products such as Arduinos too.

# Licensed Manufacture

The foundation has chosen to license manufacture of the RPi, which should provide several advantages including:

1. The involvement of RS Components and Premier Farnell means that build volume can be increased much, much faster than would have been possible otherwise. Due to costs and working capital, the foundation would have been limited to batches of only 10k Raspberry Pis; the Raspberry Pi will now be being built to match demand.
2. Both Premier Farnell and RS Components have worldwide distribution networks, so wherever you are in the world, you will be able to buy from a local distributor. It's a much better way for you to buy than getting them all shipped from the Foundation in the UK.
3. Both RS Components and Premier Farnell will be taking preorders, something which the foundation would otherwise be unable to do.
4. The foundation will still receive a percentage from the sale of every RPi sold, which will be put straight back into the charity.
5. Primarily, by removing the focus on dealing with manufacture, distribution and sales, this frees up the limited resources of the foundation to focus on the original aims and goals of the project.

Additional detail is available in the video interview between Eben Upton and SlashDot here (28/02/12) (http://hardware.slashdot.org/story/12/02/28/2347222/raspberry-pi-now-has-distributors----and-will-soon-have-boards-for-all-video) .

Unfortunately the switch to licensed manufacture has also resulted in a marked reduction in transparency of the process as Farnell and RS consider detailed information of what is going on to be confidential.

# What You Get In The Box

1. Pre-Assembled Raspberry Pi board

2. A sheet containing a combination of regulatory information and some very brief instructions.

*Note:*

*1. The board will be supplied assembled (since most of the components are not suitable for home builds, including the BGA[1] package mounted SoC[2] and PoP[3] memory). 2. The board has the GPIO header pins for the primary GPIO header (but not the secondary GPIO header added on the rev2 boards) populated. The SoC JTAG may or may not be present depening on when the board was manufactured and at which factory but aren't really of use to end users anyway due to the lack of broadcom documentation. The LAN JTAG header does not seem to be present on any boards. 3. All other connectors will be assembled in place.*

# Accessories

To use the Pi a user will typically require some accessories. All of the Pi vendors listed above sell some accessories but the exact range varies. Accessories you should consider include.

- USB Power Supply (UK/EU/US Compatible)[4]
- SD-Card, most distributors are selling pre-prepared SD cards which are usually 4GB. Software is available to prepare your own SD cards.
- There is a wide choice of cases, most distributors will have some but shopping around for one you like is suggested.
- There are a variety of AddOn/Expansion Boards now available, see that page for more details.

*See Typical Hardware You Will Need for details about other items you may require.*

# Price

The price is $35USD before shipping, duty, and tax, about $60 after.

Although the foundation is UK based, the guide price of the units are in USD since the RPi components are sourced in USD$.

The price is $25USD (~£16GBP) for model A(not yet avalable), and $35USD (~£23GBP) for model B.

Items will be subject to local Tax (i.e. UK will have 20% VAT added) and shipping cost is not included.

See the following update on RS Components and Farnell global pricing (http://www.raspberrypi.org/archives/826) (13th March 2012).

# Clones & Copies

The foundation plans to release all the required schematics and plans to reproduce the RPi hardware, so clones and copies will be welcome.

However, since the unit is built around the Broadcom SoC, the interested party will require suitable sized orders to obtain them. The foundation were fortunate enough to be supported in this aspect by Broadcom to enable the project to be feasible.

# Historic information

1. The foundation have built an initial run of 10,000 Model-B units.
2. Due to extreme demand, the units wer NOT sold directly from the shop (http://www.raspberrypi.com) (see #Licensed Manufacture below).
3. You may buy a Raspberry Pi from Farnell (http://www.element14.com/raspberrypi) or from RS Components (http://rswww.com)
4. A limit of one unit per person was applied for the first batch and some time afterwards

```
* There were reports that several people ordered multiple units at launch,
  however it appears that Farnell removed any excess items when they reviewed
  and confirmed the order for shipping dates.
  This has also appears to apply for the pre-orders they have taken.
  Many customers also ordered from both Farnell and RS.
```

## 1st Batch Order FAQ

```
NOTE: While every attempt has been made to provide accurate information,
      this FAQ is not official and is based on what information is available at the time of writing.
```

**Press Releases**

**Farnell:**

Post-Launch FAQ by Farnell (http://www.element14.com/community/docs/DOC-43262/l/frequently-asked-questions-about-raspberry-pi/?CMP=SOM-TW-e14RasPiFAQ) , see their attached docx file for details.

**RS Components:**

Post-Launch statement by RS Components (http://www.electrocomponents.com/media/press-releases/2012/02/29th/)

Raspberry Pi, Your Questions Answered by RS Components (http://uk.rs-online.com/web/generalDisplay.html?id=raspberrypi&file=questions&cm_sp=raspberrypi-_--_-questions)

**Q: Couldn't this have been handled better, I couldn't get on the site to order and they sold too quickly?**

Both distributors were indeed unprepared for the volume of traffic the launch generated (they were warned by the foundation before hand).

Chances are if the foundation had gone with their original plan of selling through their own shop, the situation would have been far worse, with no option of pre-order either.

The distributors only have 5,000 units each to sell, reports have estimated the registered interest/pre-orders totalling over 2 million (no official figures available yet). Even if it is half of that, it means the number of available units was less than 1% of the demand.

**Q: If interest was obviously so high...why only build 10,000 units?**

There is a big risk involved with building a large batch of units and selling them, and 10,000 units would take well over $250,000 in capital investment. For a very small charity, that is a massive task in itself. Much of that funding came from the Foundation Trustees' own personal investment.

Thankfully, the massive bonus of licensing out manufacture, is that the build rate is no longer limited by the foundation's own funding, which means there will be many more units available much sooner.

**Q: I've been unable to register an account with the distributor, as I am not a company?**

There have been several reported problems with individuals placing orders (i.e. not having company accounts or details).

Both distributors "should" take orders from individuals, however it appears each of the different localised sites may have different requirements so this will be investigated to ensure that this is corrected if needed.

Often, many of the company related fields on application are optional, if in doubt contact their sales team for help.

**Q: Worldwide launch? It was not available here!**

The distributors decided to make the units only available from selected locations, it appears the foundation were not made aware of this beforehand.

Considering the small number of available units, it would have been unlikely to have improved the situation.

Worldwide availability will be monitored, it is expected that they will be made available as soon as possible.

**Q: The price for the RPi from Farnell verses the price from RS Components is different, why?**

Please see the following page for details about RS Components and Farnell global pricing (http://www.raspberrypi.org/archives/826) (13 March 2012).

**Q: I've only been able to register my interest, what now?**

Be patient, both distributors have said they will contact people when they have more details (alternatively keep an eye on their sites for news).

RS Components, in particular have only taken people's details, and according to the above press-release will wait until they receive their allocated 5,000 units.

**Q: I registered on the Raspberry Pi Site's Mailing List but I didn't get an email**

Unfortunately, the mail server had problems with sending out the 100K+ emails in time, it is believed the email was often marked as spam by a lot of email systems so was rejected or returned on-mass, or sent to Junk folders. Yes, this system should have been tested, but the foundation were keen not to send unnecessary emails to people prior to launch.

The email contained the same information about the announcement as was publicly posted on the website (28th Feb 2012) before launch day, no additional or extra information was given through the email.

# References


1. ↑ http://en.wikipedia.org/wiki/Ball_grid_array
2. ↑ http://en.wikipedia.org/wiki/System_on_a_chip
3. ↑ http://en.wikipedia.org/wiki/Package_on_package
4. ↑ http://www.raspberrypi.org/forum/general-discussion/is-the-raspberrypi-going-to-be-sold-as-a-kit/#p32289

| | |
|---|---|
| **Startup** | Model Wizard - **Buying Guide** - SD Card Setup - Basic Setup - Advanced Setup - Beginners Guide - Troubleshooting |
| **Hardware** | Hardware - Hardware History - Low-level peripherals - Expansion Boards |
| **Peripherals** | Screens - Cases - Other Peripherals |
| **Software** | Software - Distributions - Kernel - Performance - Programming - VideoCore APIs |
| **Projects** | Tutorials - Guides - Projects - Tasks - DataSheets - Education - Communities |

Retrieved from "http://elinux.org/index.php?title=RPi_Buying_Guide&oldid=195140"
Category: RaspberryPi

---

# RPi Easy SD Card Setup

From eLinux.org

## Contents



Back to the Hub.

**Getting Started:**

*Buying Guide - for advice on buying the Raspberry Pi.*

***Preload your Card** - for info on how to make the SD Card used to boot your Pi.*

*Basic Setup - for help with buying other hardware and setting it up.*

*Advanced Setup - for more extensive information on setting up.*

*Beginners Guide - you are up and running, now what can you do?*

# SD Card setup

To boot the Raspberry Pi, you need an SD card installed with a bootloader and a suitable Operating System. Some Raspberry Pi kits will come with a ready-to-go card, but if you didn't receive one you will need to prepare your own:

Official images are available from http://www.raspberrypi.org/downloads and there is an overview of available distributions here.

Warning! When you write the Raspberry Pi image to your SD card you will lose all data that was on the card.

# Safest/Laziest way

Buy a preloaded card from RS Components, element14 or The Pi Hut's Raspberry Pi Store (http://thepihut.com/)

# Easiest way

- Use an installer program. The Fedora ARM Installer (http://zenit.senecac.on.ca/wiki/index.php/Raspberry_Pi_Fedora_Remix_Installation#SD_Card_Installation_Using_the_Installer) will download and install Raspberry Pi Fedora Remix images, but it will also install other images if they are already downloaded and in uncompressed or .gz format.
- (**Mac**) The RasPiWrite (https://github.com/exaviorn/RasPiWrite) utility is a python script which will walk you through the process of installing to SD card, it works with any Raspberry Pi compatible disk image, and can download one of the currently available distros if you don't have one.
- If your Pi is connected to the Internet, you can use the BerryBoot installer (http://www.berryterminal.com/doku.php/berryboot) to let it download and install the operating system. This requires that you first use a normal Windows/Mac/Linux computer to download a small .zip file with the Berryboot system files and extract it to an empty SD card. Then you put the SD card in your Pi, and follow the on-screen prompts to complete the installation. An additional advantage is that Berryboot allows you to install more than one operating system on a single SD card. Also, it is not necessary to install any additional software on your normal Windows/Mac/Linux computer.

# Easy way

To write your SD card you start by downloading the SD image (the data you will write to the card). The best way to do this is using BitTorrent (http://en.wikipedia.org/wiki/BitTorrent_(protocol)) . This generally results in a faster download as it is a highly distributed system (you will be downloading the data from users who have previously downloaded it).

This guide assumes you have downloaded the Debian "wheezy" image, with name 2012-10-28-wheezy-raspbian. Obviously, if you are downloading a different or newer version, use the name of the version you have downloaded.

## Copying the image to an SD Card on Windows

1. Download the image from a mirror or torrent. The remainder of this assumes you are using the Raspbian “wheezy” download 2012-10-28-wheezy-raspbian.zip
   - http://www.raspberrypi.org/downloads
2. Extract the image file 2012-10-28-wheezy-raspbian.img from the downloaded .zip file.
3. Insert the SD card into your SD card reader and check what drive letter it was assigned. You can easily see the drive letter (for example G:) by looking in the left column of Windows Explorer. If the card is not new, you should format it; otherwise Win32DiskImager may hang.
4. Download the Win32DiskImager (https://launchpad.net/win32-image-writer) utility. The download links are on the right hand side of the page, you want the binary zip.
5. Extract the executable from the zip file and run the Win32DiskImager utility. **You should run the utility as Administrator!**
6. Select the 2012-10-28-wheezy-raspbian.img image file you extracted earlier
7. Select the drive letter of the SD card in the device box. **Be careful to select the correct drive; if you get the wrong one you can destroy your computer's hard disk!**
8. Click Write and wait for the write to complete.
9. Exit the imager and eject the SD card.
10. Insert the card in the Raspberry Pi, power it on, and it should boot up. There is an option in the configure script that comes up to expand the partitions to use all of the SD card if you have used one larger than 4 GB

*In Windows the SD card will appear only to have a fairly small size - about 75 Mbytes. This is because most of the card has a partition that is formatted for the Linux operating system that the RPi uses and is not visible in Windows.*

# Copying the image to an SD Card on Windows if first option isn't successful

I wasn't able to choose device in Win32DiskImager on my notebook so I found a different way to achieve the same thing on windows machine..

1. Download the image from a mirror or torrent
   - http://www.raspberrypi.org/downloads
2. Extract the image file 2012-10-28-wheezy-raspbian.img from 2012-10-28-wheezy-raspbian.zip
3. Insert the SD card into your SD card reader and check what drive letter it was assigned. You can easily see the drive letter (for example H:) by looking in the left column of Windows Explorer.
4. Download flashnul software from http://shounen.ru/soft/flashnul/ here is Translated version (http://translate.google.com/translate?u=http%3A%2F%2Fshounen.ru%2Fsoft%2Fflashnul%2F&hl=en&ie=UTF8&sl=ru&tl=en
   - Download the latest version at the time of writing it was flashnul-1rc1.
   - Download and Extract the application from archive.
   - Click Start button > All Programs > Accessories > Command Prompt, right click on it and Run as Administrator.
   - Run the flashnul with argument:

```
C:/flashnul/flashnul.exe -p
```

1. - Flashnul will tell you something like:

```
Avaible physical drives:
0       size = 250059350016 (232 Gb)
1       size = 1990197248 (1898 Mb)

Avaible logical disks:
C:\
D:\
F:\
G:\
H:\

Press ENTER to exit.
```

**SDCARD number is on left! In my case it is number 1**

1. - Now we will use Load argument:

```
C:/flashnul/flashnul.exe 1 -L C:/2012-10-28-wheezy-raspbian.img
```

where **<Path to flashnul directory>**flashnul.exe **<device number>** -L **<img file path>**

1. 
   - Flashnul will give you a device summary and proceed caution, have a quick scan through the information to make sure you have selected the correct device, then type yes and press enter.
   - If you get a access denied error, try re-plugging the SD card. Also make sure to close all explorer windows or folders open for the device.
   - If you still get a access denied error, try substitute the device number with the drive letter followed by a colon. Eg:

```
C:/flashnul/flashnul.exe H: -L C:/debian6/debian6-19-04-2012.img
```

- If the device summary does not match Your card (the size is smaller, e.g. 75MB), but you are sure, that the letter is correct - please continue and then try again with the device number.

# Copying an image to the SD Card in Mac OS X (mostly graphical interface)

1. Download the image from a mirror or torrent
   - http://www.raspberrypi.org/downloads
2. Extract the image by double clicking on the download file
3. Connect the SD Card reader with the SD Card inside; note: must be formatted in FAT32!
4. From the *Apple (?) menu*, choose *About This Mac*, then click on *More info...*; if you are using Max OS X 10.8.x Mountain Lion then click on *System report*.
5. Click on *USB* (or *Card Reader* if using an in-built SD Card reader) then search for your SD Card in the upper right section of the window; click it, then search for *BSD name* in the lower right section: must be something like **disk***n* where *n* is a number (e.g.: disk4). Note this number
6. Unmount the partition so that you will be allowed to overwrite the disk by opening Disk Utility and unmounting it (do not eject it, or you have to reconnect it)
7. From the Terminal run:
   - **sudo dd if=*path_of_your_image.img* of=/dev/disk*n* bs=1m**
   - Remember to replace *n* with the number that you noted before!
8. Wait a LONG time!
9. You're done! Insert it in the raspberry pi, and have fun

# Copying an image to the SD Card in Mac OS X (command line)

**Note**: Some users have reported issues (http://www.raspberrypi.org/phpBB3/search.php?keywords=extra+files&t=8226&sf=msgonly) with using OSX to create SD Cards.

1. These commands and actions need to be performed from an account that has administrator privileges.
2. Download the image from a mirror or torrent
   - http://www.raspberrypi.org/downloads
3. Verify if the the hash key is the same (optional), in the terminal run:
   - **shasum ~/Downloads/2012-10-28-wheezy-raspbian.zip**
4. Extract the image:
   - **unzip ~/Downloads/2012-10-28-wheezy-raspbian.zip**
   - *(or: just double click the zip, it will extract automatically)*
5. From the terminal run **df -h**
6. Connect the sdcard reader with the sdcard inside
7. Run **df -h** again and look for the new device that wasn't listed last time. Record the device name of the filesystem's partition, e.g. **/dev/disk3s1**
8. Unmount the partition so that you will be allowed to overwrite the disk:
   - **sudo diskutil unmount /dev/disk3s1**
   - *(or: open Disk Utility and unmount the partition of the sdcard (do not eject it, or you have to reconnect it)*
9. Using the device name of the partition work out the raw device name for the entire disk, by omitting the final "s1" and replacing "disk" with "rdisk" (**this is very important:** you **will** lose all data on the hard drive on your computer if you get the wrong device name). Make sure the device name is the name of the whole SD card as described above, not just a partition of it (for example, rdisk3, not rdisk3s1. Similarly you might have another SD drive name/number like rdisk2 or rdisk4, etc. -- recheck by using the **df -h** command both before & after you insert your SD card reader into your Mac if you have any doubts!):
   - e.g. **/dev/disk3s1** => **/dev/rdisk3**
10. In the terminal write the image to the card with this command, using the raw disk device name from above (read **carefully** the above step, to be sure you use the correct rdisk# here!):
    - **sudo dd bs=1m if=~/Downloads/2012-10-28-wheezy-raspbian/2012-10-28-wheezy-raspbian.img of=/dev/rdisk3**
    - if the above command report an error(dd: bs: illegal numeric value), please change bs=1M to bs=1m
    - (note that dd will not feedback any information until there is an error or it is finished, information will show and disk will re-mount when complete.

However if you are curious as to the progresss - ctrl-T (SIGINFO, the status argument of your tty) will display some en-route statistics).

11. After the dd command finishes, eject the card:
    - **sudo diskutil eject /dev/rdisk3**
    - *(or: open Disk Utility and eject the sdcard)*
12. Insert it in the raspberry pi, and have fun

# Copying an image to the SD Card in Linux (command line)

Please note that the use of the "dd" tool can overwrite any partition of your machine. If you specify the wrong device in the instructions below you could delete your primary Linux partition. Please be careful.

1. Download the zip file containing the image from a mirror or torrent
    - http://www.raspberrypi.org/downloads
2. Verify if the the hash key of the zip file is the same as shown on the downloads page (optional). Assuming that you put the zip file in your home directory (~/), in the terminal run:
    - **sha1sum ~/2012-10-28-wheezy-raspbian.zip**
    - This will print out a long hex number which should match the "SHA-1" line for the SD image you have downloaded
3. Extract the image, with
    - **unzip ~/2012-10-28-wheezy-raspbian.zip**
4. Run **df -h** to see what devices are currently mounted
5. If your computer has a slot for SD cards, insert the card. If not, insert the card into an SD card reader, then connect the reader to your computer.
6. Run **df -h** again. The device that wasn't there last time is your SD card. The left column gives the device name of your SD card. It will be listed as something like "/dev/mmcblk0p1" or "/dev/sdd1". The last part ("p1" or "1" respectively) is the partition number, but you want to write to the whole SD card, not just one partition, so you need to remove that part from the name (getting for example "/dev/mmcblk0" or "/dev/sdd") as the device for the whole SD card. Note that the SD card can show up more than once in the output of df: in fact it will if you have previously written a Raspberry Pi image to this SD card, because the RPi SD images have more than one partition.
7. Now that you've noted what the device name is, you need to unmount it so that files can't be read or written to the SD card while you are copying over the SD image. So run the command below, replacing "/dev/sdd1" with whatever your SD card's device name is (including the partition number)
    - **umount /dev/sdd1**

    - If your SD card shows up more than once in the output of df due to having multiple partitions on the SD card, you should unmount all of these partitions.
8. In the terminal write the image to the card with this command, making sure you replace the input file **if=** argument with the path to your .img file, and the "/dev/sdd" in the output file **of=** argument with the right device name (**this is very important:** you **will** lose all data on the hard drive on your computer if you get the wrong device name). Make sure the device name is the name of the whole SD card as described above, not just a partition of it (for example, sdd, not sdds1 or sddp1, or mmcblk0 not mmcblk0p1)
    - **dd bs=4M if=~/2012-10-28-wheezy-raspbian.img of=/dev/sdd**
        - Please note that block size set to 4M will work most of the time, if not, please try 1M, although 1M will take considerably longer.
    - Note that if you are not logged in as root you will need to prefix this with **sudo**
    - The dd command does not give any information of its progress and so may appear to have frozen. It could take more than five minutes to finish writing to the card. If your card reader has an LED it may blink during the write process. To forcibly stop the copy operation you can run **pkill -USR1 -n -x dd** in another terminal (prefixed with **sudo** if you are not logged in as root).
9. Instead of dd you can use dcfldd; it will give a progress report about how much has been written.
10. You can check what's written to the SD card by dd-ing from the card back to your harddisk to another image, and then running diff (or md5sum) on those two images. There should be no difference.
11. As root run the command **sync** or if a normal user run **sudo sync** (this will ensure the write cache is flushed and that it is safe to unmount your SD card)
12. Remove SD card from card reader, insert it in the Raspberry Pi, and have fun

# Copying an image to the SD Card in Linux (graphical interface)

If you are using Ubuntu and hesitate to use the terminal, you can use the ImageWriter tool (nice graphical user interface) to write the .img file to the SD card.

1. Download the zip file containing the image from a mirror or torrent
    - http://www.raspberrypi.org/downloads
2. Right click the zip file and select "Extract here"
    - **ATTENTION**: As of this writing (15 June 2012), there is a bug in the ImageWriter program that causes it to fail if the filename of the image file or its path (i.e. all the names of any parent folders that you extract the image file into) contain any space characters. Before going any further, ensure that neither the file name of the image you're using or the path contain any spaces

(or other odd characters, for that matter). A bug has been opened for this issue: https://bugs.launchpad.net/usb-imagewriter/+bug/1013834 Once the issue is fixed, edit this page to advise people to use an updated/patched version of ImageWriter.

3. Insert the SD card into your computer or connect the SD card reader with the SD card inside
4. Install the ImageWriter tool from the Ubuntu Software Center
5. Launch the ImageWriter tool (it needs your administrative password)
6. Select the image file (example 2012-10-28-wheezy-raspbian.img) to be written to the SD card (note: because you started ImageWriter as administrator the starting point when selecting the image file is the administrator's home folder so you need to change to your own home folder to select the image file)
7. Select the target device to write the image to (your device will be something like "/dev/mmcblk0" or "/dev/sdc")
8. Click the "Write to device" button
9. Wait for the process to finish and then insert the SD card in the Raspberry Pi

# Manually resizing the SD card partitions (Optional)

The SD card image is sized for a 2GB card. So, if you are using an SD card with a greater capacity, you may find that only 2GB is available. If this is the case, then to gain more free space, the partitions must be resized. The Fedora Remix and the BerryBoot will automatically resize the partitions on the mounted card during the first boot. The Debian and Rasbian images won't, so you'll have to do it manually. The easiest way is to use the tool RPi raspi-config selecting menu item EXPAND-ROOTFS - Expand Root Partition to Fill SD Card. If you want to resize the SD card whilst the SD card is not mounted in the Pi, look here for instructions.

# Adding a data partition (Optional)

If you would rather not resize the partition on another machine as described above, either because you do not have another working Linux machine or you wish to keep your data on another partition to your operating system, you can instead create a new data partition and have that mount automatically at boot.

- First you need to become root and install parted (I did all of this from the boot command prompt, although if you feel safer in a GUI, you can do all of this in a terminal window):

```
sudo su -
apt-get install parted
```

- Then you need to run parted on your SD card, mine is /dev/mmcblk0, ymmv:

```
parted /dev/mmcblk0
```

- Once running, set the display units to something usable and then print your partition table

```
unit chs
print
```

- You should see something like this:

```
Model: SD SD08G (sd/mmc)
Disk /dev/mmcblk0: 121279,3,31
Sector size (logical/physical): 512B/512B
BIOS cylinder,head,sector geometry: 121280,4,32.  Each cylinder is 65.5kB.
Partition Table: msdos
Number  Start      End         Type     File system     Flags
 1      16,0,0     1215,3,31   primary  fat32           lba
 2      1232,0,0   26671,3,31  primary  ext4
 3      26688,0,0  29743,3,31  primary  linux-swap(v1)
```

- Now you need to create your data partition - you need to choose one more than the end of partition 3 with ,0,0 as your start and use the number from the line that starts with Disk as your end:

```
mkpart primary 29744,0,0 121279,3,31
print
```

- That should show your new partition:

```
Number  Start      End          Type      File system     Flags
 1      16,0,0     1215,3,31    primary   fat32           lba
 2      1232,0,0   26671,3,31   primary   ext4
 3      26688,0,0  29743,3,31   primary   linux-swap(v1)
 4      29744,0,0  121279,3,31  primary
```

- Now quit and format the partition (again, ymmv with the specific device name, try ls /dev for some clues), and then label it:

```
quit
mkfs.ext4 /dev/mmcblk0p4
e2label /dev/mmcblk0p4 data
```

- Now we need to make sure that the partition is mounted automatically when the system boots (maybe don't use vi if you never have before, try nano):

```
vi /etc/fstab
```

- Enter a line exactly like this at the end of the file and save and quit your text editor:

```
/dev/mmcblk0p4  /data           ext4    defaults        1       2
```

- Create the mount point:

```
mkdir /data
```

- Now mount the partition:

```
mount /data
cd /data
ls
```

Your new partition has been created!

# References

| Raspberry Pi | |
|---|---|
| **Startup** | Model Wizard - Buying Guide - **SD Card Setup** - Basic Setup - Advanced Setup - Beginners Guide - Troubleshooting |
| **Hardware** | Hardware - Hardware History - Low-level peripherals - Expansion Boards |
| **Peripherals** | Screens - Cases - Other Peripherals |
| **Software** | Software - Distributions - Kernel - Performance - Programming - VideoCore APIs |
| **Projects** | Tutorials - Guides - Projects - Tasks - DataSheets - Education - Communities |

# RPi Hardware Basic Setup

From eLinux.org

Back to the Hub.

**Getting Started:**

*Buying Guide - for advice on buying the Raspberry Pi.*

*Preload your Card - for info on how to make the SD Card used to boot your Pi.*

***Basic Setup** - for help with buying other hardware and setting it up.*

*Advanced Setup - for more extensive information on setting up.*

*Beginners Guide - you are up and running, now what can you do?*

## Contents



# Typical Hardware You Will Need

While the RPi can be used without any additional hardware (except perhaps a power supply of some kind), it won't be much use as a general computer. As with any normal PC, it is likely you will need some additional hardware.

**IMPORTANT** For USB devices other than a mouse and a simple wired keyboard (for USB devices drawing more than 100mA) a powered USB hub is strongly recommended. A technical discussion as to why can be found here (http://www.raspberrypi.org/phpBB3/viewtopic.php?f=24&t=5830) . Specifically the RPI's built in USB hub is designed only for "Single current unit" USB devices. Note that when using Revision 2 (or later) boards

the problem has been mitigated somewhat with the removal of the USB polyfuses, still due to the limited current the PI can provide to USB devices, due to its main polyfuse, its still recommended to use a hub for all USB peripherals requiring more than 100mA.

The following are more or less essential, and are all available from The Pi Hut's Raspberry Pi Store (http://thepihut.com/) :

- Raspberry Pi board
- Prepared Operating System SD Card
- USB keyboard
- Display (with HDMI, DVI, Composite or SCART input)
- Power Supply
- Cables

Highly suggested extras include:

- USB mouse
- Internet connectivity - a USB WiFi adaptor (Model A/B) or a LAN cable (Model B)
- Powered USB Hub
- Case
- Real Time Clock - If you can't count on Network Time
- SD card reader - if you need to prepare your own SD card

# Prepared Operating System SD Card

As the RPi has no internal storage or built-in operating system it requires an SD-Card that is set up to boot the RPi.

- Have a look at RPi Easy SD Card Setup to create your own preloaded SD Card.
- If you want an extensive technical explanation, look here : *Create your own preloaded card using any RPi VerifiedPeripherals#SD_cards card you have and this HowTo* .
- Preloaded SD cards will be available from the RPi Shop (http://www.raspberrypi.com) , The Pi Hut's Raspberry Pi Store (http://thepihut.com/) or eBay (http://www.ebay.co.uk/itm/330743733755) .
- For configuration of boot options and extensive graphic modes, look at the Configuration page.

NOTE: An RPi SD card can only be used to boot an RPi. A normal PC will refuse to boot from an RPi SD card.

This guide will assume you have a preloaded SD card.

*To check your SD card is compatible with Linux, see RPi VerifiedPeripherals#SD_cards.*

# Keyboard & Mouse

Most standard USB keyboards and mice will work with the RPi. Wireless keyboard/mice should also function, and only require a single USB port for an RF dongle. In order to use a Bluetooth keyboard or mouse you would need to use a Bluetooth dongle, which again uses a single port.

Remember that the Model A has a single USB port and the Model B only has two (typically a keyboard and mouse will use a USB port each) - see USB Hub below.

*To check your mouse and keyboard are compatible with Linux, see RPi Verified Peripherals.*

# Display

There are two main connection options for the RPi display, *HDMI* (high definition) and *Composite* (low definition).

- HD TVs and most LCD Monitors can be connected using a full-size 'male' HDMI cable, and with an inexpensive adaptor if DVI is used. HDMI versions 1.3 and 1.4 are supported, and a version 1.4 cable is recommended. The RPi outputs audio and video via HMDI, but does not support HDMI input.
- Most older TVs can be connected using Composite (a yellow-to-yellow cable). PAL and NTSC TVs are supported. Note that the RCA output is composite video, not RF, so it cannot be connected directly to the antenna input of a TV, you need to connected it the the yellow video input connector, or to the SCART input using a RCA to SCART plug, (adapter).

When using composite video, audio is available from a 3.5mm (1/8 inch) socket, and can be sent to your TV, or to an amplifier. To send audio to your TV, you will need a cable which adapts from 3.5mm to double (red and white) RCA connectors. These red and white can go into the red and white RCA plug inputs of a TV, or a stereo set, or to the above mentioned RCA to SCART plug. Another option for audio (when not using HDMI) is to connect the 3.5mm jackplug to an amplified speakerset. Do not connect the 3.5 mm jack directly to a headset, as the 3.5 mm audio output isn't suitable to drive headsets, only amplifier inputs. Attaching a low impedance load, (such as a headset) to the stereo audio output may lead to distorted sound.

**Note: There is no VGA output available, so older VGA monitors will require an expensive adaptor.**

Using an HDMI to DVI-D (digital) adaptor plus a DVI to VGA adaptor will not work. HDMI does not supply the DVI-A (analogue) needed to convert to VGA - converting an HDMI or DVI-D source to VGA (or component) needs an active converter. (It can work

out cheaper to buy a new monitor.) The lack of VGA has been acknowledged as a priority issue. In a Q/A with Slashdot (http://interviews.slashdot.org/story/11/09/14/1554243/Eben-Upton-Answers-Your-Questions) Eben said that they plan to look into providing some form of add-on.

*For detailed information see Rpi Screens.*

# Power Supply

The unit uses a Micro USB connection to power itself (only the power pins are connected - so it will not transfer data over this connection). A standard modern phone charger with a micro-USB connector will do, but needs to produce at least 700mA at 5 volts. Check your power supply's ratings carefully, and beware cheap knock-offs! (http://www.raspberrypi.org/forum/general-discussion/power-supply-warning) . Suitable mains adaptors will be available from the RPi Shop (http://www.raspberrypi.com) as well as The Pi Hut's Raspberry Pi Store (http://thepihut.com/collections/power-supplies) or eBay (http://www.ebay.co.uk/itm/330757401271) and are recommended if you are unsure what to use.

You can use a range of other power sources (assuming they are able to provide enough current ~700mA):

- Computer USB Port or powered USB hub (will depend on power output)
- Special wall warts with USB ports
- Mobile Phone Backup Battery (will depend on power output) (in theory - needs confirmation)
- Modern TV with built-in USB (for example, it has been shown to work with the Sony KDL-40HX723 and KDL-55NX813)
- Internet Routers with USB Ports (the BT Home Hub 3 seems to run the Pi nicely)

To use the above, you'll need a USB A 'male' to USB micro 'male' cable - these are often shipped as data cables with mobile phones.

*For detailed information about power requirements see RPi Hardware - Power.*

# Cables

You will probably need a number of cables in order to connect your RPi up.

1. Micro-B USB Power Cable (see above) picture (http://en.wikipedia.org/wiki/File:MicroB_USB_Plug.jpg) . This has to be a high quality one. Tested cables available at The Pi Hut's Raspberry Pi Store (http://thepihut.com/collections/cables)

2. HDMI-A picture (http://en.wikipedia.org/wiki/File:HDMI.jpg) or Composite cable picture (http://en.wikipedia.org/wiki/File:Composite-video-cable.jpg) , plus DVI adaptor picture (http://en.wikipedia.org/wiki/File:Adapter_dvi_hdmi_S7302224_wp.jpg) or SCART adaptor picture (http://en.wikipedia.org/wiki/File:Multiconnector-scart-chti.jpg) if required, to connect your RPi to the Display/Monitor/TV of your choice. Tested cables available at The Pi Hut's Raspberry Pi Store (http://thepihut.com/collections/cables)
3. Audio cable picture (http://en.wikipedia.org/wiki/File:Audio-TRS-Mini-Plug.jpg) , this is not needed if you use a HDMI TV/monitor.
4. Ethernet/LAN Cable (see below) picture (http://en.wikipedia.org/wiki/File:Ethernet_RJ45_connector_p1160054.jpg) .

The price you pay for an HDMI cable can very wildly and under most circumstances a low-cost cable from a reputable online or local supplier will be absolutely fine, but the definition of what constitutes 'low cost' can vary wildly - for example, in the UK, a 1m cable can be purchased for anything between £1 and £24.99. If, however, you want to drive a display some distance from the RPi (say greater than the ubiquitous 1.8m/6ft), or you are using a video switch to share a display between several devices, then higher quality cables might be wise - for example, a pair of 1m HDMI cables purchased in a UK 'pound shop' worked fine when directly connected between the RPi and a display, but would not give a stable picture when used via an HDMI switch. Replacing the £1 1m cable with a 1.5m cable bought online for £1.30 fixed the problem. For more insight: Why you don't need to spend more than £2 on an HDMI cable (http://www.techradar.com/news/video/why-you-dont-need-to-spend-more-than-2-on-an-hdmi-cable-1071343)

# Additional Peripherals

You may decide you want to use various other devices with your RPi, such as Flash Drives/Portable Hard Drives, Speakers etc.

*For detailed information see RPi Verified Peripherals.*

## Internet Connectivity

This may be an Ethernet/LAN cable (standard RJ45 connector) or a USB WiFi adaptor. The RPi ethernet port is auto-sensing which means that it may be connected to a router or directly to another computer (without the need for a crossover cable[1]).

*Support for USB WiFi adaptors will vary - see RPi Verified Peripherals.*

Note: If a Netgear router has a blank in the fourth box of the subnet mask, raspbian will interpret that as a 255, not as a '0' like Ubuntu will do. This will give you a subnet mask of 255.255.255.255 and a useless network connection. Changing the router's setting to put a '0' in the last field and reinitializing the network will fix this.

## USB-Hub

In order to connect additional devices to the RPi, you may want to obtain a USB Hub, which will allow multiple devices to be used.

It is nearly a requirement that a **powered** hub is used - this will provide any additional power to the devices without affecting the RPi itself. The USB ports are fused at about 140ma each without an additional external power source. This not enough to power a hard drive, and you may even have trouble powering wireless adapters and other peripherals. There is enough current out there, however, for mice and most keyboards. (see RPi Hardware - Power section).

USB version 2.0 is recommended. USB version 1.1 is fine for keyboards and mice, but may not be fast enough for other accessories.

## Heatsink

Not a vital accessory for your RPi, but will help to reduce the CPU's temperature whilst under load. Available from Etsy (http://www.etsy.com/shop/nhslzt) The Pi Hut's Raspberry Pi Store (http://thepihut.com/collections/heatsinks) or eBay (http://www.ebay.co.uk/itm/330758220781)

## Case

Since the RPi is supplied without a case, it will be important to ensure that you do not use it in places where it will come into contact with conductive metal or liquids, unless suitably protected. Some form of case should be considered, and there is a Rpi case thread (http://www.raspberrypi.org/forum/general-discussion/cases-for-the-raspberry-pi) on the forum. Cases are also available from The Pi Hut's Raspberry Pi Store (http://thepihut.com/collections/cases)

*For detailed information see Rpi Cases.*

## Real Time Clock

There are a number of possible solutions for real time clocks, but so far, most are either expensive or not particularly friendly.

One promising device is the Cymbet Evaluation board (CBC-EVAL-06) available from digikey for approximately $30. Cymbet is in the business of making small batteries and this eval board is intended just as a demonstration of their product using COTS parts on a small board that plugs directly into the USB. Their product is actually the batter that backs up the RTC memory and oscillator when not receiving power from the USB. However, this demo board is very well suited to this application. Ideally, a maker-oriented company will pick up this reference design and start producing boards based on it at a lower cost in larger volume.

To use this board, you will need some software. libmpsse from Google Code (http://code.google.com/p/libmpsse/) is a GPL library that can talk to the board in user-space.

User friendly software is a work in progress visible on GITHub http://github.com/owendelong/Cymbet-RTC

## SD card reader

If you will not use a preloaded SD card to boot from, you will need an SD card reader to prepare an SD card.

Note that the SD card reader will be connected to a traditional PC, not to the RPi. You may use an SD card reader integrated into your PC, or you may use a dedicated USB-connected SD card reader. Note that several peripherals may also be used as an SD card reader, for example cameras, smartphones, camcorders and GPS units.

## Expansion & Low Level Peripherals

If you plan on making use of the low level interfaces available on the RPi, then ensure you have suitable header pins for the GPIO (and if required JTAG) suitable for your needs.

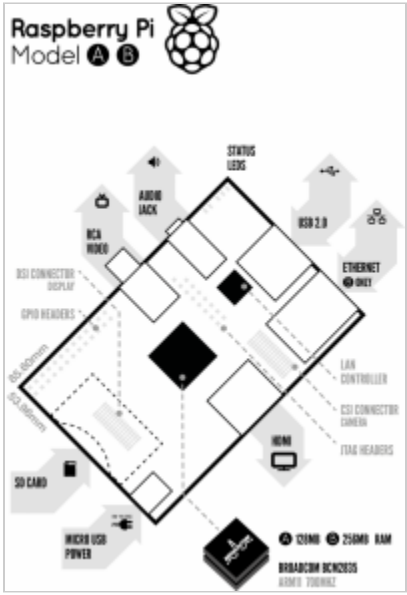
Also if you have a particular low-level project in mind, then ensure you design in suitable protection circuits to keep your RPi safe (details will be made available within the RPi Projects, Guides & Tutorials section).

*For detailed information see Rpi Low-level Peripherals*.

# Connecting Together

You can use the diagram to connect everything together, or use the following instructions:

1. Plug the preloaded SD Card into the Pi.
2. Plug the USB keyboard and mouse into the Pi, perhaps via a USB Hub. Connect the Hub to power, if necessary.
3. Plug the video cable into the screen (TV) and into the Pi.
4. Plug your extras into the Pi (USB WiFi, Ethernet cable, hard drive etc.). This is where you may really need a USB Hub.
5. Ensure that your USB Hub (if any) and screen are working.
6. Plug the power source into the main socket.
7. With your screen on, plug the other end of the power source into the Pi.
8. The Pi should boot up and display messages on the screen.




A diagram denoting the places of the different components on the Rpi, made by Paul Beech. Click to enlarge.

It is always recommended to connect the MicroUSB Power to the unit last (while most connections can be made live, it is best practice to connect items such as displays and other connections with the power turned off).

If you use both a R-PI power supply and a powered hub, its recommended you connect them to the same switched power bar, and use the switch on the power bar to switch off both the R-PI and hub at the exact same time.

Also, always shutdown using the software shutdown function, not by pulling the plug. When not using a GUI, (with a GUI use the GUI command) you can use the command "shutdown -h now", and power off when all the LED's on the board (except the power LED) go off. This is especially important the first time you boot, as in the process the R-PI modifies the content of the SD-card, without a clean shutdown the contents of the card may be damaged.

The RPi may take a long time to boot when powered-on for the first time, so be patient, and cleanly shutdown afterwards, as described above!

# External Links

For a verbose guide aimed at absolute beginners, see Peripherals You'll Need (http://h2g2.com/A13413584) and Getting Started (http://h2g2.com/A9143796) in h2g2's 'Introducing the Raspberry Pi'.

# References


1. ↑ Wikipedia:Auto-MDIX (http://en.wikipedia.org/wiki/Medium_dependent_interface#Auto-MDIX)


| Raspberry Pi | |
|---|---|
| **Startup** | Model Wizard - Buying Guide - SD Card Setup - **Basic Setup** - Advanced Setup - Beginners Guide - Troubleshooting |
| **Hardware** | Hardware - Hardware History - Low-level peripherals - Expansion Boards |
| **Peripherals** | Screens - Cases - Other Peripherals |
| **Software** | Software - Distributions - Kernel - Performance - Programming - VideoCore APIs |
| **Projects** | Tutorials - Guides - Projects - Tasks - DataSheets - Education - Communities |

# RPi Advanced Setup

From eLinux.org

Back to the Hub.

**Getting Started:**

*Buying Guide - for advice on buying the Raspberry Pi.*

*Preload your Card - for info on how to make the SD Card used to boot your Pi.*

*Basic Setup - for help with buying other hardware and setting it up.*

***Advanced Setup** - for more extensive information on setting up.*

*Beginners Guide - you are up and running, now what can you do?*

## Contents



# Notes

**WARNING: This page is not suitable for the average user. Information in this page is for experienced hackers only.**

This page is a community work in progress in preparation for the first users. If something doesn't work or isn't covered in these guides, please feel free to ask on the Forum (http://www.raspberrypi.org/?page_id=43) . But *before* you ask there, make sure you read the **FAQs (http://www.raspberrypi.org/?page_id=8)** .

This page is based on BeagleBoardBeginners so the serial port info is appliable only under explained circumstances. Also, many Raspberry Pi users will buy pre-programmed SD cards and can skip to reading RPi Hardware Basic Setup. We expect that once Raspberry Pi boards become generally available helpful volunteers will update this page to match Raspberry Pi completely or point to better information elsewhere.

**This page in a major work in progress!**

# Finding hardware and setting up

*Main article: see RPi Hardware Basic Setup*

You'll need to copy an image to a suitable SD card (or make your own image). You'll also need a USB keyboard, TV/Monitor (with HDMI/DVI/Composite/SCART input), and power supply (USB charger or a USB port from a powered USB Hub or another computer). All of which can be found over at the Pi Huts' Raspberry Pi Store (http://thepihut.com/)

You'll likely also want a USB mouse, a case, and a USB Hub (a necessity for Model A). A powered USB Hub will reduce the demand on the RPi. To connect to the Internet, you'll need either an Ethernet/LAN cable (Model B) or a USB WiFi adaptor (either model). See RPi VerifiedPeripherals for more information on supported peripherals.

When setting up, it is advisable to connect the power after everything else is ready. *See RPi_Hardware_Basic_Setup#Connecting_Together.*

# Serial connection

*For help setting up a serial connection with the Raspberry Pi, see RPi_Serial_Connection.*

# Advanced SD card setup

Now we want to use an SD card to install some GNU/Linux distro in it and get more space for our stuff. You can use either an SD or SDHC card. In the latter case of course take care that your PC card reader also supports SDHC. Be aware that you are not dealing with an x86 processor, but instead a completely different architecture called ARM, so don't forget to install the ARM port for the distro you are planning to use.

Our first step will be the formatting of the SD card.

# Formatting the SD card via the mkcard.txt script

**(to be completed)**

1. Download **mkcard.txt** from ???.
2. `$ chmod +x mkcard.txt`
3. `$ ./mkcard.txt /dev/sd`*x*, Where *x* is the letter of the card. You can find this by inserting your card and then running `dmesg | tail`. You should see the messages about the device being mounted in the log. Mine mounts as **sdc**.

Once run, your card should be formatted.

# Formatting the SD card via fdisk "Expert mode"

First, lets clear the partition table:

```
================================================================================
$ sudo fdisk /dev/sdb

Command (m for help): o
Building a new DOS disklabel. Changes will remain in memory only,
until you decide to write them. After that, of course, the previous
content won't be recoverable.

Warning: invalid flag 0x0000 of partition table 4 will be corrected by w(rite)
================================================================================
```

Print card info:

```
================================================================================
Command (m for help): p

Disk /dev/sdb: 128 MB, 128450560 bytes
....
================================================================================
```

Note card size in bytes. Needed later below.

Then go into "Expert mode":

```
================================================================================
Command (m for help): x
================================================================================
```

Now we want to set the geometry to 255 heads, 63 sectors and calculate the number of cylinders required for the particular SD/MMC card:

```
================================================================================
Expert command (m for help): h
Number of heads (1-256, default 4): 255

Expert command (m for help): s
Number of sectors (1-63, default 62): 63
Warning: setting sector offset for DOS compatiblity
================================================================================
```

NOTE: Be especially careful in the next step. First calculate the number of cylinders as follows:

- B = Card size in bytes (you got it before, in the second step when you printed the info out)
- C = Number of cylinders

```
C=B/255/63/512
```

When you get the number, you round it DOWN. Thus, if you got 108.8 you'll be using 108 cylinders.

```
================================================================================
Expert command (m for help): c
Number of cylinders (1-1048576, default 1011): 15
================================================================================
```

In this case 128MB card is used (reported as 128450560 bytes by fdisk above), thus 128450560 / 255 / 63 / 512 = 15.6 rounded down to 15 cylinders. Numbers there are 255 heads, 63 sectors, 512 bytes per sector.

So far so good, now we want to create two partitions. One for the boot image, one for our distro.

Create the FAT32 partition for booting and transferring files from Windows. Mark it as bootable.

```
================================================================================
Expert command (m for help): r
Command (m for help): n
Command action
  e   extended
  p   primary partition (1-4)
p
Partition number (1-4): 1
First cylinder (1-245, default 1): (press Enter)
Using default value 1
Last cylinder or +size or +sizeM or +sizeK (1-245, default 245): +50

Command (m for help): t
Selected partition 1
Hex code (type L to list codes): c
```

```
Changed system type of partition 1 to c (W95 FAT32 (LBA))

Command (m for help): a
Partition number (1-4): 1
```

Create the Linux partition for the root file system.

```
Command (m for help): n
Command action
  e   extended
  p   primary partition (1-4)
p
Partition number (1-4): 2
First cylinder (52-245, default 52): (press Enter)
Using default value 52
Last cylinder or +size or +sizeM or +sizeK (52-245, default 245):(press Enter)
Using default value 245
```

Print and save the new partition records.

```
Command (m for help): p

Disk /dev/sdc: 2021 MB, 2021654528 bytes
255 heads, 63 sectors/track, 245 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes

  Device Boot      Start         End      Blocks   Id  System
/dev/sdc1   *           1          51      409626    c  W95 FAT32 (LBA)
/dev/sdc2              52         245     1558305   83  Linux

Command (m for help): w
The partition table has been altered!

Calling ioctl() to re-read partition table.

WARNING: Re-reading the partition table failed with error 16: Device or resource busy.
The kernel still uses the old table. The new table will be used at the next reboot.

WARNING: If you have created or modified any DOS 6.x partitions, please see the fdisk
manual page for additional information.
Syncing disks.
```

Now we've got both partitions, next step is formatting them.

*NOTE*: If the partitions (/dev/sdc1 and /dev/sdc2) does not exist, you should unplug the card and plug it back in. Linux will now be able to detect the new partitions.

```
$ sudo mkfs.msdos -F 32 /dev/sdc1 -n LABEL
mkfs.msdos 2.11 (12 Mar 2005)
```

```
$ sudo mkfs.ext3 /dev/sdc2
mke2fs 1.40-WIP (14-Nov-2006)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
195072 inodes, 389576 blocks
19478 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=402653184
12 block groups
32768 blocks per group, 32768 fragments per group
16256 inodes per group
Superblock backups stored on blocks:
       32768, 98304, 163840, 229376, 294912

Writing inode tables: done
Creating journal (8192 blocks): done
Writing superblocks and filesystem accounting information:
================================================================================
```

All done!

*NOTE*: For convenience, you can add the `-L` option to the `mkfs.ext3` command to assign a volume label to the new ext3 filesystem. If you do that, the new (automatic) mount point under `/media` when you insert that SD card into some Linux hosts will be based on that label. If there's no label, the new mount point will most likely be a long hex string, so assigning a label makes manual mounting on the host more convenient.

# Setting up the boot partition

The boot partition must contain the following files, get them from one of the official images:(bootable/fat32 partition)

- bootcode.bin : 2nd stage bootloader, starts with SDRAM disabled
- ~~loader.bin : 3rd stage bootloader, starts with SDRAM enabled~~
- start.elf: The GPU binary firmware image, provided by the foundation.
- kernel.img: The OS kernel to load on the ARM processor. Normally this is Linux - see instructions for compiling a kernel.
- cmdline.txt: Parameters passed to the kernel on boot.

Optional files:

- config.txt: A configuration file read by the GPU. Use this to override set the video mode, alter system clock speeds, voltages, etc.
- vlls directory: Additional GPU code, e.g. extra codecs. Not present in the initial release.

## Additional files supplied by the foundation

These files are also present on the SD card images supplied by the foundation.

Additional kernels. Rename over kernel.img to use them (ensure you have a backup of the original kernel.img first!):

- kernel_emergency.img : kernel with busybox rootfs. You can use this to repair the main linux partition using e2fsck if the linux partition gets corrupted.

Before the introduction of the 512MB Raspberry PI additional GPU firmware images (start.elf files) were delivered, to be copied over start.elf to use them:

the file called start.elf actually determines how much of the available 256MB of memory is assigned to the GPU, but previously each start.elf file gave a fixed split size. The other splits were simply very similar files with a different filename, which were copied over the one called start.elf that was actually to be used, the others had names like arm192_start.elf and such.

- arm128_start.elf : 128M ARM, 128M GPU split (use this for heavy 3D work, possibly also required for some video decoding)
- arm192_start.elf : 192M ARM, 64M GPU split (this is the default)
- arm224_start.elf : 224M ARM, 32M GPU split (use this for Linux only with no 3D or video processing. Its enough for the 1080p framebuffer, but not much else)
- arm240_start.elf : 240M ARM, 16M GPU split (use this for headless mode only. It is enough to boot the system, but you can not use video at all.)

Note that actually there is no "default" split, the nature of the software determines what is the most suitable split. So a "distro" that is very heavy multimedia oriented will normally use the 128/128MB split as the GPU needs a lot of RAM, but a generic desktop distro will probably use the 64/192 MB split, and a game that doesn't use the GPU will probably use the 32/224MB split.

However for a situation where there are two memory sizes (256 and 512) this isn't a very smart system. For example the maximum GPU memory spit of 256MB /2 = 128 MB would in the past give the CPU 128 MB, and the GPU also 128 MB, but when you use that memory split on a 512 MB PI it would stil give 128 MB to the CPU, and the rest, a whopping 384 MB to the GPU, which couldn't do anything with it.

So the RPF changed the firmware so that a single start.elf you now can give the GPU exactly the amount you want, in chunks of 16MB, with 16MB as minimum, and 128MB as maximum.

The new syntax is to use:

**gpu_mem=(number of megabytes for the GPU)**

So for example putting

gpu_mem=64

will give the GPU 64 MB and whatever the rest is (either 192 or 448 MB) to the ARM CPU.

# Finally booting GNU/Linux

## important steps

to be completed

## Setting up for remote access / headless operation

If you're anything like me (lazy, with a limited number of monitors), you'll want to get your Pi set up for remote access as soon as possible. Luckily, this is easy. *These instructions assume you're using the official Debian distro for the Pi. Steps 0 & 1 based on info from Steve Smith (http://steve.dynedge.co.uk/2012/05/29/enabling-ssh-on-debian-raspberry-pi/)* .

- **Step 0**. Before you set up SSH, you might want to change the default password on the Pi, especially if it'll end up internet-facing. Do this on the Pi's console with the following command:

  ```
  passwd
  ```

- **Step 1: Enable SSH** with the following command:

  ```
  sudo mv /boot/boot_enable_ssh.rc /boot/boot.rc
  ```

  This will enable sshd on the next boot. Restart the Pi. On reboot, you should see a line like the following:

  ```
  Starting OpenBSD Secure Shell server: sshd
  ```

  near the end of the boot sequence. This indicates that sshd is enabled, and you should be able to ssh into the Pi. You'll need the Pi's IP adress to do that; get that at the Pi's console with:

```
ip addr
```

You may also find it useful to copy an SSH key to the Pi so you don't need to enter a password each time you connect. To do that, first check if you've already got a public ssh keyfile:

```
ls ~/.ssh/id_rsa.pub
```

If you haven't, you can generate one with:

```
ssh-keygen -t rsa -C "your_email@youremail.com"
```

Finally, copy the keyfile to **~/.ssh/authorized_keys** on the Pi (there's a few different ways to do this, I used Transmit[1] (http://panic.com/transmit/) to copy it over SFTP, since I'm a Mac user. Windows users have WinSCP[2] (http://winscp.net/eng/index.php) , and Linux users probably already know how to do it ;) ). This file contains **all** of the keys authorised to connect to the Pi, so will probably be blank or non-existent on a new Pi. If so, just copy **id_rsa.pub** to this location. If it already exists, add the key from **id_rsa.pub** to the end of the file.

- **Step 2: IP address config.** If your Pi is going to be always-on, or your network is set up in a such a way that devices always get the same IP, you can skip the step. However, if your Pi's IP is likely to change frequently (say, for instance, you're just powering it up every so often to play, and your network assigns IPs first-come first-served {like most home routers} ), it's a good idea to set up a consistent network address for your Pi. There's two ways to do this: the quick (but brittle) way and the more flexible way.
  - **The quick way: assign a static IP address to your Pi.** This is simple, but runs the risk of clashing IP addresses with other devices on your network since your Pi's address will no longer be managed by DHCP. I haven't tried this myself, but here's some instructions from Andrew Munsell (http://blog.andrewmunsell.com/post/24830266512/setting-up-the-raspberry-pi-as-a-headless-device) . He's using **192.168.1.222** for his Pi, since that's outside the range assigned by his router. Change this address to whatever suits.

    ```
    You can do this in Debian Squeeze on the Raspberry by modifying the /etc/network/interfaces file.

    I removed the original iface eth0 line and replaced it with the following:

    iface eth0 inet static
    address 192.168.1.222
    netmask 255.255.255.0
    gateway 192.168.1.1
    ```

    On reboot, your Pi should now be using the static address specified in **/etc/network/interfaces**.

- **The flexible way: set up avahi / zeroconf.** Zeroconf is 'a set of techniques that automatically creates a usable Internet Protocol (IP) network without manual operator intervention or special configuration servers.'[3] (http://en.wikipedia.org/wiki/Zero_configuration_networking) . Avahi is an implementation of zeroconf which 'ships with most Linux and *BSD distributions'[4] (http://en.wikipedia.org/wiki/Avahi_(software)) , but **not** the Pi's Debian distro. Zeroconf will be familiar to Apple users as **Bonjour**, and is pretty clever tech which means that things Just Work when sharing stuff across computers on a network. In this context, it means that once we've set it up on the Pi, we'll be able to address it as:

```
raspberrypi.local
```

  regardless of what IP address it's been assigned on your local network. This is handy if its IP is likely to change regularly, and even means we'll continue to be able to address it if we're on a different network (say, shuffling between home & work networks).
  *Information in this section largely gathered from 4dc5 (http://4dc5.com/2012/06/12/setting-up-vnc-on-raspberry-pi-for-mac-access/)* .

1. **Install avahi** with the following commands on the Pi:

   ```
   sudo apt-get install avahi-daemon
   ```

   and then on older Debian installs:

   ```
   sudo update-rc.d avahi-daemon defaults
   ```

   or on newer Raspbian installs:

   ```
   sudo insserv avahi-daemon
   ```

   (if in doubt, you're probably on the newer one).
2. **Create a configfile for Avahi** at **/etc/avahi/services/multiple.service**. I did this with the following command:

   ```
   sudo pico /etc/avahi/services/multiple.service
   ```

   The contents of this file should be something like the following, courtesy of **aXon** on the Rasperry Pi forums (http://www.raspberrypi.org/phpBB3/viewtopic.php?f=29&t=7795&p=94439&hilit=avahi#p94439) :

   ```
   <?xml version="1.0" standalone='no'?>
   <!DOCTYPE service-group SYSTEM "avahi-service.dtd">
   <service-group>
           <name replace-wildcards="yes">%h</name>
   ```

```
        <service>
                <type>_device-info._tcp</type>
                <port>0</port>
                <txt-record>model=RackMac</txt-record>
        </service>
        <service>
                <type>_ssh._tcp</type>
                <port>22</port>
        </service>
</service-group>
```

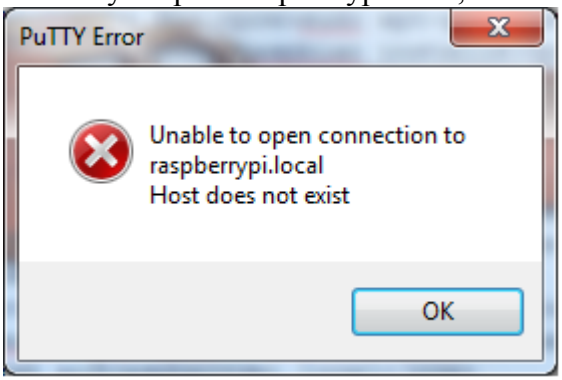
3. **Apply the new configuration** with:

```
sudo /etc/init.d/avahi-daemon restart
```

The Pi should now be addressable from other machines as **raspberrypi.local**, for example:

```
ssh pi@raspberrypi.local
```

4. **Get Wind/blows to play nice with avahi**
If you've done the first steps correctly and you open up Putty and you try to address your pi as raspberrypi.local, it will tell you:




This happens for a very good reason: your Windows PC can't interpret the udp-datagrams avahi sends and most firewalls don't even allow them to get read. So you'll have to do a couple of things extra to get it working.

---

1. **Get Bonjour for Windows**
http://support.apple.com/kb/DL999 Just install it, quick next next next next procedure will suffice. Now your computer is able to interpret the UDP datagrams which are multicasted by the pi. But we're not out of the woods just yet, if you try to ping to your raspberry pi:

```
C:\Windows\System32>ping raspberrypi.local
Ping-request cannot find host raspberrypi.local.
Check the name and try again.
```

2. **Tell your firewall: trust me, I'm an engineer.**
   Stereotypically, the firewall forbids us to have some fun. First of all, the 5353 udp-port is blocked on most firewalls, so you have to add an exception for it. Also, you'll have to grant internet access to the mDNSresponder.exe, this way, whenever your computer tries to connect with a host *.local, mDNS sends a multicast over the local subnet to ask whether anyone calls himself *.local. If mDNS isn't granted network access, nothing gets multicasted and nobody answers the phone.
   *Note:* If you have the McAfee firewall, you'll also have to enable UDP-control. If it isn't enabled, all UDP-datagrams are ignored.
3. **Enjoy the pleasure of typing raspberrypi.local in Putty**
   After these steps, you should be able to ping to raspberrypi.local and even address it that way in putty. YMMV, if you're still having troubles at this point, try to ping to raspberrypi.local with the firewall turned off. If it works: hey presto, you've got your culprit and you can start an educated google search.

--Live long and geeky 17:14, 17 November 2012 (UTC)

# Software development/proving

A supported platform for the Raspberry is Qt, which is already being worked on. C/C++ is supported through a gcc cross-compiling toolchain. On Debian/Ubuntu systems, the packages gcc-4.6-arm-linux-gnueabi and g++-4.6-arm-linux-gnueabi provide suitable compilers. For other build platforms, Chris has good instructions for building a cross-compiler (http://www.bootc.net/archives/2012/05/26/how-to-build-a-cross-compiler-for-your-raspberry-pi/#comment-22483) - this should also work in a Cygwin environment on Windows. MinGW may also be supported.

Python is being pushed forward by the foundation. (Status ??)

After compiling, using QEMU and a Linux VM would be one way of testing your apps (this also works on Windows). Search the forum for the ready-made ARM images.

The choice of programming languages, IDEs and other tools on the R-Pi is only determined by:

1) The operating system compatibility (at the moment the specific Linux distro used)

2) The status of the respective ARM package repositories and their binary compatibility

3) The possibilty to build other software + its dependencies for the R-Pi from sources (depends on C cross-compiler ???)

What kind of software development and testing loop has been proven effective please (from someone who's been there and done it)?

For me (and others, hopefully) that would be very useful.

# Further reading

The main Raspberry Pi resources are:

- Raspberry Pi Foundation-maintained Raspberry Pi home (http://raspberrypi.org/)
- Raspberry Pi Foundation-maintained Raspberry Pi Forum (http://raspberrypi.org/phpBB3)
- Community-maintained eLinux wiki (see wiki article overview for a list of existing articles)

An alternative startup guide for beginners can be found on h2g2: Introducing the Raspberry Pi (http://h2g2.com/A13735596)

For more guides and projects involving the Raspberry Pi, see RPi Projects.

# Thanks to

- Nabax, _vlad, jkridner, ds2 and the other BeagleBoard wiki contributors on elinux.org for an excellent BeagleBoardBeginners resource, which we used as the template for this page.

# References

| | |
|---|---|
| **Startup** | Model Wizard - Buying Guide - SD Card Setup - Basic Setup - **Advanced Setup** - Beginners Guide - Troubleshooting |
| **Hardware** | Hardware - Hardware History - Low-level peripherals - Expansion Boards |
| **Peripherals** | Screens - Cases - Other Peripherals |
| **Software** | Software - Distributions - Kernel - Performance - Programming - VideoCore APIs |
| **Projects** | Tutorials - Guides - Projects - Tasks - DataSheets - Education - Communities |

# RPi Beginners

From eLinux.org

Back to the Hub.

**Getting Started:**

*Buying Guide - for advice on buying the Raspberry Pi.*

*Preload your Card - for info on how to make the SD Card used to boot your Pi.*

*Basic Setup - for help with buying other hardware and setting it up.*

*Advanced Setup - for more extensive information on setting up.*

***Beginners Guide** - you are up and running, now what can you do?*

## Contents



There is some restructuring going on , we are sorry for the inconvenience.

# Where to start?

Any easy question to ask, but a very difficult one to answer!

1. **If you are looking for any information related to SD Cards and setup look here**
2. If you need to get a RPi, the see the Buying Guide.
3. If you need to know what equipment you will need and how to set it up, see the Basic Hardware Setup page.
4. If you need to install/setup an SD card see the Preload your Card section.
5. If something is not working, check the Troubleshooting section.
6. If you need help with Debian, try the Debian Wiki (http://wiki.debian.org/FrontPage) .
7. If you have imaged a SD with the Debian Wheezy image and started your RPi here's some help with what you see first - the raspi-config menu RPi_raspi-config
8. Help for Noob's with a quizical disposition and Wheezy or Raspbian instalations here
9. If you don't have a composite monitor or HDMI then it may be worth you looking at Blind Login Method
10. Build yourself a Wheezy LAMP webserver.
11. VNC connection for the monitorily challenged Noob VNC for a wheezy install (noobs that are using the Blind Login)
12. If you've done all that, and you are wondering what next...**welcome and read on!**

```
References needed (idea for new section Living Without RPi, which can guide users or link to info to users wh
    Link to emulation builds or live linux cds setup for beginners (RacyPy2 for example)
```

If you don't have a Raspberry Pi yet, you can still try things out, see Windows RPi Emulator (http://sourceforge.net/projects/rpiqemuwindows/) for details.

# What is Linux and why not use Windows?

Linux is an operating system just like Windows, however, unlike Windows (which needs a set hardware requirement to run i.e. One Size fits or get different hardware), Linux comes in many varieties and configurations which means you can usually find a flavour (or Distribution) which fits your hardware big or small / fast or slow.

The Raspberry Pi is not suited to running Windows due to its hardware, but there are plenty of Linux Distributions which fit nicely. In addition to this, most Distributions of Linux are free, however Windows can cost many times the price of the Raspberry Pi itself.

Chances are you already have Linux running in your home without you even knowing it, since it is commonly used in modern TVs, Freeview and cable boxes to run things and ensure your recording of **Inbetweeners** or **Prison Break** gets done!

For more information about Linux see Wikipedia (http://en.wikipedia.org/wiki/Linux)

Also see FAQ And Running XXX on the RPi

# Basic Debian RPi Setup

When you first turn on your Raspberry Pi with it's fresh Debian image on the SD card, you will likely want to tweak the system settings.

## Default login and password

See the *Username:Password* column of distributions table to access your Pi.

## Locale settings

By configuring the locale settings, you can change the language and country settings (e.g. to get correct sorting behaviour) for much of the software available for the RPi. The default RPi locale is English/Great Britain ("en_GB").

You can alter this with

```
sudo dpkg-reconfigure locales
```

You will get a very long list of possible locales. You can enable/disable a locale by pressing the spacebar (not Enter), and scroll through the list using the arrow keys or PgUp/PgDn.

Selecting "All locales" will generate all possible locales, taking a very long time and using a great deal of space. Select only those you wish to use.

*It is highly recommended to stick to the UTF-8 locales*, and to leave the en_GB.UTF-8 locale enabled, in addition to any other locales you enable.

If you're unsure of which locale to pick, look up a two-letter language code and a two-letter country code on Wikipedia, and see if you can find a matching locale.

When you're done picking locale(s), press Enter. You will be prompted to select a default locale as well.

# Keyboard layout

If different letters appear on-screen from that which you typed, you need to reconfigure you keyboard settings. In Debian, from a command line type:

```
sudo dpkg-reconfigure keyboard-configuration
```

Follow the prompts.

**Or:** From the command line type:

```
sudo nano /etc/default/keyboard
```

Then find where it says

```
XKBLAYOUT="gb"
```

and change the gb to the two-letter code for your country. [1] (http://www.raspberrypi.org/phpBB3/viewtopic.php?p=78325#p78325)

Also, see the Troubleshooting Guide for more information about remapping the keyboard.

You may need to restart for the changes to take effect.

If you get a very long delay during the keyboard mapping at startup, type the following once on the command line after you have logged in:

```
sudo setupcon
```

If the selected keyboard layout is not applied in the console (that is, when not running under X), try:

```
sudo apt-get install console-data
```

# Timezone

Unless you live in Great Britain, you'll have to change the default timezone:

```
  sudo dpkg-reconfigure tzdata
```

Select geographic area - Europe, America or whatever. Etc gives UNIX compatible time zones including CUT, GMT, UTC

Select city

Follow the prompts to finish the config. The change should be immediate.

# Create a new user with sudo-privileges

You may want to create a new user account for yourself.

Type in following command in the terminal to create a new user (for example the user john):

```
sudo adduser john
```

Follow the steps.

To allow the newly created user to use the "sudo" command, type:

```
sudo visudo
```

Add following line under the "root ALL=(ALL) ALL" Line:

```
john ALL=(ALL) ALL
```

Now press CTRL+O, X to save and exit the editor.

Alternatively instead of adding the user to the sudoers list, you can add your user to the sudo group with the following command:

```
adduser john sudo
```

## Debian Wheezy, using raspi-config

Debian Wheezy has a menu that will do some of the above and more. See raspi-config

# Intro to the CLI (Command Line Interface)

You will need to use the Command Line Interface at some point in your management of the RPi. The command line interface is a powerful way to interact with the Raspberry Pi and is well worth learning some basic commands to get started with.

For an introductory guide to some basic commands please see: Command Line Interface "Must Have" Commands (http://elinux.org/CLI_Spells) . Featured on the Raspberry Pi home page (http://www.raspberrypi.org/archives/1414) was also a link to this site for "learning the shell" (http://linuxcommand.org/learning_the_shell.php)

Your SD card may boot into a GUI, if not and you are done with the text interface and want to use a graphical one instead, run:

```
  startx
```

# Remote Access

Your default install probably has a ssh (secure shell) "daemon" running. This means that you can run everything on your Rpi with only the network attached. Provided you know which ip address it has. With appropriate software installed on your Winodws, Mac or Linux PC, you can also run a gui remotely.

Prior to your initial remote access it is recommended that you regenerate unique host public/private ID keys with the following command

```
rm /etc/ssh/ssh_host_* && dpkg-reconfigure openssh-server
```

More details about remote access (including remote GUI are at RPi Remote Access

# Adding more software to your Raspberry Pi

You will probably want to add software to your Raspberry Pi. Here you can find out how to do it. Adding Software (http://elinux.org/Add_software)

# Adding USB Storage to Your Raspberry Pi

Sooner or later, you're going to run out of room on the SD card used to boot up your Raspberry Pi. For a tutorial on how to connect USB flash drives and hard drives to your Pi to expand storage, see: Adding USB Drives to a Raspberry Pi (http://elinux.org/RPi_Adding_USB_Drives)

# Beginner Projects

Here are a few things you can try out with your Raspberry Pi, in most cases all you'll need is your SD Card loaded with a particular preconfigured OS Distribution.

It will be worth getting a few spare SD Cards if you think you will switch between setups regularly or become familiar with how to **back up and restore** your card.

```
Reference needed - a good guide on how to backup and restore cards or software to do this easily
```

## Backup your SD card

For Windows users the 'Raw HDD Copy Tool' from HDD Guru works well to backup and restore your SD card between proejcts. This can backup and restore the entire card sector by sector to/from an img file, and doesn't care which file system is on the card.

http://hddguru.com/software/HDD-Raw-Copy-Tool/

Linux users can use the dd tool that comes with most versions of Linux (including Raspbian) to save the contents of an SD card as an image file. Warning: be sure to use this tool carefully as accidentally choosing your hard drive as the output may destroy all data on it.

# Media Player

With this configuration you will typically have the Raspberry Pi connected to a TV or large monitor and a source of videos/music/photos etc you wish to play (i.e. Internet/ hard-drive/local network etc).

DesignSpark have written an article on this, which is worth a look, DesignSpark - Raspberry Pi goes to the movies (http://www.designspark.com/content/raspberry-pi-goes-movies)

You can download an installer from www.raspbmc.com which will install to your desktop (IOS, Windows, Linux) and write the latest install to your SD card. You then boot your Pi with the card and go through the config steps.

There is a breif video basic tutorial here: http://www.instructables.com/id/RaspberryPi-Media-center-XMBC/

*Reference needed - More information is needed on specific configuration choices for raspbmc, although raspbmc.com does have a wiki.*

# Play Games

While there are not any commercial games for the Raspberry Pi (yet) there are plenty ways to play games on it.

Many distributions will have games built into them, and some may well support emulation of other platforms so you can run those games.

Also, a lot of Raspberry Pi users will be writing simple games which will be available for others to enjoy (and if desired added to or modified).

```
Reference needed - game section is empty at the moment!
```

*See the Games Section for more details*

# Introducing Young Children To Computers

```
Reference needed - some kid friendly and fun stuff!
```

# Teaching

There is a huge number of groups, links and resources available within the Education section.

```
Reference needed - links to the learning pages, education links and school/university groups
```

# Learn To Program

There is a huge selection of programming languages which you can use to write interesting programs, games, applications and utilities. There are also more great links within the Education section.

There is a huge selection to choose from (not just Python...) which should suit any ability and a range of purposes.

If you are new to programming, there are plenty of tutorials for getting started in the Tutorials Section.

Books about programming can be found in the Books Section.

In the latest Debian, Python (+Pygame) and MIT Scratch are pre-installed.

```
Reference needed - links to the learning pages, recommended books?
```

# Interface With Hardware

1. Interfacing with Arduino

```
Reference needed - links to basic circuits tutorials and expansion boards
```

# Word Processing/Internet Browsing etc

Yes, the Raspberry Pi can do the majority of the dull stuff too which other computers do.

**Debian** currently comes with Midori installed for web browsing and word processing programs be installed rather easily.

- Entering "sudo apt-get install chromium-browser" into a terminal will install Chromium which is generally a faster and more featured browser than Midori
- Entering "sudo apt-get install openoffice.org" into a terminal will install OpenOffice.org, a free Microsoft Office-like application suite
- Entering "sudo apt-get install abiword-common" into a terminal will install AbiWord, a lighter weight but still fully functional word processor
- Entering "sudo apt-get install gnumeric" into a terminal will install Gnumeric, a lighter weight but still fully functional spreadsheet

```
More information needed
```

## Your Own Pet Project!

The sky is the limit really, with some time and effort any number of projects can be achieved.

Even if you don't have the skill to do it yourself, you can join like minded people by getting involved with one of the numerous groups in the Community Section, also within the Education pages or learn what you need in from the Guides & Tutorials sections.

Of course, if you do anything interesting then please let us know in the Projects section.

# Living Without RPi

Even if you do not have any Raspberry Pi hardware there are a number things you can do to learn about linux, programming or even controlling hardware.

## Using Linux

You can install a version of Linux on most computers, and many you will be able to "try out" Linux by using a "Live CD" - this will start your computer up running from a CD or DVD and run Linux (without installing anything to the computer itself).

RacyPy - This is a simple LiveCD of Puppy Linux which includes some basic programming languages and a light-weight graphical user interface (GUI).

You can get it from here:

teampython RacyPy (http://teampython.wordpress.com/2012/03/03/while-you-wait-for-your-raspberry-pi-why-not-use-racypy2/)

## Trying Programming

Many of the programming languages you can use on the Raspberry Pi can be installed on a Windows or Mac machine. Just visit the websites of the languages you are interested in and see if they have an installer for your operating system.

## Controlling Hardware

As discussed in the Easy GPIO Hardware & Software tutorials, there are lots of alternative hardware you can use to experiment with (some as little as $5).

# About This Page - For Contributors

The intention of this page is to provide a **starting point** for beginners and to **direct them to** the kind of information a person would need in order to start doing something useful or interesting with a Raspberry Pi.

It is not intended to contain or replicate much of the information already available on-line or elsewhere in the wiki, however please create new wiki pages and link them here if there is information beginners will find useful (similarly any section which grows too much here, should be separated into new pages as and when needed)!

```
At the moment building up ideas of content of typical things beginners will want to know and the kind of thir
```

---

# References

| Raspberry Pi | |
|---|---|
| **Startup** | Model Wizard - Buying Guide - SD Card Setup - Basic Setup - Advanced Setup - **Beginners Guide** - Troubleshooting |
| **Hardware** | Hardware - Hardware History - Low-level peripherals - Expansion Boards |
| **Peripherals** | Screens - Cases - Other Peripherals |
| **Software** | Software - Distributions - Kernel - Performance - Programming - VideoCore APIs |

# R-Pi Troubleshooting

From eLinux.org

Back to the Hub.

This page lists the most common problems and suggests some solutions.

See RPi_Bugs for problems that are bugs.

## Contents

# Power / Start-up

A good power supply that will supply 5V is vital. There is more information about See #Troubleshooting_power_problems.

Note that the PI has no BIOS, so nothing will be displayed on screen unless the PI successfully boots!

### Red power LED does not light, nothing on display

The power is not properly connected.

## Red power LED is blinking

The red power LED should never blink, because it is hard-wired to the 3.3V power supply rail. If it is blinking, as one user has reported[1] it means the 5V power supply is dropping out. Use a different power supply.

## Red power LED is on, green LED does not flash, nothing on display

*note; For technical reasons the green LED might light up very faintly, this is normal, but it doesn't mean it "burns". When flashing/blinking the green LED should light up as bright as the power LED.*

- The Raspberry Pi cannot find a valid image on the SD card. Check card is inserted correctly. Check that you have correctly written a Raspberry Pi image to the card. Did you have admin rights when you used the SD-card writer software? Without it the software might go through the motions without actually doing anything! To check if the writing process did actually happen Insert the SD card into a Windows machine and you should see bootcode.bin, fixup.dat and start.elf amongst others. See also, Known SD Cards. It is also possible that the image you are writing to the card is corrupt, as downloads do occasionally end up corrupted or truncated. You can check with the checksum utility if your download is correct.
- Try with no cables connected except the USB power lead, and SD card inserted. You should see flashing of the OK light for ~20 seconds. If that helps, plug in cables one at a time to identify which is interfering with boot.
- Confirm the USB cable is properly seated in the power slot. The red power LED does not necessarily mean it is fully connected.
- The voltage is too low (below 5 V), try a different power supply and/or cable. The R-Pi needs a supply rated for 700 mA or more. Some supplies labeled as such cannot actually provide their rated current while maintaining 5V. See also, #Troubleshooting_power_problems.
- There may be a bug in the distributed version of bootcode.bin which causes problems with some sdcards. Try this version: https://github.com/raspberrypi/firmware/blob/234c19de7cbaaf4997671d61df20a05759066295/boot/bootcode.bin. Please let us know if it "fixes" your non-working SD card (or, more importantly, if it doesn't). This can also manifest itself as intermittent booting, or only booting when cold.
- *(unlikely)* hardware abuse, for example by connecting a 7 V supply to a 3v3 GPIO output pin[2] or powering up the board after a solder splash shorts some traces[3].
- Look at the SD card holder on the Raspberry Pi carefully. At first glance it may look fine but the contacts must be springy and they must protrude at least 2mm as measured from the lower edge of the holder to the top of the contact bulge. This happens due to the solder process and the type of holder used. Some of the solder residue falls into the contact cavity restricting the springiness and the height that the

contact protrudes. You can fix this yourself but remember you can void your warranty. The contacts are delicate so be carefull. Insert a needle pin under the contact bulge and pull lightly up until the one end of the contact unclips. Clean the cavity where the contact unclipped from of any solder or other residue by blowing into the cavity. Clip the contact back into the cavity by lightly pushing it into the cavity. Do this for all the contacts. Look at these photos. Media:SDcardHolder.JPG, Media:UnclipContact.JPG, Media:UnclippedContact.JPG

- If for whatever reason the main polyfuse F3 has been overheated previously it may happen that it hasn't completely recovered, in which case, if you turn the PI on, a considerable amount of energy from the power supply is lost in the fuse and doesn't reach the PI. Try if the polyfuse seems hot. For this problem too read #Troubleshooting_power_problems.

## Green LED blinks in a specific pattern

With recent firmware, according to this forum post (http://www.raspberrypi.org/phpBB3/viewtopic.php?f=28&t=8725#p103338) the green light will blink in a specific pattern to indicate some types of errors:

- 3 flashes: `loader.bin` not found
- 4 flashes: `loader.bin` not launched
- 5 flashes: `start.elf` not found
- 6 flashes: `start.elf` not launched
- 7 flashes: `kernel.img` not found

Firmware since 20th October 2012 no longer requires loader.bin, and the flashes mean:

- 3 flashes: `start.elf` not found
- 4 flashes: `start.elf` not launched
- 7 flashes: `kernel.img` not found

If start.elf won't launch it may be corrupt.

## Coloured splash screen

With recent firmware, a coloured splash screen is displayed after firmware (start.elf) is loaded. This should be replaced by linux console a second later. However if the coloured screen remains, it suggests the kernel.img file is failing to boot. Try replacing it with a known good one.

Immediately after displaying the splash screen, the PI starts consuming a little more current, if the PI resets at that moment its an indication that your PSU isn't able to deliver the full current your PI requires, but dips its output voltage below a minimum when loaded with the full current the PI needs.

## Kernel Panic on boot

Text appears on screen, but then hangs with debug messages. This can be caused by USB devices such as keyboards. Try again with nothing in the USB.

## Raspberry Pi shuts down (or restarts) soon after booting up

This is caused by a power supply producing too low a voltage. See #Troubleshooting_power_problems.

## Pi boots sometimes but not always

With a known good power supply and known good SD card, the R-Pi boots occasionally, but other times shows only a tiny green flicker from the "OK" LED and it fails to start, even with no USB devices and no Ethernet. This has been reported several times[4] [5] [6] and remains an open issue. Low voltage or an improper SD card can cause it. Some SD cards will work until they warm up slightly, and then fail[7]. When exposed to 21 C room temperature the warmest part of an uncased working R-Pi should be 41 C[8]. The wiki

has a list of working SD cards. Buy from a reliable vendor as it has been claimed (http://www.petapixel.com/2011/05/20/one-third-of-the-sandisk-memory-cards-on-earth-are-counterfeit/) that 1/3 of all "Sandisk" labelled memory cards are counterfeit.

