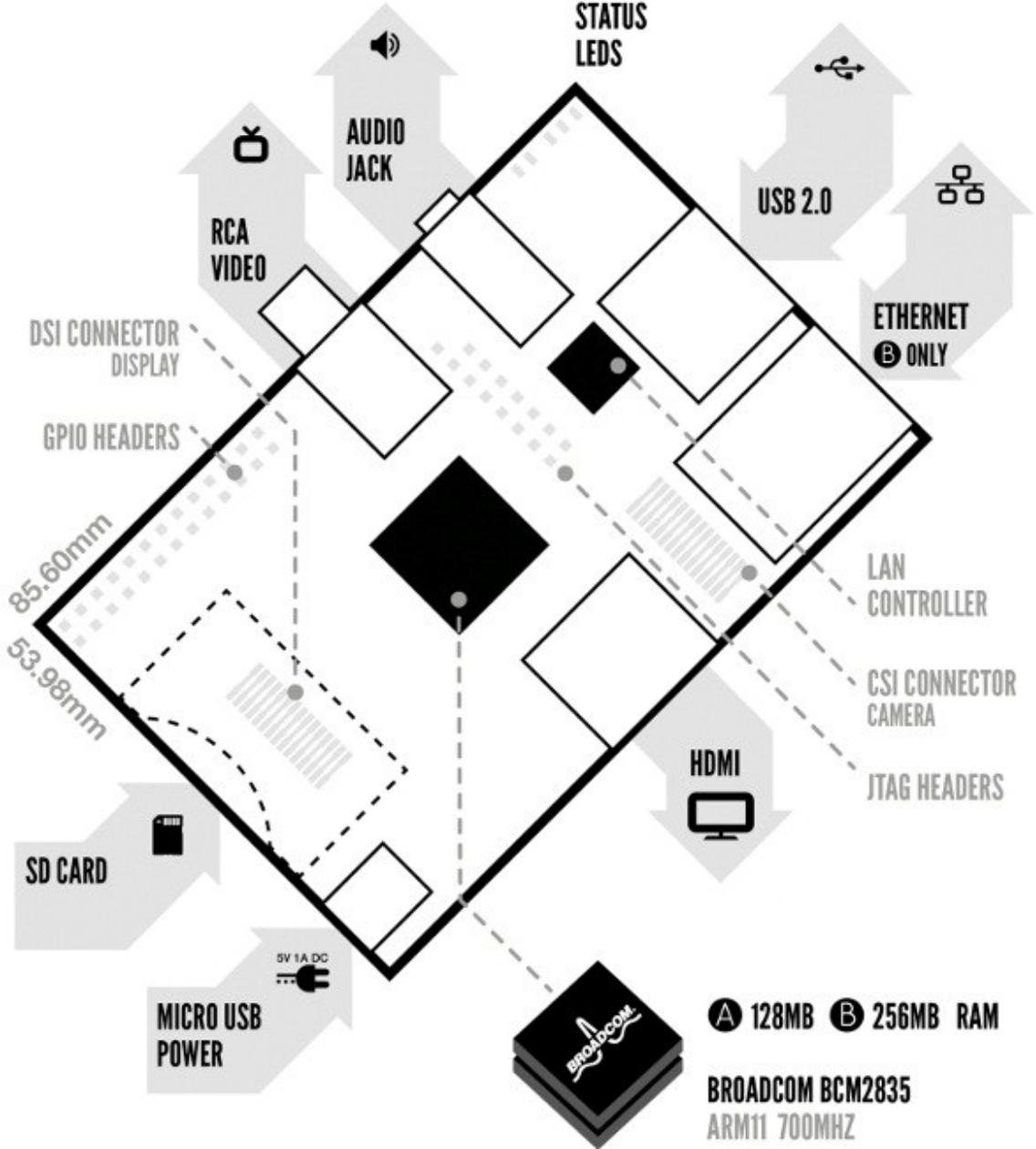




# Raspberry Pi

Model **A** **B**



# 1. Raspberry Pi Basic Hardware Setup

## 1.1. Extra Hardware You Will Need

The Raspberry Pi board contains a processor and graphics chip, program memory (RAM) and various interfaces and connectors for external devices. Some of these devices are essential, others are optional. RPi operates in the same way as a standard PC, requiring a keyboard for command entry, a display unit and a power supply.