- It could be that the SD memory card is not making proper contact with the Raspberry Pi. Look at the SD card holder on the Raspberry Pi carefully. At first glance it may look fine but the contacts must be springy and they must protrude at least 2mm as measured fron the lower edge of the holder to the top of the contact bulge. This happens due to the solder process and the type of holder used. Some of the solder residue falls into the contact cavity restricting the springiness and the height that the contact protrudes. You can fix this yourself but remember you can void your warranty. The contacts are delicate so be carefull. Insert a needle pin under the contact bulge and pull lightly up until the one end of the contact unclips. Clean the cavity where the contact unclipped from of any solder or other residue by blowing into the cavity. Clip the contact back into the cavity by lightly pushing it into the cavity. Do this for all the contacts. Look at these photos. Media:SDcardHolder.JPG, Media:UnclipContact.JPG, Media:UnclippedContact.JPG

# Keyboard / Mouse / Input Devices

## R-Pi does not respond to key presses / Keyboard randomly repeats key presses

*note:during entering the password most linux distro's wont show that you typed in anything (not even "*" characters) this is normal behaviour, try the keyboard while entering the user name!*

This is most often caused by inadequate power. Use a good power supply and a good power cable. Some cheap cables that work with a cell phone, cannot fully power the R-Pi. Some USB devices require a lot of power: most will have a label showing the voltage and mA requirements. They should be 5v 100mA each max, any more than this they must be used with a powered USB hub. Try unplugging every USB device except the keyboard (you should also note that some keyboards have built in hubs and can try to draw 150mA (Pi can only handle 100mA per USB slot without a hub)). Also, use the latest software. Forum user MrEngman reported (http://www.raspberrypi.org/forum/absolute-beginners/using-a-powered-usb-port-to-power-a-rpi#p76485) some keyboard repeats and wireless hangs until upgrading (http://www.raspberrypi.org/downloads) to the debian6-19-04-2012 kernel, which he reports stable with no problems even with a low TP1-TP2 voltage of 4.65 - 4.68 volts.

Some users have reported that their keyboards work fine on Arch linux, but on Debian distro's, their keyboards become erratic (repeats and/or skips key presses). One suggested remedy to this, which has some positive feedback, is to adjust the USB bus speed. To do this, you need to edit the cmdline.txt file, and add "dwc_otg.speed=1" (without quotes) to the end of the file (found in the /boot directory).

Worst case scenario, some (advanced) keyboards, such as the Roccat Arvo, have kernel modules that need activating. If you have access to another keyboard temporarily, you will need to modprobe the relevent driver. Or if this is not possible, you can rebuild the kernel (instructions available on the wiki page) with the modules installed. (to find the drivers for keyboards etc, you need to find "Device Drivers -> hid Devices".)

## Keyboard / Mouse interferes with USB WiFi device

Connecting a keyboard and/or mouse while a USB WiFi device is connected, may cause one or both devices to malfunction. On April 30 2012, there was a bugfix[9] relating to USB sharing between high-speed (eg. WiFi) and full/low-speed devices (eg. keyboard/mouse). User spennig[10][11] reports this patch did not fix the Mouse/WiFi conflict. On 2012-05-12, user spennig was pleased to confirm that wifi was working with a USB keyboard and mouse, as long as the Raspberry Pi had a good PSU and a powered hub. Even so, some experimentation was needed, e.g. USB WiFi connected to the device, and the keyboard and mouse connected to the powered hub. Some experimentation may be necessary to find a working combination; however a good power supply is essential.

## Wireless Keyboard trouble

Some wireless keyboards, for example the Microsoft Wireless Keyboard 800 are reported to fail[12] even though the current drawn by the wireless adaptor is within the R-Pi USB spec limit of 100 mA. This may be a software driver problem.

## Re-mapping the keyboard with Debian Squeeze

If different letters appear on-screen from that which you typed, you need to reconfigure you keyboard settings. In Debian, from a command line type:

```
sudo dpkg-reconfigure keyboard-configuration
```

Follow the prompts. Then restart your RasPi.
**Or:**
From the command line type:

```
sudo nano /etc/default/keyboard
```

Then find where it says

XKBLAYOUT=”gb”

and change the gb to the two letter code for your country. [1] (http://www.raspberrypi.org/phpBB3/viewtopic.php?p=78325#p78325)

### Slow keyboard mapping

If you have remapped your keyboard and get a very long delay during the keyboard mapping at startup, type the following once on the command line after you have logged in:

```
sudo setupcon
```

### No USB device works, with known good PS, SD card, KB

There has been more than one report[13][14][15] of a R-Pi booting but not getting USB input, using a known-good power supply, SD card, and keyboard. The more common cause for no USB devices working is low power supply voltage from bad PSU, cable, or USB hub, but in this case the problem was no clock signal present at the LAN9512 USB/ Ethernet chip "IC3", and the solution was to reflow the solder on the 25 MHz crystal "X1" on the bottom side of the board. Or return the board for a replacement, but before making this conclusion, confirm known good peripherals. A significant number of USB keyboards are not compatible with R-Pi. As of June 1 2012, Eben reported[16] that only about 1 in 1000 shipped R-Pi boards have been found to have a hardware fault of any kind.

## Updating firmware

### Check your firmware version

Using the latest firmware version may help various problems with SD card and display compatibility. Check the kernel version with:

```
uname -a
  Linux RPi 3.1.19 #1 PREEMPT Fri Jun 1 14:16:38 CEST 2012 armv6l GNU/Linux
```

And the GPU firmware with:

```
/opt/vc/bin/vcgencmd version
  May 31 2012 13:35:03
```

```
Copyright (c) 2012 Broadcom
version 317494 (release)
```

## Get the latest firmware version

The GPU firmware and kernel can be updated with Hexxeh's rpi-update tool (https://github.com/Hexxeh/rpi-update) .

However this requires the Pi to be successfully booted. With sdcard problems, you may not get that far, so can try a manual udpate. If you have a Linux machine, rpi-update can be run on that in an offline mode, and will update your sdcard from the Linux machine.

Otherwise, on a Windows computer, you will see the "/boot" partition appear as the contents of SD card. You can download the latest GPU firmware version here (https://github.com/raspberrypi/firmware/blob/master/boot/start.elf) . Click on **view raw**, then save it, and put the new start.elf file on the sdcard replacing the existing one. Similarly, the latest kernel is here (https://github.com/raspberrypi/firmware/tree/master/boot/kernel.img) . After updating these files you should be able to boot. You still need to run rpi-update to update the kernel modules (in /lib/modules) and the GPU libraries (in /opt/vc).

## Choosing the right ARM/GPU memory split

There is a choice of how the 256M/512M of RAM is divided between the ARM and GPU:

```
gpu_mem=16 :  16M GPU,  240M/496M ARM split : Maximum ARM memory. Good for ARM desktop use. No accelerated
gpu_mem=64 :  64M GPU,  192M/448M ARM split : Reasonable ARM memory. Simple video (omxplayer) or 3D (quake
gpu_mem=128 : 128M GPU, 128M/384M ARM split : Use this for heavy 3D work, or 3D plus video. Needed for XBM
```

To switch, edit the gpu_mem= setting in your config.txt and reboot.

Note: other amounts are also possible, but setting gpu_mem=32 is usually the wrong choice. gpu_mem=16 is almost always a better choice.

Also note that before the release of the 51MB PI a different method was used based on splitting the 256MB RAM in a part for the CPU and GPU. As this noting system was causing trouble if the amount of RAM was not always the same. the above new method was adapted.

Make sure your editor doesn't change the first letter of the line into an uppercase letter, as some editors do. The entry is case sensitive.

# SD cards

- If you have problems, check you have latest firmware version (described above)
- Some SD cards do not work on the R-Pi, so check the list of known SD cards.
- If you are having problems setting up your SD card you might want to start by erasing it completely - especially if it has been used elsewhere and still contains data / partitions.
  - Windows and Mac users can download a formatting tool from the SD Association: https://www.sdcard.org/downloads/formatter_3/
- Reformatting cards is also easy to do in a digital camera.
- After writing the image to the SD card, verify that you can see the boot partition when you insert the SD card into your computer. The partition should contain a number of files, including *start.elf* and *kernel.img*. If you do not see these files on the SD card, you have made an error writing the image file.
- If you are manually preparing your SD card on Linux or Mac OS using the *dd* command, this operation will completely erase any existing data and partitions. Make sure you write to the whole card (e.g. `/dev/sdd`) and not to an existing partition (e.g. `/dev/sdd1`).
- If you have an sdcard that doesn't work with latest firmware, head over here (http://www.raspberrypi.org/phpBB3/viewtopic.php?f=63&t=6093) .
- If you put the SD card into your PC in an attempt to write the R-Pi operating system onto it, and the PC tells you the card is write-protected, even with the write-protect tab in the correct, forward position, then you may have a faulty SD-card rewriter. There's a common fault with many SD-card rewriters - The write-protect tab is detected by a very thin, narrow metal strip, that is part of a switch. When the card is inserted, the write-protect tab is supposed to push the strip and make/break the contact, as needed. Unfortunately, these strips have a habit of getting stuck, because they are mounted in a thin plastic channel, and only need to be deformed slightly sideways to get jammed.

Luckily, if you have this problem, most built-in card readers are easy to pull apart and repair; some users have even reported succesfully unjamming the switch with a blast of compressed air from a can into the SD-card slot without having to dismantle anything. You may also be able to temporarily get round the problem by putting the write-protect tab in a half-way position - this pushes on a different part of the strip and may break the contact - it's worth trying a few, slightly different positions. You could also use a USB-SD card adaptor, which are cheap to buy.

# Networking

## Ethernet connection is lost when a USB device is plugged in

This is often caused by inadequate power. Use a good power supply and a good power cable. Some cheap cables that work with a cell phone, cannot fully power the R-Pi. Some USB devices require a lot of power (>100 mA), so they must be used with a powered USB hub. Some cheap USB hubs suck power from the Raspberry Pi even if a USB power supply is connected. (More often than not, however, the reverse is true with cheap hubs—the Pi draws just enough power backwards from the powered hub to unsuccessfully attempt booting.)

There is an ongoing issue with the Ethernet connection being lost when low-speed devices, such as mice or keyboards are connected via a powered USB hub. The simplest way to solve this is to connect your mouse and keyboard directly into the 2 USB ports on the R-Pi (assuming they draw less than 100 mA apiece).

## Ethernet connects at 10M instead of 100M

The LED in the corner of the board labelled "10M" is mislabeled. When that LED is on, the R-Pi is actually connected at 100 Mbps. You can confirm the true transfer rate using a network benchmark such as iperf. You can also read the current network speed with

```
cat /sys/class/net/eth0/speed
```

## Cannot ssh in to Pi

In the Debian image, ssh is disabled by default. Boot commands are taken from /boot/boot.rc if that file present. There is an example file named **boot_enable_ssh.rc** that enables ssh. So:

```
sudo mv /boot/boot_enable_ssh.rc /boot/boot.rc
```

and reboot should enable ssh. (password as below)

## Network/USB chip gets too hot to touch

This is normal. In open air at 24 C, the LAN9512 Ethernet/USB chip reaches about 52 C after some time. This is too hot to touch for more than a few seconds, but it is not unusually hot for the chip.

The LAN9512 data sheet (http://www.smsc.com/media/Downloads_Public/Data_Sheets/9512.pdf) in Table 4.1 on p.40 says it comes in two versions, rated for operation at an ambient temperature in still air (Ta) of 70 C (commercial) or 85 C (industrial). It uses 763 mW at 3.3V with maximum traffic on 100baseT and both USB ports (Table 4.3.4, p. 42).

There is a study of RasPi heat profiles by "Remy" at ¿Se calienta el ordenador Raspberry Pi? Estudio de sus temperaturas en funcionamiento (http://www.geektopia.es/es/technology/2012/06/22/articulos/se-calienta-el-ordenador-raspberry-pi-estudio-de-sus-temperaturas-en-funcionamiento.html) (*Is the Raspberry Pi computer getting hot? A study of its operational temperature.*) The Spanish article has numerous color temperature images of RasPi in various operational modes, with the highest LAN9512 case temperature measured as 64.5 C.

## Networking no longer works when changing SD card between two Raspberry Pis

In some distributions, /etc/udev/rules.d/70-persistent-net.rules remembers which MAC address is associated with eth0, so each new device will be assigned as a different interface (eth1, eth2, etc.) due to the different MAC addresses. Editing /etc/udev/rules.d/70-persistent-net.rules to remove the invalid rules and rebooting may help fix the problem.

## Crashes occur with high network load

The USB driver allocates memory from the kernel, and when traffic is very high (e.g. when using torrents/newsgroup downloads) this memory can be exhausted causing crashes/hangs. You should have a line like:

```
vm.min_free_kbytes = 8192
```

in /etc/sysctl.conf. Try increasing that number to 16384 (or higher). If that doesn't work, try adding to /boot/cmdline.txt

```
smsc95xx.turbo_mode=N
```

which will reduce network throughput, but has improved stability issues for some.

## Network connection fails when a Graphical User Interface is being used

The network connection may fail when the command startx is used to enter a Graphical User Interface. This is caused by a bug in the USB driver related to certain types of USB mouse.

As of 1 September 2012, this fault is fixed in the latest firmware. To load the latest firmware, see http://elinux.org/R-Pi_Troubleshooting#Updating_firmware

# Passwords

## I do not know the password to login

Please check the page http://www.raspberrypi.org/downloads for the correct username and password for each image.

Here are the most common username/password combinations:

- Debian after Feb 2012: pi/raspberry
- Debian 17 Feb 2012: pi/suse
- Arch: root/root
- Bodhi: pi/bodhilinux

## Some programs refuse to accept my password

While using Debian, some programs may ask for your password but refuse to accept a valid password.

This is a fault in old Debian images previous to September 2012. If you are using an image with this fault, upgrade to a more modern image or enter the following command on the command line.

```
gconftool-2  --type bool  --set  /apps/gksu/sudo-mode  true
```

Please enter this command carefully, the spaces are important. The command should be accepted without any response or errors.

## I don't know the root password

There is no root password set by default on Debian. You are expected to do everything through sudo. You can set one with "sudo passwd root" - just make sure you know what you are doing with a root account.

# Sound

## Sound does not work with an HDMI monitor

This is caused by some computer monitors which select DVI mode even if an HDMI cable is connected. This fix may be necessary even if other HDMI devices work perfectly on the same monitor (or TV)!

Edit the configuration file - see the instructions at R-Pi_ConfigurationFile.

Add the following line to the configuration file:

```
hdmi_drive=2
```

This will force it to select HDMI mode.

### More reasons why sound does not work with an HDMI monitor

With an HDMI connection it might be possible to hear:

```
./hello_audio.bin 1
```

but not:

```
aplay /usr/share/sounds/alsa/Front_Center.wav
```

Firstly, it seems that some HD TVs mute audible sound output when there is no digital input, and slowly fade the sound up and down at the start and end of digital input. This means that short duration sounds will not be heard. A work around is to play longer duration wav files.

Secondly, it seems that some HD TVs mute audible sound output when there is only one channel of digital input. So, as the file Front_Center.wav is mono, it might not be heard. ALSA aplay uses the file information header to configure its digital output. And the aplay -c 2 option does not over-ride the settings aplay picks up from the file information header. So, if your HD TV doesn't accept just one channel of digital input, you cannot use aplay to hear a mono wav file. However, with the command speaker-test, the -c2 option does work, and sets 2 channels in the digital stream. So speaker-test can be used to hear the file Front_Center.wav in either the left or right speaker using the -s option 1 or 2. For example

```
Speaker-test -c 2 -s 1 -t wav -W /usr/share/sounds/alsa -w Front_Center.wav
```

should be heard on the left speaker. But note that the command speaker-test seems only to like mono wav files, and seems not to play stereo wav files.

The command aplay plays 2 channel stereo wav files in stereo sound without problem (provided they last longer than the time it takes the TV to unmute and remute). A helpful example I found is the stereo file LRMonoPhase4.wav at the Kozco web site [2] (http://www.kozco.com/tech/soundtests.html)

## Sound does not work at all, or in some applications

In Debian Squeeze, sound is disabled by default because the ALSA sound driver is still "alpha" (not fully tested) on the R-Pi. To try out sound, from the command prompt *before* "startx", type

```
sudo apt-get install alsa-utils
sudo modprobe snd_bcm2835
```

On Debian Wheezy, snd_bm2835 is enabled, by default, do that step is not necessary. Next try:

```
sudo aplay /usr/share/sounds/alsa/Front_Center.wav
```

By default output will be automatic (hdmi if hdmi supports audio, otherwise analogue). You can force it with:

```
sudo amixer cset numid=3 <n>
```

where n is 0=auto, 1=headphones, 2=hdmi.

With recent firmware, you can build hello_audio with:

```
cd /opt/vc/src/hello_pi/
./rebuild.sh
cd hello_audio
```

With older firmware

```
cd /opt/vc/src/hello_pi/hello_audio
make
```

to test analogue output:

```
./hello_audio.bin
```

and:

```
./hello_audio.bin 1
```

to test HDMI.

Also note that you may have to add your user to the 'audio' group to get permission to access the sound card.

# Display

## Startx fails to start

If you just get errors instead of a desktop when typing

```
startx
```

you may be out of storage space on the SD card. By default there are only a few hundred MB free in the 2 GB main partition, which can quickly fill up if you download files. Make sure there is some space free (gparted can expand a partition, if the SD card is > 2GB). Also, installing some software may incorrectly create or modify a .Xauthority file in your home directory, causing startx to fail, according to this thread (http://www.raspberrypi.org/forum/troubleshooting/startx-fails-worked-yesterday) . Temporarily renaming, moving, or deleting that file may fix the problem.

## Screen is the wrong color

Check and see if the DVI cable is screwed in properly. If that doesn't work then try this section.

## Video does not play or plays very slowly

The only hardware-accelerated video player is in the XBMC distribution (http://www.raspberrypi.org/forum/general-discussion/openelec-meets-raspberry-pi-part-1-xbmc) and its command line variant omxplayer. H264 is the only hardware-accelerated codec, for playback. No hardware encoding is supported. Additional codecs were not purchased as licensing fees would have increased the R-Pi's price.

## Can only get 800x480 resolution in LXDE (Arch linux)

Known issue with distro package as of 17th April 2012 - there's some missing boot config information. Creating a suitable cmdline.txt fixes it - type the following at the Raspberry Pi command line:

```
sudo echo "dwc_otg.lpm_enable=0 console=ttyAMA0,115200 kgdboc=ttyAMA0,115200 root=/dev/mmcblk0p2 rootfstype
```

## Big black borders around small image on HD monitors

Out of the box, R-Pi graphics don't necessarily fill the whole screen. This is due to something called "Underscan", and it can be fixed easily.

Note: the best solution is to disable overscan in display menu options (it may be called "just scan", "screen fit", "HD size", "full pixel", "unscaled", "dot by dot", "native" or "1:1"), then use the disable_overscan=1 option.

Edit the configuration file, see the instructions at R-Pi_ConfigurationFile.

Add the following lines to the configuration file...

If your display has no overscan:

```
disable_overscan=1
```

or if your display has some overscan:

```
overscan_left=-20
overscan_right=-20
overscan_top=-20
overscan_bottom=-20
```

Making the R-Pi graphics fill the screen is a matter of experimenting with the numbers you put in the config.txt file. Change the numbers – try jumps of 5 or 10 at a time. Bigger negative numbers reduce the black borders (so -40 means less black border than -20). The numbers do not all have to be the same; you can use this feature to centre the display on the screen.

## Writing spills off the screen on HD monitors

Out of the box, R-Pi graphics may be larger than the 1080p (ie Full HD) screen. This is due to something called "Overscan", and it can be fixed easily by creating a simple text file on the R-Pi SD card by using Notepad on your PC.

Follow the instructions in the section "Big black borders around small image on HD monitors", but use positive numbers for the overscan settings, for example

```
overscan_left=20

overscan_right=20

overscan_top=20

overscan_bottom=20
```

## Interference visible on a HDMI or DVI monitor

This may be caused by loss of signal on long video cables. The signal level may be increased by changing a configuration parameter.


Edit the configuration file, see the instructions at R-Pi_ConfigurationFile.

Add the following line to the configuration file

```
config_hdmi_boost=4
```

You may experiment with different values of config_hdmi_boost. Value 1 is used for very short cables, value 7 is used for very long cables. At your own risk, you can go up to 11, but risk frying a sensitive monitor.

Note that various adapters, such as HDMI-to-DVI, can also cause power loss and therefore require high values of config_hdmi_boost even with short cables.

This option can also help when there is no display output at all, the display periodically blanks, or colours are wrong/inverted.

This symptom can also be caused by RasPi +5V (measured from TP1 to TP2) falling too low. See Troubleshooting Power Problems.

## No HDMI output at all

First make sure the display is powered on and switched to the right input before booting Pi.

If you have the Wheezy (http://www.raspberrypi.org/archives/1435) image (recommended) then try

```
hdmi_safe=1
```

Otherwise, try adding the following line to the configuration file (similar to interference case above)

```
config_hdmi_boost=4
```

Your monitor/cable may not be asserting the hotplug signal. You can override this with:

```
hdmi_force_hotplug=1
```

Also try (http://www.raspberrypi.org/phpBB3/viewtopic.php?f=28&t=7513) the following video options:

```
hdmi_group=2
hdmi_mode=4
```

which resolved an issue with DVI monitor reporting "input signal out of range"

As a last resort, try deleting (rename to keep backup) config.txt from the SD card.

Also check that the RasPi +5V voltage (measured from TP1 to TP2) is in the correct range. One user found that his DVI-D monitor blanked out when +5V was too low. See Troubleshooting Power Problems.

Here's a rare cause: A standard HDMI cable has five individual ground wires plus a shield. Some cheap HDMI cables do not implement the individual grounds and just have a common foil shield that's connected to the HDMI plug shells at both ends. This works OK in most HDMI applications since most HDMI sources (like RasPi) and most monitors connect the shells to circuit ground. However, some HDMI or DVI monitors may requires individual ground lines. You can tell if an HDMI cable implements the individual grounds by checking for continuity using an Ohmmeter or multimeter. You can find the HDMI pinout for full-size connectors at Wikipedia (http://en.wikipedia.org/wiki/HDMI) .

### Composite displays no image

The output display will default to HDMI if a HDMI display is connected, and composite if not. Make sure there isn't a HDMI cable connected when you want to use composite output.

Also, check that your TV is set to the correct input, normally marked "AV". If your TV has multiple AV inputs, try all of the inputs, normally by pressing a button marked "AV" or "Input" or "Source" or "->O" on the remote control.

### Composite displays only black and white image

The composite display defaults to NTSC (American) output. Most TVs will show an image with that, but older PAL (European) televisions may display only back and white or no image. To fix this:

Edit the configuration file, see the instructions at R-Pi_ConfigurationFile.

Add the following line to the configuration file

```
sdtv_mode=2
```

(You can try other values: 0 is NTSC, 1 is Japanese NTSC, 2 is PAL, 3 is Brazilian PAL)

### HDMI -> VGA adapters

Some good information can be found here:

- RPi_VerifiedPeripherals#HDMI-.3EVGA_converter_boxes
- (RPi forum) Serious HDMI Problems. What's that smell? Burning Raspberry! (http://www.raspberrypi.org/phpBB3/viewtopic.php?f=28&t=9819)

A commonly used adapter from Ebay: gallery with detailed images & steps of a modification to use external power source: HERE (http://imgur.com/a/sLogs/all) --*by Pinoccio*

# GPIO

Remember that the GPIO pins are 3.3V logic level only, and are **NOT** 5V tolerant.

If you momentarily shorted the two end GPIO pins together (+3.3V and +5V), or a supply pin to ground, and the Pi appears to be dead, don't panic. The input polyfuse may have tripped. It is self-resetting after it cools down and the polymer re-crystallizes, which can take several hours. Set the Pi aside and try again later.

The GPIO pins connect directly into the core of the ARM processer, and are static-sensitive, so you should avoid touching the pins wherever possible. If you are carrying a static charge, for example by taking off an acrylic pullover, or walking across a nylon carpet, touching the GPIO pins could destroy your R-Pi, so always earth yourself before touching the pins or anything connected to them.

# General

## The time is incorrect

If the clock is off by a series of hours, in the command line type:

```
sudo dpkg-reconfigure tzdata
```

The R-Pi has no real-time clock, so unless it can access a timeserver over the network at boot, or time is manually entered by the user, the time/date will restart counting from the last logged time in the previous session.

## A part broke off

The silver cylinder near the microUSB power input is a 220 uF capacitor ("C6" on schematic). It sticks up and due to the small surface-mount pads, it is easy to break off; several people have done so. This is a power supply filter capacitor which reduces any noise and spikes on the input +5V power. If you like, you can solder it back on, or just leave it off. If you do solder it back on, take care to observe the correct polarity with the black stripe towards the board edge. This part, C6 is a "just in case" component which is good design practice to include, but as it turns out (http://www.raspberrypi.org/phpBB3/viewtopic.php?f=2&t=4926%7C) most power supplies still work OK without this part installed. This part is also discussed here (http://elinux.org/RPi_Hardware#Capacitor_C6) .

## Unable to install new software

When trying to install a software package (using the command sudo apt-get install xxxx) you may see the error

```
Package yyyy is not available
```

This means that your software list is out of date. Before attempting to install software, you should always make sure that you are using the latest software list by using the command

```
sudo apt-get update
```

# Troubleshooting power problems

If you think you have a problem with your power supply, it is a good idea to check the actual voltage on the Raspberry Pi circuit board. Two test points labelled TP1 and TP2 are provided on the circuit board to facilitate voltage measurements.

Use a multimeter which is set to the range 20 volts DC (or 20v =). You should see a voltage between 4.75 and 5.25 volts. Anything outside this range indicates that you have a problem with your power supply or your power cable.

If you have not used a multimeter before, see these [basic instructions (http://www.sparkfun.com/tutorials/202) ]

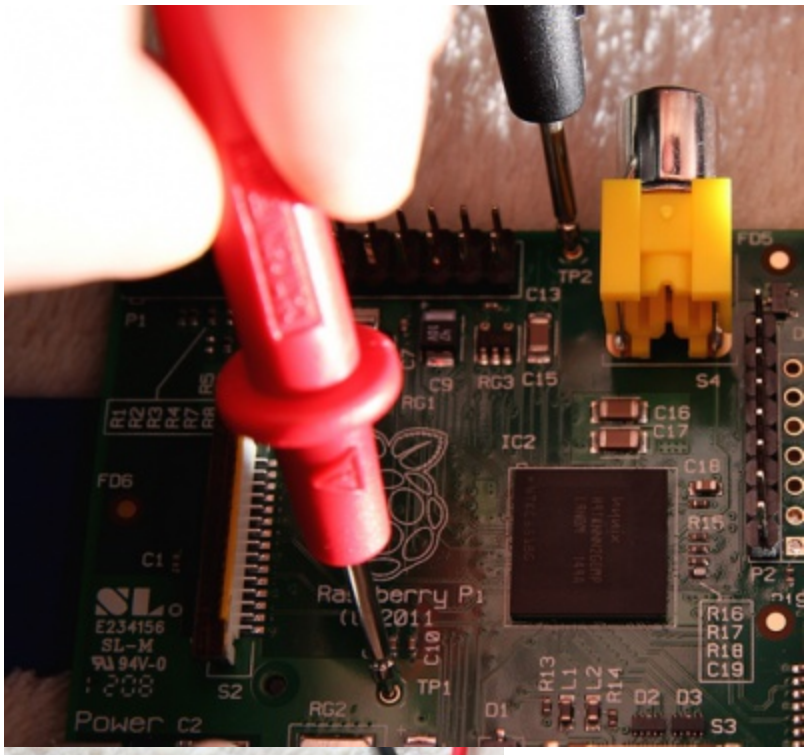
Note: Even if the multimeter shows the correct voltage, you may have some power supply problems. A multimeter only displays the average voltage. If there are very short-lived dips or spikes in the voltage, these will not be shown by the multimeter. It is best to measure voltage when Pi is busy.

If your voltage is low, it could be:

- The power supply produces too low a voltage
- The power supply cannot supply enough current, which results in a voltage drop. Make sure Power supply is labelled as at least 700mA. (Some cheap power supplies don't deliver what is labelled).
- The Micro USB power cable is low quality. Some Micro USB cables have very thin conductors, resulting in enough voltage drop for RasPi to fail even if the power supply itself is fine. For details, see On_the_RPi_usb_power_cable.
- Attached USB devices want too much power. The Pi is only designed for up to 100mA USB devices. A USB device wanting more that that will cause a voltage drop.
- The F3 Polyfuse could be blown or bad, see below for how to test.

Note: keyboards with LCD displays, built in USB hubs, backlights, etc are likely to be problematic. Try to use a basic one. Wifi dongles are also unlikely to work when directly connected. Connect high powered USB devices to a powered USB hub.

Try booting without HDMI, ethernet or USB deviced plugged in, and see if the voltage improves. See also: Power Supply Problems

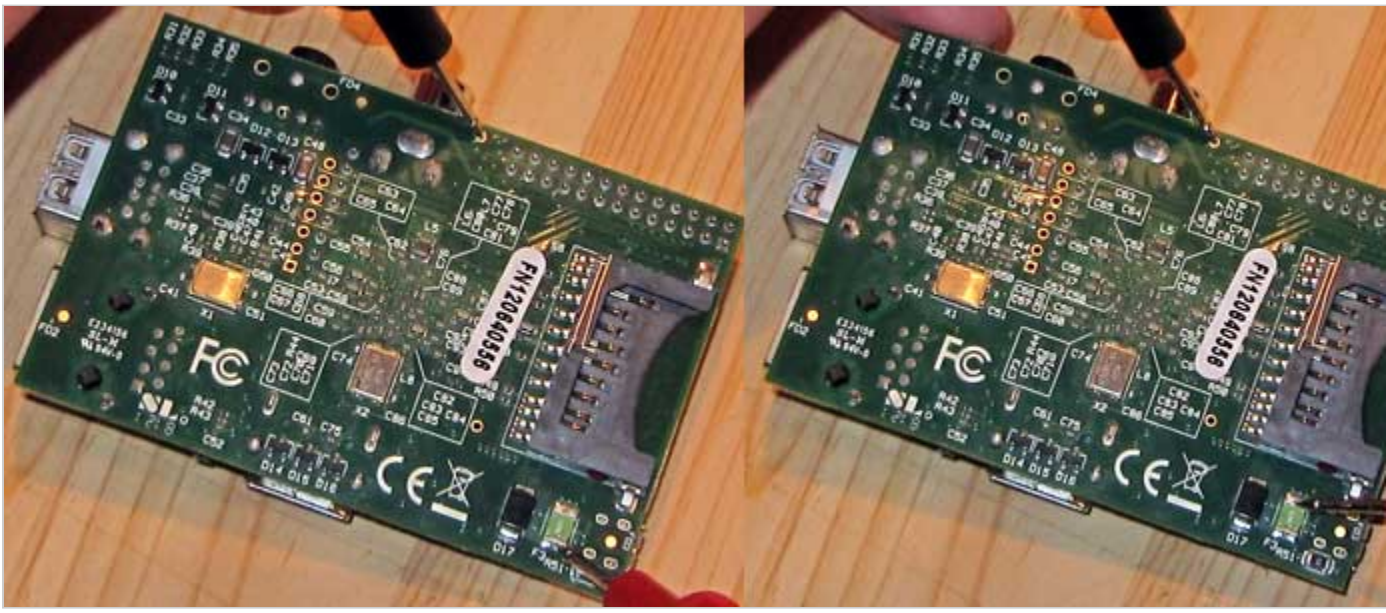




**How to test the F3 polyfuse[17]**

1. Remove all the things plugged into your Raspberry Pi, including SD card.
2. Locate the TP2 test point on the top of the board.

3. Turn your board over and find the TP2 test point on the bottom of the board. One lead of your multi-meter will always be on the TP2 point on the bottom of the board for all tests.
4. Plug your power supply into the micro usb port and power your board.
5. Place one lead of your multi-meter on the TP2 point on the bottom of the board and one lead on the side of the F3 fuse closest to the edge of the board. Note the voltage. This is the voltage coming into your RPi from your power supply.
6. Keeping one lead on TP2, move the other lead to the side of F3 closest to the SD card slot. This is the voltage coming out of the F3 fuse.



Multi-meter lead placement for testing the Raspberry Pi F3 Polyfuse

If the voltage is different by more than about 0.3v you probably have an issue with the F3 fuse[18].

When polyfuses "blow" their resistance increases dramatically, there by limiting the voltage that can pass through them. If your power problem suddenly appeared after your board was known to be working fine, it is probable the fuse is just "blown" and will return to normal. It can take 24 hours for the resistance to go back down to normal so leave it unpowered and check it again in 24 hours. If your power problem has been since the first time you plugged in your board, the fuse was probably bad when it arrived and should be returned to place you purchased it.

If you prefer to make your own PSU - see: Power Supply construction - HowTo

# Hardware versions/revisions

Several different boards have been found probably from different assembly lines, and the following tables try to help you identify your board for better troubleshooting.

Look for the date of manufacturing printed with the year and week. In this example year (2012) and week (18th):

For what we can see for model B boards there are mainly two versions that differ on the type RAM used, Samsung (S) and Hynix (H).

For **Board ver**. we used: <model><RAM Maker><production date> (ex.: BS1218 is "Model B, Samsung RAM, 18th week of 2012")

Model A:

| Board ver. | RAM Chip | USB Chip | Front | Back |
|---|---|---|---|---|
| | | | | |

Model B:

| Board ver. | RAM Chip | USB Chip | Front | Back |
|---|---|---|---|---|
| BS12xx | Samsung | SMSC |  |  |
| BH12xx | Hynix | SMSC |  |  |

See a **complete list** and user feedback here: RaspberryPi Boards

# References


1. ↑ http://www.raspberrypi.org/phpBB3/viewtopic.php?f=28&t=7528

2. ↑ http://www.raspberrypi.org/phpBB3/viewtopic.php?f=6&t=5096&p=76503#p76503
3. ↑ http://www.raspberrypi.org/phpBB3/viewtopic.php?f=6&t=5096&p=76654#p76654
4. ↑ http://www.raspberrypi.org/forum/troubleshooting/will-not-boot-consistently-any-suggestions-before-i-send-my-pi-back
5. ↑ http://www.raspberrypi.org/forum/troubleshooting/booted-once-wont-work-again
6. ↑ http://www.raspberrypi.org/forum/troubleshooting/possible-fault-pi-boots-sometimes-but-not-always
7. ↑ http://www.raspberrypi.org/phpBB3/viewtopic.php?f=6&t=5900&p=79008#p79008
8. ↑ http://www.raspberrypi.org/phpBB3/viewtopic.php?f=6&t=5900&p=78973#p78973
9. ↑ https://github.com/raspberrypi/linux/commit/e09244e60881148431ecd016ccc42f1fa0678556
10. ↑ http://www.raspberrypi.org/forum/troubleshooting/usb-power-hub-wifi/page-4#p74609
11. ↑ http://www.raspberrypi.org/forum/troubleshooting/success-with-kb-mouse-wifi?value=3761&type=8&include=1&search=1
12. ↑ http://www.raspberrypi.org/forum/troubleshooting/display-and-keyboard-issues-on-a-real-pi#p74816
13. ↑ http://www.raspberrypi.org/phpBB3/viewtopic.php?f=28&t=7533
14. ↑ http://www.raspberrypi.org/phpBB3/viewtopic.php?t=5766#p77576
15. ↑ http://www.raspberrypi.org/phpBB3/viewtopic.php?t=5766#p80995
16. ↑ http://www.raspberrypi.org/phpBB3/viewtopic.php?f=28&t=6822&p=89589&hilit=eben#p89513
17. ↑ http://www.raspberrypi.org/phpBB3/viewtopic.php?f=26&t=22318
18. ↑ http://www.raspberrypi.org/phpBB3/viewtopic.php?f=28&t=24005&p=222526#p222526

| Raspberry Pi | |
|---|---|
| **Startup** | Model Wizard - Buying Guide - SD Card Setup - Basic Setup - Advanced Setup - Beginners Guide - **Troubleshooting** |
| **Hardware** | Hardware - Hardware History - Low-level peripherals - Expansion Boards |
| **Peripherals** | Screens - Cases - Other Peripherals |
| **Software** | Software - Distributions - Kernel - Performance - Programming - VideoCore APIs |
| **Projects** | Tutorials - Guides - Projects - Tasks - DataSheets - Education - Communities |

# RPiconfig

From eLinux.org
(Redirected from RPi config.txt)

The Raspberry Pi config.txt file is read by the GPU before the ARM core is initialised. It can be used to set various system configuration parameters.

This file is an optional file on the boot partition. It would normally be accessible as /boot/config.txt from Linux.

To edit the configuration file, see the instructions at R-Pi_ConfigurationFile.

You can get your current active settings with the following commands:

```
vcgencmd get_config <config> - lists a specific config value. E.g. vcgencmd get_config arm_freq
vcgencmd get_config int - lists all the integer config options that are set (non-zero)
vcgencmd get_config str - lists all the string config options that are set (non-null)
```

## Contents



# File format

The format is "property=value" where value is an integer. You may specify only one option per line. Comments may be added by starting a line with the '#' character.

Here is an example file

```
# Set stdv mode to PAL (as used in Europe)
sdtv_mode=2
# Force the monitor to HDMI mode so that sound will be sent over HDMI cable
hdmi_drive=2
# Set monitor mode to DMT
hdmi_group=2
# Set monitor resolution to 1024x768 XGA 60Hz (HDMI_DMT_XGA_60)
hdmi_mode=16
# Make display smaller to stop text spilling off the screen
overscan_left=20
overscan_right=12
overscan_top=10
overscan_bottom=10
```

And here is another example file (https://raw.github.com/Evilpaul/RPi-config/master/config.txt) , containing extended documentation of features.

# Memory

**disable_l2cache** disable ARM access to GPU's L2 cache. Needs corresponding L2 disabled kernel. Default 0

**gpu_mem** GPU memory in megabyte. Sets the memory split between the ARM and GPU. ARM gets the remaining memory. Min 16. Default 64

**gpu_mem_256** GPU memory in megabyte for the 256MB Raspberry Pi. Ignored by the 512MB RP. Overrides gpu_mem. Max 192. Default not set

**gpu_mem_512** GPU memory in megabyte for the 512MB Raspberry Pi. Ignored by the 256MB RP. Overrides gpu_mem. Max 448. Default not set

# Video

## Video mode options

**sdtv_mode** defines the TV standard for composite output (default=0)

```
sdtv_mode=0    Normal NTSC
sdtv_mode=1    Japanese version of NTSC - no pedestal
sdtv_mode=2    Normal PAL
sdtv_mode=3    Brazilian version of PAL - 525/60 rather than 625/50, different subcarrier
```

**sdtv_aspect** defines the aspect ratio for composite output (default=1)

```
sdtv_aspect=1  4:3
sdtv_aspect=2  14:9
sdtv_aspect=3  16:9
```

**sdtv_disable_colourburst** disables colour burst on composite output. The picture will be monochrome, but possibly sharper

```
sdtv_disable_colourburst=1  colour burst is disabled
```

**hdmi_safe** Use "safe mode" settings to try to boot with maximum hdmi compatibility. This is the same as the combination of: hdmi_force_hotplug=1, config_hdmi_boost=4, hdmi_group=1, hdmi_mode=1, disable_overscan=0

```
hdmi_safe=1
```

**hdmi_ignore_edid** Enables the ignoring of EDID/display data if your display is a crappy Chinese one

```
hdmi_ignore_edid=0xa5000080
```

**hdmi_edid_file** when set to 1, will read the edid data from the edid.dat file instead of from the monitor.[1]

```
hdmi_edid_file=1
```

**hdmi_force_edid_audio** Pretends all audio formats are supported by display, allowing passthrough of DTS/AC3 even when not reported as supported.

```
hdmi_force_edid_audio=1
```

**avoid_edid_fuzzy_match** Avoid fuzzy matching of modes described in edid. Picks the standard mode with matching resolution and closest framerate even if blanking is wrong.

```
avoid_edid_fuzzy_match=1
```

**hdmi_ignore_cec_init** Doesn't sent initial active source message. Avoids bringing (CEC enabled) TV out of standby and channel switch when rebooting.

```
hdmi_ignore_cec_init=1
```

**hdmi_ignore_cec** Pretends CEC is not supported at all by TV. No CEC functions will be supported.

```
hdmi_ignore_cec=1
```

**hdmi_force_hotplug** Pretends HDMI hotplug signal is asserted so it appears a HDMI display is attached

```
hdmi_force_hotplug=1 Use HDMI mode even if no HDMI monitor is detected
```

**hdmi_ignore_hotplug** Pretends HDMI hotplug signal is not asserted so it appears a HDMI display is not attached

```
hdmi_ignore_hotplug=1 Use composite mode even if HDMI monitor is detected
```

**hdmi_drive** chooses between HDMI and DVI modes

```
hdmi_drive=1 Normal DVI mode (No sound)
hdmi_drive=2 Normal HDMI mode (Sound will be sent if supported and enabled)
```

**hdmi_group** defines the HDMI type

Not specifying the group, or setting to 0 will use the preferred group reported by the edid.

```
hdmi_group=1   CEA
hdmi_group=2   DMT
```

**hdmi_mode** defines screen resolution in CEA or DMT format

```
These values are valid if hdmi_group=1 (CEA)
hdmi_mode=1    VGA
hdmi_mode=2    480p  60Hz
hdmi_mode=3    480p  60Hz  H
hdmi_mode=4    720p  60Hz
hdmi_mode=5    1080i 60Hz
hdmi_mode=6    480i  60Hz
hdmi_mode=7    480i  60Hz  H
hdmi_mode=8    240p  60Hz
hdmi_mode=9    240p  60Hz  H
hdmi_mode=10   480i  60Hz  4x
hdmi_mode=11   480i  60Hz  4x H
hdmi_mode=12   240p  60Hz  4x
hdmi_mode=13   240p  60Hz  4x H
hdmi_mode=14   480p  60Hz  2x
hdmi_mode=15   480p  60Hz  2x H
hdmi_mode=16   1080p 60Hz
hdmi_mode=17   576p  50Hz
hdmi_mode=18   576p  50Hz  H
```

```
hdmi_mode=19   720p  50Hz
hdmi_mode=20   1080i 50Hz
hdmi_mode=21   576i  50Hz
hdmi_mode=22   576i  50Hz  H
hdmi_mode=23   288p  50Hz
hdmi_mode=24   288p  50Hz  H
hdmi_mode=25   576i  50Hz  4x
hdmi_mode=26   576i  50Hz  4x H
hdmi_mode=27   288p  50Hz  4x
hdmi_mode=28   288p  50Hz  4x H
hdmi_mode=29   576p  50Hz  2x
hdmi_mode=30   576p  50Hz  2x H
hdmi_mode=31   1080p 50Hz
hdmi_mode=32   1080p 24Hz
hdmi_mode=33   1080p 25Hz
hdmi_mode=34   1080p 30Hz
hdmi_mode=35   480p  60Hz  4x
hdmi_mode=36   480p  60Hz  4xH
hdmi_mode=37   576p  50Hz  4x
hdmi_mode=38   576p  50Hz  4x H
hdmi_mode=39   1080i 50Hz  reduced blanking
hdmi_mode=40   1080i 100Hz
hdmi_mode=41   720p  100Hz
hdmi_mode=42   576p  100Hz
hdmi_mode=43   576p  100Hz H
hdmi_mode=44   576i  100Hz
hdmi_mode=45   576i  100Hz H
hdmi_mode=46   1080i 120Hz
hdmi_mode=47   720p  120Hz
hdmi_mode=48   480p  120Hz
hdmi_mode=49   480p  120Hz H
hdmi_mode=50   480i  120Hz
hdmi_mode=51   480i  120Hz H
hdmi_mode=52   576p  200Hz
hdmi_mode=53   576p  200Hz H
hdmi_mode=54   576i  200Hz
hdmi_mode=55   576i  200Hz H
hdmi_mode=56   480p  240Hz
hdmi_mode=57   480p  240Hz H
hdmi_mode=58   480i  240Hz
hdmi_mode=59   480i  240Hz H
H means 16:9 variant (of a normally 4:3 mode).
2x means pixel doubled (i.e. higher clock rate, with each pixel repeated twice)
4x means pixel quadrupled (i.e. higher clock rate, with each pixel repeated four times)
```

```
These values are valid if hdmi_group=2 (DMT)
hdmi_mode=1    640x350   85Hz
hdmi_mode=2    640x400   85Hz
hdmi_mode=3    720x400   85Hz
hdmi_mode=4    640x480   60Hz
hdmi_mode=5    640x480   72Hz
hdmi_mode=6    640x480   75Hz
hdmi_mode=7    640x480   85Hz
hdmi_mode=8    800x600   56Hz
hdmi_mode=9    800x600   60Hz
hdmi_mode=10   800x600   72Hz
hdmi_mode=11   800x600   75Hz
hdmi_mode=12   800x600   85Hz
hdmi_mode=13   800x600   120Hz
hdmi_mode=14   848x480   60Hz
hdmi_mode=15   1024x768  43Hz  DO NOT USE
hdmi_mode=16   1024x768  60Hz
hdmi_mode=17   1024x768  70Hz
```

```
hdmi_mode=18   1024x768  75Hz
hdmi_mode=19   1024x768  85Hz
hdmi_mode=20   1024x768  120Hz
hdmi_mode=21   1152x864  75Hz
hdmi_mode=22   1280x768        reduced blanking
hdmi_mode=23   1280x768  60Hz
hdmi_mode=24   1280x768  75Hz
hdmi_mode=25   1280x768  85Hz
hdmi_mode=26   1280x768  120Hz reduced blanking
hdmi_mode=27   1280x800        reduced blanking
hdmi_mode=28   1280x800  60Hz
hdmi_mode=29   1280x800  75Hz
hdmi_mode=30   1280x800  85Hz
hdmi_mode=31   1280x800  120Hz reduced blanking
hdmi_mode=32   1280x960  60Hz
hdmi_mode=33   1280x960  85Hz
hdmi_mode=34   1280x960  120Hz reduced blanking
hdmi_mode=35   1280x1024 60Hz
hdmi_mode=36   1280x1024 75Hz
hdmi_mode=37   1280x1024 85Hz
hdmi_mode=38   1280x1024 120Hz reduced blanking
hdmi_mode=39   1360x768  60Hz
hdmi_mode=40   1360x768  120Hz reduced blanking
hdmi_mode=41   1400x1050       reduced blanking
hdmi_mode=42   1400x1050 60Hz
hdmi_mode=43   1400x1050 75Hz
hdmi_mode=44   1400x1050 85Hz
hdmi_mode=45   1400x1050 120Hz reduced blanking
hdmi_mode=46   1440x900        reduced blanking
hdmi_mode=47   1440x900  60Hz
hdmi_mode=48   1440x900  75Hz
hdmi_mode=49   1440x900  85Hz
hdmi_mode=50   1440x900  120Hz reduced blanking
hdmi_mode=51   1600x1200 60Hz
hdmi_mode=52   1600x1200 65Hz
hdmi_mode=53   1600x1200 70Hz
hdmi_mode=54   1600x1200 75Hz
hdmi_mode=55   1600x1200 85Hz
hdmi_mode=56   1600x1200 120Hz reduced blanking
hdmi_mode=57   1680x1050       reduced blanking
hdmi_mode=58   1680x1050 60Hz
hdmi_mode=59   1680x1050 75Hz
hdmi_mode=60   1680x1050 85Hz
hdmi_mode=61   1680x1050 120Hz reduced blanking
hdmi_mode=62   1792x1344 60Hz
hdmi_mode=63   1792x1344 75Hz
hdmi_mode=64   1792x1344 120Hz reduced blanking
hdmi_mode=65   1856x1392 60Hz
hdmi_mode=66   1856x1392 75Hz
hdmi_mode=67   1856x1392 120Hz reduced blanking
hdmi_mode=68   1920x1200       reduced blanking
hdmi_mode=69   1920x1200 60Hz
hdmi_mode=70   1920x1200 75Hz
hdmi_mode=71   1920x1200 85Hz
hdmi_mode=72   1920x1200 120Hz reduced blanking
hdmi_mode=73   1920x1440 60Hz
hdmi_mode=74   1920x1440 75Hz
hdmi_mode=75   1920x1440 120Hz reduced blanking
hdmi_mode=76   2560x1600       reduced blanking
hdmi_mode=77   2560x1600 60Hz
hdmi_mode=78   2560x1600 75Hz
hdmi_mode=79   2560x1600 85Hz
hdmi_mode=80   2560x1600 120Hz reduced blanking
hdmi_mode=81   1366x768  60Hz
hdmi_mode=82   1080p     60Hz
```

```
hdmi_mode=83   1600x900        reduced blanking
hdmi_mode=84   2048x1152       reduced blanking
hdmi_mode=85   720p      60Hz
hdmi_mode=86   1366x768        reduced blanking
```

**overscan_left** number of pixels to skip on left

**overscan_right** number of pixels to skip on right

**overscan_top** number of pixels to skip on top

**overscan_bottom** number of pixels to skip on bottom

**framebuffer_width** console framebuffer width in pixels. Default is display width minus overscan.

**framebuffer_height** console framebuffer height in pixels. Default is display height minus overscan.

**framebuffer_depth** console framebuffer depth in bits per pixel. Default is 16. 8bit is valid, but default RGB palette makes an unreadable screen. 24bit looks better but has corruption issues as of 20120615. 32bit has no corruption issues but needs framebuffer_ignore_alpha=1 and shows the wrong colors as of 20120615.

**framebuffer_ignore_alpha** set to 1 to disable alpha channel. Helps with 32bit.

**test_mode** enable test sound/image during boot for manufacturing test.

**disable_overscan** set to 1 to disable overscan.

**config_hdmi_boost** configure the signal strength of the HDMI interface. Default is 0. Try 4 if you have interference issues with hdmi. 7 is the maximum.

**display_rotate** rotates the display clockwise on the screen (default=0) or flips the display.

```
display_rotate=0        Normal
display_rotate=1        90 degrees
display_rotate=2        180 degrees
display_rotate=3        270 degrees
display_rotate=0x10000  horizontal flip
display_rotate=0x20000  vertical flip
```

Note: the 90 and 270 degrees rotation options require additional memory on GPU, so won't work with the 16M GPU split. Probably the reason for:

- Crashes my RPI before Linux boots if set to "1" -- REW 20120913.

## Which values are valid for my monitor?

Your HDMI monitor may support only a limited set of formats. To find out which formats are supported, use the following method.

- Set the output format to VGA 60Hz (hdmi_group=1 hdmi_mode=1) and boot up the Raspberry Pi
- Enter the following command to give a list of CEA supported modes

```
/opt/vc/bin/tvservice -m CEA
```

- Enter the following command to give a list of DMT supported modes

```
/opt/vc/bin/tvservice -m DMT
```

- Enter the following command to show your current state

```
/opt/vc/bin/tvservice -s
```

- Enter the following commands to dump more detailed information from your monitor

```
/opt/vc/bin/tvservice -d edid.dat
/opt/vc/bin/edidparser edid.dat
```

The edid.dat should also be provided when troubleshooting problems with the default HDMI mode

# Licensed Codecs

Hardware decoding of additional codecs can be enabled by purchasing a license that is locked to the CPU serial number of your Raspberry Pi.

**decode_MPG2** License key to allow hardware MPEG-2 decoding.

```
decode_MPG2=0x12345678
```

**decode_WVC1** License key to allow hardware VC-1 decoding.

```
decode_WVC1=0x12345678
```

License setup for SD-card sharing between multiple Pis. Maximum of 8 licenses at once.

```
decode_XXXX=0x12345678,0xabcdabcd,0x87654321,...
```

# Boot

**disable_commandline_tags** stop start.elf from filling in ATAGS (memory from 0x100) before launching kernel

**cmdline** (string) command line parameters. Can be used instead of cmdline.txt file

**kernel** (string) alternative name to use when loading kernel. Default "kernel.img"

**kernel_address** address to load kernel.img file at

**kernel_old** (bool) if 1, load kernel at 0x0

**ramfsfile** (string) ramfs file to load

**ramfsaddr** address to load ramfs file at

**initramfs** (string address) ramfs file and adress to load it at (it's like ramfsfile+ramfsaddr in one option). NOTE: this option uses different syntax than all other options - you should not use "=" character here. Example:

```
initramfs initramf.gz 0x00800000
```

**device_tree_address** address to load device_tree at

**init_uart_baud** initial uart baud rate. Default 115200

**init_uart_clock** initial uart clock. Default 3000000 (3Mhz)

**init_emmc_clock** initial emmc clock. Default 100000000 (100MHz)

**boot_delay** wait for given number of seconds in start.elf before loading kernel. delay = 1000 * boot_delay + boot_delay_ms. Default 1

**boot_delay_ms** wait for given number of milliseconds in start.elf before loading kernel. Default 0

**avoid_safe_mode** if set to 1, safe_mode boot won't be enabled. Default 0

# Overclocking

**WARNING:** Setting any of the parameters which overvolt your Raspberry Pi can set a permanent bit within the SOC and your warranty is void. Warranty will be voided when you use force_turbo or current_limit_override or temp_limit>85 together with over_voltage>0.[2] So If you care about the warranty, do not adjust voltage.

The latest kernel has a cpufreq (http://www.pantz.org/software/cpufreq/usingcpufreqonlinux.html) kernel driver with the "ondemand" governor enabled by default. It has no effect if you have no overclock settings. But when you do, the arm frequency will vary with processor load. Non default values are only used when needed according to the used governor. You can adjust the minimum values with the *_min config options or disable dynamic clocking with force_turbo=1. [3]

Overclock and overvoltage will be disabled at runtime when the SoC reaches 85°C to cool it down . You should not hit the limit, even with maximum settings at 25°C ambient temperature. [4]

Also at your own risk you can try overscan settings from our wiki. These were posted (http://www.raspberrypi.org/forum/features-and-requests/should-we-make-a-wiki-page-for-overscan-settings) on the forum and are not confimed to work.

## Overclocking options

| Option | Description |
|---|---|
| **arm_freq** | Frequency of ARM in MHz. Default 700 |
| **gpu_freq** | Sets core_freq, h264_freq, isp_freq, v3d_freq together. Default 250 |
| **core_freq** | Frequency of GPU processor core in MHz. It have an impact on ARM performance since it drives L2 cache. Default 250 |
| **h264_freq** | Frequency of hardware video block in MHz. Default 250 |
| **isp_freq** | Frequency of image sensor pipeline block in MHz. Default 250 |
| **v3d_freq** | Frequency of 3D block in MHz. Default 250 |
| **avoid_pwm_pll** | Unlink core_freq from the rest of the gpu. Can cause low quality analog audio, which should be fixed with latest firmware. Default 0 |
| **sdram_freq** | Frequency of SDRAM in MHz. Default 400 |

| | |
|---|---|
| **over_voltage** | ARM/GPU core voltage adjust. [-16,8] equates to [0.8V,1.4V] with 0.025V steps. force_turbo will allow values higher than 6. Default 0 (1.2V) [5] |
| **over_voltage_sdram** | Sets over_voltage_sdram_c, over_voltage_sdram_i, over_voltage_sdram_p together |
| **over_voltage_sdram_c** | SDRAM controller voltage adjust. [-16,8] equates to [0.8V,1.4V] with 0.025V steps. Default 0 (1.2V) [5] |
| **over_voltage_sdram_i** | SDRAM I/O voltage adjust. [-16,8] equates to [0.8V,1.4V] with 0.025V steps. Default 0 (1.2V)[5] |
| **over_voltage_sdram_p** | SDRAM phy voltage adjust. [-16,8] equates to [0.8V,1.4V] with 0.025V steps. Default 0 (1.2V)[5] |
| **force_turbo** | Disables dynamic cpufreq driver and minimum settings below. Enables h264/v3d/isp overclock options. Default 0 |
| **initial_turbo** | Enables turbo mode from boot for the given value in seconds (up to 60) or until cpufreq sets a frequency. Can help with sdcard corruption if overclocked. Default 0 [6] |
| **arm_freq_min** | Minimum value of arm_freq used for dynamic clocking. Default 700 |
| **core_freq_min** | Minimum value of core_freq used for dynamic clocking. Default 250 |
| **sdram_freq_min** | Minimum value of sdram_freq used for dynamic clocking. Default 400 |
| **over_voltage_min** | Minimum value of over_voltage used for dynamic clocking. Default 0 |
| **temp_limit** | Overheat protection. Sets clocks and voltages to default when the SoC reaches this Celsius value. Setting this higher than default voids warranty. Default 85 |
| **current_limit_override** | Disables SMPS current limit protection when set to "0x5A000020". Can help if you are currently hitting a reboot failure when overclocking too high. [7] |

## force_turbo mode

```
force_turbo=0
```

enables dynamic clocks and voltage for the ARM core, GPU core and SDRAM. When busy, ARM frequency go up to "arm_freq" and down to "arm_freq_min" on idle. "core_freq", "sdram_freq" and "over_voltage" behave the same. "over_voltage" is limited to 6 (1.35V). Non default values for the h264/v3d/isp parts are ignored.

```
force_turbo=1
```

disables dynamic clocking, so all frequencies and voltages stay high. Overclocking of h264/v3d/isp GPU parts is allowed as well as setting "over_voltage" to 8 (1.4V). [8]

# Clocks relationship

The GPU core, h264, v3d and isp share a PLL, therefore need to have related frequencies. ARM, SDRAM and GPU each have their own PLLs and can have unrelated frequencies.[9]

The following is not necessary with "avoid_pwm_pll=1".

```
pll_freq = floor(2400 / (2 * core_freq)) * (2 * core_freq)
gpu_freq = pll_freq / [even number]
```

The effective gpu_freq is automatically rounded to nearest even integer, so asking for core_freq=500 and gpu_freq=300 will result in divisor of 2000/300 = 6.666 => 6 and so 333.33MHz.

# Tested values

The following table shows some successfull attempts of overclocking, which can be used for orientation. These settings may not work on every device and can shorten the lifetime of the Broadcom SoC.

**Warning: Warranty will be voided if:**

```
(force_turbo || current_limit_override || temp_limit>85) && over_voltage>0
```

| arm_freq | gpu_freq | core_freq | h264_freq | isp_freq | v3d_freq | sdram_freq | over_voltage | over_voltage_sdr |
|---|---|---|---|---|---|---|---|---|
| 800 | | | | | | | | |
| 900 | 275 | | | | | 500 | | |
| 900 | | 450 | | | | 450 | | |
| 930 | 350 | | | | | 500 | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1000 | | 500 | | | | 500 | 6 | |
| 1050 | | | | | | | 6 | |
| 1150 | | 500 | | | | 600 | 8 | |

There are reports (http://www.raspberrypi.org/phpBB3/viewtopic.php?f=29&t=6201&p=159188&hilit=hynix#p159160) that Hynix RAM is not as good as Samsung RAM for overclocking.

# References


1. ↑ http://www.raspberrypi.org/phpBB3/viewtopic.php?p=173430#p173430
2. ↑ http://www.raspberrypi.org/phpBB3/viewtopic.php?f=29&t=6201&sid=eda2ef9b994cdfb28eef3e8a20d1a1e8&start=350#p176865
3. ↑ http://www.raspberrypi.org/phpBB3/viewtopic.php?p=169726#p169726
4. ↑ http://www.raspberrypi.org/phpBB3/viewtopic.php?f=29&t=11579#p169872
5. ↑ [5.0] [5.1] [5.2] [5.3] What this means is that you can specify -16 and expect about 0.8V as the GPU/core voltage. This is 0.4V below the normal value of 1.2. If you specify 16, you'd get 0.4V ABOVE the normal value of 1.2V, or 1.6V. The fact that someone carefully specified "8" and "1.4V" as the upper limit in the examples leads me to think that it is likely to shorten the life of your raspberry pi significantly if you would specify values above "8". So: don't specify values above zero, but if you do, don't go above 8.
6. ↑ http://www.raspberrypi.org/phpBB3/viewtopic.php?f=29&t=6201&start=425#p180099
7. ↑ http://www.raspberrypi.org/phpBB3/viewtopic.php?f=29&t=6201&start=325#p170793
8. ↑ http://www.raspberrypi.org/phpBB3/viewtopic.php?f=29&t=6201&sid=852d546291ae711ffcd8bf23d3214581&start=325#p170793
9. ↑ http://www.raspberrypi.org/phpBB3/viewtopic.php?f=29&t=6201&start=275#p168042



| Raspberry Pi | |
|---|---|
| **Startup** | Model Wizard - Buying Guide - SD Card Setup - Basic Setup - Advanced Setup - Beginners Guide - Troubleshooting |
| **Hardware** | Hardware - Hardware History - Low-level peripherals - Expansion Boards |
| **Peripherals** | Screens - Cases - Other Peripherals |
| **Software** | Software - Distributions - Kernel - Performance - Programming - VideoCore APIs |
| **Projects** | Tutorials - Guides - Projects - Tasks - DataSheets - Education - Communities |


# RPi Hardware

From eLinux.org

Back to the Hub.

**Hardware & Peripherals:**

***Hardware** and Hardware History.*

*Low-level Peripherals and Expansion Boards.*

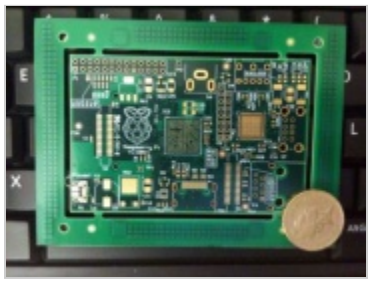
*Screens, Cases and Other Peripherals.*

## Contents



# Introduction

The first product is the size of a credit card, and is designed to plug into a TV or HDMI monitor. It comes in two variants, model A and B, with B having more features. The expected price is $25 for model A and $35 for model B. The GPIO pins on each board allow the use of optional expansion boards.



The unpopulated Rpi bèta board

Those who are looking to set up a Raspberry Pi for the first time, see RPi Hardware Basic Setup.

Several different Hardware versions/revisions RaspberryPi Boards have been found probably from different assembly lines. Try to identify your board for better troubleshooting and update it if you have one which is not mentioned.

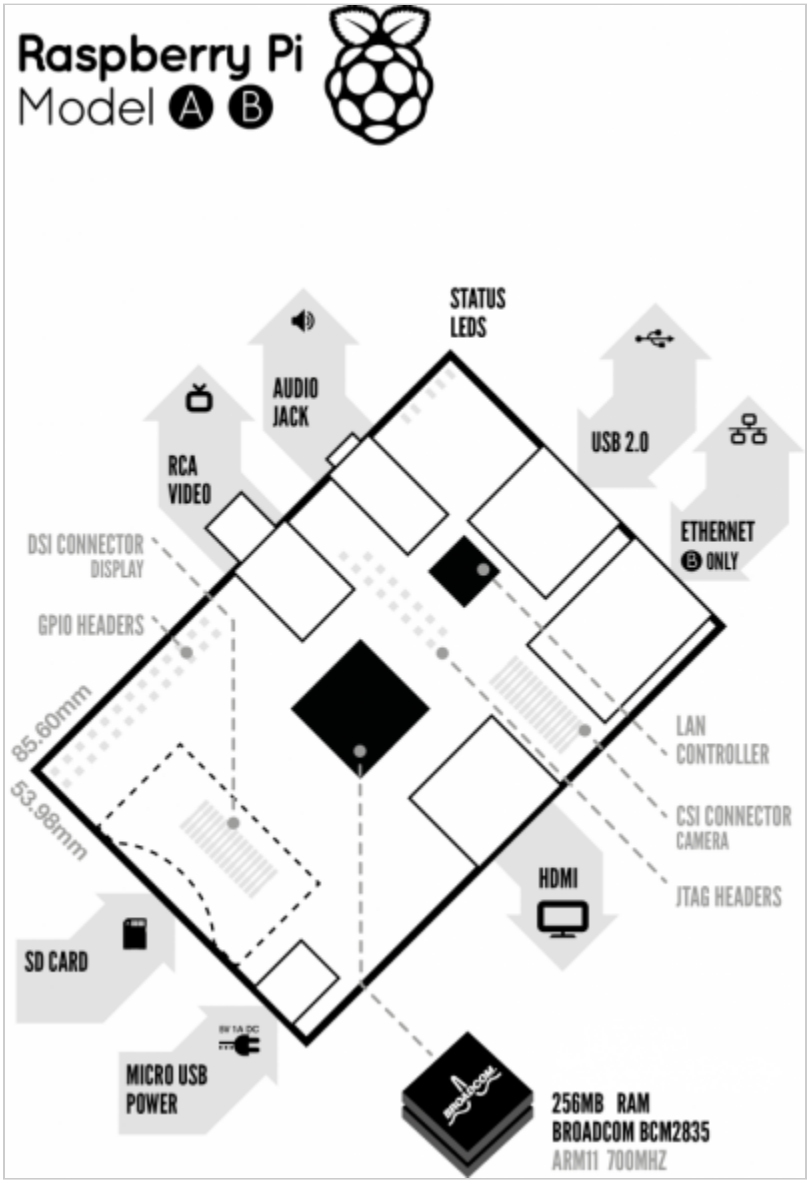
# Specifications

| | Model A | Model B |
|---|---|---|
| Target price:[1] | US$25 Ext tax (GBP £16 Exc VAT) | US$35 Ext tax (GBP £22 Exc VAT) |
| System-on-a-chip (SoC):[1] | Broadcom BCM2835 (CPU + GPU. SDRAM is a separate chip stacked on top) | |
| CPU: | 700 MHz ARM11 ARM1176JZF-S core | |
| GPU: | Broadcom VideoCore IV,OpenGL ES 2.0,OpenVG 1080p30 H.264 high-profile encode/decode | |
| Memory (SDRAM)iB | 256 MiB (planned with 128 MiB, upgraded to 256 MiB on 29 Feb 2012) | 256 MiB (until 15 Oct 2012); 512 MiB (since 15 Oct 2012) |
| USB 2.0 ports: | 1 (provided by the BCM2835) | 2 (via integrated USB hub) |
| Video outputs:[1] | Composite video \| Composite RCA, HDMI (not at the same time) | |
| Audio outputs:[1] | TRS connector \| 3.5 mm jack, HDMI | |
| Audio inputs: | none, but a USB mic or sound-card could be added | |
| Onboard Storage: | Secure Digital\|SD / MMC / SDIO card slot | |
| Onboard Network:[1] | None | 10/100 wired Ethernet RJ45 |
| Low-level peripherals: | General Purpose Input/Output (GPIO) pins, Serial Peripheral Interface Bus (SPI), I²C, I²S[2], Universal asynchronous receiver/transmitter (UART) | |
| Real-time clock:[1] | None | |
| Power ratings (provisional, from alpha board): | 500 mA, (2.5 W) [1] | 700 mA, (3.5 W) |
| Power source:[1] | 5 V (DC) via Micro USB type B or GPIO header | |
| Size: | 85.0 x 56.0 mm (two different boards, measured with callipers) | |

# Components

(Provisional - some of the expansion interfaces won't be available on production boards) (PCB IDs are those of the Model B Beta board)

- SoC: Broadcom BCM2835 media processor




A diagram denoting the places of the different components on the Rpi, made by Paul Beech, edited to show 256MB ram for both boards

(http://www.broadcom.com/products/BCM2835) (datasheet (http://www.raspberrypi.org/wp-content/uploads/2012/02/BCM2835-ARM-Peripherals.pdf) , BCM2835 datasheet errata, unofficial pinout) system-on-chip featuring:

- CPU core: ARM1176JZF-S (http://infocenter.arm.com/help/topic/com.arm.doc.ddi0301h/DDI0301H_arm1176jzfs_r0p7_trm.pdf) ARM11 core clocked at 700MHz; ARM VFP. The ARM11 core implements the ARMv6

Architecture. For details on ARM instruction sets and naming conventions, see ARM architecture (http://en.wikipedia.org/wiki/ARM_architecture) and List of ARM microprocessor cores (http://en.wikipedia.org/wiki/List_of_ARM_microprocessor_cores) .
    - GPU core: a Broadcom VideoCore (http://en.wikipedia.org/wiki/Videocore) IV GPU providing OpenGL ES 1.1, OpenGL ES 2.0, hardware-accelerated OpenVG 1.1, Open EGL, OpenMAX and 1080p30 H.264 high-profile decode. There are 24 GFLOPS of general purpose compute and a bunch of texture filtering and DMA infrastructure. Eben worked on the architecture team for this and the Raspberry Pi team are looking at how they can make some of the proprietary features available to application programmers
    - DSP core: There is a DSP, but there isn't currently a public API (Liz thinks the BC team are keen to make one available at some point)
    - 256MiB of (Hynix MobileDDR2 (http://www.hynix.com/products/mobile/view.jsp?info.ramKind=28&info.serialNo=H9TKNNN2GDMPLR&posMap=MobileDDR2) or Samsung Mobile DRAM (http://www.samsung.com/global/business/semiconductor/product/mobile-dram/detail?productId=7611&iaId=747) ) SDRAM (or 512MB Mobile DRAM (http://www.samsung.com/global/business/semiconductor/product/mobile-dram/detail?iaId=747&productId=7609) on later boards). The RAM is physically stacked on top of the Broadcom media processor (package-on-package technology (http://en.wikipedia.org/wiki/Package_on_package) ). Here is a photo of the SDRAM (left) and BCM2835 (right) (http://www.raspberrypi.org/wp-content/uploads/2012/01/brcm2835plusmemory.jpg) ball grid arrays on JamesH's finger. You are looking at the bottom side. The BCM2835 top side has a land grid array which matches the SDRAM ball grid array. Here is a highly magnified side view of the SDRAM stacked on top of the BCM2835 stacked on top of the PCB PoP stack (http://www.raspberrypi.org/wp-content/uploads/2012/09/2012-09-21-10.58.22.jpg) (you can see why it's job that can only be done by robots!).
- LAN9512 (Data Brief (http://www.smsc.com/media/Downloads_Public/Data_Briefs/9512db.pdf) | Data Sheet (http://www.smsc.com/media/Downloads_Public/Data_Sheets/9512.pdf) ) **(Model B)** providing:
    - 10/100Mb Ethernet (Auto-MDIX)[3]
    - 2x USB 2.0
- S1: Micro USB power jack (5v - Power Only)
- S2: DSI (http://www.mipi.org/specifications/display-interface) interface. 15-pin surface mounted flat flex connector, providing two data lanes, one clock lane, 3.3V and GND.
- S3: HDMI connector providing type A HDMI 1.3a out
- S4: Composite Video connector: RCA
- S5: MIPI CSI-2 (http://www.mipi.org/specifications/camera-interface) interface. 15-pin surface mounted flat flex connector.
- S6: Audio connector: 3.5mm stereo jack (output only)

- S8: SD/MMC/SDIO memory card slot (underside)
- S7: Either 1x USB 2.0 **(Model A)** 2x USB 2.0 **(Model B)**
- P1: 26-pin 2.54 mm header expansion, providing: see Low-level peripherals
  - 8 GPIOs at 3v3
  - 2-pin UART serial console, 3v3 TTL (debug); or 2 GPIOs at 3v3
  - I²C interface (3v3); or 2 GPIOs at 3v3
  - SPI interface (3v3); or 5 GPIOs at 3v3
  - 3v3, 5v and GND supply pins
  - ARM JTAG (if pins are reconfigured in software and one signal is taken from S5)
  - Second I²C interface (3v3) (if pins are reconfigured in software)
  - I²S interface (if pins are reconfigured in software, hardware hack may be required[2])
  - 6 pins reserved for future use
- P2: 8-pin 2.54 mm header expansion providing GPU JTAG (ARM11 pinout, pin 7 is nofit for locating)
- P3: 7-pin 2.54 mm header expansion (header not fitted), providing LAN9512 JTAG (pin 6 is nofit for locating)
- P4: 10/100Mb RJ45 Ethernet jack **(Model B)**
- TP1 and TP2: Test Points giving access to +5V and GND respectively
- 5 Status LEDs[4][5][6][7][8]:
  - D5(Green) - SDCard Access (via GPIO16) - labelled as "OK" on Rev1.0 boards and "ACT" on Rev2.0 boards
  - D6(Red) - 3.3 V Power - labelled as "PWR" on both Rev1.0 and Rev2.0 boards
  - D7(Green) - Full Duplex (LAN) **(Model B)** - labelled as "FDX" on both Rev1.0 and Rev2.0 boards
  - D8(Green) - Link/Activity (LAN) **(Model B)** - labelled as "LNK" on both Rev1.0 and Rev2.0 boards
  - D9(Yellow) - 10/100Mbit (LAN) **(Model B)** - labelled (incorrectly) as "10M" on Rev1.0 boards and "100" on Rev2.0 boards
- Board size: 85.60 mm x 53.98 mm. Overall height expected to be less than 25 mm. [9]
  - A model B between highest points (USB connector to card slot) measured 21 mm.
- Weight: under 40 g?
  - Alpha board weighs approx. 55 g.[10]
  - A sample model B weighed 39.45 g.
- 6 layer PCB [9]

# Schematic / Layout

- PCB screenshot (http://www.raspberrypi.org/wp-content/uploads/2011/11/gerbers2.png)
- PCB screenshot, labelled version (http://lh3.googleusercontent.com/-uO4l8pwSLvU/TsQGbth6x6I/AAAAAAAAAkk/5zQMH3uKPiE/s829/Boardlayout.png)
- PCB screenshot, Alpha board (http://www.raspberrypi.org/wp-content/uploads/2011/07/raspberry1.png)
- Preliminary power supply schematic, Beta board (http://www.raspberrypi.org/wp-content/uploads/2011/12/psu.png)
- High-resolution PCB front photo, production board (http://elinux.org/File:RPi-Front-JPB.jpg)
- High-resolution PCB back photo, production board (http://elinux.org/File:RPi-back-JPB.jpg)
- GIMP project containing properly aligned versions of the high-res PCB photos and Gerbers on separate layers (117MB) (http://www.andrewscheller.co.uk/bare_pcb.xcf)
- "Xray style" image of the beta board, created from the above GIMP project | desktop wallpapers
- Official Rev1.0 schematics PDF (http://www.raspberrypi.org/wp-content/uploads/2012/04/Raspberry-Pi-Schematics-R1.0.pdf) | Official Rev2.0 schematics PDF (http://www.raspberrypi.org/wp-content/uploads/2012/10/Raspberry-Pi-R2.0-Schematics-Issue2.2_027.pdf) | differences | errata | breakdown | partial BOM
- 'Module groups' of the PCB photos (http://www.andrewscheller.co.uk/rpi_pcb_modules.html)

# Power

The board takes fixed 5V input, (with the 1V2 core voltage generated directly from the input using the internal switch-mode supply on the BCM2835 die). This permits adoption of the micro USB form factor, which, in turn, prevents the user from inadvertently plugging in out-of-range power inputs; that would be dangerous, since the 5V would go straight to HDMI and output USB ports, even though the problem should be mitigated by some protections applied to the input power: The board provides a polarity protection diode, a voltage clamp, and a self-resetting semiconductor fuse.

Premier Farnell recommend the following power supplies:

- Model A: 5V dc, 500-700mA
- Model B: 5V dc, 700-1200mA

Power consumption of the Raspberry Pi device is

- Board A: 5V, 500 mA (2.5W) **without any devices connected** (e.g. USB, Ethernet, HDMI)

- Board B: 5V, 700 mA (3.5W) **without any devices connected** (e.g. USB, Ethernet, HDMI) (Is this correct? These [1] (http://www.raspberrypi.org/forum/troubleshooting/usb-hub-sending-power-to-raspberry-pi-through-usb-port/#p68382) links [2] (http://www.raspberrypi.org/forum/general-discussion/raspberry-pi-power-requirements/page-2/#p68224) suggest that the 700mA is only required if "using networking and high-current USB peripherals" [3] (http://www.raspberrypi.org/archives/260) .)

You will need to provide a power supply that can provide enough current to power the device plus any connected peripherals, and taking into account inefficiencies of the supply itself and the cable between the power supply and Raspberry Pi. The community advises opting for a power supply that can supply at least 1A if using USB peripherals or Pi plates that draw more than a few tens of milliamps of current.

- As the 5V rail is brought out in the GPIO pins, you can power the Rpi from there too. You should mind however, that those are *behind* the power protection circuitry, so you should provide your own.
- It is possible to power the Rpi from a powered USB hub the Rpi controls, but only on 'dumb' devices, that allow the port to supply the full current without waiting for the usb device to ask for it[4] (http://www.raspberrypi.org/forum/general-discussion/power-pi-from-usb-hub-connected-to-pi) . As the power input of the Rpi doesn't have its data leads connected, there is no chance for a communication loop of some sorts.
- POE (power over ethernet) is currently not available for the Rpi (but nobody stops you from taking your soldering iron and doing it yourself - mind though that the Ethernet jack on the board is a 'magjack' - http://www.sparkfun.com/datasheets/Prototyping/MagJack.pdf - which means that the usual 'dumb or passive PoE' power pins 47 and 78 are *not* wired through to the board. So this is not an entirely trivial exercise).
- Back-Powering; (powering the Raspberry Pi from a USB hub through the uplink/data port, single cable) Back powering is possible on the Raspberry Pi. Revision 1.0 boards have to be modified to back power, this is due to the 140ma "polyfuses" that are installed in the USB port circuit. Revision 1.1 boards do not need modifications to back-power, they have replaced the polyfuses with 0ohm resistors in their place. Revision 2.0 boards do not need modification, they have neither resistors nor polyfuses. It is advised that short (12" (.3 meter) or less) USB cables be used for back-powering a Raspberry Pi. Cable resistance plus connector resistance can quickly reduce operating voltages below the proper range(5.25V to 4.75V).

## Power Supply Problems

There have been a number of problems reported that seem to be caused by inadequate power, this is an attempt to explain what is needed and the consequences of not having enough power.

The power required by the Pi will vary depending on how busy it is and what peripherals are connected.

- Running a GUI will take more power.
- The USB devices and Ethernet connection will take power.
- Running the GPU will take extra power.

This means that it's difficult to say exactly how much power is needed. People have reported current requirements of between 300mA and 550mA. But it could in reality take more, especially for short periods. A simple multimeter will not show short surges on the power requirement. A surge in the power requirement for a few milliseconds will not be detectable by a meter but will be enough to cause problems. If the board does not get enough power the voltage will drop. If it drops enough parts of the system will run unreliably because data can get corrupted. The USB IC runs on 5V and handles the USB and Ethernet ports so it's likely that this will be the first thing to fail. Problems seen are unreliable Ethernet connection and unreliable operation of the Keyboard and/or mouse.

Each of the two USB ports on the Pi has a polyfuse rated at 140 mA, so any connected USB devices should draw less than this amount of current. In addition the polyfuse will cause a significant voltage drop, so that USB devices get less voltage than is available on the RPI itself, sometimes up to half a volt less (maybe more if the fuse has recently been hot). For regular "low power" USB devices this doesn't cause a problem as they are designed to work with voltages as low as 4.4 Volt. This isn't the case however with some USB devices such as WiFi dongles which may need 4.75 Volt, and are also known to draw more than 150 mA when configured and active. Because of the problems these polyfuses caused Raspberry PI's produced after August 25, 2012 have the USB polyfuses F1 & F2 removed (replaced with shorts).

The microUSB input port also has a 1.1 A polyfuse (700mA "hold current") which may also have enough resistance (although much smaller than the 140mA fuses) to cause a significant voltage drop on the board, even below its 1.1 A total current.

A extended explanation of the consequences of the use of these polyfuses can be found here Polyfuses explained

There are several reasons why the power to the board may be inadequate:

- The PSU may not deliver enough power. Although the maximum power requirement is said to be 700mA, that is with no peripherals connected (USB, Ethernet etc), so a 1000mA PSU should be regarded as a minimum. This allows some leeway in case the power supply cannot deliver its full power without the voltage dropping.
- The PSU is not regulated.
- The cable connecting the PSU to the Pi may not be good. People have reported cables with 4 ohms resistance on the power connections. At 500mA drain this would reduce a 5V supply to 3V.

- If the PSU is unregulated it can also output too high a voltage, which may trigger the overvoltage device in the PI, which will temporarily short the 5V to ground, this will then "blow" polyfuse F3, which will take several days to recover from. Meanwhile (possibly with another PSU) the PI might not get enough power because the (partly) blown polyfuse is consuming some of the power. The solution is when this happens to ways a few days to give the polyfuse time to recover before attempting to use the better PSU. If you suspect a blow polyfuse, measure the voltage across F3, which should be less than 0.05 Volt.

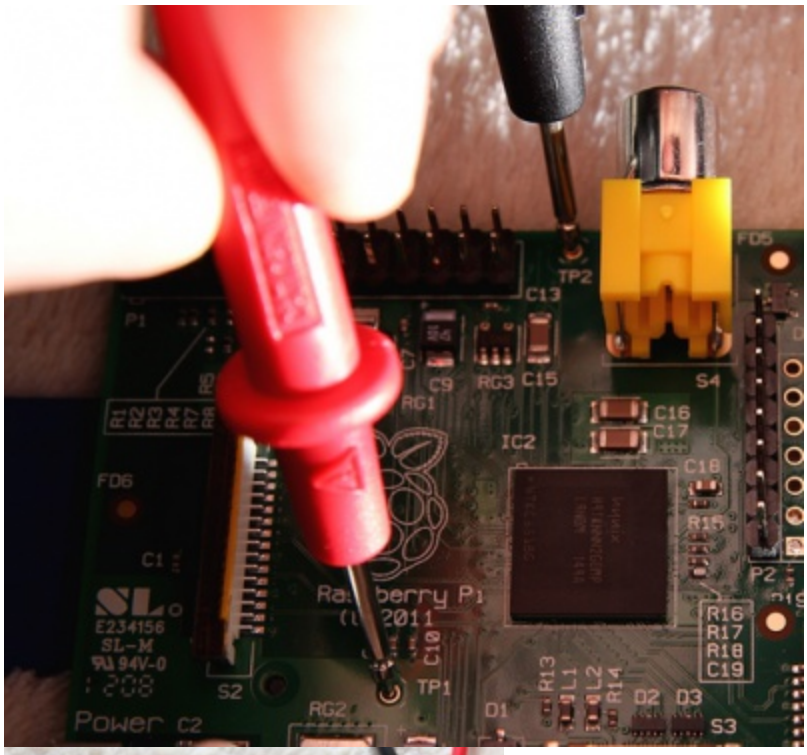
**How Can I tell if the power supply is inadequate?**

Common symptoms of an inadequate power supply are

- Unreliable Ethernet or keyboard operation, especially if it's OK at first but not when the GUI is started.
- SD card errors at start up seems to be another symptom of poor power.

If you think you have a problem with your power supply, it is a good idea to check the actual voltage on the Raspberry Pi circuit board. Two test points labelled TP1 and TP2 are provided on the circuit board to facilitate voltage measurements.

Use a multimeter which is set to the range 20 volts DC (or 20v =). You should see a voltage between 4.75 and 5.25 volts. Anything outside this range indicates that you have a problem with your power supply or your power cable, or the input polyfuse F3. Anything inside, but close to the limits, of this range *may* indicate a problem.





**Things that can cause problems**

- A USB connection on a TV or PC. The USB power supply specification is for up to 500mA and if the TV implements this then it can cause problems. The system may

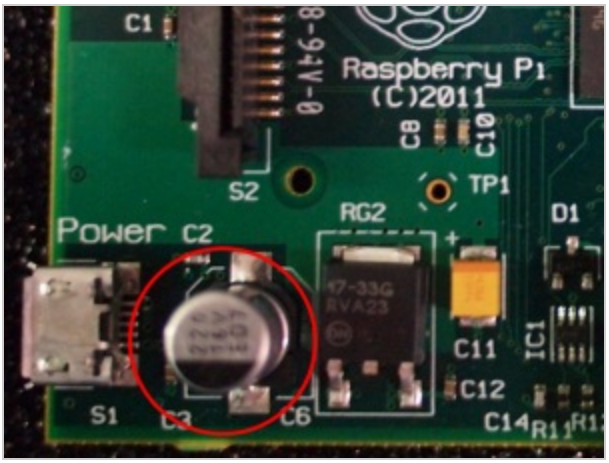
work initially but be unreliable because as it becomes more active the power requirement increases.
- A single supply from a powered hub. Most hubs seem to deliver more than the specified current but there's no guarantee. Check the power supply rating, it must be enough to supply everything that's connected to the hub.
- A power supply that is rated for less than 700mA may work some of the time.
- Adding a USB hard disk drive. A HDD will take quite a lot of power as it starts, maybe an amp or more. It the power supply for this also supplies the Pi then this could overload things and cause trouble.
- Some complex keyboards have been reported to take a considerable amount of power, maybe up to 500mA. The Pi cannot deliver this amount of power. Simpler budget keyboards may be better. If the system works with no keyboard attached but not with a keyboard then it's worth trying a different, simpler, keyboard.

**Summary**

- If you are having unreliable operation the first thing to do is check your power supply.
- Start with a good quality regulated power supply that is rated to provide 5V and at least 1A (1000mA).
- Use a good quality micro USB cable. Cables are notorious for giving trouble so be prepared to swap for another one.
- Not all power supplies will deliver what they claim.

## Capacitor C6

Behind the microUSB power connector on the Model B is a metallic grey component called a capacitor, marked as C6. This capacitor helps stabilise the DC power on the board, but for some it has also become a place for their thumb when removing the RPI's power lead; unfortunately, this can result in the capacitor breaking off! It has been stated in the forums that the type of capacitor used for C6 will be changed on later RPi models for one with sturdier leads. If you do break off your C6 capacitor, it's highly likely that your RPi will still work properly, unless you have a particularly unstable power supply, but the general advice is to not use C6 as a leverage point when removing the power connector and also take care when storing or transporting your RPi if it's not fitted in a case - try not to stow the board where C6 could be knocked by other items - for example in a laptop carry case or in amongst some books.



Capacitor C6 (ringed)

It's unlikely that replacing a broken off C6 capacitor will be covered under warranty, but fortunately they are easy to replace if you have average soldering skills (http://www.raspberrypi.org/archives/1494) , but remember that reworking your RPi will void its warranty too. C6 is a surface mount electrolytic capacitor with a capacitance of 220 microfarad (µF) and a voltage rating of 16 volt (V). The capacitor is polarised and so must be fitted the right way round - notice the black marking on one side in the picture above. A replacement capacitor can be purchased from numerous sources - for example:

Farnell (http://uk.farnell.com/jsp/search/browse.jsp?N=202457+110114112+110119850+110141127+110200576&No=0&getResults=true&appliedpa

Rapid Electronics (http://www.rapidonline.com/Electronic-Components/220uf-16v-85deg-Smd-Electro-Capacitor-11-2264)

RS Components (http://uk.rs-online.com/web/c/passives/capacitors/aluminium/?sort-by=default&sort-order=default&applied-dimensions=4294884868,%204294884170,%204294672278,4294885140&lastAttributeSelectedBlock=4294

If you prefer to make your own PSU - see: Power Supply construction - HowTo

# References


1. ↑ [1.0] [1.1] [1.2] [1.3] [1.4] [1.5] [1.6] [1.7] http://www.raspberrypi.org/faqs
2. ↑ [2.0] [2.1] Forum:Sad about removal of I2S. Why was this change made? (http://www.raspberrypi.org/forum/features-and-requests/sad-about-removal-of-i2s-why-was-this-change-made)
3. ↑ Wikipedia:Auto-MDIX (http://en.wikipedia.org/wiki/Medium_dependent_interface#Auto-MDIX)

4. ↑ RPiBlog Post: High-res pics of the PCBs (http://www.raspberrypi.org/archives/402)
5. ↑ TwitPic:Photo of Board Powered (http://twitpic.com/8edlsf)
6. ↑ Forum:What do the status indicator LEDs indicate the status of? (http://www.raspberrypi.org/forum/features-and-requests/what-do-the-status-indicator-leds-indicate-the-status-of)
7. ↑ RPi_schematic_errata
8. ↑ RPiBlog Post: A nice shiny photo of the rev2 board – and User Guide news (http://www.raspberrypi.org/archives/1959)
9. ↑ [9.0] [9.1] http://www.raspberrypi.org/archives/344
10. ↑ http://www.raspberrypi.org/?page_id=43&mingleforumaction=viewtopic&t=285.0

| Raspberry Pi | |
|---|---|
| **Startup** | Model Wizard - Buying Guide - SD Card Setup - Basic Setup - Advanced Setup - Beginners Guide - Troubleshooting |
| **Hardware** | **Hardware** - Hardware History - Low-level peripherals - Expansion Boards |
| **Peripherals** | Screens - Cases - Other Peripherals |
| **Software** | Software - Distributions - Kernel - Performance - Programming - VideoCore APIs |
| **Projects** | Tutorials - Guides - Projects - Tasks - DataSheets - Education - Communities |

Retrieved from "http://elinux.org/index.php?title=RPi_Hardware&oldid=185762"
Category: RaspberryPi

---

# RPi HardwareHistory

From eLinux.org

Back to the Hub.

**Hardware & Peripherals:**

*Hardware and **Hardware History**.*

*Low-level Peripherals and Expansion Boards.*

*Screens, Cases and Other Peripherals.*

## Contents



## Board Revision History

```
Find out your board revision with the following command:
cat /proc/cpuinfo
You will see your device data including:
 Hardware        : BCM2708
 Revision        : 0003
```

Newest revision at the top of the list.

| Release Date | Model A/B | PCB Revision | Build Revision | Notes |
|---|---|---|---|---|
| Q4 2012 | B | 2.0 | 0005 (?) | 512MB RAM |
| Q3 2012 | B | 2.0 | 0004 | |

| | | | | |
|---|---|---|---|---|
| Q3 2012 | B | 1.0 | 0003 | ECN0001 |
| Q1 2012 | B | 1.0 | 0002 | |
| Q1 2012 | B | Beta | Beta | Beta Board |

### Model B Revision 2.0

Based on a new PCB layout that includes previous build fixes from ECN0001 such us removal of the poly-fuses in series with the +5V power for USB devices, and other fixes reported by the community such as the erroneous connection of the LAN9512 VDD18CORE pins to the +1V8 power plane, addition of the 8-pin P5 header (non-populated) for extra GPIO pins, addition to the 2-pin P6 header (non-populated) for a RESET button, and other changes and improvements reported in more detail [1].

### ECN0001

ECN0001 is the request to not fit D14 and replace F1 and F2 with 0 ohm.

#### D14 Removal

D14 can interfere with some CEC devices if the Pi is left plugged in and unpowered. The benefits of having it are minimal so it was removed.[2]

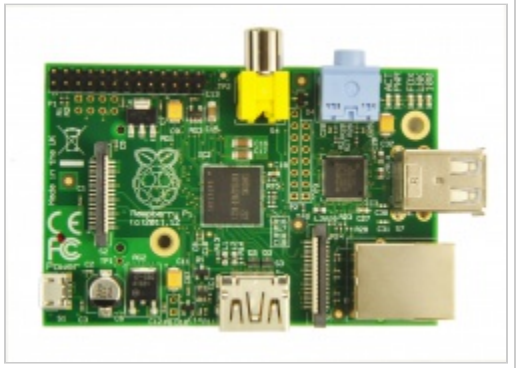
#### F1 & F2 Replacement/Removal

F1 & F2 can cause problems with some USB devices which draw high current. In particular due to the recovery characteristics of the Poly-fuses, it can take a while to recover their low resistance state afterwards, adding additional problems for other devices (lower voltage on the USB bus).

## Raspberry Pi Model-A Full Production Board

- Announced: Not Yet (as of 16 June 2012)
- Board will now have 256Mb of RAM rather than the originally planned 128Mb[3]
- Foundation will probably produce a small Beta batch before handing manufacturing over to RS and Farnell

# Raspberry Pi Model-B Full Production Board



The Rpi full production board (model B Rev 2.0)

- Announced: April 2012, first orders sent out June 2012.
- Manufacturing and Orders will be made through RS and Farnell
- This means a much higher volume of units will be produced and made available.
- Additional detail is available about the manufacturing and distribution agreement here video interview between Eben Upton and SlashDot here (28/02/12) (http://hardware.slashdot.org/story/12/02/28/2347222/raspberry-pi-now-has-distributors----and-will-soon-have-boards-for-all-video) .
- Announced: September 2012, Raspberry Pi Model B Rev 2.0 is now manufactured at Sony's manufacturing plant on Pencoed, South Wales. Full announcement from the Raspberry Pi Foundation (http://www.raspberrypi.org/archives/1925) , Element14 announcement on Raspberry Pi discussion board (http://www.element14.com/community/thread/19738?tstart=0) .

# Raspberry Pi 1st Production Board

- Announced: 29th Feb 2012 - Start of Sale Only[3]
- Credit-card Format
- Initial 10k Batch (All Model-B's) Manufactured in China (Jan/Feb 2012)[4]
- Should look identical to the Raspberry Pi Beta Board below (except different SDCard holder).
- The board has a yellow RCA connector, rather than the black one used in the Beta's.
- Nokia/Qt Development group has donated vouchers for 400 RPi units for developers[5]
- The batch was delayed several weeks due to the RJ45 network connector being substituted for the wrong part[6] and also so the board could undergo compliance testing[7]

# Raspberry Pi Beta Production Board

- Announced: December 2011[8]
- Credit-Card Format

- Manufactured in UK
- Produced 100[9] PCBs
- Characteristic feature of hand-modded correction to PCB [10]
- See the blog post (http://www.raspberrypi.org/archives/482) which includes a video explaining how the production units will differ from the beta boards.

- Pre-production board (beta board) PCB, topside (http://www.raspberrypi.org/wp-content/uploads/2011/12/Picture-002-copy2-e1322775411416.jpg)
- Pre-production board (beta board) PCB, underside (http://www.raspberrypi.org/wp-content/uploads/2011/12/Picture-003-copy2.jpg)
- Pre-production board vs credit-card (http://www.raspberrypi.org/wp-content/uploads/2011/12/Picture-001-copy.jpg)

## eBay Auction

10 of the completed Model-B boards were auctioned on eBay (Started on 1st Jan 2012) [11])

| SerialNo: | #1 | #2 | #3 | #4 | #5 | #6 | #7[12] | #8[13] |
|---|---|---|---|---|---|---|---|---|
| Date: | 11-Jan-2012 | 11-Jan-2012 | 10-Jan-2012 | 10-Jan-2012 | 09-Jan-2012 | 09-Jan-2012 | 08-Jan-2012 | 08-Jan |
| Sold For: | £3,500 | £2,150 | £2,257 | £1,550 | £1,040 | £1,000 | £989 | £1,020 |

Board #7 was anonymously (and generously) donated to Centre for Computing History (http://www.computinghistory.org.uk/) [12] (also spotted here.. (http://twitpic.com/86trra) )!

Board #8 Owned by Tech Blogger, Paul Maunders, see his blog (http://www.pyrosoft.co.uk/blog) for details[13]

# Raspberry Pi Alpha Board

- Announced: August 2011[14]
- Large Format for debugging (Model-B)
- Populated with headers for GPIO, JTAG, DSI, CSI, as well as switches and LEDs for I/O testing.

RPi Alpha Board

- Alpha prototype board, underside (http://www.raspberrypi.org/wp-content/uploads/2011/08/DSCF1809.jpg)

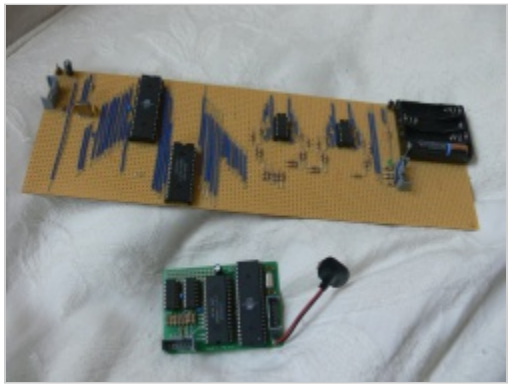
# Raspberry Pi USB Prototype Board

- Announced: May 2011
- The "Computer On A USB Stick" Format
- Included built-in camera
- HDMI one end and single USB the other
- Introduced the RPi Foundation to the world (any earlier links appreciated), featured by BBC Online Video (http://www.bbc.co.uk/news/technology-13292450) .

RPi USB Prototype Board

# Raspberry Pi Concept 2006 edition

- Vero-board Prototype & PCB Version
- Atmel ATmega644 microcontroller clocked at 22.1MHz[15]



Raspberry Pi Concept 2006 edition

# See Also

## Video

- BBC iClick's Peter Price asks whether a £15 computer can solve the programming gap (http://news.bbc.co.uk/1/hi/programmes/click_online/9504208.stm) (6 minutes, 3 June 2011)
- Raspberry Pi's David Braben talks to BBC's Rory Cellan-Jones (http://www.youtube.com/watch?v=pQ7N4rycsy4) (2:28 minutes, 5 May 2011)
- Raspberry Pi community tutorials on YouTube (http://www.youtube.com/RaspberryPiTutorials)

## Audio

- Podcast of a phone interview with Eben about the project and the motivations behind it (http://foundationlibraries.blogspot.com/2011/06/cfl-podcast-eben-upton-raspberry-pi.html) (15 minutes long.) (3 June 2011) Transcription here (http://tomhannen.posterous.com/raspberry-pi-podcast-transcript) .

# References


1. ↑ Upcoming Board Revision (http://www.raspberrypi.org/archives/1929)
2. ↑ New Pi missing D14 (http://www.raspberrypi.org/phpBB3/viewtopic.php?f=63&t=16365)
3. ↑ [3.0] [3.1] Post-Launch - And breathe… (http://www.raspberrypi.org/archives/723)
4. ↑ We've started manufacture! (http://www.raspberrypi.org/archives/509)
5. ↑ Nokia has Raspberry Pi vouchers for 400 Qt developers (http://www.raspberrypi.org/archives/369)
6. ↑ Manufacturing Hiccup (http://www.raspberrypi.org/archives/781)
7. ↑ Compliance testing (http://www.raspberrypi.org/archives/852)
8. ↑ Populated boards: an update on where we are (http://www.raspberrypi.org/archives/422)
9. ↑ We have PCBs! BETA (http://www.raspberrypi.org/archives/389)

10. ↑ (hand-mod) More on the beta boards (http://www.raspberrypi.org/archives/470)
11. ↑ We're auctioning ten beta Raspberry Pis! (http://www.raspberrypi.org/archives/482)
12. ↑ [12.0] [12.1] Beta board bought by anonymous bidder and donated to museum (http://www.raspberrypi.org/archives/503)
13. ↑ [13.0] [13.1] Paul Maunders - Raspberry Pi #8 First Photoshoot (http://www.pyrosoft.co.uk/blog/2012/01/13/raspberry-pi-8-first-photoshoot/)
14. ↑ The alpha boards are here! (http://www.raspberrypi.org/archives/78)
15. ↑ Raspberry Pi – 2006 edition (http://www.raspberrypi.org/archives/264)

| Raspberry Pi | |
|---|---|
| **Startup** | Model Wizard - Buying Guide - SD Card Setup - Basic Setup - Advanced Setup - Beginners Guide - Troubleshooting |
| **Hardware** | Hardware - **Hardware History** - Low-level peripherals - Expansion Boards |
| **Peripherals** | Screens - Cases - Other Peripherals |
| **Software** | Software - Distributions - Kernel - Performance - Programming - VideoCore APIs |
| **Projects** | Tutorials - Guides - Projects - Tasks - DataSheets - Education - Communities |

Retrieved from "http://elinux.org/index.php?title=RPi_HardwareHistory&oldid=182858"
Category: RaspberryPi

---

# RPi Low-level peripherals

From eLinux.org

Back to the Hub.

## Contents



**Hardware & Peripherals:**

*Hardware and Hardware History.*

***Low-level Peripherals*** *and Expansion Boards.*

*Screens, Cases and Other Peripherals.*

# Introduction

In addition to the familiar USB, Ethernet and HDMI ports, the R-Pi offers lower-level interfaces intended to connect more directly with chips and subsystem modules. These GPIO (general purpose I/O) signals on the 2x13 header pins include SPI, I2C, serial UART, 3V3 and 5V power. These interfaces are not "plug and play" and require care to avoid miswiring. The pins use a 3V3 logic level and are not tolerant of 5V levels, such as you might find on a 5V powered Arduino. Not yet software-enabled are the flex cable connectors with CSI (camera serial interface) and DSI (display serial interface), and a serial link inside the HDMI connector called CEC. (consumer electronics control)

# General Purpose Input/Output (GPIO)

General Purpose Input/Output (a.k.a. GPIO) is a generic pin on a chip whose behavior (including whether it is an input or output pin) can be controlled (programmed) through software.

The Raspberry Pi allows peripherals and expansion boards (such as the Rpi Gertboard) to access the CPU by exposing the inputs and outputs.

For further general information about GPIOs, see:the wikipedia article (http://en.wikipedia.org/wiki/GPIO) .

The production Raspberry Pi board has a 26-pin 2.54 mm (100 mil)[1] expansion header, marked as P1, arranged in a 2x13 strip. They provide 8 GPIO pins plus access to I²C, SPI, UART), as well as +3.3 V, +5 V and GND supply lines. Pin one is the pin in the first column and on the bottom row. [2]

**GPIO voltage levels are 3.3 V and are not 5 V tolerant. There is no over-voltage protection on the board** - the intention is that people interested in serious interfacing will use an external board with buffers, level conversion and analog I/O rather than soldering directly onto the main board.

All the GPIO pins can be reconfigured to provide alternate functions, SPI, PWM (http://en.wikipedia.org/wiki/Pulse-width_modulation) , I²C and so. At reset only pins GPIO 14 & 15 are assigned to the alternate function UART, these two can be switched back to GPIO to provide a total of 17 GPIO pins[3]. Each of their functions and full details of how to access are detailed in the chipset datasheet [4].


The layout of the Raspberry Pi Revision 1 P1 pin-header seen from the top, containing pins useable for general purpose I/O. Colour coded to the table. Source (https://sites.google.com/site/burngatehouse/home/drawings/GPIOs2.gif)

Each GPIO can interrupt, high/low/rise/fall/change.[5][6] There is currently no support for GPIO interrupts in the official kernel, howewer a patch exists, requiring compilation of modified source tree.[7] The 'Raspbian "wheezy"' [8] version that is currently recommended for starters already includes GPIO interrupts.

GPIO input hysteresis (Schmitt trigger) can be on or off, output slew rate can be fast or limited, and source and sink current is configurable from 2 mA up to 16 mA. Note that chipset GPIO pins 0-27 are in the same block and these properties are set per block, not per pin. See GPIO Datasheet Addendum - GPIO Pads Control (http://www.scribd.com/doc/101830961/GPIO-Pads-Control2) . Particular attention should be applied to the note regarding SSO (Simultaneous Switching Outputs): to avoid interference, driving currents should be kept as low as possible.

The available alternative functions and their corresponding pins are detailed below. These numbers are in reference to the chipset documentation and may not match the numbers exposed in Linux. Only fully usable functions are detailed, for some alternative functions not all the necessary pins are available for the funtionality to be actually used.

There is also some information on the Tutorial on Easy GPIO Hardware & Software.

Kernel boot messages go to the UART at 115200 bit/s.

**R-Pi PCB Revision 2 UPDATE:** According to Eben at [1] (http://www.raspberrypi.org/archives/1929#comment-31646) the R-Pi Rev.2 board being rolled out starting in September 2012 adds 4 more GPIO on a new connector called P5, and changes some of the existing P1 GPIO pinouts. On Rev2, GPIO_GEN2 [BCM2835/GPIO27] is routed to P1 pin 13, and changes what was SCL0/SDA0 to SCL1/SDA1: SCL1 [BCM2835/GPIO3] is routed to P1 pin 5, SDA1 [BCM2835/GPIO2] is routed to P1 pin 3. Also the power and ground connections previously marked "Do Not Connect" on P1 will remain as connected, specifically: P1-04:+5V0, P1-09:GND, P1-14:GND, P1-17:+3V3, P1-20:GND, P1-25:GND. According to this comment [2] (http://www.raspberrypi.org/archives/2081#comment-33577) (and confirmed in this post [3] (http://www.raspberrypi.org/archives/2233) ) the P1 pinout is not expected to change in future beyond the current Rev.2 layout.

**Header Pinout, top row:**

| Pin Number | Pin Name Rev1 | Pin Name Rev2 | Hardware Notes | Alt 0 Function | Other Alternative Functions |
|---|---|---|---|---|---|
| P1-02 | 5V0 | 5V0 | Supply through input poly fuse | | |
| P1-04 | 5V0 | 5V0 | Supply through input poly fuse | | |

| | | | | | |
|---|---|---|---|---|---|
| P1-06 | GND | GND | | | |
| P1-08 | GPIO 14 | GPIO 14 | Boot to Alt 0 -> | UART0_TXD | ALT5 = UART1_TXD |
| P1-10 | GPIO 15 | GPIO 15 | Boot to Alt 0 -> | UART0_RXD | ALT5 = UART1_RXD |
| P1-12 | GPIO 18 | GPIO 18 | | | ALT4 SPI1_CE0_N<br>ALT5 = PWM0 |
| P1-14 | GND | GND | | | |
| P1-16 | GPIO23 | GPIO23 | | | ALT3 = SD1_CMD<br>ALT4 = ARM_RTCK |
| P1-18 | GPIO24 | GPIO24 | | | ALT3 = SD1_DATA0<br>ALT4 = ARM_TDO |
| P1-20 | GND | GND | | | |
| P1-22 | GPIO25 | GPIO25 | | | ALT4 = ARM_TCK |
| P1-24 | GPIO08 | GPIO08 | | SPI0_CE0_N | |
| P1-26 | GPIO07 | GPIO07 | | SPI0_CE1_N | |

**Header Pinout, bottom row:**

| Pin Number | Pin Name Rev1 | Pin Name Rev2 | Hardware Notes | Alt 0 Function | Other Alternative Functions |
|---|---|---|---|---|---|
| P1-01 | 3.3 V | 3.3 V | 50 mA max (01 & 17) | | |
| P1-03 | GPIO 0 | **GPIO 2** | 1K8 pull up resistor | I2C0_SDA | I2C0_SDA / I2C1_SDA |
| P1-05 | GPIO 1 | **GPIO 3** | 1K8 pull up resistor | I2C0_SCL | I2C0_SCL / I2C1_SCL |
| P1-07 | GPIO 4 | GPIO 4 | | | GPCLK0 |
| P1-09 | GND | GND | | | |
| P1-11 | GPIO17 | GPIO17 | | | ALT3 = UART0_RTS,<br>ALT5 = UART1_RTS |
| P1-13 | GPIO21 | **GPIO27** | | PCM_DIN | ALT5 = GPCLK1 |
| P1-15 | GPIO22 | GPIO22 | | | ALT3 = SD1_CLK ALT4 = ARM_TRST |
| P1-17 | 3.3 V | 3.3 V | 50 mA max (01 & 17) | | |
| P1-19 | GPIO10 | GPIO10 | | SPI0_MOSI | |
| P1-21 | GPIO9 | GPIO9 | | SPI0_MISO | |
| P1-23 | GPIO11 | GPIO11 | | SPI0_SCLK | |
| P1-25 | GND | GND | | | |

| Colour legend |
| --- |
| +5 V |
| +3.3 V |
| Ground, 0V |
| UART |
| GPIO |
| SPI |
| I²C |

KiCad symbol: File:Conn-raspberry.lib

[9]

Pin 3 (SDA0) and Pin 5 (SCL0) are preset to be used as an I²C interface. So there are 1.8 kilohm pulls up resistors on the board for these pins.[10]

Pin 12 supports PWM (http://en.wikipedia.org/wiki/Pulse-width_modulation) .

It is also possible to reconfigure GPIO connector pins P1-7, 15, 16, 18, 22 (chipset GPIOs 4 and 22 to 25) to provide an ARM JTAG interface.[11] However ARM_TMS isn't available on the GPIO connector (chipset pin 12 or 27 is needed). Chipset pin 27 is available on S5, the CSI camera interface however.

It is also possible to reconfigure GPIO connector pins P1-12 and 13 (chipset GPIO 18 and 21) to provide an I2S (a hardware modification may be required[12]) or PCM interface.[13] However, PCM_FS and PCM_DIN (chipset pins 19 and 20) are needed for I2S or PCM.

A second I²C interface (GPIO02_ALT0 is SDA1 and GPIO03_ALT0 is SCL1) and two further GPIOs (GPIO05_ALT0 is GPCLK1, and GPIO27) are available on S5, the CSI camera interface.

## Referring to pins on the Expansion header

The header is referred to as "The GPIO Connector (P1)". To avoid nomenclature confusion between Broadcom signal names on the SoC and pin names on the expansion header, the following naming is highly recommended.

- The expansion header is referred to as "Expansion Header" or "GPIO Connector (P1)"

- Pins on the GPIO connector (P1) are referred to as P1-01, etc.
- Names GPIO0, GPIO1, GPIOx-ALTy, etc. refer to the signal names on the SoC as enumerated in the Broadcom datasheet, where "x" matches BCM2835 number (without leading zero) and "y" is the alternate number column 0 to 5 on page 102-103 of the Broadcom document. For example, depending on what you are describing, use either "GPIO7" to refer to a row of the table, and "GPIO7-ALT0" would refer to a specific cell of the table.
- When refering to signal names, you should modify the Broadcom name slightly to minimize confusion. The Broadcom SPI bus pin names are fine, such as "SPI0_*" and "SPI1_*", but they didn't do the same on the I²C and UART pins. Instead of using "SDA0" and "SCL0", you should use "I2C0_SDA" and "I2C0_SCL"; and instead of "TX" or "TXD" and "RX" or "RXD", you should use "UART0_TXD" and "UART0_RXD".

## Power pins

The maximum permitted current draw from the 3.3 V pins is 50 mA.

Maximum permitted current draw from the 5 V pin is the USB input current (usually 1 A) minus any current draw from the rest of the board.[14]

- Model A: 1000 mA - 500 mA -> max current draw: 500 mA
- Model B: 1000 mA - 700 mA -> max current draw: 300 mA

Be very careful with the 5 V pins P1-02 and P1-04, because if you short 5 V to any other P1 pin you may permanently damage your RasPi. Before probing P1, it's a good idea to strip short pieces of insulation off a wire and push them over the 5 V pins so you don't accidentally short them with a probe.

## GPIO hardware hacking

The complete list of chipset GPIO pins which are available on the GPIO connector is:

0, 1, 4, 7, 8, 9, 10, 11, 14, 15, 17, 18, 21, 22, 23, 24, 25

(on the Revision2.0 RaspberryPis, this list changes to: 2, 3, 4, 7, 8, 9, 10, 11, 14, 15, 17, 18, 22, 23, 24, 25, 27)

As noted above, GPIO00 and 01 (SDA0 and SCL0) have 1.8 kilohm pull-up resistors to 3.3 V.

If 17 GPIOs aren't sufficient for your project, there are a few other signals potentially available, with varying levels of software and hardware (soldering iron) hackery skills:

GPIO02, 03, 05 and 27 are available on S5 (the CSI interface) when a camera peripheral is not connected to that socket, and are configured by default to provide the functions SDA1, SCL1, CAM_CLK and CAM_GPIO respectively. SDA1 and SCL1 have 1K6 pull-up resistors to 3.3 V.

GPIO06 is LAN_RUN and is available on pad 12 of the footprint for IC3 on the Model A. On Model B, it is in use for the Ethernet function.

There are a few other chipset GPIO pins accessible on the PCB but are in use:

- GPIO16 drives status LED D5 (usually SD card access indicator)
- GPIO28-31 are used by the board ID and are connected to resistors R3 to R10.
- GPIO40 and 45 are used by analogue audio and support PWM (http://en.wikipedia.org/wiki/Pulse-width_modulation) . They connect to the analogue audio circuitry via R21 and R27 respectively.
- GPIO46 is HDMI hotplug detect (goes to pin 6 of IC1).
- GPIO47 to 53 are used by the SD card interface. In particular, GPIO47 is SD card detect (this would seem to be a good candidate for re-use). GPIO47 is connected to the SD card interface card detect switch; GPIO48 to 53 are connected to the SD card interface via resistors R45 to R50.

## P2 header

The P2 header is the VideoCore JTAG and used only during the production of the board. It cannot be used as the ARM JTAG [15]. This connector is unpopulated in Rev 2.0 boards.

Useful P2 pins:

- Pin 1 - 3.3V (same as P1-01, 50 mA max current draw across both of them)
- Pin 7 - GND
- Pin 8 - GND

## P3 header

The P3 header, unpopulated, is the LAN9512 JTAG [16].

## P5 header

The P5 header was added with the release of the Revision 2.0 PCB design.

- Pin 1 - 5V
- Pin 2 - 3V3
- Pin 3 - GPIO28
- Pin 4 - GPIO29

- Pin 5 - GPIO30
- Pin 6 - GPIO31
- Pin 7 - GND
- Pin 8 - GND

Note that the connector is intended to be mounted on the bottom of the PCB, so that for those who put the connector on the top side, the pin numbers are swapped. Pin 1 and pin 2 are swapped, pin 3 and 4, etc.

Note that the connector is placed JUST off-grid with respect to the P1 connector.

## P6 header

The P6 header was added with the release of the Revision 2.0 PCB design.

The P6 header can be used to connect a reset button to, which with the PI can be reset.

## Driver support

The Foundation will not include a GPIO driver in the initial release, standard Linux GPIO drivers should work with minimal modification.[17]

The community implemented SPI and I²C drivers [18], which will be integrated with the new Linux pinctrl concept in a later version of the kernel. (On Oct.14,it was already included in the latest raspbian image.)A first compiled version as Linux modules is available to install on the 19/04/2012 Debian image, including 1-wire support[19]. The I²C and SPI driver uses the hardware modules of the microcontroller and interrupts for low CPU usage, the 1-wire support uses bitbanging on the GPIO ports, which results in higher CPU usage.

GordonH[20] wrote a (mostly) Arduino compatible/style WiringPi library (https://projects.drogon.net/raspberry-pi/wiringpi/) in C for controlling the GPIO pins.

A useful tutorial on setting up I²C driver support can be found at Robot Electronics (http://www.robot-electronics.co.uk/htm/raspberry_pi_examples.htm) - look for the downloadable document rpi_i2c_setup.doc

## Graphical User Interfaces

### WebIOPi

WebIOPi (http://code.google.com/p/webiopi/) allows you to control each GPIO with a simple web interface that you can use with any browser. Available in PHP and Python, they both require root access, but Python version serves HTTP itself. You can setup each

GPIO as input or output and change their states (LOW/HIGH). WebIOPi is fully customizable, so you can use it for home remote control. It also work over Internet. UART/SPI/I2C support will be added later. If you need some computing for your GPIO go to code examples below.

# GPIO Code examples

### GPIO Driving Example (C)

Gert van Loo & Dom, has provided (http://www.raspberrypi.org/forum/educational-applications/gertboard/page-4/#p31555) some tested code which accesses the GPIO pins through direct GPIO register manipulation in C-code. (Thanks to Dom for doing the difficult work of finding and testing the mapping.) Example GPIO code:

```
//
//  How to access GPIO registers from C-code on the Raspberry-Pi
//  Example program
//  15-January-2012
//  Dom and Gert
//


// Access from ARM Running Linux

#define BCM2708_PERI_BASE        0x20000000
#define GPIO_BASE                (BCM2708_PERI_BASE + 0x200000) /* GPIO controller */


#include <stdio.h>
#include <string.h>
#include <stdlib.h>
#include <dirent.h>
#include <fcntl.h>
#include <assert.h>
#include <sys/mman.h>
#include <sys/types.h>
#include <sys/stat.h>

#include <unistd.h>

#define PAGE_SIZE (4*1024)
#define BLOCK_SIZE (4*1024)

int  mem_fd;
char *gpio_mem, *gpio_map;
char *spi0_mem, *spi0_map;


// I/O access
volatile unsigned *gpio;


// GPIO setup macros. Always use INP_GPIO(x) before using OUT_GPIO(x) or SET_GPIO_ALT(x,y)
#define INP_GPIO(g) *(gpio+((g)/10)) &= ~(7<<(((g)%10)*3))
#define OUT_GPIO(g) *(gpio+((g)/10)) |=  (1<<(((g)%10)*3))
#define SET_GPIO_ALT(g,a) *(gpio+(((g)/10))) |= (((a)<=3?(a)+4:(a)==4?3:2)<<(((g)%10)*3))
```

```
#define GPIO_SET *(gpio+7)  // sets   bits which are 1 ignores bits which are 0
#define GPIO_CLR *(gpio+10) // clears bits which are 1 ignores bits which are 0

void setup_io();

int main(int argc, char **argv)
{
  int g,rep;

  // Set up gpi pointer for direct register access
  setup_io();

  // Switch GPIO 7..11 to output mode

 /************************************************************************\
  * You are about to change the GPIO settings of your computer.          *
  * Mess this up and it will stop working!                               *
  * It might be a good idea to 'sync' before running this program        *
  * so at least you still have your code changes written to the SD-card! *
 \************************************************************************/

  // Set GPIO pins 7-11 to output
  for (g=7; g<=11; g++)
  {
    INP_GPIO(g); // must use INP_GPIO before we can use OUT_GPIO
    OUT_GPIO(g);
  }

  for (rep=0; rep<10; rep++)
  {
     for (g=7; g<=11; g++)
     {
       GPIO_SET = 1<<g;
       sleep(1);
     }
     for (g=7; g<=11; g++)
     {
       GPIO_CLR = 1<<g;
       sleep(1);
     }
  }

  return 0;

} // main


//
// Set up a memory regions to access GPIO
//
void setup_io()
{
   /* open /dev/mem */
   if ((mem_fd = open("/dev/mem", O_RDWR|O_SYNC) ) < 0) {
      printf("can't open /dev/mem \n");
      exit (-1);
   }

   /* mmap GPIO */

   // Allocate MAP block
   if ((gpio_mem = malloc(BLOCK_SIZE + (PAGE_SIZE-1))) == NULL) {
      printf("allocation error \n");
      exit (-1);
   }
```

```
  // Make sure pointer is on 4K boundary
  if ((unsigned long)gpio_mem % PAGE_SIZE)
    gpio_mem += PAGE_SIZE - ((unsigned long)gpio_mem % PAGE_SIZE);

  // Now map it
  gpio_map = (unsigned char *)mmap(
     (caddr_t)gpio_mem,
     BLOCK_SIZE,
     PROT_READ|PROT_WRITE,
     MAP_SHARED|MAP_FIXED,
     mem_fd,
     GPIO_BASE
  );

  if ((long)gpio_map < 0) {
     printf("mmap error %d\n", (int)gpio_map);
     exit (-1);
  }

  // Always use volatile pointer!
  gpio = (volatile unsigned *)gpio_map;


} // setup_io
```

### GPIO Pull Up/Pull Down Register Example

```
  // enable pull-up on GPIO24&25
  GPIO_PULL = 2;
  short_wait();
  // clock on GPIO 24 & 25 (bit 24 & 25 set)
  GPIO_PULLCLK0 = 0x03000000;
  short_wait();
  GPIO_PULL = 0;
  GPIO_PULLCLK0 = 0;
```

### GPIO Driving Example (Python)

This uses the Python module available at http://pypi.python.org/pypi/RPi.GPIO Any Python script that controls GPIO must be run as root.

```
import RPi.GPIO as GPIO

# Set up the GPIO channels - one input and one output
GPIO.setup(11, GPIO.IN)
GPIO.setup(12, GPIO.OUT)

# Input from pin 11
input_value = GPIO.input(11)

# Output to pin 12
GPIO.output(12, True)

# The same script as above but using BCM GPIO 00..nn numbers
```

```
GPIO.setmode(GPIO.BCM)
GPIO.setup(17, GPIO.IN)
GPIO.setup(18, GPIO.OUT)
input_value = GPIO.input(17)
GPIO.output(18, True)
```

**GPIO Driving Example (Java using the Pi4J Library)**

This uses the Java library available at http://www.pi4j.com/. (Any Java application that controls GPIO must be run as root.)

Please note that the Pi4J library uses the WiringPi GPIO pin numbering scheme [21] [22]. Please see the usage documentation for more details: http://pi4j.com/usage.html

```
public static void main(String[] args) {

    // create gpio controller
    GpioController gpio = GpioFactory.getInstance();

    // provision gpio pin #01 as an output pin and turn off
    GpioPinDigitalOutput outputPin = gpio.provisionDigitalOutputPin(RaspiPin.GPIO_01, "MyLED", PinState.LOW);

    // turn output to LOW/OFF state
    outputPin.low();

    // turn output to HIGH/ON state
    outputPin.high();


    // provision gpio pin #02 as an input pin with its internal pull down resistor enabled
    GpioPinDigitalInput inputPin = gpio.provisionDigitalInputPin(RaspiPin.GPIO_02, "MyButton", PinPullResista

    // get input state from pin 2
    boolean input_value = inputPin.isHigh();
}
```

More complete and detailed examples are included on the Pi4J website at http://www.pi4j.com/.

The Pi4J library includes support for:

- GPIO Control
- GPIO Listeners
- Serial Communication
- I2C Communication
- SPI Communication

### GPIO Driving Example (Java)

This uses the Java library available at https://github.com/jkransen/framboos. Any Java application that controls GPIO must be run as root.

```
public static void main(String[] args) {
  // reading from an in pin
  InPin button = new InPin(8);
  boolean isButtonPressed = button.getValue();
  button.close();

  // writing to an out pin
  OutPin led = new Outpin(0);
  led.setValue(true);
  led.setValue(false);
  led.close();
}
```

### GPIO Driving Example (Java Webapp GPIO web control via http)

This uses the Java Webapp available at https://bitbucket.org/sbub/raspberry-pi-gpio-web-control/overview. You can control your GPIO over the internet. Any Java application that controls GPIO must be run as root.

```
host:~ sb$ curl 'http://raspberrypi:8080/handle?g0=1&g1=0'
{"g1":0,"g0":1}
```

### GPIO Driving Example (Shell script)

This must be done as root. To change to the root user:

```
sudo -i
```

```
#!/bin/sh

# GPIO numbers should be from this list
# 0, 1, 4, 7, 8, 9, 10, 11, 14, 15, 17, 18, 21, 22, 23, 24, 25

# Note that the GPIO numbers that you program here refer to the pins
# of the BCM2835 and *not* the numbers on the pin header.
# So, if you want to activate GPIO7 on the header you should be
# using GPIO4 in this script. Likewise if you want to activate GPIO0
# on the header you should be using GPIO17 here.

# Set up GPIO 4 and set to output
echo "4" > /sys/class/gpio/export
echo "out" > /sys/class/gpio/gpio4/direction
```

```
# Set up GPIO 7 and set to input
echo "7" > /sys/class/gpio/export
echo "in" > /sys/class/gpio/gpio7/direction

# Write output
echo "1" > /sys/class/gpio/gpio4/value

# Read from input
cat /sys/class/gpio/gpio7/value

# Clean up
echo "4" > /sys/class/gpio/unexport
echo "7" > /sys/class/gpio/unexport
```

**GPIO Driving Example (Shell script - take 2)**

You need the wiringPi library from https://projects.drogon.net/raspberry-pi/wiringpi/download-and-install/. Once installed, there is a new command **gpio** which can be used as a **non-root** user to control the GPIO pins.

The man page

```
man gpio
```

has full details, but briefly:

```
  gpio -g mode 17 out
  gpio -g mode 18 pwm

  gpio -g write 17 1
  gpio -g pwm 18 512
```

The **-g** flag tells the **gpio** program to use the BCM GPIO pin numbering scheme (otherwise it will use the wiringPi numbering scheme by default).

The gpio command can also control the internal pull-up and pull-down resistors:

```
  gpio -g mode 17 up
```

This sets the pull-up resistor - however any change of mode, even setting a pin that's already set as an input to an input will remove the pull-up/pull-down resistors, so they may need to be reset.

Additionally, it can export/un-export the GPIO devices for use by other non-root programms - e.g. Python scripts. (Although you may need to drop the calls to GPIO.Setup() in the Python scripts, and do the setup separately in a little shell script, or call the **gpio** program from inside Python).

```
gpio export 17 out
gpio export 18 in
```

These exports GPIO-17 and sets it to output, and exports GPIO-18 and sets it to input.

And when done:

```
gpio unexport 17
```

The export/unexport commands always use the BCM GPIO pin numbers regardless of the presence of the **-g** flag or not.

If you want to use the internal pull-up/down's with the /sys/class/gpio mechanisms, then you can set them after exporting them. So:

```
gpio -g export 4 in
gpio -g mode 4 up
```

You can then use GPIO-4 as an input in your Python, Shell, Java, etc. programs without the use of an external resistor to pull the pin high. (If that's what you were after - for example, a simple push button switch taking the pin to ground.)

A fully working example of a shell script using the GPIO pins can be found at http://project-downloads.drogon.net/files/gpioExamples/tuxx.sh.

**GPIO Driving Example (C)**

This must be done as root. To change to the root user:

```
sudo -i
```

You must also get and install the bcm2835 library, which supports GPIO and SPI interfaces. Details and downloads from http://www.open.com.au/mikem/bcm2835

```
// blink.c
//
// Example program for bcm2835 library
// Blinks a pin on an off every 0.5 secs
//
// After installing bcm2835, you can build this
// with something like:
// gcc -o blink -l rt blink.c -l bcm2835
// sudo ./blink
//
// Or you can test it before installing with:
```

```
// gcc -o blink -l rt -I ../../src ../../src/bcm2835.c blink.c
// sudo ./blink
//
// Author: Mike McCauley (mikem@open.com.au)
// Copyright (C) 2011 Mike McCauley
// $Id: RF22.h,v 1.21 2012/05/30 01:51:25 mikem Exp $

#include <bcm2835.h>

// Blinks on RPi pin GPIO 11
#define PIN RPI_GPIO_P1_11

int main(int argc, char **argv)
{
    // If you call this, it will not actually access the GPIO
    // Use for testing
//    bcm2835_set_debug(1);

    if (!bcm2835_init())
        return 1;

    // Set the pin to be an output
    bcm2835_gpio_fsel(PIN, BCM2835_GPIO_FSEL_OUTP);

    // Blink
    while (1)
    {
        // Turn it on
        bcm2835_gpio_write(PIN, HIGH);

        // wait a bit
        delay(500);

        // turn it off
        bcm2835_gpio_write(PIN, LOW);

        // wait a bit
        delay(500);
    }

    return 0;
}
```

**GPIO Driving Example (Perl)**

This must be done as root. To change to the root user:

```
sudo su -
```

Supports GPIO and SPI interfaces. You must also get and install the bcm2835 library. Details and downloads from http://www.open.com.au/mikem/bcm2835 You must then get and install the Device::BCM2835 perl library from CPAN http://search.cpan.org/~mikem/Device-BCM2835-1.0/lib/Device/BCM2835.pm

```
use Device::BCM2835;
use strict;
```

```
# call set_debug(1) to do a non-destructive test on non-RPi hardware
#Device::BCM2835::set_debug(1);
Device::BCM2835::init()
 || die "Could not init library";

# Blink pin 11:
# Set RPi pin 11 to be an output
Device::BCM2835::gpio_fsel(&Device::BCM2835::RPI_GPIO_P1_11,
                           &Device::BCM2835::BCM2835_GPIO_FSEL_OUTP);

while (1)
{
    # Turn it on
    Device::BCM2835::gpio_write(&Device::BCM2835::RPI_GPIO_P1_11, 1);
    Device::BCM2835::delay(500); # Milliseconds
    # Turn it off
    Device::BCM2835::gpio_write(&Device::BCM2835::RPI_GPIO_P1_11, 0);
    Device::BCM2835::delay(500); # Milliseconds
}
```

## GPIO Driving Example (C#)

RaspberryPiDotNet library is available at https://github.com/cypherkey/RaspberryPi.Net/. The library includes a GPIOFile and GPIOMem class. The GPIOMem requires compiling Mike McCauley's bcm2835 library above in to a shared object.

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using RaspberryPiDotNet;
using System.Threading;

namespace RaspPi
{
    class Program
    {
        static void Main(string[] args)
        {
            // Access the GPIO pin using a static method
            GPIOFile.Write(GPIO.GPIOPins.GPIO00, true);

            // Create a new GPIO object
            GPIOMem gpio = new GPIOMem(GPIO.GPIOPins.GPIO01);
            gpio.Write(false);
        }
    }
}
```

**GPIO Driving Example (Ruby)**

This example uses the WiringPi Ruby Gem: http://pi.gadgetoid.co.uk/post/015-wiringpi-now-with-serial which you can install on your Pi with "gem install wiringpi"

```
MY_PIN = 1

require 'wiringpi'
io = WiringPi::GPIO.new
io.mode(MY_PIN,OUTPUT)
io.write(MY_PIN,HIGH)
io.read(MY_PIN)
```

# MIPI CSI-2

On the production board[23], the Raspberry Pi Foundation design brings out the MIPI CSI-2 (Camera Serial Interface[24]) to a 15-way flat flex connector S5, between the Ethernet and HDMI connectors. A compatible camera has been discussed as working in tests and is planned for release at a later date.[25].

# DSI

On the production board, the Raspberry Pi Foundation design brings out the DSI (Display Serial Interface[26]) to a 15-way flat flex connector labelled S2, next to Raspberry Pi logo. It has two data lanes and a clock lane, to drive a possible future LCD screen device. Some smart phone screens use DSI[27].

# CEC

HDMI-CEC (Consumer Electronics Control for HDMI) is supported by hardware but some driver work will be needed and currently isn't exposed into Linux userland. Eben notes that he has seen CEC demos on the Broadcom SoC they are using.

libCEC with Raspberry Pi support has been included in OpenELEC and will be included in Raspbmc RC4.[28]

For more information about HDMI-CEC and what you could do with it on the Raspberry Pi please see the CEC (Consumer Electronics Control) over HDMI article.

# References


1. ↑ http://www.raspberrypi.org/forum/features-and-requests/easy-gpio-hardware-software/page-3/#p31907
2. ↑ http://www.raspberrypi.org/archives/384
3. ↑ http://www.raspberrypi.org/archives/384
4. ↑ http://www.raspberrypi.org/wp-content/uploads/2012/02/BCM2835-ARM-Peripherals.pdf
5. ↑ http://www.raspberrypi.org/archives/384#comment-5217
6. ↑ http://www.raspberrypi.org/wp-content/uploads/2012/02/BCM2835-ARM-Peripherals.pdf
7. ↑ http://www.raspberrypi.org/phpBB3/viewtopic.php?f=44&t=7509
8. ↑ http://www.raspberrypi.org/downloads
9. ↑ http://www.raspberrypi.org/forum/projects-and-collaboration-general/gpio-header-pinout-clarification/page-2
10. ↑ http://www.raspberrypi.org/forum/features-and-requests/easy-gpio-hardware-software/page-6/#p56480
11. ↑ http://www.raspberrypi.org/forum?mingleforumaction=viewtopic&t=1288.1
12. ↑ Forum:Sad about removal of I2S. Why was this change made? (http://www.raspberrypi.org/forum/features-and-requests/sad-about-removal-of-i2s-why-was-this-change-made)
13. ↑ http://www.raspberrypi.org/forum?mingleforumaction=viewtopic&t=1288.2
14. ↑ http://www.raspberrypi.org/forum?mingleforumaction=viewtopic&t=1536#postid-21841
15. ↑ http://www.raspberrypi.org/phpBB3/viewtopic.php?f=24&t=5894
16. ↑ http://www.raspberrypi.org/phpBB3/viewtopic.php?f=24&t=5894
17. ↑ http://www.raspberrypi.org/forum?mingleforumaction=viewtopic&t=1278.0
18. ↑ http://www.bootc.net/projects/raspberry-pi-kernel/
19. ↑ http://www.raspberrypi.org/phpBB3/viewtopic.php?p=86172#p86172
20. ↑ http://www.raspberrypi.org/forum/general-discussion/wiring-for-the-raspberry-pis-gpio
21. ↑ http://pi4j.com/usage.html#Pin_Numbering
22. ↑ https://projects.drogon.net/raspberry-pi/wiringpi/pins/
23. ↑ http://www.raspberrypi.org/wp-content/uploads/2012/04/Raspberry-Pi-Schematics-R1.0.pdf
24. ↑ http://www.mipi.org/specifications/camera-interface
25. ↑ http://www.raspberrypi.org/forum/projects-and-collaboration-general/complex-camera-peripherials#p72602
26. ↑ http://www.mipi.org/specifications/display-interface
27. ↑ http://en.wikipedia.org/wiki/Display_Serial_Interface
28. ↑ http://blog.pulse-eight.com/2012/08/01/libcec-1-8-0-a-firmware-upgrade-and-raspberry-pi-support/

| Raspberry Pi | |
|---|---|
| **Startup** | Model Wizard - Buying Guide - SD Card Setup - Basic Setup - Advanced Setup - Beginners Guide - Troubleshooting |
| **Hardware** | Hardware - Hardware History - **Low-level peripherals** - Expansion Boards |
| **Peripherals** | Screens - Cases - Other Peripherals |
| **Software** | Software - Distributions - Kernel - Performance - Programming - VideoCore APIs |
| **Projects** | Tutorials - Guides - Projects - Tasks - DataSheets - Education - Communities |

# RPi Expansion Boards

From eLinux.org

Back to the Hub.

**Hardware & Peripherals:**

*Hardware and Hardware History.*

*Low-level Peripherals and* ***Expansion Boards****.*

*Screens, Cases and Other Peripherals.*

# Contents

# Introduction

On the Raspberry Pi, there are several connections which can be used for expansion:

- The Rpi GPIO (General Purpose Input/Output) pins are exposed, that means that expansion boards are able to talk directly to the CPU.
- The DSI connector will allow low-level interfacing with LCDs and other displays.
- The CSI connector will allow camera modules to be added in future.

# Current expansion boards

## AFLEX Robotic Board

AFLEX Robotic Board (http://www.web4robot.com) is dual motor control and data acquisition board with I2C and Serial interfaces. The board provides 2 motor control drivers with max current up to 3.5A, 8-bits data port with each pin setup as digital input /output or analog input, 10-bits ADC with up to 5 analog channels, 4 inputs for the sensor connections, infrared (IR) remote control. The board provides direct connection to Raspberry Pi.

## ADC Pi, Delta Sigma Pi and RTC Pi

ADC Pi from AB Electronics UK brings 8 channel 15 bit analogue sampling to the Raspberry Pi platform. A buffered 5V i2c bus and stackable headers make this a useful addition to your Raspberry Pi project. The Delta Sigma Pi is a 18 bit Delta Sigma ADC board with 8 inputs, a buffered 5V i2c bus and stackable headers. The RTC Pi is a Real Time Clock module with a buffered 5V i2c bus and stackable headers. http://www.abelectronics.co.uk/default.aspx (see also: setup tutorial)

## Arduino Shield and Raspberry Pi

a little board with Arduino socket and Raspberry Pi socket you can power the boards with 12Volt or 5Volt http://www.progetti-hw-sw.it/raspberry.htm

## Buffer Board

Buffer Board (http://www.thebox.myzen.co.uk/Raspberry/Buffer_Board.html) How to make a Pi Buffer on Veroboard. Each of the 14 outputs can drive up to 500mA using a Darlington array.

## Buzzberry Buzz-Board Interface

Buzzberry (http://fortito.com) is an interface board enabling expansion using the Buzz-Board modular system designed primarily for educational use.

## CJE/4D RTC

On 2nd January 2012, CJE/4D announced that they have a real-time clock (RTC) expansion board in the works: [1] (http://www.raspberrypi.org/forum/features-and-requests/rtc)

## GertBoard

*main page: RPi Gertboard*

This board is a buffer between your Rpi and the real world, use it to flash LEDs on and off, drive motors, run sensors and all that other fun stuff.[1]

## GELI 'jelly'(GPIO Experimenter and Lab Interface Board)

Raspberry Geli Board (http://www.fulburncams.gb.net/) Extends the GPIO and provides I2C, D2A/A2D, DC Motor(L298), RS232, Realtime Clock (DS1307), 1-wire and prototyping area on 150 * 100mmm PCB.

## GPIO isolated expansion/RTC

UT Electronics (http://www.utelectronics.com) is developing a expansion board containing a fully isolated 16-I/O I2C GPIO expander and RTC, with extensive options for further expansion. C and Python libraries will be available at launch. The board will probably be sold as a kit, with SMT components already in place.

Update: According to their website, the realities of life prevent them from bringing the product to market. They are hoping someone will pick up the ball. They have released the PCB layout and all documentation for free on their website.

## Heber x10i

Heber Ltd (http://www.heber.co.uk/gaming-amusement/xline/x10i-overview/) X10i integrates real time I/O into a RPi control system. A secure real-time controller that permits control over multiple and different types of inputs and outputs, and uses the USB 2.0 communication standard. It is an all in one plug and play board for developing LED drivers, control, sensing of different switches, and driving stepper motors. Exclusive features include a real time clock, battery backed static ram, a Dallas chip (for unique board identification), 2 serial communication ports, a powerful audio amp and a independent dedicated on board processor.

Heber now offers drivers in C/C++ and Linux to make it even easier for programmers, inventors and developers to connect with the outside world using X10i and their Raspberry Pi.

## aLaMode

“À la mode” (http://wyolum.com/?p=824) is an Arduino clone specifically designed to interface with the Raspberry Pi. You can of course connect a standard Arduino to a Pi USB port using a cord, but when you want a turnkey solution, how about an Arduino compatible “plate” (shield) that fits right on top of the Raspberry Pi with direct access to GPIO port? The Linux side handles all of the displays, human interfaces, and number crunching. The low power Arduino compatible “à la mode” board handles sensors, servos/motors, and provides a highly accurate real time clock.

## LedBorg

LedBorg (http://www.piborg.org/ledborg) is an ultra bright RGB LED add on board for your Raspberry Pi. Capable of 27 colour combinations and controllable from either a GUI or the command line, it can also perform patterns. Small board which connects directly to the GPIO header.

## PiBorg

PiBorg (http://www.piborg.org) is a Robotics add on board which adds the ability to control motors - from small to large (including DC motors, Stepper motors, BLDC motors and Solenoids) from your Raspberry Pi. It supports feedback via Encoders and Potentiometers, allowing closed loop (servo) control of motors to set positions, velocities and accelerations and it is capable of monitoring drive current and voltages. The loop is

PID based and as PiBorg is an Open Source project (http://sourceforge.net/p/piborg/wiki/Home/) , you may change the code as you please. It has the ability to drive 10A motors and more, so you'll never be left underpowered with this board!

## Pi Crust

picru.st (http://picru.st) is a very compact and cheap breakout board for your Raspberry Pi that allows easy access to the Pi's pins, grouping them into a logical order and adding clear labeling. Small and simple.

## Piface

Piface (http://piface.openlx.org.uk) is simpler than the RPi Gertboard (it's aimed at less experienced users), but also intended to connect to PCs and Android to be platform agnostic

## Pi232 RS232 board

Pi232 (http://www.logicethos.com/Blog/2012-06-21:_Pi232_Raspberry_Pi_RS232_boards) is an RS232 expansion board that plugs onto GPIO connector.

## PiDuino

Youtube video (http://www.youtube.com/watch?v=u5c1Dfaf57g) showing prototype board

## Pi Plates

Adafruit Industries (http://www.adafruit.com) announced in March 2012 the intention of making expansion boards for the Raspberry Pi under the "Pi Plate" name.[2].

The first board available is a prototyping board (http://adafruit.com/products/801) that overlays the Raspberry Pi via a long plug-in header. It has screw terminals for all the Pi GPIO lines.

## PiPLUS Multifunction I/O Extension Board

PiPLUS Multifunction I/O Extension Board (http://www.web4robot.com) is designed as versatile, general-purpose data acquisition and control module. Key Features: Battery-backed Real Time Clock; 3.5A DC motor driver chip; 8-bits digital I/O Data Port; 10-bits ADC with 4 analog channels; DAC; 4 high power outputs; 4 PWM outputs; IR Remote

Control input; 2 user's buttons; AVR ATMEGA328P microcontroller with a preloaded Arduino bootloader and Arduino Shields connectors; 3V - 5V buffers for I2C, SPI and Serial interfaces; Power supply with 5V and 3V regulators.

PiPLUS board also works as a bridge between Raspberry Pi and ARDUINO and provides a direct connection to Arduino Shields. You can use the standard ARDUINO environment and graphical interface for Windows or Linux for software development and ATMEGA328P microcontroller programming.

## Pi Tin

Not yet tested, comments welcome Project files for Eagle here: [2] (http://www.delong.com/Raspbery%20PI/) Schematic and Board images: [3] (http://elinux.org/File:PiTin_Schematic.png) [4] (http://elinux.org/File:PiTin_Boardpng.png) This board uses Microchip 16-pin GPIO expanders driven by SPI to provide up to 256 additional GPIO pins at a very low cost. Optionally, it can supply power for the board and the Raspberry PI.

The board can be made in a stackable manner allowing you to also place additional peripherals on the GPIO connector. It makes non-exclusive use of all four SPI pins as well as exclusive use of the CE0 Pin.

If you install (and power) the power supply components, the board will supply up to 1A at 5VDC. This is not enough to power all GPIO pins on a fully populated board, but in most applications should be sufficient to power the RPI and a reasonable number of GPIOs. An external power supply should be used for higher-power applications. This board should never be powered from the RPI as even one of the chips can draw more than the RPI can provide.

The power supply is quite flexible and will accept anything from 8-25VAC or 8-42VDC. It is based on a Recom module which provides a switching power supply in a form factor that is a drop-in replacement for 7805 series TO-220 linear regulators.

The 8 chips can be had for about $4@ or less and the power supply components total about $15. A fully populated board is about $49+PCB, $31+PCB for 64 GPIO pins.

You can have the PCB made at a variety of fabricators. [5] (http://batchpcb.com) does very nice work and is hobbyist friendly at very reasonable prices.

## Pi-Wire

Pi-Wire (http://go.je/18z) Homelabs are developing options for connection of a 1-wire bus to the RaspberryPi. Boards include SPI breakout connections for future boards.

## Ponte

PONTE initial post (http://omer.me/2012/05/introducing-ponte/) An arduino shield bridge from Omer and SKPang

## Quick2Wire GPIO Expansion Board

Quick2Wire GPIO board and experimenters kit (http://quick2wire.com) is an extension board for the Raspberry Pi that has level converters to allow the driving of TTL and real world devices such as LED's and switches. It will also provide an experimenters kit, a software framework and a number of tutorials.

## Raspberry Pi IO Interface

forum thread (http://dangerousprototypes.com/forum/viewtopic.php?f=56&t=3996) showing 'paper mockup'. Another buffered IO expander.

## Relay board and Raspberry Pi GPIO

a board with 8 relays and 8 input with a Raspberry Pi socket you can power the boards with 12Volt, the board has a DIN rail container http://www.progetti-hw-sw.it/raspberry.htm

## MiniPiio L293D

[6] (http://zuzebox.wordpress.com/2012/09/07/minipiio-l293d-board-v0-10/) is a small (50x40mm) add-on board which provides a dual H-Bridge DC-Motor circuit using the venerable L293D chip.

## MiniPiio Relay2

[7] (http://zuzebox.wordpress.com/2012/09/07/minipiio-relay2-board-v0-10/) is a small (50x40mm) add-on board which provides a two 1A DPCO Relays. Each relay has a set of screw terminals for easy wiring.

## MiniPiio DIO16

MiniPiio DIO16 (http://zuzebox.wordpress.com/2012/06/24/minipiio-dio16-v0-10/) is a small (50x40mm) add-on board which provides an additional 16-channels of Digital Input/Outputs for the RPi. It can use either a MCP23S17 (SPI) or MCP23017 (I2C) Port Expander.

## MiniPiio RS232

MiniPiio RS232 (http://zuzebox.wordpress.com/2012/06/24/minipiio-rs232-v0-10/) is a small (50x40mm) add-on board which provides a basic RS232 to TTL interface for the RPi. It uses a 3.3V MAX3232 to provide the RS232 interface.

## MiniPiio ULN2803

MiniPiio ULN2803 (http://zuzebox.wordpress.com/2012/06/24/minipiio-uln2803-v0-10/) is a small(50x40mm) add-on board which connects a ULN2803 Darlington Driver chip to the RPi's GPIO allowing the RPi to control electronic circuits which require more current to drive them.

## RPi MIDI Breakout Board

RPi MIDI Breakout Board (http://zuzebox.wordpress.com/2012/03/18/midi-breakout-board-for-raspberry-pi-v0-10/) is a simple MIDI breakout board for the Raspberry Pi using the hardware UART from the RPi's expansion interface

## RPi Protoboard SM

RPi Protoboard SM (http://zuzebox.wordpress.com/2012/06/25/raspberry-pi-protoboard-sm-v0-10/) is a simple prototype board for the Raspberry Pi
another link (http://www.designspark.com/knowledge/raspberry-pi-prototype-board-files) to the same project?

## RPi "UserPort"

RPi UserPort (http://zuzebox.wordpress.com/2012/03/14/userport-for-raspberry-pi-v0-10/) is a digital and analogue I/O board for the Raspberry Pi. UserPort replicates the original BBC Micros digital User Port and Analogue Port but uses more modern components such as the MCP23S17 16-ch GPIO and MCP3204 4-ch 12-bit ADC.

## rpi_serial

BitWizard has a Raspberrypi serial breakout board (http://www.bitwizard.nl/wiki/index.php/Raspberry_pi_expansion_system_page#expansion_boards) . It breaks out four serial buses from the GPIO port.

BitWizard then has a series SPI (or I2C) expansion boards that can be daisy-chained off the SPI (or I2C) buses of the expansion board. A virtually unlimited number of expansion boards can be connected. Expansion boards are available that drive a simple 16x2 text LCD, more general purpose IOs, servos, temperature sensors, relays, optocouplers etc.

## RPi RS232 Breakout Board

RPi RS232 Breakout Board (http://zuzebox.wordpress.com/2012/02/07/rs232-breakout-board-v0-20-for-raspberry-pi/) is a simple RS232 breakout board for the Raspberry Pi

## 1-Wire Masters from Sheepwalk Electronics

Sheepwalk Electronics (http://www.sheepwalkelectronics.co.uk/) are currently developing a series of expansion boards for the Raspberry Pi to interface your Raspberry Pi to a Dallas/Maxim 1-Wire network. The range includes a simple passive "master" (called the RPI1) to allow easy use of the kernel 1-Wire driver, a single channel I2C master based around the DS2482-100 (called the RPI2) and an 8 channel I2C master based around the DS2482-800 (the RPI3). The RPI1 and RPI2 modules are now available on our website. The RPI3 8 channel master is still under development. The modules are all available as a bare PCB, kit of parts or fully assembled/tested.

## Slice of Pi

Slice of Pi (http://shop.ciseco.co.uk/slice-of-pi/) Ciseco have produced a convienient small break out board for the Raspberry PI. XBee style connector for XRF / XBee / RN-XV / XBT / RF-BEE etc. Has the SPI and I2C pins on one standard 8 way header and the Raspberry PI's 8 general purpose I/O pins on another for easy access. Comes as a kit of parts that needs to be soldered. Construction is very easy and suitable for children with basic soldering skills.

## XBee ZB SMT Backpack

The Raspberry Pi XBee ZB SMT Backpack (http://www.bootc.net/archives/2012/06/20/raspberry-pi-xbee-smt-backpack/) by bootc is a carrier board for Digi XBee ZB SMT (http://www.digi.com/products/wireless-wired-embedded-solutions/zigbee-rf-modules/zigbee-mesh-module/xbee-smt) modules. These are different to the normal XBee modules because they are surface mount and additionally can interface to a host using SPI as well as serial. The backpack also features 3 LEDs for status signals as well as two FTDI headers (one for the RPi and one for the XBee), as well as being able to host a 'normal' XBee module (though of course you can't use SPI with those).

## RPi Servo board

The Raspberry Pi Servo board (http://electronics.chroma.se/rpisb.php) by adent is a small expansion board for connecting up to eight RC servos and/or an ESC (Electronic Speed Controller) to the RPi. It has a pass through for the GPIO port and it uses the serial line in it for commands. The interface is a simple ASCII-protocol via the serial port. It also has five own GPIO-pins that is not supported by card firmware yet. Firmware is released as

GPL. Youtube clip of first prototype (http://youtu.be/_W1WXnL9MeA) . Working on an alternate firmware to connect DHT22/11 humidity/temperature sensors to the board instead.

## Raspy Juice Exp Board

Raspy Juice (http://2-watt-elements.myshopify.com/) by 2-Watt Elements is an experimental board that supplies the Raspberry Pi with +5V through the GPIO header. With its wide input voltage range (6~23V), the buck regulator can be powered by batteries, 12V Adapters, solar, etc. Other features are the RS232 level console port, PCF8523 RTC, and an expansion ATmega168A microcontroller as an I2C slave. This latter MCU has interfaces of an RS485 port, an additional RS232 port, 4 RC-servo ports and unused-pins expansion header. The MCU firmware is updateable through the I2C interface. Hardware details are in http://code.google.com/p/raspy-juice/wiki/HardwareDescription

## pyMCU

pyMCU (http://www.pymcu.com) is a python controlled microcontroller that works with the Raspberry Pi, connects to the USB port and uses the pyMCU python module and pyserial to control the microcontroller in your python script. You can communicate with i2c, spi, serial, and one wire devices, software configurable pulse in / out functions, has 13 Digital IO Pins, 6 10-bit Analog Pins, 5 10-Bit PWM Pins, blink LEDs, control servos and motors, read various sensors, built-in functions for sound generation: arbitrary frequency generator, misc. sound / tone generator, DTMF generator. PyBootloader - python script for uploading new firmware versions or your own microcontroller code. Check out some of the Tutorials (http://pymcu.com/Tutorials.html) and Examples (http://pymcu.com/Examples.html)

## RPi CC1101-OneWire-Clock extension

The RPi-COC board (http://busware.de/tiki-index.php?page=COC) from busware.de (http://busware.de) adds Onewire, a Sub-1 GHz RF Transceiver, RTC and an EEPROM mainly for smart home automation. The Onewire RJ11 port is driven by a DS2482 chip supported by 5V levelshifter and strong pullup. The DS1339-RTC is powered by CR2032 battery or on-board 60mF supercap. The 2Kbit EEPROM (at24c02) is mainly to hold board specific config data. The CC1101 Sub-1 GHz RF Transceiver is controlled by an atmega1284 to pre-process air data. It is connected to RPis UART and contains a avr109-bootloader for firmware updates. The popular culfw-firmware (http://culfw.de) lets you interact with FS20, Homematic, Intertechno or similar actors and sensors - easily using FHEM (http://fhem.de) -home automation server. In addition a secured 5V power socket for external power supplies is provided.

### RFM12Pi - Wireless OpenEnergyMonitor Base-station

Add's RFM12B wireless (868/433/912Mhz) RF transceiver capability to the Raspberry Pi. The RFM12pi has got an-board ATtiny84 microcontroller pre-loaded with firmware to decode RFM12B packets from JeeNode (http://jeelabs.org) and OpenEnergyMonitor (http://openenergymonitor.org) sensor modules onto Raspberry Pi's internal serial UART. Designed to be used with emoncms (http://emoncms.org) running on a Raspberry Pi web-server to make a low power energy, temperature and other environmental data logging and visualisation server. Developed as part of the openenergymonitor.org (http://openenergymonitor.org) project. For more info see introductory blog (http://openenergymonitor.blogspot.com/2012/11/raspberry-pi-emonbase.html) post, overview documentation page (http://openenergymonitor.org/emon/emonbase/raspberrypi) and technical documentation wiki (http://wiki.openenergymonitor.org/index.php?title=Raspberry_Pi) .

# References


1. ↑ http://www.raspberrypi.org/archives/411
2. ↑ http://www.adafruit.com/blog/2012/03/14/adafruit-experimenting-with-pi-plates-for-raspberry_pi-shields-for-the-raspberry-pi/


| Raspberry Pi | |
|---|---|
| **Startup** | Model Wizard - Buying Guide - SD Card Setup - Basic Setup - Advanced Setup - Beginners Guide - Troubleshooting |
| **Hardware** | Hardware - Hardware History - Low-level peripherals - **Expansion Boards** |
| **Peripherals** | Screens - Cases - Other Peripherals |
| **Software** | Software - Distributions - Kernel - Performance - Programming - VideoCore APIs |
| **Projects** | Tutorials - Guides - Projects - Tasks - DataSheets - Education - Communities |

# RPi schematic differences

From eLinux.org

Back to RPi_Hardware

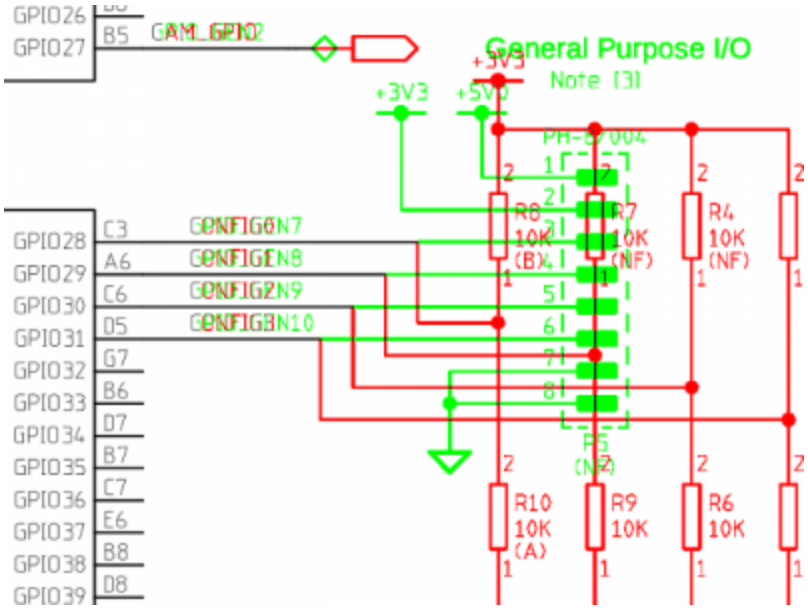
# Differences between the Rev1.0 and Rev2.0 RaspberryPi schematics

The RaspberryPi Foundation has now provided official PDF schematics of both the Rev1.0 and Rev2.0 RaspberryPi boards - links can be found here. This blog post (http://www.raspberrypi.org/archives/1929) provides an overview of the changes between the two versions, but I wanted to provide a much more "definitive" version of the differences.

## Differences in graphical form

So I loaded up GIMP (http://www.gimp.org) (my image editor of choice), imported the PDFs into that, and through careful manipulation managed to graphically separate out the differences between the two sets of schematics! In the images linked below, parts that are coloured **black** are common to *both* versions of the schematics, parts that are coloured **red** are *only* on the Rev1.0 version of the schematics, and parts that are coloured **green** are *only* on the Rev2.0 version of the schematics. I'm really pleased with how well it worked, it makes it *really* easy to spot the differences at a glance (although for full readability you'll want to refer back to the original PDFs).

Here's a small excerpt (from page 2) so you can see what I mean:




Here's download links to the full-size (4945 x 3496) images for each of the five pages in the schematics:

- Differences for page 1
- Differences for page 2
- Differences for page 3
- Differences for page 4
- Differences for page 5

# Differences in textual form

So using these above images, it was easy to update my schematics CSV files, which means I can also provide a definitive overview of the differences between the schematics revsions in 'diff' (http://en.wikipedia.org/wiki/Diff) format:

```
"Type","Component","Connection","Pin","PinName","Signal","Sheet","Location","ComponentType","Value","PartNumb
3a4,5
> "component","IC2A",,,,,1,"F3","integrated circuit","RAM","K4P2G324ED","A","BCM2835 PWR1","front",
> "component","IC2A",,,,,1,"F3","integrated circuit","RAM","K4P4G324EB","B","BCM2835 PWR1","front",
211a214,216
> "power",,,,,"+3V3",1,"D8",,,,,"BCM2835 SMPS",,
> "power",,,,,"GND",1,"D9",,,,,"BCM2835 SMPS",,
> "power",,,,,"GND",1,"E10",,,,,"BCM2835 SMPS",,
219c224,227
< "component","R15",,,,,1,"E9","resistor","100K",,,"BCM2835 SMPS","front",
---
> "component","R15",,,,,1,"E9","resistor","10K",,,"BCM2835 SMPS","front",
> "component","C97",,,,,1,"E9","capacitor","100n",,,"BCM2835 SMPS","front",
> "component","D18",,,,,1,"D8","diode (signal)",,"BAV99",,"BCM2835 SMPS","front",
> "component","P6",,,,,1,"D9","header","Reset","PH-2/002","NF","BCM2835 SMPS","front",
259a268,269
```

```
> "signal",,"P6",1,,"RUN",1,"D8",,,,,"BCM2835 SMPS",,"data"
> "signal",,"P6",2,,"GND",1,"D8",,,,,"BCM2835 SMPS",,"ground"
270c280
< "power",,,,,"+3V3",2,"H4",,,,,"BCM2835 HDMI",,
---
> "power",,,,,"+5V0_HDMI",2,"H4",,,,,"BCM2835 HDMI",,
371c381
< "signal",,"IC2","C4","GPIO21","GPIO_GEN2",2,"B5",,,,,"BCM2835 IO1",,"data"
---
> "signal",,"IC2","C4","GPIO21","CAM_GPIO",2,"B5",,,,,"BCM2835 IO1",,"data"
377c387
< "signal",,"IC2","B5","GPIO27","CAM_GPIO",2,"B6",,,,,"BCM2835 IO1",,"data"
---
> "signal",,"IC2","B5","GPIO27","GPIO_GEN2",2,"B6",,,,,"BCM2835 IO1",,"data"
383c393,394
< "power",,,,,"GND",2,"D8",,,,,"BCM2835 IO2",,
---
> "power",,,,,"+5V0",2,"C6",,,,,"BCM2835 IO2",,
> "power",,,,,"GND",2,"C7",,,,,"BCM2835 IO2",,
391,398c402
< "component","R8",,,,,2,"C7","resistor","10K",,"B","BCM2835 IO2","front",
< "component","R7",,,,,2,"C7","resistor","10K",,"NF","BCM2835 IO2","front",
< "component","R4",,,,,2,"D7","resistor","10K",,"NF","BCM2835 IO2","front",
< "component","R5",,,,,2,"D7","resistor","10K",,"NF","BCM2835 IO2","front",
< "component","R10",,,,,2,"C7","resistor","10K",,"A","BCM2835 IO2","front",
< "component","R9",,,,,2,"C7","resistor","10K",,,"BCM2835 IO2","front",
< "component","R6",,,,,2,"D7","resistor","10K",,,"BCM2835 IO2","front",
< "component","R3",,,,,2,"D7","resistor","10K",,,"BCM2835 IO2","front",
---
> "component","P5",,,,,2,"C7","header","Additional I/O","PH-8/004","NF","BCM2835 IO2","back",
411,414c415,418
< "signal",,"IC2","C3","GPIO28","CONFIG0",2,"B7",,,,,"BCM2835 IO2",,"data"
< "signal",,"IC2","A6","GPIO29","CONFIG1",2,"B7",,,,,"BCM2835 IO2",,"data"
< "signal",,"IC2","C6","GPIO30","CONFIG2",2,"B7",,,,,"BCM2835 IO2",,"data"
< "signal",,"IC2","D5","GPIO31","CONFIG3",2,"B7",,,,,"BCM2835 IO2",,"data"
---
> "signal",,"IC2","C3","GPIO28","GPIO_GEN7",2,"B7",,,,,"BCM2835 IO2",,"data"
> "signal",,"IC2","A6","GPIO29","GPIO_GEN8",2,"B7",,,,,"BCM2835 IO2",,"data"
> "signal",,"IC2","C6","GPIO30","GPIO_GEN9",2,"B7",,,,,"BCM2835 IO2",,"data"
> "signal",,"IC2","D5","GPIO31","GPIO_GEN10",2,"B7",,,,,"BCM2835 IO2",,"data"
436a441,448
> "signal",,"P5",1,,"+5V0",2,"C6",,,,,"BCM2835 IO2",,"power"
> "signal",,"P5",2,,"+3V3",2,"C7",,,,,"BCM2835 IO2",,"power"
> "signal",,"P5",3,,"GPIO_GEN7",2,"C7",,,,,"BCM2835 IO2",,"data"
> "signal",,"P5",4,,"GPIO_GEN8",2,"C7",,,,,"BCM2835 IO2",,"data"
> "signal",,"P5",5,,"GPIO_GEN9",2,"C7",,,,,"BCM2835 IO2",,"data"
> "signal",,"P5",6,,"GPIO_GEN10",2,"C7",,,,,"BCM2835 IO2",,"data"
> "signal",,"P5",7,,"GND",2,"C7",,,,,"BCM2835 IO2",,"ground"
> "signal",,"P5",8,,"GND",2,"C7",,,,,"BCM2835 IO2",,"ground"
462,463c474,475
< "signal",,"P1",3,,"SDA0",2,"E5",,,,,"General Purpose I/O",,"data"
< "signal",,"P1",5,,"SCL0",2,"E5",,,,,"General Purpose I/O",,"data"
---
> "signal",,"P1",3,,"SDA1",2,"E5",,,,,"General Purpose I/O",,"data"
> "signal",,"P1",5,,"SCL1",2,"E5",,,,,"General Purpose I/O",,"data"
465c477
< "signal",,"P1",9,,"DNC",2,"E6",,,,,"General Purpose I/O",,"nc"
---
> "signal",,"P1",9,,"GND",2,"E6",,,,,"General Purpose I/O",,"ground"
469c481
< "signal",,"P1",17,,"DNC",2,"E6",,,,,"General Purpose I/O",,"nc"
---
> "signal",,"P1",17,,"+3V3",2,"E6",,,,,"General Purpose I/O",,"power"
473c485
< "signal",,"P1",25,,"DNC",2,"E6",,,,,"General Purpose I/O",,"nc"
```