It also requires 'mass-storage', but a hard disk drive of the type found in a typical PC is not really in keeping with the miniature size of RPi. Instead we will use an SD Flash memory card normally used in digital cameras, configured in such a way to 'look like' a hard drive to RPi's processor. RPi will 'boot' (load the Operating System into RAM) from this card in the same way as a PC 'boots up' into Windows from its hard disk.

The following are essential to get started:

- SD card containing Linux Operating system
- USB keyboard
- TV or monitor (with HDMI, DVI, Composite or SCART input)
- Power supply (see Section 1.6 below)
- Video cable to suit the TV or monitor used

Recommended optional extras include:

- USB mouse
- Internet connection, Model A or B: USB WiFi adaptor
- Internet connection, Model B only: LAN (Ethernet) cable
- Powered USB hub
- Case

## 1.2. Connecting Everything Together

1. Plug the preloaded SD Card into the RPi.
2. Plug the USB keyboard and mouse into the RPi, perhaps via a USB hub. Connect the Hub to power, if necessary.
3. Plug a video cable into the screen (TV or monitor) and into the RPi.
4. Plug your extras into the RPi (USB WiFi, Ethernet cable, external 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 supply into the mains socket.
7. With your screen on, plug the power supply into the RPi microUSB socket.
8. The RPi should boot up and display messages on the screen.

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 with the power turned off).

The RPi may take a long time to boot when powered-on for the first time, so be patient!

### 1.3. Operating System SD Card

As the RPi has no internal mass storage or built-in operating system it requires an SD card preloaded with a version of the Linux Operating System.

- You can create your own preloaded card using any suitable SD card (4GBytes or above) you have to hand. We suggest you use a new blank card to avoid arguments over lost pictures.
- Preloaded SD cards will be available from the RPi Shop.

### 1.4. 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 will need a Bluetooth USB dongle, which again uses a single port.

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

### 1.5. Display

There are two main connection options for the RPi display, *HDMI* (High Definition) and *Composite* (Standard Definition).

- HD TVs and many 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 HDMI, but does not support HDMI input.
- Older TVs can be connected using Composite video (a yellow-to-yellow RCA cable) or via SCART (using a Composite video to SCART adaptor). Both PAL and NTSC format TVs are supported.

When using a composite video connection, audio is available from the 3.5mm jack socket, and can be sent to your TV, headphones or 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.

**Note: There is no analogue VGA output available. This is the connection required by many computer monitors, apart from the latest ones. If you have a monitor with only a D-shaped plug containing 15 pins, then it is unsuitable.**

### 1.6. Power Supply

The unit is powered via the microUSB connector (only the power pins are connected, so it will not transfer data over this connection). A standard modern phone charger with a microUSB connector will do, providing it can supply at least **700mA at +5Vdc**. Check your power supply's ratings carefully. Suitable mains adaptors will be available from the RPi Shop and are recommended if you are unsure what to use.

**Note: The individual USB ports on a powered hub or a PC are usually rated to provide 500mA maximum. If you wish to use either of these as a power source then you will need a special cable which plugs into two ports providing a combined current capability of 1000mA.**

## 1.7. Cables

You will need one or more cables to connect up your RPi system.

- Video cable alternatives:
  - HDMI-A cable ◦ HDMI-A cable + DVI adapter ◦ Composite video cable
  - Composite video cable + SCART adaptor
- Audio cable (not needed if you use the HDMI video connection to a TV)
- Ethernet/LAN cable (Model B only)

## 1.8. Additional Peripherals

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

### 1.8.1. Internet Connectivity

This may be via an Ethernet/LAN cable (standard RJ45 connector) or a USB WiFi adaptor. The RPi Model B 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).

### 1.8.2. 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 recommended that a **powered** hub is used - this will provide any additional power to the devices without affecting the RPi itself.

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

### 1.8.3. 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.

### 1.8.4. Expansion & Low-Level Peripherals

If you plan on making use of the low-level interfaces available on the RPi, then ensure you have a suitable plug for the GPIO header pins.

Also if you have a particular low-level project in mind, then ensure you design-in suitable protection circuits to keep your RPi safe.