```
---
> "signal",,"P1",25,,"GND",2,"E6",,,,,"General Purpose I/O",,"ground"
475c487
< "signal",,"P1",4,,"DNC",2,"E5",,,,,"General Purpose I/O",,"nc"
---
> "signal",,"P1",4,,"+5V0",2,"E5",,,,,"General Purpose I/O",,"power"
480c492
< "signal",,"P1",14,,"DNC",2,"E6",,,,,"General Purpose I/O",,"nc"
---
> "signal",,"P1",14,,"GND",2,"E6",,,,,"General Purpose I/O",,"ground"
483c495
< "signal",,"P1",20,,"DNC",2,"E6",,,,,"General Purpose I/O",,"nc"
---
> "signal",,"P1",20,,"GND",2,"E6",,,,,"General Purpose I/O",,"ground"
526d537
< "power",,,,,"+1V8",3,"A2",,,,,"LAN9512 PSU",,
568,569c579,580
< "signal",,"IC3",15,"VDD_1V8_CORE1","+1V8",3,"C2",,,,,"LAN9512 PSU",,"power"
< "signal",,"IC3",38,"VDD_1V8_CORE2","+1V8",3,"C2",,,,,"LAN9512 PSU",,"power"
---
> "signal",,"IC3",15,"VDD_1V8_CORE1","+1V8_SMSC",3,"C2",,,,,"LAN9512 PSU",,"power"
> "signal",,"IC3",38,"VDD_1V8_CORE2","+1V8_SMSC",3,"C2",,,,,"LAN9512 PSU",,"power"
668,670c679
< "power",,,,,"+5V0",3,"E7",,,,,"BCM2835 USB",,
< "power",,,,,"GND",3,"E8",,,,,"BCM2835 USB",,
< "power",,,,,"GND",3,"F8",,,,,"BCM2835 USB",,
---
> "power",,,,,"+5V0",3,"F8",,,,,"BCM2835 USB",,
680,685c689,690
< "component","C33",,,,,3,"E8","capacitor","100n",,,"BCM2835 USB","back",
< "component","C32",,,,,3,"E8","capacitor (polarized)","47u",,,"BCM2835 USB","front",
< "component","F1",,,,,3,"F7","fuse","140m 60V","miniSMDC014","B","BCM2835 USB","front",
< "component","C30",,,,,3,"F8","capacitor","100n",,"B","BCM2835 USB","front",
< "component","F2",,,,,3,"F8","fuse","140m 60V","miniSMDC014",,"BCM2835 USB","front",
< "component","C31",,,,,3,"F8","capacitor","100n",,,"BCM2835 USB","front",
---
> "component","C33",,,,,3,"F8","capacitor","100n",,,"BCM2835 USB","back",
> "component","C32",,,,,3,"F8","capacitor (polarized)","47u",,,"BCM2835 USB","front",
697c702
< "signal",,"S7","a1","Vcc","+5V0_USBB",3,"G9",,,,,"BCM2835 USB",,"power"
---
> "signal",,"S7","a1","Vcc","+5V0",3,"G9",,,,,"BCM2835 USB",,"power"
701c706
< "signal",,"S7","b1","Vcc","+5V0_USBA",3,"G9",,,,,"BCM2835 USB",,"power"
---
> "signal",,"S7","b1","Vcc","+5V0",3,"G9",,,,,"BCM2835 USB",,"power"
713,714d717
< "component","D11",,,,,3,"C8","diode",,"BAS16","B","LAN9512 USB","back",
< "component","D10",,,,,3,"D10","diode",,"BAS16","B","LAN9512 USB","back",
722c725
< "signal",,"IC3",14,"PRTCTRL_2","PRTC_2",3,"C8",,,,,"LAN9512 USB",,"data"
---
> "signal",,"IC3",14,"PRTCTRL_2","nc",3,"C8",,,,,"LAN9512 USB",,"nc"
725c728
< "signal",,"IC3",16,"PRTCTRL_3","PRTC_3",3,"C9",,,,,"LAN9512 USB",,"data"
---
> "signal",,"IC3",16,"PRTCTRL_3","nc",3,"C9",,,,,"LAN9512 USB",,"nc"
813,814c816,817
< "signal",,"S5",13,,"SCL1",4,"F5",,,,,"CSI-2 interface",,"data"
< "signal",,"S5",14,,"SDA1",4,"F5",,,,,"CSI-2 interface",,"data"
---
> "signal",,"S5",13,,"SCL0",4,"F5",,,,,"CSI-2 interface",,"data"
> "signal",,"S5",14,,"SDA0",4,"F5",,,,,"CSI-2 interface",,"data"
881c884
< "fiduciary","FD3",,,,,5,"H7",,"FID60",,,"Fiduciary markers","back",
```

```
---
> "fiduciary","FD3",,,,,5,"I7",,"FID60",,,"Fiduciary markers","back",
885c888,892
< "fiduciary","FD6",,,,,5,"H7",,"FID60",,,"Fiduciary markers","front",
---
> "fiduciary","FD6",,,,,5,"I7",,"FID60",,,"Fiduciary markers","front",
> "fiduciary","FD8",,,,,5,"J7",,"FID30",,,"Fiduciary markers","unknown",
> "fiduciary","FD9",,,,,5,"J7",,"FID30",,,"Fiduciary markers","unknown",
> "mounting hole","ST2",,,,,5,"H8",,"2M5",,,"Fiduciary markers","front",
> "mounting hole","ST1",,,,,5,"H9",,"2M5",,,"Fiduciary markers","front",
```

So there you have it! Obviously the Rev1.0 boards *do* include the RAM chip too, it's just not shown on the schematics.

# RPi Screens

From eLinux.org

Back to the Hub.

**Hardware & Peripherals:**

*Hardware and Hardware History.*

*Low-level Peripherals and Expansion Boards.*

***Screens**, Cases and Other Peripherals.*

## Contents



## Supported Standards

The following display outputs are supported on the board:

- Composite video (NTSC and PAL) via an RCA plug (the yellow socket on your TV) or SCART socket.
- HDMI 1.3a standard output.
- Display Serial Interface (DSI) - via unpopulated 15-way flat flex connector.

These interfaces allow the use of a broad range of displays, including:

- Televisions (HDMI or composite).
- Computer monitors (HDMI/DVI-D cable) (VGA monitors would require either a composite or HDMI to VGA or component scan converter box).
- DLP/Laser Pico Projectors (HDMI/DVI-D cable).
- RAW LCD panels (DSI + interfacing hardware)
- Composite and HDMI outputs can not be used at the same time (one or the other.)

For more info about DVI, VGA, and SCART screens see The RPi Verified Peripherals Page (http://elinux.org/RPi_Verified_Peripherals#Display_adapters)

# HDMI

You can connect the RasPi HDMI connector directly to an HDMI monitor using a standard HDMI cable.

## Motorola Atrix Lapdock

A number of people have used a Motorola Atrix (http://en.wikipedia.org/wiki/Motorola_Atrix_4G) Lapdock to add a screen and keyboard with trackpad to RasPi, in essence building a RasPi-based laptop computer. Lapdock is a very clever idea: you plug your Atrix smart phone into Lapdock and it gives you an 11.6" 1366 x 768 HDMI monitor with speakers, a keyboard with trackpad, two USB ports, and a large enough battery for roughly 5 hours of use. The smart phone acts as a motherboard with "good enough" performance. The advantage over a separate laptop or desktop computer is that you have one computing device so you don't need to transfer files between your phone and your desk/laptop.

Unfortunately for Motorola, Lapdock was not successful (probably because of its US$500 list price) and Motorola discontinued it and sold remaining stock at deep discounts, with many units selling for US$50-100. This makes it a very attractive way to add a modest size HDMI screen to RasPi, with a keyboard/trackpad and rechargeable battery power thrown in for free.

Lapdock has two connectors that plug into an Atrix phone: a Micro HDMI D plug for carrying video and sound, and a Micro USB plug for charging the phone and connecting to the Lapdock's internal USB hub, which talks to the Lapdock keyboard, trackpad, and two USB ports. With suitable cables and adapters, these two plugs can be connected to RasPi's full-size HDMI connector and one of RasPi's full-size USB A ports.

The RasPi forum has a long thread on Lapdock with many useful suggestions, photos, and links: I made a Raspberry PI Laptop (http://www.raspberrypi.org/phpBB3/viewtopic.php?t=6747) . There's also a good 'blog entry at element14 with photos and suggestions of where to get cables and adapters: Raspberry Pi Laptop (http://www.element14.com/community/groups/raspberry-pi/blog/2012/09/08/raspberry-pi-laptop) .

The hardest part about connecting Lapdock is getting the cables and adapters. Most HDMI and USB cables are designed to plug into jacks, whereas the Lapdock has plugs so the cables/adapters must have Micro HDMI and Micro USB female connections. These are unusual cables and adapters, so check the links.

Lapdock uses the HDMI plug to tell if a phone is plugged in by seeing if the HDMI DDC/CEC ground pin is pulled low. If it's not, Lapdock is powered off. As soon as you plug in a phone or RasPi, all the grounds short together and Lapdock powers itself on. However, it only does this if the HDMI cable actually connects the DDC/CEC ground line. Many cheap HDMI cables do not include the individual ground lines, and rely on a foil shield connected to the outer shells on both ends. Such a cable will not work with an unmodified Lapdock. There is a detailed 'blog entry on the subject at element14: Raspberry Pi Lapdock HDMI cable work-around (http://www.element14.com/community/groups/raspberry-pi/blog/2012/09/27/raspberry-pi-lapdock-hdmi-cable-work-around) . The 'blog describes a side-benefit of this feature: you can add a small power switch to Lapdock so you can leave RasPi attached all the time without draining the battery.

The Lapdock Micro USB plug is the upstream port of Lapdock's internal USB hub, and connects to one of RasPi's full-size USB ports. Lapdock is not USB compliant since it provides upstream power on its Vbus pin. Lapdock uses this to charge the Atrix phone. You can use this feature to power RasPi if you have a newer RasPi. The original RasPi rev 1 has 140 mA polyfuses F1 and F2 to protect the USB ports, which are too small for powering RasPi using upstream power. Newer RasPis replace F1 and F2 with zero Ohm jumpers or eliminate them entirely, which allows Lapdock to provide power. If you don't mind modifying your original RasPi, you can add shorting jumpers over F1 and F2 or replace them with higher-current fuses.

What gets powered on depends on whether Lapdock is open or closed. If it's open, the screen and all Lapdock USB ports are powered. If you close Lapdock, the screen and full-size USB ports are powered down, but the Micro USB still provides upstream power. This is for charging an Atrix phone. When you open or close Lapdock, the Micro USB power switches off for about a second so if your RasPi is connected it will reboot and you may have a corrupted file system. There's discussion about this at the RasPi forum link, and someone has used a supercapacitor to work around the problem: Raspberry Pi lapdock tricks (http://www.element14.com/community/groups/raspberry-pi/blog/2012/09/11/raspberry-pi-lapdock-tricks) .

# DVI

With an inexpensive passive HDMI to DVI-D cable or converter.

# Composite video

Composite video (NTSC and PAL) via an RCA plug, directly from the board. You can change between PAL and NTSC output by editing config.txt in the boot SD card. Uncommenting: sdtv_mode=2 sets output to PAL (see RPi_config.txt).

# RGB analog/VGA

The Broadcom BCM2835 only provides HDMI output and composite output. RGB and other signals needed by RGB, S-VIDEO or VGA connectors are however not provided, and the R-PI also isn't designed to power an unpowered converter box.

**A couple of options for VGA or component RGB outputs, bridging from either HDMI or, (much less obvious) the MIPI DSI interface:**

Note that any conversion hardware that converts HDMI/DVI-D signals to VGA (or DVI-A) signals may come with either an external PSU, or expects power can be drawn from the HDMI port. In the latter case the device may initially appear to work, but there will be a problem, as the HDMI specs only provide in a maximum of 50mA (@ 5 Volt) from the HDMI port, but all of these adapters try to draw much more, up-to 500mA, in case of the R-PI there is a limit of 200mA that can be drawn safely, as 200mA is the limit for the BAT54 diode (D1) on the board. Any HDMI to VGA adapter without external PSU might work for a time, but then burn out D1, therefore **Do not use HDMI converters powered by the HDMI port!** The solution is to either only use externally powered converters, or to replace D1 with a sturdier version, such as the PMEG2010AET, and to replace the power input fuse F3 with a higher rated one, as the current one is only 700mA, and the adapter may use 400mA itself. Also notice that the R-PI's power supply also must be able to deliver the extra current.

Firstly, the following *might* work. Beagleboard people have reported various levels of success (mainly "issues"):

http://www.hdfury.com/

Something similar:

http://www.fit-pc.com/web/fit-pc2/accessories/fit-vga/

...it may need to be modified as described here:

http://blog.galemin.com/2011/03/dvi-d-to-vga-converter-for-beagleboard-xm/

Alternatively, it may be possible to design an expansion board that plugs into the LCD headers on the R.Pi. Here is something similar for Beagleboard:

http://boardzoo.com/product_info12.php

Some more converters that **should** work:

- £22.99 HDMI to VGA + stereo audio converter (http://www.ebay.co.uk/itm/1080P-PC-HDMI-to-VGA-3-5mm-Audio-HD-Video-Converter-HDTV-SKY-DVD-PS3-Apple-TV-/320929883993)

- $24.00 "Video Converter adapter" from china (http://www.ebay.de/itm/New-HDMI-Male-to-VGA-RGB-Female-HDMI-to-VGA-Video-Converter-adapter-1080P-for-PC-/140625458879?pt=LH_DefaultDomain_0&hash=item20bdee36bf)
- $24.00 ASUS - Video adapter (http://www.google.com/products/catalog?q=hdmi+to+vga+converter&hl=en&show=dd&cid=4579096882877853234&ei=V8cGT5XtHoi
gbO5YSYAQ&ved=0CCUQ8wIwBDgK#scoring=p) requires additional miniHDMI to standard HDMI adapter
- $32.50 HDMI to VGA Video Converter (http://www.dealextreme.com/p/hdmi-to-vga-video-converter-71816) - Confirmed, works 100% inc HDMI audio.
- $39.99 HDCP HDMI to VGA + SPDIF RGB Component Ypbpr Converter (http://www.amazon.com/SPDIF-Component-Ypbpr-Converter-v1-3b/dp/B002SFT3ZI/ref=cm_cr_pr_product_top)
- $48.00 HP HDMI to VGA Display Adapter (http://www.google.com/products/catalog?q=HP+HDMI+to+VGA&oe=utf-8&rls=org.mozilla:en-GB:official&client=firefox-a&um=1&ie=UTF-8&tbm=shop&cid=4243749406268537354&sa=X&ei=mH0JT5jWHIuO4gS0h6ndC

More HDMI -> VGA converters are listed at the RasPi Verified Peripherals page (http://elinux.org/RPi_Verified_Peripherals#HDMI-.3EVGA_converter_boxes) , along with some caveats.

Potential interfacing chips:

- TFP9431 DVI RECEIVER WITH TRIPLE DAC (hard to find, obsolete?) (http://www.datasheets.org.uk/dl/Datasheets-36/DSA-705489.pdf)

The SOC (system on a chip) does not support any kind of analog component video, including VGA, since the SOC is designed for mobile phone use where this would not be a requirement. Additional components would be needed to generate RGB signals. Additional components would push the price beyond the $25 target and therefore won't happen.

# RGB digital

A HDMI/DIV to parallel 3.3v interface PCB, also meant for the Beagleboard:

http://www.harbaum.org/till/dvi2par/index.shtml

Potential interfacing chips:

They emit Hsync, Vsync and RGB w/ about 8 bits each (sometimes, it's called "MIPI DPI")

- Toshiba TC358762XBG deserializer bridge chip (http://www.toshiba-components.com/mobile/data/Toshiba_TC358762.pdf)

- Analog Devices HDMI Receivers (http://www.analog.com/en/audiovideo-products/analoghdmidvi-interfaces/products/index.html#HDMI_Receivers)
- Renesas µPD60800 Intelligent Buffer IC (http://www.renesas.com/products/soc/assp/mobile/ibic/pd60800/index.jsp)
- Renesas µPD60801 Intelligent Buffer IC (http://www.renesas.com/products/soc/assp/mobile/ibic/pd60801/index.jsp)

# Interfacing to non-monitor LCD panels

Embedded systems often have displays that aren't connected like televisions and computer monitors. RPI may be able to interface to some of these.

## DSI port

DSI connector is on board on the RPI. Some graphical LCD/OLED displays might be attached to it.

An additional binary blob might be required for the DSI port (http://www.raspberrypi.org/forum/features-and-requests/s2-and-s5-fit-or-no-fit#p39441) to function correctly (or function at all). When or if such a blob will be made available is unknown.

Nokia N900 has 800x480 DCS LCD (afaik its like DSI, but has build in framebuffer) (http://e-ditionsbyfry.com/Olive/ODE/ECN/default.aspx?href=ECN%2F2009%2F08%2F02&pageno=5&entity=Pc00502&view=entity) . Replacement screen is about ~$40 (~$50 with 4pin resistive touchscreen).

Nokia N8 has AMOLED 360x640 pixels DSI LCD. Replacement screen is about ~$35, another ~$25 for Multitouch Synaptics T1021A touchscreen (I2C + interrupt IO, no docs/drivers).

The schematics for apples iPhone 3gs (http://www.mikrocontroller.net/attachment/127135/iPhone_3Gs_schematics.pdf) and 4g (http://jumbofiles.com/57ycs8zez45j/iPhone_4G_schematic.pdf.html) suggest they speak DSI, thus they can probably be connected directly. The older iPhones use a "Mobile Pixel Link" connection from National Semiconductor. The 3GS panel (480×320) goes as low as US $14.88 (http://www.aliexpress.com/product-fm/377987722-Replacement-LCD-Glass-Screen-Display-for-iPhone-3GS-wholesalers.html) , while the 4G one (960×640, possibly the LG LH350WS1-SD01 (http://www.displayalliance.com/research/lh350ws1-sd01.html) , with specifications (http://www.panelook.com/modeldetail_parameter.php?id=12086) ) can be had for US $17.99 (http://www.aliexpress.com/product-fm/453840894-Replacement-LCD-Glass-Screen-Display-for-iPhone-4G-wholesalers.html) or as low as US $14.28 (http://www.ebay.com/itm/Repair-LCD-Glass-Screen-Display-Iphone-4G-4th-4-GEN-/110821471601) . The connectors used might be an issue, but this connector

(http://www.airaccent.com/lcd-screen-fpc-connector-replacement-for-iphone-4g-p-39877.html) might fit. Additional circuitry might be necessary to provide the display with required 1.8V and 5.7V for operation, and an even higher voltage for the backlight.

Other panels with MIPI DSI: www.panelook.com (http://www.panelook.com/modelsearch.php?pagesize=50&order=panel_id&panel_type=&product_composition=&brand_family=&pan

The Raspberry Pi provides one clock lane and two data lanes on the S2 connector, as can be read from the schematics (http://www.raspberrypi.org/wp-content/uploads/2012/04/Raspberry-Pi-Schematics-R1.0.pdf) . It is currently unknown whether this is enough to drive the iPhone 4G screen, as that screen seems be driven with three data lanes in its original application.

Potential LVDS interfacing chips:

TC358764/5 Display Bridge (MIPI® DSI to LVDS) (http://www.toshiba-components.com/mobile/data/Toshiba_TC358764_65XBGA.pdf)

DVI receiver TFP401A, TFP403, or TFP501 + LVDS transmitter SN75LVDS83B or SN65LVDS93A (http://e2e.ti.com/cfs-filesystemfile.ashx/__key/CommunityServer-Discussions-Components-Files/130/3252.DVI_3B00_HDMI_2D00_to_2D00_LVDS-Bridge-Application-Note.doc) (Mentioned earlier fit-VGA is build around TFP401A, probably many more "active" DVI2VGA cables are build the same way)

I2C/SPI ADC can be used to interface 4 pin resistive Touch Screens, For example STMPE812A (http://www.st.com/internet/com/TECHNICAL_RESOURCES/TECHNICAL_LITERATURE/DATASHEET/CD00291197.pdf) . Texas Instruments has a solution for 4 or 8 wire touchscreens (http://www.ti.com/sc/docs/psheets/abstract/apps/slaa384a.htm) using their rather cheap MSP4309.

### Character cell LCD modules

These have controllers and interfaces for feeding in text (and symbols). Common screen sizes include 16x2 to 40x4. Often seen in keypads, industrial machines, cash registers, laser printers etc.

The old-style 2-line, 16-character LCD displays can be commonly controlled over UART, thus providing a cheap way to display values for sensors etc.

## References

| | |
|---|---|
| **Startup** | Model Wizard - Buying Guide - SD Card Setup - Basic Setup - Advanced Setup - Beginners Guide - Troubleshooting |
| **Hardware** | Hardware - Hardware History - Low-level peripherals - Expansion Boards |
| **Peripherals** | **Screens** - Cases - Other Peripherals |
| **Software** | Software - Distributions - Kernel - Performance - Programming - VideoCore APIs |
| **Projects** | Tutorials - Guides - Projects - Tasks - DataSheets - Education - Communities |

Retrieved from "http://elinux.org/index.php?title=RPi_Screens&oldid=186068"
Category: RaspberryPi

---

# RPi Cases

From eLinux.org

Back to RPi Hardware Basic Setup.

Back to the Hub.

# Contents

    - 33.3 True Heatsink Design
    - 33.4 Mountable to a desk or wall
    - 33.5 Customizable!
- 34 Production Case
- 35 A convertible case - the Raspileon
- 36 The PiPod - a case built from a Really Useful Box
- 37 The PiSlab - a quick and dirty mounting plate
- 38 SBC Ltd Snap-together Pi case
- 39 Arbofaktur Raspberry Pi Case
- 40 MDF Curved Case for the Raspberry Pi
- 41 Raspberry Pi Case Billet Aluminum Top Quality
- 42 Polycase Pi Series Case
- 43 Cyntech Raspberry Case
- 44 Tek Berry.40
- 45 DIN rail mounting case for RPi 2.0
- 46 Injection moulding Raspberry Pi case
- 47 myraspibox case

**Hardware & Peripherals:**

*Hardware and Hardware History.*

*Low-level Peripherals and Expansion Boards.*

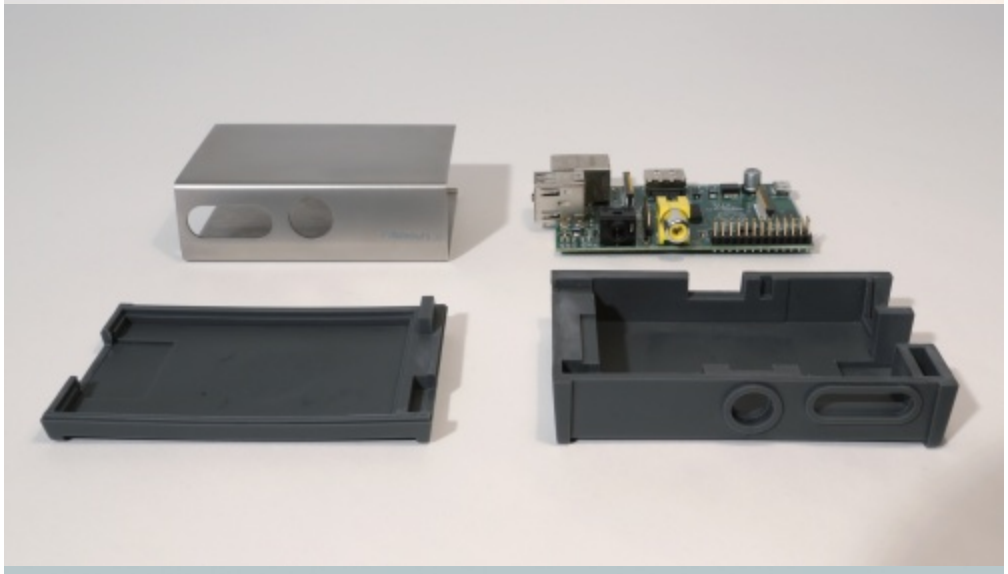
*Screens, **Cases** and Other Peripherals.*

As yet, the foundation does not provide cases for the Raspberry Pi. The small form factor or low power draw however, allow you to put it in almost everything.

# Pi Flavours

Beautifully simple and functional Raspberry Pi case, currently funding on Kickstarter [1] (http://www.kickstarter.com/projects/1554724050/pi-flavours-raspberry-pi-case)


Piflavours
SLOT FOR GPIO CABLE
PROTECTIVE STAINLESS STEEL
DURABLE SHOCKPROOF RUBBER
FINGERPRINT RESISTANT FINISH
ELECTROMAGNETIC SHIELDING
VISIBLE STATUS LEDS
RUBBER FEET
Piflavours




Piflavours

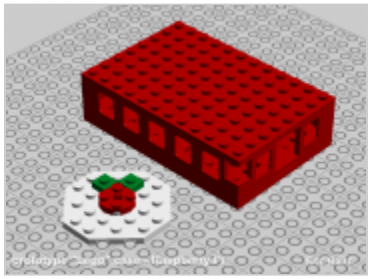

Piflavours
Piflavours
Piflavours


Piflavours


Piflavours

# Lego Case

I just had a go at knocking up a quick Lego case prototype. Since I don't know the metrics of all the connections, it's a bit of a "proof of concept" right now, but since's it's not exactly difficult to take out any offending side-pieces and move them if they're in the way of a beloved connector, I'm assuming that this isn't a big deal.



The Rpi Lego case, designed by forum user eric_baird

Also, because of the thin side-walls, a bit of additional hacksawing or dremeling shouldn't be too difficult.

I've limited myself to only using pieces that are currently available from Lego's "Pick a Brick" shop, in red. :)

I've tried to fit everything into an 8*12 grid footprint, which will hopefully fit … but I don't have the specs of the thickness of the thin wall-pieces, so no guarantees. One thing that might screw things up is the height of the board's connectors: I don't know whether they'll all fit within the upper and lower lip of the side-wall pieces. If the board's "USB port stack" is too high, I guess the "roof" could be raised by a tile or two.

I knocked it up with Lego's Digital Designer program (free download (http://ldd.lego.com/download/) from their site). The critical Lego piece is the repeated hollowed-out "side wall" ("[") brick ("wall element 1*2*2, w. window"), which you'll find on LDD's parts palette behind the little "door" symbol, or under the Pick a Brick page, as element #4507686, design #60032 (red), cost 8 pence each.

Feel free to hack, mangle or otherwise rework.

Download the Lego Digital Designer file for this case

# Lego Case 2

I had a bit of a play in lego designer with the idea of a vertical case – the USB / ethernet would emerge from the top, and the power usb would be on the bottom – possibly using a right angled usb connector. It's possible to alter the sides to allow for gaps for the various bits that stick out. There are lots of transparent bricks available – also includes a 2 x 2 brick to stick the raspberry pi sticker on.

Another Rpi Lego case, designed by forum user kimondo

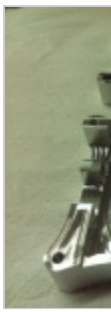
# ICEberg Case V3 for Raspberry Pi

1. First Case Aluminium with direct Coolling for CPU & LAN chipset
2. Heat transfer with Silicon Thermal Pad
3. Light LED Guide on the side (Option)
4. 100% Aluminium machined CNC
5. Case Design Pro
6. GPU port available
7. Upgrade with Vesa Mount 75x75mm & 100x100mm (Option)
8. Gloss finish
9. Rubber foot
10. Option with or without logo (ICEberg/Raspberry)

A rendering of the case made by Moovika

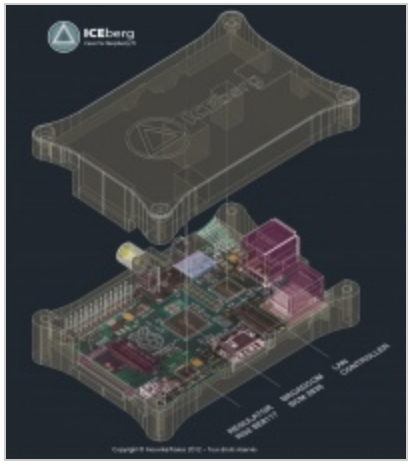
ICEberg V3

ICEberg V3



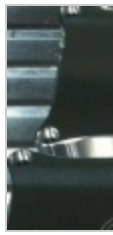
Open

ICEberg V3




Exploded View ICEberg case

ICEberg V3 Heat Transfer !



ICEberg

More information on BLOG ICEberg Case (http://www.moovika.fr/raspberry-pi.fr/?cat=1)

New Video V3 on youtube ICEberg Case V3 Aluminium for Raspberry PI (http://youtu.be/CnD0rha3n7Q)

Shop Moovika (http://www.moovika.fr/shop/product.php?id_product=129&id_lang=4)
Shop Ebay (http://stores.ebay.fr/MOOVIKA/Case-Raspberry-PI-/_i.html?_fsub=4015620011&_sid=297108081&_trksid=p4634.c0.m322)

# Raspi ALU Case for Raspberry Pi

Ben has published full details on the creation of this nice Raspberry Pi aluminium case, the board is shielded and protected from metal conductivity with an internal PVC base. Looks like a professional case for an headless computer used as a small server.

http://moebiuslinux.sourceforge.net/hardwarehacks/raspi-alu-case/

This unique case has an integrated USB hub to expand Raspberry usb ports and take power source from it as well, full disclosure and details are also reported there. This is a low budget case built from scratch with recycled parts and spare PVC and aluminium sheets

More infos on Moebius website: http://moebiuslinux.sourceforge.net

## Marco Alici Case for Raspberry Pi

Marco Alici, Italian Design Engineer, has designed this well appreciated clean enclosure to host the computer:

http://www.raspberrypi.org/forum/projects-and-collaboration-general/concept-for-a-case/

A rendering of the case made by MarcoA

Another rendering made using Blender (http://www.blender.org) and Yafaray (http://http://www.yafaray.org/)

A stackable version of the enclosure

Raspberr
into the f
enclosure
Shapewa
(http://w
shops/ma

This case is available for 3D printing **here** (http://www.shapeways.com/model/486999) on Shapeways (http://www.shapeways.com/shops/makeitreal) . Everyone can buy it directly over there.

More infos on Marco's blog: http://marcoalici.wordpress.com

# Raspi Case made a single sheet of polypropylen (PP)

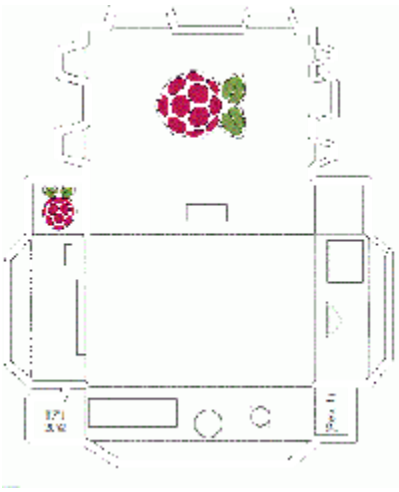
Strong case cut from a single sheet of polypropylen using a cutting plotter (video (http://www.youtube.com/watch?v=HbKY9StiFqs) ), made in germany by IP Adelt. Here's the story (http://www.ip-adelt.de/produkte/neuigkeiten/raspberry-pi-just-got-another-case/) . Sold via online shop (http://www.ip-adelt.de/shop/) to the whole world - in a simple envelope!

Raspberry Pi case from IP Adelt

Review of the Beta version of the case on the PiPod blog (http://raspberrypipod.blogspot.co.uk/2012/08/rpi-case-review-ip-adelt-enclosure-beta.html)

# Printable Mylar Sheet Fold-up Case

RaspberryPi.org forum user "eric_baird" (http://www.raspberrypi.org/forum/projects-and-collaboration-general/printable-cases-using-ohp-film) thought of printing an outline of the walls of a case on a Mylar overhead projector (OHP) sheet or cardboard that could then be cut out and folded into a case. Multiple users have since drawn such cases that can be printed on a Mylar sheet, thick paper, card stock, cardboard. The printed parts can be cut with a sharp knife or scissors and then folded/assembled into the case.



Multiple models are available:

The foldable case from "tzj" (http://pdfcast.org/pdf/raspberry-pi-card-case-revision-1) (currently based on the model B beta board).

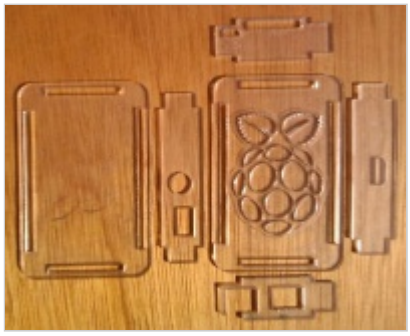
The foldable case from "alexisread" (http://elinux.org/images/0/0c/Raspberry-sandwich-1-0.pdf) originally posted here (http://www.raspberrypi.org/forum/projects-and-collaboration-general/case-design-internal-mounting-raspberry-sandwich) .

The foldable case from "Andrew K" (http://www.raspberrypi.org/phpBB3/viewtopic.php?f=40&t=6500) is based on measurements of an actual Raspberry Pi model B and fits snugly.

The foldable case from Thomas Mueller (http://h2database.com/raspi) is (arguably) a bit more stylish. It stays closed without glue, and can be re-opened.

# Laser-cut Clear Acrylic Case

eBay UK seller guitarreriacom is offering a laser-cut clear acrylic case (http://www.ebay.co.uk/itm/360439728388) .



Laser-cut Clear Acrylic Case on eBay

Laser-cut Clear Acrylic Case on eBay

Adafruit Pi Box (http://www.adafruit.com/blog/2012/05/31/new-product-adafruit-pi-box-enclosure-for-raspberry-pi)

# BRAMBLE Pi - Laser-cut Finger Jointed Wooden Case

Etsy.com seller Nhslzt (http://www.etsy.com/people/Nhslzt) is offering a finger-jointed wooden case (https://www.etsy.com/listing/93162730/brambles-raspberry-pi-laser-cut-finger) for the Raspberry Pi.

New design! I've been licensed the use of the **Raspberry Pi logo**!

Laser-cut finger-jointed wooden case.

Comes as a kit, easy to assemble. NO glue or screws required.

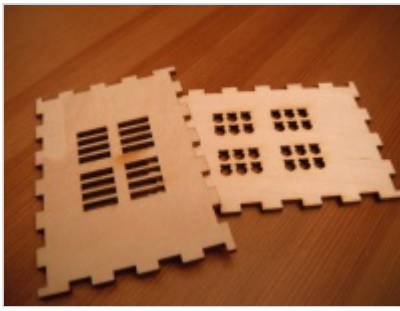
---

## Custom engraved Bramble Pi case

Etsy.com seller Nhslzt (http://www.etsy.com/people/Nhslzt) also offers a Custom engraved Bramble Pi case (https://www.etsy.com/listing/102467745/custom-engraved-bramble-pi-case) for the Raspberry Pi.

Virtually any motif can be engraved!

Linux's Tux.



Ventilation ports are possible on the bottom plate (ad top) but also on both long sides.

---

## BRAMBLE Pi2 - laser engraved wooden case

Bramble Pi2 - Raspberry Pi laser engraved wooden case (https://www.etsy.com/listing/103284715/bramble-pi2-raspberry-pi-laser-cut) is also on sale on Etsy.com (Nhslzt (http://www.etsy.com/people/Nhslzt) ). Laser cut and engraved with a bramble motif on both top and bottom.


Both bottom and top of the case are laser engraved.

Ventilation ports are in the shape of the Raspberry Pi logo.


Laser-cut finger-jointed wooden case on Etsy.com

---

## BRAMBLE Pi3 -

Bramble Pi3 - Raspberry Pi case with GPIO-cable slot & space for IDC connector (https://www.etsy.com/listing/104955140/bramble-pi3-raspberry-pi-case-with-gpio) .

- Slot for GPIO-cable.
- An IDC female connector can be used but without the strain relief.
- On sale on Etsy.com (Nhslzt (http://www.etsy.com/people/Nhslzt) ).
- Laser cut from high quality birch plywood and engraved with a circuit diagram design.
- Comes as a kit, easy to assemble. NO glue or screws required.

Circuit schematic engraved!

With a slot for a GPIO cable.

# Raspberry Pi Board B Enclosure

A solidworks concept from http://solidworksbootcamp.com/raspberry-pi-board-b-enclosure/

# Raspberry Pi air case

http://www.shapeways.com/model/434919/ and this is the video (http://www.youtube.com/watch?v=NrLEiujfQh8)

# Raspberry Pi fimo case

The bijoux artist Annarella gioelli (http://www.annarellagioielli.com/) has made her versione of case for raspberry pi usign fimo (a kind of polymer clay), there are a tutorial (http://annarellagioielli.blogspot.it/2012/04/tutorial-raspberry-pi-fimo-case-cover.html) and a video tutorial (http://www.youtube.com/watch?v=77Ur56PB9iw)

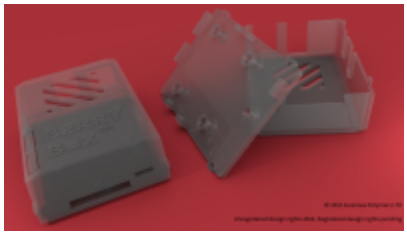
## ModMyPi - Raspberry Topping Case

ModMyPi LTD was founded in February 2012 following the public release of the ground breaking Raspberry Pi Model B. ModMyPi LTD specialise in the manufacture of unique, professional and high-quality cases for the Raspberry Pi. ModMyPi is offering mix and match colour customisable cases for sale on their website (http://www.modmypi.com/) .

The red and white 'pokeball' case designed by ModMyPi

## Berry Box - The Lego compatible, transparent case for the Raspberry Pi

this is a project (http://www.wefund.com/project/berry-box) to make a case compatible with lego components, there's a video (http://www.youtube.com/watch?v=CvuWAJ1Dn_o)



## RaspBerry Slice

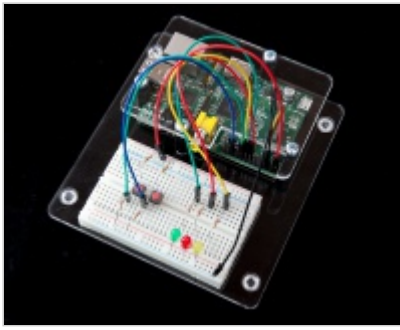
this is a project of the designer Brian Garvey, there a page (http://www.indiegogo.com/projects/90582?c=home) and a video (http://www.youtube.com/watch?v=u6WcazMu8OQ)

# Raspberry Pi Cover - SK Pang electronics

Developed in-house and manufactured in the UK. A range of laser cut acrylic covers for the Raspberry Pi. Link (http://www.skpang.co.uk/catalog/raspberry-pi-c-240.html)

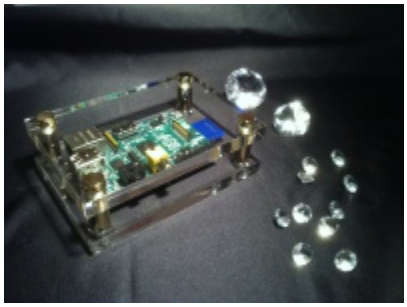
RaspBerry Cover

RaspBerry Cover with Breadboard Area



RaspBerry Cover with Breadboard Area

# Pi-Stack Raspberry Pi enclosure

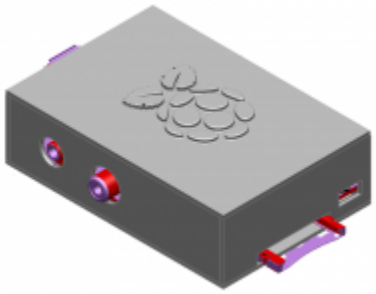


Developed in-house and manufactured in the UK. One of a range of compatible acrylic products designed exclusively for the Raspberry Pi. While everyone else seems determined to "cover up his beauty from the world", the Pi-Stack exposes the Raspberry Pi elegantly from all 4 sides. Unlike some of the other designs the makers claim that this also allows access to all the GPIO pins. Currently available in "Gold", "Silver" and black with 10mm acrylic base and top. Currently sold in USA, Canada and Australia as well as the UK, via Ebay.

Here's a link to a video showing how the Pi-STACK can be cable managed to reduce the maze of wires normally hanging off the Raspberry Pi management (http://www.youtube.com/watch?v=dstji8ftZAY%7Ccable)

# RepRap friendly cover for Raspberry Pi

The Rep-Rap we have is not very reliable and is only really able to produce basic designs so this is a 6 part case that has to be glued together. There are 6 stl files here (http://goo.gl/dqsvk) with construction notes.



# Mega Drive / Genesis Case for Raspberry Pi

The design was thought up by osholt on the evening after receiving his Pi. The case is strictly DIY and an Instructable for it can be found at the Instructables website (http://www.instructables.com/id/Raspberry-Pi-Sega-Mega-DriveGenesis-II-Case/) . The case is well suited to Green enthusiasts as it can easily be made with only reused or reclaimed parts as well as to emulation enthusiasts and to users with limited resources and design skill (you only need to know how to use a screwdriver to make the whole thing).


# RPIBOX

Our intention is to design a case for B model and provide that model of a functional protection, which all of us we will enjoy if you help me to achieve my objectives with your cooperation.

You can support al RPIBOX project at lanzanos.com (http://www.lanzanos.com/proyectos/rpi-box/eng/apoyar/) . For more information visit at oficial forum (http://www.raspberrypi.org/phpBB3/viewtopic.php?f=40&t=8710) and rpibox web (http://www.rpibox.net)



# RaspBox

The RaspBox is made of two acrylic glass plates and four metallic spacers. All parts are hold together by eight screws. This minimalistic design comes from the Swiss company Yoctopuce (http://www.yoctopuce.com) . Originally, the RaspBox was just a pet-project, but as it was very appreciated within the company staff, the decision was made to bring it to the public. The design itself has been released under a Creative Commons Attribution-ShareAlike 3.0 License and can be downloaded from the product page (http://www.yoctopuce.com/EN/products/raspbox) . The finished product is also available from the Yoctopuce shop (http://www.yoctopuce.com/EN/products/raspbox) .

# Makerbot Cases

Two cases have been successfully printed on the makerbot so far. Both are vented for heat concerns. The main difference is one allows GPIO pin access directly.

Design One (http://www.thingiverse.com/thing:24945)

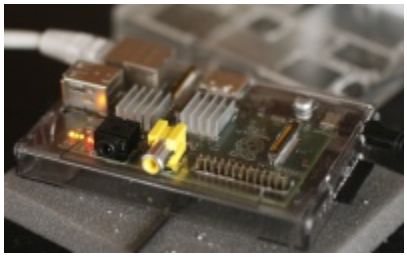


Design Two (http://www.thingiverse.com/thing:24721)



# Tape Case

Transparent cases for raspberry can be created using the case of a cassette tape. Simply drill and cut the holes that are needed into the case using a dremel.

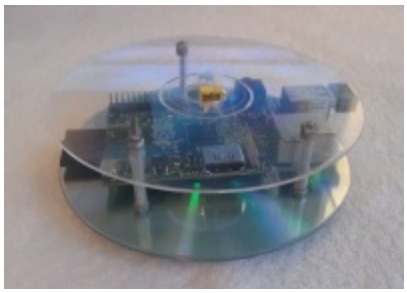


more images of the tape case (http://imgur.com/a/AZIZN)

# DiscPi Case

Easy DIY case made from a CD and plastic CD protectors.

More images (http://discpi.vkspartak.sk)



# An 4€ RPi case

When having an RPi for 30€, buying a 15€ case is quit expensive. I decided to create this case. You just need :

1. An 21x29.7 Art foam Cardboard
2. Cutter
3. Glues : sticker and gel

How to :

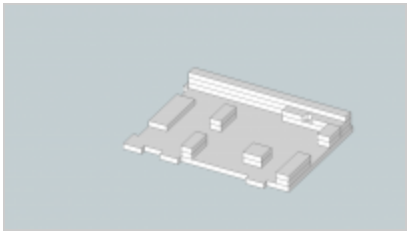
1. Print the templates with the right scale
2. Validate the sizes
3. Glue the template on the board using the glue sticker
4. Cut, assemble and glue using the glue gel
5. If the RPi will stay powered for a long time. A few vent holes could be added

Final touch:

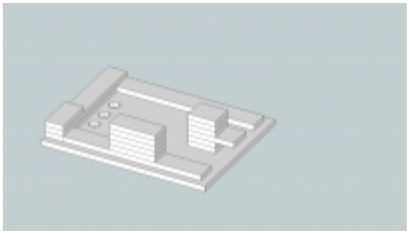
1. Print a Raspberry Pi logo and glue it

The libreCad template files could be downloaded : File:Raspberry-pi-3mm-foamboard-case.dxf and the File:Raspberry-pi-3mm-foamboard-case-strips.dxf

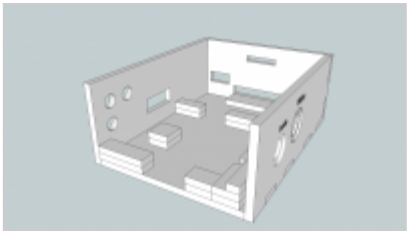
The 3d views of the case, thank you Hervé C. for this nice design :



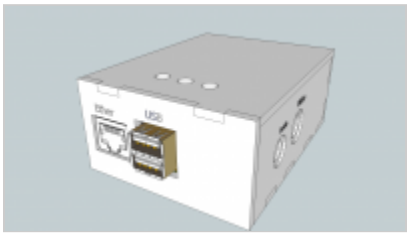
FoamBoxBottomPlane.png



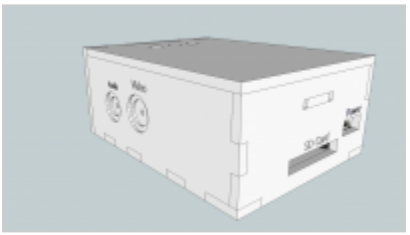
FoamBoxTopPlane.png



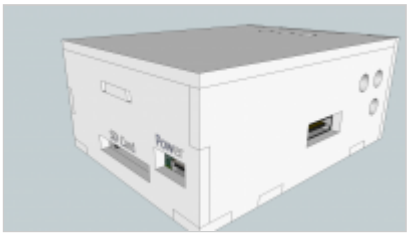
FoamBoxBottom.png



FoamBox1.png



FoamBox2.png



FoamBox3.png

# Pibow

Made up of colorful layers sandwiched together between clear acrylic. Well received by the folks at the RaspberryPi foundation (http://www.raspberrypi.org/archives/1640) .

# LCD Monitor Mount

PI LCD Mount from PC Supplies Limited (eBay (http://www.ebay.co.uk/itm/LCD-MOUNT-Case-for-Raspberry-Pi-PCSL-Deluxe-Wafer-LCD-VESA-100-Mount-/280921730684) ), VESA 100 x 100 Standard Mount, Requires the 4xVESA Holes on your Monitor, Maybe not compatible if your monitor uses the VESA for the Base / Stand, Not compatible if you are already wall mounting your LCD Screen, Wafer Design, Motherboard is sandwiched between 2 wafers of clear shiny acrylic! Designed for Raspberry PI, Secured using 8 x M3 Nuts, Hex Spacers & Screws to allow you to build and unbuild, 4xM4 Spacers and 4xM4 Screws for the VESA Mounting. GPIO Compatible

PI LCD Monitor Mount by PC Supplies

# Wafer Case

PI Wafer Case from PC Supplies Limited, Wafer Design, Motherboard is sandwiched between 2 wafers of clear shiny acrylic!

Available from Amazon UK, Shipping throughout Europe Amazon UK (http://www.amazon.co.uk/PCSL-Brand-Raspberry-Professional-Delivery/dp/B008KPZADY)

Wafer by PC Supplies

# PI Box Case

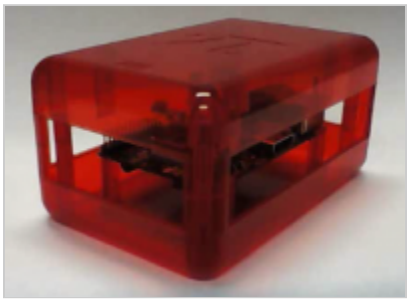
Pi Box is the new Professional Case from PC Supplies Limited, Covers all sides of the motherboard for the ultimate protection. Unique Fit-together design with custom supplied 'PI Clips' Allows Access to SD Port / USB / Ethernet / Audio / Video / HDMI and PSU , No screws! and NO elastic bands! - "A true PRO design"

Available from Amazon UK, Shipping throughout Europe Amazon UK (http://www.amazon.co.uk/gp/product/B008DYNO6W)

Pi Box by PC Supplies

# PI Sandwich Case

BUD Industries is Proud to introduce The PI Sandwich Enclosure, designed for use with the Raspberry Pi microcomputer (not supplied) and to accommodate changes in component location on the board as well as the potential addition of components . The enclosures provide protection, flexibility and ease of access to all components with quick snap-in installation. This rectangular version is open on all four sides for direct access.



BUD PI Sandwich

more details

I bought two of these at Jameco Electronics in Belmont, CA for $7 each. It's okay, but the board is not held tightly in place. You wand to plug in cables and the SD card before the board is snapped into place because the board will pop out otherwise, and could break the plastic pieces. The two sides of the case are identical. You have to gently rock the sides back and forth to disassemble the case without breaking anything.

# Simple sandwich case

Like me, most people do not have access to precision cutting tools like laser cutters. This makes it's rather difficult to do some of the intricate laser-cut case designs at home. So I decided to go with a simple sandwich case.

Sandwich case

The case consists of:

- Two sheets of 75x120 mm polycarbonate
- Twelve 12 mm M5 countersunk hex screws
- Six 25 mm round spacers

The spacers have a notch at 6 mm which holds the board in place between the sheets of polycarbonate. Sadly, my design isn't optimal since one of the spacers covers the GPIO pins.

This isn't the most beautiful case but I hope it inspires people to be creative and build their own case instead of just buying one. Building is fun!

# Aluminum Engraved Case by Barch Designs

CNC Machined from Billet Aluminum. Mounting Holes in Bottom. Acts as a Heat Sink. LED Fiber Optics!

Features:

- **Ships NOW Worldwide**
- **GPIO Port Access**
- **Fiber Optic LED**
- **True Heatsink Design**
- **Curved Sleek Look**
- **Mountable to a desk or wall**

- **Customizable!**

- **Nearly Indestructible**
- **Great Warranty**

Manufacturing Website (http://www.Raspberry-Pi-Case.com) www.Raspberry-Pi-Case.com

Official Store (http://www.PiHolder.com) www.PiHolder.com

# Production Case

This is a production quality case designed to meet most RPi owners needs. There is a Kickstarter project (http://www.kickstarter.com/projects/250365370/raspberry-pi-case-0) trying to make this case available both with and without external screw terminal.

Production quality Raspberry Pi case

# A convertible case - the Raspileon

The Raspileon can be changed from a housing for a server or home computer to a housing with access to the expansion ports. All without using tools. The Raspileon will be available in Germany in the second half of September. More information and a short survey is available on this site (in German): http://plastikdrucker.de/page2/

# The PiPod - a case built from a Really Useful Box

The PiPod case is a DIY project built from a "Really Useful Box" (http://www.reallyusefulproducts.co.uk/uk/html/onlineshop/fullrange_rub.php) and cable ties. The two most important factors were a) Ability to mount a car rear-view monitor on top, b) protect the SD card by having it enclosed inside the case. More details on the Raspberry PiPod blog (http://raspberrypipod.blogspot.co.uk)

# The PiSlab - a quick and dirty mounting plate

The PiSlab is made from a slab of 1/4" aluminum and some PCB mounting clips (Mouser P/N 561-LMTP375). More details on this site (http://synapticcircle.com/technopolis/2012/08/11/raspi-on-a-slab/)

## SBC Ltd Snap-together Pi case

This is a semi-transparent ABS case that gives access to all the Pi's connectors. It also incorporates light pipes for LEDs.

All in all I'm quite happy with it. What do you think?

Currently available on ebay (http://cgi.ebay.co.uk/ws/eBayISAPI.dll?ViewItem&item=261085689501&ssPageName=STRK:MESE:IT#ht_819wt_1071)

## Arbofaktur Raspberry Pi Case

A wooden case made from pear and cherry wood. Available from arbofaktur.de (http://www.arbofaktur.de) .

Additional woods will get added in the coming weeks. Additional shipping countries get added to the shop as fast as we can clear the legal details for each one. Don't hesitate to contact (http://www.arbofaktur.de/contact) Arbofaktur if you can't wait that long.

# MDF Curved Case for the Raspberry Pi

A case for the Raspberry Pi, using 3mm MDF, laser cut in a pattern that gives it a smooth curved appearance. The result is an object that stands out from the crowd, it hints at the technical Raspberry Pi inside, with a more natural rather than the typical high-tech look. This case started as a personal project/experiment, however it is now made in small batches for sale because many people requested one. It doesn't allow access to the analogue audio and video ports because these are behind a curved section of the case. Available from [2] (http://rpicase.jelledekker.com) , the drawings are available on Thingiverse.

# Raspberry Pi Case Billet Aluminum Top Quality

This Raspberry Pi case is by far the most durable, functional, and stylish available. Ships within 5 business days no waiting or pre-ordering.

**What People Are Saying:**

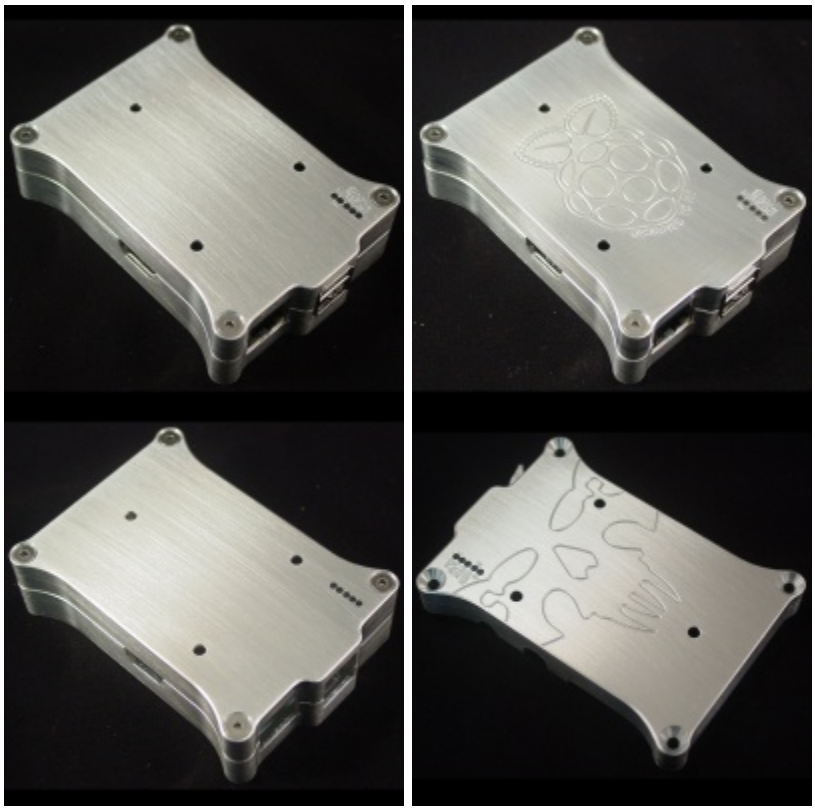
Wolf Paulas Review (http://wolfpaulus.com/journal/embedded/raspberrypi_enclosures?utm_source=rss&utm_medium=rss&utm_campaign=raspberrypi_enclosures)

**From eBay:**

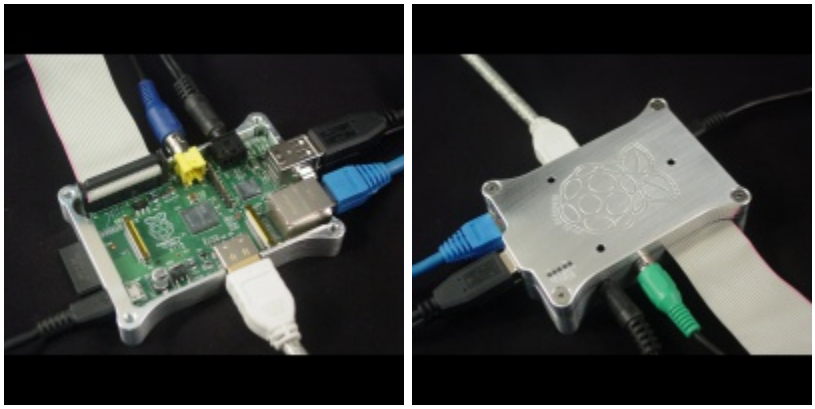
"Def the best looking RP case around" vertitis Sep-04-2012

"this is a thing of beauty" gasolene Aug-31-2012

"Perfectly engineered and beautiful case. Great job guys!" the_atilla Aug-29-2012

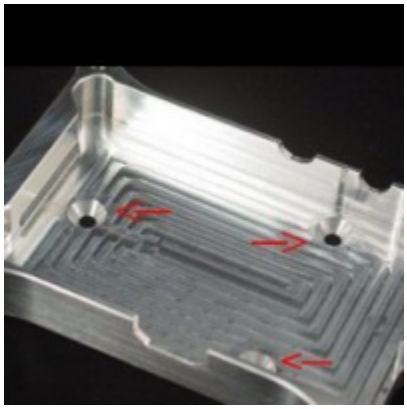


**4 Different Design Options**



**Access to GPIO**


**Fiber Optic Cables above LED's with or without Labels**



**Mountable**

**Available for Sale at:**

PiHolder (http://piholder.com)

eBay (http://www.ebay.com/sch/cooltrays/m.html?item=110936118988&sspagename=STRK%3AMESELX%3AIT&rt=nc&_trksid=p3984.m1558.l26

tINDIE (https://tindie.com/?categories=Raspberry%20Pi)

Cool Trays (http://cooltrays.com)

**Manufacturer** Barch Designs (http://www.raspberry-pi-case.com/)

# Polycase Pi Series Case


The new Pi Series is a stylish and functional case for the Raspberry Pi and **is now available** from Polycase.

**Features:**

- Includes 5 light pipes for the LEDs
- PCB held captive by case with access and labeling for all board components
- Textured finish resists fingerprints and scratching
- Ships within 1 business day

**Order your case at:** Pi Series (https://www.polycase.com/pi-series)

# Cyntech Raspberry Case

Raspberry Case by Cyntech

The compact, low-cost case is tailored to fit the Raspberry Pi board and provides openings for all the connectors. This includes an exit slot in the side of the case allowing a ribbon cable to be fitted to the board's 40-pin GPIO header. Another neat feature is the light pipe window for viewing the board's LED indicators. The case, which is supplied in the distinctive Raspberry colour and printed with the Raspberry Pi logo, provides an attractive solution for protecting the printed circuit board. The cable kit comprises: micro-USB power with PSU, HDMI AV output, Ethernet, USB (type A to B), RCA video (yellow – yellow), 3.5mm audio output. Available from Amazon UK Amazon.co.uk (http://www.amazon.co.uk/PCSL-Brand-Raspberry-Manufactured-Supplies/dp/B009LPMXH8/ref=sr_1_1?ie=UTF8&qid=1349719129&sr=8-1)

The same case is also available in blue (pictured) and clear.

BluBerry Case by Cyntech

# Tek Berry.40


Length: 100.6 Width: 73.5 Height: 26.5 Tek berry white paper (http://www.teko.it/multimedia/manuali/pdf/TEK-BERRY.pdf)

**Manufacturer**

Teko enclosure solutions (http://www.teko.it/en/prodotti/famiglia/PO/serie/145)

**Order your case at:**

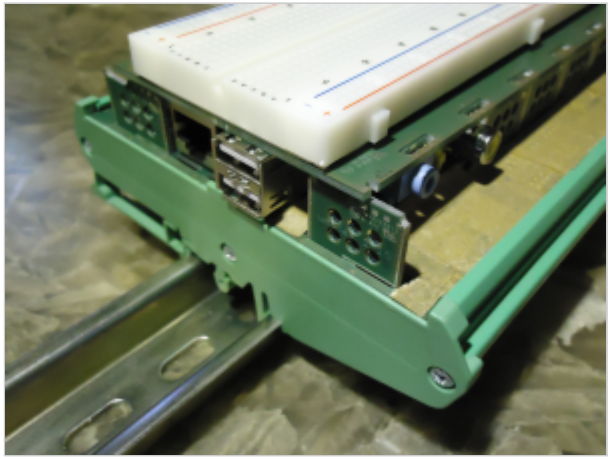
Reichelt ordering page (https://secure.reichelt.de/Kunststoffgehaeuse-TEKO/TEK-BERRY/3/index.html?;ACTION=3;LA=446;ARTICLE=124752;GROUPID=3354;artnr=TEK-BERRY) Price: 4.95 €

# DIN rail mounting case for RPi 2.0

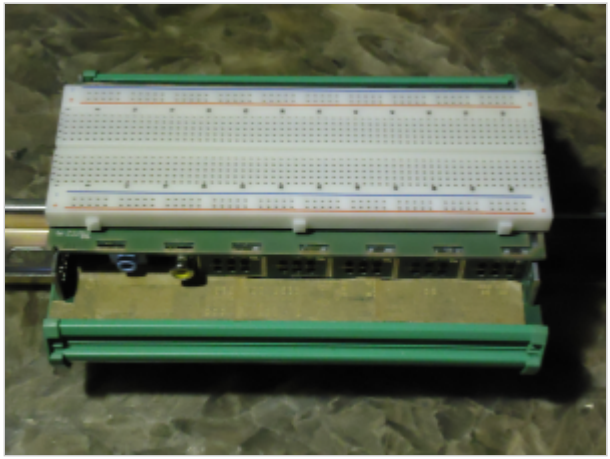
DINpi provides a simple and safe way for mounting and using the Pi on standard DIN rails in professional applications. Due to its complete shielding, it enables using the RPi in harsh or sensitive EMC environments.

There's a modular concept behind the DINpi case. Help us figure out what modules to realise first by using our feature poll below.

Length x Width x Height: 167 mm x 126 mm x 55 mm (height was measured from top of DIN rail)



DINpi Case Development Mule (side view)



DINpi Case Development Mule (top view)

**Enlist for updates on availability here:**

You can register for updates here (http://launch.dinpi.com/) .

**Request your DINpi feature here:**

There is also a product feature poll available here (http://polldaddy.com/poll/6594440/) .

# Injection moulding Raspberry Pi case

Buy here! (https://www.etsy.com/listing/111066753/pre-order-injection-moulding-raspberry) .

- Industrial quality!
- No glue or screws required!

Black

White

Blue, yellow and red

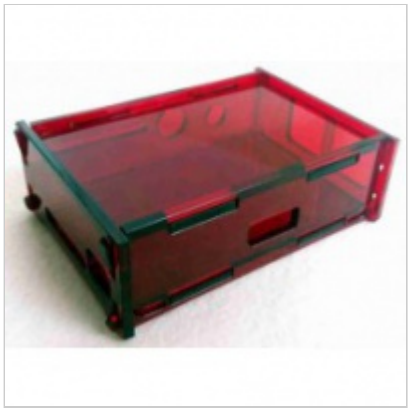
# myraspibox case

Raspberry Pi compatible semi-transparent case/enclosure cut from 3mm thick high quality plexiglass.

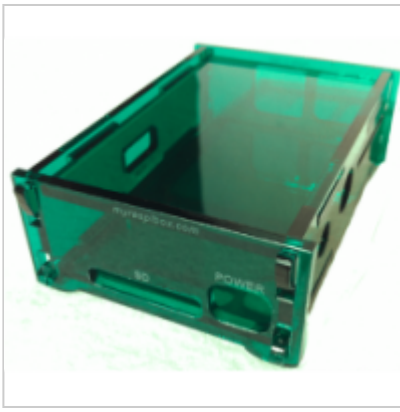
All side connectors are made available and engraved/labelled. There is also a cutout for a ribbon cable you may plug into the 26 pin expansion header.

The case has no screws, the pieces snap together making it quick and easy to assemble.

Clear



Red



Green

**Purchase here:**

Europe customers: myraspibox store (http://www.myraspibox.com/) Price: 6.00€ to 7.00€

USA customers: USA reseller store (https://store.acmeun.com/) Price: $7.50

| Raspberry Pi | |
|---|---|
| **Startup** | Model Wizard - Buying Guide - SD Card Setup - Basic Setup - Advanced Setup - Beginners Guide - Troubleshooting |
| **Hardware** | Hardware - Hardware History - Low-level peripherals - Expansion Boards |
| **Peripherals** | Screens - **Cases** - Other Peripherals |
| **Software** | Software - Distributions - Kernel - Performance - Programming - VideoCore APIs |
| **Projects** | Tutorials - Guides - Projects - Tasks - DataSheets - Education - Communities |

# RPi VerifiedPeripherals

From eLinux.org

Back to the Hub.

**Hardware & Peripherals:**

*Hardware and Hardware History.*

*Low-level Peripherals and Expansion Boards.*

*Screens, Cases and **Other Peripherals**.*

# Contents

**A note about this page: For USB devices, please specify if they required a powered hub**

# Notes

19-Apr-2012: Now that the Model B board is shipping, details added should relate to this board and the default Debian distribution



(http://www.raspberrypi.org/downloads) unless stated otherwise. A suggested suffix markup scheme is as follows:

- (A) - Relates to model A production board
- (B) - Relates to model B production board
- (!) - Information from alpha and beta board days -- beta board verified peripherals should still apply to production boards for the most part, but the alpha board is fairly different
- No markup - relates to all production boards

*Discuss: http://www.raspberrypi.org/forum/?mingleforumaction=viewtopic&t=247*

If you are adding to a product list it would help clarity if entries are kept/added in alphabetical order.

# Power Usage Notes

**Warning**: Adding peripherals may increase the loading on the power supply to your board and this, in turn, may affect the voltage presented to the RPi. If the RPi's supply voltage falls below a certain value (anecdotally stated as around 4.75V), or it begins to fluctuate, your setup may become unstable. There is a Wiki section about this issue (http://elinux.org/RPi_Hardware#Power) which is worth a read.

**Model B Hardware Revisions and USB Power limits Hardware Revision 1.0** The original Model B board had current limiting polyfuses which limited the power output of each USB port to approximatly 100mA. USB devices using more than 100mA had to be connected via a powered hub. The PI's PSU was chosen with a power budget of 700mA of which 200mA were assigned to the USB ports, so the Raspberry Pi's (poly)fuses were designed only for devices up to 100mA, and typical 140mA polyfuses will have as much as 0.6 volt across them when drawing currents near the 100mA limit. As a consequence the USB ports are only directly suitable for "single current unit" USB devices which, according to USB specifications, are designed to work with just 4.4 Volt. Not only do non single current unit devices draw more current (causing greater Voltage drops, and greater stress on the fuses), they also might require 4.75 Volt to work.

**Model B Hardware Revision 2.0 and Revision 1.0 with ECN0001 change** This had the polyfuses removed, removing the 100mA current limitation for each USB port (but leaving the main fuse F3 intact). Users should still ensure their power supply can power the RPi and the USB peripherals. Revision 2.0 was released in August 2012.

# Linux Driver Issues

Shortly after the Raspberry Pi was released it was confirmed that there were a number of issues with the Linux USB driver for the SMSC95xx chip. These included problems with USB 1.x peripherals that use split transactions, a fixed number of channels (causing problems with Kinect) and the way the ARM processor handles the SMSC95xx interrupts. [1] (http://www.raspberrypi.org/phpBB3/viewtopic.php?f=28&t=12097&start=76) [2] (http://www.raspberrypi.org/phpBB3/viewtopic.php?f=28&t=5249&start=44) A large number of fixes were included in the 2012-08-19-wheezy-raspbian Linux image.

# Powered USB Hubs

A number of low-cost powered USB hubs are known to have caused problems. Members of the Raspberry Pi forums have reported low power or no power at all in some cases. The following is a list of specific Powered USB Hubs which appear to be fault-free. Please note that these do not take into account powering the Raspberry Pi from the hub, in addition to its peripherals.

If you use a powered hub and PI PSU together consider powering them from the same power bar with switch, so you can turn them on simultaneously., especially if the HUB tries to feed the PI through their interconnect cable, due to the 100mA limiting fuse in the PI the PI will be partially powered which may cause problems (unwanted writes to the SD card).

## Working USB Hubs

- **Acme**
  - USB 2.0 hub 4 port (ACME (http://www.acme.eu/en-us/product/019188) ) Based on NEC µPD720114 USB2.0 Hub Controller USB ID 0409:005a **NOTE!** It is bus-powered hub, but very cheap and small and works after a small modding: on usb-hub board you have 4 holes: V, D+, D- and GND. Connect GND, D+ and D- to the RasPI, and additionally connect GND and +5v from power supply to the same holes on usb-hub GND and V. Now there is common contacts: GND, D+ and D- between RasPI and hub needed to work, and additional power for USB devices, connected to the hub. Tested on my RasPI.
- **Belkin**
  - F4U040 4-Port Ultra-Slim Desktop hub (powered 5v, 2.6A, lsusb lists as Genesys Logic 05e3:0608)
  - F5U224 4 port powered USB hub
  - F5U231/F5U234 Hi-speed USB 2.0 Tertrahub - 4 port powered USB hub (verified.. able to power Raspberry Pi using micro USB directly from hub)
  - F5U237 7 Port powered USB 2.0 5V 3.8A (5 back port 2 top ports)
  - F5U259-ME USB 2.0 7-Port Hub (Powered, able to apply power to Raspberry Pi via micro USB from this hub at same time)
  - F5U403 USB 2.-0 4 Port Hub (Powered, suspect see F5U404 in non-working, didn't test power the RPi from hub.)
  - F5U700 USB 2.0 7-Port Hub (Powered, able to power Raspberry Pi via micro USB directly from hub)
  - F5U706ea/uk 2-in-1 Hub (USB 2.0, powered, 7-port)
  - F5U706701PerBlk 7-in-1 Hub (USB 2.0, powered 5V 2.5A , 7-port)
  - F4U039qukAPL 7 port Ultra-Slim Desktop Hub (internally two Genesys Logic 05e3:0608 devices - powering RPi from port furthest away from power supply. Toshiba Stor.E 1TB must be powered from ports closest to the power supply to

avoid errors in dmesg. Flash drives seem fine on ports away from the power supply.)

- **Benq**
  - E2220HD LCD Monitor with 4 port USB Hub. Able to power the Pi and no backfeed of power from the monitor to the Pi via the interconnect. Just works.
- **Biltema**
  - 23-924 4-port powered USB 2.0 Hub (2.0A) Able to power Raspberry Pi via USB port
- **C3 Tech**
  - C3 Tech 7-port powered hub with PSU 5V, 2.0A. Working without problems.**WARNING** The hub is Backpowering so if you don´t like Backpower mod the hub or cut the Red wire from uplink cable. USB ID 1a40:0201 Terminus Technology Inc. Hub (B)
- **CyberPower**
  - [3] (http://www.newegg.com/Product/Product.aspx?Item=N82E16817804002) CP-H720P 7-port powered hub with 3.6A adapter. Internally, a NEC Corp 0409:0050 device. Works perfectly with Model B, regardless of whether the RPi is being powered by the hub or externally. **WARNING**: This device seems to have been replaced with one based on dual 05e3:0608 Genesys Logic, Inc. USB-2.0 4-Port HUB internally
- **Dell**
  - Dell 2001FP monitor has 4 USB ports and acts as a powered hub.
  - Dell SP2309W monitor has 4 USB ports and acts as a powered hub.
  - Dell 2407FWP monitor has 4 USB ports and acts as a powered hub. Additionally, the 6-in-1 Card Reader part of the monitor works as well, though it will not read SDXC Cards.
  - Dell U3011 monitor has 4 USB ports and acts as a powered hub. Additionally, the Card Reader part of the monitor works as well, and is compatible with 128GB SDXC Lexar Brand Cards
- **Delock**
  - 4-port powered USB 2.0 Hub (2.0A) Able to power Raspberry Pi via USB port (Model: B/N61393)
- **DELTACO**
  - UH-715 Rev 2 (https://www.deltaco.se/products/items/itemid/(UH-715)/index.aspx) 7-port powered hub with 2A adapter.
- **DYNEX**
  - 7port hub idVendor=0409, idProduct=0050 works
- **D-Link**
  - [4] (http://www.amazon.com/D-Link-DUB-H7-High-Speed-7-Port/dp/B00008VFAF) 7-Port USB Hub DUB-H7 (See note below - doesn't work for all, apparently). Working model marked BUBH7A....A5. Worked with Debian on production B model, for keyboard, mouse, and thumb drives, also worked with

ArchLinux, didn't work with Bodhi Linux immediately thereafter. Recent model did not work with default raspbian firmware (3.1.9+ #272); updated firmware with rpi-update (to 3.2.27+ #66), now seems to work perfectly.
    - [5] (http://www.newegg.com/Product/Product.aspx?Item=N82E16817111131) 4-Port USB Hub DUB-H4 Worked on Debian with keyboard, mouse, and thumb drive. Also tested with Raspbmc and external HD (powered through USB). While the hub has a charging port, which should be able to provide power enough to the RasPi (1.2 A), connecting the RasPi here doesn't work, as it seems the power is cut during boot (At least with hub hardware rev. C1). While it does boot from any of the other ports, it shouldn't be used it doesn't provide enough power (Standard 500 mA per port. Measuring at P1-P2 on the RasPi: ~4.45 V).
- **Digicom**
    - [6] (http://www.digicom.it/digisit/prodotti.nsf/itprodottiidx/MiniHubUsb204P#) MiniHUB 4-Port USB 2.0 with PSU 5V - 2A .
- **Digitus**
    - 7-port USB2.0 Powered Hub. Model DA-70226.
- **Eminent**
    - [7] (http://www.eminent-online.com/en/product/22/em1102-4-port-usb-hub---black.html) EM1102 4 Port USB 2.0 Hub with 1A power adapter. It's able to power the RPi, external HDD and other peripherals.
    - [8] (http://www.eminent-online.com/en/product/27/7-port-usb-2-0-hub.html) EM1107 7 Port USB 2.0 Hub with 2A power adapter. It's able to power the RPi, external HDD and other peripherals.
- **GearHead**
    - [9] (http://www.amazon.com/gp/product/B004OBZ088/) GearHead 4 Port Hub with Energy Saving Power Switch (5V, 1A)
- **Gembird**
    - Gembird UHS 242 4-port USB 2.0 Hub 1.8 Amps
- **Genesys Logic (sold at Fry's)**
    - Genesys Logic 4-Port USB 2.0 Hub (ID 05e3:0608) (Other brands include Gigaware and Belkin, same ID shows up in lsusb)
    - Genesys Logic 4-Port USB 2.0 Hub (ID 05e3:0606) (Other brands include i-Rocks, same ID shows up in lsusb)
- **Hama**
    - Hama 4-way USB 2.0 Hub
- **HP**
    - HP ZR2240w 21.5" Monitor with built in 2-Port USB Hub (B)
- **König Electronic**
    - CMP-USB2HUB55 - 7 port USB2.0 HUB, (ID 1a40:0201 Terminus Technology Inc. Hub) 2.0A power supply, backpowers RPi well.
- **Laser**

    - "7 port USB hub with AC adapter Version 2.0". 5V 1A (found at Harvey Norman Australia for $24.95 and Australia Post Shops for $9.95). You can power the PI by connecting both the main USB connector to the PI USB port, **and** from a spare USB port back to the power micro USB socket. If you don't do both, boot-loops are likely to occur.
- **Logik**
    - [10] (http://www.currys.co.uk/gbuk/logik-lp4hub10-4-port-powered-usb-hub-04979038-pdt.html) LP4HUB10 4-Port USB Hub. **Throws errors when used with Fedora remix 14**
    - Logik L4THUB10 4 Port powered hub works fine under raspbian/wheezy/model B. Captive usb cable, 2A power supply, convenient single top mounted usb socket. Unlike my last hub, will power wifi!
- **LogiLink**
    - UA0085 USB 2.0 Hub, 4-Port with PSU 5V, 2A
    - UA0091 USB 3.0 Hub, 4-Port with PSU 5V, 4A. Connected with USB2.0 cable. 1A per port, able to support USB HDD drives and other power hungry devices. Tested with kernel 3.1.9-cutdown, Wheezy.
    - UA0096 USB 2.0 Hub, 10-Port with PSU 5V, 3.5A (Not suitable for powering RPi because it doesn't work unless there is working USB input present even with PSU plugged in.)
    - UA0160 USB 2.0 Hub, 4-Port with PSU 5V, 2A. Able to power the RPi, keyboard, mouse and LogiLink UA0144 USB ethernet adapter. (More testing to come.)
- **Macally**
    - [11] (http://www.macally.com/EN/?page_id=2312) Hi-Speed 7-Port USB 2.0 Powered Micro HUB, AC Powered. Includes a 2000mA wall-wart (US style)
- **Manhattan**
    - [12] (http://manhattan-products.com/en-US/products/6500-hi-speed-usb-2-0-micro-hub) (#160612) Hi-Speed USB 2.0 Micro HUB, AC Powered (identifies as ID 05e3:0608 Genesys Logic) Includes a 1000mA wall-wart (US style)
    - [13] (http://manhattan-products.com/en-US/products/9583-mondohub) (#161718) MondoHub 28 Port USB 3.0 & USB 2.0 HUB (24 USB 2 Ports @500ma each) + (4 USB 3.0 Ports @900ma each) Power Switches on each port, AC Powered and Includes a 5V 4A wall-wart (US style)
- **Newlink**
    - NLUSB2-224P 4 port USB 2.0 Mini hub with PSU 5V 1A
    - NLUSB2-222P 4 port USB 2.0 Hub with 5V 2A PSU (Available From | ModMyPi (https://www.modmypi.com/shop/raspberry-pi-accessories/New-Link-4-Port-USB-Hub-(USB-2.0-with-Mains-Adaptor)) )
- **Nilox**
    - Nilox USB 2.0 4port HUB model HUB4USB2AC with PSU 5V 1.0A
- **Plugable**

    - [14] (http://plugable.com/products/USB2-HUB4BC/) USB2-HUB4BC 4 Port USB 2.0 Hub with BC 1.1 Fast Charging. 5V 2.5A power supply. Powering Pi via microUSB from a hub port. USB Audio peripheral tested and working.
    - [15] (http://plugable.com/products/USB2-HUB-AG7/) USB2-HUB-AG7 7 Port USB 2.0 Hub with 5V 3A power supply. There are US and UK power supply versions and it can be ordered in US and (for the UK version) many countries in Europe. There is a video showing this hub powering both the Pi several peripherals at once[16] (http://www.youtube.com/watch?v=pDA7MxFtoS0) .
- **Pluscom**
    - Pluscom 7 Port USB 2.0 Hub Model U7PH-3A with 3Amp PSU. USB ID 1a40:0101. Powering Pi via microUSB from a hub port. Internally two 4 Port switches linked. Leaks power back up USB data cable to Pi but not really a problem when powering Pi at the same time.
- **Satechi**
    - ST-UH12P 12 port powered hub with 2 Control Switches. Also works while powering the Pi.
- **Staples (Business Depot) (Bureau EN GROS)**
    - Staples 4-port hub Item 607477-CA
- **StarTech.com**
    - StarTech.com 7-port Compact USB 2.0 Hub (ST7202USB). Comes with 5v 2A supply. Shows in lsusb as two Genesys Logic, Inc. USB-2.0 4-Port HUBs (05e3:0608). Back powers Pi (Just, Voltage across TP1 & TP2 is a little low when powered from this hub).
- **SumVision**
    - Sumvision Slim 4 Port High Speed USB 2.0 HUB with PSU 5V 1.0A (from | 7dayshop (http://www.7dayshop.com/catalog/account_history_info.php?page=1&order_id=5130107) )
- **Sitecom**
    - CN-032 4 Port USB 2.0 Pocket Hub. Works for powering the Pi, an USB WLAN Adapter, wireless Kbd+Mouse. Using an 2500 mA Voltcraft
    - CN-060 4 Port USB 2.0 Hub powered with AC Adapter (1A). Powering Pi via microUSB from a hub port.
- **Sweex**
    - US014 4 Port USB 2.0 Hub
- **Targus**
    - ACH81xx 7-port powered hub. 5V 3A power supply, with 2 high power ports. (possible conflicting behaviour with USB keyboard / Wifi Dongles)
    - ACH63EU 4-port. Using a 5V 2A power supply, which isn't supplied with the hub, it is able to power the PI as well.
- **The Pi Hut**
    - 7 Port USB Hub (from The Pi Hut's Raspberry Pi Store (http://thepihut.com/products/7-port-usb-hub-for-the-raspberry-pi) )

- **Trendnet**
  - [17] (http://www.trendnet.com/products/proddetail.asp?prod=130_TU2-700&cat=49) TU2-700 7 Port Powered USB 2.0 Hub with AC Adapter (5V 2A)
- **Tripp-Lite**
  - [18] (http://www.tripplite.com/en/products/model.cfm?txtModelID=3167) U222-007-R 7 Port Powered USB 2.0 Hub with AC Adapter (5V 2.5A) Powering RPi from Hub works
- **Ultron**
  - [19] (http://www.ultron.de/v1/produktansicht.php?artnr=67072&kid=bfa8340c4e245...&l=en&WGType=Neue+USB-HUBS) UHN-710 7-port powered hub with PSU 5V, 3A. USB ID 1a40:0201.
- **VANTEC**
  - 4 Port USB 2.0 Powered Hub Model: UGT-MH304. 5V 2A AC/DC adapter. Go 2.0 Mini hub.
- **Z-TEK**
  - Z-TEK 7-port powered hub with PSU 5V, 4A. USB ID 1a40:0201.
- "Unknown"
  - 10(7-4) port hub idVendor=1a40, idProduct=0201 / idVendor=1a40, idProduct=0101 works

## Problem USB Hubs

Please check known workarounds here (http://elinux.org/Rpi_USB_check-list) before adding to the list

- **Addon**
  - 7-Port Powered Hub - labelled ADDUH070P - Gives constant Eth0 errors on boot.
- **Belkin**
  - 7-Port Powered Mobile Hub - device labelled F4U018, packaging labelled F5U701. lsusb reveals it to be two Genesys Logic 4-port hubs based on the GL850G chipset (vendor: 0x05e3 product: 0x0608) ganged together. Yields a lot of "handle_hc_chhltd_intr_dma:: XactErr without NYET/NAK/ACK" errors and device resets in /var/log/messages. Low speed devices such as keyboards work OK, wifi/mass storage is unreliable or broken. -- No error messages with the latest kernel, but still unstable with mass storage devices. Also, leaks current back to the Pi (can be fixed by overtaping GND and +5V pinouts)
  - F4U022 7-Port powered USB hub (powered 5v, 2.6A), same as F4U018
  - 7-Port Powered Hub - device labled F5U237 Rev.3 - ID 050d:0237 Wired ethernet fails to connect; gives "DWC OTG HCD URB enqueue failed adding QTD. Error status -4008" Result is same as DUB-H7 below.

    - F5U404 Hi-Speed USB 2.0 4-Port Mobile Hub. Faulty/bad design; Leaks current back up the cable to the Raspberry Pi.
    - F5U307 Hi-Speed USB 2.0 7-Port Hub (Powered, able to apply power to Raspberry Pi via micro USB from this hub at same time) It work's sometimes. (Works always without powering the RPi, haven't tried that)
- **Dell**
    - Dell U2410 Monitor Built-in 4 Port Hub - Shows up as a pair with 0424:2514 and 0424:2640. Standard Microsystems Corp. USB 2.0 Hub. When connecting some devices it kills the Ethernet with "smsc95xx 1-1.1:1.0: eth0: Failed to read register index 0x0000011X" errors. It did work for a keyboard and webcam. Bluetooth that works connected directly to the Pi triggers the error.
- **DELTACO**
    - 7-Port USB Hub UH-713 Rev 3. This one consists also of two 05e3:0608 Genesys Logic, Inc. USB-2.0 4-Port HUBs connected together. The power supply is rated at 5 V 2 A. It kills ethernet when X11 is started.
- **Dynex**
    - 7-Port USB Hub - Does not work in Debian 19-04 image.
    - DX-HB7PT 7-Port USB Hub - As per the Gear Head below, it's 2 daisy-chained Genesys Logic 05e3:0608 devices. Appears to result in significant slow downs when the USB is under load, such as running the root filesystem from a USB drive.
- **Dynamode**
    - 7-Port USB 2.0 Hub (Silver and black). Feeds power back up the interconnect to the Pi causing the power LED to light on the Pi if the hub is powered on but the Pi is not. The Pi also fails to boot when powered off this hub, with or without the interconnect plugged in. Stops the network from working when connected to the Pi after booting the Pi - cannot ssh to the Pi. Best avoided. :-( Shows up in *lsusb* as a pair of *ID 05e3:0608 Genesys Logic, Inc. USB-2.0 4-Port HUB* which is interesting. - Confirmed. This hub also appears unable to power an external USB drive using a y-cable as it gives the error -71 message in dmesg (when providing external power to the RPi)
    - 4-Port High-Speed USB 2.0 Hub (USB-H40-A2.0), came with with a 1A power supply. Leaks power to the Pi through the uplink. Doesn't work with Pi, unless the Pi is powered by a second power source. This hub is completely generic and I've seen it being sold under different brand names as well. Therefore, a picture is included (http://i.imgur.com/BPZ3j.jpg) for easy identification.
- **D-Link**
    - 7-Port USB Hub DUB-H7 (Crashes USB stack, including Ethernet, when plugging / using some peripherals). (See note above, it works with some distros and/or with latest firmware)
- **E-Solution**

    - 4-Port 2A Supply (Does not detect at all during boot or after boot- no messages) [IC = Alcor Micro Corp (AU6254)]
- **Fosmon**
    - 7-Port USB 2.0 Hub w/ 1A Power Supply (Causes interference with other USB devices and sends enough power to light up the pi with it's Micro USB cable unplugged).
- **Gear Head**
    - UH7250MAC 7-port powered hub. Internally, two daisy-chained Genesys Logic 05e3:0608 devices. Causes Ethernet instability when used under very specific circumstances, in X11.
    - ~~UH5200T 4-port powered hub. As of 2012-08-16 Wheezy, if any USB 1.x device (a keyboard, for example) is plugged into this hub, Ethernet stops, and USB interrupts for other devices get dropped (keys repeating forever), etc. Occurs even if power is not attached (not a power leakage problem).~~ Appears working after a bootloader and/or firmware update on 9/12. Also, turned out to be somewhat more specific to the combination of two particular low-speed devices.
- **Hama**
    - 4-Port USB 2.0 "bus hub", model 78496 (?). Only works for low power devices (card readers?), but does not work for power hungry devices (HDD,WLAN). Doesnt boot when hub connected to RPi. The funniest thing is that RPi powers on when I plug in this hub to normal size USB port (not that small dedicated port). idVendor=05e3, idProduct=0608
- **Kensington**
    - 7-Port Dome Hub model no 1500129 (Possible problems with malfunctioning keyboard, kills mouse when GUI started).
- **iBall**
    - Piano 423 4-Port USB hub. Listed in lsusb as Genesys Logic. Fails to deliver enough power to connected devices even when using AC power suply.
- **Inland**
    - 4-Port USB 2.0 Cable Hub model no 480426 (Some devices work, some don't, cheap unshielded untwisted wire design)
- **Logik**
    - LP7HUB11 7-Port USB Hub. (Ethernet failed, slow response, in LXDE. Happened whether or not the hub's independent power supply was connected to the hub.)
- **Soniq**
    - 4-Port 5V supply. Model number CUH100. (B). Appears to draw power away from the Raspberry Pi, even when the Pi has an isolated power line. Netgear WNA1100 WiFi Adapter (which is known to work in other setups is recognized, but unresponsive.

- **Targus**
  - ACH115EU 7-port powered hub. 5V 3A power supply. Arduino communicates with RPi when connected directly to Pi's USB port, but it hangs soon if connected via ACH115. Also sometimes smsc95xx eth0 Failed to read register index 0x00000114 etc. errors in syslog when used.
- **TCM**
  - Model 234298 s/n T634007737 powered hub. 4 ports plus card reader. 1A power supply. Model B, Wheezy raspian works ok with keyboard/mouse but problems with WiFi no connects. (insufficient power?)
- **Trust**
  - 10-port USB 2.0 Hub (powered). Prevents ethernet from being recognised.
  - SliZe 7 port USB 2.0 Hub (powered) - Item number 17080 (Barcode 8 713439 170801). Prevents ethernet from being recognised. Keyboard sends multiple characters.
- **Unbranded / Multiple Brands**
  - 7-port silver/black hub. Also sold elsewhere under brands such as 'EX-Pro', 'Trixes' and 'Xentra' -- This is *probably* due to an inadequate power supply. -- I replaced the terrible power supply with a very good one, kept getting "DEBUG: handle_hc_chhltd_intr_dma:: XactErr without NYET/NAK/ACK" in dmesg, with no devices plugged in to the hub (with or without the power supply in). Measurements by TrevorGowen (talk) of the power loading behaviour of an example of this type of hub and its supplied PSU are logged here (http://www.cpmspectre.pwp.blueyonder.co.uk/raspberry_pi/MoinMoinExport/PoweredUSBHubs.html) , together with similar measurements of other devices.
  - Generic 7-port black hub with Genesys Logic GL850A chipset
  - Cerulian 10 Port USB 2.0 Top Loading Hub with 2A supply (kills mouse and network port)[1]
  - USB 2.0 4 PORT INT/EXT DUAL HUB BAY (http://www.monoprice.com/products/product.asp?c_id=103&cp_id=10307&cs_id=1030701&p_id=226) -- Genesys Chipset -- idVendor=05e3, idProduct=0607 -- low speed devices worked, but strange USB failures when X session started. High speed devices such as hard drives had failures.

# USB Remotes

- ATI Remote Wonder (X10 Wireless Technology, Inc. X10 Receiver) — ID 0bc7:0004 — appears as a joystick-like 2 button mouse and a 0-9 keypad without drivers on console and X.
- Logitech Wireless Touch Keyboard K400 with Built-In Multi-Touch Touchpad (920-003070) (http://www.amazon.com/gp/product/B005DKZTMG/ref=oh_details_o02_s00_i00) - keyboard and touchpad work. Have not verified multi-touch features.

- iPazzport (http://www.ipazzport.com/02A.html) mini 2.4 GHz wireless keyboard and touchpad.
- PKB 1800 (http://www.ortek.com/html/pdt_view.asp?area=46&cat=152&sn=76) Wireless Smart Pad ad Mini Keyboard. Pad works as mouse but not multi touch features. Keyboard works.
- Riitek RT-MWK01 (http://www.riitek.com/product_Info.asp?id=56) **Rii** Wireless 2.4 Ghz Keyboard-mouse Combo, also known as Digicom WKEYPE01 (http://www.digicom.it/digisit/prodotti.nsf/itprodottiidx/WKEYPE01) , and Prodige Nanox (http://www.verkkokauppa.com/fi/product/52783) . Working perfectly, just plug & play.
- Tranksung TS-Y150 (https://www.google.com/search?q=tranksung+TS-Y150) USB RF Keyboard and air mouse (B)
- Exo Ultra U12-41310 Mini Keyboard (http://www.tigerdirect.com/applications/SearchTools/item-details.asp?EdpNo=6753651&CatId=3680#) Bluetooth Adapter, Touchpad, Laser Pointer, Presentation & Multimedia Controls work perfectly but need a little love and config for make it work.Exo Installer script (https://github.com/thunderbirdtr/rs-pi-exo-keyboard)

# USB Keyboards

USB keyboards that present themselves as a standard HID (Human Interface Device) device should work. **Please be aware that some of these keyboards were probably used with a powered hub**

## Working USB Keyboards

The following is a list of specific keyboards known to work and which appear to work fault-free.

- **A4 Tech**
  - Model KL-5 USB Keyboard, 20mA.
- **ABS**
  - M1 Heavy Duty Professional Gaming Mechanical Keyboard (B)
- **Action Star**
  - ACK-5010U Mini Keyboard And Mouse
- **Accuratus**
  - KYB-Toughball-HI
- **Acer**
  - KG-0917 Wireless Keyboard And Mouse Bundle (B)
  - KU-0906 Compact Keyboard (B) (Also known as Genius LuxeMate i200 Keyboard)

    - SK-9625 Multimedia Keyboard (B) (multimedia functions not tested)
- **Adesso**
    - PS/2 to USB Adapter (http://ergoprise.com/product_images/j/699/ADP-PU21_big__14173_zoom.jpg) ADP-PU21, 100mA (tested only with keyboards) Any PS/2 keyboard will work only if it will work with a reduced operating voltage.
    - Model AKB-410UB. Keyboard with Touchpad.
- **Apple** (Apple keyboards that have USB ports require an external powered hub to work, and do not work on the PI directly! Note: Apple keyboard works fine using the latest PI, even when connected directly (and with mouse connected))
    - Apple Keyboard with Numeric Keypad (aluminium/wired) A1243 (http://upload.wikimedia.org/wikipedia/commons/thumb/e/ea/Apple_iMac_Keyboard_A1243.png/800px-Apple_iMac_Keyboard_A1243.png)
    - Apple Keyboard (aluminium/wired) A1242 (http://upload.wikimedia.org/wikipedia/commons/8/81/Apple_Keyboard_A1242.jpg)
- **Asda**
    - Basic Wired Keyboard HK2026 (B)
    - Basic Wired Keyboard HK3014
        - (Please note when I put this keyboard through Newlink USB hub, it didn't work as expected)
    - Premium Wireless Keyboard (white keys, silver back) HK8028
    - Wireless Multimedia Deskset (keyboard, mouse and USB dongle) Model: HKM8016B (Note: Shown on Asda Website as HK8016B) (B)
- **Asus**
    - KS-631U (comes with Asus Vento KM-63 keyboard/mouse set, not using powered hub) (B)
- **Banbridge**
    - PS/2 to USB Banbridge CPA4002 Adapter (http://www.kurpirkti.lt/imagesi/infodb/org_d69dbd9707af8df77eae6e005f681a9a/BANDRIDGE-USB-2X-PS-2-ADAPTER.jpg) (B) (Tested with Logitech C-SF17 Cordless Desktop Express)
- **BTC - Behavior Tech Computer Corp.**
    - Wired Portable Keyboard Model 6100 US (86+9 keys)
        - Works with or without a powered hub
    - Wireless Multimedia Keyboard with build in pointer/mouse Model 9029URF III (86+17 keys) (B)
    - Wired Multimedia keyboard 6311U/6310U (http://www.btc.com.tw/english/2-7-07keyboard.htm) - rated at 5V/100mA, works directly
- **Bush**
    - Wired Slimline Keyboard KU-0833

        - This does not require a USB hub in order to work with the Raspberry Pi
        - In the UK, it is available from Argos for £9.99
- **Cerulian**
    - Mini wireless keyboard and mouse deskset (B)
- **CD Training**
    - Wireless Combo Keyboard and Mouse (SolClavGlos) (http://www.cd-training.fr/?&feed=product&product_id=308)
- **Cherry**
    - CyMotion Master Linux (B)
    - RS 6000 USB ON
    - G84-4100PTMUS (B) (Compact keyboard. Rated 100mA. Works directly in Pi)
- **Compaq**
    - Compaq Internet Keyboard KU-9978 (049f:000e). Rated 5v 100mA. Works directly connected to Pi
- **Das Keyboard**
    - Model S Professional Keyboard (Built in USB hub not tested) (B)
    - Model S Ultimate Keyboard (Built in USB hub working) (B)
- **Dell**
    - SK-8115 (B) (Rated 100mA. Works directly in pi)
    - L100 (B)
    - RT7D50 (75mA) (run "sudo dpkg-reconfigure keyboard-configuration")
    - KB1421 (100mA)
    - KB2521 (100mA)
    - KB212-B (Works directly in pi, without powered hub)
    - 1HF2Y (Works directly in pi)
    - Bluetooth Wireless Keyboard and Mouse Bundle (B), Bluetooth USB dongle C-UV35 (Rated 500mA but works great), Keyboard Y-RAQ-DEL2, Mouse M-RBB-DEL4
- **Delux**
    - K8050
- **Digicom**
    - WKEYPE01 Wireless 2.4 Ghz Keyboard-mouse Combo, also known as Riitek RT-MWK01 (http://www.riitek.com/product_Info.asp?id=56) and Prodige Nanox (http://www.verkkokauppa.com/fi/product/52783)
- **Dynex**
    - DX_-WKBD (60ma) (B)
    - DX_-WKBDSL (Hot keys not yet tested with Debian) (tested through non-powered 3 dongle usb hub) (B)
- **EAPPLY**

    - EBO-013 Wireless 2.4GHz compact keyboard with touchpad. Rated <40mA works directly from Pi. eBay ref 260962010276 from Shenzen, China.
- **Emprex**
    - Wireless Media Control Keyboard With Trackball 9039ARF III (Media functions untested)
- **Fujitsu Siemens**
    - KB SC USB UK (!)
    - KB910 USB, with led light on the highest level (B)
    - KB400 USB US
- **GE**
    - 98139 Rev.K1 (Power Keyboard) (lsusb shows it as "0b38:0010 Gear Head 107-Key Keyboard") - works without a hub (i.e. directly connected) (B)
- **Gear Head**
    - KB3700TP (USB Mini Smart Touch Touchpad Keyboard) (B)
    - KB3800TP (Wireless Touch Mini Touchpad Keyboard with Smart Touch) (B)
        - Works when plugged directly into Raspberry Pi, did not work with powered hub (could be a hub issue)
    - KB3800TPW (Windows Smart Touch Wireless Keyboard with Touchpad) (B)RASPBMC supported
    - KB4950TPW (Wireless Touch II Touchpad Keyboard) (B)
    - KB1500U (USB Mini Keyboard) (B)
    - KB5150 (2.4Ghz wireless keyboard/mouse Combo) (B)
        - Works well with a powered hub
- **Genius**
    - Ergomedia 700 (GK-04008/C) used without Hub
    - KB-06XE (K639) (B)
    - Slimstar 8000 wireless keyboard
- **HP**
    - KG-1061
    - KG-0851 Wireless Keyboard and Mouse
    - KU-0316 (B)
    - LV290AA#ABA Wireless Keyboard and Mouse
    - PR1101U (available from Sainsbury's in the UK, £8, July 2012)
    - SK-2880
- **Hyundai**
    - HY-K201
- **iConcepts**
    - 2.4GHz Wireless Keyboard and Optical Mouse Model 62550
        - (saves a USB port since keyboard and mouse share one transceiver, $14.99 at Fry's Electronics)

- **Imation**
  - KBD-702 Multi-media Wired Keyboard
    - (works after the firmware update via rpi-update (https://github.com/Hexxeh/rpi-update) as of 06/27/2012)
- **IOGEAR**
  - IOGEAR GKM561R Wireless HTPC Multimedia Keyboard with Trackball
  - IOGEAR GKM681R 2.4GHz Wireless Compact Keyboard with Optical Trackball and Scroll Wheel
- **iPazzPort**
- **i.t.works**
  - KC04 (direct and by usb hub)
  - KC Silicone (only tested directly)
- **Jenkins**
  - Jenkins Wireless Desktop Set Blue (B)
- **KeySonic**
  - ACK-540RF (Wireless USB keyboard with built-in trackpad); works fine on Debian Squeeze plugged directly into Pi. Also works with Raspbmc with powered hub.
  - ACK-540RF+ (UK) WiFi keyboard inc touchpad with USB wifi dongle works fb with on model B/raspian/wheezy via powered hub
  - ACK-3700C
  - ACK-340U+(DE)
  - ACK-3400U (UK) mini keyboard
  - ACK-612RF (GER) Wireless Mini-Keyboard; works fine with its wireless adpater plugged directly into Pi
- **Labtec**
  - Ultra-flat Keyboard (http://www.labtec.com/index.cfm/gear/details/EUR/EN,crid=28,contentid=692%7C)
- **Laptopmate**
  - AK-98UNTN7-UBRII Laptopmate RII Touch N7 Mini Wireless Keyboard with touchpad
- **LC-Power**
  - K1000BMW (lsusb: ID 1241:f767 Belkin; dmesg: HOLTEK Wireless 2.4GHz Trackball Keyboard) tested with Debian 6.0.4
- **Lenovo**
  - SK-8825 UK (B)
  - Lenovo Enhanced Multimedia Remote with backlit keyboard N5902 (US)
  - Lenovo Mini Wireless Keyboard N5901 (US)
- **Lindy**

    - 21840 (Wireless RF 2.4GHz Micro Keyboard with built-in optical touchpad/ trackpad, USB); works fine on model B/raspian/wheezy - the supplied Lindy USB nano dongle transceiver plugged directly into Pi USB port.
- **Logik**
    - Ultra slim keyboard LKBWSL11 (B) >> **This is also listed under Problem USB Keyboards?**
- **Logitech**
    - Comfort Wave 450, labeled 100mA (M/N Y-U0001, P/N 820-001725, PID SC951C40001)
    - diNovo Mini wireless keyboard with media controls and clickpad 920-000586 (B)
    - diNovo Edge Keyboard, Windows edition, built-in TouchDisc track-pad, bluetooth w/ USB mini-receiver 967685-0403 (B)
    - Wii wireless keyboard KG-0802 (!)
    - C-BG17-Dual Wireless keyboard and mouse with wired USB receiver (B)
    - Deluxe 250 Keyboard
    - Internet 350 (M/N 967740-0403)
    - Internet Navigator Keyboard
    - MK120 wired keyboard and mouse
    - MK220 wireless keyboard and mouse
    - MK250 wireless keyboard and mouse (no hub needed)
    - MK260 wireless keyboard and mouse (no hub needed)
    - MK300 wireless keyboard and mouse
    - MK320 wireless keyboard and mouse [20] (http://www.amazon.co.uk/Logitech-920-002885-MK320-Wireless-Desktop/dp/B003STDQYW/ref=sr_1_3?ie=UTF8&qid=1339166178&sr=8-3)
    - MK350 wireless keyboard (using Unifying receiver)
    - MK520 wireless keyboard and mouse
    - MK550 wireless keyboard and mouse (B)
    - MX3200 wireless keyboard and mouse (B)
    - MX5000 Bluetooth keyboard and mouse (B) The Logitech Bluetooth dongle also does proprietary wireless so it works without Bluetooth drivers.
    - EX100 Cordless Desktop, Wireless Keyboard and Mouse (B)
    - EX110 Cordless Desktop, wireless keyboard and mouse (B)
    - C-SF17 Cordless Desktop Express, Wireless Keyboard and Mouse (B) PS/2 Interface. Tested using PS/2 to USB Banbridge CPA4002 Adapter (http://www.kurpirkti.lt/imagesi/infodb/org_d69dbd9707af8df77eae6e005f681a9a/BANDRIDGE-USB-2X-PS-2-ADAPTER.jpg)
    - K120 Keyboard (B)
    - K200 Keyboard (B)
    - K230 Wireless Keyboard (Unifying receiver, no powered hub) (B)
    - K340 Wireless Keyboard (Unifying receiver, no powered hub) (B)
    - K350 Wireless Keyboard (B)

- K400 wireless keyboard with touchpad - also listed under "problematic". Works for weeks with openelec and raspbian without any problems. Worked out of the box - the on/off switch needs to be "on" for it to function correctly. Highly recommended if you are "working from the sofa".
- K520 Keyboard (B)
- K700 Wireless Keyboard with Touchpad and unifying receiver
- K750 Wireless Solar Keyboard (B) (Mac version works too. (B) )
- LX 710 - works fine with receiver plugged directly into the RPi (accompanying mouse works fine too).
- S510 wireless keyboard and mouse (B)
- Ultra-Flat Keyboard (M/N Y-BP62A P/N 820-000245 PID SY126UK)labelled 100 mA. OK direct into Model B RPi.
- G19 Gaming Keyboard, works fine with no external power. Illumination with external power. Powered hum in back of keyboard works too.
- G15 Gaming keyboard, as long as you press the backlight button twice to turn off the backlight (it says below it dosen't work with backlight on.
- V470 Bluetooth Laser Mouse

*Keyboards and mice also together with Unifying receiver*

- **Microsoft**
  - Microsoft Comfort Curve Keyboard 2000
  - Microsoft Comfort Curve Keyboard 3000 for Business
  - Microsoft Digital Media Pro Keyboard Model : 1031 (Debian 13-Apr-2012)
  - Microsoft Natural Ergonomic Keyboard 4000 (B) (Debian "Wheezy" beta 18-June-2012)
  - Microsoft Wired Keyboard 600 Model 1366 (Debian 28-May-2012 on Production Model B)
  - Microsoft Wireless Desktop 700 Keyboard v2.0 (Raspbian Pisces image 08-June-2012 on Production Model B)
  - Microsoft Wireless Photo Keyboard (Model 1027) Unifying receiver, no hub
  - Microsoft Wireless Natural Multimedia Keyboard (Raspbian Pisces 08-July-2012) (B)
  - Microsoft Windows 2000 Keyboard (KB-USBK110610)
  - Microsoft Wired Keyboard 600 (https://www.microsoft.com/hardware/en-us/p/wired-keyboard-600/ANB-00001) . The keyboard is rated at 5v/100mA (Wheezy 5-Sept-2012)
- **Mikomi**
  - Wireless Deskset KM80545 Keyboard and mouse (Works but range is terrible less than a metre) (B)
- **Monoprice**
  - PS/2 To USB Adapter (http://www.monoprice.com/products/product.asp?c_id=104&cp_id=10404&cs_id=1040401&p_id=6854&seq=1&format=2%7CMonopric Directly and through an unpowered hub with a USB mouse plugged in.

- **Motorola**
- - Bluetooth wireless ultra slim keyboard and mouse combo (sold as for the "Atrix" phone) work in combination with the Technika Bluetooth adaptor listed below
- **Novatech**
  - Wireless Combo - Keyboard & Mouse, Nano adapter (http://www.novatech.co.uk/products/peripherals/desktopkits/nov-wcombo.html%7CNovatech) (B)
- **ONN**
  - ONN Keyboard Stock No: ONA11HO089 (from Walmart). Seems to work fine, even without a hub.
  - ONN Keyboard Stock No: ONA11HO087 (from Walmart). Combination keyboard and mouse package with nano receiver. Be sure to configure keyboard layout.
- **Ortek**
  - Ortek Technology, Inc. WKB-2000S (http://www.ortek.com/html/pdt_view.asp?area=46&cat=150&sn=79) Wireless Keyboard with Touchpad works fine on Raspbian Wheezy and Raspbmc. Wireless USB receiver (device ID 05a4:2000) is recognised automatically. Connected directly to Pi USB port, no powered hub used.
- **Perixx**
  - Periboard 716 Wireless Ultra-Slim Keyboard with Touchpad (Debian 07-Jun-2012 on Production Model B)
  - PERIBOARD-502 wired keyboard inc built in touchpad (model B/raspian wheezy)
  - Periduo-707 Plus (Wireless Keyboard and Mouse) works fine *most* of the time. Does suffer from dropouts and glitches though. Usual "drawing too much power from USB" problems show up as well - dropped key presses or constant autorepeats. These can be cured by pulling out and reinserting the dongle in the USB socket. The keyboard sometimes hangs after power on when used with my laptop - it seems to need 30 seconds of non-use before it works fine. Again, remove and insert the dongle cures it. Works fine vi my Benq monitor's USB Hub.
- **Philips**
  - Wired Multimedia Keyboard SPK3700BC/97 (Debian 19-Apr-2012 on Production Model B)
- **Prodige**
  - Nanox Wireless 2.4 Ghz Keyboard-mouse Combo, also known as Riitek RT-MWK01 (http://www.riitek.com/product_Info.asp?id=56) and Digicom WKEYPE01 (http://www.digicom.it/digisit/prodotti.nsf/itprodottiidx/WKEYPE01)
- **Rapoo**

    - Rapoo E9080 Wireless Ultra-Slim Keyboard with Touchpad
    - Rapoo Wireless Multi-media Touchpad Keyboard E2700 [21] (http://www.rapoo.com/showdetails.aspx?P_No=E2700)
    - Rapoo Ultra-Slim Wireless Multimedia Keyboard and Mouse E9060 (works proper on powered USB Hub)
- **Riitek**
    - RT-MWK03 mini wireless keyboard & trackpad
    - RT-MWK02+ mini bluetooth keyboard & trackpad. Followed instructions from this page: [22] (http://www.ctheroux.com/2012/08/a-step-by-step-guide-to-setup-a-bluetooth-keyboard-and-mouse-on-the-raspberry-pi/) and it worked, connection persists across reboots, no problem with either builtin USB or powered USB hub.
    - RT-MWK01 mini wireless 2.4 Ghz Keyboard-mouse Combo, also known as Digicom WKEYPE01 (http://www.digicom.it/digisit/prodotti.nsf/itprodottiidx/WKEYPE01) , and Prodige Nanox (http://www.verkkokauppa.com/fi/product/52783)
- **Rosewill**
    - RK-200 Standard Keyboard
- **Saitek**
    - Eclipse II Backlit Keyboard PK02AU (B)
    - Eclipse Backlit Keyboard PZ30AV (B) - works fine when connected directly to Pi rev.1 and 2 USB port. No powered hub used.
    - Expression Keyboard (US)
    - Cyborg V.5 (B)
- **SelecLine**
    - WK11P & WM11P-SP-PP. Keyboard and mouse set. (B)
- **SIIG**
    - SIIG Wireless Multi-Touchpad Mini Keyboard 02-1286A v1.0 (B)
- **Silvercrest**
    - MTS2219 Wireless Keyboard and mouse set. Powered hub NOT used. (B)
- **SolidTek**
    - Solid Tek KB-P3100BU ASK-3100U.
- **Sony**
    - Keyboard for PlayStation 2 (PS2) Linux. Works without powered hub with 5v1A supply, requires manual keyboard remapping with Debian Squeeze to USA 101-key layout.
- **SteelSeries**
    - Merc keyboard (B)
- **Sun Microsystems**
    - Model: Type 7, SUN PN: 320-1348-02 (Danish key layout)
    - Model: Type 6, SUN PN: 320-1279-01 (Danish key layout)

- **Sweex**
  - KB060UK (http://www.sweex.com/en/assortiment/input/keyboards/KB060UK/) Wired Multimedia Keyboard
- **Technika**
  - WKEY03 (B)
  - TKD-211
- **Tesco**
  - Value Keyboard VK109 (B)
  - Multimedia K211 Wired Keyboard (B)
- **The Pi Hut**
  - Super Slim Apple Style Keyboard (from The Pi Hut's Raspberry Pi Store (http://thepihut.com/products/usb-keyboard-for-the-raspberry-pi) )
  - Super Slim Apple Style Keyboard Set (Keyboard & Mouse) (from The Pi Hut's Raspberry Pi Store (http://thepihut.com/products/usb-keyboard-mouse-bundle-for-the-raspberry-pi) )
- **Trust**
  - Trust 17916 Compact Wireless Entertainment Keyboard http://www.trust.com/products/product.aspx?artnr=17916 (B)
  - Trust ClassicLine Keyboard http://trust.com/17184
  - Trust Camiva MultiMedia Keyboard http://trust.com/products/product.aspx?artnr=16087
  - Trust Convex Keyboard http://trust.com/products/product.aspx?artnr=17603 tested debian6-19-04-2012 and archlinuxarm-13-06-2012 (B)
- **Unbranded**
  - AK-601 Wireless Mini Keyboard and Trackball (with laser pointer) - sourced from eBay Chinese seller
- **Unicomp**
  - USB Endurapro - keyboard and trackpoint work perfectly from powered hub
- **Q-Connect**
  - AK-808 (B)
- **Xenta**
  - 2.4GHz Wireless Multimedia Entertainment Keyboard with Touchpad (B)
  - Mini Multimedia Keyboard (Model no.: 808M) (B)

## Problem USB Keyboards

Note that generally PS/2 keyboards with an USB adapter will not work directly on a PI port, due to the fact that PS/2 keyboards are designed for normal 5V +-5% range, while USB keyboards must be designed to work with 4.4 Volt, and generally USB devices on the PI may receive less than 4.75 Volt. PS/2 + USB adapter keyboards might work behind

a powered hub, which does provide the full 5.0V. Some of these keyboards work when running the latest raspbian but not when using the overclocked xbmc version of raspbmc, probably due to the overclocking drawing more power away from the rest of the support system devices.

- **A4 Tech**
  - Model GL-6 USB Keyboard, 20mA. Part of wireless keyboard/mouse bundle GL-6630 (GL-6 + G7-630 + RN-10B) - suffers from USB flakeyness. Even on a powered hub. No problems on other computers I have tested it with.
- **Accuratus**
  - Accuratus KYBAC100-101USBBLK causes kernel panic (rated 100mA). Tested with 1000mA cheap unbranded and Nokia 1200mA power adaptors.
- **Apple**
  - Apple Keyboard (109 keys) A1048 (http://www.powerbookmedic.com/xcart1/images/D/apple-keyboard.jpg) . Draws too much power and does not seem to work properly when plugged into a powered hub.
- **Argos**
  - Argos Value Wired Keyboard causes kernel panic
- **Choidy**
  - Identifiers from usb-devices: Vendor=1a2c ProdID=0002 Rev=01.10 Product=USB Keykoard (yes, 'Keykoard') causes kernel panic
- **Cit**
  - KB-1807UB Causes kernel panic (Rated <200ma)
- **Dell**
  - SK-8135 (B) (Rated 1.5A. Takes too much power from pi even when not used as USB hub. Symptom = repeated keystrokes)
  - SK-8115 causes kernel panic (rated 100mA) Debian 6-19-04-2012 (B)
  - Y-U0003-DEL5 Sticky / Non-responsive keys
- **Gear Head**
  - KB2300U - Causes kernel panic (B)
- **GMYLE**
  - Wired USB Slim Chocolate Multimedia Media Typing Keyboard With 3 USB Port hub (B) - Kernel Panic on startup if plugged in. If plugged in at login prompt then freeze. [23] (http://www.amazon.co.uk/gp/product/B0067EC3GW/)
- **Inland**
  - Inland USB Keyboard Model #70010
- **Jeway**
  - JK-8170 "The Hunter" - causes kernel oops (Debian6-19-04-2012) (B)
- **Labtec**
  - ultra-flat wireless desktop USB - Keyboard has 'sticky' keys. Tested both debian6-19-04-2012 and archlinuxarm-13-06-2012 (B)
- **Logik**

    - Wired Multimedia Keyboard Model: LKBWMM11 - causes kernel panic (on Debian 190412 distro) (B)
    - Wired Ultra Slim Keyboard Model: LKBWSL11 - causes USB power issues. Not reliable. Causes other USB devices to fail (B) >> **This is also listed under Working USB Keyboards??**
- **Logitech**
    - Logitech Illuminated Keyboard (unstable; not working with led light on; tested both US and NO layouts with both Apple iPad 2 and Asus TF-101 USB chargers)
    - G110 Gaming Keyboard - only works with illumination off, otherwise unresponsive. Once failed it needs reconnecting before another attempt. (B)
    - G15 Gaming Keyboard - LCD and key backlights flicker, 95% unresponsive to typing. I don't know of a way to turn the illumination off. (B)
    - K360 Wireless Keyboard - Occasional sticky keys. (B)
    - K400 wireless keyboard with touchpad (completely non-functional on debian6-19-04-2012)
    - G510 Gaming Keyboard - lagging or unresponsive keys.
    - MX5500 wireless keyboard and mouse with usb bluetooth reciever - Unstable, looses connection without prior notice
    - EX100 Cordless Desktop, wireless keyboard and mouse. Mouse and keyboard hangs every few minutes (with or without hub).
- **Microsoft**
    - Wireless Desktop 800 - Keyboard has 'sticky' keys. (B)
    - Wireless Entertainment Keyboard - No key input recognized (possibly connectivity issue as pairing devices does not seem to work)
    - Wireless Optical Desktop 1000 - Keyboard has 'sticky' keys (B)
    - Wireless Keyboard 2000 - Keyboard has 'sticky' keys. (B)
    - Wireless Desktop 3000 - Keyboard has 'sticky' keys.
    - Arc wireless - Keyboard has 'sticky' keys. (B)
    - Sidewinder X4 - Keyboard has 'sticky' keys. (B)
    - Sidewinder X6 - Keyboard has 'sticky' keys. (B)
    - Wireless Comfort Keyboard 5000 - Keyboard has 'sticky' keys. (B)
    - Razer Reclusa - Keyboard has 'sticky' keys. (B rev 2.0)
- **Novatech**
    - NOV-KEY2 - Causes kernel panic (B)[2]
- **PC World Essentials**
    - PKBW11 Wired Keyboard - no power to keyboard, no error messages on both Arch 29-04-2012 and Debian6-19-04-2012, same Pi works with Asda keyboard. Me too, but caused a kernel panic -- tested on powered hub and direct.
- **Razer**
    - Razer Tarantula gaming keyboard - sticky keys, could be power issue as is programmable with host powered USB hub and audio jacks.
    - Razer BlackWidow - Sticky keys, could be a power related issue due to illuminated logo (Blue LED).

    - Razer Arctosa - Sticky keys, most probably power related issue since it states it's rated at 5v 500mA. (B)
- **SIIG**
    - Wireless Ultra Slim Multimedia Mini Keyboard JK-WR0612-S1 - Unresponsive and sticky keys.
- **Texet**
    - MB-768B standard keyboard (Rated 5V 1.5A(!), so probably too much power drain. Kernel panic, Debian6-19-04-2012)
- **Trust**
    - TRUST GXT 18 Gaming Keyboard - No power to keyboard, could be a driver issue - no error messages.
- **Unbranded**
    - Compuparts
    - model no. HK-6106 (B) [3]
    - LK-890 (Multimedia keyboard & Optical Mouse) - kernel panic on Debian Squeeze, ArchLinux and Qtonpi.
- **Verbatim**
    - 97472 Mini Wireless Slim Keyboard and Mouse (http://www.amazon.com/gp/product/B004LB5AKY/ref=oh_details_o00_s00_i02%7CVerbatim) - Keyboard has lagging, unresponsive and sticky keys issues. (Tested with and without powered USB hub.)
- **Wilkinsons / TEXET**
    - Model MB-768B causes kernel panic on debian6-19-04-2012.
- **Xenta**
    - HK-6106 - causes kernel panic (on Debian 190412 distro)(B)
    - Multimedia Wireless Keyboard and Mouse Set (Keyboard Model: HK3518B + Mouse Model HM3301) (B) - occasional sticky keys, and occasional complete lock-up

# USB Mouse devices

USB mouse devices that present themselves as a standard HID (Human Interface Device) device should work, however some hardware requires special drivers or additional software, usually only compatible with Windows operating systems.

## Working USB Mouse Devices

The following is a list of specific mouse devices known to work and which appear to be fault-free.

- **A4Tech**
    - OP-530NU Padless Wired Mouse

- **Asda**
  - HM5058 (Smart Price) Wired Mouse
  - Wireless Multimedia Deskset (keyboard, mouse and USB dongle) Model: HKM8016B (Note: Shown on Asda Website as HK8016B) (B)
- **ASUS**
  - MS-511U (comes with Asus Vento KM-63 keyboard/mouse combo) (B)
  - MG-0919 (wireless)
- **Belkin**
  - F8E882-OPT (B)
- **Dell**
  - M-UVDEL1 (B)
  - MOC5UO (100mA)
  - M056U0A (B)
  - DZL-MS111-L (B) (100mA)
  - MS-111P (100mA)
  - Bluetooth Wireless Keyboard and Mouse Bundle (B), Bluetooth USB dongle C-UV35 (Rated 500mA but works great), Keyboard Y-RAQ-DEL2, Mouse M-RBB-DEL4
- **Dynex**
  - DX-WMSE (100mA) (B)
- **Fellowes**
  - 99928 USB Micro Track Ball (works without a hub, directly plugged in) (B)
- **Filand**
  - OP-102i Mini Optical Mouse
- **Genius**
  - GM-04003A (B)
  - Slimstar 8000 wireless mouse (Can be intermitent. Mouse pointer sometimes is irratic.)
  - Traveler 515 Laser
- **HP**
  - MN-UAE96 (The basic stock HP wired mouse)(B)
- **iConcepts**
  - 2.4GHz Wireless Keyboard and Optical Mouse Model 62550
    - (saves a USB port since keyboard and mouse share one transceiver, $14.99 at Fry's Electronics)
- **Jenkins**
  - Jenkins Wireless Desktop Set Blue (B)
- **Kensington**
  - Kensington Expert Mouse Trackball K64325

    - Kensington Expert Mouse "Slimblade" K72327US
- **Labtec**
    - Corded Laser Glow Mouse 1600, rated 5V 100mA (P/N 810-000819, M/N M-UAZ149, PID GT83401)
- **Lenovo**
    - Wired Optical Mouse Model: MO28UOL
- **Logik**
    - Wired Optical Glow Mouse Model: LGGMO10. (B)
- **Logitech**
    - B105 Mouse for Laptops (OEM)
    - Cordless Pilot Optical Mouse M/N M-RR95 with Cordless Mouse Receiver M/N C-BA4-MSE
    - G5 Logitech Gaming Mouse (B)
    - G5v2 Logitech Gaming Mouse (B)
    - G500 Logitech Gaming Mouse (B)
    - G700 Logitech Wireless Gaming Mouse (B)
    - LX-700 Cordless Desktop Receiver (B)
    - LX 710 Wireless Mouse - works fine with receiver plugged directly into RPi (accompanying keyboard works fine too).
    - M90 optical mouse
    - M185 Wireless Mouse (B)
    - M210 (part of the MK260 set) (B)
    - M305 Wireless Mouse
    - M310 Cordless Mouse
    - M325 Wireless Mouse
    - M505 USB wireless laser, model no: 910-001324 (B)
    - M510 Wireless Mouse (B)
    - M705 Marathon Mouse (Unifying receiver, no powered hub) (B)
    - M-BD58 Wheel Mouse (B)
    - M-BJ58/M-BJ69 Optical Wheel Mouse (B)
    - M-BJ79 (B)
    - M-BT96a Optical Mouse
    - MX320/MX400 laser mouse (B)
    - MX518 Optical wheel mouse (B)
    - Optical USB Mouse (M/N 931643-0403)
    - Performance Mouse MX (B)
    - MX Revolution (B) (Debian "Wheezy" beta 18-June-2012)
    - VX Nano Cordless Laser Mouse for Notebooks
    - Wheel Mouse (M/N BJ58)
- **Medion**
    - Mini mouse Model M101-CBJ P/N 40016632 S/N 7BFSA00003445 rated 5v 100ms Works fb on model B with raspian wheezy

- **Microsoft**
  - Comfort Curve Mouse 3000 for Business
  - Comfort Mouse 6000 (works when directly connected to Pi (B). Does not work when connected through USB Hub (mouse pointer intermittent).
  - Compact optical mouse 500 V2.0 (B)
  - Wheel Optical Mouse (wheel and additional buttons not tested) (B)
  - Microsoft Intellimouse Optical Mouse
  - Microsoft Wireless Laser Mouse 8000
  - Microsoft Wireless Mobile Mouse 1000
  - Microsoft Wireless Mobile Mouse 3500
  - Microsoft Wireless Mobile Mouse 4000
  - Microsoft Wireless Mouse 700 v2.0
  - Microsoft Comfort Mouse 4500
  - Wireless IntelliMouse Explorer 2.0 (unifying receiver, no hub)
- **Novatech**
  - M1 USB Mouse - Wired (http://www.novatech.co.uk/products/peripherals/miceandtrackballs/nov-mouser.html%7CNovatech) (B)
  - DL10 Wireless Mouse (http://www.novatech.co.uk/products/peripherals/miceandtrackballs/nov-dl10.html%7CNovatech) (B)
- **Razer**
  - Boomslang Collectors Edition 2007 (B)
- **Rosewill**
  - Rosewill RM-C2U
- **Saitek**
  - Notebook Optical Mouse (PM46)
- **Samsung**
  - Samsung model:AA-SM3PCPB usb Optical Mouse (draws 50mA)
- **Sun microsystems**
  - Model: FID-638 , SunPN: 371-0788-01
- **Sweex**
  - MI015 (http://www.sweex.com/en/assortiment/input/optical-mice/MI015/)
- **Swiftpoint**
  - [24] (http://http://www.americas.futuremouse.com/) Swiftpoint Mini Wireless Optical Mouse. Does not require any special drivers. Haven't confirmed if charging the mouse requires a powered USB hub or not.
- **Targus**
  - AMU2701EUK (B)
- **Technika**
  - TKOPTM2 (B)

    - TKD-211
    - TKNM110
- **Tesco**
    - Wired optical mouse M211 (B)
- **The Pi Hut**
    - USB Mouse for Raspberry Pi (from The Pi Hut's Raspberry Pi Store (http://thepihut.com/products/usb-mouse-for-the-raspberry-pi) )
    - Super Slim Keyboard & Mouse Set (from The Pi Hut's Raspberry Pi Store (http://thepihut.com/products/usb-keyboard-mouse-bundle-for-the-raspberry-pi) )
- **Trust**
    - Trust Nanou Wireless Micro Mouse http://trust.com/products/product.aspx?artnr=17087
- **Verbatiam**
    - Mini Nano Optical Mouse 97470 (wireless on non-powered 3 usb dongle hub) (B)
- **Xenta**
    - MOW0810 (B)
    - Wired Optical Mouse (from The Pi Hut's Raspberry Pi Store (http://thepihut.com/products/usb-mouse-for-the-raspberry-pi) )
- **Generic**
    - Generic 2.4GHz Wireless Mouse (ID 040b:2013 Weltrend Semiconductor) (B)

## Problem USB Mouse Devices

The following is a list of specific mouse devices that have problems working with the Raspberry Pi

- **A4Tech**
    - Model G7-630 Wireless Mouse, 20mA. Part of wireless keyboard/mouse bundle GL-6630 (GL-6 + G7-630 + RN-10B) - suffers from USB flakeyness. Even on a powered hub. No problems on other computers I have tested it with.
- **HP**
    - HP Retractable Mobile Mouse (Optical) HP Product Number XP472AA - errors / boot loop RASPBMC (B)removed mouse, started with no further errors.
- **Logik**
    - Logik IMF Blue Trace Wired USB mouse (Model LMWBLU11) - disconnects from the USB port every 20 seconds when using the Raspian distro. Always reconnects to the USB port successfully (B)
- **Logitech**

    - Logitech G400 Gaming Mouse - 100% CPU load and laggy mouse cursor when the mouse is moved. MX518 works fine on the same setup, so I suspect it's a polling rate issue. this (http://tech2.in.com/reviews/mice/logitech-g400-is-it-a-worthy-successor/231012) says the mouse is 1000Hz out of the box, whereas the 518 is only 125Hz. Solution found: add usbhid.mousepoll=8 to the kernel commandline.
- **Microsoft**
    - Microsoft Touch Mouse - Does not see right clicks, Only left.
- **Razer**
    - Naga Wired USB mouse - the mouse seems to present itself as a keyboard because the numpad on the left-hand side of the device works but the cursor doesn't move.
- **Roccat**
    - Kone[+] Wired USB mouse - Nothing happens when moving the mouse, haven't looked further into the issue (B)
- **Trust**
    - Optical USB Mouse MI-2250 - Nothing happens when moving the mouse (B)
- **Xenta**
    - Multimedia Wireless Keyboard and Mouse Set (Mouse Model: HM-3301) (B) - frequent lost connection giving stuttering mouse cursor indicating USB current not enough for dongle

# USB Real Time Clocks

- Cymbet
    - Cymbet CBC-EVAL-06 USB Real Time Clock (FT2232 to SPI to RV-2123)

Device information at http://www.cymbet.com/pdfs/DS-72-22.pdf Code to access the RTC from Linux: https://github.com/owendelong/Cymbet-RTC Does not require a powered hub.

# USB WiFi Adapters

See also: http://www.element14.com/community/docs/DOC-44703/l/raspberry-pi-wifi-adapter-testing

There is a howto on installing the TL-WN722N adapter here (http://elinux.org/RPi_Peripherals#Wireless:_TP-Link_TL-WN722N_USB_wireless_adapter_.28Debian_6.29) , which also acts as a guide for installing others too.

## Working USB Wifi Adapters

These adapters are known to work on the Raspberry Pi. This list is not exhaustive, other adapters may well work, but have not yet been tried.

**Note:** A WiFi adapter will probably need more power than the Raspberry Pi USB port can provide, especially if there is a large distance from the WiFi adapter to the WiFi Access Point. Therefore, you may need to plug the WiFi adapter into a powered USB hub.

- **3COM**
  - 3CRUSB10075: ZyDAS zd1211rw chipset (!)
- **7DayShop**
  - W-3S01BLK, W-3S01BLKTWIN : Unbranded product available from 7DayShop, in a single or twin pack. [25] (http://www.7dayshop.com/catalog/product_info.php?cPath=777_9&products_id=112046) , [26] (http://www.7dayshop.com/catalog/product_info.php?&products_id=112527) . Tested on Debian Wheezy, with the dongle attached directly to the RPi along with the wireless keyboard receiver. Shows up as a Ralink RT5370 device, and no drivers or additional software downloads required. Created wpa.conf, edited 'interfaces' file and restarted the networking. The manufacturer portion of the MAC address (7cdd90) is assigned to "Shenzhen Ogemray Technology Co., Ltd."
  - It works without additional software connected directly to a Rev 2 Pi but stops working after a period of time (3 to 4 hours) with a fully updated Wheezy and all the 'USB workarounds' [27] (http://elinux.org/Rpi_USB_check-list) in place.
- **Alfa**
  - AWUS036NEH: Tested on Debian Squeeze (with Ralink firmware package)
  - AWUS036NH: Tested on Arch Linux ARM using the rt2800usb module.
  - AWUS036NH: Tested on Debian Wheezy (with Ralink firmware package). Tested on Raspbian too (drivers from aircrack-ng).
  - AWUS036H (500mW version): Tested on Raspbian (drivers from aircrack-ng).
  - AWUS036H (1W version): Tested on Raspbian (drivers from aircrack-ng). Needs USB powered HUB or Rev2 of the board / polyfuse bypass.
  - AWUS036NHA: Tested on Raspbian (drivers from aircrack-ng). Works fine if connected after boot, otherwise Raspberry Pi won't boot up.
- **AirLink101**
  - AWLL5088: Tested on Debian Wheezy. This adapter is based on the OEM Edimax EW-7811Un. For automatic installation, See MrEngmanns script listed below under the Edimax device.
- **Asus**
  - USB-N10 (http://www.element14.com/community/docs/DOC-44703) USB ID 0b05:1786, r8712u staging driver, included on Fedora Remix & Arch, must

download (http://www.element14.com/community/servlet/JiveServlet/download/44948-8-97488/r8712u_ko.zip) for Debian and install firmware-realtek from non-free squeeze repo (B) (not needed with latest Raspbian "wheezy" 2012-07-15: this Asus works N10 out of the box) Does not support nl80211 APIS, so hostapd won't work.
    - USB-N13 (http://www.element14.com/community/docs/DOC-44703) USB ID 0b05:17ab, works with Adafruit Occidentalis v0.1 image (http://learn.adafruit.com/adafruit-raspberry-pi-educational-linux-distro/occidentalis-v0-dot-1) as it includes kernel with 8192u driver built-in (http://www.element14.com/community/message/57635#57660) (B)
    - WL-167G v1 USB ID 0b05:1706, Ralink RT2571 working out-of-the-box on Debian image from 2012-04-19. Requires powered hub, otherwise it is detected by OS but will not function.
    - WL-167G v3 USB ID 0b05:1791, working out-of-the-box on Linux raspberrypi 3.2.27+ #160 PREEMPT Mon Sep 17. Does not require powered hub.
- **AusPi Technologies**
    - AusPi Wireless Adapter [Realtek RTL8188S]. Works without a powered HUB. Tested on OpenELEC (works OOB), RaspBMC (works OOB), XBian (works OOB) and 2012-08-08 Raspbian Wheezy (works OOB). Distributed in Australia by Buy Raspberry Pi Australia (http://www.buyraspberrypi.com.au/raspberry-pi-802-11bgn-usb-wireless-dongle/) .
- **Belkin**
    - Belkin Components F5D7050 Wireless G Adapter v3000 [Ralink RT2571W]. On Debian requires the firmware-ralink package from the non-free repository. The usbcore module needs to be added to /etc/modules install instructions (http://www.penguintutor.com/blog/viewblog.php?blog=6281) .
    - Belkin Components F5D8053 ver.6001 Wireless N Adapter [Realtek RTL8188SU]. Tested on OpenELEC (works OOB), RaspBMC (works OOB), Raspian - 2012-07-15-wheezy-raspbian (followed instructions here (http://forum.xbian.org/viewtopic.php?f=7&t=29) ) **Powered hub required!**
    - Belkin Components F5D8053 ver.6001 Wireless N Adapter [Realtek RTL8188SU]. Works on RaspBMC OOB (with NetworkManager plugin). Works WITHOUT powered hub on 5v 800mA power with 6 overvolt (nothing else connected to USB)
    - Belkin Components F7D1101 v1 Basic Wireless Adapter [Realtek RTL8188SU] USB ID 050d:945a, r8712u staging driver, included on Fedora Remix & Arch, must download (http://www.element14.com/community/servlet/JiveServlet/download/44948-8-97488/r8712u_ko.zip) for Debian and install firmware-realtek from non-free squeeze repo (B)
    - Belkin Components F6D4050 V1 [Realtek RT3070] USB ID: 050d:935a Driver: RT3572STA(recommended),RT2800USB,RT2870STA. Tested under Arch using this (https://wiki.archlinux.org/index.php/Setting_Up_Belkin_F6D4050_Wireless_USB_Dongles) guide.

    - Belkin Components F6D4050 V1/V2 [Realtek RT3070] USB ID: 050d:935a / 935b Driver: RT3572STA. Tested with Raspbian - See installation instructions (http://iggy82.blogspot.co.uk/2012/08/wireless-n-raspberry-pi-belkin-f6d4050.html) - Powered hub not required!
    - Belkin Components F7D2102 "N300" Micro Wireless USB adapter. Tested with Occidentalis 0.1. Tested and working on Rasbian wheezy (and RaspBMC), driver RTL8192CU, no powered hub needed (dongle directly attached to the onboard ports)
    - Belkin Components F9L1001v1 "N150" Wireless USB Adapter. Tested and working on Rasbian wheezy WITHOUT powered hub.
    - Belkin Surf Micro WLAN USB-Adapter (Raspbian Wheezy, unpowered hub, "N150")
- **BlueProton**
    - BT3 (http://www.element14.com/community/docs/DOC-44703) USB ID: 0bda:8187; tested on Debian, Fedora & Arch; rtl8187 driver (B)
- **Buffalo**
    - USB ID: 0411:01A2 WLI-UC-GNM - Tested on Raspbmc; rt2800usb driver
- **Conceptronic**
    - C300RU. Works out of the box in Raspbian. Causes reboot when plugging on a live Rev. 2 RPi
- **Conrad**
    - WLAN Stick N150 mini. Works out of the box in OpenELEC, requires firmware-realtek and r8712u kernel module on Debian (http://www.t3node.com/blog/sempre-wireless-usb-stick-wu300-2-on-raspberry-pi/) .
    - WLAN Stick N150 Nano [Realtek RTL8188CUS]. Requires a powered USB hub. See Micronet SP907NS for installation instructions and script.
- **DELL**
    - Wireless 1450 [Intersil ISL3887]. Works out of the box but requires a powered hub (the RPi boots with this dongle plugged in, recognizes and configures it, works for some time but then crashes randomly under heavy traffic. A powered hub seems to fix the issue).
- **DIGICOM**
    - USBWAVE54 [chipset Zydas ZD1211] . [[28] (http://www.digicom.it/digisit/prodotti.nsf/itprodottiidx/UsbWave54) ] Works out of the box in OpenELEC. With Raspbian or Debian squeezy/wheezy works with zd1211-firmware .
    - USBWAVE300C [chipset Ralink 2870] . [[29] (http://www.digicom.it/digisit/prodotti.nsf/itprodottiidx/UsbWave300c) ] Works out of the box in OpenELEC. With Raspbian or Debian squeezy/wheezy works with firmware-ralink .
- **D-Link**
    - AirPlus G DWL-G122 (rev. E). USB ID 07d1:3c0f, Ralink RT2870. On Debian requires the `firmware-ralink` package from the `squeeze-firmware`

non-free repository. (However I experience total crashes on raspbian 2012-07-15 after a few minutes of load on the wlan. Will have to investigate via serial console.)
    - AirPlus G DWL-G122 (rev. C). USB ID 07d1:3c03, Ralink RT2571. Working out-of-the-box on Arch image from 2012-04-29.
    - AirPlus G DWL-G122 (rev. B1). USB ID 2001:3c00, Ralink RT2571. Working out-of-the-box on Arch image from 2012-06-13.
    - DWA-110 (Version A1). Requires the ralink package from the non-free repository on Debian.
    - DWA-121 (Version A1). Wireless N 150 Pico. Works out-of-the-box with Raspian Wheezy (2012-09-18) and Raspbmc (2012-11-06) using Network-Manager addon (see Program - Addons)
    - DWA-123 (Version A1). USB ID 2001:3c17, Ralink RT2800. Working out-of-the-box on Arch image from 2012-04-29. (working without UBS Hub - not yet sure if it achieves full speed though.)
    - DWA-131 USB ID 07d1:3303,Realtek RTL8192SU, 802.11n Wireless N Nano. Works out of the box on Raspbian "wheezy". Verified with direct USB : no powered USB hub needed. Also verified when Nano used in powered USB hub. Someone had trouble configuring SSID/Passphrase in etc/network/interfaces file. But no problem & very easy to configure using wicd : wicd is a gui interface on LXDE for network configuration. Install it using command-line : `apt-get install wicd`. Once configured ith wicd to auto-run on boot, no need to turn back to LXDE. Recommended.
    - DWA-140 (Version B1). USB ID 07d1:3c09, Ralink RT2870. On Debian requires the `firmware-ralink` package from the `squeeze-firmware` non-free repository.
    - DWA-140 (Version B2). USB ID 07d1:3c0a, Ralink RT3072. Workaround for faulty firmware binary: Place file rt2870.bin from linux-firmware_1.53.tar.gz (https://launchpad.net/ubuntu/oneiric/+source/linux-firmware/1.53/+files/linux-firmware_1.53.tar.gz) in /lib/firmware. Explanation (https://bugs.launchpad.net/ubuntu/+source/linux-firmware/+bug/770232) .
    - DWA-160 (Version B1). USB ID 07d1:3c11, Ralink RT2870. On Debian requires the `firmware-ralink` package from the `squeeze-firmware` non-free repository.
    - DWA-160 (Version A2). USB ID 07d1:3a09, Atheros AR9170. (NOTE: I can only get it to work through powered USB hub) requires carl9170-fw firmware [30] (http://http://aur.archlinux.org/packages.php/packages.php?ID=44102)
- **Edimax**
    - EW-7811Un (http://www.edimax.co.uk/en/produce_detail.php?pd_id=328&pl1_id=1&pl2_id=44) USB ID 7392:7811, RTL8192CU, driver blob download (http://www.electrictea.co.uk/rpi/8192cu.tar.gz) via Element14 (http://www.element14.com/community/docs/DOC-44703) , works with WPA2-AES-CCMP (howto (http://www.ctrl-alt-del.cc/2012/05/raspberry-pi-meets-edimax-ew-7811un-wireless-ada.html) ) (B) -

Alternative driver download link that works with Raspian (http://dl.dropbox.com/u/80256631/8192cu-latest.tar.gz) . **Note:** With current raspbian (2012-09-18-wheezy) it is recognized immediately, the default module works fine; the configuration is easy using wireless-essid and wireless-key in /etc/network/interfaces.

- The EW-7811Un can be powered directly from the Raspberry Pi if the Raspberry Pi is powered using a well regulated power supply.
- A script-based installation for the EW-7811Un (http://www.edimax.co.uk/en/produce_detail.php?pd_id=328&pl1_id=1&pl2_id=44) by MrEngman can be found on the RasPi forums (http://www.raspberrypi.org/phpBB3/viewtopic.php?f=26&t=6256&hilit=edimax) . Tested with Debian Squeeze and Raspbian. An installation guide can be found here. (http://dl.dropbox.com/u/80256631/install-rtl8188cus.txt)
- Instructions for getting the EW-7811Un (http://www.edimax.co.uk/en/produce_detail.php?pd_id=328&pl1_id=1&pl2_id=44) working in Raspbmc (tested RC3) can be found here (http://forum.stmlabs.com/showthread.php?tid=780) .
- Simple step-by-step instructions for EW-7811Un (http://www.edimax.co.uk/en/produce_detail.php?pd_id=328&pl1_id=1&pl2_id=44) which uses the RTL8192 chipset RPi_edimax_EW-7811Un(B)
- EW-7318USg (http://www.edimax.com/en/produce_detail.php?pd_id=8&pl1_id=1&pl2_id=44) USB ID 148f:2573, rt73usb. RT2573 chipset. Works with powered usb-hub or shorted polyfuses.
- EW-7711UAn (http://www.edimax.co.uk/en/produce_detail.php?pd_id=261&pl1_id=1&pl2_id=44) , Ralink RT2870, works perfectly on Arch with a powered hub (not tested without yet). Simply required wireless_tools and wpa_supplicant, the drivers/firmware are included in kernel 3.0. I followed the Arch Wireless Setup (https://wiki.archlinux.org/index.php/Wireless_Setup) instructions.

- **edup**
  - [Edup 150MBPS wifi adapter (http://www2.buyincoins.com/details/usb-150m-wifi-wireless-lan-network-card-adapter-antenna-product-1916.html) ] USB ID: 148f:5370 Ralink Technology, Corp. RT5370 Wireless Adapter. Driver is the RT2800USB module, I had to install the firmware as rt2870.bin in /lib/firmware.(requires firmware-ralink from wheezy (http://raspberry-pi-notes.blogspot.com/2012/05/rt5370-cheap-micro-usb-wireless-dongle.html) ) (B)
  - Ultra-Mini Nano USB 2.0 802.11n 150Mbps Wifi/WLAN Wireless Network Adapter (http://dx.com/p/ultra-mini-nano-usb-2-0-802-11n-150mbps-wifi-wlan-wireless-network-adapter-48166?item=1&Utm_rid=24958662&Utm_source=affiliate) USB ID: ID 0bda:8176 Works stable when using VLC for internet radio receiver. Works stable 24/7 on two of my Raspberries used as webserver. Use method shown here (http://www.raspberrypi.org/phpBB3/viewtopic.php?t=7471&p=91736) for debian.

- - edup nano EP-N8508 (http://www.szedup.com/show.aspx?id=1681) Use method shown here (http://www.raspberrypi.org/phpBB3/viewtopic.php?t=7471&p=91736) for debian. Requires powered USB hub for adequate power. When directly powered by Pi, it fails after a few minutes. (B) Unusable with analog audio because when data is being send or recieved the audio get disorted. Use script from here (http://dl.dropbox.com/u/80256631/install-wheezy-beta-rtl8188cus-20120619.sh) for Wheezy.
- **Eminent**
  - EM4575 - rt2800usb driver.
- **EnGenius**
  - EUB9603 EXT - Realtek r8712u driver
- **Gigabyte**
  - Gigabyte GN-WB32L 802.11n USB WLAN Card. Works with the rt2800usb driver.
- **GMYLE**
  - Wireless 11n USB Adapter. Uses RTL8188CUS chipset - cheap on eBay. Installs and works using the install-rtl8188cus-latest.sh script.
- **IOGear**
  - GWU625 (http://www.element14.com/community/docs/DOC-44703) USB ID 0bda:8172, r8712u staging driver, included on Fedora Remix & Arch, must download (http://www.element14.com/community/servlet/JiveServlet/download/44948-8-97488/r8712u_ko.zip) for Debian Squeeze and install firmware-realtek from non-free squeeze repo. No need to download firmware when using Debian Wheezy (B)
- **Linksys**
  - Linksys (Cisco) WUSB100 ver.2 1737:0078, tested on raspbian; follow Brucalipto.org (http://www.brucalipto.org/linux/the-raspberry-diary-wusb100-wireless-n/) instructions; not stress tested but works without issues for light network load.
  - Linksys (Cisco) WUSB600N, test on raspbian, details here (http://elibtronic.ca/content/20120731/raspberry-pi-part-1-wifi-support)
  - Linksys WUSB54GC (manufactured 07/2008) No issues! needs powered hub on version 1.0 boards.
- **LogiLink**
  - Wireless LAN USB 2.0 Nano Adapter 802.11n LogiLink [31] (http://www.logilink.eu/showproduct/WL0084B.htm) is working even usb powered.
- **Micronet**
  - Micronet SP907NS, 11N Wireless LAN USB Adapter (uses Realtek RTL8188CUS) works plugged directly into R-Pi USB (B) Debian installation instructions (http://dl.dropbox.com/u/80256631/install-rtl8188cus.txt)

IMPORTANT: read the instructions first to avoid problems, and Auto-install script (http://dl.dropbox.com/u/80256631/install-rtl8188cus-latest.sh) . The script has been used to install other adapters using the RTL8188CUS chip. Updated driver (http://dl.dropbox.com/u/80256631/8192cu-latest.tar.gz) that handles the latest rpi-updates that kill the original driver, download for manual installation, automatically installed by the Auto-install script.

- **MSI**
  - 0db0:6861 MSI-6861 802.11g WiFi adapter (US54G): works with external powered USB hub, requires firmware from here (http://sourceforge.net/projects/zd1211/files/zd1211-firmware/) , power management must be disabled: `iwconfig wlan0 power off`
- **Mvix**
  - Mvix Nubbin (MS-811N): works out of the box on Raspbian "wheezy" and does not need a powered USB hub.
- **Netgear**
  - N150: Reported as WNA1100 device, uses the Atheros ar9271 chipset. On Debian, requires the `firmware-atheros` package from the `squeeze-backports` non-free repository (!)
  - N150: Some versions reported as Realtek RTL8188CUS device. Read Micronet entry above and use RTL8188CUS script for installation. Works best plugged into powered USB hub.
  - WG111v1: Prism54 chipset. Needs powered hub. Follow info for Prism54 chipset on Debian wiki.
  - WG111v2: Realtek rtl8187 chipset. Seems to draw a lot of power; e.g. I can't power this and a USB thumb drive simultaneously.
  - WNA1000M works with Raspberry Pi Model B Board v. BS1233.However when downloading torrents, when torrent pick up speed system become unresponsive.
- **OvisLink**
  - Evo-W300USB: USB ID 148f:2270 Ralink Technology RT2770. apt-get install firmware-ralink
- **Patriot Memory**
  - PCUSBW1150 (http://patriotmemory.com/products/detailp.jsp?prodline=6&catid=69&prodgroupid=163&id=1198&type=20) Wireless 11N USB adapter (uses Realtek RTL8188CUS) Install using Micronet script. Works only through powered usb hub.
  - PCBOWAU2-N (http://www.patriotmemory.com/products/detailp.jsp?prodline=6&catid=69&prodgroupid=163&id=973&type=20) Wireless 11N USB adapter (uses Realtek RTL8191SU chip) Installed using r8712u Kernel module
- **Ralink**

    - inner 02 joggler wifi usb RT2770F USB-ID 148f:2770 (firmware-ralink required) (only got dhcp on powered hub)
    - RT2070 (http://www.dx.com/p/24688) USB-ID 148f:2070 firmware is already loaded into Raspbian. For Debian, the firmware must be installed (instructions (http://wiki.debian.org/rt2870sta) ). Needs a powered USB hub.
    - RT3070 USB-ID 148f:3070 firmware is already loaded into Raspbian.
    - RT2501/RT2573 (http://www.element14.com/community/docs/DOC-44703) USB-ID 148f:2573 (firmware-ralink required) (B)
    - RT5370 USB-ID 148f:5370 (requires firmware-ralink from wheezy (http://raspberry-pi-notes.blogspot.com/2012/05/rt5370-cheap-micro-usb-wireless-dongle.html) ) RPi_Ralink_WLAN_devices(B). An image of an adapter with this chip can be found here (http://i.imgur.com/wRF7L.jpg) .
- **Rosewill**
    - RNX-N180UBE Wireless B/G/N Adapter
        - Realtek RTL8191SU chipset, USB-ID 0bda:8172
        - Tested in Arch, works out of box. Powered USB hub required.
        - Tested in Raspbian, used wicd to configure network settings. Powered USB hub Required.
        - Tested in Raspbmc. Needs package firmware-realtek and used wicd-curses to configure. Powered USB hub required
    - RNX-G1 Wireless B/G Adapter
        - Realtek RTL8187 chipset, USB-ID 0bda:8187
        - Tested in Arch, works out of box. USB hub required.
    - RNX-MiniN1 (RWLD-110001) Wireless-N 2.0 Dongle (Realtek Semiconductor Corp. RTL8188CUS 802.11n WLAN Adapter)
        - Tested in Raspbian, powered from USB hub.
- **Sagem**
    - Sagem Wireless USB stick XG-760N : USB ID 079b:0062, Module is not shipped in Debian image, but can be "sudo apt-get install zd1211-firmware"
- **Sempre**
    - Sempre Wireless USB stick WU300-2: USB ID 0bda:8172, Realtek r8712u driver + firmware-realtek package. Module is shipped in Raspbian image. If you need to build it for other distros, read this: http://www.t3node.com/blog/sempre-wireless-usb-stick-wu300-2-on-raspberry-pi/
- **SL**
    - SL-1507N: USB 802.11n 150M WiFi Wireless Lan Network Card Adapter SL-1507N Black
        - I bought this on on eBay for $4.19 (free shipping) @ http://www.ebay.com/itm/270853614804?ssPageName=STRK:MEWNX:IT&_trksid=p3984.m1497.l2649#ht_4379wt_119
        - It worked out of the box on Raspbmc RC4, with the network manager add-on; seems to be an rt2800usb

        - dmesg output "usbcore: registered new interface driver rt2800usb"
- **SMC**
    - SMCWUSBS-N : Hardware detected as rt2800 but missing firmware; "sudo apt-get install firmware-ralink" fixed it
    - SMCWUSB-G : Gives "couldn't load firmware" error. "sudo apt-get install zd1211-firmware" fixes it.
- **Sony**
    - Sony UWA-BR100 802.11abgn Wireless Adapter [Atheros AR7010+AR9280] (Vendor ID: 0411, Product ID: 017f) - Tested with Raspbian. Needs package firmware-atheros.(B)
- **Tenda**
    - USB 11n adapter on a G network: Ralink 2870/3070 driver (!)
    - Tenda W311MI Wireless N Pico USB Adapter (identified as Ralink RT5370 Wireless Adapter; USB-ID: 148f:5370) - Works out-of-the-box for Raspian 2012/09/18 or later. An earlier version gave me problems.
    - Tenda W311U Mini 11N Wireless USB Adapter (USB-ID 148f:3070): Ralink 2870/3070 driver; needs powered hub. Debian installation instructions (http://blog.modmypi.com/2012/06/installing-tenda-w311u-mini-wireless.html)
    - Tenda W311U+ Wireless USB Adapter - Tested with Raspian.
- **The Pi Hut**
    - USB 802.11n WIFI adapter (from The Pi Hut's Raspberry Pi Store (http://thepihut.com/products/usb-wifi-adapter-for-the-raspberry-pi) )
- **TP-Link**
    - TL-WN422G v2 (ath9k_htc) Works OOTB in Debian Wheezy Beta. Runs without powered Hub when plugged into running RasPi, but the RasPi won't boot while the stick is plugged in.
    - TL-WN721N (ath9k_htc device with htc_9271.fw file from http://linuxwireless.org/download/htc_fw/1.3/htc_9271.fw); needs powered USB Hub (B) | works OOTB with wheezy raspbian (2012-08-16) connected directly to raspberry pi (B) and AP functionality tested with hostapd.
    - TL-WN722N (ath9k_htc device with htc_9271.fw file from http://linuxwireless.org/download/htc_fw/1.3/htc_9271.fw); needs powered USB Hub (B)
    - TL-WN723N (RTL8188SU); works OOTB with raspbian 2012-09-17, (B) stable with 1A PSU and without powered USB hub on r2.0.
    - TL-WN821N v3 (ath9k_htc, htc_7010.fw); works out of the box on ArchLinuxARM and on OpenElec (>r11211), Problems with prior OpenElec; needs powered USB Hub (B)
    - TL-WN823N Works out of box on Raspian using powered USB Hub
- **Trendnet**
    - TEW-648UBM (http://www.wikidevi.com/wiki/TRENDnet_TEW-648UBM) USB ID: 20f4:648b, works OOTB with Adafruit Occidentials Raspbian Wheezy

variant (http://learn.adafruit.com/adafruit-raspberry-pi-educational-linux-distro/) as it includes kernel with RTL8188CUS driver built-in (http://www.wikidevi.com/wiki/Special:Ask?title=Special%3AAsk&q=%5B%5BChip1+model%3A%3ARTL8188CUS%5D%5D&p (B)

- **Widemac**
  - RT5370 Wireless Adapter from Ebay (http://www.ebay.co.uk/itm/180887771838?ssPageName=STRK:MEWNX:IT&_trksid=p3984.m1497.l2649) runs without powered hub. Follow these instructions (http://elinux.org/RPi_Ralink_WLAN_devices) but go to ftp.de.debian.org/debian/pool/non-free/f/firmware-nonfree/ (http://ftp.de.debian.org/debian/pool/non-free/f/firmware-nonfree/) and pick the latest firmware-ralink_0.xx_all.deb
- **ZyXEL**
  - NWD2105 (http://www.element14.com/community/message/50015#50015/l/re-installing-kernel-headers-on-the-pi) USB ID: 0586:341e, RT3070 chipset, rt2800usb driver (B)
  - G-202 (http://www.zyxel.com/products_services/g_202.shtml) model 0586:3410 ZyXEL Communications Corp. ZyAIR G-202 802.11bg using zd1211rw kernel module and zd1211-firmware package

## Problem USB Wifi Adapters

These adapters were tested and found to have issues the Raspberry Pi. Note [32] (http://www.raspberrypi.org/phpBB3/viewtopic.php?f=28&t=6928) as a possible solution/explanation for errors while running LXDE.

- **Alfa**
  - AWUS036NHA (Vendor ID: 0cf3, Product ID: 9271) - Tested with Raspbian. Works fine if connected after boot. Kills boot process if previously attached. Details here. (http://www.raspberrypi.org/phpBB3/viewtopic.php?f=28&t=16809&p=169469#p169469)
- **EDIMAX**
  - EW-7811Un (Vendor ID: 7397, Product ID: 7811) - Reports as containing the Realtek RTL8188CUS chipset listed below, no lockup or kernal oops under wheezy but dmesg reports constant timeouts trying to initialize the module. This appears to be resolved on 2012-09-18-wheezy-raspbian and newer versions.
- **Linksys**
  - WUSB300N (Vendor ID: 13B1, Product ID: 0029) - Tested with Raspbian, OpenELEC, among others. No Linux chipset support for Marvell 88W8362 at all.
- **LogiLink**
  - WL0085 tested under debian (squeeze, wheezy, raspbian); no stable connection can be established. This gets even worse when X is running.

- **MicroNEXT**
  - MN-WD152B (Debian image) modprobe hangs when plugged in, lsusb hangs. udevd errors in the logs. [33] (http://www.element14.com/community/thread/17632) [34] (http://www.raspberrypi.org/phpBB3/viewtopic.php?t=6737)
    - Possible fix: try the new Adafruit Occidentalis v0.1 (http://learn.adafruit.com/adafruit-raspberry-pi-educational-linux-distro/occidentalis-v0-dot-1) image (based on Raspbian Wheezy) as it includes the needed 8192cu driver builtin to the kernel
- **Netgear**
  - WNDA3100v2 tested with debian (wheezy); no driver for broadcom chipset (see http://www.wikidevi.com/wiki/Netgear_WNDA3100v2).
- **Realtek**
  - RTL8188CUS USB-ID 0bda:8176, kernel oops in dmesg and freeze when pulled from USB. (B)
- **Trendnet**
  - TEW-424UB (http://www.element14.com/community/docs/DOC-44703) USB ID: 0bda:8189; tested on Debian, Fedora & Arch; rtl8187 driver; errors with LXDE running (B)
- **TP-Link**
  - TL-WN821N (http://www.element14.com/community/docs/DOC-44703) USB ID: 0cf3:7015; tested on Debian; requires htc_7010.fw (http://linuxwireless.org/download/htc_fw/1.3/htc_7010.fw) firmware; ath9k_htc driver; errors with LXDE running (B)
  - TL-WN723N USB ID: 0bda:8176; tested on Arch without a powered hub; it seems to draw too much current.

# USB Bluetooth adapters

## Working Bluetooth adapters

- Asus USBIA-EG (paired with Asus Blutooth Keyboard/Media Center Remote
  - Verified works error-free in Multiple Distros (Openelec, Raspbian, RaspBMC, Xbian) Latest builds eliminate text echo problems.
- Cambridge Silicon Radio, Ltd Bluetooth Dongle (HCI mode) - (USB ID 0a12:0001)
  - Example of above is; TOPDIGI UA01 Bluetooth USB Dongle Plug and Play (install bluez package from std repos)
  - Tesco own brand 'Technika' Nano Bluetooth Adaptor has the Cambridge Silicon Radio chipset and works fine, cost £5.97 at time of posting.
  - Hama USB Bluetooth 3.0 adapter (Class 1) ~£10 on amazon.co.uk.
  - Another sample: Product ID: 0a12:0001, pictured here: http://www.element14.com/community/message/58288

    - RiiTek RT-MWK02+ - comes with a usb bluetooth adapter that works perfectly for both the RiiTek mini bluetooth keyboard/mouse and other bluetooth devices. Tested both on builtin USB and on powered USB hub. There are other RiiTek bluetooth (and non-bluetooth wireless) devices on the working list. Bluetooth adapter shows up in lsusb as "0a12:0001 Cambridge Silicon Radio" - this is notable as most other sources of this chipset do not seem to be available in the US.
- D-Link DBT-122, with ID 07d1:f101, using a Broadcom chip
    - http://www.element14.com/community/message/58288
- IOGear GBU321 (Broadcom BCM2045 Chipset)
    - Works with Raspbian Wheezy directly attached to Pi and via powered USB hub.
- Trust BT-2400p
    - Working well with Raspbian Wheezy directly attached to Pi. Using with sma-bluetooth (SMA Solar Inverter reading software).

### Problem Bluetooth adapters

- **Belkin**
    - Belkin F8T017. Tested with Raspbian 2012-07-15 and bluez installed with apt-get. When dongle is inserted into Pluscom powered USB hub, my remote PuTTY session scrolls incredibly slowly (testing with ls -R to generate text). Suspect network issue. Lots of errors on dmesg too. Pi itself is responsive when using directly. On removal of the device everything goes back to normal.
- **Generic**
    - Bluetooth "3.0" Dongle (http://dx.com/p/mini-bluetooth-v3-0-usb-2-0-dongle-71248) . Doesn't work reliably - eg. after some time it will hang and the device will need to be reset using fcntl. The device id is 1131:1004 Integrated System Solution Corp. Bluetooth Device.
- Asus USB-BT211
    - Shows up as HCI device in Raspbian, but does not scan or pair.
    - http://www.raspberrypi.org/phpBB3/viewtopic.php?f=28&t=9962

## USB Ethernet adapters

### Working Ethernet adapters

- **AVM**
    - FRITZ!Box WLAN 3030 USB Ethernet Adapter: Works out of the box. No external power source needed.
- **Wintech**

    - USB 2.0 LanCard Model: LAU-15 (CK0049C) using the mcs7830 driver. Probably needs more than 100 mA current. [35] (http://www.raspberrypi.org/phpBB3/viewtopic.php?f=46&t=8708#p106136)
- **LogiLink**
    - USB 2.0 UA0144: AX88772 chipset using the asix kernel driver. Tested only on powered USB hub so far.
    - LogiLink Fast EN USB 2.0 to RJ45 Adapter: Test on wheezy-Raspian (2012-08-16) without USB Hub will be confirmed

lsusb output: Bus 001 Device 004: ID 9710:7830 MosChip Semiconductor MCS7830 10/100 Mbps Ethernet adapter

- **Apple**
    - Apple USB Ethernet Adapter using asix kernel driver. Works out of the box on Raspbian, haven't tested on any other OS.
- **Edimax**
    - Edimax EU-4230 USB2.0 Fast Ethernet Adapter with 3 port USB hub. Works out of the box. Needs its own power source.
- **D-Link**
    - D-Link DUB-E100 Fast Ethernet USB 2.0 Adapter - works out of the box, requires own power supply (from powered USB hub)
- **Sitecom**
    - Sitecom LN-030 V2 detected as ASIX AX88772 USB 2.0 Ethernet Adapter works out of the box. Doesn't seem to require any extra power supply.
- **A-Link**
    - A-Link NA1GU Gigabit USB 2.0 ethernet adapter

This adapter works, but (probably) requires a bit of work. The driver for the chipset (Asix AX88178) included with the Raspbian kernel (v 3.1.9+ Aug 7 2012) does **not** work. With that driver the device is detected, but it does not seem to be possible to actually put any traffic through it. :-( In order to make it work you need to download the latest driver from the chipset manufacturer (http://www.asix.com.tw/products.php?op=pItemdetail&PItemID=84;71;100&PLine=71) . The version I used was "Linux kernel 3.x/2.6.x Driver" v4.4.0, released 2012-05-18. Fortunately this is GNU GPLv2 -licenced source code and not a binary blob, so compiling it for the Raspberry Pi is perfectly doable. The hardest part was in fact getting the Linux source code required, because the repositores contained the source for the wrong kernel version. >:-( Fortunately there is a very useful guide (https://www.grendelman.net/wp/compiling-kernel-modules-for-raspbian-raspberry-pi) for how to get the sources from github, and preparing that source so that you can compile modules. Unfortunately you will have to compile the kernel (even if you don't actually install it) - which will take the better part of the day on the Raspberry, but once that's done you can unpack the driver source and just run "make && sudo make install". Reboot and you should have a fully working ethernet adapter.

The adapter seems to work without a powered USB hub, but according to the specifications it can draw up to 190 mA, so there might be stability issues if additional power is not provided.

### Problem Ethernet adapters

- Axago
  - Axago ADE-X1 10/100 Ethernet Adapter (usb: 9710:7830 driver:mcs7830). Adapter working about 10 minutes without problem, but after that kernel write error message to dmesg and no packet is received. Needed to unplug and plug USB again. Tested with and without powered USB hub.

## USB Sound Cards

You will usually want the `alsa` package for sound. In the Debian image for Raspberry Pi (and possibly other distributions) USB sound cards are prevented from loading as the first sound card, which can be an annoyance if it's the only device you have. To disable this behaviour edit `/etc/modprobe.d/alsa-base.conf` and comment out the last line; `options snd-usb-audio index=-2` . If you are not user *pi* you may need to add your username to the *audio* group thus: `sudo adduser yourusername audio` (user *pi* usually belongs to this group anyway).

- **Creative**
  - Sound Blaster Play! (http://asia.creative.com/products/product.asp?category=1&subcategory=207&product=17892)
- **Daffodil**
  - USB Sound Adapter US01 (http://www.amazon.co.uk/gp/product/B002FI7GWK/ref=oh_details_o03_s00_i00) . Tested with low-cost headphone/microphone set via *audacity* (See notes at cpmspectre.pwp.blueyonder.co.uk/raspberry_pi/MoinMoinExport/DaffodilUSBSoundAdapter (http://www.cpmspectre.pwp.blueyonder.co.uk/raspberry_pi/MoinMoinExport/DaffodilUSBSoundAdapter.html) ).
- **Edirol**
  - UA-1A (http://www.roland.com/products/en/UA-1A/)
- **Hercules**
  - Gamesurround Muse XL (Pocket LT3) (http://www.hercules.com/fr/Cartes-Son/bdd/p/123/gamesurround-muse-xl-pocket-lt3/)
- **Logilink**
  - UA0053 USB Soundcard with Virtual 3D Soundeffects LogiLink (http://www.logilink.de/showproduct/UA0053.htm?seticlanguage=en)
- **NuForce uDAC-2**

    - NuForce uDAC-2 Headphone Amplifier and USB DAC (http://www.nuforce.com/hp/products/iconudac2/index.php)
- **Terratec**
    - Aureon Dual USB (http://www.terratec.net/fr/produkte/Aureon_Dual_USB_12339.html)
- **Texas Instruments PCM2704**
    - PCM2704 98dB SNR Stereo USB2.0 FS DAC with line-out and S/PDIF output, Bus/Self-powered (http://www.ti.com/product/pcm2704)

# USB 3G Dongles

- Huawei E173
- Huawei E220
- Huawei E160 (AT commands only)
- Franklin U600 from Sprint / VirginMobile
    - Use usb_modeswitch and vendor 0x1fac and product 0x0150/0x0151
- Digicom Internet Key 7.2 HSUPA **MU372-L01** [36] (http://www.digicom.it/digisit/prodotti.nsf/itprodottiidx/MU372L01)

Tested on Raspbian and Archlinux. Detected as 230d:0001. Works with cdc_acm driver. Install usb_modeswitch. There are 2 "com ports"( /dev/ttyACM0 and /dev/ttyACM1 ) . Tested with Network Manager.Works also perfectly with SAKYS3G [37] (http://www.sakis3g.org/) tools (!! led is always off !!) and wvdial. A working wvdial.conf : http://ubuntuforums.org/showpost.php?p=10361881&postcount=28 . (for example for Vodafone IT , replace Init3 with this : Init3 = AT+CGDCONT=1,"IP","web.omnitel.it" and replace line Modem = /dev/ttyUSB0 with Modem = /dev/ttyACM1 ) and run with wvdial voda .

# USB IR Receivers

SMK Manufacturing, Inc. eHome Infrared Receiver (Works out of the box with OpenELEC)

# USB Radio devices

- FM Radio
    - ADS InstantFM Music - FM radio tuner works fine under debian.

# USB TV Tuners and DVB devices

- August

    - DVB-T205, based on rtl2832u chipset, working with this driver (https://github.com/ambrosa/DVB-Realtek-RTL2832U-2.2.2-10tuner-mod_kernel-3.0.0) . Tested with Saorview (Irish DTT service), both HD & SD.
- DVBSky
    - Mystique SaTiX-S2 Sky USB (http://dvbsky.eu/Products_S860.html) : Scanning/ watching SD and HD works via vdr and streamdev plugin, watching on the Pi directly is laggy as hell. DVB-USB and I2C support must be enabled in the kernel. Needs drivers/firmware from here (http://dvbsky.eu/Support.html) .
- Sundtek
    - Sundtek MediaTV Digital Home
    - Sundtek MediaTV Pro
    - Sundtek SkyTV Ultimate
    - DVB-C, DVB-T, DVB-S/S2 (http://shop.sundtek.de) : digital TV works, streaming to Windows / Linux is no problem. Easy installation English (http://support.sundtek.com/index.php/topic,4.0.html)
- Hauppauge
    - Hauppauge NOVA-T Stick (Revision 70xxx) DiBcom DiB0700 chipset, requires powered hub.
    - Hauppauge NOVA-TD Stick (Revision 52xxx) DiBcom DiB0700 chipset, requires powered hub.
    - Hauppauge WinTV-HVR-1950 (tested analog tuner with omxplayer)
    - Hauppauge WinTV-HVR-950Q (tested Digital OTA with TVHeadend in Raspbian)
- K-World
    - K-World UB499-2T Dual DVB-T USB Tuner. IT9137 chipset. With no other USB devices connected Pi can just about power this stick. IR and supplied remote work with XBMC.
- Technisat
    - Technisat_SkyStar_USB_HD. Instructions: http://www.linuxtv.org/wiki/index.php/Technisat_SkyStar_USB_HD Used the Pi to receive and redirect it via network to another host. Didn't try to play back the stream on the Pi itself. Tested with Astra 19.2E radio and SD-TV channels
- Generic
    - DVB-T USB Dongle (Silver casing) (http://www.onsources.com/product_images/a/757/watch_and_record_digital_tv_dongle__44323_zoom.jpg) , based on AF9015 chipset.
    - DVB-T USB Dongle (http://www.electrodepot.fr/media/catalog/product/cache/1/image/500x/9df78eab33525d08d6e5fb8d27136e95/P926993.jpg) , based on RTL2832 FC12 (HD/SD), IR detected but not tested

# USB Webcams

Debian image is missing v4l kernel modules, so video devices are not available. Kernel and firmware upgrade can possibly be used to fix this[38] (http://blog.pixelami.com/2012/06/raspberry-pi-firmware-update-for-debian-squeeze/) .

## Working USB Webcams

- **Canyon**
  - Canyon CNR-WCAM820 - 2Mpix cam with manual focus; works with *fswebcam* and *v4l4j* on Raspbian wheezy armhf; problems with 1600x1200 resolution in some apps (timeouts - probably too slow USB); 1280x1024 and lower resolutions works OK
- **Creative**
  - Creative VF0470 Live! (works out of the box on ArchLinux)
  - Creative VF0260 Live! Cam Vista IM (works out of the box)
  - Creative VF0640 Live! Cam Socialize (works on Raspbian at 320x240 resolution, 15fps)
  - Webcam Notebook PD1170 (detects, untested)
- **HP**
  - Webcam HD-2200 (Amazon) (http://www.amazon.com/HP-Webcam-HD-2200-BR384AA-ABA/dp/B004UR9P9Q/) (HP) (http://shopping.hp.com/en_US/home-office/-/products/Electronics/Webcams/BR384AA?HP-HD-2200-Webcam) (Walmart) (http://www.walmart.com/ip/HP-Webcam-HD-2200/16775645)
  - Webcam HP-3100 - UVCVideo /dev/video0 Needs chmod to 666 to operate. Will work without hub if only device in USB ports. Works with both Arch and wheezy out of the box
- **Logitech**
  - Webcam C100 Model Number V-U0013 (works fine without powered hub - Tested on 2012-08-16-wheezy-raspbian image - motion detection was good - video streaming was really slow might be unusable)
  - Webcam C200
  - Webcam C270 (with external power)
  - Webcam C310 does not require a powered hub to capture snapshots
  - Webcam C510
  - Webcam C525 (works fine without powered hub)
  - HD Webcam C615 (works fine without powered hub)
  - Webcam C910 (with external power, is uncvideo)
  - Webcam C920 (with powered hub, detected out of box on Raspain as Video0 V4L device)
  - QuickCam Orbit/Sphere USB webcam (ext. power)

    - QuickCam Pro 9000 - powered by Raspi, working on debian wheezy
    - Webcam Pro 9000 (046d:0809), powered by RPi (measured ~120 mA capturing at ~5 fps), works on Arch
- **Medion**
    - MD86511 - powered by Raspi, working on Raspbian “wheezy” from 2012-07-15
- **Microsoft**
    - Xbox Live Vision camera (045e:0294), powered by Raspi, working on Arch
    - LifeCam Cinema 720p USB HD Webcam H5D-00001 - Powered by USB Hub. Working on Raspbian "wheezy"
    - LifeCam HD-6000 - Powered by Raspberry Pi. Working on Raspbian "wheezy" (2012-07-15)
    - LifeCam NX-6000 - Powered by Raspberry Pi. Working on Debian "wheezy"
    - LifeCam VX-7000 - Powered by USB Hub. Working on Raspian "wheezy"
    - LifeCam VX-3000 - On "raspbian" wheezy (though there do appear to be some issues with image quality and getting partial frames and such, with fswebcam)
    - LifeCam VX-800 - Powered by Raspberry Pi. Working out of the box on Raspbian (Amazon) (http://www.amazon.it/Microsoft-JSD-00008-LifeCam-VX-800/dp/B0057FWVSC) Doesn't work at full 640 * 480 resolution but OK at 352 * 288.
- **Sony**
    - PlayStation Eye (for PlayStation 3) (the occasional frame is corrupted/stutters when running at 640x480)
    - PlayStation Eyetoy (for PlayStation 2) (Occasional 'mangled frame' directly connected to Rev 2 Pi)
- **Trust**
    - 2MP Auto Focus Webcam (works out of the box on ArchLinux)

## Problem USB Webcams

- **Creative**
    - WebCam Pro / PD1030 - ov519 driver crashes almost immediately. ("gspca: ISOC data error: [0] len=0, status=-4004")
- **Logitech**
    - Webcam Pro 9000 - Has issues capturing images at higher than default resolutions (using motion - Arch and Debian).
    - Webcam Pro 4000 - It uses pwc driver which does not work. Maybe it's because of general Raspi USB bug.
- **Microsoft**
    - Lifecam HD5000 - Picture breaks up at the bottom
    - LifeCam Studio/Cinema - Has UVC issues detailed here [39] (http://www.ideasonboard.org/uvc/#devices) . Horizontal lines problem [40]

(http://www.raspberrypi.org/phpBB3/viewtopic.php?f=63&t=12304) . Stability issues [41] (http://www.raspberrypi.org/phpBB3/viewtopic.php?f=63&t=12247) .

- **Sony**
  - Eye Toy (PlayStation 2) model SLEH 00030 - (OV519 camera). Picture constantly breaks up on xawtv and wxcam under Arch Linux. Noted there were ISOC data error len=0 status=-4004 errors in dmesg. This happens when powered from the Pi and when powered from a Pluscom USB hub. Arch was updated on 17th July 2012
- **Trust**
  - SPACEC@M 200 - (OV511 camera). Picture stops after a few seconds in xawtv under Arch Linux and xawtv reports libv4l2 errors. This happens when powered from the Pi and when powered from a Pluscom USB Hub. Arch was updated on 17th July 2012

# USB GPS devices

- Royaltek
  - Royaltek RGM 2000 SiRF2 using the included serial (TTL) to USB - converter. That uses a Profilic pl2303-chip so you'll need to compile the module or the kernel manually
- Garmin
  - Garmin eTrex Vista HCx: Works but may draw much power. To get it working (software part): https://wiki.openstreetmap.org/wiki/USB_Garmin_on_GNU/Linux
- GlobalSat
  - GlobalSat BU-353 Does not require a powered hub, works fine when directly plugged into the RPi. On Raspian, requires the gpsd and gpsd-client packages. For some reason, the gpsd daemon does not always start correctly on boot. You may need to do something like the following to manually restart it:

```
sudo killall gpsd; sudo gpsd /dev/ttyUSB0 -F /var/run/gpsd.sock
```

- Wintec
  - WBT-200: No problem on Debian
- Holux
  - Holux M-215: Works fine on Arch, uses Silicon Labs CP210x RS232 serial adaptor driver
- Bluenext
  - Bluenext BN903S: No problem on Debian image (19-04-2012).

# USB UART and USB to Serial (RS-232) adapters

A USB UART adapter is used to access the serial console of the Raspberry Pi from a development host such as a laptop or desktop PC. The USB end connects to the PC and the UART header end connects to the USB. While it is possible to connect the USB end to another Raspberry Pi, this configuration has not been tested unless explicitly mentioned against an individual entry below.

- **FTDI**
  - FT232 chip based adapters works for some people but others find it hangs Linux when the port is opened. module is ftdi_sio
- 
  - FT2232D dual RS232/FIFO works (used in various JTAG devices)
- **Prolific**
  - PL2303 chip based adaptors works fine on latest Debian tested with *minicom* and *gtkterm*

A USB to Serial (RS-232) adapter is used the other way around, ie. the USB end connects to the Raspberry Pi and the RS-232 end (DSUB-9 or DSUB-25 pin) to the other device which may be another computer, (old) modem or printer, or some electronic test equipment.

- "Best Connectivity" (Possibly also sold under the "Newlink HQ" or "Kenable HQ" labels)
  - FG-U1232-PL2 Based upon the Prolific PL2303X chipset and listed by *lsusb* as `ID 067b:2303 Prolific Technology, Inc. PL2303 Serial Port`. Appears as `/dev/ttyUSB0`, and requires the user to be a member of the *dialout* group (which *pi* is for *Raspbian Wheezy*). Initially tested using an old RS Datalinker setup in "loopback" mode via *microcom* upto 9600 baud, and *gtkterm* after installing that from source code. All handshake lines toggled as expected and no characters were lost. Subsequently *gtkterm* was used to check bi-directional communication with an ancient brother EP44 electronic typewriter (as a printer/dumb terminal) at 1200 baud. Signal lines were again monitored with the Datalinker.

# Other, exotic USB devices

## USB to Parallel Port/Printer Adapters

- **Prolific**
  - PL2305 Chipset with Centronics 36w connector. Originally purchased for use with a netbook and connected to an old Canon BJC-250 printer. Worked fine under RISC OS Pi with its in-built BJC-250 driver. Could not install the CUPS

drivers etc. for wheezy-raspbian but was able to do so for wheezy-armel. (See notes at http://www.cpmspectre.pwp.blueyonder.co.uk/raspberry_pi/MoinMoinExport/USBtoParPrntAdapter (http://www.cpmspectre.pwp.blueyonder.co.uk/raspberry_pi/MoinMoinExport/USBtoParPrntAdapter.html) for more info.)

## USB to SATA

- **Nippon Labs**
  - 2.5" SATA HDD USB Adapter with silicone HDD sleeve. Model: USB-ADT-25SATA. Works on powered Hub, not directly to Raspberry Pi. Built-in "Y" power adapter.

## CAN Bus

- PEAK-System (www.peak-system.com)
  - PCAN-USB using the driver (kernel module) from http://www.peak-system.com/fileadmin/media/linux/index.htm

## Home automation

- Tellstick (www.telldus.com), installation instructions
  - Depends on libftdi1

## Touch Screen

- ACER T230H touch screen [42] (http://support.acer.com/acerpanam/monitor/2009/acer/t230h/t230hnv.shtml)
  - USB TS identifies as "Quanta Computer, Inc. Optical dual-touch panel", module hid_quanta
  - Seems to draw over 200 mA from USB!

## Floppy Disk Drive

- Samsung USB Floppy Drive SFD-321U/HP
  - I suppose a floppy drive might be considered exotic nowadays!
  - LSUSB lists it as Samsung Electro-Mechanics Co. Floppy Disk Drive
  - Only tried connected to a powered USB hub, as the drive is labelled 5V at 0.5A on a Raspberry Pi running Debian Wheezy.
  - tail -f /var/log/syslog looking for mount device when plugged in, came up as SDA in testing.
  - sudo mkdir /media/floppy
  - sudo mount /dev/sda /media/floppy

- Contents of floppy now available in /media/floppy
- To remove drive, ensure no sessions have the floppy directory as the current working directory.
- sudo umount /media/floppy

## USB Missile Launcher

- USB Missile Launcher / Rocket Launcher sold in UK by Marks and Spencer but also sold under a range of other names.
  - USB ID 1130:0202 Tenx Technology, Inc. Use apt-get install pymissile (python code) and there is C code at usbmissile from Source Forge (http://sourceforge.net/projects/usbmissile/)

## USB Docking Stations

- StarTech USB 3.0 to Dual 2.5"/3.5" SATA HDD Dock (SATDOCK2U3GB)
  - This is an externally powered dual sata HDD docking station, which has USB2.0 compatibility with the Pi.
  - Tested with latest raspbmc and debian wheezy raspbian, 3.1.9+ #168

## USB RFID Reader

- Unbranded 125KHz EM4100 RFID reader from eBay sellers (< £7), the one with a Windows logo on (easily scratches off for Linux users).
  - Initially would not work when plugged in directly to RPi. Worked when connected via an unpowered Trust hub. Worked after RPi was modified with 10K resistors over the USB polyfuses (warranty invalidated). Probably would work fine with powered hub.
  - Sends a 10 digit string to current window or console as if it was a keyboard. Can be captured independently of keyboard using Linux event interface (/dev/input) but kernel in current distributions does not have CONFIG_INPUT_EVDEV selected so kernel rebuild is necessary.

## JTAG

- FTDI2232D dual RS232/FIFO based JTAG (e.g. SheevaPlug JTAGKey USB-ID 9e88:9e8f)
  - works using the RPi as a development host

## USB 3.0 Multi-Card Reader

- US Robotics All-In-One Multi-Format Card Reader (Product # USR8420) Accepts 5 cards simultaneously

- SD/MMC + MS/MS PRO or DUO/DUO PRO + CF/MD + SM + SD/MMC or MS/MS PRO. Useful for backing up cards containing other OS Distros

# PS2 / AT to USB Converters

- Unbranded active converter known as the "blue cube". Based on the Cypress CY7C63723C 8 bit RISC. Please see http://geekhack.org/showwiki.php?title=PS2-to-USB+adapters for more information.

Note that although the adapter might work, PS/2 keyboards were not designed to be low power USB devices, so they might not meet the requirement to work with considerable lowered supply voltage (4.4 volt) provided by the USB ports of the raspberry PI. These keyboards should work when powered by a powered hub.

**Tested PS2/AT keybords**

All above tested with the famous "blue cube" on a powered USB hub.

- IBM Model F (please note requires an additional AT to PS2 converter)
- Dell AT101w
- Northgate Ominikey Ultra T (please note requires an aditonal AT to PS2 converter)
- 04d9:1400 Holtek Semiconductor, Inc. PS/2 keyboard + mouse controller
  - Working: Ipex RT215KTW PS/2 keyboard
  - Not working: HP SK-2502 PS/2 keyboard (gets power but does not init - three LEDs remain permanently lit. Keyboard + Holtek converter work on a Linux PC, although this keyboard doesn't work with some native PS/2 ports.)

# Power adapters

The Raspberry Pi uses a standard Micro USB (type B) power connector, which runs at 5v. Generally you can use a MicroUSB to USB cable and then either power the Raspberry Pi directly from your main computers USB ports (if they provide enough power), or by using a USB to Mains adaptor. A number of mobile phones use MicroUSB power cables, and these are compatible with the Raspberry Pi in most cases. Below is a list of power adaptors known to work.

## Working power Adapters

- **AlcaPower**
  - 5V 2.5A Model AP5A - Charger/switching with 7 connectors(also Microusb)
- **Ansmann**
  - - Dual USB charger slim, Model-Nr. 1201-0001
- **Apple**

    - 5V 2.1A USB charger for iPad2, model A1357
    - 5V 1.0A USB Charger for iPod
    - 5V 1.0A USB Charger for iPhone 4
- **Amazon**
    - 5V 0.85A USB charger for Kindle
    - 5V 2A Mains to USB A adaptor, Branded "CostMad"
- **Asus**
    - 5V 2.0A USB charger for Google Nexus 7
- **Belkin**
    - 5V 2.6A 4 port Ultra-Slim Desktop hub (Model F4U040) (RPi running from USB Hub port)
    - 5V 2.5A 4 port USB Hub (Model F5U404) (RPi running from USB Hub port)
    - 5V 3.5A 7 port USB 2.0 Mobile Powered Hub (Model F4U018) (RPi running from USB Hub port)
    - 5V 3.5A 7 port USB Hub (Model F5U706) (RPi running from USB Hub port)
    - Mini Surge Protector Dual USB Charger (Model BZ103050-TVL)
    - Universal USB Wall Charger (5V 1A) (Model F8Z222uk)
- **Blackberry**
    - Charger for Pearl Flip 8220, Bold 9600 (B)
    - Charger for Tour 9630
    - 5V 0.7A Model PSM04R-0500CHW1(M), RIM Part Number HDW-17957-003 (B)
    - 5v 750mA Model RIM-C-0004aDUUUC-001, RIM Part Number HWD-24481-001 (comes with Blackberry 9300)
    - 5v 750mA Model RIM-C-0004ADUUS-001 035D, Single port plug. (Tested with USB B to Micro USB cable from Logitech H760 Headset)
    - 5V 2A Model PSAC10R-050QT, RIM Part Number HDW-34725-001
    - 5v 550ma curve 8520 charger works with raspberry pi Model B Board v. BS1233. It does not work with raspbmc image.Symtoms are frequent key board and external hdd disconnects.
- **Deal Extreme**
    - S-10-5 5V 2A Regulated Switching Power Supply (110~220V) (http://dx.com/p/5v-2a-regulated-switching-power-supply-110-220v-94518) (DIY: requires additional micro-USB connector and wiring)
- **Dell**
    - USB Hub integrated in Dell monitors (B)
- **The FX Factory**
    - 5V 1A (1.2A max) AC Travel Charger Model KJ-USB Mains. Typically provides 4.9V at 1A [4]
- **Garmin**
    - 5V 1A charger (Model: PSA105R-050Q) supplied with Garmin Edge 800 GPS. Requires a USB-A to MicroUSB-B cable. Belkin 6ft cable (F3U151B06) works.

- **Globe Electric**
  - 2-Outlet Tap with Surge Protection and 2 USB Chargers (46082 (http://globe-electric.com/product/2-outlet-tap-with-surge-protection-and-2-usb-chargers-grounded-white/) ). Rated at 1000 mA. 120V systems only.
- **Griffin**
  - Power Block Model P2417. 5V 2.1A
  - Power Block Model P1190R2 Two USB 5V Outputs, 1Amp each
- **Hama**
  - 1000mA Travel Charger for Micro USB universal (barcode nr: 4 007249 935854)
- **HP**
  - 5.3V 2A Charger for HP Touchpad (B)
- **HTC**
  - 5V 1A TCP-300 USB phone charger (B)
  - 5V 1A TC B250 USB charger (HTC R/N: 79H00096-00M)
  - 5V 1A TC E250 USB charger (HTC R/N: 79H00098-02M)
- **i-box (Philex Electronic Ltd)**
  - 5V 1A USB charger, 1 USB socket, no USB lead supplied, Model: 76971HS/02 (available from ASDA and others in the UK) (B).
- **IDAPT**
  - i4 multi device charger (http://www.idaptweb.com/universal_chargers/i4/) - 3 interchangeable device tips + USB A socket (see it in use (https://twitter.com/andrewmk/status/226057302879375361) )
- **Innergie**
  - 15W Dual USB Adapter. Model: mMini AC15. Output: 5V, 3A (max per port), 15W max. Spec Sheet (http://www.myinnergie.com/DuoPowerKit/specification.aspx)
- **Kodak**
  - 5V 1A TESA5G1-0501200
  - 5V 1.0A K20-AM
- **LG**
  - 4.8V 1A Travel Adapter
  - 5.1V 0.7A Travel Adapter (Model: STA-U34WVI)
  - 5.1V 0.7A Travel Adapter (Model: STA-U12ER)
- **Logic**
  - 4 port USB Hub (Model LP4HUB10). (RPi running from USB Hub port, red power line (+5v) inside hub cut) (B)
- **LogiLink**
  - 5V 2.1A Switching power supply, model PA0040 (B)
- **Logitech**
  - 5V 1A SDC115-USB Remote Control Charger and cable
- **Maplin Electronics**

    - 5V 1A dual USB power supply, model number H25B-MT-K2
    - Micro USB Power Supply N19HX
- **Medion**
    - 5V 1A USB power supply for OYO ebook reader
- **Microsoft**
    - Zune Zune AC Adapter v2
- **Motorola**
    - 5V 0.85A SPN5504 Charger with Cable (http://www.amazon.com/Motorola-Micro-USB-Home-Travel-Charger/dp/B004EYSKM8/)
- **Nokia**
    - 5V 1.2A AC-10E Charger
    - 5V 1A AC-16E Charger (http://accessories.nokia.com/products/nokia-fast-usb-charger-ac-16/)
- **Noname**
    - 5V 2.1A KMS-AC09 4 port USB charger (B) [43] (http://www.miniinthebox.com/kms-ac09-universal-ac-adapter-for-ipad-ipad-2-iphone-white_p208568.html)
    - 5.2V 1A MW-3NU10GT - no cable, but this one works well (1m): [44] (http://www.amazon.de/gp/product/B005L8VELA)
    - 5V 1A Model H-IP008 Serial No. H10T80L068
- **Novatel Wireless**
    - 5V 1.05A Charger, model number SSW-1811, packaged with Verizon Wireless MiFi device
- **Orange**
    - 5V 0.7A Charger for Orange San Francisco
- **Palm**
    - 5V 1A Charger for Palm Pixi+ (B)
- **Pantech**
    - 5.0V 1A CNR USB with LG DLC100 micro usb cable
- **Petzl**
    - 5.0V 1A Charger that came with the Tikka core2 XP
- **Phihong**
    - Switching Power Supply. Model: PSAC09R-050. Output: 5V, 1.8A, microUSB. Digi-key Link (http://www.digikey.com/product-detail/en/PSAC09R-050/993-1109-ND/2635771)
- **PortaPow**
    - PortaPow UK Mains Wall Power Supply
- **RS Components'**
    - HNP06UK (RS 7263069) Switching Adapter 5.0V 1200mA
- **Samsung**
    - 5V 0.7A Charger for Galaxy S model ETA0U10EBE

    - 5V 0.7A Charger for Galaxy SII
    - 5V 1A Charger for Galaxy SIII
    - 5V 1A Charger for Galaxy Nexus
    - 5V 0.7A Charger for Galaxy S Vibrant (SGH-T959)
    - 5V 0.7A Travel Adapter model ATADU10EBE
    - 5V 1A? Samsung C Series TV USB-port for external HDDs. Running stable with openelec
    - 5v ?A(Unknown) Samsung Service Port (USB) on LN32A330J1DXZA 720p 32 inch HDTV
    - 5V Unknown Ampere Samsung UA22D5000 & UA32D5000 TV USB Port. Test with Raspbian Wheezy, Raspbmc, and RPITC
- **Shun Shing**
    - 100-240VAC to 5VDC 1A USB power supply, model SP5Q-AU Jaycar (http://jaycar.co.nz/productView.asp?ID=MP3455)
- **Sony Ericsson**
    - 5V 0.7A Charger CST-80
    - 5V 0.85A Greenheart™ Charger EP800. Typically provides 4.8V at 0.85A [5].
- **StarTech**
    - 4 Port USB 2.0 Hub Raspberry Pi can be powered just by plugging USB input into the Pi, don't need power in micro USB port.
- **Travel Charger**
    - 5V 2.0A USB Power Adapter, Amazon Link (http://www.amazon.co.uk/gp/product/B0065JCIPU/)
- **Technika**
    - 5V 1A USB Power Adapter, model MPASS01 (B)
- **The Pi Hut**
    - Micro USB Power Supply for the Raspberry Pi. 5V 1000mA (from The Pi Hut's Raspberry Pi Store (http://thepihut.com/collections/power-supplies) ) (also from eBay (http://www.ebay.co.uk/itm/330757401271) )
- **Trisonic**
    - TS-CP600T - MICRO USB HOME & TRAVEL CHARGER (5V, 800mA) $3 at Daiso U.S. stores.
- **TruePower**
    - U-Socket (http://u-socket.com/) 5V 2.1A AC Receptacle with Built-in USB ports (2.1A per USB port) model ACE-7169
- **Voltcraft**
    - SPS5-12W, 2500 mA, requires additional USB <-> miniUSB adapter/cable, works perfectly (bought from Conrad Shop (http://www.conrad.de/ce/de/product/512660/VOLTCRAFT-SPS5-12W-Steckernetzteil-Steckernetzgeraet-5-VDC-2500-mA-12-Watt) )

## Problem power Adapters

- **Masterplug**
  - Masterplug Surge Protected USB Adaptor 2 x 1A USB Polished Black - USB ports and ethernet don't work with this adapter and some screen artefacts using HDMI.
- **Monoprice**
  - 5v, 2A 3 Outlet Power Surge Protector Wall Tap w/ 2 Built-In USB Charger - some display artifacts, sometimes unable to find mouse, some failures to boot. Measured less than 4.75v between TP1 and TP2 when used with a Monoprice cable.
- **Sony Ericsson**
  - 5v, 850mA EP800. Some failures to boot , ethernet loops at boot.

## External Battery packs (with 5V regulated output)

- **Anker Astro3**
  - Anker Astro3 10000mAh with Dual 2A USB Output
- **Duracell**
  - PPS2 Instant USB Charger
- **Energizer/XPAL**
  - XP18000 18000mAh Power Pack
- **Generic - eBay no brand**
  - 6000T Pocket Power 5000mAh - eBay item 271009959140
  - Power Bank for iPad/iPhone 5000mAh (looks the same as a New Trent IMP50D or TeckNet iEP380) - eBay item 280914455938
- **New Trent**
  - iCurve IMP70D 7000mAh (Approx 12hrs from full charge)
  - IMP120D 12000mAh
- **Sinoele**
  - Movpower - Power Bank 5200mAh (8hrs with Wifi active)
- **TeckNet**
  - iEP387 Dual-Port 7000mAh External Power Bank (The charging lead can be used to connect the Tecknet to the RPi. Ran the RPi with wifi dongle and wireless keyboard receiver for over 9 hours of light use.)
  - iEP392 Dual-Port 12000mAh External Power Bank (1A port, ~16.5 hours)
  - Rayovac PS60 5v 800mAh
- **VINZO**
  - Power Bank 5000mAh Grey Output 5V 1000mA
- **Kodak Power Pack KP1000**

- 1A USB rechargeable battery pack - see Shea Silverman's blog (http://blog.sheasilverman.com/2012/09/its-alive/)

# Display adapters

Note that active converter boxes may draw power through the HDMI port, and thus will put an extra load on your PSU, and also increase the current running through the PI's primary input fuse. HDMI ports (and the raspberry PI) are designed so that they deliver a very limited amount of power (50mA) to the TV/Monitor/display-adapter and much more isn't in theory allowed. In fact there is a diode (D1) in series with the power line which can only handle 200mA, if the adapter tries to draw much more than that the diode might fail. Therefore only externally powered adapters are to be recommended. Despite this, many people report success with these high powered devices.

## HDMI->DVI-D

There are three kinds of DVI. There is DVI-D, a digital signal fully compatible with HDMI, so a passive cable can be used. There is DVI-I, which is a connector with both analog pins and digital pins. An HDMI to DVI-D adapter fits in a DVI-I female connector. Finally, there is DVI-A. This a fairly rare connection, but occasionally it will be found on some monitors and is an analog interface, in fact the same as VGA!

Some adapters like Farnell part AK-CBHD03-BK are HDMI to DVI-I, which, while not fitting in a DVI-D monitor, are still compatible. The analog pins simply must be bent.

The HDMI to DVI-D cable provided by Apple with the 2010 Mac Mini worked. It does not appear this adapter can be purchased separately.

- **The Pi Hut**
  - HDMI to DVI Cable for the Raspberry Pi (from The Pi Hut's Raspberry Pi Store (http://thepihut.com/collections/video-output/products/hdmi-to-dvi-cable-for-the-raspberry-pi) )
- **Other Variants**
  - AmazonBasics HDMI to DVI Adapter Cable (model SK231) works and is inexpensive.
  - A generic HDMI-to-DVI converter from eBay (http://www.ebay.com/itm/DVI-Female-to-HDMI-Male-Adapter-Converter-Adaptor-Gold-for-HDTV-Full-HD-/320946033059?pt=US_Video_Cables_Adapters&hash=item4ab9dfd1a3) . Works well, but it's probably the cause of some power loss between the RPi and the monitor, causing this (http://elinux.org/R-Pi_Troubleshooting#Interference_visible_on_a_HDMI_or_DVI_monitor) problem. A setting of config_hdmi_boost=**5** in /etc/boot solved this. Note that config_hdmi_boost=**4**, as suggested in the troubleshooting guide, helped but did not solve the problem completely.

## HDMI->VGA converter boxes

Most will require use RPi_config.txt. Start off with hdmi_safe=1.

Sanoxy HDMI to VGA converter (http://www.element14.com/community/groups/raspberry-pi/blog/2012/08/16/raspberry-pi-hdmi-to-vga-converter) , $27 from Amazon, no changes required with official Raspbian Wheezy image (2012-Jul-15), note: had already disabled overscan previously

http://www.amazon.co.uk/gp/product/B007KEIRNG -- "Neewer" HDMI to VGA -- some issues discussed below: However, according to user "Tom1989" the same Neewer HDMI to VGA adapter burned out BAT54 Schottky diode D1 on the RasPi and broke its HDMI output: Serious HDMI Problems. What's that smell? Burning Raspberry! (http://www.raspberrypi.org/phpBB3/viewtopic.php?f=28&t=9819) . On that thread, "mahjongg" suggested the NXP (or equivalent) PMEG2010AET as a high-current replacement for D1. The PMEG2010AET has 1A max forward current, much greater than the BAT54's 200 mA limit which may be exceeded by your HDMI -> VGA converter. Remember that the converter's current must come from your RasPi power supply and go through the Micro USB cable and polyfuse F3, so you may get extra voltage drops and/or cause F3 to trip depending on how much current the converter uses. As always with board modifications, YMMV. Also on the "Burning Raspberry!" thread, user "pwinwood" reported the Neewer's current to be 400 mA, which is twice the limit of BAT54 diode D1. "pwinwood" also took the Neewer apart and added its own +5V connection adapted from a USB cable, which bypasses RasPi's Micro USB cable and polyfuse F3.

- Link to a gallery with detailed images & steps of the same adapter modification: HERE (http://imgur.com/a/sLogs/all) --*by Pinoccio*

http://www.amazon.co.uk/KanaaN-Adapter-Converter-Cable-Resolutions/dp/B007QT0NNW -- "Kanaan" HDMI-VGA

http://www.ebay.com/itm/ws/eBayISAPI.dll?ViewItem&item=130699741793 -- eBay is swarming with $16 converters all like this one.

This adapter -- http://www.ebay.co.uk/itm/300692770623 -- works from 640x480 up to 1920x1080, audio over HDMI works too. Sadly the IC's on the PCB have all been scrubbed. Requires HDMI boost and overscan, config.txt settings for 640x480@60Hz:
hdmi_drive=2
hdmi_group=2
hdmi_mode=4
config_hdmi_boost=4
overscan_top=-30

overscan_bottom=-30
overscan_left=-30
overscan_right=-30

According to user "Mortimer" -- HDFuryPro HDMI to YPbBr/VGA Converter found on Amazon -- http://www.amazon.co.uk/Inputs-Component-Video-YPbPr-Converter/dp/B00797ZZ4S/ -- Works with Raspberry Pi. Tested against a Philips 170B 1280x1024 LCD monitor, producing a full native resolution image. Not tested against a Component Video TV yet, and audio has yet to be got working. The config.txt settings used are:
hdmi_drive=2
hdmi_group=2
hdmi_mode=36
disable_overscan=1

According to user "Mortimer" -- HDFury1 1080p HDMI to VGA Converter from HDFury.com. I'm not sure the HDFury1 can be got a hold of easily nowadays, I happened to have access to one to try out. HDFury2, 3 and 4 are available as far as I can tell, but are very pricey compared to alternatives. HDFury1 was around £80 when we bought one for a project at work. HDFury2 seems to be around £130, 3 and 4 are getting on towards £200 or more. So not to be recommended as a solution unless you happen to have one lying around. I don't believe there is any relationship between the company that produces these and the HDFuryPro I bought for myself (See above). I didn't alter any config settings, just plugged it in. It doesn't work without having its external power supply connected, as it requires 0.4A, which is too much draw for the 5V supply available from the HDMI socket on the Raspberry Pi. Its power LED lights, but no picture is produced. In comparison to the HDFuryPro this picture from this device is sharper, but not enough to justify the extra cost. The config.txt settings used are:
hdmi_drive=2
hdmi_group=2
hdmi_mode=36
disable_overscan=1

http://www.amazon.co.uk/gp/product/B007SM7O2U/ref=oh_details_o02_s00_i00 - "Cable Matters"

Here It is another option: http://www.dealextreme.com/p/hdmi-v1-4-male-to-vga-female-converter-adapter-cable-white-15cm-130458, is cheap (it's free shipping from china) and works perfectly, I tested it with an Acer VGA monitor (AL1511), without no change in my XBMC distribution. The config.txt for Raspbian (Flatron VGA monitor 1024 * 768):
hdmi_drive=2
hdmi_group=2
hdmi_mode=16
hdmi_force_hotplug=1
disable_overscan=0

And another one: http://cgi.ebay.pl/ws/eBayISAPI.dll?ViewItem&item=251086464644. Very cheap but works perfectly. No config.txt changes was needed at all. I've booted Raspbian and OpenELEC. Monitor is detected correctly and the optimal resolution is set (Raspbian) or you can change the res in the menu (OpenELEC). The /opt/vc/bin/tvservice is able to read monitor edid data. I tested the adapter using NEC 72VM 15" LCD. (1280x1024 60Hz, 1024x768 60Hz, 640x480 works) The adapter is based on Lontium LT8511A chip, but I was unable to get the spec for it. The D1 diode is getting very hot though. Most likely the adapter drives more than 200mA. The standard RS Components 1,2A usb power supply is able to provide enough power for the RPi and the adapter. I'll try to modify the adapter to connect external power to bypass D1. Marcin.

### DVI-D -> VGA active adapters

None are currently listed

### Composite->SCART

SCART adapters (SCART plugs with three RCA connectors in the back), will probably work when used with the yellow RCA plug connected to the R-PI's RCA video output. Additionally using a splitter cable (3.5mm jack plug on one end, and red-white RCA plugs on the other end) will probably work when plugged into the red and white (left and right audio channels) of the SCART adapter.

- Generic - works

### Composite->VGA converter boxes

- Extron DVS-204 (http://www.extron.com/product/product.aspx?id=dvs204%7C) - works no problem!

## SD cards

The SD card is a key part of the Raspberry Pi; it provides the initial storage for the Operating System and files. Storage can be extended through many types of USB connected peripherals.

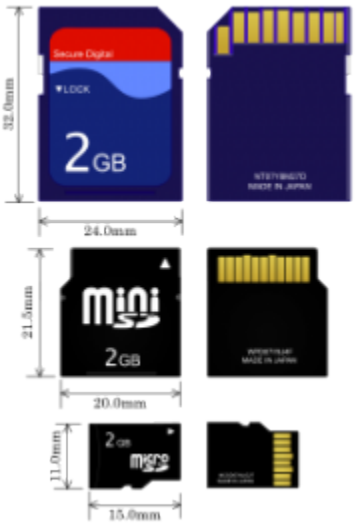
When the Raspberry Pi is 'switched on', i.e. connected to a power supply, a special piece of code called the bootloader is executed, which reads more special code from the SD Card that is used to start up the Raspberry Pi. If there is no SD Card inserted, it will not start. Do NOT push in or pull out an SD Card while the Raspberry Pi is connected to the power, as this is likely to corrupt the SD Card data (you might get away with it, but it is best not to).

The SD Card must be formatted, or written to, in a special way that means the Raspberry Pi can read the data it needs to start properly. If you are new to this check the instructions, or buy a pre-formatted SD Card.

One advantage to using an SD Card like this is that you can have several SD Cards, each with a different operating system, or a different purpose. Simply power off, switch cards, and reconnect the power. You have a different computer to play with.

## Which SD Card?

SD Cards come in three physical sizes (see picture). The Raspberry Pi needs the largest one. The miniSD Card and the MicrSD Card can be used in a Raspberry Pi, but you will need an adaptor / holder to fit it.




SD Cards come in a range of storage sizes. You need one of type SDHC, but there are other types of SDSC, SDXC and SDIO which will not work in a Raspberry Pi (confirmation needed). The SDHC type comes in memory sizes of up to 32GB.

There are other properties of SD Cards that are not covered here. Read the Wikipedia article (http://en.wikipedia.org/wiki/Secure_Digital) for those details.

## Other SD Card content

See the following links for other information:

- Select a Distribution
- Easy SD Card set up
- Advanced set up
- Troubleshooting
- SD Card Performance

## Technical Information

Note that manufacturers change their designs over time, even as the specs stay the same. (E.g. an ACME 8 GB class 4 card manufactured in 2011 might work, while one manufactured in 2012 might not.) For this reason, please specify product numbers in the lists below, when possible.

You can also attach the following fields from your card's CID :

```
cd /sys/class/mmc_host/mmc?/mmc?:*
echo "man:$(cat manfid) oem:$(cat oemid) name:$(cat name) hwrev:$(cat hwrev) fwrev:$(cat fwrev)"
```

please merge with http://elinux.org/RPi_Performance#SD_card

## Preinstalled SD Cards

Sandisk SD Cards Preinstalled with the latest Raspbian operating system are available from The Pi Hut's Raspberry Pi Store (http://thepihut.com) .

- **SanDisk**
  - 4GB SDHC Class 4 - Preinstalled with Raspbian Wheezy Linux. (http://thepihut.com/products/4gb-sandisk-sd-sdhc-card-with-raspbian-wheezy-linux-preinstalled)
  - 8GB SDHC Class 4 - Preinstalled with Raspbian Wheezy Linux. (http://thepihut.com/products/8gb-sandisk-sd-sdhc-card-with-raspbian-wheezy-linux-preinstalled)
  - 16GB SDHC Class 4 - Preinstalled with Raspbian Wheezy Linux. (http://thepihut.com/products/16gb-sandisk-sd-sdhc-card-with-raspbian-wheezy-linux-preinstalled)
  - 32GB SDHC Class 4 - Preinstalled with Raspbian Wheezy Linux. (http://thepihut.com/products/32gb-sandisk-sd-sdhc-card-with-raspbian-wheezy-linux-preinstalled)

Kingston and other verified SD Cards Preinstalled with the latest Raspbian operating system are available from many other websites Amazon UK (http://www.amazon.co.uk) and eBay UK (http://www.ebay.co.uk/) .

## Working SD Cards

- **7DAYSHOP.COM**
  - 8GB Professional SDHC Class 10 (man:0x000027 oem:0x5048 name:SD08G hwrev:0x3 fwrev:0x0)
- **Adata**
  - 2GB SD Class 2 Speedy (8B0947 printed on back) This card works with every distro I tried. May be old, may not be the fastest, but is very stable.
  - 4GB SDHC Class 4 (BH1109416141G)
  - 8GB SDHC Class 2 (MMB3F08GWMCA-GE)
  - 8GB SDHC Class 4 (MicroSD w/ adapter)
  - 8GB SDHC Class 6 (MMAGR08GUDCA-DB)
  - 8GB SDHC Class 10 (AUSDH8GCL10-R)
  - 8GB SDHC Class 10 (ASDH8GCL10-R) Tested on 2012-06-18-wheezy-beta.zip
  - 8GB SDHC Class 10 (P-SDH8G10-EC from BJ's USA tested on Raspbian)

    - 16GB SDHC Class 6
    - 16GB SDHC Class 10 (16GSDHC10)
    - 16GB SDHC Class 10 (microSD w/ adapter AUSDH16GCL10-RA1)
    - 32GB SDHC Class 10 (ASDH32GCL10-R) Tested on wheezy-beta with latest kernel and firmware and raspbian wheezy
- **AmazonBasics**
    - 8GB SDHC Class 10 B0058GH0LS (http://www.amazon.com/AmazonBasics-SDHC-Class-Secure-Digital/dp/B0058GH0LS)
    - 16GB SDHC Class 10 B0058GH1IK (http://www.amazon.com/AmazonBasics-SDHC-Class-Secure-Digital/dp/B0058GH1IK)
    - 32GB SDHC Class 10
- **Apacer**
    - 8GB microSDHC Class 10 (with adapter)
    - 8GB SDHC Class 6
- **Centon**
    - 16GB SDHC Class 4 (1447 printed on back)
- **CnMemory**
    - 8GB SDHC Class 4 (Silver/Black label says 'High Capacity Card') 84209_8GB_SDHC, bought from Maplins. No error messages seen, but operation is much slower than with a SanDisk 4GB Class 4 card.
- **Dane-Elec**
    - 16GB SDHC Class 4
    - 16GB Pro 200X Class 10 DEMS16GB2683ENBA
- **Dikom**
    - 16GB SDHC Class 10 (serial 207H3MD016IBSD)
- **Duracell**
    - 4GB SDHC Class 4
    - 16GB SDHC Class 10 (labelled Pro Photo 200x)
    - 32GB SDHC Class 10 (man:0x00001d oem:0x4144 name:SD hwrev:0x1 fwrev:0x0) (~4.6MB/s read, ~4.4MB/s write on debian6-19-04-2012, following RPi_Performance#SD_card)
- **Emtec**
    - 2GB SD man:0x000027 oem:0x5048 name:SD02G hwrev:0x2 fwrev:0x0
    - 4GB SDHC Class 4 (EKMSD4G60XHCN)
    - 16GB SDHC Class 10 (EKMSD16G150XHC) (less than half as fast as Sandisk 16gb Class 10)
- **Extrememory**
    - 16GB SDHC Class 10 (man:0x000012 oem:0x3456 name:F0F0F hwrev:0x1 fwrev:0x0)

    - 32GB SDHC Class 10 (man:0x000003 oem:0x5344 name:SMI hwrev:0x1 fwrev:0x0)
- **Eye-Fi**
    - 4GB WiFi SDHC (Wi-Fi doesn't work)
- **Fugi**
    - 32GB SDHC Class 10 (P10NM00580A) (man:0x000073 oem:0x4247 name:NCard hwrev:0x1 fwrev:0x0)
- **Hama**
    - 2GB SD Class 2
    - 8GB SDHC High Speed Pro Class 6
- **Hema (Dutch dept. store)**
    - 4GB
    - 8GB SDHC Class 4
- **Goodram**
    - 8GB microSDHC Class 4
    - 16GB microSDHC Class 4 (SDU16GHCAGRR10)
    - 16GB SDHC Class 10
- **HP**
    - 8GB SDHC Class 4 (doesn't reboot during first time startup process, but restart again and fine after that).
    - 32GB SDHC Class 10 (http://www.amazon.com/HP-CG790A-AZ-Flash-Memory-Class/dp/B007X7U224)
- **ICIDU**
    - 4GB SDHC Class 10 (also had no issues)
    - 16GB SDHC Class 10 (image write had issues, might be my inexperience. It boots & shows Xserver)
    - 32GB SDHC Class 10 (had no issues whatsoever, the comment above might be a dud.)
    - 8GB microSDHC Class 10
    - 16GB microSDHC Class 10 (20MB/sec)
    - 32GB microSDHC Class 10 (20MB/sec)
- **Integral**
    - 4GB SDHC Ultima Pro Class 10
    - 4GB SDHC Class 4 SD-K04G (Purple label). Also type SD-MO4G.
    - 8GB SDHC Ultima Pro Class 6 (Works - initial error -110 but boots within 5 seconds with no further errors or issues)
    - 8GB SDHC Ultima Pro Class 10 (20MB/s) (Works - initial error -110 but boots within 5 seconds with no further errors or issues)
    - 16GB SDHC Ultima Pro Class 6
    - 16GB SDHC Class 10 Ultima Pro (20MB/s) (http://www.amazon.co.uk/gp/product/B0047T6XME)

    - 32GB SDHC Ultima Pro Class 10 (20MB/s) - Slow to initially boot past the Rainbow Screen.
- **Joyflash**
    - 16GB SDHC Class 10 (LTSD1112016GB)
- **Kingmax**
    - 4GB SDHC Class 2
    - 4GB microSDHC Class 4 (KM04GMCSDHC4) won`t reboot when it`s hot
    - 8GB microSDHC Class 4 (KM08GMCSDHC41A) won`t reboot when it`s hot
- **Kingston**
    - 2GB SD
    - 2GB microSD (N0185-002.A00LF) + Adapter (File system .img written via Transcend microSDHC "USB stick-like" adapter - P3-102510)
    - 4GB microSD Class 4
    - 4GB SDHC Class 4 (SD4/4GB) (Writes at 4.8MB/s, Reads at 9MB/s)
    - 4GB SDHC Class 10 (SD10V/4GB)
    - 8GB SDHC Class 4 (http://img341.imageshack.us/img341/1619/dsc0253y.jpg) (SD4/8GB (http://img833.imageshack.us/img833/2028/dsc0254br.jpg) ) (Works reliably with Raspbian 18-9-2012 and previous Debian releases) (Writes at 4.8MB/s, Reads at 9MB/s)
    - 8GB microSDHC Class 4 (http://img600.imageshack.us/img600/3849/dsc0251et.jpg) (SDC4/8GB (http://img707.imageshack.us/img707/363/dsc0252ld.jpg) )
    - 8GB SDHC Class 6 (SD6/8GB) (errors on boot, boots Debian ok)
    - 8GB SDHC Class 10 (SD10G2/8GB, SD10V/8GB, ultimateX 100X, ultimateX 120X)
    - 16GB SDHC Class 4 (SD4/16GB)
    - 16GB microSDHC Class 10 (SDC10/16GB)
    - 16GB SDHC Class 10 (SD10G2/16GB, ultimateX 100X)
    - 16GB SDHC Class 10 (SD4/16GBET)
    - 32GB SDHC Class 10 (SD10V)
    - 32GB SDHC Class 10 (SD10G2/32GB, ultimateX 100X)
    - 64GB SDXC Class 10 (SDX10V/64GB)
- **Kodak**
    - 4GB SDHC Class 2
    - 8GB SDHC Class 4
- **Kruidvat**
    - 8GB SDHC Class 4
    - 8GB SDHC Class 10 (actually cheaper then the class 4 in my store)
- **Lexar**
    - 4GB SDHC Class 4 (Boots consistently and no error messages in log after 1/2 hour use ) (works with Raspbmc)

    - 4GB SDHC Class 6 Platinum II (from Microcenter (http://www.microcenter.com/single_product_results.phtml?product_id=0350735) )
    - 8GB SDHC Class 4
    - 8GB SDHC Class 6 Premium Series
    - 8GB SDHC Class 6 Platinum II
    - 16GB SDHC Class 6 Platinum II
    - 32GB microSDHC HIGH-SPEED Class 10 (from Amazon (http://www.amazon.co.uk/Lexar-32GB-Micro-Speed-Reader/dp/B004BR2ZTM) )
    - 128GB SDXC UHS-I Card LSD128CTBNA400 (from Amazon (http://www.amazon.com/gp/product/B007BZRXK2) )
- **Master**
    - 16GB SDHC Class 10 [man:0x000003 oem:0x5344 name:SMI hwrev:0x1 fwrev:0x0]
- **Medion**
    - 8GB Class 4 SDHC UK sourced (Aldi)
- **Microcenter Brand (sold in bins at checkout)**
    - 8GB SDHC Class 4 (http://www.microcenter.com/single_product_results.phtml?product_id=0289508)
    - 8GB SDHC Class 10 (http://www.microcenter.com/single_product_results.phtml?product_id=0349728)
    - 16GB SDHC Class 10 (http://www.microcenter.com/single_product_results.phtml?product_id=0349729)
- **Mushkin**
    - 16GB SDHC Class 10 (MKNSDHCU1-16GB) [45] (http://www.newegg.com/Product/Product.aspx?Item=N82E16820226324)
    - 32GB SDHC Class 10 (MKNSDHCC10-32GB) [46] (http://www.newegg.com/Product/Product.aspx?Item=N82E16820226235)
- **Mustang**
    - 8GB SDHC Class 10 (http://www.mustang-flash.de/Products/Flash%20Products/Secure%20Digital/SD-Card/8GB%20Mustang%20SDHC%20Card%20LeMans%2C%20Class%2010%2C%20Retail%7CSD8GR.html)
- **MyMemory**
    - 8GB SDHC Class 10 (MYMESDH8G10) MyMemory 8GB class 10 (http://www.mymemory.co.uk/SDHC/MyMemory/MyMemory-8GB-SD-Card-%28SDHC%29---Class-10) (Latest batch not working)
    - 16GB SDHC Class 10 (MYMESDH16G10) [47] (http://www.mymemory.co.uk/SDHC/MyMemory/MyMemory-16GB-SD-Card-(SDHC)---Class-10)
    - 32GB SDHC Class 10 [48] (http://www.mymemory.co.uk/SDHC/MyMemory/MyMemory-32GB-SD-Card-%28SDHC%29---Class-10)
- **NovaTech**

    - 8GB SDHC Class 10 (Integral Branded)
- **OCZ**
    - 8GB SDHC Class 6 Gold Series (08110596-8GB-6) tested with Debian Squeeze (official Raspberry Pi distribution debian6-19-04-2012.zip)
- **Optima**
    - 8GB SDHC Class 10 (Pro-Speed)
    - 8GB SDHC Class 4 - working from 2012-09-18
- **Panasonic**
    - 4GB SDHC Class 4
    - 4GB SDHC Class 10 UHS-I (~11.2MB/s read, ~6.2MB/s write, following RPi_Performance#SD_card)
    - 8GB SDHC Class 2 (~11.1MB/s read, ~9.7MB/s write, following RPi_Performance#SD_card)
    - 8GB SDHC Class 6 (~4.8MB/s read, ~4.4MB/s write, following RPi_Performance#SD_card)
- **Patriot**
    - 8GB SDHC Class 6 (PSF8GSDHC10-PC)
    - 8GB SDHC Class 10 LX Series (PSF8GSDHC10-PC1)
    - 16GB SDHC Class 10 (PSF16GMCSDHC10)
    - 16GB SDHC Class 10 LX Series (PSF16GSDHC10) (19.3MB/s read, 9.3MB/s write)
    - 16GB microSDHC Class 10 (PSF16GMSHC10) (requires recent kernel update for boot)
    - 32GB SDHC Class 10 (PSF32GSDHC10)
    - 32GB SDHC Class 10 UHS-1 (PEF32GSDHC10U1) (20.4MB/s read, 12.1MB/s write)
- **Peak**
    - 4GB microSDHC Class 4 (MMBTR04GUBCA-ME) tested with Arch
- **Philips**
    - 8GB SDHC Class 4 (FM08SD35B)
- **Platinum**
    - 4GB SDHC Class 6
    - 8GB SDHC Class 6 (man:0x00006f oem:0x0000 name:SMI hwrev:0x1 fwrev:0x0)
    - 64GB SDCX Class 10
- **Play.com**
    - 4GB SDHC Class 6 (S4E3CD04GEFAA 0907090121106)
- **PNY**
    - 4GB SDHC Class 4
    - 4GB SDHC Class 4 Optima (SD-K04G 0834TT1297Y)

    - 4GB SDHC Class 4. Micro SD Card with adapter.
    - 8GB SDHC Class 6
    - 8GB SDHC Class 10. Micro SD card with adapter.
    - 16GB SDHC Class 4
    - 16GB SDHC Class 10 (P-SDHC16G10-GE)
        - See the note for P-SDHC16G10-EF. Works with Wheezy, does not work with Squeeze, Arch, or Fedora Remix.
    - 16GB SDHC Class 10 (P-SDHC16G10-EF)
        - Works with Debian Wheezy (http://www.raspberrypi.org/archives/1435)
        - Does not work with Debian Squeeze (debian6-19-04-2012: mmc0: timeout waiting for hardware interrupt).
        - Does not work with Arch Linux Arm (archlinuxarm-29-04-2012: no video is displayed, solid red power light, tiny green light)
    - 16GB SDHC Class 10 Pro-Elite (P-SDH16U1-30-GE). Works with raspbmc, haven't tested others.
- **pqi**
    - 8GB SDHC Class 6
        - Works with official debian6-19-04-2012
- **PRETEC**
    - 8GB SDHC Class 10 (8DK52-122ME)
- **Samsung**
    - 4GB SDHC
    - 8GB SDHC Class 6 (MB-SS8GAEU)
    - 8GB SDHC Class 10 (MB-MP8GA, MB-SP8GA/EU, MB-SP8GA/AM)
    - 16GB SDHC Class 6 (MB-SSAGAEU)
    - 16GB SDHC Class 10 (MB-SPAGA aka MB-SPAGAEU)
    - 32GB SDHC Class 10 (MB-SSBGA, MBSSBGVEOBGA-SH) fine with Debian Wheezy (http://www.raspberrypi.org/phpBB3/viewtopic.php?f=50&t=8071) , but does not work with Debian Squeeze (debian6-19-04-2012: mmc0: timeout waiting for hardware interrupt).
- **SanDisk**
    - 2GB SD, white "SanDisk for Wii" branded, no class mentioned
    - 2GB SD (with a circle 2 --probably class 2), writes at 3.5 Mb/s
    - 2GB SD Class 2 (BE0816113150D)
    - 2GB SD Class 4 Ultra (15MB/s)
    - 2GB SD Class 4 Ultra II
    - 2GB SD Ultra II (BE0719111366D)
    - 2GB SD Extreme III (BE0715105083B)
    - 2GB SD Extreme III (BE0804212046D) - 20MB/s - Class 6
    - 4GB SDHC Class 2 (BH0820113475D) - Tested with RPITC (Based on Raspbian Wheezy)
    - 4GB SDHC Class 4 (SDSDB-004G-B35)

- 4GB SDHC Class 4 (SDSDB-004G-BT35). Confirmed working with stock debian6-19-04-2012.img
- 4GB SDHC Class 4 (BH1210821913G)
- 4GB SDHC Class 4 (SDSDH2-004G-AC11, BH1127216239D) Costco 2-pack, booting Wheezy 2012-07-15
- 4GB SDHC Class 4 Ultra (SDSDH-004G-U46) won`t reboot when it`s hot
- 4GB SDHC Class 4 Ultra II
- 4GB SDHC Class 6 Extreme III labelled as 30MB/s works with (B) 2012-10-28-wheezy-raspbian
- 4GB SDHC Class 6 Ultra 30MB/s BH1200421822D)
- 4GB SDHC Class 6 Ultra (SDSDH-004G-U46 - BH1136121837G, BH1130521822D)
- 4GB SDHC Class 10 Extreme (BH10297143382G)
- 8GB SDHC Class 4 (writes at ~1.5MB/s)
- 8GB SDHC Class 4 Ultra labelled as 15MB/s (BI1024716014G)
- 8GB SDHC Class 6 Ultra
- 8GB SDHC Class 6 micro - MMAGR08GUDCA-DB
  - also SDSDH-008G-U46 - BI1131222083D see update from andrew.blake (http://www.raspberrypi.org/phpBB3/viewtopic.php?p=88625#p88625)
  - except SDSRH-008G-A11 could be problematic, see below
- 8GB SDHC Class 6 Ultra labelled as 20MB/s (BI11321422083D)
- 8GB SDHC-I Class 6 Ultra labelled as 30MB/s (SDSDH2-008G-AC11)
  - requires updated Squeeze or Wheezy beta
- 8GB SDHC Class 10 Extreme (BI11017514367G)
- 8GB SDHC Class 10 Extreme (B11209116254G) - Managed to get it working with raspbian R3 rpi_pisces_r3.zip (http://archive.raspbian.org/images/rpi_pisces_r3.zip) however does not work with official squeeze nor Arch linux.
- 8GB SDHC Class 10 Extreme (30MB/s HD Video) - working with new bootcode.bin (https://github.com/raspberrypi/firmware/blob/9308c7ed387e5422883753f7fb71a75506abd1f8/boot/bootcode.bin) . Confirmed on 2012-07-10 for Debian Squeeze 2012-04-19 and Arch Linux 2012-06-13 images (BI1130916254G).
- 8GB SDHC Class 10 Ultra(30MB/s) (SDSDU-008G-U46) - Works with stock debian6-19-04-2012 or raspbian images but not with OpenELEC r11212 (works with OpenELEC r11493)
- 8GB SDHC Class 10 Ultra(30MB/s) (SDSDU-008G-UDQ46) - Works with stock 2012-09-18-wheezy-raspbian
- 8GB SDHC Class 10 Extreme (SDSDX-008G-X46/BI1218822414G) - Works with stock 2012-08-16-wheezy-raspbian
- 8GB SDHC Class 10 Extreme Pro (95MB/s UHS-I) (SDSDXPA-008G-X46) - Works with stock 2012-07-15-wheezy-raspbian
- 16GB SDHC Class 4
- 16GB SDGC Class 4 (SDSDB-016G-B35) - working with bootcode.bin (https://github.com/raspberrypi/firmware/blob/

234c19de7cbaaf4997671d61df20a05759066295/boot/bootcode.bin) . Confirmed on 2012-07-15 for Debian Squeeze 2012-04-19

- 16GB SDHC Class 6 Ultra (30MB/s) (BL1133921933G) - Work with OpenELEC r11324
- 16GB SDHC Class 10 Ultra(30MB/s) (SDSDU-016G-U46) - Work with stock debian6-19-04-2012 image. Gave Kernel Panic with stock debian6-19-04-2012 image. Worked fine with Wheezy image.
- 16GB SDHC Class 10 Extreme (30MB/s HD Video) (SDSDX3-016G-X46) - Works with 2012-06-18-wheezy-beta.img and updated firmware (tested 2012-07-02)
- 16GB SDHC Class 10 Extreme (45MB/s U1) (BL1203322025G) - Works with 2012-08-16-wheezy-raspbian.img (tested 2012-09-15). Doesn't work with stock debian6-19-04-2012 image, but does work with freshly compiled kernel
- 16GB SDHC Class 10 Extreme (45MB/s) (SDSDX-016G-X46) (UPC 619659062224) - Works with 2012-09-18-wheezy-raspbian.img (tested 17/10/2012). Working with Raspbmc RC5 if writing standalone image; working with Raspbian “wheezy”.
- 16GB SDHC Class 10 Extreme (45MB/s) (SDSDXPA-016G-FPP) - Working with latest RaspBMC image (tested 12/09/2012) Amazon Link (http://www.amazon.co.uk/gp/product/B00422J0CG/ref=oh_details_o00_s00_i00)
- 16GB SDHC Class 10 Extreme Pro (95MB/s UHS-I) (SDSDXPA-016G-A75) - Doesn't work with stock debian6-19-04-2012 image, but does work with freshly compiled kernel
- 32GB SDHC Class 4
- 32GB SDHC Class 6
- 32GB SDHC Class 10 Ultra (30MB/s) - Works with stock debian6-19-04-2012 image
- 32GB SDHC Class 10 Extreme (45 MB/s UHS-I) (SDSDX-032G-X46) - works with arch-04-29-image and latest firmware (booting problems without firmware update)
- 64GB SDXC Class 10 Extreme (45 MB/s UHS-I) (SDSDX-064G-X46) - works with 2012-07-15-wheezy-raspbian
- microSDHC / microSDXC
  - 4GB microSDHC Class 2
  - 4GB microSDHC Class 4
  - 8GB microSDHC Class 2
  - 8GB microSDHC Class 4
  - 8GB microSDHC Class 6 Mobile Ultra (SDSDQY-008G-U46A) working with the latest firmware, won`t reboot when it`s hot
  - 8GB microSDHC Class 10 Ultra(30MB/s) (SDSDQU-008G-U46) tested and working on Raspbian wheezy (and RaspBMC)
  - 16GB microSDHC Class 10 Mobile Ultra (SDSDQUA-016G-U46A) working with the latest firmware

    - 32GB microSDHC Class 4 (SDSDQM-032G-B35)
    - 64GB microSDXC Class 6 Mobile Ultra (http://img217.imageshack.us/img217/6435/dsc0255uc.jpg) (SDSDQY-064G-A11A) (boots up much more consistently with latest firmware)
- **Silicon Power**
    - 4GB microSDHC Class 6 (SP004GBSTH006V10-SP)
    - 8GB microSDHC Class 10 (S608G1202)
    - 16GB microSDHC Class 10 (SP016GBSTH010V10)
    - 16GB SDHC Class 10 (SP016GBSDH010V10)
- **Sony**
    - 4GB SDHC Class 4 (SF-4B4) (Write 6MB/s, Read 20MB/s)
    - 4GB SDHC Class 4 (SF-4N4)
    - 8GB SDHC Class 4 (Write 11.8MB/s, Read 17.4MB/s)
    - 32GB SDHC Class 10 (SF-32NX/TQ) (http://store.sony.com/webapp/wcs/stores/servlet/ProductDisplay?catalogId=10551&storeId=10151&langId=-1&partNumber=SF32NX/TQ#features) (Max read speed of ~94MB/s, min write speed of ~10MB/s) - Works with archlinuxarm-29-04-2012 dd image with latest firmware update (as of 10-06-2012)
- **Strontium**
    - 8GB SDHC Class 10 (SD-T08G 1045 US6923 G (White Shell - SKU 8 886450 703492))
- **Super Talent**
    - 32GB Secure Digital High Capacity SDHC Card (Class 10), Model SDHC32-C10 SKU: 116-557-001 (works with Raspbmc RC4 and 2012-07-15-wheezy-raspbian))
- **TakeMS**
    - 4GB microSDHC Class 4 (with adapter) Micro SDHC Class 4 + 1 Adapter(Order No.88662) (http://www.takems.com/products.php?categ=flash&prod=Micro_SDHC-Card)
- **TDK**
    - 4GB SDHC Class 4 (1008WW5261B)
    - 4GB SDHC Class 4 (80-56-10275-004G,Debian works **BUT** mmc0 errors when booting Fedora)
    - 4GB microSDHC Class 4 (80-56-10301-004G)
    - 4GB SDHC Class 6 (S404G1113) - Works with Debian Wheezy (2012-06-18 beta), not tried latest OpenELEC yet.
    - 8GB SDHC Class 10 - Works with Raspbian 2012-07-15
    - Sandisk 64GB Class 10 Ultra SDXC UHS-I FFP (3A114807)
- **Toshiba**
    - 8GB mircoSDHC SD-C08GJ(BL3A

    - 16GB SDHC Class 10 SD-T16G (1046 US7022 C)
- **Transcend**
    - 4GB SDHC Class 4 - we've found these to work without any errors and offer reasonable performance
    - 4GB SDHC Class 4 (TS4GSDHC4 - BH1130821915G)
    - 4GB SDHC Class 6 (TS4GSDHC6) - no problems. (does not work with Raspbmc as of 6/1/12)
    - 4GB SDHC Class 10 (TS4GSDHC10E)
    - 8GB SDHC Class 4 (http://www.mymemory.co.uk/SDHC/Transcend/Transcend-8GB-SD-Card-(SDHC)---Class-4) (TS8GSDHC4) (man:0x000003 oem:0x5344 name:SD08G hwrev:0x8 fwrev:0x0) - works with both Debian "squeezy" and Raspbian "wheezy" distributions.
    - 8GB SDHC Class 6 (~5.8 MB/s read/write following RPi_Performance#SD_card)
    - 8GB SDHC Class 6 (TS8GSDHC6-P2 - MMBFG08GWACA-M6)
    - 8GB SDHC Class 10 (TS8GSDHC10) Transcend 8G class 10 (http://www.mymemory.co.uk/SDHC/Transcend/Transcend-8GB-SD-Card-%28SDHC%29---Class-10-)
    - 16GB SDHC Class 6 (TS16GSDHC6)
    - 16GB SDHC Class 10 (TS16GSDHC10)(TS16GSDHC10E)
    - 32GB SDHC Class 10 (http://www.transcend.com.es/tarjetas-de-memoria/sd-sdhc/32gb-sdhc-class-10) (TS32GSDHC10)(TS32GSDHC10E)
    - 64GB SDXC Class 10 (TS64GSDXC10)
- **Verbatim**
    - 8GB SDHC Class 10 (43961)
    - 16GB SDHC Class 4 (44020)
    - 16GB SDHC Class 10 (43962)
    - 32GB SDHC Class 6 (44032)
- **Traveler**
    - 4GB High Speed Memory Card - no class mentioned. No problems. Tested with Raspbian.
- **The Pi Hut**
    - Sandisk 4GB Class 4 - Preinstalled with Raspbian Wheezy Linux. (from The Pi Hut's Raspberry Pi Store (http://thepihut.com/products/4gb-sandisk-sd-sdhc-card-with-raspbian-wheezy-linux-preinstalled) )
    - Sandisk 8GB Class 4 - Preinstalled with Raspbian Wheezy Linux. (from The Pi Hut's Raspberry Pi Store (http://thepihut.com/products/8gb-sandisk-sd-sdhc-card-with-raspbian-wheezy-linux-preinstalled) )
    - Sandisk 16GB Class 4 - Preinstalled with Raspbian Wheezy Linux. (from The Pi Hut's Raspberry Pi Store (http://thepihut.com/products/16gb-sandisk-sd-sdhc-card-with-raspbian-wheezy-linux-preinstalled) )

    - Sandisk 32GB Class 4 - Preinstalled with Raspbian Wheezy Linux. (from The Pi Hut's Raspberry Pi Store (http://thepihut.com/products/32gb-sandisk-sd-sdhc-card-with-raspbian-wheezy-linux-preinstalled) )
- **V-Gen**
    - 8GB microSDHC - no class mentioned. No problems.(man:0x000073 oem:0x4247 name:NCard hwrev:0x1 fwrev:0x0). Tested with Raspbian Wheezy & Raspbmc.
- **Veho (http://www.veho-uk.com)**
    - 8Gb "Ultra Fast" Class 6. (man:0x00001b oem:0x534d name:00000 hwrev:0x1 fwrev:0x0) 7.8Mb/s. Slow but tested with Arch Linux.
- **W Photo (Walgreens photo)**
    - 1GB SD memory card. Works with raspbmc, have not tested others.
    - 2GB SD memory card. Works with raspbian, not tested with others.

Known good (and pre-loaded) cards will be available for sale from RS and element14 at a *later* date (TBA).

## Problem SD Cards

Make sure that you buy your card from a reliable source. There are many cheap Chinese copies of (brand name) SD-Cards on the market, [49] (http://www.petapixel.com/2011/05/20/one-third-of-the-sandisk-memory-cards-on-earth-are-counterfeit/) in addition they are often mislabeled as having greater capacity than they really have. For example they might be sold as being 4GB, but are actually 2GB (or even less).

There were initially issues with most Class 10 SDHC cards, apparently due to a bug in the Broadcom bootloader.[50] (http://www.raspberrypi.org/forum/general-discussion/class-10-sd-cards-on-the-production-boards/page-3/#p39181)

This seems to have been fixed in sdhci.c: [51] (https://github.com/raspberrypi/linux/commit/7e8ae226fe6e95954df6b0dcdde40a53dbbc1a0b) Further feedback will be useful.

If you add an SD card here, please also mention the kernel date and the date you tried it. This allows people to estimate how likely it is that a driver-fix in the kernel has been fixed. (i.e. I think some/most of the cards here work fine now, because a problem in the kernel driver has been fixed).

- **Acumem**
    - 8GB SDHC Class 6 (many errors on 6/7/2012)
- **Adata**
    - 2GB Speedy (MMAGF02GWMCA -NA)
    - 8GB SDHC Class 6 - Sometimes boots

    - 16GB SDHC Class 6 (Possibly SD5MY168G0, label with gold <> black gradient) - Doesn't boot
- **Agfa**
    - 16GB MicroSDHC class 6 (as written on SD-Adapter, MicroSD card itself no-name? ENAAJK121960): mixed results, such a card was working on another RPi
- **Amazon Basics**
    - 16GB SDHC Class 10 (many errors on 6/7/2012)
- **Delkin Devices**
    - 4GB SDHC Class 6 "Delkin pro" -- Note: works with Fedora Beefy Miracle 17
- **GSkill**
    - 32GB SDHC Class 10
- **Integral**
    - 16GB SDHC Class 6 Ultima Pro (SH016GAA2BB)
    - 4GB SDHC class 4 (S404G1115)
- **Kingston**
    - 2GB SD looks like this (http://www.geeks.com/details.asp?invtid=KING-SD-M02G-BULK) - boots the kernel, but damages the filesystem.
    - 4GB SDHC Class 6 - Boots kernel but won't run init (times out)
    - 8GB/Go SDHC Class 10 - SD10V/8GB Very slow writing images to card and then either won't boot, or boots very slowly
    - 16GB SDHC Class 4 (SDC4/16GB) - Reported earlier as not working. Stable and works well with all Debian/Raspbian releases
    - 16GB SDHC Class 10 (SD10V/16GB) - Starts boot ok but then gets stuck in mmc0 timeouts
- **Memory2GO**
    - 4GB SDHC Class 6 (S404G1029) - I/O Errors leading to Kernel Panic on startup.
- **Micro Center**
    - 4GB SDHC Class 4 — hasn't worked with any of the images I've tried; appears to be completely unrecognized
- **MyMemory.com**
    - 8GB SDHC Class 10
- **Optima**
    - ~~8GB SDHC Class 4 - Does not boot with Raspbian Wheezy 2012-07-15~~ - works with 2012-09-18
- **Panasonic**
    - 8GB SDHC Class 10 (RP-SDU08GD1K) mmc0: timeout waiting for hardware interrupt Panasonic 8GB Class 10 (http://www.mymemory.co.uk/SDHC/Panasonic/Panasonic-8GB-UHS-1-London-2012-Collection-SDHC-Card---Class-10)
- **Patriot**

    - 8GB SDHC Class 6 (PS8GSDHC10-BC) - repeatable corruption after 1 or 2 reboots with 2012-07-15-wheezy-raspbian
    - 8GB SDHC Class 10 (PSF8GSDHC10)
    - 8GB SDHC Class 10 (PSF8GSDHC10-PC) - won't even boot 2012-08-16-wheezy-raspbian (mmc0: timeout waiting for hardware interrupt, followed by continuous I/O errors, timeouts, etc.). Seems functional in Arch, but sometimes freezes at the beginning of boot (blinking underscore).
- **Platinum**
    - 8GB SDHC Class 8 (O08G840 M3100487 TW)
    - 16GB SDHC Class 10 (article code 177117) - Does not boot with Raspbian Wheezy 2012-09-12
- **PNY**
    - 8GB Optima SDHC 120 HD Class 4 SD-K08G 0928 WF3673 - mmc -110 errors at init time on 6/12/12
    - 8GB Premium SDHC Class 4 - mmc - mmc0: timeout waiting for hardware interrupt
    - 32GB SDHC Class 10 Professional (P-SDHC32G10-EF) from play.com (http://www.play.com/Electronics/Electronics/4-/18814903/-/Product.html) (mmc0 timeout with Debian, error -84 whilst initialising sd card with Fedora and QtonPi. Arch seems to work, gets to the login prompt)
    - 2GB card SD-M02G
- **Polaroid**
    - 16GB SDHC C10 (P-SDHC16GB10-EFPOL) - mmc0: timeout waiting for hardware interrupt on debian6-19-04-2012
- **PRETEC**
    - 8GB SDHC Class 10 233x - mmc0: timeout waiting for hardware interrupt, Sometimes does not boot, kernel panic, ...
- **Reekin**
    - 4Gb HighSpeed SH4GC6M16MIN9C0812TE (old) don't boot ! (11/07/2012)
- **Samsung**
    - 4GB SDHC Class 4 (MB-SS4G MBSS4GMBDDBA-DD) doesn't boot with 2012-07-15-wheezy-raspbian (http://downloads.raspberrypi.org/images/raspbian/2012-07-15-wheezy-raspbian/2012-07-15-wheezy-raspbian.zip) - OK light partially lit.
    - 32GB SDHC Class 10 (MB-SSBGA, MBSSBGVEOBGA-SH) does not work with Debian Squeeze (debian6-19-04-2012: mmc0: timeout waiting for hardware interrupt), but works fine with Debian Wheezy (http://www.raspberrypi.org/phpBB3/viewtopic.php?f=50&t=8071)
- **SanDisk**
    - 2GB SD Extreme III (BE0722702998D) (man:0x000003 oem:0x5344 name:SD02G hwrev:0x8 fwrev:0x0) - tested with Raspbian (build 2012-07-15) and Raspbmc installer (build 2012-07-13)
    - 2GB SD (BE0916214253D)

- 2GB Ultra || 15MB/s (BE0828713280D)
- 4GB SDHC Class 2 - Debian and xbmc boot, but fedora gets a lot of mmc0 note long write sync errors and then hc_xfer_timeout errors at the login prompt.
- 4GB SDHC Class 2 "Limited Edition" (8H825413279G) - Error -110 whilst initialising sd card
- 4GB SDHC Class 4 (BH1030216016G) - Doesn't boot.
- 4GB SDHC Class 4 (BH1031116016G) - Doesn't boot.
- 4GB SDHC Class 6 Extreme (BH0822411730D)
- 4GB SDHC Class 6 Extreme III (30 MB/s) (BH0822712362G)
- 4GB SDHC Class 10 Extreme (SDSDX-004G-X46) (30 MB/s HD Video) doesn't boot (also not with new kernel.img and start.elf 17-06-2012 or "wheezy"-beta)
- 4GB SDHC Class 10 Extreme (30 MB/s HD Video) (Doesn't boot) - Works with new kernel.img and start.elf [52] (https://github.com/raspberrypi/firmware/tree/master/boot)
- 4GB microSDHC Class 6 Mobile Ultra (tried 15-06-2012 with kernel 19-04-2012) error -84 transferring data, kernel panic: no init found
- 8GB SDHC Class 6 Ultra (B11201421964G)
- ~~8GB SDHC Class 6 Ultra (SDSDH-008G-U46 - BI1131222083D) - Boots kernel but won't run init ( mmc timeout waiting for interrupt )~~ see update from andrew.blake (http://www.raspberrypi.org/phpBB3/viewtopic.php?p=88625#p88625)
- 8GB SDHC Class 6 Ultra labelled as 30MB/s (BI1208721965G)) - Boots kernel but won't run init ( mmc timeout waiting for interrupt )
- 8GB SDHC Class 6 Ultra labelled as 30MB/s SDSRH-008G-A11 - Boots kernel but won't run init ( mmc timeout waiting for interrupt )
- 8GB SDHC Class 6 Ultra labelled as 30MB/s SDSDH-008G-T11 - Boots kernel but won't run init ( debian6-19-04-2012: mmc timeout waiting for interrupt ) , but works fine with Debian Wheezy (http://www.raspberrypi.org/phpBB3/viewtopic.php?f=50&t=8071) on 6/22/12
- 8GB SDHC Class 6 Ultra I (BI1201221964G) - Boots kernel but won't run init ( mmc timeout waiting for interrupt )
- 8GB SDHC Class 6 Extreme (BI1101116253G)
- 8GB SDHC Class 10 Extreme (BI1108716254G)
- 8GB SDHC Class 10 Extreme (BI1201416254G) - Still doesn't work with Debian Wheezy beta (2012-06-18)
- ~~8GB SDHC Class 10 Extreme (BI1201516254G) [amazon.co.uk (http://www.amazon.co.uk/gp/product/B00422FBJ2) ]+amazon.fr~~ works with wheezy 19/09/2012
- 8GB SDHC Class 10 Extreme (BI1200916252D/SDSDX-008G-X46) - Tried with Debian "Squeeze"(19/04/2012), Debian "Wheezy"(18/06/2012) and Arch Linux(13/06/2012). None works. With Debian "Wheezy" Green LED stays ON continuously, with the other two it turns on very faint.
- 8GB SDHC Class 10 Extreme Pro- Works with updated kernel/firmware, stock debian6-19-04-2012 boots kernel but won't run init ( mmc timeout waiting for interrupt )

    - ~~16GB SDHC Class 10 Extreme (30MB/s HD Video) (SDSDX3-016G-X46) - Doesn't boot with debian6-19-04-2012.img, or newer firmware (tested 2012-06-17).~~
    - 16GB SDHC Class 6 Ultra (BL1202021933G)
    - 16GB SDHC Class 6 Ultra I (BL1205921933G) - Boots kernel but won't run init ( mmc timeout waiting for interrupt )
- **Silicon Power**
    - 8GB SDHC Class 10 (SP008GBSDH010V10) - Boots kernel but won't run init (mmc timeout waiting for interrupt ) - Tested 20/11/2012, 2012-10-28-wheezy-raspbian.img with Nov 20 kernel.
    - 32GB SDHC Class 6 (LS2N732GQON03ASP) - boots debian6-19-04-2012.img, but frequent slow response / system hangs.
- **TDK**
    - 4GB SDHC Class 6 (S404G1041) - Tried (end May 2012) with new kernel.img and start.elf [53] (https://github.com/raspberrypi/firmware/tree/master/boot) but still won't run init.
    - 4GB SDHC Class 6 (S404G1046) [Barcode: 4 902030 784447] - Tried (4th June 2012) with debian6-19-04-2012.img and with replacement kernel.img and start.elf from github [54] (https://github.com/raspberrypi/firmware/tree/87a04c0be0c05e20f94f223183a0310b37c9bd89/boot) but still got 'Error -84' and 'Kernel panic - not syncing: No init found'
- **Transcend**
    - 2GB MicroSD (MMAGR02GUECA-MB) - reads fine initially after image was written on a PC, gives mmc0 timeout errors reading back data after writing a large amount (in this case with 'pacman -Syu'). Still seems to work, but is *very* slow after this happens, even across reboots.
    - 32GB MicroSD (TS32GUSDHC4) - Doesn't boot.
    - 2GB SD (6451AG 2G O2DS1)
    - 16GB SD Class10 (TS16GSDHC10U1) - Doesn't Boot, show that "kernel panic - not syncing attempted to kill init"
- **Veho**
    - 4GB SDHC Class 6
- **Verbatim**
    - 16GB SDHC Class 6 (47178) - Raspbian Pisces RC3 - boots, but after login: mmc timeout waiting for interrupt
    - 8GB microSD Class 10 (44012) - ArchLinux - boots, but after system update develops segmentation faults
    - 8GB SDHC Class 10 (Premium) - Tested with September release of Raspbian and Debian Wheezy - both fail to boot with mmc errors.

The usual warnings against less reputable sellers (such as Ebay merchants) apply.

Note that the following error is sometimes accompanied with a non-working SD card after booting (on Debian):

```
mmc0: timeout waiting for hardware interrupt
```

### Benchmarks

- http://www.sakoman.com/OMAP/microsd-card-perfomance-test-results.html
- http://usbspeed.nirsoft.net/usb_drive_speed_summary.html?o=11
- http://www.raspberrypi.org/phpBB3/viewtopic.php?f=2&t=4076
- http://forum.xda-developers.com/showthread.php?t=1005633 (Doesn't originate from R-Pi, but very related)

## Foreign Language Translations

- Ru:RaspberryPiBoardVerifiedPeripherals

## References


1. ↑ http://www.raspberrypi.org/forum/absolute-beginners/cheap-powered-usb-hub-uk/#p76452
2. ↑ http://www.raspberrypi.org/forum/troubleshooting/keyboard-creates-kernal-panic/page-2
3. ↑ http://www.raspberrypi.org/forum/troubleshooting/keyboard-creates-kernal-panic/page-2
4. ↑ http://www.cpmspectre.pwp.blueyonder.co.uk/raspberry_pi/MoinMoinExport/USBPowerSupplies.html
5. ↑ http://www.cpmspectre.pwp.blueyonder.co.uk/raspberry_pi/MoinMoinExport/USBPowerSupplies.html



| Raspberry Pi | |
|---|---|
| **Startup** | Model Wizard - Buying Guide - SD Card Setup - Basic Setup - Advanced Setup - Beginners Guide - Troubleshooting |
| **Hardware** | Hardware - Hardware History - Low-level peripherals - Expansion Boards |
| **Peripherals** | Screens - Cases - **Other Peripherals** |
| **Software** | Software - Distributions - Kernel - Performance - Programming - VideoCore APIs |
| **Projects** | Tutorials - Guides - Projects - Tasks - DataSheets - Education - Communities |


♦



---

# RPi Software

From eLinux.org

Back to the Hub.

**Software & Distributions:**

***Software*** *- an overview.*

*Distributions - operating systems and development environments for the Pi.*

*Kernel Compilation - advice on compiling a kernel.*

*Performance - measures of the Pi's performance.*

*Programming - programming languages that might be used on the Pi.*

## Contents



## Overview

If you just want a working system, all that is required is a correctly formatted SD card. For details on how to create or get one, please see the Hardware Basic Setup page.

In order to understand the software compoonents in the RPi, you should first understand how it boots up. At power-up, the CPU is offline, and a small RISC core on the GPU is responsible for booting the SoC, therefore most of the boot components are actually run on the GPU code, not the CPU.

The boot order and components are as follows:

- **First stage bootloader** - This is used to mount the FAT32 boot partition on the SD card so that the second stage bootloader can be accessed. It is programmed into the SoC itself during manufacture of the RPi and cannot be reprogrammed by a user.
- **Second stage bootloader** (bootcode.bin) - This is used to retrieve the GPU firmware from the SD card, program the firmware, then start the GPU.

- **GPU firmware** (start.elf) - Once loaded, this allows the GPU to start up the CPU. An additional file, fixup.dat, is used to configure the SDRAM partition between the GPU and the CPU. At this point, the CPU is release from reset and execution is transferred over.
- **User code** - This can be one of any number of binaries. By default, it is the Linux kernel (usually named kernel.img), but it can also be another bootloader (e.g. U-Boot), or a bare-bones application.

Prior to 19th October 2012, there was previously also a third stage bootloader (loader.bin) but this is no longer required. [1]

Because of this boot process, use of an SD card to boot the RPi is mandatory. This does however mean that you cannot 'brick' the device.

# GPU bootloaders

Currently all of the GPU software and firmware is supplied in binary format. It can be downloaded from the RPI firmware section on GitHub (https://github.com/raspberrypi/firmware/tree/master/boot) . At this time, the source code is not available.

# Distributions

*Main page: Distributions*

SD card images of a number of pre-built distributions including Raspbian (the RPi official distribution based on Debian), Arch Linux ARM, and RISC OS are available from the Raspberry Pi foundation website (http://www.raspberrypi.org/downloads) . Pre-loaded SD cards are also available from The Pi Hut (http://thepihut.com/collections/sd-cards) .

Raspbian is the recommended distribution.

# Kernel

*Main page: RPi Kernel Compilation*

The kernel is sources can be obtained from the RPI linux section on GitHub (https://github.com/raspberrypi/linux)

# Compiler

The Broadcom processor on Raspberry Pi contains an ARM v6 general purpose processor and a Broadcom VideoCore IV GPU. No data is currently available on other cores (if any) available in the BCM2835.

## ARM

There is broad compiler support for the ARM processor including GCC - please see ARM Compilers. There are also a number of cross-compiler toolchains - please see toolchains.

The gcc compiler flags which will produce the most optimal code for the RPi are:

```
-Ofast -mfpu=vfp -mfloat-abi=hard -march=armv6zk -mtune=arm1176jzf-s
```

`-Ofast` may produce compile errors for some programs. In this case, `-O3` or `-O2` should be used instead. Note that `-mcpu=arm1176jzf-s` can be used in place of `-march=armv6zk -mtune=arm1176jzf-s`.

If you want to generate a relatively up-to-date compiler that uses the optimal flags by default, you can roll your own version of Linaro GCC - see RPi Linaro GCC Compilation.

## GPU

The GPU provides APIs for Open GL ES 2.0, hardware-accelerated OpenVG, and 1080p30 H.264 high-profile decode.

The GPU is capable of 1Gpixel/s, 1.5Gtexel/s or 24 GFLOPs of general purpose compute and features a bunch of texture filtering and DMA infrastructure - the Raspberry Pi team are looking at how they can make this available to application programmers. For the documentation on some Broadcom APIs exposed to control the GPU, see RPi VideoCore APIs.

The GPU blob is an 18MB elf file, including libraries. It does an awful lot. [2]

## DSP

There is a DSP, but there isn't currently a public API (Liz thinks the BC team are keen to make one available at some point).

# Performance

A large number of benchmark results are available on the performance page.

# Programming

A number of development environments are available depending on which language you are writing - see the programming page.

# Emulation

The ARM processor on the RPi can be emulated using QEMU. See emercer's tutorial (http://cronicasredux.blogspot.co.uk/2011/09/installing-and-running-debian-armel-on.html) , and also this discussion (http://www.raspberrypi.org/forum/projects-and-collaboration-general/emulating-a-raspi-on-windows) .

# References


1. ↑ https://github.com/raspberrypi/firmware/commit/c57ea9dd367f12bf4fb41b7b86806a2dc6281176
2. ↑ http://www.raspberrypi.org/?page_id=43&mingleforumaction=viewtopic&t=247


| Raspberry Pi | |
|---|---|
| **Startup** | Model Wizard - Buying Guide - SD Card Setup - Basic Setup - Advanced Setup - Beginners Guide - Troubleshooting |
| **Hardware** | Hardware - Hardware History - Low-level peripherals - Expansion Boards |
| **Peripherals** | Screens - Cases - Other Peripherals |
| **Software** | **Software** - Distributions - Kernel - Performance - Programming - VideoCore APIs |
| **Projects** | Tutorials - Guides - Projects - Tasks - DataSheets - Education - Communities |

# RPi Distributions

From eLinux.org

Back to the Hub.

**Software & Distributions:**

*Software - an overview.*

***Distributions** - operating systems and development environments for the Pi.*

*Kernel Compilation - advice on compiling a kernel.*

*Performance - measures of the Pi's performance.*

*Programming - programming languages that might be used on the Pi.*

# Contents

# Available Distributions

## What is armhf

The official Debian Squeeze image issued by the Raspberry Pi foundation uses "soft float" settings. The foundation found it necessary to use the existing Debian port for less capable ARM devices due to time and resource constraints during development of the Raspberry Pi. Therefore, it does not make use of the Pi's processor's floating point hardware - reducing the Pi's performance during floating point intensive applications - or the advanced instructions of the ARMv6 CPU.

The official Raspberry Pi distributions (http://www.raspberrypi.org/downloads) are now optimized for ARMV6 and for "hard float" which should have better performance on certain CPU intensive tasks.

There are some info on the news groups that "hard float" optimization can speed up floating point operating up to 10x, please read detailed discussion on Raspberry Pi forums - http://www.raspberrypi.org/phpBB3/viewtopic.php?p=61497#p61497

# Comparison

| Distribution | Latest | First | Type | License |
|---|---|---|---|---|
| Arch Linux ARM (http://archlinuxarm.org/) | 2012-09-18 | 2012-03-01 | Linux | OSI GPLv2 (http://www.opensource.org/licenses/gpl-2.0.php) |
| BerryTerminal (http://www.berryterminal.com/doku.php) | 2012-06-02 | 2012-06-02 | Linux | |
| Bodhi Linux (http://bodhilinux.com/) | 2012-09-13 (raspbian/wheezy) | 2012-06-12 (wheezy) | Raspbian | Core: OSI mixed (http://www.debian.org/legal/licenses/) (GPLv2 BSD etc) |
| Debian ARM (http://www.debian.org/ports/arm/) | 2012-04-19 (Squeeze) | 2012-02-16 (Squeeze) | Linux | Core: OSI mixed (http://www.debian.org/legal/licenses/) (GPLv2 BSD etc) |
| Fedora Remix (http://fedoraproject.org/wiki/Architectures/ARM) | 2012-07-07 (F14) | 2012-07-07 (F14) | Linux | OSI mixed (http://fedoraproject.org/wiki/Licensing:Main) (GPLv2 BSD etc) |
| Gentoo Linux (http://www.gentoo.org/) | weekly autobuilds | 2012-04-27 | Linux | GPLv2 (http://www.opensource.org/licenses/gpl-2.0.php) |
| IPFire (http://planet.ipfire.org/post/ipfire-on-raspberry-pi-ready-to-first-test) | 2012-06-27 (2.11) | 2012-06-27 (2.11) | Linux | Open Source |
| Meego MER + XBMC (http://wiki.meego.com/User:Vgrade#Raspberry_Pi) | 2012-04-27 (0.2) | 2012-04-11 (0.1) | Linux (embedded) | OSI mixed (http://www.opensource.org/licenses/index.html) (GPLv2 BSD etc) |
| Moebius (http://moebiuslinux.sourceforge.net/) | 2012-09-11 (1.0.1) | 2012-08-01 (1.0.0) | Raspbian | (GPLv2) |

| | | | | |
|---|---|---|---|---|
| OpenELEC (http://openelec.tv/component/k2/item/235-openelec-on-raspberry-pi-our-first-arm-device-supported) | 2012-11-25 (3.0 beta 1) | 2012-05-10 | Linux 3.6.7 (embedded) | OSI mixed (http://www.opensource.org/licenses/index.html) (GPLv2 BSD etc) |
| openSUSE (http://lists.opensuse.org/opensuse-arm/) | 2012-10-16 | 2012-07-30 | Linux 3.1 | OSI mixed (http://www.opensource.org/licenses/index.html) (GPLv2 BSD etc) |
| OpenWRT (http://wiki.openwrt.org/toh/raspberry_pi) | 2012-10-23 | 2012-08-15 | Linux | OSI mixed (http://www.opensource.org/licenses/index.html) (GPLv2 BSD etc) |
| PiBang Linux (http://pibanglinux.org/) | November 9th, 2012 (RC4) | November 29th, 2012 (Alpha1) | Linux | Core: OSI mixed (http://www.debian.org/legal/licenses/) (GPLv2 BSD etc) |
| PwnPi (http://www.pwnpi.net/index.html) | 2012-06-29 (Squeeze) | 2012-05-26 (Squeeze) | Linux | GNU General Public License version 3.0 |
| QtonPi (http://wiki.qt-project.org/QtonPi) | 2012-05-27 (0.2) | 2012-05-07 (0.1) | Linux | |
| Raspbian (http://www.raspbian.org/) | 2012-09-18 | 2012-05-28 (Wheezy) | Linux | Core: OSI mixed (http://www.debian.org/legal/licenses/) (GPLv2 BSD etc) |
| raspbmc (http://www.raspbmc.com/) | 2012-10-10 | 2012-06-30 (Squeeze) | Raspbian | custom (http://svn.stmlabs.com/svn/raspbmc/LICENSE) |
| RISC OS (http://en.wikipedia.org/wiki/RISC_OS) | 2012-11-01 (5.19 RC6) | 2012-07-09 (5.19) | RISC OS | Shared Source (http://www.riscosopen.org/content/documents/ssfaq) |

| | | | | |
|---|---|---|---|---|
| SliTaz (http://www.slitaz.org/) | 2012-05-29 (4.0) | 2012-05-29 (4.0) | Linux | GPLv2 (http://www.opensource.org/licenses/gpl-2.0.php) |
| Xbian (http://xbian.org/) | 2012-10-13 | 2012-07-29 | Raspbian | OSI mixed (http://www.opensource.org/licenses/index.html) (GPLv2 BSD etc) |
| Aros hosted on Raspbian Limited Demo (http://www.aros.org/) | 2012-06-14 | 2012 | Mixed Debian6 and Aros | Mixed - GPLv2 (http://www.opensource.org/licenses/gpl-2.0.php) and APL (MPL derivative) |

# Android

Discuss: [1] (http://www.raspberrypi.org/phpBB3/viewforum.php?f=73)

Wiki & Main site (http://androidpi.wikia.com/wiki/Android_Pi_Wiki)

# Fedora Remix

The Raspberry Pi Fedora Remix is a Linux software distribution for the Raspberry Pi computer. It contains software packages from the Fedora Project (specifically, the Fedora ARM secondary architecture project), packages which have been specifically written for or modified for the Raspberry Pi, and proprietary software provided by the Raspberry Pi Foundation for device access.

- wiki page (http://zenit.senecac.on.ca/wiki/index.php/Raspberry_Pi_Fedora_Remix)

# Debian (Squeeze/6.x)

http://www.debian.org/ports/arm/

Debian (http://www.debian.org/) was the default distribution on the Alpha boards. Boot time depends on width & speed of SD-card. Alpha board boot into Debian prompt (no GUI) was timed taking about 34 seconds.

The Debian distro for Raspberry Pi is the Cambridge reference filesystem, which is a fully functional Debian Squeeze installation containing LXDE (desktop) and Midori (browser); development tools; and sample code for accessing the multimedia functionality on the device.

# Arch

Arch Linux ARM (http://archlinuxarm.org) is based on Arch Linux (http://www.archlinux.org/) , which aims for simplicity and full control to the end user. It provides a lightweight base structure that allows you to shape the system to your needs. For this reason, the Arch Linux ARM image for the Raspberry Pi does not come with a graphical user interface, though you can easily install one yourself. Please note that the Arch distribution may not be suitable for beginners.

Arch Linux ARM is on a rolling-release cycle that can be updated daily through small packages instead of huge updates every few months.

More information is available at http://archlinuxarm.org

# Raspbian

Raspberry Pi + Debian = Raspbian (http://www.raspbian.org) . A project to create a hard float port of Debian Wheezy (7.x) armhf for the Raspberry Pi. The intent of Raspbian is to bring to the Raspberry Pi user 10,000s of pre-built Debian packages specifically tuned for optimal performance on the Raspberry Pi hardware. The project is still in it's early phases, but the major push to rebuild nearly all Debian packages for the Raspberry Pi is expected to be completed by early June, 2012 (only several hundred packages remain as of June 1st). After that, efforts will focus on making Raspbian the easiest to use, most stable and best performing Linux distribution available for the Raspberry Pi.

More information is available at http://www.raspbian.org

# Moebius

A very compact ARM HF debian based distribution, it fits in a 1Gb SD card, has autoresizing features to better adapt to your SD card size and uses Raspbian huge repositories for installing everything you need. A wise configuration and a small memory footprint are ideal for an headless machine or for interacting with real word I/O devices, take a look at Moebius Website (http://moebiuslinux.sourceforge.net/)

# Raspbian Server Edition

It's a stripped version of Raspibian with some other packages

- Main site of version 2.1 (http://sirlagz.net/?p=662)
- Dowload Version 2.1 (https://docs.google.com/file/d/0B1RhPrxJp7gySmpybnhXOEo0MXM/edit?pli=1)

# Red Sleeve Linux

Red Sleeve Linux (http://www.redsleeve.org/) is a Linux distribution that aims to bring the RHEL clone design to the ARM architecture. There are images for several ARM devices including the Raspberry Pi.

# IPFire

IPFire (http://www.ipfire.org) is an Open Source firewall distribution for x86 and ARM-based systems. It turns the Raspberry Pi computer into a small router for home networks and very small businesses. As the Raspberry Pi computer comes with only one NIC, it works perfectly as a 3G router without plugging in additional hardware.

The generally small system that provides essential services for networks can be enhanced by addons which add new features to IPFire. So the system can be turned into a file server and much more.

More information is available at http://www.ipfire.org

# Raspberry Pi Thin Client

Thin Client project want to create a very low price thin client over Raspberry Pi board! Microsoft RDC, Citrix ICA & VMWare View

- Homepage (http://rpitc.blogspot.se/)
- Dowload (http://rpitc.blogspot.se/p/download.html)

# DarkElec

None of the currently available solutions do a perfect job with running XBMC on the Pi, however OpenELEC comes by far the closest, in spite of its locked down nature.

This fork aims to remedy the very few flaws in its implementation and to focus 100% on the Pi, while also sticking to the upstream and incorporating its updates.

Features:

```
•Low idle CPU usage (< 15%)
•Smoother and more responsive
•Built in XBMC addons: iPlayer, custom fixed version of Demand 5, various unofficial repos
•iPlayer, 4oD, Demand 5, ITV Player, SportsDevil all fully tested+working
•Improved wifi connectivity
•Added test-connman scripts for easy wifi setup
•Added wireless_tools (iwconfig etc.)
```

```
•Added rndis_wlan wifi driver (broadcom 4320 chipset)
•Easy SD card installation script for building from source
```

- Main site (http://darkimmortal.com/category/raspberry-pi/)
- Download DarkELEC Release 3 (http://shit.weeaboo.com/darkelec3.zip)

# OpenELEC

OpenELEC is an embedded operating system built specifically to run XBMC (http://www.xbmc.org) , the open source entertainment media hub. The idea behind OpenELEC is to allow people to use their Home Theatre PC (HTPC) like any other device you might have attached to your TV, like a DVD player or Sky box. Instead of having to manage a full operating system, configure it and install the packages required to turn it into a hybrid media center, OpenELEC is designed to be simple to install, manage and use, making it more like running a set-top box than a full-blown computer.

- OpenELEC Mainsite (http://www.openelec.tv)
- In February 2012, OpenELEC.tv announced their ARM port for Raspberry Pi (http://openelec.tv/component/k2/item/235-openelec-on-raspberry-pi-our-first-arm-device-supported)
- OpenELEC forum (http://openelec.tv/forum/90-miscellaneous/11763-raspberry-pi) thread
- RaspberryPi forum (http://www.raspberrypi.org/forum/general-discussion/openelec) thread
- Raspberry Pi build instructions for OpenELEC (http://elinux.org/Rpi_openELEC)

# Raspbmc

Raspbmc is a minimal Linux distribution based on Debian that brings XBMC to your Raspberry Pi. This device has an excellent form factor and enough power to handle media playback, making it an ideal component in a low HTPC setup, yet delivering the same XBMC experience that can be enjoyed on much more costly platforms. Raspbmc is brought to you by the developer of the Crystalbuntu Linux Distribution, which brings XBMC and 1080p decoding to the 1st generation Apple TV.

- Main Site (http://www.raspbmc.com/)
- Blog (http://www.stmlabs.com/2012/06/24/network-issues/)
- image (http://files.velocix.com/c1410/raspbmc/downloads/bin/ramdistribution/installer-testing.img.gz)
- 1-click-Installer (Win) (http://download.raspbmc.com/downloads/bin/installers/raspbmc-win32.zip)
- Installation instructions (Mac/Lin) (http://www.raspbmc.com/wiki/user/os-x-linux-installation/)

- source (http://svn.stmlabs.com/listing.php?repname=raspbmc)

# XBian

XBian is a small, fast and lightweight media center distro for the Raspberry Pi, based on a minimal Raspbian image. It's slogan is "XBMC on raspberry pi, bleeding edge" and thus it's main focus is delivering the fastest XBMC solution for the Raspberry Pi. Thereby making most of the commercial media-center products obsolete...

Features:

- Fits on a 1GB SD card
- Low RAM usage and low CPU usage
- Very smooth UI
- Auto mount USB
- AFP support
- NFS support
- AirPlay support
- CEC support
- Lirc support
- PVR support
- Kernel 3.6.1 + a lot of modules
- Performance as the default governor
- Out of the box support for almost all wlan adapters
- User friendly configuration tool xbian-config
- Source code on git

- Main Site (http://xbian.org/)
- Download (http://xbian.org/?page_id=21)
- Xbian Github (https://github.com/Koenkk/xbian)

# PwnPi

- Main Site (http://www.pwnpi.net/index.html)

PwnPi is a Linux-based penetration testing dropbox distribution for the Raspberry Pi. It currently has 181 network security tools pre-installed to aid the penetration tester. It is built on the debian squeeze image from the raspberry pi foundation's website and uses Xfce as the window manager

# ha-pi

- Main Site (https://sourceforge.net/projects/ha-pi/)

Description This debian squeeze image created to perform "pwn plug" type of attacks using Raspberry pi. pleas look at the wiki for further details Wiki (https://sourceforge.net/p/ha-pi/wiki/Home/)

# Bodhi

Bodhi Linux is a small Linux distribution using the Enlightenment (http://www.enlightenment.org) window manager and the ARM build is based on Debian.

If you hit any snags or find bugs with this image please let us know in the R_Pi section of our user forums (http://forums.bodhilinux.com/index.php?/forum/30-raspberry-pi/) so we can improve this release.

- ARMHF (http://jeffhoogland.blogspot.co.at/2012/07/bodhi-linux-raspberry-pi-beta.html?showComment=1343869408306#c8475812441665709126/) announced for Bodhi Linux on R_Pi
- Release Announcement (http://jeffhoogland.blogspot.co.at/2012/06/bodhi-linux-arm-alpha-release-for.html) from Bodhi Developer Blog
- Download (http://sourceforge.net/projects/bodhilinux/files/ARM/RaspBerryPi/) from sourceforge
- what-about-the-raspberry-pi (http://forums.bodhilinux.com/index.php?/topic/2472-what-about-the-raspberry-pi/) Forum thread

Alpha Release | Link Alpha Bodhi R_Pi (http://jeffhoogland.blogspot.co.at/2012/06/bodhi-linux-arm-alpha-release-for.html) ) User/Password: bodhi/bodhi root/raspberry Beta Release | Link Beta Bodhi R_Pi (http://jeffhoogland.blogspot.co.at/2012/07/bodhi-linux-raspberry-pi-beta.html) User/Password: pi/bodhilinux Root: sudo su root/bodhilinux

Bodhi Linux moves ARM Branch to ARMHF (http://jeffhoogland.blogspot.co.at/2012/08/bodhis-arm-branch-moves-to-armhf.html) Download newest Release from Sourcforge (http://sourceforge.net/projects/bodhilinux/files/ARMHF/Pi/) The R_Pi Bodhi build is built directly on top of Raspbian and incorporates all of their changes and improvements.

# Gentoo

Gentoo Linux (http://www.gentoo.org/) is a source based rolling-release distribution which emphasizes choice and flexibility. Gentoo ARM (http://www.gentoo.org/proj/en/base/arm/) aims to be the most up to date and fastest ARM distribution available.

A Quick Start Guide (http://wiki.gentoo.org/wiki/Raspberry_Pi_Quick_Install_Guide) exists how to install Gentoo on the Raspberry Pi.

Gentoo Section (http://www.raspberrypi.org/phpBB3/viewforum.php?f=54) on the official Raspberry Pi forum.

# Adafruit - Occidentalis v0.1

http://learn.adafruit.com/adafruit-raspberry-pi-educational-linux-distro/occidentalis-v0-dot-1 Occidentalis v0.1. Rubus occidentalis is the black raspberry. It is derived from Raspbian Wheezy July 15 Made a few key changes to make it more hardware-hacker friendly!

- I2C and hardware SPI support
- I2C/SPI modules initialized on boot

... Please keep in mind, adafruit is not full time linux distro maintainers - we will try to fix any bugs we find but this distro is not for beginners or people who are new to linux!

# RISC OS

RISC OS is a fast and lightweight computer operating system designed in Cambridge, England by Acorn (http://en.wikipedia.org/wiki/Acorn_Computers) . First released in 1987, its origins can be traced back to the original team that developed the ARM microprocessor. RISC OS includes BBC BASIC (http://en.wikipedia.org/wiki/BBC_BASIC) which was primarily conceived to teach programming skills as part of the BBC computer literacy project.

- RISC OS Open (http://www.riscosopen.org/) (ROOL) has released the sources. Community members have ported the OS to the BeagleBoard and similar hardware
- In November 2011, RISCOScode.com announced that RISC OS will be available as an alternative OS (http://www.riscoscode.com/Pages/Item0113.html) for Raspberry Pi ~~from launch~~
- RaspberryPi forum (http://www.raspberrypi.org/forum?mingleforumaction=viewtopic&t=919) thread
- ROOL forum (http://www.riscosopen.org/forum/forums/5/topics/783) thread
- http://www.pilearn.com/Pages/Page1001.html

# PiBang Linux

PiBang linux is a Raspbian based distribution. PiBang is inspired by Crunchbang Linux, an i686 and x86_68 Debian based distribution. It comes preconfigured with many helpful scripts and pipemenus as well as a fork of Raspi-config with increases functions such as

support for changing the user and hostname. PiBang is also one of the heavier Rasperry Pi distributions boasting a complete package set with favorites such as Abiword, OMXPlayer, GIMP, and VLC all pre-installed.

http://www.pibanglinux.org

# Announced distributions

The following distributions have been announced and may have been publicly demonstrated but distributions are not generally available quite yet.

## NetBSD

NetBSD is an operating system based off 4.3BSD and is geared towards embedded systems. There has been an unofficial public beta release here (ftp://ftp.netbsd.org/pub/NetBSD/misc/skrll/rpi-netbsd-6.img.gz) , however the since there is no video or networking support yet, the only way to interface with it is through a serial console.

## FreeBSD

Details and install guide of the FreeBSD port (http://kernelnomicon.org/?p=164)

## Chromium OS

Details about the work (http://www.engadget.com/2012/06/20/chromium-os-gets-ported-to-raspberry-pi/) Chromium OS is Google own version of linux os

## KidsRuby

KidsRuby is what it sounds like – a Ruby for kids – and it's running beautifully on the Raspberry Pi. This is exactly the sort of application we want to see on the device, and we're really pleased to see it up and running. It looks like there will be some optimisation for speed before we launch, but what's there already is very useable.

R.Pi blog entry: http://www.raspberrypi.org/2011/09/kidsruby-on-raspberry-pi-another-video-demo/ More info & Video: http://confreaks.net/videos/637-gogaruco2011-kidsruby-think-of-the-children?player=html5

# Meego MER & XBMC

The MeeGo MER project provides a Linux-based, open source software platform for the next generation of computing devices. The MeeGo MER software platform is designed to give developers the broadest range of device segments to target for their applications, including netbooks, handheld computing and communications devices, in-vehicle infotainment devices, smart TVs, tablets and more – all using a uniform set of APIs based on Qt. XBMC is an award-winning free and open source (GPL) software media player and entertainment hub for digital media. Meego TV 1.2 uses XBMC as a reference GUI (that is, a starting point for creating a custom GUI).

- http://www.madeo.co.uk/?p=783
- http://www.madeo.co.uk/?page_id=605
- http://wiki.meego.com/User:Vgrade#Raspberry_Pi
- http://wiki.merproject.org/wiki/Community_Workspace/RaspberryPi
- https://github.com/xbmc/xbmc-rbp

# Puppy

Puppy Linux is designed to be a small tiny Linux distribution (<100MB). One distro version of Puppy for ARM is SAP6 Debian6 armel binaries (http://distro.ibiblio.org/quirky/arm/test/raspi-sap-5.95-alpha1/sap-5.95-alpha1-readme.htm) and another PuppiPlan (http://puppylinux.org/wikka/PuppiPlan) all under the Puppy (http://puppylinux.org/wikka/PARM) initiative. Puppy Linux (http://en.wikipedia.org/wiki/Puppy_Linux) is going back to his roots. Designed to run from 256MB ram. Making every bit count. Join the Puppy geek adventure (http://www.murga-linux.com/puppy/viewtopic.php?p=526#526) for 2012. Woof Woof

# OpenWrt

OpenWrt is described as a Linux distribution for embedded devices. The Rpi is now supported by the Attitude Adjustment (12.09-beta) release available here:

http://downloads.openwrt.org/attitude_adjustment/12.09-beta/brcm2708/generic/

OpenWrt Wiki for R_pi http://wiki.openwrt.org/toh/raspberry_pi

Related links:

- http://www.zoobab.com/raspberry-pi-openwrt
- http://thread.gmane.org/gmane.comp.embedded.openwrt.devel/14815
- openWRT Thread (https://forum.openwrt.org/viewtopic.php?pid=173937#p173937) about Raspberry Pi status

## Mes (Marshmallow Entertainment System Engine

Old school 8bit and 16bit 2D game under development.

- Website (http://guillermoamaral.com/marshmallow_h/)
- Demo SD card .img images (https://github.com/gamaral/rpi-buildroot/downloads)
- Youtube Updates (http://www.youtube.com/playlist?list=PL6663F4636B896305)

## Aros Hosted on Linux

Aros (http://www.aros.org) is an open source Amiga like operating system (OS) at the api level. This version runs as a task under Linux to take advantage of the drivers available inside the GNU Linux OS core.

Related links

- http://amigaworld.net/modules/newbb/viewtopic.php?topic_id=35843&forum=48
- http://www.raspberrypi.org/archives/tag/aros
- Youtube videos (http://www.youtube.com/results?search_query=raspberry+pi+aros&oq=raspberry+pi+aros&gs_l=youtube.3..0.614.4729.0.4969.11tiINLoemg)
- http://www.amiga.org/forums/archive/index.php/t-62135.html

# Other Distributions

These are other popular distributions that are often asked about for Raspberry Pi but are not available.

## GeeXboX ARM

GeeXboX is a free and Open Source Media-Center purposed Linux distribution for embedded devices and desktop computers. GeeXboX is not an application, it's a full-featured OS, that one can boot as a LiveCD, from a USB key, an SD/MMC card or install on its regular HDD. The GeeXboX distribution is lightweight and designed for one single goal: embed all major multimedia applications as to turn your computer into an HTPC.

http://www.geexbox.org/category/arm/

## Ubuntu

Ubuntu (http://www.ubuntu.com/) was initially planned to be the default distribution, but the current version of Ubuntu only supports ARMv7 onwards, not the ARMv6 architecture used by the Raspberry Pi's processor. Therefore Ubuntu does not work on Raspberry Pi, and there is no further information about this changing in the near future.

A bug report on this subject was submitted to Ubuntu's bug tracker. The responses to that bug include an unofficial viewpoint from a Canonical employee, outlining the amount of work required to support ARMv6 (and therefore, potentially, Raspberry Pi). See Bug 848154 (https://bugs.launchpad.net/ubuntu/+bug/848154)

https://wiki.ubuntu.com/ARM

# References

| Raspberry Pi | |
|---|---|
| **Startup** | Model Wizard - Buying Guide - SD Card Setup - Basic Setup - Advanced Setup - Beginners Guide - Troubleshooting |
| **Hardware** | Hardware - Hardware History - Low-level peripherals - Expansion Boards |
| **Peripherals** | Screens - Cases - Other Peripherals |
| **Software** | Software - **Distributions** - Kernel - Performance - Programming - VideoCore APIs |
| **Projects** | Tutorials - Guides - Projects - Tasks - DataSheets - Education - Communities |

# RPi Kernel Compilation

From eLinux.org

Back to the Hub.

**Software & Distributions:**

*Software - an overview.*

*Distributions - operating systems and development environments for the Pi.*

***Kernel Compilation** - advice on compiling a kernel.*

*Performance - measures of the Pi's performance.*

*Programming - programming languages that might be used on the Pi.*

## Contents



# Overview

This page explains how to rebuild the kernel image for the RPi. There are two possible routes available:

1. Compile on the Raspberry Pi itself
2. Cross compile on another Linux system

Both of these routes are covered below, however, you are strongly recommended to follow the cross compilation route. The low processing power of the RPi means that a local compile will take many hours.

# Get the kernel source

The kernel source should be downloaded from the RPI linux section on GitHub (https://github.com/raspberrypi/linux) . Although you could just compile the vanilla kernel from Kernel.org (http://www.kernel.org/) , it will not have the necessary drivers and modules for the Broadcom SoC on the RPi. You can however apply patches from the vanilla kernel to the RPi one - be prepared for potential compiler grumbles though!

At the time of writing, two branches of interest are available:

- **rpi-3.2.27** - This is the version of the kernel currently used in Raspbian.
- **rpi-3.6-y** - This is a development branch based on the current vanilla kernel. It will eventually replace the 3.2 branch.

You can download the source directly using git. For the 3.2 branch:

```
git clone git://github.com/raspberrypi/linux.git
```

and for the 3.6 branch:

```
git fetch git://github.com/raspberrypi/linux.git rpi-3.6.y:refs/remotes/origin/rpi-3.6.y
```

Or you can download a tarball from the website using these links: rpi-3.2.27 (https://github.com/raspberrypi/linux/archive/rpi-3.2.27.tar.gz) rpi-3.6.y (https://github.com/raspberrypi/linux/archive/rpi-3.6.y.tar.gz)

# Get a compiler

Next, you will need to get a version of GCC in order to build the kernel.

## On the RPi

### Raspbian

```
apt-get update
apt-get -y dist-upgrade
apt-get -y install gcc make
```

### Arch Linux

```
pacman -Syu
pacman -S gcc make
```

# Cross compiling from Linux

Please note that when cross-compiling, your compiler may not target the correct ARM processor by default. This will at best reduce performance, or worse, compile for a much newer processor resulting in illegal instructions in your code. The pre-built compiler or a custom-built compiler are recommended because of this. (For example, the latest GCC Linaro binary targets armv7-a by default, whereas the RPi requires armv6kz). It is possible to add extra compiler options to the `HOSTCFLAGS` line in `Makefile`. The correct flags are shown on the software page - note that you may also need to add `-marm` if your compiler produces Thumb code by default.

### Use the provided compiler

Download the pre-built bmc2708 compiler from the RPI tools section on GitHub (https://github.com/raspberrypi/tools/tree/master/arm-bcm2708/arm-bcm2708hardfp-linux-gnueabi) .

```
git clone git://github.com/raspberrypi/tools.git
```

or you can download a tarball from the website using this link (https://github.com/raspberrypi/tools/archive/master.tar.gz) .

### Custom-built Linaro GCC

See Linaro GCC Compilation.

### Ubuntu

```
apt-get install gcc-arm-linux-gnueabi make ncurses-dev
```

### Gentoo Linux

```
crossdev -S -v -t arm-unknown-linux-gnueabi
```

Crossdev should create a cross-toolchain using the latest stable versions of the required packages. If it fails, you can specify exact versions by removing the "-S" flag and adding the "--b", "--g", "--k" and "--l" flags. On 2012-05-06, `cross -S -v -A gnueabi arm` works just fine.

### Arch Linux

```
yaourt -S arm-linux-gnueabi-gcc
```

# Cross compiling from OSX

## Macports

The Kernel source requires a case-sensitive filesystem. If you do not have a HFS+ Case-sensitive partition that can be used, create a disk image with the appropriate format. Ensure latest Xcode and command line tools are installed from Apple Developer Connection (http://developer.apple.com/downloads) Install macports (http://guide.macports.org/#installing)

```
port install arm-none-eabi-gcc
port install arm-none-eabi-binutils
```

### If you get an error message that elf.h is missing

```
sudo port install libelf && sudo ln -s /opt/local/include/libelf /usr/include/libelf
```

From opensource.apple.com, download and copy elf.h (http://opensource.apple.com/source/dtrace/dtrace-48/sys/elf.h?txt) and elftypes.h (http://opensource.apple.com/source/dtrace/dtrace-48/sys/elftypes.h?txt) to /usr/include

Edit elf.h and add

```
#define R_386_NONE        0
#define R_386_32          1
#define R_386_PC32        2
#define R_ARM_NONE        0
#define R_ARM_PC24        1
#define R_ARM_ABS32       2
#define R_MIPS_NONE       0
#define R_MIPS_16         1
#define R_MIPS_32         2
#define R_MIPS_REL32      3
#define R_MIPS_26         4
#define R_MIPS_HI16       5
#define R_MIPS_LO16       6
```

**If you get a "SEGMENT_SIZE is undeclared" error** open the Makefile and change the line:

```
NOSTDINC_FLAGS += -nostdinc -isystem $(shell $(CC) -print-file-name=include)
```

to

```
NOSTDINC_FLAGS += -nostdinc -isystem $(shell $(CC) -print-file-name=include) -Dlinux
```

### Yagarto

Download and install from here (http://www.yagarto.de/#downloadmac) .

# Perform the compilation

Firstly, ensure your build directory is clean:

```
make mrproper
```

Next, in all cases, you will want to get a working kernel configuration to start from. You can get the one running on the RPi by typing the following (on the RPi):

```
zcat /proc/config.gz > .config
```

then copy `.config` into your build directory.

Alternatively, the default configuration is available in the downloaded kernel source in `arch/arm/configs/bcmrpi_defconfig`. Just copy this to `.config` in the build directory.

From this point on, if you are cross-compiling, please substitute `<your_compiler>` with your compiler binary prefix (e.g. `arm-bcm2708hardfp-linux-gnueabi-`) as each compiler will be named slightly differently. If you are building on the RPi, remove `ARCH=arm CROSS_COMPILE=<your_compiler>` from each command.

Ensure that your configuration file is up-to-date:

```
make ARCH=arm CROSS_COMPILE=<your_compiler> oldconfig
```

If any configuration options have been added, you will be asked what set each option to. If you don't know the answer, just press enter to accept the default.

Optionally, if you want to make changes to the configuration, run this next:

```
make ARCH=arm CROSS_COMPILE=<your_compiler> menuconfig
```

Now you are ready to build:

```
make ARCH=arm CROSS_COMPILE=<your_compiler>
```

If you are on a multi-core system, you can make the build faster by appending `-j<N>` where `N` is the number of cores on your system plus one.

Find something else to get on with while the compilation takes place. On an average PC with the default configuration, this should take about 15 minutes.

# Prepare the image file

Because of the way the memory addresses are arranged in the Broadcom SoC, you will need to prepare the compiled image for use.

If you haven't got the tools directory from the Git repo, please do so now:

```
git clone git://github.com/raspberrypi/tools.git
```

or you can download a tarball from the website using this link (https://github.com/raspberrypi/tools/archive/master.tar.gz) .

In the tools set, there is a folder called `mkimage`. Enter this directory, then run the following:

```
./imagetool-uncompressed.py <your_kernel_build_directory>/arch/arm/boot/zImage
```

This will output a file called `kernel.img`.

# Transfer the build

Copy your new `kernel.img` file into the RPi boot partition, though preferably as a new file (such as `kernel_new.img`) just in case it doesn't work. If you're building on the RPi, just copy the file to `/boot`. If you use a different filename, edit `config.txt` change the kernel line:

```
kernel=kernel_new.img
#kernel=kernel.img
```

Now you need to transfer the modules. In the build directory, run the following (substituting `<modules_path>` for a folder somewhere (e.g. `~/modules`):

```
ARCH=arm CROSS_COMPILE=<your_compiler> make modules_install INSTALL_MOD_PATH=<modules_path>
```

The contents of this directory should then be copied into the RPi root directory. NOTE: If you have rebuilt the new kernel with exactly the same version as the one that's running, you'll need to remove the old modules first. Ideally this should be done offline by mounting the SD card on another system.

Your RPi should now be ready to boot the new kernel. However, at this point it's recommended that you update your GPU firmware and libraries. **This is required if you've just moved from 3.2 to 3.6 as the firmware interface has changed**.

# Get the firmware

The firmware and boot files should be updated at the same time to ensure that your new kernel works properly. Again, two branches are available:

- **master** - This is the version of firmware currently used in Raspbian (i.e. it works with the 3.2 kernel).
- **next** - This is a development branch which provides a newer GPU firmware to work with the updated drivers in the 3.6 kernel.

You can either download the source directly using git: You can download the firmware directly using git. For the master branch:

```
git clone git://github.com/raspberrypi/firmware.git
```

and for the next branch:

```
git fetch git://github.com/raspberrypi/firmware.git next:refs/remotes/origin/next
```

Or you can download a tarball from the website using these links: master (https://github.com/raspberrypi/firmware/archive/master.tar.gz) next (https://github.com/raspberrypi/firmware/archive/next.tar.gz)

# Transfer the firmware

Firstly, update the required boot files in the RPi `boot` directory with those you've downloaded. These are:

- bootcode.bin
- fixup.dat
- start.elf

Next, you need to copy the VC libraries over. There are two copies of this: one for hard float and one for soft float. To find the correct one, run the following command (substituting the program name for your compiler binary as required):

```
arm-none-linux-gnueabi-gcc -v 2>&1 | grep hard
```

If something prints out, and you can see `--with-float=hard`, you need the hard float ones. NOTE: The current version of Raspbian uses hard float.

Remove the `/opt/vc` directory from the RPi root, then:

- For hard float, copy `vc` from the `hardfp/opt` directory into `/opt` in the RPi root directory
- Otherwise copy `vc` from the top-level `opt` directory into `/opt` in the RPi root directory.

# Test your build

Power cycle your RPi and check the following:

- If you have the serial port on the GPIO expander wired up, you should see the kernel booting.
- The screen works - the kernel boots and you get a login prompt.
- The VC interface is working - if the 'OK' LED flashes regularly eight or so times every few seconds once the OS has booted, it's not. You can also test this by running

`vcgencmd measure_temp`. If it prints "VCHI initialization failed", you have the a mismatch between the firmware, the VC libraries, and the kernel driver.

- Run `uname -a` and check that your new kernel is the one that's running.
- Make sure you don't have any odd error messages during boot that may indicate a module isn't working properly. If you see `missed completion of cmd 18` regarding DMA transfers to the SD card, you can safely ignore it.

| Raspberry Pi | |
|---|---|
| **Startup** | Model Wizard - Buying Guide - SD Card Setup - Basic Setup - Advanced Setup - Beginners Guide - Troubleshooting |
| **Hardware** | Hardware - Hardware History - Low-level peripherals - Expansion Boards |
| **Peripherals** | Screens - Cases - Other Peripherals |
| **Software** | Software - Distributions - **Kernel** - Performance - Programming - VideoCore APIs |
| **Projects** | Tutorials - Guides - Projects - Tasks - DataSheets - Education - Communities |

# RPi Performance

From eLinux.org

Back to the Hub.

**Software & Distributions:**

*Software - an overview.*

*Distributions - operating systems and development environments for the Pi.*

*Kernel Compilation - advice on compiling a kernel.*

***Performance** - measures of the Pi's performance.*

*Programming - programming languages that might be used on the Pi.*

## Contents

# CPU

## Linpack

The Arm has been tested using the linpack benchmark from [1] (http://www.netlib.org/benchmark/linpackc.new) , built with gcc with -O3 (Optimisation level 3). Run with array size 200.

With software floating point

### Source

[2] (http://www.netlib.org/benchmark/linpackc.new)

### Compile/Run

```
cc -O3 -o linpack linpack.c -lm
  linpack.c: In function ‘main’:
  linpack.c:69: warning: return type of ‘main’ is not ‘int’
./linpack
  Enter array size (q to quit) [200]: 200
```

### Results

Crippled

```
Memory required:  315K.

LINPACK benchmark, Double precision.
Machine precision:  15 digits.
Array size 200 X 200.
Average rolled and unrolled performance:

    Reps Time(s) DGEFA   DGESL  OVERHEAD    KFLOPS
       2   0.53  92.45%   1.89%   5.66%   5493.333
       4   1.07  92.52%   2.80%   4.67%   5385.621
       8   2.12  92.45%   2.36%   5.19%   5466.003
      16   4.24  92.45%   2.83%   4.72%   5438.944
      32   8.49  92.11%   2.71%   5.18%   5459.213
      64  16.98  92.05%   2.89%   5.06%   5452.440
```

Hardware floating point (-mfloat-abi=softfp)

```
Memory required:  315K.
LINPACK benchmark, Double precision.
```

```
Machine precision:  15 digits.
Array size 200 X 200.
Average rolled and unrolled performance:

    Reps Time(s) DGEFA   DGESL  OVERHEAD    KFLOPS
       8   0.51  90.20%   3.92%   5.88%  22888.889
      16   1.02  89.22%   4.90%   5.88%  22888.889
      32   2.05  90.24%   3.41%   6.34%  22888.889
      64   4.08  91.42%   2.94%   5.64%  22829.437
     128   8.16  91.54%   2.94%   5.51%  22799.827
     256  16.31  91.35%   2.76%   5.89%  22903.800
```

Full hardware floating point on Raspbian (-mfloat-abi=hard -mfpu=vfp) and arm_freq=700

```
Memory required:  315K.
LINPACK benchmark, Double precision.
Machine precision:  15 digits.
Array size 200 X 200.
Average rolled and unrolled performance:

    Reps Time(s) DGEFA   DGESL  OVERHEAD    KFLOPS
      16   0.58  89.66%   3.45%   6.90%  40691.358
      32   1.17  87.18%   4.27%   8.55%  41071.651
      64   2.32  88.36%   3.02%   8.62%  41459.119
     128   4.67  88.22%   3.43%   8.35%  41071.651
     256   9.33  88.85%   3.32%   7.82%  40880.620
     512  18.63  89.00%   2.95%   8.05%  41047.675
```

Full hardware floating point on Raspbian (-mfloat-abi=hard -mfpu=vfp) and arm_freq=1000 and core_freq=500

```
Memory required:  315K.
LINPACK benchmark, Double precision.
Machine precision:  15 digits.
Array size 200 X 200.
Average rolled and unrolled performance:

    Reps Time(s) DGEFA   DGESL  OVERHEAD    KFLOPS
      32   0.79  89.87%   0.00%  10.13%  61896.714
      64   1.58  89.24%   1.27%   9.49%  61463.869
     128   3.16  90.19%   1.90%   7.91%  60407.789
     256   6.32  88.13%   3.80%   8.07%  60511.761
     512  12.65  87.83%   3.56%   8.62%  60825.836
```

Full hardware floating point on Gentoo with more compiler optimizations (gcc-4.6.3 -Ofast -fno-fast-math), default clocks

```
Memory required:  315K.
LINPACK benchmark, Double precision.
Machine precision:  15 digits.
Array size 200 X 200.
Average rolled and unrolled performance:
```

```
   Reps Time(s) DGEFA   DGESL  OVERHEAD    KFLOPS
-----------------------------------------------------
     16    0.56  89.29%   1.79%   8.93%  43084.967
     32    1.13  91.15%   4.42%   4.42%  40691.358
     64    2.25  89.78%   3.56%   6.67%  41853.968
    128    4.51  87.80%   4.21%   7.98%  42358.233
    256    9.01  88.68%   3.88%   7.44%  42155.076
    512   18.01  89.23%   2.78%   8.00%  42434.923
```

# Whetstone/Dhrystone

All code compiled with gcc options -float-abi=softfp -O3

## Source

Code for these tests can be found here http://www.rowley.co.uk/arm/whet_dhry.zip. Or if 404 this code might be analogous http://freespace.virgin.net/roy.longbottom/benchnt.zip

## Compile/Run

```
?
```

## Results

Dhrystone

```
Microseconds for one run through Dhrystone: 1.2

Dhrystones per Second: 809061.5
```

Whetstone Crippled

```
Loops: 1000, Iterations: 10, Duration: 24 sec.

C Converted Double Precision Whetstones: 41.7 MIPS
```

Rebuilding the Whetstone test code with 'gcc -mfpu -float-abi=softfp' gives better results:

```
Loops: 1000, Iterations: 100, Duration: 106 sec.
C Converted Double Precision Whetstones: 94.3 MIPS
```

However, the majority of compute time is spent in the SQRT function, which for the above test was built without -mfpu=vfp. Using a library with vfp give the following much improved result :

```
Loops: 1000, Iterations: 100, Duration: 15 sec.
C Converted Double Precision Whetstones: 666.7 MIPS
```

# OpenSSL

## Source

[3] (http://www.openssl.org/source/)

## Compile/Run

```
openssl version;
openssl speed;
```

## Results

Assembly optimization disabled:

```
OpenSSL 0.9.8o 01 Jun 2010
built on: Thu Aug 26 18:56:26 UTC 2010
options:bn(64,32) md2(int) rc4(ptr,int) des(idx,risc1,4,long) aes(partial) blowfish(idx)
compiler: gcc -fPIC -DOPENSSL_PIC -DZLIB -DOPENSSL_THREADS -D_REENTRANT -DDSO_DLFCN -DHAVE_DLFCN_H -DL_ENDIAN
available timing options: TIMES TIMEB HZ=100 [sysconf value]
timing function used: times
The 'numbers' are in 1000s of bytes per second processed.
type             16 bytes     64 bytes    256 bytes   1024 bytes   8192 bytes
md2                148.81k      372.18k      624.81k      769.95k      832.90k
mdc2                 0.00         0.00         0.00         0.00         0.00
md4                615.30k     2468.76k     7612.19k    16707.01k    28104.86k
md5                380.13k     1501.12k     4800.77k    11312.81k    21682.77k
hmac(md5)         1022.28k     3480.23k     9587.80k    17492.25k    25441.78k
sha1               303.72k     1092.39k     3106.50k     6302.57k     9852.39k
rmd160             244.29k      849.04k     2414.53k     4747.26k     7513.00k
rc4              14658.70k    16836.49k    17462.03k    17628.21k    17522.08k
des cbc           2913.17k     3221.30k     3289.77k     3360.09k     3367.21k
des ede3          1149.87k     1188.59k     1198.46k     1206.00k     1208.25k
idea cbc             0.00         0.00         0.00         0.00         0.00
seed cbc             0.00         0.00         0.00         0.00         0.00
rc2 cbc           2812.71k     3012.02k     3054.19k     3077.82k     3076.12k
rc5-32/12 cbc        0.00         0.00         0.00         0.00         0.00
blowfish cbc      6091.32k     7007.89k     7250.62k     7288.21k     7163.88k
```

```
cast cbc          5068.25k     6020.03k     6345.71k     6367.64k     6260.44k
aes-128 cbc       3205.76k     3497.72k     3616.00k     3652.49k     3665.85k
aes-192 cbc       2730.65k     2981.88k     3073.20k     3102.38k     3111.86k
aes-256 cbc       2383.90k     2596.12k     2659.91k     2702.13k     2732.50k
camellia-128 cbc     0.00         0.00         0.00         0.00         0.00
camellia-192 cbc     0.00         0.00         0.00         0.00         0.00
camellia-256 cbc     0.00         0.00         0.00         0.00         0.00
sha256             679.98k     1629.47k     2905.43k     3708.32k     4175.45k
sha512              41.02k      163.83k      232.63k      318.20k      353.81k
aes-128 ige       3089.03k     3579.08k     3698.68k     3689.14k     3578.18k
aes-192 ige       2641.68k     3019.45k     3111.38k     3144.95k     3035.70k
aes-256 ige       2334.50k     2632.35k     2705.04k     2735.69k     2687.74k
                  sign    verify    sign/s verify/s
rsa  512 bits 0.013747s 0.001193s     72.7    838.4
rsa 1024 bits 0.063481s 0.002742s     15.8    364.7
rsa 2048 bits 0.321250s 0.007378s      3.1    135.5
rsa 4096 bits 1.805000s 0.022528s      0.6     44.4
                  sign    verify    sign/s verify/s
dsa  512 bits 0.011690s 0.013597s     85.5     73.5
dsa 1024 bits 0.027233s 0.031683s     36.7     31.6
dsa 2048 bits 0.073897s 0.087304s     13.5     11.5
```

Assembly optimization enabled:

```
OpenSSL 1.0.1c 10 May 2012
built on: Sun Jul 29 00:43:16 CEST 2012
options:bn(64,32) rc4(ptr,char) des(idx,cisc,16,long) aes(partial) idea(int) blowfish(ptr)
compiler: armv6j-hardfloat-linux-gnueabi-gcc -fPIC -DOPENSSL_PIC -DZLIB -DOPENSSL_THREADS -D_REENTRANT -DDSO_
-DHAVE_DLFCN_H -DL_ENDIAN -DTERMIO -Wall -DOPENSSL_BN_ASM_MONT -DOPENSSL_BN_ASM_GF2m -DSHA1_ASM -DSHA256_ASM
-DSHA512_ASM -DAES_ASM -DGHASH_ASM -O2 -march=armv6j -mfpu=vfp -mfloat-abi=hard -fno-strict-aliasing -Wa,--no
The 'numbers' are in 1000s of bytes per second processed.
type             16 bytes     64 bytes    256 bytes   1024 bytes   8192 bytes
md2                 0.00         0.00         0.00         0.00         0.00
mdc2              724.41k      933.06k     1024.68k     1063.59k     1075.88k
md4              2547.83k     9441.28k    27284.48k    51824.98k    69894.14k
md5              1954.05k     7217.96k    20805.95k    39365.29k    53226.15k
hmac(md5)        3075.61k    10241.88k    26669.65k    44729.00k    55386.11k
sha1             2115.34k     6823.83k    16264.45k    25053.18k    30121.35k
rmd160           1487.88k     4783.96k    10707.71k    15800.32k    19303.08k
rc4             34205.43k    39535.98k    41215.83k    41561.43k    41570.04k
des cbc          6251.12k     6605.08k     6686.81k     6713.01k     6707.54k
des ede3         2326.45k     2368.36k     2385.83k     2397.53k     2391.84k
idea cbc         8758.77k     9421.31k     9607.34k     9653.93k     9687.93k
seed cbc         8274.52k     9036.46k     9264.64k     9321.47k     9284.27k
rc2 cbc          6047.90k     6354.82k     6458.82k     6465.19k     6485.33k
rc5-32/12 cbc   16204.47k    18649.32k    19367.94k    19560.11k    19649.84k
blowfish cbc    11934.03k    13189.85k    13546.92k    13633.19k    13486.76k
cast cbc        10797.59k    11828.46k    12156.58k    12187.65k    12050.43k
aes-128 cbc     12978.72k    14708.69k    15387.40k    15472.93k    15529.06k
aes-192 cbc     11441.49k    12834.60k    13315.69k    13453.78k    13430.80k
aes-256 cbc     10267.01k    11409.83k    11744.41k    11812.86k    11859.64k
camellia-128 cbc     9312.98k    10278.89k    10572.46k    10646.19k    10657.82k
camellia-192 cbc     7541.38k     8140.71k     8325.63k     8370.18k     8361.30k
camellia-256 cbc     7513.97k     8138.65k     8297.98k     8351.40k     8347.65k
sha256           3598.03k     8377.26k    14605.57k    17979.39k    19300.35k
sha512           1080.74k     4322.82k     6151.85k     8416.32k     9418.07k
whirlpool         361.82k      729.24k     1186.42k     1425.38k     1512.79k
aes-128 ige     11702.57k    13853.45k    14429.53k    14671.38k    14057.47k
aes-192 ige     10468.67k    12165.24k    12628.24k    12743.72k    12331.69k
aes-256 ige      9505.78k    10831.25k    11205.36k    11333.43k    10982.74k
ghash           15681.70k    17279.32k    17770.84k    17894.06k    17940.48k
                 sign    verify    sign/s verify/s
```

```
rsa  512 bits 0.002185s 0.000217s    457.6   4611.1
rsa 1024 bits 0.011325s 0.000640s     88.3   1563.5
rsa 2048 bits 0.074296s 0.002289s     13.5    436.8
rsa 4096 bits 0.544211s 0.008741s      1.8    114.4
                  sign    verify    sign/s verify/s
dsa  512 bits 0.002157s 0.002262s    463.5    442.0
dsa 1024 bits 0.006234s 0.007123s    160.4    140.4
dsa 2048 bits 0.022247s 0.025884s     44.9     38.6
```

# GPU

The RaspberryPi appears to handle h264 1080p movie from USB to HDMI at least 4MB/s.

The Admin "JamesH" said it would handle "basically 1080p30, high profile, >40Mb/s." (5MB/s) in h264

And about WVGA(480p30) or 720p20 in VP8/WEBM

# ioquake3

## Source

```
https://github.com/raspberrypi/quake3
```

## Compile/Run

```
- Download source, compile as delivered
- Start game
- Runs at display's native res, in my case 1280x1024
- Bitdepth stuck at 16bpp, not sure how to change, values in q3config.cfg seem to be ignored
- In-game console commands:
\timedemo 1
\demo four
```

## Results

```
armel "driver info" : http://i.imgur.com/wtYhB.jpg
armel timedemo score: http://i.imgur.com/i2TkN.jpg
20.2fps
```

```
armhf "driver info" : http://i.imgur.com/8nqa1.jpg
armhf timedemo score: http://i.imgur.com/dUu0g.jpg
28.5fps
```

# IO

## USB bus

- All IO uses the same bus so the combination of all IO can not exceed the the bus speed of an as yet hypothetical 60MB/s
- A test with a fast USB-Stick showed that Raspberry Pi can achieve about 30 MB/s:

```
root@raspberrypi:~# dd if=/dev/sda of=/dev/null bs=32M count=10 iflag=direct
10+0 records in
10+0 records out
335544320 bytes (336 MB) copied, 10.6428 s, 31.5 MB/s
```

## SD card

- TODO test

**Note: the dd test should probably use i/oflags=direct for reads and writes. But that will change the results recorded to date**

### Compile/Run

```
# write
dd if=/dev/zero of=~/test.tmp bs=500K count=1024
# read
dd if=~/test.tmp of=/dev/null bs=500K count=1024
# cleanup
rm ~/test.tmp
# find out which kernel you're running
uname -a
```

### Results

- Depends on SD card used http://elinux.org/RaspberryPiBoardVerifiedPeripherals#SD_cards

| SD Card | Read (MB/s) | Write (MB/s) | Distro | Kernel | Notes |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| ADATA 8GB SDHC Class 10 (ASDH8GCL10-R) | 19.6 | 18.8 | 2012-08-04 Debian Wheezy "Raspbian" | Linux raspberrypi 3.1.9+ #168 PREEMPT Sat Jul 14 18:56:31 BST 2012 armv6l GNU/ Linux | |
| ADATA 16GB SDHC Class 10 | 19.5 | 16.9 | 2012-06-13 Arch Linux ARM | Linux alarmpi 3.2.27+ #60 PREEMPT Thu Aug 23 15:33:51 BST 2012 armv6l GNU/ Linux | |
| ADATA 32GB SDHC Class 10 (ASDH32GCL10-R) | 20.1 | 6.4 | 2012-06-18-wheezy-beta | Linux raspberrypi 3.1.9+ #152 PREEMPT Fri Jul 6 18:47:16 BST 2012 armv6l GNU/ Linux | |
| AmazonBasics SDHC Class 10 8GB (http://amzn.com/ B0058GH0LS) | 19.3 | 8.6 | Debian Wheezy "Raspbian" | Linux massah 3.1.9+ #168 PREEMPT Sat Jul 14 18:56:31 BST 2012 armv6l GNU/ Linux | |
| AmazonBasics SDHC Class 10 8GB (http://amzn.com/ B0058GH0LS) | 17 | 9.4 | Debian Wheezy "Raspbian" | Linux massah 3.1.9+ #202 PREEMPT Wed Jul 25 22:11:06 BST 2012 armv6l GNU/ Linux | Same board and card as a newer kernel. |
| Extrememory SDHC 16GB class 10 | 4.7 | 4.5 | Debian Wheezy "Raspbian" | Linux raspbian 3.1.9+ #52 | |
| Extrememory SDHC 16GB class 10 | 11.3 | 5.4 | Debian Wheezy "Raspbian" | Linux raspbian 3.1.9+ #101 | init_emmc_clock=20000 |
| Extrememory SDHC 16GB class 10 | 18.2 | 6.3 | Debian Wheezy "Raspbian" | Linux raspbian 3.1.9+ custom | kernel and firmware as o extra option in config.txt |

| | | | | | |
|---|---|---|---|---|---|
| Extrememory SDHC 16GB class 10 (man:0x000012 oem:0x3456 name:F0F0F hwrev:0x1 fwrev:0x0) | 16.9 | 10.7 | archlinuxarm-13-06-2012 | Linux alarmpi 3.1.9-25-ARCH+ #1 PREEMPT | |
| Extrememory SDHC 32GB class 10 (man:0x000003 oem:0x5344 name:SMI hwrev:0x1 fwrev:0x0) | 18.7 | 16.5 | archlinuxarm-13-06-2012 | Linux alarmpi 3.1.9-25-ARCH+ #1 PREEMPT | |
| Farnell Branded (Samsung) SDHC 4GB Class 4 (MMBTF04GWBCA-ME) | 20.1 | 6.9 | Debian Wheezy Raspbian | Linux raspbian 3.1.9+ #168 | Pi overclocked to 900 MH 500 Mhz sdram_freq |
| Fugi SDHC 32GB class 10 (P10NM00580A) | 12.7 | 19.8 | Debian Wheezy Raspbian | Linux raspbian 3.1.9+ #168 | man:0x000073 oem:0x42 hwrev:0x1 fwrev:0x0 |
| GoodRAM SDHC 16GB Pro class 10 (SDC16GHC10PGRR9) | 19.4 | 18.0 | Debian Wheezy Raspbian | Linux raspbian 3.1.9+ #272 | |
| Integral SDHC 16GB class 10 | 17.7 | 19.6 | Debian Wheezy Raspbian | Linux raspbian 3.1.9+ #168 | |
| Kingmax 8GB microSDHC Class 4 (KM08GMCSDHC41A) | 13.6 | 3.7 | Debian Wheezy Raspbian | Linux 3.1.9+ #242 PREEMPT Wed Aug 1 19:47:22 BST 2012 | |
| Kingston SDHC 4GB class 4 | 4.5 | 4.1 | Debian Squeeze "debian6-19-04-2012" | Linux raspberrypi 3.1.9+ #52 Tue May 8 23:49:32 BST 2012 | |
| Kingston SDHC 4GB class 4 | 4.2 | 2.5 | archlinuxarm-19-04-2012 | Linux alarmpi 3.1.9-13+ #6 Thu May 10 00:48:37 UTC 2012 | Identical card to one abov into, as I was expecting A |
| Kingston uSDHC 4GB class 4 | 4.0 | 3.8 | Debian Squeeze | Linux 3.1.9+ #90 | |
| Kingston uSDHC 8GB class 4 (SDC4/8GB) | 4.7 | 3.7 | archlinuxarm-29-04-2012 | Linux alarmpi 3.1.9+ #66 Thu | CrystalDiskMark results (http://dl.dropbox.com/u/ Kingston_uSD_8GB_CD |

| | | | | | |
|---|---|---|---|---|---|
| | | | | May 17 16:56:20 BST 2012 | This is my only card that to boot up on each plug-i |
| Kingston SDHC 8GB class 4 (SD4/8GB) | 4.6 | 3.0 | archlinuxarm-29-04-2012 | Linux alarmpi 3.1.9+ #66 Thu May 17 16:56:20 BST 2012 | CrystalDiskMark results (http://dl.dropbox.com/u/ Kingston_SD4-8GB_CD |
| Kingston SDHC 8GB class 4 (SD4/8GB) | 13.2 | 3.4 | Hexxeh Raspbian r3 | Linux raspbian 3.1.9+ #202 PREEMPT Wed Jul 25 22:11:06 BST 2012 armv6l GNU/ Linux | man:0x000002 oem:0x54 hwrev:0x1 fwrev:0x0 |
| Kingston SDHC 32GB class 10 | 10.8 | 8.1 | Fedora 17 ARM snapshot 07 May 2012 | Linux fedora-arm 3.1.9 #1 | mmc0: note - long write s 14608 its. - kernel/modul |
| Kingston SDHC 32GB class 10 | 4.7 | 4.1 | Fedora 17 ARM nightly snapshot | Linux fedora-arm 3.1.9+ #101 PREEMPT Mon Jun 4 17:19:44 BST 2012 | custom kernel from raspb more mmc0 sync problen |
| Kingston SDHC 32GB class 10 | 4.6 | 3.5 | Debian Squeeze "debian6-19-04-2012" | Linux raspberrypi 3.1.9+ #90 | |
| Noname uSDHC 16GB class 4 | 18.5 | 2.6 | Raspmc | Linux raspbmc 3.2.27 #1 PREEMPT Mon Nov 5 20:50:02 UTC 2012 armv6l GNU/ Linux | |
| Panasonic SDHC 8GB class 6 | 4.8 | 4.4 | | | |
| Panasonic SDHC 8GB class 4 | 11.1 | 9.7 | Debian Wheezy "Rasbpian" | Linux rpi 3.1.9+ #168 PREEMPT Sat Jul 14 18:56:31 BST 2012 armv6l GNU/Linux | |
| Patriot microSDHC 16GB Class 10 (PSF16GMSHC10) | 9.5 | 5.2 | Fedora 14 | Linux raspi 3.1.9+ #101 | init_emmc_clock=20000 |

| | | | | | |
|---|---|---|---|---|---|
| Patriot SDHC 16GB Class 10 (PSF16GSDHC10) | 19.3 | 9.3 | Debian Wheezy "Rasbpian" | Linux raspberrypi 3.1.9+ #168 PREEMPT Sat Jul 14 18:56:31 BST 2012 armv6l GNU/ Linux | |
| Patriot SDHC 32GB Class 10 UHS-1 (PEF32GSDHC10U1) | 20.4 | 12.1 | Debian Wheezy "Rasbpian" | Linux raspberrypi 3.1.9+ #168 PREEMPT Sat Jul 14 18:56:31 BST 2012 armv6l GNU/ Linux | |
| Samsung SDHC 16GB Class 10 (MB-SPAGA) | 10.7 | 8.8 | Fedora 17 ARM snapshot 07 May 2012 - GUI release | Linux fedora-arm 3.1.9 #1 | Had "long write sync" er times and then system ins port on Macbook, switch charger (5V 1A) and war |
| Samsung SDHC 16GB Class 10 (MB-SPAGA) | 19.6 | 18.7 | Debian Wheezy "Raspbian" | Linux raspberrypi 3.1.9+ #168 PREEMPT Sat Jul 14 18:56:31 BST 2012 armvl GNU/Linux | (Same user / card as abov notable that Raspbian is s |
| Samsung microSDHC 16GB Class 10 (MB-MPAGA/US) | 19.8 | 15.8 | Debian Wheezy "Raspbian" | Linux pisces 3.1.9+ #155 PREEMPT Mon Jul 9 12:49:19 BST 2012 armv6l GNU/ Linux | - |
| Samsung microSDHC 16GB Class 4 (MB-MS4GA/US) | 19.2 | 5.5 | Debian Wheezy "Raspbian" | ? | - |
| SanDisk Extreme III 2GB Class 10 (BE07054050838) | 23.3 | 21.5 | Raspbmc | Linux raspbmc 3.2.27 #1 PREEMPT Mon Nov 5 20:50:02 UTC arm61 GNU/Linux | 512Mb version of Raspb |

| | | | | | |
|---|---|---|---|---|---|
| SanDisk microSD 2GB | 4.7 | 4.2 | archlinuxarm-29-04-2012 | Linux alarmpi 3.1.9+ #66 Thu May 17 16:56:20 BST 2012 | CrystalDiskMark results (http://dl.dropbox.com/u/ SanDisk_2GB_uSD_CD Card has no serial/is likel |
| SanDisk Ultra SDHC 4GB class 4 | 4.7 | 4.4 | Raspbian Wheezy | Linux raspberry-pi 3.1.9+ #1 PREEMPT Wed Jun 6 16:26:14 CEST 2012 armv6l GNU/ Linux | man:0x000003 oem:0x53 hwrev:0x8 fwrev:0x0 |
| SanDisk Ultra II SDHC 4GB class 4 (15 MB/s) | 20.9 | 14.6 | Raspbian Wheezy | Linux raspberry-pi 3.1.9+ | |
| SanDisk SDHC 8GB class 4 | 11.1 | 5.6 | Raspbian Wheezy | Linux raspberrypi 3.1.9+ #202 PREEMPT | After Hexxeh rpi-update. man:0x000003 oem:0x53 hwrev:0x8 fwrev:0x0 |
| SanDisk SDHC 8GB class 4 | 4.7 | 3.2 | Debian Squeeze | | |
| SanDisk Ultra SDHC I 8GB class 6 "30MB/s*" | 19.5 | 7.6 | archlinuxarm | 3.1.9-22-ARCH+ #1 PREEMPT Sun Jun 17 13:54:30 UTC 2012 | "mmc0: error -84 whilst i card" at bootup, but work |
| SanDisk Ultra SDHC I 8GB class 10 "30MB/ s*" | 19.3 | 3.2 | Raspbian Wheezy | 3.1.9+ #168 PREEMPT Sat Jul 14 18:56:31 BST 2012 | |
| SanDisk Ultra SDHC I 8GB class 10 "30MB/ s*" | 13.6 | 14.5 | raspbmc rc3 | Linux raspbmc 3.1.9-test-12-06 #1 PREEMPT Mon Jun 18 20:07:45 UTC 2012 armv6l GNU/Linux | |
| SanDisk Ultra SDHC II 16GB class 2 "15MB/ s*" | 16.7 | 16.2 | Raspbian Wheezy | 3.1.9+ #168 PREEMPT Sat Jul 14 18:56:31 BST 2012 | man:0x000003 oem:0x53 hwrev:0x8 fwrev:0x0 |
| SanDisk Ultra SDHC 16GB class 10 UHS-1 | 20.9 | 18.1 | Raspbian Wheezy | Linux raspberrypi | After Hexxeh rpi-update. man:0x000003 oem:0x53 hwrev:0x8 fwrev:0x0 |

| | | | | | |
|---|---|---|---|---|---|
| "30Mb/s" (SDSDU-016G-U46) | | | | 3.1.9+ #202 PREEMPT | |
| SanDisk Extreme SDHC I 4GB class 10 "30MB/s" | 19.7 | 21.0 | 2012-07-15-wheezy-raspbian | Linux raspberrypi 3.1.9+ #168 PREEMPT Sat Jul 14 18:56:31 BST 2012 armv6l GNU/Linux | Only boots with images v didn't boot with previous |
| SanDisk Extreme SDHC I 8GB class 10 "30MB/s" | 17.7 | 19.7 | Archlinuxarm 2012-06-13 | Linux raspi 3.1.9-28-ARCH+ #1 PREEMPT Fri Jul 6 23:07:26 UTC 2012 armv6l GNU/Linux | |
| SanDisk Extreme SDHC UHS-I 16GB class 10 "45MB/s" (SDSDX-016G-X46) | 21.1 | 20.8 | 2012-09-18-wheezy-raspbian | Linux raspberrypi 3.2.27+ #160 PREEMPT Mon Sep 17 23:18:42 BST 2012 armv6l GNU/Linux | man:0x000003 oem:0x53 hwrev:0x8 fwrev:0x0 |
| SanDisk SDHC 32GB class 6 | 4.6 | 4.8 | | | |
| SanDisk uSDXC 64GB class 6 | 4.9 | 3.8 | archlinuxarm-29-04-2012 | Linux alarmpi 3.1.9+ #66 Thu May 17 16:56:20 BST 2012 | CrystalDiskMark results (http://dl.dropbox.com/u/ SanDisk_64GB_uSDXC_ |
| TDK microSDHC 4GB, Class 4 (80-56-10301-004G) | 11.2 | 4.7 | Debian Wheezy "Raspbian" (2012-07-15) | 3.1.9+ #168 PREEMPT Sat Jul 14 18:56:31 BST 2012 | |
| Toshiba SD-T16G SDHC 16GB, Class 10 (1046 US7022 C) | 20.6 | 13.5 | Debian Wheezy "Raspbian" | 3.1.9+ #272 PREEMPT Tue Aug 7 22:51:44 BST 2012 armv6l GNU/Linux | |

| | | | | | |
|---|---|---|---|---|---|
| Transcend SDHC 8GB class 6 | 5.8 | 5.8 | | | |
| Transcend SDHC 8GB Class 6 (TS8GSDHC6) | 4.6 | 4.0 | Debian Squeeze "debian6-19-04-2012" | Linux raspberrypi 3.1.9+ #90 Wed Apr 18 18:23:05 BST 2012 armv61 GNU/ Linux | Tested with dd. Card doe promised minimum class |
| Transcend SDHC 8GB Class 4 (TS8GSDHC4) | 11.1 | 8.1 | Debian Wheezy "Rasbpian" | Linux raspberrypi 3.1.9+ #168 PREEMPT Sat Jul 14 18:56:31 BST 2012 armv6l GNU/ Linux | man:0x000003 oem:0x53 hwrev:0x8 fwrev:0x0 |
| Transcend microSDHC 8GB Kit, Class 4 (TS8GUSDHC4) | 4.7 | 3.7 | Raspbian Wheezy | Linux raspberry-pi 3.1.9+ #1 PREEMPT Wed Jun 6 16:26:14 CEST 2012 armv6l GNU/ Linux | man:0x000003 oem:0x53 hwrev:0x8 fwrev:0x0 |
| Transcend SDHC 8GB Class 10 (TS8GSDHC10) | 4.6 | 4.6 | Debian Squeeze "debian6-19-04-2012" | Linux raspberrypi 3.1.9+ armv61 GNU/Linux | |
| Transcend SDHC 8GB Class 10 (TS8GSDHC10) | 19.5 | 18.5 | Debian Wheezy "Rasbpian" | Linux raspberrypi 3.1.9+ #168 PREEMPT Tue Aug 7 22:51:44 BST 2012 armv6l GNU/ Linux | |
| Transcend SDHC 4GB Class 6 | 9.8 | 8.8 | Fedora Remix FC14 | Linux raspi 3.1.9 #1 PREEMPT Sat Mar 3 21:58:00 UTC 2012 armv6l armv6l armv6l GNU/Linux | Not sure why this setup i test results repeatable. |

| | | | | | |
|---|---|---|---|---|---|
| Transcend SDHC 16GB Class 10 | 20.3 | 11.9 | Debian Wheezy "Rasbpian" | Linux raspberry-pi 3.1.9-cutdown+ #173 | |
| Transcend SDHC 32GB Class 10 (TS32GSDHC10E) | 20.3 | 15.3 | Debian Wheezy "Rasbpian" | Linux raspberrypi 3.1.9+ #242 PREEMPT Wed Aug 1 19:47:22 BST 2012 armv6l GNU/ Linux | man:0x000074 oem:0x4a hwrev:0x1 fwrev:0x0 |
| Sandisk Extreme Pro SDHC 16GB Class 10 UHS-I (SDSDXPA-016G-A75) | 21.6 | 21.7 | Debian Wheezy "Rasbpian" | Linux raspberrypi 3.2.27+ #160 PREEMPT Mon Sep 17 23:18:42 BST 2012 armv6l GNU/ Linux | |
| SanDisk Extreme Pro SDHC 16GB Class 10 | 20.8 | 18.6 | Debian Wheezy "Raspbian" | Linux raspberrypi 3.1.9+ #125 PREEMPT Sun Jun 17 16:09:36 BST 2012 armv6l GNU/ Linux | |
| Sandisk Ultra SDHC I Class 6 ("30MB/s") | 4.7 | 4.8 | Debian Wheezy "Raspbian" | 3.2.18+ #3 PREEMPT | Feels faster than my King card. |
| Sony 8GB SDHC Class 4 | 17.4 | 11.8 | Debian Wheezy Raspbian | Linux 3.1.9+ #272 PREEMPT Tue Aug 7 22:51:44 BST 2012 | |
| WINTEC FileMate Professional SDHC 16GB Class 10 (3FMSD16GBC10-R) | 4.6 | 4.5 | Debian Squeeze "debian6-19-04-2012" | Linux raspberrypi 3.1.9+ #95 PREEMPT Thu May 31 13:21:40 BST 2012 armv6l GNU/ Linux | After installing new kern on 2012-06-01 |

| | | | | | |
|---|---|---|---|---|---|
| Lexar SDHC 8GB Class 4 "Multi-use" | 18.9 | 6.8 | Debian Wheezy "Raspbian" | 3.1.9+ #110 PREEMPT | |
| Lexar SDHC 8GB Class 6 "PLATINUM II" | 19.7 | 10.1 | Debian Wheezy "Raspbian" | 3.1.9+ #168 PREEMPT | |
| Lexar SDHC 16GB Class 10 "PLATINUM II" | 5.3 | 4.8 | Debian Wheezy/sid | Linux raspberrypi 3.2.19-rpi1+ #3 | |
| Lexar SDHC 16GB Class 10 "PLATINUM II" | 18.9 | 9.0 | Debian Wheezy "Raspbian" | Linux raspbian 3.1.9+ #168 PREEMPT | Same card as 'Lexar SDH "PLATINUM II"' above - Raspbian |
| Mushkin SDHC 16GB Class 10 MKNSDHCC10-16GB | 19.7 | 10.9 | 2012-07-15-wheezy-raspbian | 3.1.9+ #168 PREEMPT | |
| PNY SDHC 8GB Class 6 Limited Edition | 7.4 | 13.2 | Debian Wheezy "Rasbpian" | Linux raspberrypi 3.1.9+ #168 PREEMPT Sat Jul 14 18:56:31 BST 2012 armv6l GNU/ Linux | |
| SanDisk MicroSDHC 4GB | 5.1 | 11.4 | Debian Wheezy "Rasbpian" | Linux raspberrypi 3.1.9+ #168 PREEMPT Sat Jul 14 18:56:31 BST 2012 armv6l GNU/ Linux | |
| SanDisk UHS-I C10 Ultra SDHC 8GB (SDSDU-008G-U46) | 19.1 | 20.8 | Debian Wheezy "Rasbpian" | Linux raspberrypi 3.1.9+ #272 PREEMPT Tue Aug 7 22:51:44 BST 2012 armv6l GNU/ Linux | |
| Panasonic SDHC 4GB Class 10 UHS-I | 11.2 | 6.2 | Debian Wheezy "Raspbian" | 3.1.9+ #144 PREEMPT | Panasonic RP-SDU04GE |

# NIC

## Compile/Run

On LAN server:

```
iperf -s
```

On Raspberry Pi:

```
iperf -t 60 -c <SERVER_IP_ADDRESS> -d
```

## Results

| Bandwidth (Mbit/s) | CPU usage (top) | Distro | Kernel | Notes |
|---|---|---|---|---|
| 52.1 + 46.4 | 5.1%us, 66.2%sy, 28.7%si | Debian Squeeze "debian6-19-04-2012" | Linux raspberrypi 3.1.9+ #95 PREEMPT | |
| 91.8 + 36.8 | 1.6%us, 60.8%sy, 37.5%si | Debian Wheezy "Raspbian" | Linux raspbian 3.1.9+ #101 PREEMPT | |
| 65.1 + 48.8 | 1.3%us, 61.9%sy, 36.8%si | Arch Linux 2012-04-29 | Linux alarmpi 3.1.9-12+ #5 Sat Apr 28 04:49:38 UTC 2012 armv6l ARMv6-compatible processor rev 7 (v6l) BCM2708 GNU/ Linux | Remote host connected at gigabit |
| 69.5 + 29.1 | 0.6%us, 55.5%sy, 40.0%si | Debian Wheezy "Raspbian" | Linux rpi 3.1.9+ #168 PREEMPT | Remote connected at gigabit, values for si between 30 and 55 % |
| 90.8 + 91.4 | 0.3%us, 62.2%sy, 37.5%si | Gentoo Linux ARM | Linux genpi 3.2.23-bootc #1 | Remote host connected at gigabit, vm.min_free_kbytes = 4096 |

### Additional Observations

Using netperf -H [netserver host IP] with Debian Wheezy and changing the CPU clock rate, the TCP performance increased linearly from 61 Mb/s at 500 MHz to 80.6 Mb/s at 900 MHz.

Performance seems to improve considerably by dropping MTU from the default 1500 to 1488. However, this has caused kernel instabilities with Debian Squeeze images (debian6-19-04-2012). It is unknown if this performance benefit is also gained on other images, or if these kernel instabilities have been resolved.

# Power

This table lists how much power is drawn over the 5V power cable whilst performing various tasks.

| Task | Power use (mA) | Notes |
|---|---|---|
| Booting (without peripherals) | 120-400 | Taken from Agilent lab power supply readings. No composite/ keyboard/mouse/network connected. HDMI was enabled but the cable was disconnected. |
| Idling (HDMI on, network on) | 370 | Taken from Agilent lab power supply readings. No composite/ keyboard/mouse connected. |
| Idling (HDMI on, network off) | 320 | Taken from Agilent lab power supply readings. No composite/ keyboard/mouse/network connected. |
| 1080p video playback | 750 | About 3h on 4 AA batteries |
| Text editing | - | Same as idling |
| Compiling C code | ? | |
| Running a Python program | ? | |
| Playing Quake III | ? | |

# References

| Raspberry Pi | |
|---|---|
| **Startup** | Model Wizard - Buying Guide - SD Card Setup - Basic Setup - Advanced Setup - Beginners Guide - Troubleshooting |
| **Hardware** | Hardware - Hardware History - Low-level peripherals - Expansion Boards |
| **Peripherals** | Screens - Cases - Other Peripherals |
| **Software** | Software - Distributions - Kernel - **Performance** - Programming - VideoCore APIs |
| **Projects** | Tutorials - Guides - Projects - Tasks - DataSheets - Education - Communities |

Retrieved from "http://elinux.org/index.php?title=RPi_Performance&oldid=195566"
Category: RaspberryPi

---

# RPi Programming

From eLinux.org

Back to the Hub.

**Software & Distributions:**

*Software - an overview.*

*Distributions - operating systems and development environments for the Pi.*

*Kernel Compilation - advice on compiling a kernel.*

*Performance - measures of the Pi's performance.*

***Programming*** *- programming languages that might be used on the Pi.*

## Contents



# Programming languages, IDEs, etc

### Tested on Alpha board

- Clojure
- gas (GNU assembler) [1]
- gcc
- g++
- Interp
- Mono (C#)
- OCaml
- NodeJS 0.6.18 (Javascript)
- Perl
- Python [2]
- Ruby 1.9.2 (KidsRuby)
- Scala
- Nimrod (http://nimrod-code.org/)
- Tiny BASIC for Curses (http://freecode.com/projects/tinybc)

## Tested on RPi

- Python [3]
- Java
- PHP
- Groovy
- Free Pascal Compiler / Object Pascal language (http://www.freepascal.org)

## Expected to work

- Java
- Eclipse
- Tcl/Tk
- Lazarus
- (maybe) BoaConstructor
- Anjuta for C/C++
- Dev-C++
- CodeBlocks
- Lua (http://www.lua.org/)
- BBC BASIC (http://www.bbcbasic.co.uk/bbcbasic.html)
  - mdfs.net (http://mdfs.net/Software/BBCBasic/)
  - ROOL wiki (http://www.riscosopen.org/wiki/documentation/show/*BASIC) , forum threads: 1 (http://www.riscosopen.org/forum/forums/1/topics/693) , 2 (http://www.riscosopen.org/forum/forums/3/topics/183) , 3 (http://www.riscosopen.org/forum/forums/5/topics/129) , 4 (http://www.riscosopen.org/forum/forums/2/topics/71) , 5 (http://www.riscosopen.org/forum/forums/2/topics/71)
- Small Basic (http://smallbasic.com/)
- Squeak implementation of Smalltalk (http://www.squeak.org/)
- Processing (http://processing.org/)
- Other BASIC variants common to Debian/Ubuntu/Fedora etc. are all likely to work fine, including:
  - basic256 (http://http://basic256.org) - educational BASIC programming environment for children
  - bwbasic (http://www.bwbasic.at/tutorial.htm) - Bywater BASIC Interpreter
  - sdlbasic (http://sdlbasic.sf.net) - BASIC interpreter for game development
  - yabasic (http://www.yabasic.de/) - Yet Another BASIC interpreter
- Regina Rexx (http://regina-rexx.sourceforge.net/)
- GalaxC programming language and XXICC "Chicken Coop" environment (http://xxicc.org) (works in progress)

*See also:* RaspberryPiBoard/EducationalLinks for education-friendly languages.

# Graphical Programming

- Gambas (http://gambas.sourceforge.net/) - possibly a good choice; easy like old visual basic
- Scratch (http://scratch.mit.edu/)
- Alice (http://www.alice.org/)
- Android App Inventor (http://appinventor.googlelabs.com/)
- Kodu (http://fuse.microsoft.com/projects-kodu.html)
- Star Logo (http://education.mit.edu/starlogo/)
- PrimerLabs CodeHero (http://primerlabs.com/codehero)
- Lazarus (http://www.lazarus.freepascal.org) I was working on LaZor**OS4**Pi a while back to provide a on-device IDE but I'm stuck with only a VGA monitor + chroot. Will pick it back up asap for it is a great combination. (Used: Fedora, Razor-QT desktop (http://razor-qt.org/) and Lazarus-QT+FreePascal. 2nd attempt => Funtoo (http://funtoo.org) )
- YAD (http://code.google.com/p/yad) 'Yet Another Dialog' for fast GUI scripting in BASH.
- EasyBashGui (https://sites.google.com/site/easybashgui) Want to keep it fast and simple than this is your tool. Goes even faster with the code snippets from Komodo Edit + BASH Menu plugin.
- BlueGriffon (http://bluegriffon.org) is a very slick WYSIWYG editor for HTML5.
- fpGUI Toolkit (http://fpgui.sourceforge.net) has been tested and fully working on the RPi. fpGUI is a custom drawn, full featured, cross-platform GUI toolkit that has been in development since 2006. fpGUI can be use for Desktop or Embedded environments, and is suitable for commercial and open source projects. Implemented 100% in Object Pascal, and producing small executables and very low library dependency (just the standard X11 - no Qt or GTK etc required). For a very quick setup of the Free Pascal Compiler & fpGUI Toolkit, download the starter archive (3.5MB download) from http://www.turbocontrol.com/easyfpgui.htm. Unzip, and you are ready to go! fpGUI includes lots of ready made widgets, a documentation viewer (docview), a Visual GUI Forms Designer (uidesigner), and an IDE (maximus). The IDE is still in the very early stages of development, but any programmer editor could be used with fpGUI too.
- Pi3D hardware accelerated 3D (and 2D) for python (https://github.com/rec/pi3d) - still being improved but works now
- Adafruit Learning System Raspberry Pi WebIDE (http://learn.adafruit.com/webide/overview) - allows programs to be written, compiled, and executed on the RPi via a web interface.

# Robotics

- Lego Mindstorms (http://mindstorms.lego.com/en-us/Default.aspx)

- KTurtle (http://edu.kde.org/kturtle/) and other Logo/turtle graphics (http://en.wikipedia.org/wiki/Turtle_graphics) (The IO board supports motor drive outputs)

## Would Be Great If These Worked

- wvdial -- Dialer for Land-line, GSM, UMTS modems and other serial devices.
- VHDL -- VHDL (VHSIC hardware description language) is a hardware description language used in electronic design automation to describe digital and mixed-signal systems such as field-programmable gate arrays and integrated circuits.
- Verilog -- Verilog, standardized as IEEE 1364, is a hardware description language (HDL) used to model electronic systems. It is most commonly used in the design and verification of digital circuits at the register-transfer level of abstraction.

## Uncategorised

- Sugar Learning Platform: An alternative to the Desktop metaphor of the GUI (http://wiki.sugarlabs.org/go/What_is_Sugar%3F)
- Frink (http://futureboy.us/frinkdocs/) - A language that tracks units of measure through all calculations. If Java works, Frink will work. Frink runs under any version of Java 1.1 or later. Can work without GUI, with AWT GUI, or with Swing GUI.
- GAViewer (http://www.geometricalgebra.net/gaviewer_download.html)
- GeoGebra (http://www.geogebra.org/cms/)
- codecademy.com (http://codecademy.com)

See also Category:Education

## References


1. ↑ http://www.vanhaarlem.eu/assembler
2. ↑ http://ntoll.org/article/baking-with-raspberrypipy
3. ↑ http://ntoll.org/article/baking-with-raspberrypipy


| Raspberry Pi | | |
|---|---|---|
| **Startup** | Model Wizard - Buying Guide - SD Card Setup - Basic Setup - Advanced Setup - Beginners Guide - Troubleshooting |  |
| **Hardware** | Hardware - Hardware History - Low-level peripherals - Expansion Boards | |
| **Peripherals** | Screens - Cases - Other Peripherals | |

| | |
|---|---|
| **Software** | Software - Distributions - Kernel - Performance - **Programming** - VideoCore APIs |
| **Projects** | Tutorials - Guides - Projects - Tasks - DataSheets - Education - Communities |

# RPi VideoCore APIs

From eLinux.org

## Contents



Back to the Hub.

**Software & Distributions:**

*Software - an overview.*

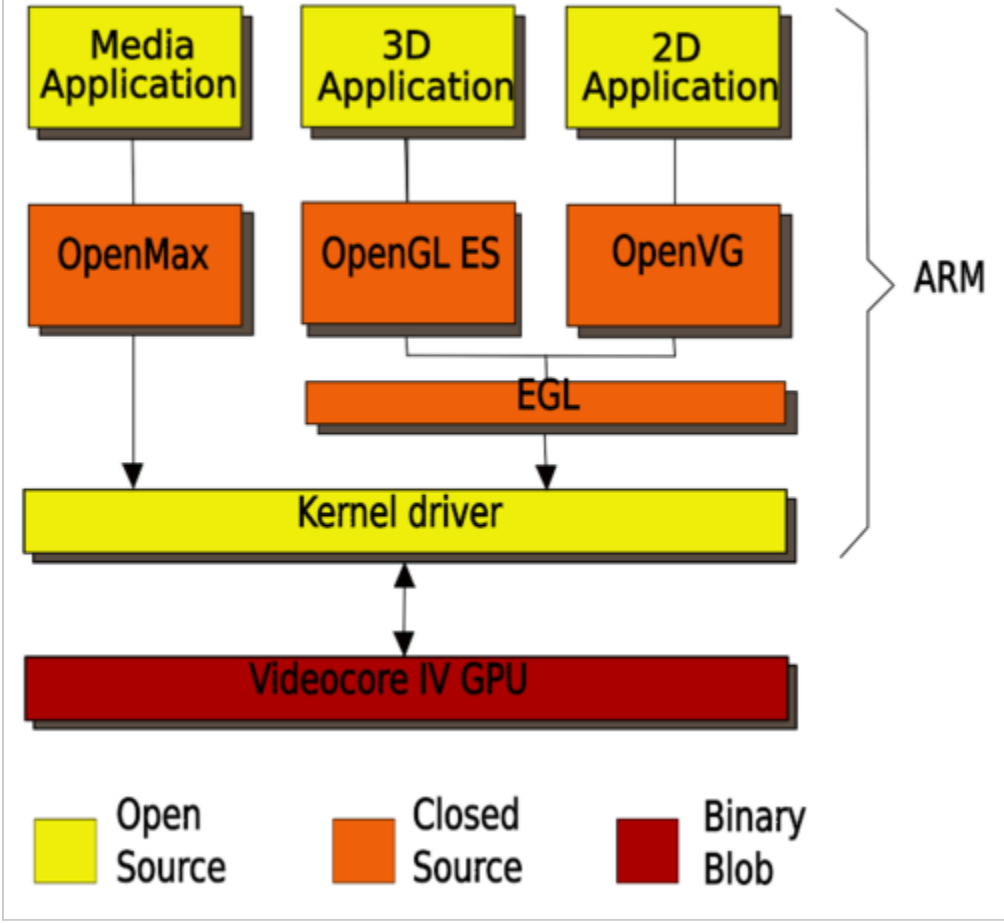
*Distributions - operating systems and development environments for the Pi.*

*Kernel Compilation - advice on compiling a kernel.*

*Performance - measures of the Pi's performance.*

*Programming - programming languages that might be used on the Pi.*

The




Source: http://elinux.org/images/b/be/Raspberrypi_video_API_03.svg

Raspberry Pi contains a Broadcom VideoCore (http://en.wikipedia.org/wiki/Videocore) IV GPU providing OpenGL ES 1.1, OpenGL ES 2.0, hardware-accelerated OpenVG 1.1, Open EGL, OpenMAX and 1080p30 H.264 high-profile decode. There are 24 GFLOPS of general purpose compute and a bunch of texture filtering and DMA infrastructure. Eben worked on the architecture team for this and the Raspberry Pi team are looking at how they can make some of the proprietary features available to application programmers.

Currently C header files and libraries for many of the Broadcom APIs are located in `/opt/vc/include` and `/opt/vc/lib` respectively, or available from GitHub (https://github.com/raspberrypi/firmware) within the same directory structure. Some documentation is contained within comments in the header files, as well as documentation for the OpenMAX IL components in the documentation directory on Github (https://github.com/raspberrypi/firmware/tree/master/documentation/

ilcomponents) , however it is severely lacking and difficult to understand in a general sense for people wanting to experiment with the device due to it being proprietary. As such, we encourage you to edit this page (http://elinux.org/index.php?title=RPi_VideoCore_APIs&action=edit) to help us build a much better open documentation.

# Quirks

- The Raspberry Pi requires that the `bcm_host_init()` function is called first before any GPU calls can be made.
- Before calling any of the vc_* functions, you need to initialise vcos and vchi, and make a vchi connection, before then calling the corresponding vc_*_init function for the part of the library you want to use: `vc_vchi_dispmanx_init`, `vc_vchi_tv_init`, `vc_vchi_cec_init` or `vc_vchi_gencmd_init`. (See this sample code (https://github.com/adammw/rpi-output-swapper/blob/master/video_swap.c#L152-169) which does initialisation for vc_tvservice_* APIs)
- Linking against the EGL library (-lEGL) also requires you to link against the GLESv2 library (-lGLESv2).
- `graphics_get_display_size()` is a broadcom-specific function

# Built-in Sample Programs

The Raspberry Pi comes with 7 sample programs and two helper libraries in the /opt/vc/src/hello_pi directory showing some of the system's capabilities and sample code.

### hello_video

This sample decodes h264 video using the OpenMAX APIs and the ilclient library, and is distributed with a short scene of Big Buck Bunny (http://www.bigbuckbunny.org/)

### hello_audio

This sample plays a sine wave for ten seconds using the ??? APIs.

### hello_triangle

This sample shows how to get a OpenGL ES context on the Raspberry Pi.

### ilclient helper library

This library is described as: `This API defines helper functions for writing IL clients.`

```
*
* This file defines an IL client side library.  This is useful when
* writing IL clients, since there tends to be much repeated and
* common code across both single and multiple clients.  This library
* seeks to remove that common code and abstract some of the
* interactions with components.  There is a wrapper around a
* component and tunnel, and some operations can be done on lists of
* these.  The callbacks from components are handled, and specific
* events can be checked or waited for.
*/
```

# Libraries

## libbcm_host

bcm_host is the Broadcom hardware interface library.

## vc_dispmanx_*

Dispmanx is a windowing system in the process of being deprecated in favour of OpenWF (http://www.khronos.org/openwf/) (or similar), however dispmanx is still used in all API demos and it's replacement may not yet be available. [1](confirmation required?)

## vc_tvservice_*

These APIs allow controlling the HDMI and SDTV video outputs of the Raspberry Pi, as well as allowing the user to query the supported HDMI resolutions and audio formats and turn on/off copy protection. The Raspberry Pi can only have one output active at a time - turning on the HDMI automatically turns off the SDTV and vice-versa. However either can be turned off using the `vc_tv_power_off()` function.

The header file vc_tvservice.h (https://github.com/raspberrypi/firmware/blob/master/opt/vc/include/interface/vmcs_host/vc_tvservice.h) documents the functions quite well via comments above each prototype function, however before any of these functions will succeed you must initialise the connection to the host API like so:

```
void tvservice_init() {
   VCHI_INSTANCE_T vchi_instance;
   VCHI_CONNECTION_T *vchi_connections;

   // initialise bcm_host
   bcm_host_init();

   // initialise vcos/vchi
   vcos_init();
   if (vchi_initialise(&vchi_instance) != VCHIQ_SUCCESS) {
       fprintf(stderr, "failed to open vchiq instance\n");
```

```
        exit(-2);
    }

    // create a vchi connection
    if ( vchi_connect( NULL, 0, vchi_instance ) != 0) {
        fprintf(stderr, "failed to connect to VCHI\n");
        exit(-3);
    }

    // connect to tvservice
    if ( vc_vchi_tv_init( vchi_instance, &vchi_connections, 1) != 0) {
        fprintf(stderr, "failed to connect to tvservice\n");
        exit(-4);
    }
}
```

*TODO: Deinitialization*

**Samples**

- rpi-output-swapper (https://github.com/adammw/rpi-output-swapper) Uses tvservice apis to power on HDMI or SDTV display in specific or preferred mode.

## vc_cec_*

The vc_cec APIs allow programs to interface with the Consumer Electronics Control (CEC) (http://en.wikipedia.org/wiki/Consumer_Electronics_Control#CEC) host middleware on the system to send CEC packets, set strings for the middleware to auto-respond to certain requests or override the middleware handling by adding custom callbacks.

*TODO: Samples/Howto*

## vc_gencmd_*

*TODO*

# EGL

EGL (Native Platform Graphics Interface) (http://www.khronos.org/egl/) is an interface between Khronos rendering APIs such as OpenGL ES or OpenVG and the underlying native platform. The Raspberry Pi supports EGL Version 1.4 (http://www.khronos.org/registry/egl/specs/eglspec.1.4.20110406.pdf) and the following EGL extensions (links are to EGL registry documentation):[2]

- EGL_KHR_image (http://www.khronos.org/registry/egl/extensions/KHR/EGL_KHR_image.txt)

- EGL_KHR_image_base (http://www.khronos.org/registry/egl/extensions/KHR/EGL_KHR_image_base.txt)
- EGL_KHR_image_pixmap (http://www.khronos.org/registry/egl/extensions/KHR/EGL_KHR_image_pixmap.txt)
- EGL_KHR_vg_parent_image (http://www.khronos.org/registry/egl/extensions/KHR/EGL_KHR_vg_parent_image.txt)
- EGL_KHR_gl_texture_2D_image (http://www.khronos.org/registry/egl/extensions/KHR/EGL_KHR_gl_image.txt)
- EGL_KHR_gl_texture_cubemap_image (http://www.khronos.org/registry/egl/extensions/KHR/EGL_KHR_gl_image.txt)
- EGL_KHR_lock_surface (http://www.khronos.org/registry/egl/extensions/KHR/EGL_KHR_lock_surface.txt)

Creating an on-screen EGL rendering surface requires you to to use the eglCreateWindowSurface function, which takes a EGLNativeWindowType parameter. On the Raspberry Pi, this is implemented as a EGL_DISPMANX_WINDOW_T struct, which is defined in eglplatform.h as:

```
typedef struct {
  DISPMANX_ELEMENT_HANDLE_T element;
  int width;   /* This is necessary because dispmanx elements are not queriable. */
  int height;
} EGL_DISPMANX_WINDOW_T;
```

Therefore, to create a EGL surface you must also use the Dispmanx library to get a dispmanx element handle. The hello_triangle source code (https://github.com/raspberrypi/firmware/blob/master/opt/vc/src/hello_pi/hello_triangle/triangle.c#L147-173) provides example code to do this.

**Samples**

See Getting Started with EGL (http://jonmacey.blogspot.com.au/2012/05/getting-started-with-egl-on-raspberry.html) post by Jon Macey. Extended documentation available in the EGL Version 1.4 Specification (http://www.khronos.org/registry/egl/specs/eglspec.1.4.20110406.pdf) and Simple Reference available in the EGL 1.4 API Quick Reference Card (http://www.khronos.org/files/egl-1-4-quick-reference-card.pdf) .

**Function Documentation**

```
int32_t graphics_get_display_size( const uint16_t display_number,
uint32_t *width, uint32_t *height);
```

This function allows you to get the size of the display, and is often used in creating an EGL Surface. width and height are pointers that you pass in to where you want the response values to be written to, display number 0 is usually used for the Raspberry Pi. return value of >= 0 indicates success, <0 indicates failure.

This function is implemented in libbcm_host, and the implementation has been made public (https://github.com/raspberrypi/firmware/issues/14#issuecomment-5652185) showing that it internally calls the vc_dispmanx_display_get_info function to get the width and height of the current mode.

Bugs present in early versions of the firmware caused this function to always return 1920x1080, however this can easily be fixed by updating the firmware with Hexxeh's rpi-update (https://github.com/Hexxeh/rpi-update) (see the Updating firmware page for help).[3][4]

## OpenGL ES

The Raspberry Pi supports OpenGL ES 2.0 with the following extensions: [2]

- GL_OES_compressed_ETC1_RGB8_texture
- GL_OES_compressed_paletted_texture
- GL_OES_texture_npot GL_OES_depth24
- GL_OES_vertex_half_float
- GL_OES_EGL_image
- GL_OES_EGL_image_external
- GL_EXT_discard_framebuffer
- GL_OES_rgb8_rgba8
- GL_OES_depth32
- GL_OES_mapbuffer
- GL_EXT_texture_format_BGRA8888
- GL_APPLE_rgb_422
- GL_EXT_debug_marker

*TODO: Sample of how to use/initalise OpenGL ES*

## OpenVG

The Raspberry Pi supports OpenVG 1.1 for hardware-accelerated two-dimensional vector and raster graphics. See the full specification here (http://www.khronos.org/registry/vg/specs/openvg-1.1.pdf) or the API quick reference card (http://www.khronos.org/files/openvg-quick-reference-card.pdf) .

### Samples

- Code sample: Drawing a triangle by using OpenVG (http://docs.blackberry.com/en/developers/deliverables/17967/CS_Drawing_a_triangle_using_OpenVG_1241146_11.jsp) *(Java implentation for RIM devices, however should be able to get a grasp on how it works and be able to port it to the Raspberry Pi)*

## OpenMAX

See /documentation/ilcomponents (https://github.com/raspberrypi/firmware/tree/master/documentation/ilcomponents) on GitHub firmware repository for official documentation.

*TODO: Sample of how to use OpenMAX to decode audio/video/images, etc.*

# Bindings for Other Programming Languages

### Python

- RPi_Vid_Core (https://bitbucket.org/bryancole/rpi_vid_core/) - *python bindings of EGL, OpenGL ES, OpenVG and bcm_host for Raspberry Pi implemented using Cython*

### Java

- JogAmp JOGL (http://www.jogamp.org) - *JogAmp JOGL Java bindings for EGL and OpenGL ES for Raspberry Pi implemented using Gluegen.*
  - Raspberry Pi autodetection is included in JogAmp JOGL RC11 and later. http://forum.jogamp.org/Pls-test-new-JOGL-aggregated-build-pre-RC11-no-XInitThreads-tp4026312p4026410.html

# Open Source Software compatible with the VideoCore APIs

- **omxplayer (https://github.com/huceke/omxplayer)** - *a command line a/v player for the Raspberry Pi utilising the OpenMAX APIs and ffmpeg*

- **XBMC (http://wiki.xbmc.org/index.php?title=Raspberry_Pi)** - *a media center, omxplayer's "big brother"*
- **piNGL (http://nccastaff.bournemouth.ac.uk/jmacey/GraphicsLib/piNGL/index.html)** - *port of the NGL graphics library to Raspberry Pi*
- **Qt on Pi (http://qt-project.org/wiki/Qt-RaspberryPi)** - *Raspberry Pi port of the Qt toolkit*

# References


1. ↑ http://www.raspberrypi.org/phpBB3/viewtopic.php?t=5621&p=77981
2. ↑ [2.0] [2.1] eglinfo, http://www.raspberrypi.org/phpBB3/viewtopic.php?p=35942#p35942 , http://www.raspberrypi.org/phpBB3/viewtopic.php?p=36318#p36318
3. ↑ http://www.raspberrypi.org/phpBB3/viewtopic.php?f=68&t=8252
4. ↑ https://github.com/raspberrypi/firmware/issues/14


| Raspberry Pi | |
|---|---|
| **Startup** | Model Wizard - Buying Guide - SD Card Setup - Basic Setup - Advanced Setup - Beginners Guide - Troubleshooting |
| **Hardware** | Hardware - Hardware History - Low-level peripherals - Expansion Boards |
| **Peripherals** | Screens - Cases - Other Peripherals |
| **Software** | Software - Distributions - Kernel - Performance - Programming - **VideoCore APIs** |
| **Projects** | Tutorials - Guides - Projects - Tasks - DataSheets - Education - Communities |

# RPi Tutorials

From eLinux.org

# Contents



Back to the Hub.

**Community Pages:**

***Tutorials*** *- a list of tutorials. Learn by doing.*

*Guides - a list of informative guides. Make something useful.*

*Projects - a list of community projects. Help others out.*

*Tasks - for advanced users to collaborate on software tasks.*

*Datasheets - a frambozenier.org documentation project.*

*Education - a place to share your group's project and find useful learning sites.*

*Community - links to the community elsewhere on the web.*

*Games - all kinds of computer games.*

# Introduction

This page contains a set of tutorials to help the reader to learn by doing. The reader is encouraged to follow the steps in the tutorials.

The Raspberry Pi Forum has a list of Project Ideas & Links (http://www.raspberrypi.org/forum/projects-and-collaboration-general/the-projects-list-look-here-for-some-ideas) , to help people get started.

Please add links to your tutorials (and ones you find interesting).

Fill in each section:

- Tutorial Title (as a link to the project webpage or connected wiki page)
- Tutorial Description (including any additional links or information
- Skill level/Ages it is aimed at (Any/Beginner/Intermediate/Advanced)
- Tags (key words related to the project, i.e. LCD Screen, Teaching, Python)
- Author(s) or group who have produced it (also if it is an Open/Community Project for anyone to contribute)
- Tutorial Status (Not Started/In-Progress/Available).

# Tutorials List

| Tutorial Title and Link | Descript |
| --- | --- |
| **Tutorial: Set-up XBMC with Desktop, Internet Browser and Despotify (http://www.raspberrypi.org/phpBB3/viewtopic.php?f=35&t=23051)** | A walthr browser easy swit couple o |
| **Tutorial: How to use your RPi like an Arduino (http://log.liminastudio.com/writing/tutorials/tutorial-how-to-use-your-raspberry-pi-like-an-arduino)** | A thorou Python, |
| **Raspberry Pi YouTube Tutorials (http://www.youtube.com/user/RaspberryPiTutorials)** | Forum L (http://w applicati |
| **Raspbian on Raspberry Pi using SD card + USB memory stick (http://www.networkinghowtos.com/howto/raspbian-on-raspberry-pi-using-sd-card-usb-memory-stick/)** | Tutorial card and stick. |
| **Introducing the Raspberry Pi (http://h2g2.com/dna/h2g2/brunel/A13735596)** | h2g2 pro (http://h2 |
| **Getting Started with the Raspberry Pi (http://log.liminastudio.com/writing/tutorials/getting-started-with-the-raspberry-pi)** | Introduct Raspberr the Raspb tutorials/ |
| **Cable management for the Raspberry Pi - (Forum article) (http://www.raspberrypi.org/phpBB3/viewtopic.php?f=26&t=14087&p=152824&hilit=cable+management#p152824)** | Video sh tangles : Raspberr |

| | |
|---|---|
| **The Coding Club Free eBook(s) (http://codingclub.cuteseal.co.uk/index.php)** | Forum L (http://w applicati |
| **DracoSoftware (http://dracosoftware.blogspot.com/)** | Forum L for Wind projects- working- |
| **Easy GPIO Hardware & Software**<br><br>(Wiki) | Forum L (http://w requests/<br><br>Aim to i through t |
| **SD Card setup using DD for Windows (http://myraspberrypiexperience.blogspot.co.uk/2012/03/using-dd-for-windows.html)** | Blog Lin (http://m 03/using-<br><br>How to s with step |
| **Software: C64 Emulator (VICE)** | Forum L (http://w collabora |
| **Setting up VNC (http://myraspberrypiexperience.blogspot.co.uk/2012/04/setting-up-vnc.html)** | Blog Lin (http://m 04/settin<br><br>How to s able to c screensh |

| | |
|---|---|
| **Setting up Apache2 (http://fusionstrike.com/2012/installing-apache2-raspberry-pi-debian)** | Blog Lin<br>2012/inst<br><br>A guide<br>Screensh |
| **Setting up PHP (http://fusionstrike.com/2012/setting-php-raspberry-pi-debian)** | Blog Lin<br>2012/sett<br><br>A guide<br>Apache & |
| **Setting up MySQL (http://fusionstrike.com/2012/setting-mysql-raspberry-pi-debian)** | Blog Lin<br>2012/sett<br><br>A guide<br>web serv<br>Screensh |
| **Running Puredata on the Raspberry Pi (http://log.liminastudio.com/programming/running-puredata-on-the-raspberry-pi)** | How to g<br>platform,<br>the Raspb<br>programm |
| **How to mount a USB flash drive on the Raspberry Pi (http://raspi.tv/2012/mount-a-usb-flash-drive-on-raspberry-pi)** | Blog link<br>Raspberr<br>drive-on- |
| **How to mount and use a USB Hard Disk Drive on the Raspberry Pi (http://raspi.tv/2012/how-to-mount-and-use-a-usb-hard-disk-with-the-raspberry-pi)** | Blog link<br>Raspberr<br>use-a-usb |
| **How to build a cheap powered USB hub (http://pihub.blogspot.co.uk/2012/06/raspberry-pi-power-supply-and-powered.html)** | Blog link<br>(http://pi<br>power-su |

| | |
|---|---|
| | How to a existing supply ar |
| **5V Power Supply construction - How To** | How to d design ar experienc required. |
| **Raspberry Pi UPnP Media Player (http://chrisbaume.wordpress.com/2012/06/24/raspberry-pi-upnp-media-player/)** | Blog link (http://ch raspberry<br><br>A guide Pi as a U |
| **Cross Compiling and Cross Debugging C++ with Eclipse from Debian Squeeze x64 to Debian Squeeze ARM (Raspberry Pi) (http://linuxtortures.blogspot.fr/2012/06/cross-compiling-and-cross-debugging-c.html)** | Blog link with Ecli Squeeze (http://lin compilin<br><br>A guide C++ with |
| **Setting up the Broadcom watchdog to reboot a hung Pi (Raspberry Pi) (http://pi.gadgetoid.co.uk/post/001-who-watches-the-watcher)** | Blog link reboot a (http://pi watcher)<br><br>A quick that your "panic=2 running |

| | |
|---|---|
| **Communicating with RaspBerry via GSoap C++ Web Services (http://linuxtortures.blogspot.fr/2012/07/communicating-with-raspberry-via-gsoap.html)** | Blog link<br>C++ Web<br>2012/07/<br>gsoap.htm<br><br>A step by<br>a C++ W<br>API GSo |
| **Setting up RPi as a Torrent Client and Server (http://cumulativeparadigms.wordpress.com/2012/08/13/tutorial-1-setting-up-rpi-as-a-torrent-server/)** | Blog link<br>Server (h<br>2012/08/<br>server/)<br><br>An in-de<br>Transmis<br>common<br>solved. |
| **Setting up Raspberry Pi as a PPTP VPN Server (http://wellsb.com/post/29412820494/raspberry-pi-vpn-server)** | Blog link<br>Server (h<br>raspberry<br><br>Step-by-s<br>Pi runnin<br>dynamic |
| **Running Ruby on Rails on Rasberry Pi** | Blog link<br><br>Step-by-s<br>Rails run |
| **Streaming audio with MPD and Icecast2 (http://www.t3node.com/blog/streaming-audio-with-mpd-and-icecast2-on-raspberry-pi/)** | Blog link<br>Raspberr<br>audio-wi<br><br>Tutorial t<br>audio file |

| | |
|---|---|
| **Live mp3 streaming from audio-in with DarkIce and Icecast2 (http://www.t3node.com/blog/live-streaming-mp3-audio-with-darkice-and-icecast2-on-raspberry-pi/)** | Blog link DarkIce (http://w mp3-aud pi/)<br><br>Tutorial streamin |
| **Control a Raspberry Pi with iPhone or iOS Device (http://www.samratamin.com/blog/raspberry-pi-iphone-control-a-rpi-with-an-iphone-in-2-minutes)** | Blog link an iPhon blog/rasp iphone-i<br><br>A tutoria iPhone o |
| **Reading ADC values over I2C using Python** | Step-by- ABelectr |
| **Control Raspberry Pi with iOS or Android device ( NetIO App ) (http://netio.davideickhoff.de/?p=hardware#raspberry)** | Link: Ne (http://ne<br><br>A step-b your Ras see exam watch?fe works wi devices. |

# References

**Raspberry Pi**

| | |
|---|---|
| **Startup** | Model Wizard - Buying Guide - SD Card Setup - Basic Setup - Advanced Setup - Beginners Guide - Troubleshooting |
| **Hardware** | Hardware - Hardware History - Low-level peripherals - Expansion Boards |
| **Peripherals** | Screens - Cases - Other Peripherals |
| **Software** | Software - Distributions - Kernel - Performance - Programming - VideoCore APIs |
| **Projects** | **Tutorials** - Guides - Projects - Tasks - DataSheets - Education - Communities |

Retrieved from "http://elinux.org/index.php?title=RPi_Tutorials&oldid=195386"
Category: RaspberryPi

---

# RPi Guides

From eLinux.org

Back to the Hub.

**Community Pages:**

*Tutorials - a list of tutorials. Learn by doing.*

***Guides** - a list of informative guides. Make something useful.*

*Projects - a list of community projects. Help others out.*

*Tasks - for advanced users to collaborate on software tasks.*

*Datasheets - a frambozenier.org documentation project.*

*Education - a place to share your group's project and find useful learning sites.*

*Community - links to the community elsewhere on the web.*

*Games - all kinds of computer games.*

## Contents

# Introduction

This page contains a set of guides to show readers how to do useful tasks. These guides focus on achieving a goal as simply as possible, with the aim to build the confidence of the reader. Hopefully, the reader will also be inspired to learn at the same time.

The Raspberry Pi Forum has a list of Project Ideas & Links (http://www.raspberrypi.org/forum/projects-and-collaboration-general/the-projects-list-look-here-for-some-ideas) , to help people get started.

Please add links to your guides (and ones you find interesting).

Fill in each section:

- Guide Title (as a link to the project webpage or connected wiki page)
- Guide Description (including any additional links or information
- Tags (key words related to the project, i.e. LCD Screen, Teaching, Python)
- Author(s) or group who have produced it (also if it is an Open/Community Project for anyone to contribute)
- Guide Status (Not Started/In-Progress/Available).

# Absolute beginners

Suitable for absolute beginners who have never experimented with Linux before.

| Guide Title and Link | Guide Description | Tags | Author | Status |
|---|---|---|---|---|
| **Installing Chromium web browser** | Installing the Chromium web browser on Debian. | Chromium | bredman | Ready for testing |

# Easy

Suitable for beginners who are confident typing commands into Linux but need a lot of guidance.

| Guide Title and Link | Guide Description | Tags | Author | Status |
|---|---|---|---|---|
| **Network Attached Storage** | Network Attached Storage - Basic concept: A place to save copies of all your important files | Samba | bredman - Open Project | Tested on Debian, some help needed with Fedora chapter |
| **Connect your RPi to your MS Windows machines** | The guide above is a full NAS setup - This guide/script just configures and installs a very simple setup to allow you to read/write to your RPi files | Samba | Simon Walters - Open Project | Tested on Raspbian |
| **Python 3 on Debian** | Installing the latest Python 3 and common modules on Debian. | Python | croston | Tested. Needs more modules adding |
| **Debian Auto Login/ Startx** | How to launch LXDE without the need of a username/Password in Debian. | LXDE, Boot, Login, Auto | Ian Hartwell (helpme1986) | Early draft. |
| **RPiForked-Daapd** | How to install Forked-Daapd, an itunes media server | Debian, streaming, | Greg (pr1sm) | Early draft. |

| | | | | |
|---|---|---|---|---|
| **Setting up a static IP in Debian** | How to set-up a static IP in Debian | Debian, Static IP | sleepy | Available |
| **Text to Speech (Speech Synthesis)** | Three easy methods of getting your Raspberry Pi to talk | Raspbian | StevenP | Draft |

# Medium

Suitable for beginners who are willing to experiment and only need a little guidance.

| Guide Title and Link | Guide Description | Tags | Author | Status |
|---|---|---|---|---|
| **Classroom Boot Server** | Classroom boot server - Basic concept: A PXE server to allow cheap computers without hard disks to boot into Windows or Linux. | PXE, netboot | bredman - Open Project | Lots of random text, needs organisation and testing |
| **Installing Ruby on Rails** | Installing Ruby on Rails and common modules on Debian. | Ruby, Rails | Erik | Partially tested. Still early draft. |

| | | | | |
|---|---|---|---|---|
| **Share your screen with VNC** | Installing VNC to allow remote control of the screen from another computer. | VNC | Simon H | Early draft. |
| **iSCSI support and boot** | Adding iSCSI initiator/target support, setting up iSCSI initiator, and configuring booting from an iSCSI volume. | iSCSI, netboot | Alex (nidO) | Early draft, tested |
| **Send email containing Pi ip address on boot** | Send email containing the ip of your Pi so you can access via SSH or other network protocol when your ip changes (moving networks) and you are working headless | SSH, email, python | -<br>-Geraldcor 03:36, 18 June 2012 (UTC) | Early draft, tested |
| **Connecting securely to TightVNC over the Internet (http://www.penguintutor.com/linux/tightvnc)** | Guide to installing Tightvnc server on the Raspberry Pi and securing it using ssh to allow connecting over the Internet. | VNC, ssh | Stewart Watkiss | Available |

| | | | | |
|---|---|---|---|---|
| **Configuring a LAMP webserver (http://www.penguintutor.com/linux/raspberrypi-webserver)** | Guide to configuring the Raspberry Pi as a LAMP (Linux, Apache, Mysql, PHP) webserver. | apache, mysql, php | Stewart Watkiss | Available |
| **Storage Filer/NAS via Chef (https://github.com/ewindisch/chefiler)** | Turn-key package to turn a machine into a storage filer / NAS. Developed and tested on a RaspberryPi. Still in early development. Deploys with Chef. | samba, nfs, chef | Eric Windisch | Alpha/ early-stage |
| **Raspberry Pi WiFi Hotspot (http://elinux.org/RPI-Wireless-Hotspot)** | Turn your Raspberry Pi into a WiFi hotspot! | wifi, hotspot, hostapd | Isaac Smith | Works like a charm. |

# Advanced

Suitable for confident users who want to try something more advanced.

| **Guide Title and Link** | **Guide Description** | **Tags** | **Author** | **Status** |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| **building and installing OpenELEC** | How to build and install OpenELEC,a embedded Multimedia Distro. You can learn (cross)compiling, building packages from source, how buildsystems are working and what is needed to install a OS on a SD-card for Raspberry Pi. | XBMC, HTPC, Multimedia, Distro, compiling | Stephan Raue | Available |
| **Using Skypekit** | How to get started using Skypekit to make calls & chat. This is currently only useful for advanced users & developers. | Skype, Skypekit | Henry Cooke | Alpha. |
| **Pre-configuring SD card with a static IP address (http://www.penguintutor.com/linux/raspberrypi-headless)** | Guide to pre-configuring a SD image so that it boots with a static IP address. Useful for running headless without needing to know what DHCP address will be allocated. | networking, tcpip | Stewart Watkiss | Available |

# References

| Raspberry Pi | |
|---|---|
| **Startup** | Model Wizard - Buying Guide - SD Card Setup - Basic Setup - Advanced Setup - Beginners Guide - Troubleshooting |
| **Hardware** | Hardware - Hardware History - Low-level peripherals - Expansion Boards |
| **Peripherals** | Screens - Cases - Other Peripherals |
| **Software** | Software - Distributions - Kernel - Performance - Programming - VideoCore APIs |
| **Projects** | Tutorials - **Guides** - Projects - Tasks - DataSheets - Education - Communities |

Retrieved from "http://elinux.org/index.php?title=RPi_Guides&oldid=190586"
Category: RaspberryPi

---

# RPi Projects

From eLinux.org

Back to the Hub.

**Community Pages:**

*Tutorials - a list of tutorials. Learn by doing.*

*Guides - a list of informative guides. Make something useful.*

***Projects** - a list of community projects. Help others out.*

*Tasks - for advanced users to collaborate on software tasks.*

*Datasheets - a frambozenier.org documentation project.*

*Education - a place to share your group's project and find useful learning sites.*

*Community - links to the community elsewhere on the web.*

*Games - all kinds of computer games.*

## Contents



# Introduction

This page contains a set of ongoing projects. When complete, these projects will create new applications or card images or tutorials or guides. Anybody is welcome to help.

The Raspberry Pi Forum has a list of Project Ideas & Links (http://www.raspberrypi.org/forum/projects-and-collaboration-general/the-projects-list-look-here-for-some-ideas) , to help people get started.

Please add links to your projects (and ones you find interesting).

Fill in each section:

- **Project Title** (as a link to the project webpage or connected wiki page)
- **Project Description** (including any additional links or information
- **Skill Level/Ages** it is aimed at (Any/Beginner/Intermediate/Advanced)
- **Tags** (Keywords related to the project, i.e. LCD Screen, Teaching, Python)
- **Author(s) or the group who are producing it** (also if it is an Open/Community Project for anyone to contribute)
- **Project Status** (Theory/Not Started/In-Progress/Available).

# Community Project List

| **Project Title and Link** | **Project Description** |
|---|---|
| **Pi In The Sky**<br><br>(Wiki) | Cloud Storage and Management - Basic co<br>switch and share system images for the R-<br>allowing joint development and easy mana<br><br>▪ Fast/Easy backup of system/data to ex<br>or cloud).<br>▪ Management/Repository of base imag<br>▪ Boot from network<br><br>Forum Link: Pi in the Sky - Cloud manage<br>(http://www.raspberrypi.org/<br>forum?mingleforumaction=viewtopic&t= |
| **BerryTerminal (http://www.berryterminal.com/)** | BerryTerminal (http://www.berryterminal.<br>Raspberry Pi into an affordable thin-client<br>central Edubuntu or other LTSP (Linux Te<br>and run all applications on the central serv<br><br>Advantages of using a central server inclu<br><br>▪ Greatly simplifies management.<br>▪ Applications only need to be installed<br>then available on all Raspberry termin<br>▪ Only need to backup the central server<br>Raspberries.<br>▪ Because the applications run on the ce<br>affected by the resource limitations Ra<br>to run applications like LibreOffice. |

| | |
|---|---|
| **Home Automation and Monitoring** | Home automation using Raspbery Pi is ac<br>a few links<br>▪ raspberrypi.homelabs.org.uk (http://ra<br>▪ www.domoticaforum.eu (http://www.d |
| **Raspberry pi... In a laptop** | Me and my colleagues are starting a comp<br>making our first prototype with a raspberr<br>awesome! Boy, Will this be interesting! O<br>speed doesn't matter in this case. Stay tune<br>(http://www.raspberrypilaptop.tk) ! |
| **BlueProximity 2.0** | Detect presence in any room via a small n<br>Devices [Blueproximity (http://blueproxin<br>will be a complete rewrite to manage sens<br>logic on top. |
| **Raspberry Pi Seed Field** | Provides a simple torrent centre that allow |
| **Arr (Audio relay raspi) (https://docs.google.com/document/d/1tI1sBstetYyMbfRXNgeQF5y3UwWD89jUH46S5X-bHE8/edit)** | The idea is to create a wireless speaker. Be<br>smartphones or computers. Protocols like<br>could be supported. An advanced option c<br>libraries from linux to synchronize music<br>attached to the raspberry pi could be a con<br>we are also thinking about some DIY solu<br>install the raspi and the speakers on the ce |
| **Raspberry Projects (http://www.raspberryprojects.com)** | Collaboration of projects from start to fini |

| | |
|---|---|
| **WiringPi** | WiringPi is a library by Gordon Henderso<br>GPIO access in both shared-memory and /<br>The WiringPi project seeks to wrap this lib<br>creating a standardised way of working wi<br><br>WiringPi currently works with C, Ruby, P<br><br>Gordon's pages on WiringPi are here: http<br>raspberry-pi/wiringpi/<br><br>And the GitHub organisation is here: https |
| **Serial JPEG camera (TTL, µCAM** | Attaching the "Serial JPEG µCAM" (UK<br>(http://www.coolcomponents.co.uk/catalo<br>p-369.html?osCsid=j90j5kqfegquksdbuma<br>) to the GPIO pins and take pictures on co |
| **Digital Signage** | A place to collect information about using<br>displays of useful information. |

Retrieved from "http://elinux.org/index.php?title=RPi_Projects&oldid=192878"
Category: RaspberryPi

# RPi Tasks

From eLinux.org

Back to the Hub.

**Community Pages:**

*Tutorials - a list of tutorials. Learn by doing.*

*Guides - a list of informative guides. Make something useful.*

*Projects - a list of community projects. Help others out.*

***Tasks** - for advanced users to collaborate on software tasks.*

*Datasheets - a frambozenier.org documentation project.*

## Contents



*Education - a place to share your group's project and find useful learning sites.*

*Community - links to the community elsewhere on the web.*

*Games - all kinds of computer games.*

# About

This page lists key functionality missing from Raspberry Pi Foundation's (http://www.raspberrypi.org) ultra-low-cost (~15UKP or 25USD) Linux computer for teaching computer programming to children, and encourages the community to provide a solution.

The Raspberry Pi Foundation is a UK registered charity (Registration Number 1129409) which exists to promote the study of computer science and related topics, especially at school level, and to put the fun back into learning computing. We expect this computer to have many other applications both in the developed and the developing world.

**Please note that the Raspberry Pi has only just been released - this page is a community work in progress in preparation for when people get their devices. Please also note that we will be setting up a repository for uploading contributions, but this isn't ready yet so please simply use http://pastebin.com or http://dropbox.com and provide a link from this page, until we have something set up**

It is intended that these tasks will be implemented by the Raspberry Pi community.

# OTG device mode

Inspired by the device mode idea below: Allow the Raspberry Pi to work as an USB device. Sharing the SD card as a storage device is one option. But becoming an USB-display is another.

Decisions to make: Run Linux on the "device mode" Raspberry Pi or not?

Difficulties: the Raspberry Pi has a "device mode" connector, but the data pins are unconnected. Solutions: Use the USB connector on a Model A with a custom cable/ converter, or find pins on the board to attach patchwires to.

# OTG Device mode

**The idea**: A student has damaged or wiped the OS on their SDCard. By plugging two Raspberry Pi's back-to-back using the Mini-AB cable with the white end attached to the working device and a recovery SDcard image in the non-working device, the firmware will allow the non-working unit's SD card to be accessible to the working unit.

**The detail**: Once both devices are booted, the recovery image runs completely from RAM. The SDcard can be ejected and the damaged or wiped SDcard inserted. The SDcard of the working machine can then be cloned.

**The task**: The device won’t support device mode out of the box, though we’re using a Synopsys OTG core so the hardware is there and the firmware is open, so it might be possible. I suspect if you forced 5V onto the USB power rail it would boot. (Note: Maybe not: There might be a 140mA Polyfuse in there, if the PI is produced before August 25, 2012).

A device driver would need to be written and a recovery image created. A command line tool set will need to be provided to deliver the functionality described above.

## Possibly simpler recovery idea

How about a recovery application as part of the standard image, that can run from RAM? This just needs a working SDcard. The goal is to clone the working SDcard to a "bricked" SDcard.

Here's a possible workflow:

1. Start the device with a working SDCard.
2. Start the "recovery" application. This probably does super kernel/driver magic to only provide text out, and SDcard mounting/unmounting, and prompts the user.
3. Using the available RAM as buffer, load the first 128/256 MB (minus 1 MB for the recovery thing.)
4. Ask the user to switch to the "bricked" card.
5. Write the first 128/256 MB to the bricked card.
6. Keep swapping, 16 times (or 8, if you have a 256 MB device)
7. If the card has two partitions, one for OS, and one for user files, the number of swaps needed is smaller.

With two devices, this can be improved to something similar to the original suggestion, but using a simple binary that comes with the distribution:

1. Start device 1 with a working SDcard.
2. Run the "brick recovery" application. This makes sure to lock itself in RAM. Prompt user to insert the bad card and connect device 2.
3. Start device 2 off the working SDcard and connect to device 1. (How does power work here? That might be really hard without a special "A to A" cable...)
4. Run the "brick recovery" application on device 2. This detects that device 1 is already connected, and starts transferring the image from the SDcard.

The nice thing here is that recovery only needs to be a small binary on the original image, and is always available, and would be available even without a USB cable in case 1.

The special affordances needed by the recovery application are:

1. Switch graphics into text mode, or some other super-simple presentation mode that doesn't need lots of RAM.
2. Run the SDcard port.
3. Stop everything else from happening.
4. Lock the recovery application and SDcard driver into RAM.
5. Optional USB driver for 2-device recovery, also coded into the recovery app.

Once the kernel has that "take over the device" mode, I'm sure some neato to-the-metal applications will also spring up ;-)

### An Even Simpler Backup/Restore Idea

A much easier and less error-prone recovery method would be to clone the current system's SDcard to another card in a USB writer. The software required could be a simple shell script wrapper around dd, maybe using dialog for prompts and warnings and confirmations.

USB SDcard Reader/Writers are cheap - even Amazon has them for $1.75, retail price for single units, and you can probably find them even cheaper if you google for "USB SDcard writer". Some writers are as small as USB thumb-drives.

They could offered as an optional purchase along with a Raspberry Pi, or schools could be given one or two with larger orders, along with instructions on how to use them to restore a student's damaged SDcard.

This could be treated as a mundane "Backup Your SDcard" procedure, rather than as a scary last resort.

# mkcard.sh

**The idea**: A script which partitions and formats the SDcard ready for software.

**The detail**: BeagleBoard community uses something similar, see http://www.angstrom-distribution.org/demo/beagleboard/ and http://www.xora.org.uk/2009/08/14/omap3-sd-booting/

**The task**: Write a script to create a FAT32 partition for the GPU firmware and a EXT3 partition for the rootfs.

Tomato 22:08, 22 October 2011 (UTC)

Some of my past projects use such a script to generate a sdcard. I modified it, so it does only the requested things ( removed the part that installs a MBR and copies files to the card ). It can be found here http://pastebin.com/u9Qpm5n0. ATM the partitions are ~80 MB for ext, rest of the card for FAT32 (can be changed on request).

John Lane has made his utilities for the Raspberry Pi available. Included is rpi_mkimage (https://github.com/johnlane/rpi-utils/blob/master/disk/rpi_mkimage) which partitions and formats an sd card, aligning it with its preferred erase size. It can also copy files onto the card leaving it ready to boot. Available on GitHub (https://github.com/johnlane/rpi-utils) . August 22nd, 2012.

# delay_copy.sh

**The idea**: A script that copies files from an attached USB flash drive to the SDcard after a delay, allowing the user to unplug the keyboard or mouse and plug in the USB drive.

**The detail**: See http://www.raspberrypi.org/?page_id=43&mingleforumaction=viewtopic&t=152.0

**The task**: Write the script. Make it bullet proof.

### Automatic, no delay solution

--Markit 21:24, 26 October 2011 (UTC)

- Download devmon (http://igurublog.wordpress.com/downloads/script-devmon/) .
- Start a daemon with
  - devmon --no-gui --exec-on-drive "cp -r /directory/to/copy/each/time %d;devmon --unmount-recent;echo Copy complete, safe to remove | wall"

Tomato 23:38, 26 October 2011 (UTC)

{

- "rsync -ac /directory/to/copy/each/time %d" might be better suited to transfer the files to the card.
- "sync" to flush the buffers afterwards couldn't hurt either

}

- Each time a usb key is added, the daemon will automatically copy the folder, unmount the disk and send a message to all connected local/ssh terminals.

udev could also be used.

# RISC OS

- Discussion and task list being developed on the ROOL site (http://www.riscosopen.org/forum/forums/5/topics/783) .

# R-Pi System/Data Management

--Meltwater 20th Dec 2011

Details here: Pi in the Sky - Cloud management? (http://www.raspberrypi.org/forum?mingleforumaction=viewtopic&t=1204) Basic concept: Enable ways to easily switch and share system images for the R-Pi and manage user data, allowing joint development and easy management of set-ups.

- Fast/Easy backup of system/data to external storage or network (local or cloud).
- Management/Repository of base images.
- Boot from network

This would enable a number of potential scenarios:

- Keep multiple R-Pi's synced across locations (office vs home or classroom vs home)
- Manage a multiple users of R-Pi's (i.e. classroom setup, each user's data gets synced with network so each user can continue their own work on any R-Pi)
- Easy switching of function by booting to multiple images (i.e. Media centre image, programming image, in-car image)
- Remote management of R-Pi's (by updating the master image)

The project should be able to be divided into a number of smaller projects which when put together may well be able to perform the functions we want.

- User Data sync/web mount
- System Image backup/restore (to online/local network/local)
- Bootloader with boot from online/local network/local image
- Online image repository

Project Wiki Page - R-Pi System/Data Management

**First problem** Defining how user applications are managed and installed, and thus how the card is partitioned. Straw man proposal:

- FAT GPU (and boot?) partition
- EXT partition for rootfs and /usr and /var /etc ... root writable
- EXT partition for /usr/local ... all user-installed applications go here (note: traditional Linux "rpm -i something.rpm" writing everywhere in the FS is not particularly great for manageability)
- FAT partition for Windows-shareable user files -- perhaps /home is mounted here?
- Do we need swap?
- Default for bigger cards should probably be something like putting 65% of free space on /usr/local (EXT) and 35% on /home (FAT)

# Multi Code

**The idea**: One R_pi will be connected to another and both can work on the same code.py. So that way say a teacher wanted to help a student with code without taking over. They can just plug there pi in to the students and go through checking for mistakes ect.

**The Conection**: Conection will probably be via Ethernet using an *ad hoc* Network.

**Whats needed?**: The program needs to open .py files and edit them. Next it needs to make a shered file that is updated every time a character changes. A different program (or same does not matter) should then connect to this file and update it in the same way. Every 10 seconds both pi's reload the shared file, thus have the same code. If the changes contradict each other then the host pi will override the connected pi.

Why not just use VNC?

How much of this "collaborative editing" is already built into Sugar? [1] (http://wiki.laptop.org/go/Activity_sharing)

For something a little less intrusive/immediate, a DVCS like mercurial or git keeps people from stepping on each other's toes.

**Further evolutions**: once/if the initial goals are acheved then further developments to the project would include making the systom compleatly live so there in no 10 second delay to each update. And make it posibal to connect the pi's via the Internet.

**The initial task**: The first stage In this project is to make a file browser that can open and edit .py files.

**More info**: for more information about the project follow @Lipj01 on twitter or email me at: Lippojac@gmail.com

# References

| | |
|---|---|
| **Startup** | Model Wizard - Buying Guide - SD Card Setup - Basic Setup - Advanced Setup - Beginners Guide - Troubleshooting |
| **Hardware** | Hardware - Hardware History - Low-level peripherals - Expansion Boards |
| **Peripherals** | Screens - Cases - Other Peripherals |
| **Software** | Software - Distributions - Kernel - Performance - Programming - VideoCore APIs |
| **Projects** | Tutorials - Guides - Projects - **Tasks** - DataSheets - Education - Communities |


Categories: Linux | ARM Development Boards | Broadcom | Development Boards | RaspberryPi | Education

---

# RPi DatasheetCategories

From eLinux.org

Back to the Hub.

## Contents



**Community Pages:**

*Tutorials - a list of tutorials. Learn by doing.*

*Guides - a list of informative guides. Make something useful.*

*Projects - a list of community projects. Help others out.*

*Tasks - for advanced users to collaborate on software tasks.*

***Datasheets** - a frambozenier.org documentation project.*

*Education - a place to share your group's project and find useful learning sites.*

*Community - links to the community elsewhere on the web.*

*Games - all kinds of computer games.*

**This is a list of the proposed datasheet numbers for Rpi categories:**
Created by turbo at frambozenbier.org for the community documentation project

As discussed on the main raspberrypi.org forums, this documenation will be:

1) Born on the wiki
2) Peer reviewed on the wiki and approved by community members
3) Then translated by community members
4) Then published as a full article or PDF by the frambozenier.org documentation team

**Categories**

001-100 Raspberry Pi Foundation product literature

```
Rpi_Datasheet_001_Raspberry_Pi_Foundation
```

101-200 Raspberry Pi Foundation announcements
201-300 Raspberry Pi Computing devices

```
Rpi_Datasheet_201_Raspberry_Pi_Computer

Rpi_Datasheet_202_Rasperry_Pi_IO
```

301-400 Raspberry Pi Computing accessories
401-500 Raspberry Pi Getting started guides

```
Rpi_Datasheet_401_Connecting_Together
```

501-600 Raspberry Pi Operating system guides
601-700 Raspberry Pi Development tools and libraries
701-800 Raspberry Pi Utilities and Code Examples

```
Rpi_Datasheet_701_Downloading_OS_Images

Rpi_Datasheet_751_GPIO_Registers
```

801-900 Raspberry Pi Hardware compatibility
901-999 Raspberry Pi Software compatibility

**NOTE: some of this information may initially duplicate other content on this and other Raspberry Pi sites.**
**The purpose of this project is to collate all relevant community documentation into simple 2-page datasheets.**

# References

**Raspberry Pi**

| | |
|---|---|
| **Startup** | Model Wizard - Buying Guide - SD Card Setup - Basic Setup - Advanced Setup - Beginners Guide - Troubleshooting |
| **Hardware** | Hardware - Hardware History - Low-level peripherals - Expansion Boards |
| **Peripherals** | Screens - Cases - Other Peripherals |
| **Software** | Software - Distributions - Kernel - Performance - Programming - VideoCore APIs |
| **Projects** | Tutorials - Guides - Projects - Tasks - **DataSheets** - Education - Communities |

# RPi Education

From eLinux.org

Back to the Hub.

## Contents



**Community Pages:**

*Tutorials - a list of tutorials. Learn by doing.*

*Guides - a list of informative guides. Make something useful.*

*Projects - a list of community projects. Help others out.*

*Tasks - for advanced users to collaborate on software tasks.*

*Datasheets - a frambozenier.org documentation project.*

***Education** - a place to share your group's project and find useful learning sites.*

*Community - links to the community elsewhere on the web.*

*Games - all kinds of computer games.*

# The Manual

A manual is currently in production by members of the Computing At School (http://www.computingatschool.org.uk/) working group. This began on the 13 October 2011 and is due to be ready for early March 2012. The manual is aimed at the project's target audience, children, so that they can take their "First steps in Computer Science".

For the first release (~January/February 2012), there will mostly likely be very minimal documentation. A 'schools' release is due in June/July 2012.

Contributions to the educational manual can be placed here in the Manual contribution page.

# Your Projects

**Doing a project at school or have a Raspberry Pi Club? Add it in this section to allow others to follow your progress!**

Please add details of your group and what plans you have for the RPi or provide a link to your homepage.

## Organizations

## Swansea ITeC

We're running a 'Raspberry PITeC' project unded by an RSC Wales Technology for Learning Small Grant program to engage our Traineeship learners in more hands on IT. We're keeping a blog of the process - Social Pi (http://techpi.wordpress.com) - which staff and learners will contribute to and as part of the grant process will be releasing all resources we create, which will probably involve a Moodle course, back into the community. We're also maintaining a Diigo (http://groups.diigo.com/group/raspberry-pitec) list of useful resources we find along the way.

### Puppy *hacker* School

For smarter kids of all ages, teachers, self-tutored and the fast learner. Based on doacracy (http://puppylinux.org/wikka/Organisation) principles of *learning by doing* Puppy Hacker School (http://puppylinux.org/wikka/PuppySchoolProgramming) is open for learning on

your existing hardware, using Puppy Linux (http://puppylinux.org) . Whilst awaiting your first punnet of raspberries, get cracking. All bones welcome (http://www.murga-linux.com/puppy/viewtopic.php?p=604710#604710) .

### Computer History Museum, Silicon Valley

The Computer History Museum (http://www.ComputerHistory.org) in the heart of Silicon Valley in Mountain View, California, has an educational program which provides resources to educators and students from pre-school up through graduate school levels. Museum staff and volunteers provide tours of the museum's exhibits that contain the largest collection of computing artifacts in the world, from the abacus through massively-parallel supercomputers. Modern computing fundamentals are introduced, from how individual transistor circuits hold binary values, through data processing, input/output, short and long-term storage, and a wide variety of software, from the earliest punched card programs to current operating systems and programming languages. We will be coordinating hosting Raspberry Pi user groups in the area after boards start being delivered, and will provide assistance to educators and students in setting up their R-Pi systems and learning how to perform software development, from games to whatever anyone wants. We will also participate in developing educational documentation in the eLinux.org R-Pi wiki (http://elinux.org/RaspberryPiBoard) and contributing to the Computing At School (CAS) (http://www.computingatschool.org.uk) initiative.

## Schools

### Manchester Grammar School Computing Society, The

A new co-curricular club for Y9 boys aimed squarely at the new "UK Computing in Schools" initiative. Details of what we're doing are on the MGS Computing Society page.

### Winsford E-Act Academy Programming Club

This is an after-school club set up to encourage students to learn programming and more about how computers work. There's a blog site to support the club at teampython (http://teampython.wordpress.com/) . We are very excited about the Raspberry Pi and can't wait to get our hands on one. For the time being, we are learning Python 3 with Pygame. To get the students used to using Linux, we are using a remaster of Puppy that's available here: RacyPy2 (http://teampython.wordpress.com/2012/03/03/while-you-wait-for-your-raspberry-pi-why-not-use-racypy2/) . Anyone who wants to join in online or share ideas is very welcome!

**Trinity School Computer Club**

Plans for setting up the club based on headless RPi is shown in the RPI_Trinity_Computer_Club page.

## Universities

**Kent - School of Computing, The University of**

Many of both the students and staff at the School of Computing (http://www.cs.kent.ac.uk/) have been following the Raspberry Pi for a long time and are eagerly waiting to get started on projects using them. We are also strong supporters of the Foundation's objective in getting more young people interested in "real" computing rather than just playing games or web browsing.

**Manchester - School of Computer Science, University of**

Pi Projects at Manchester (http://pi.cs.man.ac.uk) . We've got a competition for the best Raspberry Pi Project starting soon, and are getting activities together for schools and youth groups.

We want to use the Raspberry Pi with a simple hardware board and set of downloadable activities to use it to encourage young people (or anyone else) get into embedded computing. We're currently looking at piface (http://piface.openlx.org.uk) for the interface board and trying to come up with little activities to do. We've got some ideas but would love some more if anyone else wants to get involved.

We already run Linux workshops for schools and the National UK Schools Animation Competition (http://animation12.cs.manchester.ac.uk) , which uses Scratch.

# Educational Links

## Programming languages

*Items in **bold** specifically support the Raspberry Pi device*

- **http://www.kidsruby.com/ - Have fun and make games, or hack your homework using Ruby! Just tell your parents or teachers you're learning Ruby programming... ;)**
- http://scratch.mit.edu/ - Graphical OO-based visual programming environment.
- http://www.alice.org/ - Similar to scratch AFAICT
- http://python.org/ - The original 'designed for teaching' language of the 90s
- http://lua.org/ - Small, extensible and fits in your head

- BBC BASIC - The original 'designed for teaching' language of the 80s - A large number of implementations are listed here: http://www.bbcbasic.co.uk/bbcbasic.html
- Object Pascal (http://www.freepascal.org) (aka Delphi) - a modernized version of the Pascal language, with OOP and much much more. A fantastic language that is easy to learn, read and write. It is also a very versatile language that can be used for Desktop apps, Daemon/Services, Embedded system and Web development.
- http://basic256.org/index_en - Another BASIC variant with integrated IDE and simple graphics.
- C/C++ via GCC + CMake build system for advanced use.
- Alice (http://en.wikipedia.org/wiki/A…..(software)) – event-driven object-oriented programming via drag-and-drop programming. A variant with an even stronger storytelling approach is Story Telling Alice.
- Baltie (http://www.sgpsys.com/) – graphics-oriented programming to execute commands, conjure pictures, exercise logical thinking, etc., via play and imagination.
- CiMPLE (http://www.uptosomething.in/we…..log/?p=531) – visual programming language for the Indian iPitara robotic kit with a strong resemblance to the C programming language.
- E-Slate (http://e-slate.cti.gr) – exploratory learning environment workbench and pre-fabricated, interoperable computational objects. Software Microworlds are easily constructed by plugging components in various configurations, and the behavior of both components and Microworlds can be programmed in a Logo-based scripting language implemented in Java.
- E-Toys (http://www.squeakland.org/) - an educational tool based on Squeak Smalltalk for teaching children powerful ideas via a media-rich authoring environment and visual programming system.
- Fluxus (http://linux.softpedia.com/progDownload/fluxus-Download-15847.html) - reads live audio, OSC network messages, keyboard, or mouse input for simple game development, and a physics engine is included for real-time simulations of rigid-body dynamics. The built-in Scheme code editor runs on top of the renderer, allowing editing of scripts while they are running. Fluxus supports procedural modeling and animation, texturing, and basic material properties.
- Frink (http://futureboy.us/frinkdocs) - a full-featured programming language for physical computations which runs on the Java Virtual Machine and has both a terminal-like interface as well as a standard program editor.
- GA Viewer (http://www.geometricalgebra.net/gaviewer_download.html) - open source Linux graphical calculator for Geometric Algebra (GA) for physical applications, a mathematical lingua franca uniting and replacing vectors, quaternions, differential forms, complex analysis, many linear algebra and tensor applications, and homogenous and conformal systems. It condenses the full, relativistic form of Maxwell`s equations into just four symbols and also works well in every other area of physics, including quantum mechanics.
- Guido van Robot (http://en.wikipedia.org/wiki/G….._van_Robot) – robot control program similar to Logo or Karel, with a minimal Python syntax. A variant that includes the full Python syntax and a canonical set of lessons called RUR-PLE also exists.

- Hackety Hack (http://en.wikipedia.org/wiki/H…..ckety_Hack) – Ruby-based environment aiming to make learning programming easy for teenagers.
- Karel, Karel++, and Karel J. Robot (http://en.wikipedia.org/wiki/K….._language)) – for absolute beginners, used to control a simple robot in a city consisting of a rectangular grid of streets. Karel is its own programming language, Karel++ is a version of Karel implemented in C++, and Karel J. Robot is a version of Karel implemented in Java. NCLab offers free Karel programming (albeit with a modified syntax closer to Python) through a web browser.
- Kodu (http://en.wikipedia.org/wiki/Kodu) – entirely icon-based Microsoft Research project for younger children and especially girls. Programs are composed of pages, which are divided into rules, which are further divided into conditions and actions, and conditions are evaluated simultaneously. Designed for game development and provides specialized primitives derived from gaming scenarios. Programs are expressed in physical terms, using concepts like vision, hearing, and time to control character behavior. Available as a free Windows download in public beta and academic forms, and as a low-cost Xbox 360 Live download.
- Laby (http://www.pps.jussieu.fr/~gimenez/laby) – teaches various programming languages (OCaml, Python, Lua, Ruby, C, Java, Prolog and Perl) via ants and spider webs.
- Learn to Program BASIC (circa 1998) – BASIC interpreter with an interactive course intended to teach the language to middle school students. Game-specific additions to the BASIC language include 2D sprite support. Programs written in "LTPB" could be executed on computers without the software by means of a freely-distributable "runner".
- Lego Mindstorms (http://en.wikipedia.org/wiki/L…..Mindstorms) – Lego sets combining programmable bricks with electric motors, sensors, Lego bricks, and Lego Technic pieces (such as gears, axles, and beams). Mindstorm programs can be implemented in Logo, BASIC, Java derivatives, Smalltalk, and C.
- LegoSheets – a programming language for the Lego Mindstorms based on AgentSheets which had a less steep learning curve than Brick Logo.
- Mama (http://en.wikipedia.org/wiki/M….._(software)) – object oriented programming language for young students in a subset of their local human language, both left-to-right (LTR) and right-to-left (RTL) syntaxes. A variant of Mama was built on top of Alice for scripting of 3-D stage objects for building 3D animations and games.
- OfLiveCoding (http://code.google.com/p/oflivecoding/) - allows modification of a Javascript program at runtime, allowing real-time views of how the modifications affect the behavior and flow of the executed code.
- Phrogram (http://en.wikipedia.org/wiki/Phrogram) – second-gen Kid"s Programming Language is a commercial easy-to-learn programming language and integrated development environment (IDE) that emphasizes graphics and sounds, is a simplified structured language, offers component-based development features such as classes and methods, and is modeled on Eclipse and Visual Studio .NET IDEs to help transition to them.

- Processing (http://processing.org) - an open-source programming language and environment for creating images, animations, and interactions to teach fundamentals of computer programming within a visual context. Interactive programs creating 2-D, 3-D, or PDF output, supports OpenGL accelerated 3-D, projects run online or as double-clickable applications, and over 100 libraries extend the software into sound, video, computer vision, and more.
- ProcessingJS (http://processingjs.org/) - Javascript version of Processing allowing code to be run within a web browser.
- Pynguin (http://code.google.com/p/pynguin) – Python Turtle Graphics editor, interactive console, and graphics display area implemented in Python and the PyQt toolkit (in contrast to the wxPython of PythonTurtle). Meant to be an easy environment for introducing programming concepts to beginning programmers.
- PythonTurtle (http://en.wikipedia.org/wiki/P…..thonTurtle) – LOGO-like turtle graphics implemented in wxPython. There is also Python standard Turtle graphics module (based on TK), and Python Turtle Demo examples for using Python and turtlegraphics in an educational setting.
- RoboMind (http://en.wikipedia.org/wiki/RoboMind) – educational programming environment that lets beginners program a robot via popular programming techniques, some robotics, and artificial intelligence principles. The robot can be programmed in Arabic, Chinese, Dutch, German, English and Swedish.
- Stagecast Creator (http://en.wikipedia.org/wiki/S…..st_Creator) – visual programming system based on programming by demonstration via movement of icons on the screen, and it generates rules for the objects (characters). Users can create two-dimensional simulations that model a concept, multi-level games, interactive stories, etc.

## Communities

- http://madlab.org.uk/about/ - The Manchester Digital Laboratory
- The Science, Technology, Engineering and Mathematics Network, UK (http://www.stemnet.org.uk/) - This covers all the red tape that is necessary when working with children, as well as networking with other like-minded volunteers to share ideas.
- Raspberry Projects (http://www.raspberryprojects.com/) - Site dedicated to blogging plans as well as showing off completed projects.
- SchoolForge.net (http://www.schoolforge.net/) - SchoolForge's mission is to unify independent organizations that advocate, use, and develop open educational resources.
- WISE-Quatar.org (http://www.wise-qatar.org) - The World Innovation Summit for Education (WISE) is an international platform for creative thinking, debate and action to raise the status of education through year-round programs to transform education by highlighting its leading role in global development, and by fostering innovative thinking and practices. Efforts include:

- WISE Summit (http://www.wise-qatar.org/content/about-summit) - 1,000 top decision-makers, thought-leaders, practitioners and education stakeholders from over 100 countries share best practices
- WISE Prize for Education - recognizes an individual or a team for a world-class contribution to education
- WISE Awards (http://www.wise-qatar.org/awards) - identify and spotlight each year six of the most innovative projects in education from around the world
- WISE Publications (http://www.wise-qatar.org/content/wise-prize-education) - "Innovation in Education: Lessons from Pioneers around the World"
- Learners' Voice - encourages students aged 18 - 25 to make their voices heard as full delegates, participating in sessions, conducting video interviews, blogging and tweeting on a year-round basis
- Online Collaborative Web Platform - interactive knowledge base that offers a wide range of tools
- MyWISE (http://www.wise-qatar.org/my-wise) - social networking that enables the WISE community to connect and share knowledge and best practices on a continuing basis
- Learning World (http://www.wise-qatar.org/learning_world) - weekly TV magazine program on education developed in partnership with Euronews broadcast 16 times a week to 155 countries in 11 languages
- WISE Haiti Task Force - brings together innovators and successful projects that can contribute to rebuilding Haiti's education system
- WISE Program for Education Leadership - helps prepare newly appointed education leaders from the developing world

## Software suites

- http://gcompris.net/-en- - GCompris is a high quality educational software suite comprising of numerous activities for children aged 2 to 10. *Confirmed working on alpha boards*.
- http://www.sugarlabs.org/ - The Sugar Sweet, a desktop environment used on the XO One Laptop Per Child.
- OpenSUSE Linux for Education (LiFE) (http://en.opensuse.org/openSUSE:Education-Li-f-e) - an open-source Linux operating system with educational software.
- PuppyLinux.org/wikka/Education (http://puppylinux.org/wikka/Education) - Puppy Linux lightweight, open-source, educational distribution including OpenOffice, TuxType2, TuxMath, GCompris and SuperTux.

## Libraries/applications

- http://arstechnica.com/gaming/news/2006/02/games-perl.ars - Developing games with Perl and SDL
- http://www.pygame.org/ - Simple SDL wrapper for Python.

- http://docs.python.org/library/idle.html - The Python IDE that comes with Python.
- http://love2d.org/ - Something akin to pygame for Lua.
- https://github.com/ntoll/RaspberryPy - An interactive set of programming lessons for Python, written in Python. To be built at PyconUK (http://pyconuk.org) during the sprints. :-)
- http://www.khronos.org/openvg/ - OpenVG vector graphics library. Natively supported by GPU(?)
- Hackety Hack (http://en.wikipedia.org/wiki/Hackety_Hack) - an open source application that teaches coding in a simple manner.
- fpGUI Toolkit (http://fpgui.sourceforge.net) - an open source, custom drawn, cross-platform GUI toolkit implemented in 100% Object Pascal, and fully tested on the RPi. Thanks to the Free Pascal Compiler (http://www.freepascal.org) this toolkit can be used for Desktop and Embedded development work, with a single set of source code.

## General resources

- ComputerScienceForFun.org (http://www.cs4fn.org/) - Computer Science for Fun
- ComputingAtSchool.org.uk (http://computingatschool.org.uk/) - Computing at School Working Group
- LiteratePrograms.org (http://en.literateprograms.org/LiteratePrograms:Welcome) - An MIT project to develop programs which are self describing.
- HappyNerds.net (http://www.happynerds.net/view/linux) - External site listing educational programming resources for children.
- ProjectGuts.org (http://projectguts.org/) - An extracurricular program in the US teaching programming using LOGO-like language.
- CodeAcademy.com (http://www.CodeAcademy.com/) - Learn how to code - it's interactive, fun, and you can do it with your friends - for free.

## Articles/opinion pieces/trade bodies

### In the UK:

- http://royalsociety.org/education/policy/computing-in-schools/ - The Royal Society's Computing in Schools project
- http://securiously.wordpress.com/2011/09/09/do-we-really-need-to-teach-our-kids-to-code/ - Teaching the skills associated with programming rather than programming as an aim in itself.

### General:

- http://www.edutopia.org/programming-the-new-literacy - Programming is the new literacy
- http://bengoldacre.posterous.com/three-things-we-have-to-teach-in-schools - Ben Goldacre's list of "Three things we have to teach in schools"

- http://blog.jgc.org/2011/09/teach-our-kids-to-code.html
- http://www.osnews.com/story/6282 - An article on the command-line as a good interface for new users.

### Direct action

- http://epetitions.direct.gov.uk/petitions/15081 - A petition to the Department for Education about teaching programming in schools (UK only).

# References

| Raspberry Pi | |
|---|---|
| **Startup** | Model Wizard - Buying Guide - SD Card Setup - Basic Setup - Advanced Setup - Beginners Guide - Troubleshooting |
| **Hardware** | Hardware - Hardware History - Low-level peripherals - Expansion Boards |
| **Peripherals** | Screens - Cases - Other Peripherals |
| **Software** | Software - Distributions - Kernel - Performance - Programming - VideoCore APIs |
| **Projects** | Tutorials - Guides - Projects - Tasks - DataSheets - **Education** - Communities |

# RPi Community

From eLinux.org

Back to the Hub.

**Community Pages:**

*Tutorials - a list of tutorials. Learn by doing.*

*Guides - a list of informative guides. Make something useful.*

*Projects - a list of community projects. Help others out.*

*Tasks - for advanced users to collaborate on software tasks.*

## Contents



*Datasheets - a frambozenier.org documentation project.*

*Education - a place to share your group's project and find useful learning sites.*

***Community** - links to the community elsewhere on the web.*

*Games - all kinds of computer games.*

# About

The Raspberry Pi Community is steadily growing, so get involved where-ever you want to and share.

**Please do add links to any Raspberry Pi related forums/subforums/blog pages which focus on the RPi.**

**The more the community can connect with one another the better it will be.**

# Download Mirrors

Please add a link if you mirror official foundation download images. Please also remove the link when it's no longer available.

RPi Download Mirrors

# Raspberry Pi Community e-Magazine

The Mag Pi (http://www.themagpi.com/) (non-flash site (http://themagpi.wordpress.com/) )

```
- Issue 01 - May 2012 - Available NOW -
- Issue 02 - June 2012 - Available NOW -
- Issue 03 - July 2012 - Available NOW -
- Issue 04 - August 2012 - Available NOW -
- Issue 05 - September 2012 - Available NOW -
- Issue 06 - October 2012 - Available NOW -
```

The Pi User (http://www.thepiuser.co.uk)

Get involved!

Contribute and be part of the RPi Community Magazine - contact the site and join in.

# Forums

- Official Raspberry Pi Forum (http://www.raspberrypi.org/forum) - A great place to share ideas and get the latest information on the Raspberry Pi.
- Raspberrymod.com (http://www.raspberrymod.com/) - Boost your device, share ideas and knowledge, ask for help and find useful how to's.
- RaspberryPiForums.com (http://www.raspberrypiforums.com/) - - New Community forum intended to provide Guides and Tutorials for Raspberry Pi Users, and space for users to work on more complex projects.
- Frambozenbier (Raspberry Pi Homebrew) (http://www.frambozenbier.org/index.php/raspi-forum) - These forums are intended to provide practical information about Building, Developing and Sharing information about the Raspberry Pi, in addition to the more "general discussions" that go on in official forums.

- RasPi Forums on EduGeek.net (http://www.edugeek.net/forums/frambozenbier-raspi-forums/) - Edugeek is a site for Educational network and ICT admins. This is the dedicated Raspberry Pi sections.
- AmateurRadioPi.com Forums (http://amateurradiopi.com/forum) - A forum centered around discussing the interactions between Amateur (HAM) Radio and the Raspberry Pi.
- World Of Pi (http://www.worldofpi.com/) A forum based on all things Raspberry Pi ranging from basic usage through to programming and electronics/robotics.

# Blogs/News

- Russell Davis' Blog (http://russelldavis.org/) - Russell Davis (aka forum admin ukscone) includes posts about the story of the Raspberry Pi, general RPi stuff and other non-Rpi posts too.
- Pyrosoft Paul Maunders' Blog (http://www.pyrosoft.co.uk/blog/) - Paul Maunders, owner of beta board #8[1], provides details about the new board and its use.
- Arc Software Consultancy using the Raspberry Pi Blog (http://blogs.arcsoftwareconsultancy.com/pi/) - Blogging the experiences of the Arc Software team as they learn about, experiment with and develop software for the Raspberry Pi computer.
- Unofficial RPi blog by a software developer (http://www.raspberrypiblog.com/)
- ICS Raspberry Pi blog (http://raspberrypiblog.ics.com/)
- CNXSoft Blog Raspberry Pi (http://www.cnx-software.com/tag/raspberry-pi/) - Blog posts about the Raspberry Pi including news and how-tos.
- RaspberryProjects.com (http://www.raspberryprojects.com/) - mutli user blogging for all projects.
- AmateurRadioPi.com (http://amateurradiopi.com/) - A blog for documenting interactions between amateur radio and the Raspberry Pi.
- RasPi.tv (http://raspi.tv/) - Raspberry Pi information and videos - emphasis on comprehensive, foolproof instructions that new users can follow.
- ChezCummings' Blog (http://chezcummings.wordpress.com/category/computing/) - General Blog with a Raspberry Pi experience diary
- Joshua Poehls' Blog (http://zduck.com/) - General blog with Raspberry Pi specific articles.
- RPi-Blog.com (http://rpi-blog.com) - Blog with Raspberry Pi guides, tips, tricks, and resources
- Raspberry PiPod (http://raspberrypipod.blogspot.co.uk/) - Michael Horne's blog with details about various projects and experiences

# Distributions & Development Groups

The RPi without an operating system and software to run on it. Many of the groups involved have RPi specific sections and groups working on RPi specific releases and projects.

- Qt on Raspberry Pi (http://wiki.qt-project.org/Qt_RaspberryPi)

The goal of this project is to develop the required enablers for App and Platform Developers to enjoy Qt 5 after investing $35 in a Raspberry Pi board.

*See the RPi Distributions page for details about the various groups and links to places where you can get involved with building and using RPi Operating Systems.*

*See the RPi Programming page for details about the different programming languages and groups which are focusing on them.*

# Other Groups

- Facebook (https://www.facebook.com/pages/Raspberry-Pi/203296286406503?sk=wall)
- LinkedIn (http://www.linkedin.com/groups?about=&gid=4232349)
- Google Plus (https://plus.google.com/107182636490355951240/posts)
- *Raspberry Jams*

# Other Pages

- Educational links
- Conferences (http://www.raspberrypi.org/forum/general-discussion/conferences-and-other-public-appearances) (R.Pi Forum thread)
- Raspberry Projects (http://www.raspberrypprojects.com) Multi-User blog site for plans/projects
- RaspberryPi Download (http://www.raspberrypidownload.co.uk) Dedicated Raspberry Pi Mirror
- RaspberryPi Developers (https://rpi-developers.com/) Independent Forge site for RaspberryPi projects and development.
- Open Indie Project Dot Org (https://www.openindieproject.org) Non-profit organisation developing Open Source projects for use with the RaspberryPi

# References


1. ↑ http://www.pyrosoft.co.uk/blog/2012/01/13/raspberry-pi-8-first-photoshoot/


| Raspberry Pi | |
|---|---|
| **Startup** | Model Wizard - Buying Guide - SD Card Setup - Basic Setup - Advanced Setup - Beginners Guide - Troubleshooting |
| **Hardware** | Hardware - Hardware History - Low-level peripherals - Expansion Boards |
| **Peripherals** | Screens - Cases - Other Peripherals |
| **Software** | Software - Distributions - Kernel - Performance - Programming - VideoCore APIs |
| **Projects** | Tutorials - Guides - Projects - Tasks - DataSheets - Education - **Communities** |